PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHTON

VOLUME 41

Published by the Society
WASHINGTON, D. C.
1939
ACTUAL DATE OF PUBLICATION OF VOLUME

January 27, 1939

Number 1— pages 1-31 inclusive
Number 2— pages 33-64 inclusive
Number 3— pages 65-96 inclusive
Number 4— pages 97-142 inclusive
Number 5— pages 143-182 inclusive
Number 6— pages 183-206 inclusive
Number 7— pages 207-230 inclusive
Number 8— pages 231-246 inclusive
Number 9—pages 247-270 inclusive

February 25, 1939

March

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J.

24,

1939

April 26, 1939

May 27, 1939
June 29, 1939
October 27, 1939
November 30, 1939
December 29, 1939

PRESS OF
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B.

McQueen,

Washington, D. C.

Inc.


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THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON
Organized March 12, 1884.

The regular meetings of the Society are held in the National Museum on the first Thursday of each month, from October to June, inclusive, at 8 p.m.

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ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

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DESCRIPTIONS OF NEW SPECIES OF MATSUCOCCUS (HEMIPTERA : COCCIDAE).

By Harold Morrison, Bureau of Entomology and Plant Quarantine.

The following preliminary descriptions of apparently new species belonging in the coccid genus Matsucoccus are published at this time in order to make the names available to economic workers concerned with some of these species, and in subsequent taxonomic and biological papers to make easier discussion of the various forms now recognized. It is hoped that the publication of these descriptions will stimulate entomological interest in the genus, since it now appears that it is widely distributed through the world on pine hosts, and probably includes several additional new species beyond those here and previously described. The relationship of some of these species is so close that excellent insect material of all the stages, in quantity, and much further study are needed for their proper characterization, and especially for the establishment of a basis for the accurate differentiation of the species in any stage in which they may be encountered. For a basic characterization of the genus and other details of structure and habit reference should be made to two papers by F. B. Herbert (Ent. Soc. Wash. Proc., vol. 21, n. 7, Oct. 1919, pp. 157–161, and vol. 23, n. 1, Jan. 1921, pp. 15–22), and for a discussion of the relationship of this genus to other coccids reference may be made to the paper by the present writer on the classification of the Margarodidae (U. S. Dept. Agr. Tech. Bull. 52, 1928, pp. 48–53).

The inconspicuousness of most of the members of this genus is really extraordinary, and on this account the securing of satisfactory study material usually demands painstaking and critical examination of supposedly infested host material. Therefore, there should be special mention of the careful work of Miss Louise M. Russell, of the Bureau of Entomology and Plant Quarantine, who recovered and prepared for study most of the specimens discussed in the following descriptions. She should in each case be given collector's credit for the material obtained as a result of her examination of herbarium specimens of the genus Pinus in the herbaria of the United States National Museum, of the Arnold Arboretum and the Gray Herbarium of
Harvard University, of the New York Botanical Garden, of Yale University, and of the Connecticut Agricultural Experiment Station. The type material of the new species here described is included in the National Collection of Coccidae.

Matsucoccus alabamæ, new species.

Occurring in cracks and crevices in the heavy bark of the host pine; adult female producing secretion at oviposition.

Adult female.—Relatively large; length, as mounted, 5.8 to 6.5 mm., width 1.9 to 2.5 mm. Parallel sided to very elongate ovoid. Membranous throughout. Antennae characteristic for the genus, the sixth to ninth segments inclusive each with a pair of stout sensory spines. Legs not unusual, the trochanters each normally with a single long seta. Mouth parts suggested only by a fold in the derm. Thoracic and the seven pairs of abdominal spiracles normal for the genus, the posterior abdominal slightly smaller than the anterior. With posterior apical cluster of 50 to 70 multilocular disk pores, and with bilocular tubular ducts scattered over body, clearly in segmental arrangement on the abdomen, the first and second complete bands behind the posterior legs each including around 30 such ducts; these tubular ducts in profile in their widest dimension showing the inner ends of the tubes plainly, although not prominently, swollen and lobate. Body setae all delicate and small, especially in relation to the body size, an average mid-dorsal seta about 7.5 μ, longest ventral about 16 μ, shortest in same transverse row about 10 μ; with 3 or 4 small intercoxal setae inside each coxa, longest perhaps 12 μ. Dorsal cicatrices not numerous, around 200 to 300 in 4 or 5 transverse clusters on posterior half of abdomen, size medium, but variable, 8–14 μ.

Intermediate female.—(Described from cast skins.) Probably normally globular if not subjected to pressure, broadly elliptical as mounted, 2.5 to 3 mm. long, 1.75 to 2 mm. wide, posterior apex broadly rounded. Derm somewhat sclerotized, showing a lightly areolate pattern in a broad band along body margin. Trachea entering thoracic spiracles on anterior face, abdominal on posterior side; all spiracles shallowly invaginated, the length of atrium to pore plate less than its diameter; tracheal entrance in thoracic spiracle enlarged into a conspicuous subatrium nearly as large in diameter as pore plate, a similar but less conspicuous subatrium present in each abdominal spiracle; abdominal spiracles plainly smaller than thoracic and gradually smaller from first to last, pore plates small, and especially so in relation to size of insect, thoracic with 17 to 22 small pores, anterior abdominal with about 10 pores, apical with 6 or 7.

Larva.*—Characteristic for the genus, without lobes or other unusual struc-

*Herbert (reference cited) and Howard L. McKenzie (in litt.) have indicated that in certain species of Matsucoccus the active larva which hatches from the egg molts to produce a second active larva, almost or entirely identical structurally with the one coming from the egg. Although many larvae have been examined in connection with the description of these new species, no definite evidence supporting this has been obtained and the larval descriptions here given consequently make no differentiation between two such stages.
tural modifications, each abdominal spiracle set at inner end of a tiny but
distinct sclerotized cup.

This new species has been described from three lots of speci-
mens collected on *Pinus* sp., at Calhoun, Ala., March 16 and 31,
and April 21, 1902, by A. M. Troyer, all presumably from the
same tree. According to notes made by Theo. Pergande at time
of receipt of specimens, the collector reported hundreds of
specimens on one pine tree. The original sending was said to
have included adult males, but specimens of these, unfortu-
nately, have not been located in the coccid collections.

The large size of the adult female of this insect, combined with
the presence of multilocular disk pores and of small setae only
in the ventral abdominal area is sufficient to isolate it in a group
including *vexillorum* and *californicus*. From the first it may be
distinguished by its somewhat larger size, distinctly fewer
dorsal cicatrices, and fewer tubular ducts anteriorly and in the
two bands just behind the posterior legs. It is extraordinarily
close to the second species, so close in all observed morphological
details, in fact, that if the representatives of the two species
came from adjacent localities and related hosts, the temptation
would be great to ascribe the observed differences to variation.
In the adult female the most obvious difference is in the shape of
the bilocular ducts, which are swollen at the inner ends, as
described above, in *alabamae*, but have practically straight
sides, although somewhat divergent toward the inner ends, in
*californicus*. These specimens from Alabama were erroneously
placed as *Matsucoccus matsumurae* Kuwana by the writer in
1928 (reference cited).

*Matsucoccus bisetosus*, new species.

Probably occurring on the heavy bark of the host trees in
crevices and cracks; adult female producing a mass of woolly
white threads at oviposition.

*Adult female.*—As mounted, elongate ovoid, broadest at or behind middle of
abdomen; length 3.25 to 5 mm., width 1.4 to 2.5 mm., depending in part on
amount of distension. Derm membranous throughout. Antennae character-
istic for genus, normally, apparently, with a single sensory spine on fifth seg-
ment, smaller than but similar to those in pairs on the remaining distal segments,
this spine sometimes not visible and perhaps detached or even wanting. Mouth
parts more or less developed. Legs about as usual for the genus, except the
trochanters, each of these normally bearing two long and relatively conspicuous
setae, instead of the single one usually found on this leg segment, these attaining
a length of from 68 to 90 μ. Spiracles not unusual, the thoracic conspicuously
larger than the abdominal, the anterior abdominal a little larger than the poster-
or. With multilocular disk pores at posterior apex of body, usually from 60 to
90 altogether, and with bilocular tubular ducts, present along body margins in small numbers on anterior portion and in transverse bands on abdomen, the first and second of these bands with from 30 to 50 such pores. Body setae fairly elongate, an average mid-dorsal about 7.6 μ, genital 11 to 13 μ, largest mid-ventral abdominal 30 to 41 μ, smallest (submarginal) ventral in same area 6 to 8 μ; each intercoxal cluster with 3 to 4 setae, the longest of these 35 to 45 μ. Dorsal cicatrices fairly numerous, in 5 to 7 recognizable transverse clusters, total present in material checked from 180 to 280, size range around 5 to 7 μ.

Intermediate female.—Stout, probably normally globular to stoutly elliptical, but usually distorted by pressure; diameter, as mounted, 1.7 to 2.5 mm. Lightly sclerotized, derm not exhibiting any evident pattern. Spiracles fairly large, tracheae entering on anterior edge of pore plate in thoracic and posterior edge in abdominal, as with other American species, but without traces of subatrium; thoracic and anterior abdominal spiracles about the same size, posterior abdominal gradually somewhat smaller; pore plates fairly large, showing evidence of an outer dark band. Not exhibiting any clearly defined protrusion, cleft, vertical septum, or other structural peculiarity at posterior apex of body.

Larva.—(Described from cast skins only.) Apparently characteristic for the genus, not exhibiting any marked structural peculiarities or any at present recognized as distinctive.

This insect has been described from material from the western part of the United States as follows: On Pinus ponderosa, near Willow Spring, Lassen National Forest, Calif., collected August 8, 1936, by F. C. Craighead (holotype and paratypes), and from Hat Creek, Lassen County, Calif., collected July 26 and August 23, 1938, by H. L. McKenzie (paratypes); on Pinus jeffreyi, Eagle Lake, Lassen National Forest, Calif., collected August 10, 1936, by K. A. Salman (paratypes).

Placed here also, although not included in the type series, are specimens obtained from samples of Pinus jeffreyi collected 1.2 miles north of Brockway, Calif., on May 18, 1934, by G. E. Paxton and G. H. Godfrey, and received through the Division of Forest Pathology of the Bureau of Plant Industry, and from Pinus ponderosa from Cleveland National Forest, Calif., July 23, 1934, from the same collectors and source, and, tentatively, specimens from under bark of Pinus ponderosa obtained from pine material collected at Monument, Colo., in the summer of 1935, by Carl Hartley.

Only a comparatively small amount of material of this species has been available for examination but the evidence from it suggests that the presence of two long setae on every trochanter in the adult female is definitely characteristic and that the presence of a single sensory spine on each fifth antennal segment in normal specimens may likewise be fairly distinctive. The adult female should be positively recognizable from these two characters in association with the other structural details covered in the description. Bisetose trochanters have been
observed in other species here described but only with great rarity, and thus far with no more than one to an individual, indicating clearly that the occurrence is one of minor abnormality.

*Matsucoccus californicus*, new species.

Occurring on the heavy bark of the host tree, in cracks and crevices; adult female producing a secreted ovisac at maturity.

*Adult female.*—Extraordinarily close to *alabamae*, differing positively, so far as now known, only in the shapes of the bilocular tubular ducts, these with the tubes in widest profile slightly and uniformly widened from outer to inner end, with sides straight in contrast to *alabamae* with its pores distinctly swollen and somewhat lobate at inner end. Body, as mounted, membranous throughout. Length 5 to 7 mm., width 1.5 to 2.5 mm., average toward the larger sizes. Antennae characteristic for genus, with pairs of sensory spines on the sixth to ninth segments inclusive. Legs characteristic for the genus, trochanters each with a single long seta, this about 80 μ long. Mouth parts more or less developed, but none observed fully so. Spiracles present in usual nine pairs, the thoracic distinctly larger than the abdominal, the anterior abdominal only a little larger than the posterior. With a few multilocular disk pores, probably usually around 50 to 60, at posterior apex of body and with bilocular tubular pores scattered over body, the two bands immediately behind posterior legs with only a few such pores, perhaps 25 or fewer in each. Derm setae small and slender, those anterior to genital area in the ventral abdominal area probably not exceeding 15 μ and usually 12 or 13 μ, with the shortest in the corresponding transverse row about 8 μ; intercoxal setae in clusters on derm ventrally inside coxal attachments likewise small and slender, probably not exceeding 13 μ. Dorsal cicatrices intermediate in size, 7.5 to 9.5 μ, usually in 3 or 4 short transverse bands on intermediate portion of dorsal surface of abdomen, probably normally totalling 150 to 200, sometimes fewer.

*Intermediate female.*—Corresponding to the adult female in its extraordinarily close resemblance to the intermediate stage of *alabamae*. Somewhat larger, cast skins as mounted reaching a length of 3.5 mm. and a width up to 2.6 mm., and the subtrarium in each of the abdominal spiracles somewhat less pronounced than in *alabamae*, but depth of atrium slight as in that species. Otherwise without tangible differences, so far as has been determined from the limited study material available for examination.

*Larva.*—Only fragments available, characteristic for the genus, differing from *alabamae* in that the anterior abdominal spiracles have very little sclerotized cup or ring around opening and are not invaginated, while the posterior ones show only moderate development of this sort. The sclerotization and invagination are more evident in all spiracles in *alabamae*.

This insect has been described from several specimens (holotype and paratypes) of the stages mentioned on *Pinus ponderosa* from Burgess Spring, Harvey Valley, Lassen National Forest, Calif., collected August 2, 1936, by K. A. Salman (36–10).
The close relationship between this species and *alabamae* has been indicated in the discussion of that species and in the preceding description. These two and *vexillorum* agree in having the setae in the transverse rows on the ventral surface of the abdomen of the adult female all slender, inconspicuous, and relatively short, although this characteristic is least pronounced in *vexillorum*.

*Matsucoccus degeneratus*, new species.

Occurring completely concealed till maturity between sheath and needles at base of needle bundle; tip of abdomen protruding at maturity.

*Adult female.*—As mounted, very elongate, broadest across anterior third of body, tapering uniformly to a narrow, deeply incised posterior end, length 4 to 5.25 mm., greatest width 1.4 to 1.5 mm. Derm membranous throughout. Antennae much reduced, only two or three definitely recognizable segments present, the apical with one relatively large and stout sensory seta at tip, the remaining setae short and stiff but apparently not of the sensory type. Eye spot present, small, circular, surrounded by a small sclerotized area. Legs represented by somewhat differentiated areas in derm, each bearing several setae of various sizes, and a rather slender, protruding claw. No traces of mouth parts. Spiracles not unusual, the thoracic plainly larger than the abdominal, the anterior four abdominal pairs larger than the posterior three, with each spiracle of this anterior group opening at the apex of a distinct, but not conspicuous, slightly sclerotized cone, but each of the posterior ones opening flush with the body surface and without plate or cone around opening. Body without multilocular disk or other derm pores, but with the generically characteristic short bilocular tubular ducts, these, however, very few in number, apparently confined to the posterior three abdominal segments. A few small to medium setae scattered over the body, the longest, in the pregenital ventral abdominal area, about 27 μ, the shortest here about 8.5 μ. Dorsal cicatrices of medium size, measured range 6.5 μ to 11 μ, average probably around 8 to 9 μ, in five or six rows, total around 243, each row extending around the body margin onto the ventral surface.

*Intermediate female.*—In early period, before final distension, small, about 1.5 to 1.75 mm. long and 0.8 mm. wide, usually elongate ovoid, with tendency toward formation of an almost acute posterior apex; later (cast skin) with anterior portion of body much elongated, appearance usually very elongate conical, mostly tapering nearly uniformly from head to tip of abdomen, or irregular, due to adjacent pressure, length then 4.5 to 5 mm., width up to 1.5 mm. Derm distinctly but not heavily sclerotized over most of surface. Each spiracle with its axis forming an acute angle with the surface on which it opens as in *fasciculennis* and *secretus*, and each pore plate appearing as if provided with a thicker outer band, as in *secretus*; spiracles maintaining approximately same spacing in early and late periods of development, the conspicuous late body
enlargement resulting almost entirely from a great elongation of that portion of body lying anterior to beak and anterior spiracles, and presumably designed both to provide room for the adult female and larvae and to force the posterior apex of the body into the open to assist the larvae in their emergence. Posterior apex of abdomen narrow and rounded, showing internally a plainly developed median vertical septum corresponding in position to the notch of the adult female, and externally a slight notch at the extreme tip of the body, this abdominal tip lost in cast skins, evidently due to need to provide emergence opening for larvae.

_Larva._—Apparently identical in appearance with the first-stage larva of *fasciculensis*; thus far no basis for differentiating this stage of these two species established.

This insect has been described from several specimens of the different stages, including holotype adult female and paratypes of this and other stages collected from _Pinus ponderosa_ twig blight samples obtained on Colcord Mountain, Tonto National Forest, Ariz., December 3, 1935, by R. W. Davidson of the Division of Forest Pathology, Bureau of Plant Industry (68832).

Although not included in the type series, specimens on _Pinus_ sp. from the mountains near Pachucha, Hidalgo, Mexico, collected by Louise M. Russell from herbarium material obtained June 1, 1899, by J. N. Rose, seem clearly to represent this species.

In the adult female stage this species is readily differentiated from all other known _Matsucoccus_, except _subdegeneratus_, by the elongated, posteriorly tapering shape and the conspicuous reduction of the antennae and especially of the legs. From _subdegeneratus_ it is distinguished by the greater reduction in legs and antennae as well as through the retention of a full set of abdominal spiracles and the development of the conspicuous cleft at the apex of the abdomen. The elongated, posteriorly tapering preadult cast skin seems to be distinctive in both these species, but _subdegeneratus_ appears to split vertically on the median line at its apex to permit larval emergence, so there is no loss of the apex of the abdomen as in _degeneratus_, and, of course, the differences in the abdominal spiracles parallel the condition in the adult female stages of the two species.

_Matsucoccus eduli_, new species.

Occurring frequently, and perhaps characteristically, deeply imbedded in the axils of small branches of the host, with presence indicated only by gum exudations; also present exposed in twig axils and in crevices caused by bark injuries.

_Adult female._—Elongate elliptical, head end narrowed somewhat more than posterior end. Of medium size, length as mounted around 4.5 mm., width around 2 mm. Derm membranous throughout. Antennae characteristic for
genus, sixth to ninth segments inclusive with pairs of stout sensory spines. Legs characteristic for genus, with only a single long seta on each trochanter. Mouth parts more or less completely developed. Spiracles not unusual. With a cluster of around 50 to 75 multilocular disk pores at posterior apex of body; bilocular tubular ducts present, in transverse rows on abdomen, around 30 in each of the two circles behind posterior legs, a similar row between posterior thoracic spiracles, a very few along margin anterior to this but the total on head and anterior thoracic segments greatly reduced to give impression of complete absence of pores in this area. Body setae fairly elongate but not conspicuous, those in the ventral rows anterior to genital area reaching a length of 45 μ, with the shortest here, near margin, about 9.5 μ, some of intercoxal setae also attaining length up to 45 μ. Dorsal cicatrices normally present in 6 rows, with a total of around 260 cicatrices, usual diameter around 7 to 7.5 μ.

Intermediate female.—Fully developed form or cast skin circular, flattened by pressure, around 2.5 mm. in diameter, posterior apex in properly oriented specimens exhibiting two short rounded lobes separated by a short median vertical cleft. Derm lightly sclerotized, not exhibiting any definite pattern. Spiracles placed close to surface. Atrium relatively very large, but shallow, pore plate of moderate size but relatively conspicuously pedicillate, each trachea opening into a large subatrium, of diameter approaching or even exceeding that of accompanying pore plate, this described spiracular condition most conspicuous in cast skins or fully matured intermediate females, thoracic spiracles largest, abdominal gradually smaller to apical.

Larva.—Characteristic for the genus but with the abdominal spiracles, except the first pair, each opening into a well developed, invaginated, sclerotized cup of relatively large diameter, so large that with the posterior spiracles the interspaces between cups appear shorter than the cup diameters.

This species has been described from a few adult and immature females from central and northern Arizona as follows: From typical Pinus edulis, collected along the Jerome-Flagstaff road about 10 miles east of Clemenceau, Ariz., April 27, 1936, by Harold Morrison (holotype and paratypes), the same, 11 miles, and the same, 15 miles, beyond Clemenceau; from typical Pinus edulis, collected along Lynx Creek road, near Black Canyon road, Prescott-National Forest, April 28, 1936, by Harold Morrison; from single-leaf form of Pinus edulis, collected along Copper Basin road, 5 miles south of Prescott, April 29, 1936, by Harold Morrison and H. G. West; another collection from the last locality, made May 9, 1936, by H. G. West; and another collection from the same locality (entrance to Copper Basin area) made February, 1937, by Jack N. Orr.

Although the adult female of this insect is not conspicuously differentiated from related species—it is probably closest morphologically to M. gallicolus—the spiracular characteristics of the intermediate female and first-stage larva, as described above, appear to be distinctive and should satisfactorily establish the identity of the species. Thus far it has been discovered
only on *Pinus edulis*, and it may prove that restriction to this host, or to it and the related *P. monophylla*, is likewise an acceptable distinctive characteristic. The complete burial of many individuals in the soft phloem tissue in the axils of the twigs is a curious adaptation, which may be an accidental one only, resulting from the rapid growth of the host tissue subsequent to the attachment of the first-stage larva, but it is evident from the injured condition of the plant tissue as it appears in split infested forks and from the gum exudations which signalize the presence of the *Matsucoccus* that definite damage can result from these infestations. It seems reasonable to suppose that critical survey work will greatly widen the known distribution of this species, since it has been found thus far wherever its host has been properly examined.

*Matsucoccus* gallicolus, new species.

Occurring during the growing stage in small pustule galls on the young twigs of the host pines; adult females usually emerging and migrating to oviposit.

*Adult female.*—As mounted, elongate, tapering slightly to a rounded posterior end and a somewhat sharper anterior end, of moderate size, but this varying appreciably; range in material examined, length 2 to 4.5 mm. (one, apparently abnormal, specimen 1.5 mm.), width 0.8 to 1.65 mm. (abnormal specimen 0.6 mm.). Membranous throughout. Antennae characteristic for genus, with pairs of sensory spines on segments 6 to 9 inclusive; legs characteristic for genus, with a single large trochanter seta, very rarely with a second such seta. Mouth parts wanting or more or less developed. Spiracles characteristic for genus, the seven abdominal pairs nearly equal in size. With multilocular disk derm pores at apex of abdomen, the number ranging from 13 to 31 in material tabulated, and with short tubular ducts, scattered over both surfaces of body, clearly in segmental rows in abdominal region. Body with the usual few small scattered setae, those in the mid-ventral area of the abdomen, however, fairly long—up to 42 μ in an average or large specimen—and much longer than the smallest seta (submarginal) in the corresponding row, which may be less than 9 μ in length. Dorsal cicatrices numerous, in from 5 to 10 rows across the intermediate abdominal segments, total number present ranging from about 150 to 350 with the average for material tabulated around 241; individual cicatrices small, ranging from 2.7 to 5 μ, with an average around 3.5 μ.

*Intermediate female.*—Quite distinctive in shape, presumably owing to effects of inclosure within the tissue of the host, appearing at maturity, or as a cast skin, as a flat conical, approximately circular disk having the tip of the body central at the apex of the disk and at the opening formed through the host bark when the second stage emerged from the first larva and penetrated the plant tissue. Diameter 1 to 1.6 mm. Derm moderately sclerotized and in the cast skin appearing irregularly wrinkled and roughened but without evident areolate or striate pattern. Spiracles small, the pore plates with comparatively few pores, the abdominal spiracles gradually smaller posteriorly and usually with
each spiracle of the posterior three pairs lying at the anterior end of a deep and often conspicuous groove in the derm.

_Larva._—Elliptical, small, length about 0.26 mm., width about 0.15 mm. Antennae comparatively short, terminal segment stout, abdominal spiracles without any traces of sclerotic collar, cup, or plate around opening of each. This stage otherwise paralleling the structural condition found normally in the larvae of the genus, but apparently unique in the molting method, since the second stage emerges through the ventral face of the larva and penetrates the host tissue directly beneath the larval skin.

Third and second stages, but no adults of the male series, have been located in material that has been available for study. The second-stage male closely resembles the same stage in the female series, differing only, perhaps, in the smaller number of pores in the spiracular pore plates in the male. The third-stage larvae are hardly satisfactory for study, but show the antennae stouter, the body size smaller, and the cicatrices and apical multilocular disk pores lacking as compared with the adult female.

The species as here recognized has a wide distribution through the pine areas of the Eastern States. The holotype female came from the farm of Mrs. E. Bethel about 6 miles from Stroudsburg, Pa., collected there on _Pinus rigida_ by E. C. Pyle, April, 1936, and this may be regarded as the type locality for the insect. In addition, however, specimens have been included in the para-type series that came from the following localities and hosts:


_Massachusetts:_ On _Pinus rigida_, collected by Louise M. Russell from pine samples in the Gray Herbarium, Harvard University, from Cataumet, October 26, 1913, M. L. Fernald, Eastham, May 30, 1913, F. S. Collins, and Sandwich, June 9, 1916, Fernald and Hunnewell, all from Barnstable County; from New Bedford, Bristol County, E. W. Hervey; from Needham, May 23, 1883, T. O. Fuller, and Norwood, May 31, 1897, E. F. Williams, both in Norfolk County; from Jamaica Plain, C. E. Faxon, in Suffolk County; additional Massachusetts specimens on _Pinus rigida_ come from Cape Cod, sent in to the Bureau of Entomology and Plant Quarantine on account of injury by Wm. Becker, November, 1935.


_Co nnecticut:_ On _Pinus rigida_, Chaplin, February 13, 1937, collected by R. C. Brown, Willamantic, June 7, 1937, collected by Thaddeus J. Parr; collected by Louise M. Russell on herbarium samples from Gastonburg, May, 1903, F. W. Starmer,
in the Yale University Herbarium, and from Stafford Springs, May 23, 1929, G. B. Clinton, in Connecticut Agricultural Experiment Station Herbarium.

**New York:** On *Pinus rigida*, collected by Louise M. Russell from pine samples in Gray Herbarium from West Fort Ann, May 27, 1896, S. H. Burnham, and from Southampton, Long Island, June, 1893, W. N. Clute, in New York Botanical Garden Herbarium; much additional material is included from collections made in August, October, and December, 1919, by J. F. Morton or L. C. Griffiths at Centerport, Long Island.

**New Jersey:** On *Pinus rigida*, Barnegat, from pine samples collected July 22, 1936, by R. R. Whitten, between Tom's River and Tuckerton, from pine samples collected February 18, 1937, by May, and from Millville, May 27, 1934, Adams and Thebes, collected by Louise M. Russell from herbarium samples in Arnold Arboretum Herbarium.

**Pennsylvania:** In addition to the holotype material, already cited (on *Pinus rigida*, farm of Mrs. Bethel, near Stroudsburg, Pa., collected April, 1936, by E. C. Pyle), the paratype material includes specimens collected at the same locality, July, 1936, by C. W. Collins, and July 24, 1936, by Harold Morrison; on the same host, collected at State Forest Park, Mont Alto, Pa., September, 1935, by J. C. Kase, July 26, 1936, by Harold Morrison, and January, 1937, by J. C. Kase; from Pond Bank Division, Mont Alto State Forest, March, 1937, J. C. Kase; on *Pinus echinata*, Mont Alto, Pa., January 30, 1937; from Pond Bank Division, Mont Alto State Forest, Pa., March, 1937, and on *Pinus ponderosa* (!), Sprow District near Renova, collected June, 1937, by J. C. Kase; specimens from herbarium material collected by L. M. Russell include examples on *Pinus rigida*, Delaware Water Gap, May, 1899, F. E. Floyd, New York Botanic Garden Herbarium; on *Pinus echinata*, Chester County, Rothrock collection, Arnold Arboretum Herbarium; and on *Pinus* sp., Wilkesbarre, April, 1903, E. Paddock, Gray Herbarium.

**Maryland:** Collected by Louise M. Russell on *Pinus taeda* from herbarium samples from Crisfield, September 4, 1924, G. M. Merrill, in Arnold Arboretum Herbarium, and from Pocomoke River, May 15, 1905, F. Hains, in U. S. National Herbarium; on *Pinus virginiana*, Elk Neck, Cecil County, June 4, 1923, W. L. Abbott, in Arnold Arboretum Herbarium.


**Virginia:** On *Pinus virginiana*, Franklin Park, East Falls Church, collected April 20, and August 11, 1936, by Ida Wecklerly; on *Pinus taeda*, collected from herbarium samples by
Louise M. Russell from material from Princess Anne County, May 9, 1898, T. H. Kearney, Jr., and from Cape Henry, October 17, 1909, I. Tidestrom, both in U. S. National Herbarium; and from *Pinus* sp. from 20 miles south of Richmond, April 28, 1933, G. P. Clinton, in Connecticut Agricultural Experiment Station Herbarium.


*Tennessee*: Collected from herbarium samples by Louise M. Russell on *Pinus echinata*, Campbell County, June 21, 1935, L. V. Cline, in Arnold Arboretum Herbarium.

*Missouri*: Collected from herbarium samples by Louise M. Russell, on *Pinus echinata*, north fork of White River, Ozark County, October 7, 1927, E. J. Palmer, Arnold Arboretum Herbarium.

*Ohio*: Collected from herbarium samples by Louise M. Russell on *Pinus rigida* from C.C.C. Camp Gordon, Shawnee State Forest, Scioto County, April 25, 1934, D. Demaree.

In the present state of our knowledge of *Matsucoccus*, positive recognition of this species rests almost entirely on the galling habit of the intermediate stage with its associated modification of the shape and orientation of the body of the insect. The adult female can be recognized with reasonable assurance through the combination of relatively small size, possession of a few apical multilocular disk pores, presence of relatively large and small setae in each of the transverse ventral rows in the abdominal region, presence of numerous small dorsal cicatrices in several rows, and presence of a single long seta on each trochanter. The complete absence of any sclerotic rim or plate around the flush abdominal spiracles in the first larva may prove to be distinctive, but this stage has not yet been studied with sufficient thoroughness to provide final opinion on this point. It is conceivable that this species might, in some cir-
cumstances, develop on the surface of the host twigs as do some of the others, and that there would be no body distortion under such conditions, but thus far no such externally developing specimens have been recognized in material that has been studied. There is decided variability in size, number of dorsal cicatrices, and other characters in the adult females of the material that has been included in the type series, but no sound basis for the establishment of added species or subordinate segregates has been observed. This is the insect which was figured and described (in part) by Herbert (reference cited) under the name _matsumurae._

**Matsucoccus paucicicatrices**, new species.

Occurring on the young twigs of the host trees, usually on the bark in the angle formed by the attachment of the needle bundle to the twig much as with _Matsucoccus vexillorum._

**Adult female.**—A small species, length up to 2.7 mm., width to 1.1 mm. but averaging a little smaller, as mounted, elongate ovoid, widest across the middle of the abdomen. Derm membranous throughout. Antennae characteristic for genus, the intermediate joints more deeply constricted than in some other species, and also differing from other known species having genital multilocular disk pores in having stout sensory spine pairs on the fifth to ninth segments inclusive. Legs characteristic for genus. Mouth parts more or less developed. Spiracles not unusual. With multilocular disk pores at posterior apex of body, but the number much reduced in comparison with other species, except _gallicolus_, observed range from 20 to 40; tubular ducts small, few, first complete band behind posterior legs with about 15 to 20 ducts, anterior portion of body with 1 to 4 such ducts on each margin of each segment, none through middle portion of body. Body setae actually small, but larger in relation to body size, longest ventral abdominal 20 to 27 μ; shortest in corresponding row 5 to 7.5 μ; setae inside each coxal attachment about same as longest ventral abdominal setae. Dorsal cicatrices small, 4.7 to 6.8 μ, circular to elliptical, and conspicuous because of their small number, showing only some 15 to 30 scattered over the dorsal middle portions of the posterior abdominal segments.

**Intermediate female.**—Small, probably normally stout elliptical, but almost invariably distorted by pressure; length up to 1.25 mm., width up to 0.8 mm.; derm definitely sclerotized over exposed portions but not exhibiting any evident pattern. Spiracles small, each placed at bottom of a short but distinct tube, pore plates with around 16 tiny pores and showing more or less obviously the heavier outer band or section so conspicuous in some other species; size somewhat variable, thoracic spiracles little if any larger than abdominal, except posterior, these usually but not invariably a little smaller; no traces of a subatrium, tracheae entering directly into edge of pore plate, on anterior edge in thoracic spiracles, on posterior in abdominal. Posterior apex of body protruding slightly from the uniform curve, showing a distinct, though shallow, vertical cleft with internal septum at extreme apex.
Larva.—Described from cast skins only.) Apparently characteristic for the genus; not exhibiting any recognized distinctive specific characteristics; with a very narrow sclerotized collar around each abdominal spiracle, these neither invaginated nor with intermediate marginal projections.

Male second stage.—Smaller than second-stage female, elliptical, spiracular pore plates smaller and with fewer pores.

Adult male.—Only a few fragments available, insufficient for description but suggesting that the stage is apterous, lacks the cluster of tubular ducts toward apex of abdomen, and has compound eyes somewhat reduced and irregularly facetted.

This species has been described from small quantities of material taken from several host pines and widely separated localities as follows: On Pinus lambertiana, Eight Mile, Yosemite National Park, Calif., collected June 27, 1936 (Hopkins U. S. 31905), and May 10, 1937 (Hopkins U. S. 32126), by G. R. Struble (holotype and paratypes); Sierra Nevada Mountains, Calif., collected by Louise M. Russell from herbarium material obtained by J. G. Lemmon in 1875; Galice District, Rogue River National Forest, Oreg., collected September, 1936, by R. L. Furness, and Siskiyou National Forest, Oreg., collected June 11, 1937, by R. L. Furness; on Pinus monticola, Chagoopa Plateau, Upper Kern River, Calif., collected June 20, 1923, by G. F. Ferris; on Pinus flexilis, Old Marias Pass (E. Slope), Montana, collected by Louise M. Russell from herbarium material obtained in August, 1882 or 1883 by C. S. Sargent, now in Arnold Arboretum Herbarium, and from Elk Mountain, Saratoga, Wyo., collected June 1, 1938, by D. DeLeon and C. L. Massey (Hopkins U. S. 31509–G); on Pinus sp., Rimrock Crater at the Palisades, Crater Lake National Park, Oreg., collected by Louise M. Russell from material in U. S. National Herbarium obtained September 14, 1902, by F. V. Coville.

The marked reduction in the number of dorsal cicatrices in the adult female, the presence of a pair of sensory spines on the fifth antennal segment, possibly a unique characteristic among the species having apical multilocular disk pores, and the small size of the adult and intermediate stages of this insect should make it definitely recognizable, especially when coupled with one of the indicated host associations, since these, so far as known, all belong to the white pine group of species.

Matsucoccus secretus, new species.

Occurring characteristically secreted deeply within the bundle sheath at the base of the needle bundle.

Adult female.—As mounted, membranous throughout, very elongate ovoid, broadest across posterior portion of abdomen, narrowed anteriorly, length up to 4.5 mm., greatest width up to 2 mm. Antennae characteristic for genus, length
up to 0.8 mm., segments from fifth to ninth inclusive bearing pairs of heavy sensory setae. Legs characteristic for the genus, length of posterior up to 1.25 mm., each trochanter with a single large subapical ventral seta. Thoracic and the seven pairs of abdominal spiracles characteristic for genus. Without multilocular disk pores at the posterior apex of the body as in some species, the generically characteristic bilocular tubular ducts present, but apparently confined to the margins and the posterior apical portions of the abdomen. With some small setae scattered over both surfaces of body, obviously in segmental arrangement on abdomen, and in addition with a few conspicuously enlarged setae, near coxae on thorax, in mid-section of each segment on abdomen, those on abdomen attaining a length up to 75 μ, with the smallest in the same row not over 10 μ. Dorsal cicatrices numerous, apparently, from the limited material available for study, varying considerably in numbers, maximum probably totaling around 770 in 10 rows, large, diameter ranging from 15 to 23 μ with the average probably around 20 μ.

Intermediate female.—(Described from cast skin.) Probably stout elliptical to ovoid, distorted by pressure, much smaller than adult, perhaps never much more than 2.25 mm. long. Cast skin lightly sclerotized, pale brown, surface appearing smooth, neither striated nor marked off into areolate patterns by color differences. Framework of mouth parts large and conspicuous. Spiracles present in the normal two thoracic and seven abdominal pairs, all large, the posterior abdominal somewhat smaller than the thoracic, tube of each set at an acute angle with the plane of the surface surrounding its opening, each tube short, tracheal tube entering thoracic spiracles on anterior curve of bottom, but on posterior curve in all abdominal spiracles; pore plates deep, giving impression, when viewed from above, of small inner lighter area surrounded by a heavier band.

Larva.—Mostly characteristic for the genus, but with antennae more elongate and slimmer than in many other species and differing from all thus far discovered in having the last four pairs of abdominal spiracles opening at the apices of conspicuous protruding digitate membranous tubercles, with much smaller marginal protruding membranous tubercles similar to those of fasiciculensis interposed between these and between the anterior nontuberculate spiracles.

Male second larva.—(Described from cast skin.) Readily distinguished from the corresponding female stage by its more slender shape and somewhat smaller size, length less than 2 mm., width about 0.9 mm. Spiracular structure as in the female larva.

Male third larva.—Length about 2.25 mm., membranous throughout, similar in appearance to adult female except for size, lack of dorsal cicatrices, and stouter individual antennal segments. No other male stages available for study.

This species has been secured from a number of different localities in the western part of the United States, suggesting a wide distribution, and always from Pinus ponderosa. Detailed localities included in the type material are Colorado, Monument, summer of 1935, collected from pine samples obtained in the field by Carl Hartley (holotype adult female and paratypes of all described stages); Colorado Springs, from pine samples
collected in field March 27, 1936, by J. A. Beal (larvae), and Black Forest, north of Colorado Springs, from pine samples collected in field May 16, 1936, by C. R. Donaldson (larva); New Mexico, Policia Canyon, Santa Fe National Forest, from pine samples collected in field, May 28, 1936, by W. H. Long and V. O. Sandberg (larva and second stage); Arizona, Rose Creek, Tonto National Forest, collected from pine samples obtained in field December 3 and 4, 1935, by R. W. Davidson (68831) (larva), same, Indian Garden Ranger Station, December 3, 1935 (68830), Oak Creek, Coconino National Forest, from pine samples collected in field by R. W. Davidson (68828) (larval skin and intermediate female), north of Flagstaff, collected from pine samples obtained in field November 30, 1935, by R. W. Davidson (larval skin and intermediate female), Prescott National Forest, several localities including Copper Basin, from pine samples collected in field March 11, March 31, April 8, and April 16, 1936, by Forest Pathology (larva), Iron Springs, from pine samples collected in field March 18, 1936, by Forest Pathology (larvae) and April, 1937, by J. C. Nave, Forest Supervisor (larval skin and intermediate female), Lynx Creek, C.C.C Camp, from pine samples collected in field November 29, 1935 (68746) (larva and intermediate female), by R. W. Davidson and May 10, 1936 (adult female), by Harold Morrison, Peterson Area, from pine samples collected in field November 29, 1935 (larval skins, intermediate female), by R. W. Davidson, and February 17, 1936, by Forest Pathology.

Additional specimens not included in the type material are from Nevada, near Reno, collected by Louise M. Russell from herbarium pine samples obtained in field September 20, 1910, by A. A. Heller (U. S. National Herbarium 309663) (adult female); California, near Willow Springs, Lassen Nat. Forest, from pine samples, collected in field by F. C. Craighead (adult female, larva); and Mexico, San Jose Mountains, Sonora, collected by Louise M. Russell from herbarium material obtained in field August 3, 1893, by E. A. Mearns (No. 1591) (U. S. National Herbarium 231329) (larva), and Chihuahua, collected by Louise M. Russell from herbarium material obtained in field June 3, 1908, by E. Palmer (Nos. 329 and 330) (U. S. National Herbarium 573795 and 573796) (this material labeled Pinus sp.) (larval skin, second-stage female).

This species is very closely related to fasciculensis Herbert, differing conspicuously only in the first larval stage, and here only in the four protruding posterior abdominal pairs of spiracles. Both species have the anterior spiracles set at the bottom of a large cup, but the posterior ones of fasciculensis are likewise so placed, and both species have the protruding tubercles between the spiracles. The adult females apparently may be separated by the large number of dorsal cicatrices (probably at
east 450 or usually more) and the longer enlarged ventral abdominal setae (around 70 μ) in *secretus* in contrast to the fewer cicatrices (probably not over 300) and shorter enlarged setae (probably not over 50 μ) of *fasciculensis*. No satisfactory basis has developed as yet for the separation of the intermediate stages of the two species.

**Matsucoccus subdegeneratus**, new species.

Occurring imbedded in sheath around base of needle.

*Adult female.*—As mounted, very elongate, slender, tapering toward tip, length 5 mm., width of anterior portion of body 1 mm., of posterior portion of abdomen 0.5 mm. Membranous throughout. Antennae located near anterior apex of body, close together, somewhat reduced, apparently 6- or 7-segmented, but condition obscured in specimen studied, stout sensory setae present on the three apical segments at least, segments not departing evidently from the characteristic *Matsucoccus* type. Eye spot small, placed close to antennal base on each side. Legs strongly reduced, total length about 90 to 100 μ. No trace of mouth parts. Thoracic spiracles apparently characteristic for the genus; abdominal spiracles obscure, poorly developed, only three pairs through middle section of abdomen clearly observed. No multilocular disk pores at posterior end of abdomen or elsewhere; a few of the generically characteristic bilocular tubular ducts at posterior apex of abdomen, apparently lacking elsewhere. With a few small setae scattered over body both dorsally and ventrally and with some pairs of longer ones ventrally in the thoracic region. Dorsal cicatrices intermediate in size, from 7 to 10.5 μ in diameter, not abundant, about 216 in 4 transverse rows and an apical cluster at posterior end of abdomen as follows: 5 (anterior), 25, 64, 72, about 50 (apical), the ends of the last two rows and the apical cluster extending on to the ventral side of their abdominal segments.

*Intermediate female.*—(Described from cast skin only.) About 3.5 mm. long, elongate, largest at anterior end and tapering to a slender abdominal tip, color of cast skin very dark brown, almost blackish, much of its surface densely transversely striate. Two pairs of normally developed thoracic spiracles and three pairs of normally developed abdominal spiracles, all with axis of tube parallel to longitudinal axis of body and hence with opening forming an acute angle with this axis, tracheal tube in each entering bottom of spiracle on the morphologically posterior side of the pore plate; four additional recognizable pairs of abdominal spiracles behind the three normal pairs, but all these greatly reduced, tiny and almost structureless.

This species has been described from a single mounted adult female and its cast preadult skin collected by Louise M. Russell from an herbarium sample of *Pinus occidentalis (cubensis)* in the Arnold Arboretum Herbarium. The plant material was collected at Moncion, Monte Cristi Province, Dominican Republic, October, 1929, by E. J. Valeur (252). It may be differentiated easily from all other known *Matsucoccus* by the reduction in number of abdominal spiracles in both adult and preadult stages.
and more obviously by the partial reduction of the antennae and legs in the adult females. It seems clearly to be most nearly related to *degeneratus*, which it closely resembles in shape and habitus.

**Matsucoccus vexillorum**, new species.

Normally occurring during the growing stage on the twigs of the host, characteristically wedged into the angle formed by twig and needle bundle; often with three or four at each such point and the area involved, when infestation is heavy, extending over 2 or 3 years' growth and into injured areas of the older bark. Adult females emerging from the preadult stage and migrating to the tips of the twigs or to roughened areas in the bark for oviposition, secreting a mass of shining fluffy wax threads at posterior apex of abdomen, this gradually invaginating as the eggs are laid.

**Adult female.**—As mounted, elongate ovoid, broadest across the posterior part of the abdomen, to almost parallel sided, with rounded ends; distended length, as mounted, around 4 to 5 mm., width 1.5 to 2 mm. Membranous throughout. Antennae 9-segmented, normal for the genus, the terminal segment fairly elongate, a pair of stout sensory spines on segments 6 to 9 inclusive. Legs characteristic for the genus, normally a single stout seta on each trochanter. Mouth parts usually wanting, the area represented by a folded or wrinkled area in the derrm, rarely more or less developed even to the point of appearing normal, with styles, and possibly functional. Spiracles present in the normal two thoracic and seven abdominal pairs, the posterior abdominal gradually smaller. Derm with a cluster of multilocular disk pores at posterior body apex, numbering around 70 to 80, number of loculi to the pore from 10 to 14; in addition with the generically characteristic conspicuous bilocular ducts in transverse segmental rows across both surfaces of the body, the two complete circles immediately behind the posterior legs each including 50 to 60 ducts. Body setae all small and in fact very small for size of body, maximum (in ventral abdominal area) probably not exceeding 18 μ and usually less, the size ratio between largest and smallest setae in the posterior ventral abdominal rows rarely exceeding 3 : 1 and usually less, and sometimes as little as 2 : 1. Dorsal cicatrices numerous, from 400 to 800 or perhaps even more but mostly around 600 to 700, usually in 6 or 7 transverse rows, but the number of such rows ranging from 5 to 8, size small, mostly around 5 μ diameter, but exhibiting an observed range of 3.6 to 9 μ.

**Intermediate female.**—(Described from cast skin.) Tending toward a globular form, but almost invariably distorted owing to pressure of adjacent plant material; length around 2 mm., but varying considerably, the variation in part due also to effects of compression. Exposed portions of body definitely and relatively rather strongly sclerotized, protected portions less affected, some portions showing a fairly distinct areolated pattern. With the usual two pairs of thoracic and seven pairs of abdominal spiracles, the tracheae entering the
anterior curve of the bottom of the thoracic spiracles and the posterior curve of the abdominal spiracles; pore plates not showing a conspicuous double-thickness band as in secretus, for example, but with numerous small pores (around 25 in thoracic and 18 in anterior abdominal spiracles); apex of body characteristically terminating in a short, conical, almost cauda-like extension.

Larva.—Showing no unusual features, length of recently hatched larva 400 μ, width 155 μ, length of antenna 84 μ. Spiracles in 9 pairs, minute, the two thoracic appearing distinctly smaller than the abdominal owing to presence of a small but distinct, cup-shaped, invaginated, sclerotized area around each abdominal spiracle.

Adult male.—Adhering very closely to the appearance characteristic of the genus as typified by the male of matsumurae, the only male previously described. Setae in dorsal cluster on prothorax and abdominal segments longer and more numerous; possibly some slight but characteristic differences in the shapes of the internal apodemes of meso- and metathorax.

Male third larva.—Much smaller than female, length about 1.7 mm., width 0.42 mm.; membranous throughout, antennae, legs, and spiracles much as in adult female, the antennal segments stouter, each showing somewhat less pronounced basal constriction; body without disk pores or cicatrices, with tubular ducts scattered, not numerous, most abundant in cephalic area. Ventral abdominal setae attaining a maximum length of about 17 μ.

Male second larva.—More elongate in shape than corresponding stage of female, length around 1.3 mm., width around 0.9 mm., moderately sclerotized, the exposed portions more heavily so, much of derm exhibiting a fairly distinct areolate pattern. Spiracles as in corresponding female stage, but smaller and with fewer pores in plates, thoracic with about 16, first abdominal with about the same; apical projecting cone quite evident.

A relatively large amount of material of this species has been available for examination. The host in all collections is Pinus ponderosa. The holotype adult female was selected from specimens collected from pine samples obtained in the Copper Basin Area, Prescott National Forest, near Prescott, Ariz., March 11, 1936, by Forest Pathology. Paratype specimens of the various stages described come from host samples from the following sources: Arizona, Prescott National Forest, Copper Basin area, pine samples collected February 17, March 11, 15, 24, 27, and 31, and April 8 and 16, 1936, by Forest Pathology; junction Copper Basin, Paradise Valley Roads, samples February 17, 1938, by Forest Pathology; Groom Creek area, samples March 19, 1936, by Forest Pathology; Iron Springs area, samples March 18, 1936, by Forest Pathology, February, 1937, by J. N. Orr, and March and April, 1937, by J. C. Nave, Forest Supervisor; Lynx Creek Area, near C.C.C. Camp, April 30, and May 8 and 10, 1936, specimens collected by Harold Morrison; November 15, 1936, sample material collected by J. N. Orr; April, 1937, samples collected by J. C. Nave; above Walker, collected May 9, 1936, by H. G. West; Peterson area, host sample collected.
February 17, 1936, by Forest Pathology; junction Senator and Upper Groom Creek Roads, samples taken February 17, 1936, by Forest Pathology; Thumb Butte Area, samples taken March 18, 1936, by Forest Pathology; Prescott National Forest without closer placing, from pathological samples collected June, 1934, by Carl Hartley, May 24, 1935 (Hopk. U. S. 21189), and April 11, 1937, by J. M. Miller, and January 25, and February, 1937, by Cleveland; Coconino National Forest, Baker's Butte, specimens collected May 8, 1936, by Morrison and West; New Mexico, Mimbares Area, Gila National Forest, from pine samples collected February 21, 1936, by W. H. Long and V. O. Sandberg, and Policia Canyon, Santa Fe National Forest, collected May 28, 1936, by Long and Sandberg.

The insect pretty certainly occurs outside the limits indicated by the above listed distribution records, but no careful collecting of satisfactory study specimens has been undertaken in adjacent regions.

The name applied has been given at the desire of Dr. F. C. Craighead in order to signalize the present belief that this insect is associated with the conspicuous type of injury to the small branches of ponderosa pine in the Southwest which has been given the name "flagging" by field workers who have studied it.

This species associates fairly clearly with alabamae and californicus, the adult female resembling them in having actually and proportionately small setae only in the mid-ventral area of the posterior abdominal segments. It is somewhat smaller than either of these species and has many more bilocular tubular ducts in the two circles around the abdomen posterior to the hind pair of legs and over the entire anterior portion of the body, and many more dorsal cicatrices.

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SOIL CONSERVATION VERSUS INSECT CONTROL.

By Kenton L. Harris.

With the publication of the 1938 United States Department of Agriculture Yearbook concerned with the immediate national importance of soil rebuilding and maintenance, and the possibility of a cooperative study of the relationship between entomological problems and erosion control now proposed by the United States Department of Agriculture, there is brought to light the importance of detrimental results arising from certain insect control practices. The possibility that control measures may have undesirable effects and so prove harmful to food production and consumption has always faced the economic entomologist. Recently this effect has been broadened by the
realization that some insect control has shown itself to be contrary to soil conservation. This is the result when clean culture is made either a supplementary or obligatory recommendation, running counter to the demands of soil conservation.

While numerous publications written for the guidance of crop producers often advise clean culture (7, 8, 11, 18), including even the burning of crop residues, such drastic measures may not appear sensible to the far-seeing conservationist (1, 4, 15, 30) or to the actual grower and entomologist. (20, 26, 27) Now more than ever, the soil erosion problem in its enormous complexity is being met with varying degrees of success making the use of certain cultural practices precarious, while the necessity for adequate insect control is as essential as ever. Compulsory clean-up laws for corn were even in effect in one State (3).

It is possible to control many insect species purely through the use of chemicals, and, as demonstrated by the accumulation of lead and arsenic in apple growing regions of the Pacific Northwest, this in itself presents a cultural problem. There are hundreds of types of insects against which cultural measures play an important part. An obvious example is that of the codling moth against which the spray schedule is reinforced by the destruction of windfalls, packing shed and dry-yard sanitation, banding, and weed and refuse elimination. (10) In this case, the otherwise useless fruit may be fed to livestock, buried, or destroyed (8) so that with the exception of the recommendation for weed and refuse elimination there is no greater loss than the labor involved. It is this latter practice that is at odds with soil conservation methods for it suggests clean culture. Further: with western armyworms and cutworms “clean culture and thorough plowing of infested fields to kill the hibernating pupae in the cells is supposed to reduce the next year’s broods.” (8) Walton (26) has suggested, along with other recommendations, more timely cultural methods of control throughout the United States east of the Rocky Mountains, suggesting that land that is likely to contain cutworms should be plowed in mid-summer or early fall about the time the eggs are laid, or better before the eggs are laid. ** The earlier the preceding year grasslands to be planted to corn are plowed, the less will be the probability that the cutworm moths will have laid their eggs thereon. ** Quoting from Essig and Hoskins: the control of the Hessian fly contains recommendations for “deep plowing under of stubble immediately after harvest, summer fallow or a rotation of crops.” (8) Walton and Packard (27) recognize the necessity of both preventatives in “keeping the pest from attacking young wheat in the fall, and increasing the vigor of the young plants” by proper soil preparation, moisture conservation,
use of good seed, soil enrichment, and correct sowing date. For preventive measures they give late sowing, crop rotation, plowing under of stubble, and destruction of volunteer wheat. Hinds and Osterberger's (14) recommendations for the control of the sugar-cane borer in Louisiana include cutting the cane to the ground level or below during harvest, cleaning up the corn and cane stalks after harvest, and burning cane top trash. Similar control measures are practiced for such insects of greater or lesser importance as the harlequin cabbage bug, chinch bug, Mexican bean beetle, the sorghum worm, etc. (12, 29)

Cultural control methods are the only practical means available to control wireworms (8, 13, 17, 24), and, as applied here, clean culture, summer fallow, flooding, crop rotation and plowing are often markedly adverse to soil building. In addition, a recent suggestion to grow wheat in the Pacific Northwest in such a manner as to actually dry out the soil (25) may start a chain of consequences with unexpectedly harmful results.

As stated in Metcalf and Flint: "Crop rotations are by far the best, and in some cases almost the only, means we have of controlling certain insects. *** The importance of farm practices on insect control is demonstrated by the effect on the infestations of the Hessian fly on early and late seedings of wheat" (18) and similarly by the early planting and harvesting of cotton which boll weevil control necessitates. Control of the sweetpotato weevil includes recommendations for a crop rotation requiring clean cultivation, clean harvest and burning of vines. (5) "In some sections *** where the European corn borer is well established, it has become necessary to practice plowing under, or destruction by burning *** of all crop residues and weeds remaining in the fields. *** Deep, thorough, and frequent cultivation of fields infested by the corn root aphid and its attendant ant is the best method of freeing the soil of these insects. Some species of insects that go through a part of their development in the ground can be easily killed if the soil is tilled while they are in their pupal cells; the plum curculio is an example." (18) But while the plowing up of grasshopper eggs in the breeding areas as a reliable means of preventing invasions is now recognized as being precarious in some localities because of soil drifting, the whole subject of land conservation in respect to grasshopper egg control must be considered and egg destruction is recommended where practical. (21)

Almost all insect control demands the removal of certain plants and plant products. For example, cultural practices considered valuable for freeing cotton from the flower thrips include clean culture throughout the year and growing as far removed from cover crops as possible. (28) Clean culture also induces water runoff, removing topsoil and reducing water
absorption. It does not permit the maximum amount of soil building. Accompanied by the burning which is still erroneously practiced, not only is the foregoing true but the humus and the plants that could build the soil are destroyed. Burning has even been practiced for grasshopper control. In regard to burning one authority has stated that “burning harvest debris on the surface of the field has proved to be an effective method of killing weevils in shattered peas.* * * However since burning is contrary to good soil conservation practices, it is not recommended except as a last resort.” (16)

Varieties of plants resistant to insect infestation may be susceptible to drought or may reduce yield and so further complicate the disharmony which exists in crop production between soil and pest control needs. So that we find in many control schedules a well rounded soil depletion program and the country at large is being pushed to the realization of the soil’s needs. Not that insect control measures are the largest items in contributing to soil depletion but they do play an appreciable part.

But to combine an insect reducing, soil building, and economically profitable rotation into one, calls for a cautious selection of plants and planting seasons, and usually one phase must suffer. To-day, in certain areas comprising the Texas and Oklahoma panhandles and adjacent regions “wind erosion control must center around the maintenance of a good cover of vegetation, continuous on range lands and during critical periods on cropland. * * * Another sound rule is not to destroy protective crop residues until there is sufficient moisture to start the next crop.” (15) Stubble or stalks left on the field are a very definite aid in holding the soil against the wind, and the root systems tie the soil together. “Obviously, if crop residues are destroyed * * * the soil has less protection * * *.” (23)

It becomes a necessity in many areas to keep the soil covered by this means or by a strip crop or even retire badly eroded lands to trees or grass. Water conservation with dams, terraces, contour ridges, and their accompanying vegetation must be practiced. (1, 4, 30) And yet with all of these necessities for soil conservation, insect control demands that the soil be left bare at intervals with quickly growing crops, clean harvesting, and adjusted planting schedules.

However, there are some cases where soil conservation and entomological control measures are identical. “The beet leafhopper and curly top can be controlled provided that all lands not continuously farmed and well farmed can be restored to and maintained as good desert range. The measures proposed for the accomplishment of this are similar to those contemplated or now under way for purposes of land conservation and differ only in the results sought for.” (22) Decidedly detrimental recommendations can sometimes be worked into more satis-
factory methods. (19) The increase of insect population by practices like strip cropping may cause more damage than is off-set by erosion and water control advantages. The grasshoppers, cutworms, armyworms, white grubs, etc., and their grassland ecology is scarcely known. Grasshoppers may turn into greater permanent menaces than over-grazing or improper cropping. (31)

For the two to meet on common ground will probably depend upon advances from the entomologist’s side, for the soil’s demands are fairly rigid. Table I tabulates the contrasting soil conserving and insect controlling features. Whether modifications to harmonize the two will come from natural control, new insecticides, resistant plant varieties, or from an entirely new aspect developed from joint conferences between entomologists and soil technologists is questionable, but with the apparent insecticide resistance building up in some species the problem is not a simple one.

**Table 1.**

<table>
<thead>
<tr>
<th>Soil Conservation</th>
<th>Pest Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep covered by a growing crop or residue from a crop; use cover crops.</td>
<td>Plow and leave bare and exposed; use quick growing clean harvest crops.</td>
</tr>
<tr>
<td>Adjusted crop rotations for correct land use.</td>
<td>Adjusted crop rotations for reduction of insect populations.</td>
</tr>
<tr>
<td>Strip cropping: leave foliage in gullies, fence rows, etc.</td>
<td>Clean culture; elimination of over-wintering, breeding, feeding areas.</td>
</tr>
<tr>
<td>Retirement of badly eroded lands to trees or grass.</td>
<td>Elimination of such areas close to growing crops.</td>
</tr>
<tr>
<td>Water conservation with ponds, dams, contour ridges.</td>
<td>Pests harmful to man and animals breed in such water.</td>
</tr>
<tr>
<td>Green manuring; soil improvement with crop residues.</td>
<td>Burn over lands.</td>
</tr>
<tr>
<td>Use of drought-resistant varieties.</td>
<td>Use of insect resistant varieties.</td>
</tr>
<tr>
<td>Use plants that maintain cover and protection.</td>
<td>Dry farm to starve and dry out insects.</td>
</tr>
</tbody>
</table>
Bibliography.


A NEW ANOBIID BEETLE FROM OREGON.

By W. S. Fisher,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In the course of rearrangement of the United States National Museum material in the family Anobiidae a number of specimens were found that appeared to be quite different from others which had been identified as Xestobium elegans (Horn). From the original description of that species, however, it was impossible to decide which of the two forms was the one described by Horn (1894) as Xestobium elegans and for which Fall (1905) erected the genus Utobium.

While in Philadelphia recently the writer compared specimens with the type of elegans in the Horn collection and determined which of the two forms mentioned is actually that species. The other is described below as new.

Utobium marmoratum, new species.

Elongate, strongly convex, blackish-brown, legs and antennae slightly paler, body clothed above with short, inconspicuous, brownish-black hairs, and marmorated with longer whitish and brownish-yellow hairs.

Head finely, densely granulose, rather densely, irregularly clothed with rather long, recumbent, whitish hairs, with two more or less distinct elongate spots on vertex and a transverse spot on front sparsely clothed with short brownish-black hairs. Antenna about one-third as long as the body; first segment robust,
slightly longer than wide; second similar but much smaller; third and fourth
narrow, the former slightly longer than fourth; fifth and seventh elongate-
triangular, each twice as long and twice as wide as the fourth; sixth and eighth
triangular, as wide as long; ninth and tenth similar but not quite so triangular
as the seventh; eleventh longer and slightly narrower than the tenth.

Pronotum one-fourth wider than long, slightly narrower at apex than at
base; sides feebly, arcuately rounded; base broadly, arcuately rounded; surface
strongly convex, slightly flattened at the sides, densely granulose, rather densely,
irregularly clothed with long, recumbent, whitish hairs at the sides, and with
numerous areas clothed with inconspicuous brownish hairs on the median part.

Elytra slightly wider at base than, and three times as long as pronotum,
widest at apical third; surface densely, finely granulose, rather densely clothed
with short, recumbent, inconspicuous, brownish-black hairs, and marmonated
with longer, recumbent, whitish and brownish-yellow hairs, the whitish hairs
forming more or less distinct spots on basal and apical thirds, and smaller spots
along sutural margins at middle, and the brownish-yellow hairs predominating
basally, near apices, and along sutural margins.

Body beneath densely, finely punctate, rather densely clothed with moderately
long, recumbent, whitish pubescence, which does not entirely conceal the surface.

Length 5.5–7 mm.; width 2.5–3 mm.

Type locality.—Crater Lake, Oregon.
Type and paratypes.—No. 53111, United States National Museum.

Described from 8 specimens (one type). The type and 6
paratypes collected at the type locality, May 9, 1930, by
W. J. Buckhorn, together with larvae and pupae under the
bark and in the wood of dead lodgepole pine (Pinus contorta
Loudon), which had been killed by Dendroctonus monticolae
Hopkins; and one paratype collected at the same locality
during August, 1935, by J. S. Brode.

This species resembles Utobium elegans (Horn) very closely,
but it differs from that species in having the elytra ornamented
with brownish-yellow pubescence, with dark brown areas more
conspicuous, and with only a few small spots of white pubes-
cence. The pubescent markings on the elytra are slightly
variable.

Utobium elegans (Horn) was described from specimens col-
lected by Morrison in western Nevada, and is represented in the
National collection from the following localities:
Utah: Brightons, July 19 (Hubbard and Schwarz). Michigan:
Marquette, June 16; White Fish Point, Lake Superior (Hubbard
and Schwarz). Wyoming: Big Horn Mountains, July 15, 1896
Mines, July 21, 1903, collected on snow at an altitude of 7,000
feet (R. P. Currie).
REPORT OF THE TREASURER FOR THE YEAR 1938.

Although the year 1938 has been a prosperous one financially for our Society, receipts and expenditures were both less than in 1937, when a record was made for the sale of back numbers of the Proceedings. Receipts from the sale of back numbers in 1938 were $196.16 less than in 1937. However, collections in the form of current dues and initiation fees were considerably increased in 1938. A tabular summary of receipts and expenditures for the calendar year 1938 is here given:

**Receipts.**

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<td>Cash on hand (Jan. 1, 1938)</td>
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<td>From members, dues for 1938</td>
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<td>back dues</td>
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<td>initiation fees</td>
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<td>From subscribers, for subscription to Proceedings</td>
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<td>From authors, for separates and authors’ copies</td>
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<td>for entire cost of articles</td>
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<td>exchange and donated literature</td>
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<td>From miscellaneous sources</td>
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<td><strong>Net receipts</strong></td>
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**Expenditures**

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<td>To H. L. and J. B. McQueen, Inc., for printing Proceedings</td>
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<td>(nos. 1-9 of Vol. 40) and separates</td>
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<td>To H. L. and J. B. McQueen, Inc., for printing programs of meetings</td>
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<td>To Southern Engraving Co. for engravings</td>
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<td>For clerical help, Office of Corresponding Secretary</td>
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<td>For rent, 1938, of safe deposit box at The City Bank</td>
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<td>For refreshments, June picnic</td>
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<td>Miscellaneous expenses</td>
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<td><strong>Total expenditures for 1938</strong></td>
<td><strong>$1,863.63</strong></td>
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<td>Receipts from sale of three complete sets of Proceedings transferred</td>
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<td>to publication fund</td>
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<td>Cash on hand (Jan. 1, 1939)</td>
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<td>Outstanding obligations</td>
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<td><strong>Total</strong></td>
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**Publication Fund.**

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<td>Total in publication fund</td>
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Respectfully submitted,

H. E. Ewing,
*Treasurer.*

---

**REPORT OF THE AUDITING COMMITTEE OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON FOR THE YEAR 1938.**

On January 7, 1939, the Committee examined the Treasurer's financial accounts and found them correct for the year 1938.

Respectfully submitted,

E. C. Cushing,
C. M. Packard.
*Auditing Committee.*
REPORT OF THE CORRESPONDING SECRETARY OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON FOR
THE CALENDAR YEAR 1938 (TO DECEMBER 1,
1938.

The Corresponding Secretary submits the following summarized report, pertaining to the duties of his office, for the calendar year 1938, up to and including December 1, 1938:

Correspondence:
Approximately 500 letters and other communications have been handled.

Reserve publications:
Statement of the inventory and sales of Proceedings and Reprints:

Proceedings.
1. Copies of Proceedings on hand January 1, 1938 ................................... 31,461
2. Copies of Proceedings acquired during 1938 ........................................ 470
3. Copies of Proceedings available (total of 1 and 2) ................................. 31,931
4. Copies of Proceedings sold during 1938 ............................................. 1,188
5. Copies of Proceedings on hand .......................................................... 30,743

Reprints.
1. Reprinted articles on hand January 1, 1938 ........................................ 472
2. Total copies reprints available January 1 ........................................... 13,987
3. Copies reprints sold during 1938 ....................................................... 14
4. Copies reprints on hand ....................................................................... 13,973

Sales of Proceedings and Reprints.
1. Total number of sales ........................................................................... 39
2. Total number of complete sets sold ..................................................... 3
3. Additional orders exceeding $20.00 net value ..................................... 6
4. Total net value of sales ......................................................................... $454.65

Members and Subscribers:

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<th>1935</th>
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<th>Gain</th>
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<td>210</td>
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<td>37*</td>
<td>Plus 32*</td>
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<tr>
<td>Subscribers</td>
<td>121</td>
<td>111</td>
<td>120</td>
<td>124</td>
<td>0</td>
<td>4</td>
<td>Plus 4</td>
</tr>
</tbody>
</table>

* Includes one reinstatement and one member elected at the December, 1937, meeting.

Two members were lost through death during the current calendar year and the resignations of three members were accepted.

Respectfully submitted,

D. J. Caffrey,
Corresponding Secretary.
MINUTES OF THE 496TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 496th meeting of the Society was held Thursday, December 1, 1938, in Room 43 of the National Museum. President Back called the meeting to order at 8 p. m.; 83 members and 55 visitors signed the attendance list for a total of 138. About 10 additional persons were present. The report of the previous meeting was read and approved.

The following members of the Bureau of Entomology and Plant Quarantine, Washington, D. C., were elected to membership in the Society:

B. M. Gaddis, Division of Domestic Plant Quarantines.
L. A. Hawkins, Division of Control Investigations.
L. B. Reed, Division of Truck Crops and Garden Insect Investigations.
R. G. Richmond, Division of Domestic Plant Quarantines.

The following report, to December 1, 1938, was submitted by the Corresponding Secretary, D. J. Caffrey: [See Corresponding Secretary's Report.]

A preliminary report was submitted by the Treasurer, H. E. Ewing; a final report will be published separately.

The following talks comprised the regular program of the meeting:

1. Here and there with the Bureau of Entomology and Plant Quarantine, L. A. Strong.
2. The place of basic research in the Bureau. P. N. Annand.
3. Application of the results of basic research in the Bureau. S. A. Rohwer.
4. Insect control operations conducted by the Bureau. A. S. Hoyt.

The nominating committee, composed of R. A. Cushman, Carl Heinrich, U. C. Loftin, E. C. Cushing and J. S. Wade, submitted, through their chairman, Mr. Cushman, the following nominations for 1939:

President........................................... R. E. Snodgrass
First Vice-President................................. Lee A. Strong
Second Vice-President............................... C. F. W. Muesebeck
Recording Secretary............................... Ashley B. Gurney
Corresponding Secretary.......................... D. J. Caffrey
Treasurer........................................... H. E. Ewing
Editor............................................... W. R. Walton
Executive Committee............................... E. A. Back

To represent the Society as Vice-President of the Washington Academy of Sciences.................. Austin H. Clark

It was unanimously voted to elect the officers as nominated.

Adjournment at 9.45 p. m.

Ashley B. Gurney,
Recording Secretary.

Actual date of publication, January 27, 1939.
ANNOUNCEMENT

Prices for back volumes and single numbers of the Proceedings of the Entomological Society of Washington are as follows, until further notice:

<table>
<thead>
<tr>
<th>Volume Range</th>
<th>Price per Volume</th>
<th>Price per Number</th>
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</thead>
<tbody>
<tr>
<td>Vols. 1-19</td>
<td>$2.00</td>
<td>$.50</td>
</tr>
<tr>
<td>Vols. 20-40</td>
<td>$4.00</td>
<td>$.50</td>
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</table>

**Complete sets, Vols. 1-40 (1884-1938) Inclusive**  $113.00

Double numbers: (per double no.) .50

These include Nos. 2-3 of Vol. 7; Nos. 1-2 and 3-4 of Vol. 8; Nos. 1-2 and 3-4 of Vol. 10; Nos. 7-8 of Vol. 24; Nos. 5-6 and 7-8 of Vol. 25 and Nos. 8-9 of Vol. 36.

*Note:* Nos. 1-4 of Vol. 9 and Nos. 1-4 of Vol. 19 (each of which were issued under one cover) are available only as complete volumes. Per volume 2.00

A classified list of available separates of articles which have appeared in the Proceedings will be furnished upon request.

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Domestic shipments prepaid, foreign shipments f. o. b. Washington.

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(Make checks, drafts, etc. payable to the Entomological Society of Washington.)

---

D. J. CAFFREY,
Corresponding Secretary,
*Address: Bureau of Entomology and Plant Quarantine,*
*Washington, D. C.*
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</tbody>
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THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON
Organized March 12, 1884.

The regular meetings of the Society are held in the National Museum on the first Thursday of each month, from October to June, inclusive, at 8 P. M.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the Proceedings and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1939.

Honorary President ...................................... L. O. Howard
President .................................................... R. E. Snodgrass
First Vice-President ...................................... Lee A. Strong
Second Vice-President .................................... C. F. W. Meusebeck
Recording Secretary ...................................... Ashley B. Gurney
Corresponding Secretary ................................ D. J. Caffrey
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ENTOMOLOGICAL SOCIETY OF WASHINGTON.

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A REVIEW OF THE GENUS SCAPHOIDEUS.

By Dwight M. DeLong,
The Ohio State University, Columbus, Ohio.

The Genus Scaphoideus was erected by Uhler in 1889 (1) to include one species, immistus, already described as *Jassus* by Say, and three others, intricatus, jucundus and consors, which Uhler described at that time. *S.* immistus Say was cited as the logotype. Although several species were later described by different authors it was not until 1900 that Osborn (2) published the first synoptic treatment of the species of the genus. A second, supplemental treatment, was published (3) in 1911 by the same author. In 1932 (4) Ball described several new genera from *Scaphoideus* and described some new species of this genus. He erected at that time the Genera Sanctanus, Prescottia, Osbornellus and Portanus.

Although external morphological characters are of very little value in separating the species of the genus, no attempt had been made to use the internal characters as a basis of specific identification until 1936 (5) (6) when Mohr, Berry, and the author described several species on the basis of studies of the male genitalia.

The present treatment is a result of these studies together with examination of available type material and recent examination of material from several sources.

Bibliography.

(3) Osborn, Herbert. Ohio Nat. 11: 249-260. 1911.

The Genus *Scaphoideus* apparently comprises three rather distinct groups if we arrange the species in respect to the general type of male genital structures. The first group, subgenus *Lonenus*, is represented by a single species, *intricatus*, which is characterized by long, rather narrow plates, *styles*
with long narrow attenuated apices, and by the dorsal portion of the oedagus which is distinctive in type as compared with the other species of the genus. *Cypris* Ball may belong to this group also, but specimens have not been available for study and its position can not be definitely determined.

A second group, the subgenus *Angenus*, represented by *immistus*, is composed of some thirty described species. This group is characterized by species which possess male plates narrowed but slightly apically, and their apices are broadly rounded. Within the group which is thus designated by the male plates are two rather distinct subgroups based upon the character of the dorsal portion of the oedagus. In one group represented by *immistus* and its allies, the dorsal portion of the oedagus is composed of a long, slender basal portion terminating with a pair of short processes which are usually slightly separated. The other group, represented by *opalinus* and its allies, has a dorsal oedagus process which is shorter, more inflated or bulbous and terminates with a pair of processes which are more widely separated. The anterior process in several species is only a pointed tooth. In the *immistus* group the ventral process is long and slender or may be broadened throughout or at various parts of the process. Also the apical portion may be variously curved, pointed, or enlarged. In the *opalinus* group the ventral portion is usually short and rather narrow. The length may vary with the species.

A third group, the subgenus *Latenus* (the *productus-carinatus* series), is composed of some sixteen species. In 1932 Ball in his discussion of the Genus *Scaphoideus* divided the species of the genus into three groups on the basis of face color. This classification does not agree with either the type of male plates or the type of oedagus presented by the various species, and apparently does not show relationships among the group. Furthermore, Ball placed *carinatus* and *major*—the latter of which he termed *magnus*—as synonyms with *productus*, stating it was “apparently a single very large and distinct species.” Recent studies have indicated that these three species are apparently distinct, and several others only recently named were also confused with them because of similar external appearance.

This latter group (*Latenus*) is characterized by rather short broad plates which are tapered to bluntly pointed or sharply angled apices. Several species of this group are distinct in external and internal characters. *Carinatus* is characterized by a broad oedagus connective and abruptly narrowed male plates. *Chelus* is distinctive by having broad chelate oedagus tips. *Major* and *densus* have short, blunt male plates and straight oedagi. *Cylindrus*, *transcuss*, *veterator*, and *elongatus* have rather long plates compared to the other allied species, while *bifurcatus* has a unique central bifurcate oedagus structure.
Nigricans is characterized by a short vertex and distinctive black markings, and ochraceous, paludosus, and baculus are orange or reddish orange in color.

The following key, together with the accompanying illustrations, should be of assistance in the identification of most of the species of the genus.

The following species have been omitted from the key:
S. productus Osborn. The female type has been examined but no male has been examined which seems to be this species. The female has a very distinctly produced and keeled segment and is apparently a distinct form.

S. cyprinus Ball is apparently closely related to intricatus and for many years was confused with that species by Dr. Ball in his own collection.

S. atlanticus Ball has not been examined. It is larger than immistus and has the appearance of Osbornellus auronitens. It is known from a single holotype male.

S. titanus Ball, described as a variety of immistus, has not been examined.

S. incisus Osborn. The type specimens have been observed and the males which seem to belong with the females are examples of minor. It seems, therefore, that the females are variations of female specimens of minor.

I am indebted to Professor Herbert Osborn for the opportunity of examining the large number of type specimens in his collection and to Dr. R. H. Beamer who has kindly lent from the Kansas Collection paratypes of inundatus Ball, littoralis Ball and "compared with type" specimens of trinitatus Ball. Dr. Carl O. Mohr, Illinois Natural History Survey, has very kindly assisted in the preparation of the illustrations.

Synonymy.

A study of the types has indicated that inundatus Ball is a synonym of immistus Say and that brevidens DeLong and Mohr is a synonym of littoralis Ball.

Key to Species of Scaphoideus.

1 Male plates almost as long as pygofer, reaching to tip of anal tube, long, narrow, gradually tapered to bluntly pointed apices (Subgenus Lonenus) .............................................................. intricatus.

11 Male plates much shorter, not reaching anal tube .......................................................... 2.

2 (1) Male plates only slightly narrowed apically, apex broadly rounded, species usually small, narrow, not exceeding 6 mm. in length. (Subgenus Angenus) .............................................................. 3.

21 Male plates broad at base gradually narrowed to inner margin, apex bluntly or sharply angled, species usually larger, robust, exceeding 6 mm. in length. (Subgenus Latenus) ......................................................... 24.
3 (2) Dorsal process of male oedagus in lateral view with a long slender basal portion, bifurcate at apex, ventral portion usually much longer than dorsal ........................................... 4.
3\(^1\) Dorsal process of male oedagus shorter, more inflated or bulbous, usually with a pair of small terminal processes, ventral portion shorter than or only slightly exceeding dorsal process ....................... 19.
4 (3) Claval area of elytra brown, almost unicolorous, veins inconspicuous, without spots or pale areas .......................................................... 5.
4\(^1\) Claval areas of elytra spotted or with pale areas, veins conspicuous .......... 6.
5 (4) Male oedagus in lateral view broadened at apex and directed dorsally .......................................................... latatus.
5\(^1\) Male oedagus narrower, pointed at apex and curved slightly ventrally .......................................................... cincerosus.
6 (4\(^1\)) Appearing transversely banded, elytra to almost apex of clavus milk white faintly marked with brown. A dark brownish band across apex of clavus, apices of elytra smoky ......................... obtusus.
6\(^1\) Elytra not distinctly banded, entirely pale or mottled ........................ 7.
7 (6\(^1\)) Elytra pale in color, veins dark, dorsal portion of oedagus with a median tooth between anterior and posterior terminal processes. Ventral portion in lateral view broadened on apical half. Apex curved ventrally and pointed .......................................................... immistus.
7\(^1\) Elytra darker in color or with darker markings, without median apical tooth on dorsal portion of oedagus ........................................... 8.
8 (7\(^1\)) Ventral process of oedagus narrow tapered at apex .................... 9.
8\(^1\) Ventral process of oedagus broader or enlarged at apex or both .......... 10.
9 (8) Ventral oedagus process narrow throughout its length, apex gently curved ventrally .......................................................... immistus.
9\(^1\) Ventral oedagus process enlarged at base of dorsal process, tapered to slender apex, which is strongly curved ventrally ...................... camurus.
10 (8\(^1\)) Face pale in color, often marked with dark arcs above .......... 11.
10\(^1\) Face black or smoky bordered with brown or black, dark arcs sometimes concealed by coloration or arcs pale .................... 15.
11 (10) Vertex sharply angled, transverse band on vertex, two on pro-
notum and one on anterior margin of scutellum dark brown (known only from Arizona) .......................................................... triunata.
11\(^1\) Vertex bluntly angled, band on vertex some shade of red or orange, pronotum not distinctly banded ........................................... 12.
12 (11\(^1\)) Male oedagus enlarged just before bluntly pointed apex .......... auctus.
12\(^1\) Male oedagus not enlarged at apex ........................................... 13.
13 (12) Male oedagus in lateral view broad throughout, apex broad, abruptly rounded to ventral pointed tooth .................................. crassus.
13\(^1\) Male oedagus narrower on apical two-thirds, decidedly broadened at junction of dorsal process, apex more narrowed ....................... 14.
14 (13\(^1\)) Male pygofer truncate at apex, oedagus slightly curved down-
wardly at apex ............................................................................ curvatus.
14\(^1\) Male pygofer rounded at apex, oedagus one-fourth longer, more narrowed at apex .......................................................... dilatus.
15 (10) Face entirely black with a small white spot just below apex, without arcs........................................... melanotus.
15 Face smoky to brown with conspicuous arcs on upper portion..............16.
16 (15) Elytra rather uniformly dark in color, scutellum conspicuously pale, dark only in basal angles.........................................................17.
16 Elytra with numerous pale markings or areas, scutellum with dark markings other than on basal angles..................................................18.
17 (16) Male oedagus with ventral portion enlarged at junction of dorsal process and again at apex, which is curved ventrally and bluntly pointed.............................................................. pullus.
17 Ventral portion of male oedagus almost uniform in size throughout, slightly narrowed on upper surface just before apex, which is obliquely sloping to ventral blunt apex........................................... sensibilis.
18 (16') Pygofer blunt, broadly rounded, ventral portion of male oedagus almost uniform in size throughout, apical portion curved ventrally, apex truncate with a pointed ventral projection..........flexus.
18 Pygofer more elongate, bluntly pointed, ventral portion of male oedagus narrowed on median half, apex obliquely sloping with a pointed tooth on upper margin and an elongate, more acutely pointed ventral apex............................................................... radix.
19 (3') Face black or dark brown with pale arcs beneath vertex margin, dorsal portion of oedagus constricted just before divergent apical processes............................................................... nigrellus.
19 Face pale, often conspicuously yellow with dark arcs...............................20.
20 (19') Entire dorsal surface pale with veins of elytra dark and a few dark markings on elytra, apex of elytra brown or smoky................. opalinus.
20 Darker in color, brownish or heavily marked with brown..........................21.
21 (20') Vertex and scutellum conspicuously light, faintly marked, elytra dark brown to black, white commissural spot conspicuous, ventral portion of oedagus very short........................................... scelestus.
21 Vertex and scutellum darker or more heavily marked, commissural spot on elytra not conspicuously white, ventral portion of oedagus longer..................................................................................22.
22 (21') Vertex marked with a narrow and faint transverse band, dorsal portion of oedagus gradually broadened to apex, which has a posterior curved finger process........................................... amplus.
22 Vertex marked with a wider and darker transverse band, dorsal portion of oedagus more abruptly widened at base and with an anterior and posterior tooth or fingerlike process at apex.........................23.
23 (22') Ventral oedagus process not as long as dorsal process, apex of pygofer rounded................................................................. littoralis.
23 Ventral oedagus process longer than dorsal process. Apex of pygofer more pointed................................................................. diutius.
24 (21') Orange yellow or orange red in color................................................25.
24' Some shade of brown marked with dark brown or black..........................27.
25 (24) Smaller, not exceeding 5 mm. in length, vertex almost uniform orange yellow, without median transverse band, margin white with a black marginal line above and another below.................. baculus.
25 Larger, more than 6 mm, in length. Vertex white to yellow with an orange transverse band............................................26.
26 (25) Transverse band with a strongly produced tooth at middle, marginal brown line broad and often interrupted at middle. Apex of elytra narrowly black margined (northern in distribution). *ochraceous.*
26† Vertex more strongly produced, transverse band only slightly produced at middle, marginal line very narrow, apices of elytra broadly black (known only from Florida). *paludosus.*
27 (24) Oedagus of male with a median process which bears a pair of laterally divergent processes at ventral apex ..................*bifurcatus.*
27† Oedagus of male with a pair of processes but without median process bearing divergent processes..................................28.
28 (27†) Male pygofer unusually long, narrowed and rather sharply pointed apically..................................................29.
28† Male pygofer normally produced, rounded or truncated ..................30.
29 (28) Male oedagus in ventral view with broad processes which bear large chelate-like processes at apices ..........................*chelus.*
29† Male oedagus in ventral view with processes which taper to form long, slender, apically curved structures which cross each other...........*elongatus.*
30 (28†) Male oedagus in lateral view with basal portion decidedly wider than apical portion.............................................31.
30† Male oedagus in lateral view with basal portion not wider than apical portion..........................................................32.
31 (30) Male plates distinctly constricted near apices and produced as rather broad, tooth-like apical processes, apical portions of oedagus tapered and recurved...........................................*carinatus.*
31† Male plates gradually tapered to bluntly pointed apices; oedagus concavely curved at middle, then apical portion convexly curved, tapered, crossed and directed laterally ..................................*frisoni.*
32 (30†) Apical processes of male oedagus in ventral view appearing flat, about the same width throughout, evenly curved, rather abruptly narrowed to pointed apices..............................................33.
32† Apical processes of male oedagus in ventral view unevenly curved or gradually tapered to more acutely pointed apices or both ........34.
33 (32) Size smaller, 6 mm., oedagus processes more narrowed, marginal stripe on vertex narrow, broken at middle..................*augustatus.*
33† Size larger, 6.5 mm. or more, oedagus processes slightly widened just before being abruptly narrowed at apex. Marginal stripe on vertex broken at middle and widened, almost forming a spot either side..........................................................*merus.*
34 (32†) Apices of ventral processes of male oedagus in ventral view long, slender, crossing, tips directed laterally ..................35.
34† Apices of ventral processes of male oedagus blunt, or if acutely pointed directed caudally and not crossed at apex................38.
35 (34†) Vertex bluntly angled, almost rounded, heavily marked with black, transverse band of vertex black ...........*nigricans.*
35\textsuperscript{1} Vertex more strongly produced, marked with brown, transverse band on vertex some shade of red or orange. ..........................36.

36 (35\textsuperscript{1}) Male oedagus concavely narrowed either side, causing it to appear constricted at middle. .............................................\textit{teterator}.

36\textsuperscript{1} Male oedagus not concavely narrowed on outer margin at middle........37.

37 Male oedagus widened near base in ventral view, gradually tapering to long slender apex.................................\textit{transicus}.

37\textsuperscript{1} Basal two-thirds of male oedagus about the same width in ventral view, apical third gradually tapering...........................................\textit{torquus}.

38 (34\textsuperscript{1}) Male oedagus with ventral processes in ventral aspect unevenly curved, apices bluntly pointed, male plates long and narrowed..............\textit{cylindratus}.

39\textsuperscript{1} Ventral processes of male oedagus rather evenly curved, apices acutely pointed, male plates shorter and broader........................39.

39\textsuperscript{1} Ventral processes of oedagus enlarged on inner margins about one-third the distance from apex, outer margins straight..............40.

40 (39) Ventral portion of oedagus one-half longer than connectives.
Dorsal oedagus process broad at base and with short, thick apical portion which is rounded at apex and bears a conspicuous dorsal spine.............................................\textit{minor}.

40\textsuperscript{1} Ventral portion of oedagus only slightly longer than connectives.
Dorsal oedagus process semicircular tapered to apex, which is blunt, slightly enlarged and bearing a small dorsal spine..............\textit{major}.

\textbf{Scaphoideus rubranotum, n. sp.}

Resembling \textit{carinatus} in general size and form, but paler in color, markings less intense and with anterior margin of pronotum and disc of scutellum marked with red spots. Length 7.5 mm.

Vertex bluntly angularly produced one-half its length before anterior margins of eyes, slightly wider between eyes than median length.

Color, vertex with a heavy black band just above margin between ocelli and a transverse brown line extending between ocelli with a small tooth produced anteriorly at middle. Pronotum pale brown, anterior margin marked with large red spots. Scutellum with a pair of round red spots on disc, a longitudinal white line either side. Elytra gray to pale brown, veins narrowly marked with brown. Apex of elytra brown. Face with heavy black arcs.

Genitalia: Female last ventral segment keeled at middle, roundedly produced.

Holotype female and paratype female from Ithaca, N. Y., July 9, 1904, in author's collection.

Although it is doubtful whether females should be described without a corresponding male, these two female specimens are described because of their unique color markings.
Seaphoideus tergatus, n. sp.

Resembling *luteolus* in general appearance but with elytra more mottled and with male oedagus more slender on apical portion and with apex curving ventrally. Length 5.5–6 mm.

Vertex strongly produced, a little longer at middle than width between eyes. Color: Vertex white, with a very narrow brown marginal line usually slightly interrupted at middle, and a broad testaceous transverse band between anterior margins of eyes, scarcely produced at middle. Pronotum testaceous with a white transverse band on middle. Scutellum testaceous, apical third white with a black spot on either side of apical spine. Elytra dark brown, veins on clavus indistinct, veins on corium and costa brown, apical portion black, very few pale areas. Face pale with two dark arcs.

Genitalia: Female last ventral segment long, apical third of posterior margin produced in a short, broad rounded black tooth. Male oedagus in lateral view with ventral portion narrow, widened at junction of dorsal portion, apex gradually narrowed to pointed tip which is curved slightly ventrally.

Holotype male, allotype female collected at State Forest, Jonesboro, Illinois, July 31, 1934 (DeLong and Mohr), in Illinois Natural History Collection. Female paratypes same date and locality and from Havana, Illinois, August 30, 1917, in Illinois Natural History Survey collection and in the author’s collection.

NEW SPECIES AND A NEW GENUS OF NEARCTIC SIPHONAPTERA.

By Irving Fox,

Department of Zoology and Entomology, Iowa State College.

The following descriptions of three new species and a new genus are based upon material in the United States National Museum, to whose authorities the writer is indebted for the privilege of studying their extensive collections of fleas. Particular thanks are due to Dr. H. E. Ewing for his helpful advice and assistance.

FAMILY DOLICHOPSyllIDAE.

*Trichopsylla floridensis*, new species. (Fig. 6.)

*Male.*—Frons broadly rounded with a conspicuous frontal tubercle. The preantennal region of the head with 2 rows of bristles; the upper or frontal row consists of 6 bristles, while the lower or ocular row consists of 4 very long and stout ones arranged in an almost vertical line. Eyes prominent, well pigmented, and round. The genal process is highly pigmented and pointed. First segment of the antenna with numerous small setae in a longitudinal row; apically it is
provided with 8 or 10 larger setae in a transverse row. Second segment of the antenna with a transverse row of about 8 small setae and several long bristles about as long as the third segment. The postantennal region of the head is armed with three irregular rows of bristles; the first consists of 3 stout bristles, the second of 5, and the third or marginal row of about 9 long bristles, which alternate with about 7 small setae. The labial palpi 5—segmented and reaching to about two-thirds of the fore coxa. The maxillae are not broad and come to a rather abrupt point. The dorsal region of the head and thorax is provided with a conspicuous pubescence. Neither a genal nor a pronotal ctenidium is present. The pronotum bears a marginal row of about 8 bristles on a side and a patch of bristles dorsally. Both the meso- and metanotum bear two irregular rows of bristles of which the posterior consists of longer and more robust elements than the anterior. The metepimeron is armed on its posterior margin with about 6 long bristles anterior to which is an irregular row of 5 or 6 shorter bristles. The abdominal tergites have two rows of bristles, the posterior of which is made up of long bristles reaching to the spiracles of the next segment, while the anterior row consists of much shorter bristles. The spiracles are large, round, and conspicuous. Anteptygidal bristles are absent. The fore coxa is armed with numerous bristles longitudinally arranged. The hind coxa bears a patch of bristles at the apical half near the anterior margin. Each femur has a row of about 15 bristles near the anterior margin on both the outer and inner surfaces. Each tibia bears a longitudinal row of about a dozen bristles on the outer surface, and also on the posterior margin about 6 pairs of stout bristles, each pair consisting of a long bristle and a short bristle. The tarsi are richly supplied with spine-like bristles. The last tarsal segment bears 4 pairs of stout lateral plantar bristles. Modified segments.—The clasper is broad and flat. Its dorsal margin bears a row of numerous long bristles; in addition there are numerous long slender setae on the anterior and posterior margins. The process of the clasper is not distinctly separated from the body proper. The manubrium is finger-like and ends bluntly. The movable finger is long and curved. The penis does not end in a sharp point but is blunt terminally. The spring is long but does not complete a turn. For further details of the male genitalia see Fig. 6.

Female.—General structural details essentially as in the male except that the pubescence on the head and thorax which characterizes that sex is absent. The seventh sternite is deeply sinuate. The tail of the receptaculum seminis is longer than the head, which is oval and longer than wide.

Type locality.—Gainesville, Florida.

Type slide.—U. S. N. M. No. 52897.

The cotypes consist of 2 males and 2 females collected in garden truck leaf mold on September 30, 1935, at Gainesville, Florida. The true host is unknown.

This new species may be readily separated from T. lotoris Stewart by the chaetotaxy of the head and metepimeron.
Megabothris asio (Baker). (Fig. 3.)


*Male.*—Frontal tubercle small and acutely pointed. Preantennal region of the head with 2 rows of bristles; the upper or frontal row consists of 7 bristles of which those closest to the antennal groove are weakest, while the lower or ocular row is made up of 3 long bristles. Interspersed among these bristles are a number of minute setae. Eyes round and well pigmented. Postantennal region of the head armed with 2 rows of 4 or 5 bristles each, anterior to which is a single bristle close to the antennal groove. Along the posterior margin of the antennal groove is a series of about 15 small setae. Labial palpi 5-segmented and reaching to about four-fifths the length of the fore coxa. Pronotum armed with a marginal row of alternating strong and weak bristles, anterior to which is a single row of bristles. Pronotal ctenidium with 9 or 10 spines on a side. Meso- and metanotum each with a marginal row of long bristles anterior to which are 2 or 3 rows of weak ones. Abdominal tergites with 2 or 3 rows of bristles, and in the case of the first 4 tergites, 1 or 2 dorsal teeth on a side. Three antepygidial bristles present on a side. Fifth tarsal segment of each leg with 5 pairs of lateral plantar bristles. *Modified Segments.*—Process of the clasper very long and tapering to a blunt termination. Manubrium short and broad. Penis slender, scimitar-like, ending in a curved point. Spring of the penis long and completing 1 or 2 large circles about the distal half of the penis. Movable finger prominent, with 2 short spiniform bristles at the apex and a longer bristle at the outer angle. Eighth sternite expanded apically and armed with a number of slender curved setae. For further details see Fig. 3.

*Records.*—Taken from *Microtus pennsylvanicus pennsylvanicus* (Ord) by C. N. Smith at the following localities in Massachusetts: Edgartown, June 14, 1936, male and female; Scraggy Neck, June 18, 1936, 2 females; Lamperts Cove, June 17, 1936, female; W. Falmouth, June 8, 1936, male and female; Nantucket, June 13, 1936, female, 2 males; Squibnocket, June 11, 1936, female. Taken from the same host species at Ruthven, Iowa, July, 1938, by E. R. Becker and P. C. Waters, 4 males and 8 females.

**FAMILY HYSTRICHOPTYLLIDAE.**

All the nearctic fleas hitherto included in the complex known under the generic name, *Ctenopsyllus* Kolenati (= *Leptopsylla* Jordan and Rothschild) seem to comprise a distinct genus easily separable from the type of the latter group by the character of the genal ctenidium. This new genus is herewith described.

**PEROMYSCOPSYLLA**, new genus.

Head subangulate in front; frontal tubercle inconspicuous. Anterior margin of the head with a series of bristles; 2, 3, or 4 of those near the frontal tubercle thickened and pigmented. Genal ctenidium more or less horizontal, consisting of 2 spines, varying in size and shape according to the species. Genal process
prominent, variable in shape. Labial palpus composed of 5 segments. Ante-
pygidial bristles 3 or 4 on a side. Last segment of each tarsus with 4 pairs
of lateral plantar bristles and a basal submedian pair.

*Type species.—* Ctenopsyllus hesperomys Baker.

**Peromyscopsylla spinifrons**, new species. (Figs. 1 and 2.)

*Male.—* Frontal tubercle inconspicuous, acutely pointed. Anterior border of
the head armed with 8 or 9 bristles, of which the first 3 in the vicinity of the
frontal tubercle are sharp and spine-like. Five long bristles are situated on the
dorsal region of the frons, while the lower frons bears 3 long and stout bristles.
Irregularly scattered over the preantennal region are numerous small setae.
The eyes are partially covered by the base of the second genal spine. The
genal ctenidium consists of 2 well separated spines, of which the lower extends
slightly more distad than the upper. The genital process is not spatulate, but
rather slender and extends well beyond the rounded termination of the upper
genal spine (Fig. 1). The first and second segments of the antenna are without
distinct setae. The post-antennal region of the head bears 5 irregular rows of
bristles. The first row consists of 2 bristles, the second of 3, the third of 4,
the fourth of 5, and the fifth or marginal of 7. Along the posterior margin of
the antennal groove is a series of about 8 small setae. The labial palpi are 5-
segmented and reach to about one-half the length of the fore coxa. The
maxillae are broad basally and taper abruptly to a long sharp point. The
pronotum bears a single row of alternating long and short bristles, and a cteni-
dium of about 14 spines on a side. Both the meso- and metanotum are armed
with numerous bristles which are arranged in 3 or 4 irregular rows. The
abdominal tergites are armed with 2 rows of bristles and 1 tooth on a side.
There are 3 antepygidial bristles, of which the middle is the longest. The fore
coxa is armed with numerous long bristles on the outer surface, and a series of
curved setae along the posterior margin. The hind coxa bears a patch of bristles
near the anterior border apically. Each tibia is armed with about 13 stout
bristles along the posterior margins. Among these are 3 long bristles, one
situated at each end and one in the middle. The fifth segment of each tarsus
is armed with 4 pairs of lateral plantar bristles. *Modified segments.—* The
genitalia resemble somewhat those of P. hamifer (Rothschild) in general appear-
ance. The movable finger, however, differs in shape, being widest near the
middle and tapering apically, its anterior margin curving outward slightly
below the middle. On the posterior margin the movable finger bears 3 robust
bristles and 2 or 3 smaller ones, while its anterior margin is armed with about
5 weak bristles and a few small setae. Manubrium about as long as penis,
slender and tapering to a point. Apex of the ninth sternite rather abruptly
pointed, its posterior margin with 3 long bristles and a number of smaller ones.
For further details concerning the structure of the male genitalia see Fig. 2.

*Type locality.—* Buttry’s Cave, Jefferson City, Tennessee.

*Type slide.—* U. S. N. M. No. 52899.

Male holotype collected by J. D. Ives in Buttry’s Cave,
400 ft. from entrance, Jefferson City, Tennessee, February 4,
1933. The true host is unknown.
Peromyscopsylla scotti, new species.

Female.—The general arrangement of the bristles of the head is essentially the same as in *P. hesperomys* (Baker). The genal ctenidium, however, consists of 2 spines of which the lower extends only slightly more distad than the upper. The genal process is spatulate and prominent (Fig. 5). Each abdominal tergite is armed with 1 to 3 short teeth on a side, with the anterior tergites usually having more teeth than the posterior. Four antepygidial bristles are present on a side. Each of the posterior sternites is armed with a row of 4 or 5 long bristles. The seventh sternite, unlike that of *P. hesperomys*, is without a deep sinus and its margin is irregular in outline. The eighth sternite bears a patch of about a dozen bristles of which 6 or 7 are long and robust. The receptaculum seminis is of characteristic shape; its tail is about as long as the head, which is about twice as long as wide. For further details of the structure of the female genitalia see Fig. 4.

Type host and type locality.—White-footed mouse, *Peromyscus leucopus noveboracensis* (Fischer) at Dubuque, Iowa.

Type slide.—U. S. N. M. No. 52900.

Female holotype collected by T. G. Scott from the white-footed mouse at Dubuque, Iowa, November 4, 1937, in the United States National Museum. Female paratype bearing the same data in the author’s private collection.

This new species may be readily distinguished from *P. hesperomys* (Baker) by the characters of the genal ctenidium and of the seventh sternite in the female.

Explanation of Plate No. 6.

Fig. 1.—*Peromyscopsylla spinifrons*, new species, genal ctenidium of male.

Fig. 2.—*Idem*, male genitalia.

Fig. 3.—*Megabothris asio* (Baker), male genitalia.

Fig. 4.—*Peromyscopsylla scotti*, new species, seventh sternite of female.

Fig. 5.—*Idem*, genal ctenidium of female.

Fig. 6.—*Trichopsylla floridensis*, new species, male genitalia.
A NEW CYNOPID GALL IN VALONIA.

By Lewis H. Weld.

Commercial shipments of valonia, the acorn cups of *Quercus aegilops*, often contain the acorns also. Most of the shipments come from Turkey with a few from Greece, Italy and Albania. They arrive in every month of the year, most frequently in the spring months, the shipments consisting of from a score to a few thousand bags, presumably of the previous year's crop.

When these shipments are examined at the port of entry (New York and occasionally Philadelphia) two kinds of cynohipid galls are often found. One consists of from one to three stony-hard, many-celled masses inside the acorn beside the much reduced cotyledons. When placed in rearing cages out-of-doors on the ground near Washington, D. C., adults begin to emerge the second spring. Pupation takes place early in October and transformation to adults later in the month. The adults, all females, remain in the galls all winter and emerge the next spring from April 15 to May 8. The other larvae remain dormant to transform the next fall or even later so that the emergence is distributed over three or four seasons.

Gall and host agree with the description of *Andricus glandium* Giraud. His types are in Paris and I have compared these reared adults with one of his paratypes and concluded that they were the same species. Dalla Torre and Kieffer in 1910 in *Das Tierreich* 24:562 placed the species in *Callirhytis* and routine determinations for the Bureau have followed this usage. During the last ten years some 99 lots of these galls have been intercepted at quarantine and sent in for determination. Some were sent in liquid and some were too small to bother with placing in rearing. But adults have been obtained from 62 different lots and a tarsus has been removed from at least one individual of each lot, crushed under a cover glass and examined under a compound microscope. In every case the claw has been found to be toothed and the species should be retained in *Andricus* where Giraud placed it.

Father Dettmer in 1933 professed to find three species represented in the type material of *glandium* in Paris, basing his conclusions on slight differences in color and the structure of the claw but I find no statement in his paper or his correspondence that a tarsus was removed and mounted for study. Color depends somewhat on amount of exposure to light after emergence and also on climate. There is considerable variation in color in this reared Turkish material, adults that emerge the third and fourth spring being darker than those that emerged previously from the same lot of galls.

Measurements of 300 specimens from 30 lots range in length from 2.2-4.0 mm. Average 2.97 mm.
Some acorns contain galls of quite a different sort, being small, separable and from only a few to as many as 70 in a single acorn, much like those of Callirhytis lapillula Weld in Quercus bicolor. Transformation and emergence dates are the same as for glandium and the adults, all females, are superficially very similar to that species in color and sculpture, differing only in that the foveae are more sharply marked off from the disk of the scutellum and in the greater uniformity in the ridges radiating from the corners of the mouth. Adults have been reared from 44 out of 68 lots of this sort and at least one individual of each lot has been examined and in every case the claws have been found to be simple, which would place it in the genus Callirhytis. (Described below.)

Callirhytis glandulosa, n. sp.

Female.—Head, thorax and base of abdomen dark amber; rest of abdomen, tip of antenna and mandible, foveae, mesosternum, metanotum and parts of propodeum fuscous to black. Head transverse, as broad as thorax, cheeks broadened behind eyes, malar space .4 eye, striate; antenna 14-segmented, lengths as (scape 16 (8) : 9 : 15 (5) : 12 : 11 : 11 : 10 (7) : 9 : 9 : 9 : 19 (6). Sides of pronotum rugose. Mesonotum bare, with sharp, parallel, transverse ridges on a cariaceous ground, parapsidal grooves perpendicular, median distinct only posteriorly. Disk of scutellum reticulate, pits dull, not smooth, bounded laterally. Carinae on propodeum straight, parallel. Mesopleura with a few parallel ridges across middle. Wing hyaline, pubescent, margin not ciliate, veins yellowish, first abscissa of radius angled, arcolet reaching about one-sixth way to basal, median reaching basal. Abdomen as long as head plus thorax, length to height to width as 30 : 25 : 20. Lengths of tergites along dorsal curvature as 52 : 19 : 8 : 10 : 15 : 8; ventral spine in side view 2-3 times as long as broad, ovipositor sheaths projecting obliquely, a few scattered hairs on the sides of tergites II and VII. Claws simple. Using the width of the head as a base the length of mesonotum ratio is 1.2, antenna 2.0, wing 3.5, ovipositor 2.8. Length 1.9 3.55 mm. Average of 200 specimens from 15 lots 2.80 mm.

Close to lapillula which has smooth and shining pits, a shorter ventral spine and a median not reaching basal.


Gall.—Brown, seed-like, more or less tuberculate and angular cells tightly packed in alongside the reduced cotyledons of mature acorns. Length 3-5 mm.

Host.—Quercus aegilops L.

Habitat.—The type material is from Turkey, some of the paratypes from Greece. These galls have been received from Italy also.
NOTES ON *LYTOXYSTA BREVIPALPIS* KIEFFER (CYNIPIDAE: CHARIPINAE).

By Lewis H. Weld.

In 1909 Kieffer founded the genus *Lytoxysta* on female specimens of *L. brevipalpis* from Forest Hills, Mass., and Fayetteville, Ark., sent him by Paul Hayhurst, bred "probably from *Aphis rumicis*." The present location of the types is unknown. One of the original series, labelled "Forest Hills, Mass., 388," obtained from Fayetteville by exchange, is now in the U. S. N. M. collection.

During the last two seasons Mr. Clyde F. Smith has been rearing parasites from aphids and out of 55 lots of Charipinae secured, 24 lots contain a *Lytoxysta* which seems to agree with the above specimen. Fifteen lots contain what must be the associated male for Mr. Smith has seen them pairing in his breeding cages. As these males present some unusual features and as males in this genus have not previously been seen a description is here recorded.

**Lytoxysta brevipalpis** Kieffer.

*Male*—Whole head, thorax and legs coriaceous as in female but amber in color. Head from above massive, broader than thorax; from in front higher than broad, malar space as long as eye, antennae 13-segmented as in female (an unusual condition), segments 2, 3, 4, as 14:16:10. Mesoscutum almost flat, triangular. Wing narrow, reaching about one-fourth its length beyond tip of abdomen, not ciliate, venation indistinct. Tergite III longer than II. Using the width of the head as a base the length of mesonotum ratio is 1.0, antenna 3.0, wing 2.5. Range in length .75–1.2 mm. Average of 57 specimens .97 mm. Range in length of the females is .95–1.35 mm. Average of 50, 1.08 mm.

Males or females or both have been reared from the following aphids: *Aphis artemisicola, helianthii, heradella, rumicis, Macrosiphum solanifolii, Periphyllus populicola* and from unidentified species on *Artemesia, Chrysothamnus*, burdock, sunflower, sweet clover and wild gooseberry, and from the following localities: Columbus, O.; Clinton, Granger, Hyde Park, Hyrum, Joseph, Lewiston, Morgan, N. Ogden, Paradise, Roy, Richmond, Smithfield, Springville, Sunset and Woodruff in Utah; Arimo, Castleford, Minkcreek, Murtaugh, Riverdale and Whitney in Idaho.
SEVEN NEW SCARAB BEETLES FROM CALIFORNIA.

By Lawrence W. Saylor,

Bureau of Biological Survey, U. S. Department of Agriculture.

The new species here described have been brought to light through the author's studies of the California Scarabaeidae, which it is expected will lead eventually to a synopsis of the species of this family from the State.

*Phobetus comatus robinsoni*, new subspecies.

*Male.*—Robust-oval, body black, legs and antennae testaceopiceous; the long cilia of the entire body a light-brown color, a few short hairs on the side of the abdomen whitish. Head and clypeus with fine dense punctures, a large area on the vertex impunctate; clypeal disc with a few erect, short hairs. Antenna 9-segmented, club one-third longer than the funicle. Terminal segment of the maxillary palpi two and one-half times longer than wide, slightly flattened on outer basal two-thirds, the flattened area not impressed. Shape and punctuation of thorax, elytra, and pygidium as in typical *comatus*. Length 11-14 mm. Width 6-7 mm.

The holotype and paratype, males, from "San Diego, California, collected by Morris on Nov. 11, 1931," were received from Mark Robinson of Philadelphia. The type has been returned to Mr. Robinson for disposition, while the paratype remains in the author's collection.

The male genitalia and most of the external characters are the same as in typical *P. comatus*; the entirely black color and small size are very striking and enable one to place the species readily. Possibly a distinct species, this form seems best treated as a subspecies until such time as taxonomic characters in the genus are better understood. In Cazier's recent excellent revision of the genus, *P. robinsoni* runs out closest to *P. saylori*, which it approaches in size, but from which it differs in the entirely black dorsal surface and in the color of the body pile.

*Chaunocolus cornutus* Saylor.


The unique type of this interesting species was described by the writer from La Paz, Lower California. Recently the author has received for examination, through the courtesy of Mark Robinson of Philadelphia, a second specimen from "Lower California." This is apparently either a male minor or a female, but its condition does not permit dissection.

This second specimen differs from the type as follows:
Clypeal horn one-half as long; thorax convexly rounded, with no trace of the oblique tumosities mentioned in the original description; the apical fourth of the disc is abruptly, semicircularly declivous to the apical margin; the surface of the thoracic disc is sparsely, and rather coarsely punctured laterally and on each side of the median line; the hind angles and a median longitudinal area of the disc are practically impunctate; the surface of the declivity is nearly impunctate, except for a row of coarse punctures along the apical margin.

**Serica craighead**, new species.

*Male.*—Testaceo-castaneous, head with traces of piceous; above moderately shining and faintly iridescent. Clypeus tumid at center, the punctures fine and separated by distances equal to one or more times their diameters; front margin sharply reflexed, apex slightly emarginate, lateral margins with no trace of clypeal notch; front very sparsely punctate, vertex impunctate. Antennal club shorter than funicle. Thorax with fine dense punctures, and with a few short, erect hairs on each side. Elytra sparsely clothed with short erect hairs.

*Female.*—Slightly pruinose above; antennal club only slightly shorter than in male; scutellum more densely hairy; otherwise similar to male. Length 7.5 mm. to 7.8 mm. Width 4 mm.

The *type* male is from "Sangre de Cristo, Lower California," collected in June (L. W. Saylor collection) and the *paratype* male and *allotype* female are both from "V. Trinidad, Lower California, also collected in June." *Type* and *allotype* will be deposited on loan in the United States National Museum, while the paratype remains in the Saylor collection. The male genitalia of the new species are most closely related to those of *S. watsone*, described herein. The author takes pleasure in naming this species for his good friend Dr. F. C. Craighead of Washington, D. C.

**Serica cruzi**, new species.

*Male.*—Unusually elongate, subparallel, piceo-castaneous; head with a few scattered hairs; thorax apparently glabrous except at lateral margins; surface shining. Clypeus long, faintly tumid at center and with coarse and dense punctures, the sides strongly convergent apically, and the apex moderately reflexed with a wide, shallow, semicircular emargination, without trace of clypeal notches; front punctured like the clypeus, vertex impunctate. Antennal club as long or longer than the entire stem. Thorax with sides evenly arcuate, punctures on disc moderately coarse, and not close. Elytra with coarse, rugose punctuation and wrinkled: a few scattered short, erect hairs near side margins. Length 5.4 mm. Width 3 mm.

The unique male *type* is from "Santa Cruz Island, California, May," L. W. Saylor collection, and will be deposited on loan in the United States National Museum. The long antennal
club, slender form, shape of the clypeus and head, and the strong elytral punctuation (as well as the insular habitat) readily distinguish this species. The male genitalia, somewhat similar to those of S. abdita, are, however, specifically different.

**Serica joaquinella**, new species.

_Male._—Robust, rufo-piceo-castaneous, with moderate pruinose sheen above; elytra and clypeus with a very few erect scattered hairs. Entire clypeal surface with coarse, moderately close punctures, center of disc somewhat convex; apical margin strongly reflexed, truncate (viewed from above) or arcuately rounded with the center a little the highest (viewed from above and behind); no clypeal notches; front densely pruinose, punctuation, if present, obscured by the pruinosity. Antennal club subequal to funicle. Thorax finely and densely punctate, sides evenly and arcuately rounded. Elytral apices subtruncate. Length 7 mm. Width 4.2 mm.

The type is from "San Joaquin County, California," L. W. Saylor collection, and will be deposited on loan in the National Museum. In size and appearance this beetle much resembles a bicolored example of _S. anthracina_. The genitalia are probably more similar to those of _S. caliginosa_ than to those of any other described species.

**Serica oliver**, new species.

_Male._—Robust, piceous, densely pruinose above; glabrous except for a few dozen very fine, minute to short, scattered hairs on the sides and base of the elytra, and on the clypeus. Clypeus somewhat shiny, slightly convex at center, sparsely and entirely punctured, apex moderately reflexed, subtruncate, with no trace of lateral clypeal notches, front finely punctate, the punctures almost obscured by the pruinosity, vertex impunctate. Antenna testaceous, club one-fifth longer than the funicle. Thorax finely and densely punctate, sides arcuately rounded. Elytra very finely, and quite sparsely punctate. Length 8.4 mm. Width 4.5 mm.

The unique male type, collected by S. J. Oliver at "Pine Ridge, 35 miles N. E. of Fresno, California, elevation 5,000 feet," and presented by the collector to the author, will be deposited on loan in the National Museum Collection. The genitalia of _S. oliver_ are most similar to those of _S. solita_.

**Serica elmontea**, new species.

_Male._—Elongate, dull brunneo-rufous, the surface pruinose; entire dorsal surface except for the middle of the front and the clypeus, with short, erect and moderately dense hair. Clypeus distinctly tumid at center, coarsely and closely punctate, apex narrowly reflexed, with moderately deep, arcuate emargination, sides without any trace of notches; front finely and sparsely punctate, opaque on basal two-thirds. Antenna 9-segmented, testaceous, club ovate and shorter than funicle. Length 7.5 mm. Width 4.5 mm.
The type and 3 paratypes, all males, from "El Monte Oaks, San Diego Co., California, June 8, 1934, collected by Albert Watson" and 7 paratypes from Lake Arrowhead, Calif. (Paul Allen) VI–23–34, and 1 paratype from Bear Lake, California, collected in May. All specimens were given to the writer by the collector. The type will be deposited on loan in the United States National Museum, while the paratypes remain in the author's collection.

Serica watson, new species.

Male.—Robust, somewhat shining, elytra slightly pruinose; elytra, sides of thorax and clypeus, base of clypeus, and apex of thorax with sparse erect hairs. Clypeus tumid, densely and coarsely punctate, apex with moderately deep, and widely arcuate emargination, the margin slightly and gradually reflexed, no trace of lateral clypeal notches. Front sparsely and finely punctate, the entire front and vertex opaque. Antenna 9-segmented, testaceous, club ovate and not quite equal to the funicle in length. Length 8 mm. Width 4–5 mm.

The type and paratype, both males, are from "El Monte Oaks, San Diego County, California, collected by Albert Watson on June 8, 1934" and by him presented to the author. The type will be deposited on loan in the National Museum. The genitalia are most similar to those of S. craighead Saylor; but vary slightly within the species, as is shown in the drawings. Figure 6b is the typical form and 6b, the variation.

Explanation of Figures.

Figure 1. Serica craighead Saylor
Figure 4. Serica oliver Saylor
2. Serica cruzi Saylor
5. Serica elmontea Saylor
3. Serica joaquinella Saylor
6. Serica watson Saylor
   a. Side view of male genitalia.
   b. Idem.
   c. En-face view of male genitalia.

THREE NEW HYMENOPTEROUS PARASITES OF THE LEMNA FLY.

By C. F. W. Muesebeck,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The material on which this paper is based was reared by Dr. Minnie B. Scotland, who has conducted studies on the Lemna fly, Lemnaphila scotlandae Cress., at Ithaca, N. Y. In order to make names available for use in her forthcoming publication the descriptions of a new species of the braconid genus Opius and of two new species of Diapriidae belonging in the genus Trichopria are presented at this time.
Opius lemnaphilae, new species.

(Fig. 1, D.)

This species runs to couplet 53 in Gahan's key\(^1\) to the North American forms. It differs, however, from both species included there, as well as from *hydrelliae* Muesebeck, which belongs in the same group, in the exceedingly narrow stigma, shorter second cubital cell, unusually narrow posterior wing, and absence of nervellus.

**Female.**—Length about 1.3 mm. Head completely polished; temple receding, very slightly convex; malar space barely as long as basal width of mandible; lower margin of mandible entire; a conspicuous opening between clypeus and mandibles; clypeus a little elevated from base toward middle, depressed toward apex; ocellocular line nearly twice as long as postocellar line; antenna slender, about as long as body, 15-segmented, first flagellar segment a little longer than second and about as long as scape and pedicel combined.

Thorax short, compact, not broader at tegulae than high; notaulices impressed to middle of mesoscutum; mesoscutum and scutellum polished; propodeum mostly smooth, with a narrow sculptured strip down the middle; side of pronotum and mesopleuron polished; mesopleural impression short, with two or three foveolae; stigma exceptionally narrow, barely distinguishable from costa; recurrent vein entering second cubital cell; first and second cubital cells and first discoidal cell unusually small; third abscissa of radius more than three times as long as second; medius obsolescent toward base; first brachial cell open; posterior wing unusually narrow, not wider than length of marginal cilia; nervellus wanting.

Abdomen as broad as thorax; first tergite broader at apex than long, closely rugulose; second tergite more or less aciculate longitudinally and impressed at base each side of middle; suture between second and third tergites weakly indicated; third and following tergites smooth and polished; ovipositor sheath extending about length of first tergite beyond apex of abdomen.

Black; mandible brownish yellow; antenna brownish black with scape and pedicel yellow; wings hyaline; legs yellow, except posterior tibiae and all tarsi, which are more or less dusky.

**Male.**—Differing in no essential from female; antennae 17-segmented.

**Type locality.**—Ithaca, N. Y.

**Type.**—U. S. National Museum No. 53079.

**Host.**—*Lemnaphila scotlandae* Cresson.

Described from 20 specimens reared by Minnie B. Scotland in August, 1936, and August, 1938.

Trichopria angustipennis, new species.

(Fig. 1, B, C.)

Distinguished from all described North American species known to me by the unusually narrow anterior wings, which are only about twice as wide as the length of the longest marginal cilia.

**Female.**—Length about 1 mm. Head subspherical, polished; vertex strongly convex, its summit above level of upper eye margins; temple much broader than eye but receding gradually from eye margin, not noticeably convex; ocelli very small, in an equilateral triangle, separated from each other by about twice the diameter of one of them; eye sparsely hairy; malar space hardly as long as the subtriangular clypeus; antenna slightly shorter than body, inserted about on a level with middle of eyes; scape slender, nearly or quite as long as height of head; pedicel shorter but thicker than first segment of flagellum; first six flagellar segments slender, the second to the fifth subequal in length and each slightly shorter than the first; sixth shorter than the fifth; the seventh to the tenth each distinctly longer than broad but much thicker than the other flagellar segments and combining to form a club.

Thorax slightly deeper than broad, strongly narrowed both cephalad and caudad from the tegulae, polished; notaulices wanting; scutellar sulcus represented by a fine, faintly punctate line that is strongly curved forward at the middle; scutellum large, subtruncated at apex; propodeum with a low acute median tooth at base; side of pronotum and mesopleuron polished; metapleuron thickly pubescent; anterior wing as long as entire body and nearly four times as long as wide, subcosta less than one-third wing length, and longest marginal cilia about as long as half greatest width of wing; posterior wing very narrow, not nearly as wide as length of its longest marginal cilia.

Abdomen with first segment parallel-sided and slightly longer than broad; remainder of abdomen abruptly broadened, considerably broader than thorax, polished, the third tergite about three times as long as the combined lengths of the following tergites; apex of abdomen abruptly acute.

Black; basal half of scape yellowish brown; legs piceous; wings hyaline.

**Male.**—Differs noticeably from the female only in the antennae, which are definitely longer than the body and not distinctly clavate; first flagellar segment the longest and also much longer than pedicel; second conspicuously emarginate outwardly on basal half.

**Type locality.**—Ithaca, N. Y.

**Type.**—U. S. National Museum No. 53080.

**Host.**—Lemmaphila scotlandiae Cresson.

Described from 38 specimens reared from pupae of the above host by Minnie B. Scotland August, 1936, and August, 1938.

Fig. 1.—A, Trichopria paludis, antenna of female; B, Trichopria angustipennis, antenna of female; C, Trichopria angustipennis, wings; D, Opius lemmaphilae, wings. Drawn by H. B. Bradford.
Trichopria paludis, new species.

(Fig. 1, A.)

Exceedingly similar to angustipennis, which it resembles especially in its strikingly narrow wings. It may be distinguished from that species, however, by the shorter, more abruptly clavate female antennae and the differently shaped head.

Female.—Differs from the foregoing description of angustipennis as follows:

Head subtransverse, not narrowing so strongly behind as in that species; temple gently convex; pedicel of antenna slightly longer than first segment of flagellum; club, composed of last four segments, stout, its second segment a little longer than broad, its third about as broad as long; scutellar sulcus smooth, entirely without punctures; median tooth at base of propodeum blunt; greatest width of anterior wing only slightly more than twice length of longest marginal cilia; abdomen narrowing gradually from middle to acute apex. Only extreme base of scape yellowish brown.

Type locality.—Ithaca, N. Y.
Type.—U. S. National Museum No. 53081.
Host.—Lemnaphila scotlandae Cresson.

Three females reared by Minnie B. Scotland in August, 1936.

A NEW SPECIES OF HETEROSPILUS PARASITIC ON AN INJURIOUS ANOBIID (HYMENOPTERA : BRACONIDAE).

By C. F. W. Muesebeck,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Under the name Neogastrallus librinocens Fisher¹ has recently described an anobiid beetle which was discovered by E. A. Back, of the Bureau of Entomology and Plant Quarantine, to be causing serious damage to books in certain libraries. Two adults of a new braconid parasite of that insect have now been reared by Dr. Back, and in order to provide him with a name for use in a paper on the anobiid the following description is offered at this time.

Heterospilus anobiidivor us, new species.

Apparently most closely related to melleus Riley but readily distinguished by its much smoother abdomen and darker color.

Female.—Length about 2.3 mm. Head viewed from above one and one-half times as broad as long; temple convex, not receding, at narrowest point barely as wide as eye; malar space longer than transverse diameter of opening between clypeus and mandibles; face convex, smooth and shining; frons polished; vertex and occiput very weakly transversely aciculate; temple and cheek smooth and shining; ocellar line twice as long as a side of the ocellar triangle; antenna about as long as the body, 17- or 18-segmented, first flagellar segment not longer than the second.

Thorax as wide as head, not depressed; notaulices weakly foveolate anteriorly, shallow and not foveolate on posterior half of mesoscutum; mesonotal lobes finely shagreened but shining; scutellum smooth and shining, only very slightly longer than the foveate sulcus at its base; propodeum rugulose reticulate except for the two large basal areas which are faintly sculptured and strongly shining; mesopleuron smooth except for some longitudinal ridges transversing the vertical anterior impression and some indefinite shagreening below; first abscissa of radius hardly as long as width of stigma and about half as long as the mostly obsolete first intercubitus; second abscissa of radius much shorter than first intercubitus but decidedly longer than first abscissa of radius or second intercubitus; recurrent vein definitely entering second cubital cell, and much less than half as long as first intercubitus; second cubital cell measured on cubitus very nearly, or quite, as long as third; nervulus interstitial; mediella definitely shorter than lower abscissa of basella; radiella and cubitella indistinct.

Abdomen longer than head and thorax combined; first tergite distinctly longer than broad at apex, striate, rather noticeably narrowly elevated down the middle for its entire length; remaining tergites completely smooth and polished except for a small delicately aciculated area at base of second; second tergite much longer than third; neither second nor third with an indication of a transverse impression; ovipositor sheath about as long as abdomen.

Yellowish brown, irregularly varied with darker brown on head and thorax; antenna brown, scape and pedicel yellow; legs entirely yellow; wings hyaline, stigma and veins brown.

Type locality.—St. Augustine, Fla.

Type.—U. S. National Museum No. 53108.

Host.—Neogastrallus librinocens Fisher.

Described from two females reared by E. A. Back, April 28, 1938.

MINUTES OF THE 497TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 497th meeting of the Society was called to order by President Snodgrass at 8 p. m., Thursday, January 5, 1939, in Room 43 of the National Museum. There were 46 members and 17 visitors present. H. E. Ewing made a correction in the minutes of the previous meeting, which were then approved.

The following individuals were elected to membership in the Society:

Osmond P. Breland, Department of Zoology, University of Texas, Austin, Texas.
H. E. Milliron, Division of Entomology, University of Minnesota, University Farm, St. Paul, Minnesota.

The President announced the appointment of the following committees:

Program.—George G. Becker, J. F. G. Clarke, F. W. Poos, H. H. Richardson.


Auditing.—E. C. Cushing, C. M. Packard.

President Snodgrass called attention to a conservation and parkway project to be begun soon by the National Park Service along the Potomac River and nearby canal north of Georgetown. Several local societies concerned with Natural History have shown an interest in cooperating with the National Park Service as regards the specific areas to be left unchanged, and for this reason the matter was presented to the Entomological Society. Discussion followed by J. C. Bridwell and H. S. Barber.

The regular program of the meeting was as follows:

1. Report of the Christmas Meetings of the American Association of Economic Entomologists. E. N. Cory, State Entomologist, Maryland Agricultural Experiment Station.

The Richmond meeting was characterized by a Virginian welcome and sustained hospitality that surpassed even what had been anticipated. Too fulsome praise can not be given W. D. Reed and his co-workers on the local committee which arranged the details in preparation for receiving visitors. At the business meeting of the Association 92 membership applications were approved, bringing the total paid up membership to about 1250. Two societies, The Newell Entomological Society and The Florida Entomological Society, became affiliates and a third society made tentative overtures for similar status. The many titles on the regular program are characteristic of the tradition that each member has an opportunity to present his work. A member of the Entomological Society of Washington, E. R. Sasscer, is the President of the Association for 1939. (Author's abstract.)


3. Entomological Explorations in Guam. Otto H. Swezey, Hawaii Sugar Planters' Experiment Station, Honolulu, T. H.

Mr. Swezey gave a highly interesting talk, supplemented by photographs of the Natural History of Guam with special reference to insects. He had recently spent about 7 months on the island and based his discussion on the experiences of that visit, together with notes on the general historical background of Guam. Insect collections in all important orders were made and as these are studied by specialists it is planned to publish lists of the species. (Secretary's abstract.)


Adjournment at 9.50 p.m.

Ashley B. Gurney,
Recording Secretary.

Actual date of publication, February 25, 1939.
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THE
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NEW SPECIES OF TRICHOPTERA FROM THE APPALACHIAN REGION.

By Herbert H. Ross,

Among the aquatic insects collected in various parts of the Appalachian system by Dr. T. H. Frison, his son, Theodore Jr., Dr. B. D. Burks, Mrs. Ross, and myself, there have appeared several new species of caddis flies. Those of especial interest or those which were reared are described in this paper. Types designated are in the collection of the Illinois Natural History Survey. I am greatly indebted to Dr. C. O. Mohr of the Survey staff for much assistance with the drawings.

Rhyacophila ledra, new species.

Male.—Length 11 mm. Body brown, without conspicuous dark areas but with irregular patches of darker brown along most of the sutures. Forewings gray with white fenestrated markings, the largest marks grouped along hind margin; hind wings uniform bluish-gray. General structure typical for genus. Genitalia, fig 1, closely resembling those of fenestra Ross, differing in the short apical segment of the claspers and the shape of the lateral aedeagal arms. Tenth tergite pointed and beak-like, incised apically down the meson to form a pair of pointed lobes. Claspers relatively short; basal segment broad, its ventral margin strongly angled; apical segment short, without a baso-mesal lobe, its apical margin deeply incised to form a short, dorsal “thumb” and a long, tapering ventral portion. Inner face of apical segment with a brush-like mass of short, brown setae covering almost the entire area. Aedeagus, fig. 1A, composed of a pair of lateral arms and a mesal process formed of a dorso-mesal beak and a pair of flared ventral plates. Lateral arms set in a membranous, extensile pocket; their basal stock is long and narrowed, the apex enlarged, rounded and club-shaped, and in the middle of the apex is a pocket of long, brown spicules of fairly even length. Central part of aedeagus with the mesal beak double and the lateral extensions wide and regular, the apical margin of each half evenly concave.

Female.—Similar in size, color, and general structure to male. Apical segments of abdomen tapering rapidly and forming a regular, tube-like apex. Characters have not yet been found to distinguish it from the female of fenestra.
Holotype, male.—Jasper, Tenn., April 25, 1938, Ross & Burks. 
Allotype, female.—Same data. Paratype.—Martin Springs, Tenn., April 25, 1938, Ross & Burks, 1 ♂.

Rhyacophila carolina Banks.

Male.—Length 11 mm. Similar to preceding in color, general structure and general plan of genitalia, differing in details of genitalia as follows, fig. 3: lateral lobes of tenth tergite short, ending in a short, sharp point; apical segment of clasper arcuately incised, dorsal lobe rounded, ventral lobe long and somewhat finger-like, the inner face of the segment with two long patches of short, black setae, one along the dorsal lobe which makes a short curl at base, the other along the entire ventral margin; lateral arms of aedeagus entirely membranous with a paw-like apical brush of long setae grouped into six brushes; median carinate process of aedeagus with top wide, concave and narrowed at apex into a beak, the horizontal process below this tubular.

This species resembles the above most closely in general appearance but is very distinct on the basis of the flat crest of the aedeagus.

Agapetus cramus, new species.

Male.—Length 5 mm. Body dark brown, the entire insect appearing blackish in life. Legs with basal half dark brown, apical half lighter, clothed with straw-colored setae. Wings dark brown with slightly lighter setae. Spurs, antennae, ocelli, and wings typical of the genus. Genitalia most closely resembling those of artesus Ross, differing as follows, fig. 2: Claspers short; lateral face with a sharp, apico-dorsal corner and a straight, oblique apical margin; ventral face showing a wide base abruptly excavated on the meson to form a very slender, latero-apical area, with two heavily sclerotized points showing in silhouette. Tenth tergite divided almost to base, each half with the ventral portion heavily sclerotized and upturned into a hook-like apex; dorsal portion membranous.

Female.—Similar in size, color, and general structure to male, apparently inseparable from related species.

Holotype, male.—Martin Springs, Tenn., April 25, 1938, Ross & Burks. Allotype, female.—Same data. Paratypes.—Same data, 4 ♂, 3 ♀.

DIBUSA, new genus.

Characteristics.—Wings, fig 5, typical of primitive genera of Hydropsyphidae, especially the genus Agraylea with noteworthy characters as follows: front wing with 5c forked; Rs divided into four branches, M divided into three branches, Cu and anal veins normal. Antennae filiform, the apical segment constricted at end to form a small bump. Ocelli absent. Maxillary palpi five-segmented, first two segments short, remaining three almost subequal and filiform, the last one slightly narrower and longer than preceding. Spur count 1–3–4. Combina-
tion of characters which distinguish this genus from all other Hydroptilidae: simple venation and elliptic ovate wings, lack of ocelli, and spur on front tibiae.

Genotype.—Dibusa angata, n. sp. (original designation).

Dibusa angata, new species.

Male.—Length 5.5 mm. Color of head and body various shades of light brown, legs straw colored, wings hyaline, clothed with a mixture of gray and brown hairs. General structure as described for genus. Genitalia as in figs. S A, B, and C. Ninth segment considerably retracted into eighth, with sides sclerotized and dorsum membranous. Tenth tergite contiguous with ninth, divided into a pair of lateral sclerotized plates separated on the meson by membranous folds, and curved downward at apex to form a short hook. What are apparently the cerci arise as a small lobe in the middle of the lateral margin at the base of the tenth tergite. Claspers biramous; ventral lobe slightly enlarged and upturned at apex; dorsal lobe more slender, outcurved, and widest at middle. Aedeagus, fig 5C, composed of a somewhat filiform basal portion markedly enlarged near base, and a semimembranous, irregularly tapering, pointed apical portion.

Holotype, female.—Dillsboro, N. C., April 24, 1938. Ross & Burks.

Hydropsyche alhedra, new species.

Male.—Length 13 mm. Body a medium shade of brown, dorsum of head and body darker. Flagellum straw color, with a dark, dorsal V-mark on the basal eight segments. Legs straw color, the tarsi and first two pairs of tibiae shaded by dusky pubescence. Front wings mottled over their entire surface with a mixture of pale and chocolate brown areas, the two colors contrasting strongly to make an irregular pattern much more pronounced than in other members of the group. Hind wings straw color. General structure typical for genus. Genitalia, fig. 7, nearest those of slossonae Bks., differing in details of aedeagus. Tenth tergite with meso-dorsal portion rounded and hump-like, divided at apex into a pair of long, thin, blade-like lobes forming a horseshoe-shaped arc from above. Claspers with apical segment subconical, tapering gradually from a rounded base to a somewhat pointed apex. Aedeagus with basal portion at almost a right angle to remainder; apical bulb bearing a single, mesal pair of pockets of spicules; membranous appendages behind mesal plate provided at tip with long, stout, pointed spine and just below base of this with a small pocket containing a few short spicules. The reverse is true in slossonae.

Holotype, male.—Black Gap, N. C., April 24, 1938, Ross & Burks.

Hydropsyche catawba, new species.

Male.—Length 11.5 mm. Head, body and wings a uniform mottling of medium and light shades of brown; flagellum and legs straw color, the former with black, dorsal V-marks on the basal nine segments. Structure typical for genus. Genitalia, fig. 6, most closely related to simulans, differing in the stock-
ier ninth segment and the shorter apical segment of clasper. Ninth segment cylindrical, the dorsal two-thirds very wide, the dorsal third only indistinctly separated from the tenth. Tenth tergite small, divided into a pair of sub-triangular lobes. Clasper with apical segment short, upturned, and pointed at apex, the dorsal margin evenly sinuate. Aedeagus with basal curve very obtuse, the apex slightly enlarged at origin of lateral processes; these are broad at base and taper to a sharp point; mesal plates small and thumb-like, approximate on meson; ventral cavity ovate, the lateral processes covering most of it, leaving an opening which is widest at apex and narrows markedly on the basal half.

**Holotype, male.**—Catawba River, Catawba, N. C., April 23, 1938, Ross & Burks. **Paratypes.**—Same data, 1♂.

**Cheumatopsyche helma**, new species.

**Male.**—Length 7 mm. Color entirely dark brown, the legs, sutures and venter of abdomen paler than other parts of the body; wings with inconspicuous pale areas along apex. Genitalia closest to petiti (Bks.), differing in the structure of ninth and tenth segments as follows: Ninth segment cylindrical without conspicuous widening of the lateral face. Tenth tergite with apex produced into a high mesal point and a lower pair of lateral erect plates; the apex of these is somewhat rounded, clothed with long setae and bears a sharp lateral projection. Claspers with apical segment one-third length of basal segment, sinuate, and tapering to a narrow apex. Aedeagus with base bulbous and apical neck slightly constricted.

**Female.**—Length, size and general structure same as for male. Genitalia similar to those of other species of genus.


**Heteroplectron amerus**, new species.

**Male.**—Length 11 mm. Color yellowish brown, with the eyes and dorsum slightly darker. General structure typical for genus. Head with interocellar tubercles meeting on the meson. Maxillary palpi cylindrical, 5-segmented, all clothed with long setae forming a loose brush; first two segments subequal in length, next three subequal to each other and about a fourth longer than second. Legs with spur count of 2-4-4. Genitalia, fig. 8, differing from those of *frontalis* and other members of the genus in the long spines of the tenth tergite. Ninth segment deeply incised on lateral margin near dorsum, ventral portion robust and dorsal portion contiguous with tenth tergite. Tenth tergite long, the extreme apex produced into a narrow, bifid tip; below the tenth tergite arises a pair of short, stout, curved spines; just beyond this and close to apex of lateral margin of tergite is a long, sinuate, sclerotized process. Cerci large, clothed on the outer margin with long setae. Basal segment of claspers tapering to apex;
apical segment short, the right one with three long, stout spines, the left one with two. Aedeagus with a slender base surmounted by a sub-membranous bulb in which is embedded a sclerotized, U-shaped process.

**Female.**—Size and color similar to male. General structure and genitalia apparently identical with other species in the genus.

**Holotype, male.**—Parksville, Tenn., Apr. 25, 1938, Ross & Burks. **Allotype, female.**—Same data. **Paratype.**—Same data, 1 ♀.

**Heteropletron gameta, new species.**

**Male.**—Length 13 mm. Head, body, and appendages various shades of dark and medium brown. General structure similar to above except as follows: Ocellar tubercles of head well separated on meson. Maxillary palpi with second segment annular, with a dorsal brush of long black setae; third segment three times as long, fourth segment half as long as third, both uniformly clothed with silky hair; fifth segment as long as first three combined and with a dense, appressed brush of black silky hair arising from near base and reaching apex. Genitalia, fig. 10, differing from those of *amerus* as follows: Ninth segment with a long, needle-like process extending under the cerci. Tenth tergite with the apex divided into a pair of lateral lobes, each of these with a wide, sinuate, pointed blade digressing slightly ventrad and then pointing caudad; at base of blade arises a stout sclerotized hook. Cerci relatively long, pointed at the apex. Claspers wide at base, tapering markedly to apex; apical segment short, right one with three, left with four, small sclerotized denticles. Aedeagus arcuate, shaped as in fig 10 A.


**Lepidostoma swannanoa, new species.**

**Male.**—Length 8 mm. Color dark brown, with the exception of the wings and legs below coxae which are tawny. Maxillary palpi club-shaped, the mesal margin flat and modified into a pocket bearing a dense cluster of white setae. Scape and wings simple, without scales. Genitalia, fig. 11, most closely related to *modesta*, differing in the shorter processes of the tenth tergite. Tenth tergite cleft almost its entire length down the meson; lateral lobes long, sinuate, with a large hump at base, a smaller one beyond it, the apex slightly upturned, lateral margin serrate. Claspers angled at base; ventral lobe with apex sinuate, narrowed and curved toward meson, with a fairly large apico-dorsal projection; dorsal process arising at base of ventral one, its base stout, narrowed, and slightly sinuate, and suddenly narrowing to a sub-ovate, flat, apical expanse.

**Female.**—Similar in size, color, and general structure to male, differing in the usual antigenetic characters as follows: maxillary palpi 5-segmented and cylindrical; genitalia semi-membranous, appearing as flat sclerites and apparently identical with related species.
**Holotype, male.**—Black Mountain, N. C., April 24, 1938, North Fork Swannanoa River, Ross & Burks. **Allotype, female.**—Same data. **Paratypes.**—Same data, 2♂.

*Lepidostoma Lydia,* new species.

**Male.**—Length 9 mm. Color and general structure as in preceding species. Male genitalia, fig. 9, closest to the preceding but differing in the rectangular tenth tergite with its evenly immarginate apex. Tenth tergite with base wide, apical portion narrowed to a rectangular, longitudinally convex plate arcutely incised at apex, with the apico-lateral corners slightly upturned, and setae arranged as in the illustration. Claspers with base angular; ventral lobe robust, curved mesad and pointed at apex; distal process of this lobe short and finger-like; dorsal lobe with narrow basal portion, the apex enlarged, spatulate and curved mesad.

**Female.**—Size, color, and general structure apparently identical with *swannanoa.*

**Holotype, male.**—Lydia, Va., April 20, 1938, Ross & Burks. **Allotype, female.**—Same data. **Paratypes.**—Same data, 18♂.

**Explanation of Plates.**

*Male genitalia (except fig. 5).*

Fig. 1. *Rhyacophila ledra:* 1A, aedeagus, lateral view.

Fig. 2. *Agapetus crassus.*

Fig. 3. *Rhyacophila carolina:* 3A, aedeagus, dorso-lateral view.

Fig. 4. *Cheumatopsyche helma:* 4A, tenth tergite, caudal view.

Fig. 5. *Dibusa angata,* wings: 5A, male genitalia, lateral view; 5B, same, dorsal view; 5C, aedeagus.

Fig. 6. *Hydropsyche catawba:* 6A, aedeagus, ventral view; 6B, aedeagus, lateral view.

Fig. 7. *Hydropsyche alhedra:* aedeagus; 7A, tenth tergite, lateral view; 7B, same, dorsal view.

Fig. 8. *Heteroplectron amerus:* 8A, aedeagus; 8B, apical segment of claspers, ventral view.

Fig. 9. *Lepidostoma Lydia:* 9A, tenth tergite, dorsal view; 9B, clasper, ventral view.

Fig. 10. *Heteroplectron gameta:* 10A, aedeagus; 10B, apical segment of clasper, ventral view.

Fig. 11. *Lepidostoma swannanoa:* 11A, tenth tergite, dorsal view; 11B, clasper, ventral view.
A NEW GEOMETRID GENUS FROM NORTH AMERICA, WITH A DISCUSSION OF ITS TYPE (LEPIDOPTERA).

By J. F. Gates Clarke,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The new genus of Geometridae described below is closely allied to both Hulstina and Pterotaea and the moths of all three genera look much alike. In genitalia, however, it appears to be most closely allied to Nepterotaea.

JENANA, new genus.

Plate 11, Figs. 1-5.

Labial palpus porrect, not exceeding front. Frontal prominence rounded, terminating in a ridge between the antennae and with a narrow, horizontal, corneous plate below. Tongue well developed. Antennae bipectinate in both sexes, the pectinations shorter in the female than in the male; pectinations arising from slightly before middle of segments.

Fore wing broad, pointed, with 11 veins; costa straight or slightly concave; fovea absent in both sexes; 2 from well before angle of cell; 3 and 4 approximate at base; 10 and 11 coincident, forming, by anastomosis with 9, a long narrow aereole; 1b not furcate at base.

Hind wing ample, outer margin excavated between 1 and 3; 8 approximate to 7 for less than half the length of the cell.

Fore tibia with short apical spine; hind tibia without hair pencil.

Male genitalia with harpe broadly attached at base; costa produced beyond cucullus; armature of the sacculus consisting of a cluster of stout curved spines; uncus narrow, simple, pointed; gnathos well developed.

Female genitalia with signum present.

Genotype.—Glaucina simularia Barnes and McDunnough.

The pectinations of the antenna arise from about the middle of the segments, while in Pterotaea and Hulstina they arise from the apices of the segments and in Nepterotaea their origin is at the bases of the segments. In Jenana the palpus does not exceed the front, the base of vein 1b of the fore wing is simple, and vein 8 of the hind wing is approximate to vein 7 for less than half the length of the cell, while in the other three genera the palpus does exceed the front, the base of vein 1b is furcate, and vein 8 is approximate for at least half the length of the cell.

The genitalia of Jenana are indistinguishable from those of Nepterotaea. From Pterotaea and Hulstina, Jenana can be distinguished by the pointed uncus, the extension on the costa of the harpe, and the absence of cornuti in the male, and by the simple sclerotized signum of the female. In Pterotaea and Hulstina the signum is either absent or is a stellate plate.

Jenana simularia (Barnes and McDunnough).

Male genitalia.—Harpe broader apically than basally; costa, beyond cucullus, clothed with strong hairs; cucullus with median excavation; armature at distal end of sacculus consisting of seven or eight strong curved spines arising from a broad, strongly sclerotized projection. Anellus a long, strap-like plate broadly dilated proximally and distally. Aedeagus stout, straight, somewhat narrower at middle than at either end; distal end flattened and bluntly pointed and armed with a sharp, slender spine.

Female genitalia.—Ostium with paired, sclerotized lateral ridges. Ductus bursae with a broad sclerotized band at ostium. Bursa copulatrix round; signum a simple sclerotized plate with a prominent posterior transverse ridge.

Alar expanse.—24-33 mm.

Type.—In the United States National Museum.

Type locality.—Monachee Meadows, Tulare County, Calif., altitude 8,000 feet.

Distribution.—California: Inyo Mountains, Inyo County, altitude 9,000 feet (18 ♂ ♂, 11-5-1936, R. H. Andrews and Lloyd M. Martin; 12 ♂ ♂, 28-5-1937, M. Walton); Lundy Creek, near Mono Lake, 2 ♀ ♀ (10-5-1936, Lloyd M. Martin); Monachee Meadows, Tulare County, altitude 8,000 feet, ♂ ♀ (July 8-14). Utah: Eureka, ♂ (4-IV-1921, Tom Spalding); Ridgefield, ♂ (28-5-1930).

Remarks.—When Barnes and McDunnough described this species they acknowledged that it was probably misplaced in Glaucina. The pectinations of the female antenna and the habitus will immediately distinguish it from the species of that genus.

The specimens from Utah, which I have associated with the California examples, are smaller but undoubtedly belong here.

I am indebted to Dr. J. A. Comstock for the long series from California. Until the receipt of this series the species was represented in the National collection by the unique type female and two additional battered specimens.

Plate 11.

Jenana simularia (Barnes and McDunnough).

1. Wings.
2-2a: 2, lateral view of head, male; 2a, section of male antenna.
3-3a: 3, lateral view of head, female; 3a, section of female antenna.
4-4c: Male genitalia. 4, ventral aspect with aedeagus removed; 4a, aedeagus, ventral view; 4b, armature of sacculus, enlarged, from outer side of harpe; 4c, armature of sacculus, enlarged, from inner side of harpe.
5. Female genitalia, ventral view.

All drawings are by Eleanor A. Carlin, Bureau of Entomology and Plant Quarantine.
A NEW SPECIES OF NORTH AMERICAN PONERA, WITH AN ERGATANDROUS FORM (HYMENOPTERA: FORMICIDAE).

By Marion R. Smith,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In a previous article entitled "Ants of the Genus Ponera in America, North of Mexico" (Ann. Ent. Soc. Amer., Vol. 29, pp. 420–430, 1936) I dealt with the taxonomy, biology, and distribution of the five known North American species. Recently A. B. Gurney, of this Bureau, has collected in a sawdust pile at Priest Bridge, Md., a species of Ponera which can not be assigned to any of those discussed in my article. Among the specimens are workers, queens, and ergataners, but no males. The ergataner is characterized by its exceedingly large, sub-rectangular head, 13-segmented antennae, extremely small eyes, and the deep, broad mesoepinotal constriction. The possibility that the species might be new was increased by the fact that only four species and one variety are known to have ergatandrous forms, namely, opaciceps Mayr, eduardi Forel, ergatanidia Forel, punctatissima Roger, and ragusai var. santschii Emery, and only two of these, opaciceps and ergatanidia, are known to occur in North America. The new ergataner differs from those of ergatanidia and punctatissima in having 13-segmented antennae, and from those of opaciceps and eduardi in possessing dentate mandibles, and an antennal scape much longer than funicular segments 1 to 4 combined, but it bears a close similarity to the description and figure of the ergataner of santschii. I therefore sent specimens of workers, queens, and an ergataner to Carlo Menozzi of Italy, who very kindly compared these with Emery's type of santschii. He stated, however, that the Maryland species and santschii can not possibly be the same because of the difference in the number of segments in the maxillary palpus of the worker, the former having two segments, and santschii one segment. Although an ergataner was sent Menozzi, no comment was made. His opinion after a very careful study was that my specimens represent a new form very closely allied to ergatanidia. I take the liberty of quoting his remarks as follows: "I find your Ponera is allied to ergatanidia, from which one can distinguish it as a species or subspecies by the head being a little narrower, with sculpture less impressed, the scape of the antenna, and the scale of the petiole thicker; furthermore the pubescence of the new species is coarser than that of P. ergatanidia."

Ponera oblongiceps, sp. nov.

Worker (Plate 12, fig. 1).—Length, 2.2–2.4 mm.

1 The drawings accompanying this paper are by Mary F. Benson of the Bureau of Entomology and Plant Quarantine.
Head, excluding mandibles, approximately one-third longer than broad, posterior border faintly emarginate, sides gently convex, thus giving a subparallel effect. Antennal scape extending to the posterior nine-tenths of the head, exclusive of the mandibles; first funicular segment approximately as long as the three succeeding segments taken together, the last funicular segment exceeding in length the two preceding segments taken together. Eye extremely small, circular, apparently with only 1 to 3 ommatidia. Thorax with well defined promesonotal and mesoepinotal sutures, the suture separating the mesopleura from the mesonotum distinct in some specimens, indistinct in others; mesoepinotum with a rather strong constriction which is well defined laterally; base of epinotum and the declivital surface meeting in a distinct, obtuse angle. Petiole viewed laterally thick anteroposteriorly, slightly thinner above than below, with convex anterior surface and flattened posterior surface, dorsal surface blunt; petiole viewed posteriorly rounded from side to side; ventral surface with a prominent, rounded tubercle. Gaster of the usual shape; first two segments occupying more than half the surface.

Body rather shining in spite of the dense pubescence which covers its surface; mandibles glabrous, with coarse, sparse punctures; punctuation of head not clearly discernible except under high magnification.

Hairs grayish, subrect to erect, sparse, but especially noticeable on the clypeus and the pygidium of the gaster.

Yellowish brown; mandibles, thoracic sutures, and the gaster more infuscated.

_Ergataner_ (Plate 12, figs. 2, 3).—Length 3.1–3.3 mm.

Head, excluding mandibles, large, subrectangular, one-fifth longer than broad, posterior border very faintly emarginate, sides gently convex, subparallel; anterior border of head slightly narrower than posterior border. Antenna 13-segmented; antennal scape exceedingly short, extending only three-fifths the length of the head, when the mandibles are not included; funiculus gradually enlarging from base to apex. Eye extremely small, circular, with 1 to 3 ommatidia. Thorax smaller and distinctly narrower than the head; promesonotal and mesoepinotal sutures distinct; a deep, broad constriction in the region of the mesoepinotum, clearly setting the mesonotum apart from the epinotum. Epinotum and petiole similar to those of the worker. Gaster with 5 distinct segments in addition to the terminal, male genital appendages.

Color, pubescence, and pilosity as in the worker.

_Queen._—Length 2.9–3 mm.

Head similar in shape to that of the worker. Vertex with 3 ocelli arranged in an almost equilateral triangle. Antennal scape, when fully extended, slightly surpassing the anterior ocellus. Anterior border of the compound eye almost touching the posterior border of the clypeus. Dorsal border of the petiole narrower anteroposteriorly than that of the worker. Wings hyaline, with pale-yellowish veins.

Body rather smooth and shining, although covered by dense pubescence. Pilosity similar to that of the worker.

Black; mandibles, clypeus, antennae, legs, and tip of gaster reddish brown.

Described from 47 workers, 3 ergataners, and 15 queens, all of which were collected at Priest Bridge, Md., by A. B. Gurney. These cotytes are in the United States National Museum.
Changes of Names in Carabidae and Rhynchophora (Coleoptera).

By L. L. Buchanan, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Among the beetles frequently mentioned in economic reports are several whose scientific names have recently been, or should now be, changed. A few of these changes are here reviewed or briefly discussed. The species are as follows:

Agonoderus lecontei Chaud. (*Agonoderus pallipes* authors, not F.) Seed-corn beetle.
Arrhenodes minutus (Drury). (*Eupsalis minuta* (Drury); *Platysystrophus minutus* (Drury)). Oak timber worm.
Rhynchaenus pallicornis (Say.) (*Orchestes pallicornis* Say.) Apple flea weevil.
Euscepes postfasciatus (Fairm.). (*Enscepes batatae* (Waterh.).) West Indian sweetpotato weevil.
Sternochetus lapathi (L.) (new combination). (*Cryptorhynchus lapathi* (L.); *Cryptorhynchidius* (new generic synonymy) *lapathi* (L.).) Poplar and willow borer.

Agonoderus lecontei Chaud. (Carabidae).

H. C. Fall (Ent. News, vol. 44, 1933, pp. 102–104) shows that this name replaces *Agonoderus pallipes* authors, not *Carabus pallipes* F. The Fabrician *pallipes* becomes *Agonum pallipes* (F.) with synonym *Feronia limbata* Say. (*Platynus limbatus* (Say); *Agonum limbatum* (Say).)

Arrhenodes minutus (Drury) (*Curaclio minutas* Drury) (Brentidae).

Formerly called *Eupsalis minuta* (Drury), more recently *Platysystrophus minutus* (Drury).

Schoenherr 1826 (Curc. Disp. Meth., p. 7 and 70) erected *Arrhenodes* (crediting it to Steven), and designated *Brentus septentrionis* Hbst. (*septentrionis* authors) as type. Kleine 1917 (Arch. Nat. vol. 82, p. 138, 139) erected *Platysystrophus*, and designated *minutus* (Drury) as type. These genotypes are forms of a single species and *Platysystrophus* is therefore a synonym of *Arrhenodes*. (See Kuntzen, Mitt. Zool. Mus. Berlin, b. 22, 1937, pp. 190–197.) *Eupsalis* was erected by Lacordaire 1866 (Gen. Col. vol. 7, p. 430), but I have not found whether or not a genotype has been selected.

The adoption here of *Arrhenodes minutus* as the correct name
for this species is based on acceptance of Kuntzen’s statement (ib., pp. 194–195, footnote) that *Brentus* F. 1787 (type species, *Curculio anchorago* L., designated by Latreille 1810, Consid. Gener., p. 430) antedates *Brentus* Panzer of about same time but exact date unknown (type species, *minutus* (Drury), *teste* Kuntzen; probably by monotypy, but Panzer’s paper not available to me).

**Rhynchites bicolor** (F.) (*Curculio bicolor* F.) (*Curculionidae*).

The correct generic name for this species is uncertain. *Rhynchites* is usually attributed to Herbst 1797 (Natursys. Ins., vol. 7, p. 133) who assigned to it *Curculio bacchus* L. and several other species. Latreille 1810 (Consid. Gener., p. 430) designated *bacchus* as type of *Rhynchites*, and the generic concept thus established has been universally followed.

The name had been previously mentioned by Schneider 1791 (Neuestes Mag., p. 83, footnote) who stated, in effect, that *Rhynchites* (presumably a Hellwig manuscript name) may be used for “die hiither gerechneten” weevils, referring apparently to the species which Laicharting placed in *Rhinomacer* in 1781 or 1784 in his “Verzeichnisse” Tyrol. Ins.” Neither volume of Laicharting’s work being available to me, I can not say what bearing it may have on the problem; but in any case it seems better to credit *Rhynchites* to Herbst 1797, thus preserving the familiar sense of this name.

If *bacchus* (L.) is taken as type of *Rhynchites*, the genus in its restricted sense will include those species having a spine on the prothorax in the male, with *velatus* Lec. the only true representative in the United States fauna.

*Merhynchites* Sharp 1889, now usually considered a subgenus, was originally erected as a genus for *hungaricus* (Hbst.) and *bicolor* (F.). The type species is *bicolor*, designated by Pierce 1913 (Proc. U. S. N. M., vol. 45, p. 370). Reitter’s designation of *hungaricus* as type is invalid (Fauna Germ., vol. 5, 1916, p. 262). *Merhynchites* might be elevated to generic rank in order to provide a generic name for *bicolor*, but such action should be deferred at least until the unfinished parts of Voss’ revision and catalogue of the Rhynchitini have been published.

The latest assignment of *bicolor* is to the genus *Caenorhinus* Thomson (as *Coenorhinus*) in the Schenkling catalogue (part 158, 1937, p. 55) but this is untenable, as *Caenorhinus* (Thomson, Skand. Col., vol. 1, 1859, p. 130) is monobasic, originally including only *Rhynchites megacephalus* Germar. a species now placed in the genus *Deporus* (Winkler catalogue, 1930, col. 1380). Voss’ designation of *Curculio aequatus* L. as type of *Caenorhinus* (Kol. Rund., b. 18, 1932, p. 168) is therefore invalid.

In view of these uncertainties it is suggested that *Rhynchites*
be temporarily retained in its broad sense, and that the name *Rhynchites bicolor* (F.) be continued for the rose curculio.

*Rhynchaeus pallicornis* (Say) (*Orchestes pallicornis* Say) (Curculionidae).

*Rynchaenus* Clairville-Schellenberg 1798 (Ent. Helv., p. 70). Genus described, and two species described and placed in it, *Rynchaenus xylostei* Clair.-Schell. (n. sp.) and *Curculio populi* F. Both species are figured.

*Rynchaenus*. An emendation used by Fabricius 1801, Illiger 1804, and by later writers.

*Orchestes* Illiger 1798 (Verz. Kaf. Preuss., p. 498). Name merely listed in index thus: “67. Orchestes*. (Curculiones saltatorii)” Fabricius, Herbst, and probably other early writers separated the jumping weevils as a group of *Curculio* (“femoribus posticis saltatorius,”—Fabricius, Syst. Ent., 1775, p. 144, and in other works; “Russelkafer mit spring-füssen,”—Herbst, Natursys. Ins., vol. 6, 1795, p. +20), and Illiger’s expression “Curculiones saltatorii” probably can be taken as a definition or reference sufficiently exact to establish *Orchestes* Illiger as of 1798 under article 25 of the International Rules of Nomenclature.

The actual date of publication of *Rynchaenus* and of *Orchestes* is uncertain. Beyond the 1798 title page of the Clairville-Schellenberg paper no evidence has been found as to the time of publication of *Rynchaenus*. A foreword by Hellwig to Illiger’s paper is dated Sept., 1798, indicating actual date of publication of *Orchestes* as probably very late in the year.

Illiger 1804 (Mag. für. Ins., 3, p. 105) listed these names as follows: “176. Rhynchaeus (Orchestes Illig.).” The fact that Illiger himself synonymized his *Orchestes* seems to show that he recognized the priority of *Rynchaenus*. It may be pointed out also that the principles laid down in recommendations (a) and (c) under article 28 favor the selection of *Rynchaenus* over *Orchestes*.

On the basis of these data, *Rynchaenus*, or its emendation *Rhynchaeus*, should be used for the genus known as *Orchestes* in American literature. The adoption of *Rhynchaeus* is here recommended (instead of *Rynchaenus*) on the grounds of its conformity with common usage, though the retention of the original orthography would seem to be more in accord with the spirit of the code.

*Euscepes postfasciatus* (Fairm.) 1849 (*Cryptorhynchus postfasciatus* Fairm.) (Curculionidae).

*Euscepes batatae* (Waterh.) 1850 is a synonym. (See Zimmerman, Bernice P. Bishop Mus., Occ. Pap., vol. 12, no. 23, 1936, pp. 14–16.)
Sternochetus mangiferae (F.) (*Curculio mangiferae* F.) (Curculionidae).

*Sternochetus* is an uncatalogued generic name, first used by W. D. Pierce in his "Manual of Dangerous Insects . . .", U. S. Dept. Agr., 1917, pp. 143-144, figs. 71-72. *Sternochetus* is validated in this paper by the inclusion in it of two species of mango weevils, *Curculio gravis* F. and *C. mangiferae* F. Of these, *mangiferae* is well known and rather widely distributed, and seems the logical choice for genotype. Therefore, *Curculio mangiferae* F. 1775 (Syst. Ent., p. 139) is hereby designated genotype of *Sternochetus* Pierce 1917. The species is called *Cryptorhynchus mangiferae* in most published reports.

*Sternochetus lapathi* (L.) (new combination) (*Curculio lapathi* L.) (Curculionidae).

For more than a hundred years this familiar species has been known as *Cryptorhynchus lapathi*, but a change of generic name seems unavoidable, unless the rules are suspended. Latreille's unfortunate choice of "*Rhynchacaeus pericarpinus* F." which evidently equals *Curculio pericarpinus* L., as genotype of *Cryptorhynchus* (here accepted as a justifiable emendation of *Cryptorhynchus Illiger*) moves the name *Cryptorhynchus* to the Ceutorhynchini, where it replaces *Rhionoeus* authors, not Schoenherr 1825 (Isis von Oken, heft 5, p. 586). This change was proposed by Pierce 1919 (Proc. Ent. Soc. Wash., vol. 21, p. 25), but has not been generally adopted. Pierce, ib., erected *Cryptorhynchidius*, with designated genotype *Curculio lapathi* L., for "*Cryptorhynchus Schoenherr 1826 (not Illiger 1807)*," which, it seems to me, should read "*Cryptorhynchus and Cryptorhynchus authors (part) not Cryptorhynchus (or Cryptorhynchus Illiger)".

The question arises as to the relationship of *Cryptorhynchidius* Pierce 1919 to *Sternochetus* Pierce 1917, and as to the scope of each. The genotypes, *lapathi* (L.) and *mangiferae* (F.) respectively, differ in several ways and, in a revisional study, *Cryptorhynchidius* and *Sternochetus* might be treated as at least subgenerically distinct; but without such a study it is impossible to know just which of the numerous species now listed in *Cryptorhynchus* should be referred to *Cryptorhynchidius* and which to *Sternochetus*. It seems best, therefore, to treat them as synonymous, in which case *Sternochetus* Pierce 1917 (*Cryptorhynchidius* Pierce 1919, new synonymy) will have to be used for both *lapathi* (L.) and *mangiferae* (F.), as well as for all other species listed under "*Cryptorhynchus*" in the recent Schenkling catalogue (part 151, 1936, p. 216).
FIVE NEW SPECIES OF METEORUS (HYMENOPTERA: BRACONIDAE).

By C. F. W. Musebeck,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

When at the British Museum recently I was handed four specimens of a remarkable new species of Meteorus which I agreed to describe. Since the collections of the United States National Museum contained four other undescribed species of this genus, all of them rather unusual, it has seemed desirable to include descriptions of all five species in the same paper.

Meteorus insignis, new species.

This appears to differ from all described species of the genus in its aciculate second tergite.

Female.—Length about 4 mm. Head wider than thorax; face nearly twice as broad as long, mostly smooth; malar space not more than half as long as basal width of mandible; temple convex, not receding; cheek slightly bulging; ocellar line nearly three times as long as diameter of an ocellus; antenna a little shorter than the body, 32- to 33-segmented.

Thorax rather slender; notaulices sharply impressed and finely punctate; mesonotal lobes minutely punctured anteriorly; propodeum gradually declivous, rugose reticulate, without transverse basal or median longitudinal carina; side of pronotum almost entirely smooth and polished; mesopleuron smooth except for a narrow longitudinal strip ventrad and an area below tegula, which are weakly rugulose; hind coxa smooth, with only a little weak punctuation at base; first abscissa of radius not more than half width of stigma and shorter than second abscissa, the latter less than half as long as first intercubitus; radial cell ending distinctly before apex of wing; recurrent vein entering first cubital cell at apex, nearly interstitial; radicellae cell not widening apically; nervellus slightly longer than lower abscissa of basella.

First tergite with a very short petiole, the deep dorsal fossae about as far from base of tergite as petiole is wide, spiracles at or slightly before middle, surface of tergite closely longitudinally rugulose; second tergite closely, almost completely aciculate; second suture fine but distinct; third and following tergites smooth and polished; ovipositor sheath about as long as propodeum and abdomen combined.

Black; clypeus and mandibles reddish brown; palpi yellow; antennae brown, darkest apically; wings subhyaline, stigma and veins dark brown, the former with a pale spot at base; tegulae dirty brownish yellow; legs testaceous, posterior tibiae, except narrowly at bases, and posterior tarsi blackish.

Type locality.—Bricket Wood, Herts, England.

Type.—In the British Museum; also one paratype deposited in that collection; two paratypes in the U. S. National Museum, No. 53134.
Described from four female specimens taken June 17, 1936, by R. B. Benson, of the Division of Entomology, British Museum of Natural History.

**Meteorus cognatus**, new species.

Although only a single specimen is available, this species is described here since it resembles the preceding form in the unusual characteristic of a sculptured second tergite. It is also like that species in general habitus, in color, and in many structural details, but it may be readily distinguished by the coarsely sculptured side of the pronotum, longer first abscissa of radius, longer radial cell, more abruptly declivous propodeum, and larger size. From the foregoing description of *insignis* it differs as follows:

**Female.**—Length 3.5 mm. Face minutely punctate and rather dull; antennae 36-segmented; notaulices foveate; mesonotal lobes not distinctly punctate, even anteriorly; propodeum coarsely rugulose reticulate, rather abruptly declivous behind and with the basal transverse carina and the median longitudinal carina more or less distinct; side of pronotum coarsely rugose except narrowly along upper margin; mesopleuron with a broad rugulose area ventrad; first abscissa of radius only a little shorter than width of stigma and about as long as second abscissa, the latter about half as long as first intercubitus; radial cell almost attaining extreme apex of wing; fossae of first tergite removed from base by more than width of petiole. Mandibles yellowish; wings hyaline, stigma brownish yellow without a pale spot at base; tegulae bright yellow.

*Type locality.*—Great Alpine Creek, Tahoe, Calif.

*Type.*—U. S. National Museum No. 53135.

Described from a single specimen collected July 16, 1915, by E. P. Van Duzee.

**Meteorus crassifemur**, new species.

This species runs to couplet 4 in my key to the North American species,¹ but it disagrees with the first alternate in having the lower abscissa of the basella much shorter than the nervellus, and with the second alternate in the longer ocellocular line. It closely resembles *maximus* Muesebeck, but from that species it may be distinguished by the longer ocellocular line, broader face, and stout hind femur.

**Female.**—Length about 10 mm. Head a little broader than thorax; temple convex, at least half as broad as eye; face twice as broad as long, closely, finely punctate; malar space about one-third as long as basal width of mandible; ocellocular line definitely longer than greatest diameter of an ocellus; antennae usually 43- to 45-segmented.

Thorax elongate, deeper than broad; notaulices foveolate, meeting in a large impressed area which is divided by a delicate median longitudinal keel; propodeum rugose reticulate, with a prominent arched basal transverse carina, and a more or less complete median longitudinal carina; side of pronotum finely rugulose; lower sunken half of mesopleuron closely punctate; nervulus interstitial; first abscissa of radius less than half as long as second, the latter about as long as second intercubitus; radial cell ending well before apex of wing; recurrent vein entering first cubital cell at extreme apex; lower abscissa of basella less than half as long as nervellus, the latter about as long as upper abscissa of basella; radiellan cell widening apically, weakly constricted at end of basal third, the cross vein wanting; posterior coxa minutely punctate; hind femur rather stout, not distinctly twice as long as trochanter and only about four times as long as broad; posterior tibia a little longer than femur and trochanter combined.

Abdomen a little stouter than in **maximus**; first tergite finely rugulose beyond spiracles and with two conspicuous dorsal fossae before spiracles; ventral margins of first tergite widely separated; second and following tergites polished; ovipositor sheath hardly half as long as abdomen.

Ferruginous; antennae blackish apically, apices of posterior tibiae dark; posterior tarsi yellowish white; wings hyaline, iridescent; stigma brownish yellow; veins darker.

**Type locality.**—Wellington, Kans.

**Type.**—U. S. National Museum No. 53136.

Described from four female specimens: Type collected by E. G. Kelly; one paratype from Texas (Belfrage Collection); one from Brookings, S. Dak., June 14, 1923, G. I. Gilbertson; and one from Winfield, Kans., 1935, Charles E. Burt.

**Meteorus townsendi,** new species.

This species appears to differ from all described South American forms in combining an incompletely margined occiput, a relatively long first abscissa of the radius, rather strongly infuscated wings, and dark tegulae.

**Female.**—Length 3.5 mm. Head not quite so wide as thorax, strongly transverse, smooth; temple receding gradually from eye margin; occipital carina interrupted medially; malar space longer than basal width of mandible; ocellular line more than twice greatest diameter of an ocellus; antennae usually 25- to 28-segmented; maxillary palpus not longer than height of head.

Thorax short and compact; notaulices sharply impressed; mesonotal lobes mostly smooth, the median lobe shallowly impressed down the middle, finely punctate anteriorly; scutellum very small, smooth, barely longer than the large sulcus at its base, the latter divided by a median carina into two large pits; propodeum rugoso-reticulate, excavated medially on posterior declivity; mesopleuron smooth, with a broad impression below crossed by several carinae; hind coxa smooth; first abscissa of radius much longer than second and as long as width of stigma; second abscissa of radius not more than half as long as
second transverse cubitus; radial cell very nearly attaining extreme apex of wing; recurrent interstitial with first transverse cubitus or entering first cubital cell at extreme apex; lower abscissa of basella at least as long as nervellus; radiella and cubitella rather strongly sinuate; radiellan cell in widest part nearly as wide as cubitellan cell at narrowest point.

Abdomen narrower than thorax; first tergite very slender at base, with no indication of dorsal foveae, smooth before spiracles, delicately longitudinally acuminate caudal except for a smooth strip medially, ventral margins meeting on basal half; second and following tergites polished; ovipositor sheath about half as long as abdomen; ovipositor strongly thickened toward base.

Honey yellow, with head and mesonotum tinged with ferruginous; palpi pale; antennae and tegulae blackish; wings strongly infumated basally, more weakly so apically; stigma and veins brown; apex of posterior tibia, and posterior tarsus except basal two-thirds of metatarsus, blackish.

_Male._—Differs in no essential respect from the female.  
_Type locality._—Beltterra, Para, Brazil.  
_Type._—U. S. National Museum No. 53137.  
_Host._—A sphingid larva feeding on rubber.  
_Cocoons._—In a compact mass enclosed in loose silk and suspended on a silken thread several inches in length.  
Described from 11 females and 13 males reared in August, 1938, by E. D. Townsend.

_Meteorus congregatus_, new species.

Closely related to _townsendi_ but distinguished by the complete occipital carina, shorter malar space, relatively shorter first abscissa of radius, absence of impression on median lobe of mesoscutum, and relatively narrower radiellan cell.

_Female._—Agrees with the foregoing description of _townsendi_ except as follows: Temple strongly receding but distinctly a little convex; malar space about equal to basal width of mandible; occipital carina weak medially but complete; antennae usually 27- to 30-segmented. Notaulia more shallowly impressed than in _townsendi_; middle mesonotal lobe not at all impressed down the middle but with a more or less distinct median longitudinal keel; propodeum coarsely rugose reticulate; mesopleuron minutely punctate, longitudinal impression shallow and rugose; first abscissa of radius much longer than second but shorter than greatest width of stigma; lower abscissa of basella longer than nervellus; radiellan cell in widest part only about half as wide as cubitellan cell at narrowest point; first tergite rather strongly, evenly, longitudinally acuminate on apical half, ovipositor slender.  Head, thorax, and abdomen honey yellow; wings less strongly but more uniformly infumated than in _townsendi_, tegulae brown.

_Male._—Essentially like the female.  
_Type locality._—Ancon, Canal Zone.  
_Type._—U. S. National Museum No. 53138.  
_Host._—Larva of _Erinnyis ello_ (L.) on papaya.
Cocoons.—The single cluster at hand is more than 3 inches in length and apparently contains several hundred cocoons which are surrounded by some loose silk.

Described from 15 females and 4 males reared in October, 1926, by James Zetek, of the Bureau of Entomology and Plant Quarantine under his number 2822.

A NEW DOLICHOPUS FROM IOWA (DIPTERA).\textsuperscript{1}

By F. C. Harmston and G. F. Knowlton.\textsuperscript{2}

During the past year the writers have had the opportunity of examining the Dolichopodidae material of the Iowa Wesleyan College through the courtesy of Professor H. E. Jaques. The following species appears to be undescribed.\textsuperscript{3}

Dolichopus jaquesi, n. sp.

Male.—Length 5-5.2 mm.; wing 4.8-5 mm. Face short, wide, sides nearly parallel, covered with ochre yellow pollen which extends above the antennae, especially along the orbits. Front green. Palpi deep velvety black. Antennae wholly black, third joint but little longer than wide, rounded at tip. Orbital cilia black. Thorax covered with brownish pollen, almost hiding coppery ground color; pleurae blackish with coppery reflections, dulled with grey pollen. Abdomen dark green with coppery reflections, dusted with grey pollen. Hypopygium large, black; its moderate sized lamellae of a greyish color with deeply jagged black border; rather truncate at apex. Coxae black; anterior pair dusted with grey pollen and having strong black bristles at apex. Hairs on anterior surface of fore coxae black. Middle coxae with strong bristles at apex and having the anterior surface clothed with black hairs. Femora black; extreme tips yellowish. Middle and hind femora each with one preapical bristle, the latter ciliate along entire lower inner edge with black hairs which are not longer than one-third the width of the femora. Tibiae black; extreme base yellowish. Middle tibiae with one bristle below. Posterior tibiae slightly thickened at tip. Tarsi black; fore tarsi about one and one-third times as long as their tibiae. First joint of fore tarsi nearly one and a half times the length of second joint; other joints of regularly decreasing length. Middle tarsi one and one-third times the length of corresponding tibiae. Hind tarsi almost one and one-half times the length of their tibiae. First two joints of nearly equal length. Calypters and halteres yellow, the former with black cilia. Wings greyish, tinged with brown in front of third vein. Costa with elongated enlargement at tip of first vein. Last section of fourth vein bent near its middle, curving forward to run

\textsuperscript{1} Contribution from the Department of Entomology, Utah Agricultural Experiment Station.

\textsuperscript{2} Research assistant and associate research professor of entomology, respectively.

\textsuperscript{3} The writers are indebted to Mr. C. T. Greene for his opinion concerning this species.
parallel with third vein to wing margin. A conspicuous jet black spot near the apex on the posterior margin. Wing but little indented at tip of fifth vein; anal angle not at all prominent.

Female.—Much like male. Third antennal joint shorter. Costal vein not enlarged at tip of first vein. Hind tibiae not thickened. Posterior femora lack cilia along inner lower edge. Abdomen is dark metallic green with slight coppery reflections.

Taxonomy.—This species runs to fortis Aldrich in Van Duzee and Currans' analytical key (American Museum Novitates No. 683) but differs in having no infuscation on cross-vein and has a deep black spot at apex of wing on posterior margin. The cilia of posterior femora are darker and shorter than those of fortis Aldrich.

Types.—Described from 6 males and 7 females collected at Mt. Pleasant, Iowa, May 23, 1938, by B. G. Berger. Holotype and allotype deposited in U. S. National Museum: Paratypes in insect collections of Iowa Wesleyan College and Utah Agricultural Experiment Station.

Dolichopus jaquesi, n. sp. Male.

TWO NEW CALIFORNIA PHYLLOPHAGA (COLEOPTERA: SCARABAEIDAE).

By Lawrence W. Saylor,
Bureau of Biological Survey, U. S. Department of Agriculture.

The description of the following two species brings the total known species of the genus Phyllophaga in California to five, with the possibility of a sixth being found in the northern part of the State. The previously known species are: P. errans Leconte, P. sequoiana Saylor, and P. stohleri Saylor. P. anxia (Leconte) has been recorded from northern California but it is possible that the so identified specimens may be P. errans.
Phyllophaga reevesi Saylor, new species.

(Figure 1, a–e.)

Male.—Robust, wider behind; rufocastaneous, the thorax and head rufous and shining, the elytra pruinose; elytra with very minute hair on disc. Punctures of head and elytral very coarse, variolate, and contiguous; elytral apex scarcely reflexed, faintly emarginate at center, the angles very broadly rounded. Antennae 10-segmented, the testaceous club one-third longer than the funicle. Thorax with moderately coarse punctures, somewhat densely punctate on disc, with a small median smooth area, the punctures much closer and coarser apically and near the sides. Pygidium with sparse punctuation and short subrectic hairs, apex broadly rounded, entire surface moderately pruinose. Abdomen shining; 5th segment with a median patch of dense fine punctures at base, the latter with short erect hair, the apical third suddenly declivous to apical margin; 6th sternite flattened, finely punctured, with a subbasal and submarginal row of short erect hairs. All claws with short triangular tooth slightly above the middle, the area between the claw tooth and basal dilation minutely crenulate. Length 14 mm. Width 7 mm.

The unique male Type from “Dante’s View, Death Valley, California, April, 1935, Lawrence W. Saylor Collector,” will be deposited on loan in the collection of the United States National Museum. The specimen was taken under a rock on the side of the hill just below the top of Dante’s View; remains of a second individual were seen in a spider web also under a rock on the hillside. It affords the writer much pleasure to name this species in honor of his close friend and companion on many enjoyable collecting and fishing trips, William C. Reeves, Jr., of the University of California.

Phyllophaga xerophila Saylor, new species.

(Figure 2, a–e.)

Male.—Shape, coloration, and punctuation of the entire dorsal surface similar to that of P. reevesi. Antennal club one-fourth longer than funicle, the entire antenna testaceous. Pygidium sparsely and finely punctate with minute hair, surface pruinose in basal three-fourths; apex subtruncate. Abdomen polished, with punctuation of 5th segment moderately dense at center, and with minute hair at center-base, apex and sides very sparsely punctate, the apical half gradually declivous to apical margin; 6th sternite nearly as long as 5th, flat, with faint indication of a median longitudinal sulcus, nearly impunctate at center. All claws with short triangular tooth above the middle, surface between the tooth and basal dilation very minutely crenulate. Length 15 mm. Width 7 mm.

The unique male Type is from “Vermo, near Barstow, San Bernardino County, California, collected in April, 1935, Lawrence W. Saylor,” and will be deposited on loan in the United States National Museum.
Phyllophaga stohleri Saylor.

This species was described by the writer from specimens collected in Nye County, Nevada; since that time he has received an additional pair collected in the "Panamint Mountains, Inyo County, California, May 20, 1937, taken in copulation on a Juniperus bush by W. C. Reeves," and presented to him by the collector. The author has also seen two additional specimens of this species, one taken at the same time and place, in the collection of Mr. James Elsea, and another, a male, from Essex, Calif., collected April 29, 1937, by Mr. Mont. A. Cazier and presented to the writer by the collector.

The species of this group may be separated by means of the following key, as well as by the male genitalia:

**Key to Males of the Phyllophaga sociatus Group.**

1. Antennal club distinctly longer than the funicle; thoracic punctures at the front margin dense but usually not contiguous .................................. 2
   Antennal club shorter than funicle; punctures of thorax usually coarser and contiguous at the front margin, and immediately adjacent to the latter ........................................... 3

2. Pygidium sparsely punctate, the hairs procumbent and minute; 5th abdominal sternite not abruptly declivous at apex xerophila, new species

Pygidium sparsely punctured with short and suberect hairs; 5th sternite abruptly declivous at apical fourth to apex ... reevesi, new species

3. Pygidium with close dense punctures, the hairs short, dense and erect; sutural stria of elytra widest at middle and narrowing abruptly towards base and apex; hind femur with long dense hair over the entire surface ................................................................. stohleri

Pygidium sparsely punctate; sutural stria of very nearly the same width throughout, except immediately adjacent to the scutellum; hind femur with but two marginal rows of long hairs, the surface between them impunctate .................................................... sociatus Horn

These four species seem to form a very definite group of nearctic Phyllophaga; they approach somewhat the members of subgenus Listrochelus (in which sociatus was originally described) but are distinguished by the entire lack of a transverse carina on the vertex, as well as by the smoother tarsal claws, which at most have a very faint crenulation visible only at the base under rather high magnification. The group includes: Oblong-oval species, wider behind, of varying shades of rufocastaneous and rufous, often with a marked degree of pruinosity above; the head and thorax coarsely punctate, the latter especially at front margins and sides, the lateral margins strongly crenulate and ciliate; elytra with sparse fine punctures; 5th abdominal segment exhibiting varying degrees of declivity at apex, the 6th segment
flat; hind femur densely pilose, at least on margins, hind tibia with moderately dense, long cilia on inner surface; front tarsal segments with a small spine at inner side of apex; all claws with a small, triangular preapical tooth, the surface between the tooth and the basal dilation very minutely crenulate in some specimens; under surface with long, erect, very dense hair.

Explanation of Text Figures.

Figure 1. *Phyllophaga reevesi* Saylor

a. Ventral view of male genitalia.
b. Side view of male genitalia.
c. Side view of male genitalia.
d. Side view of aedeagus.
e. Tip of aedeagus enlarged.

Figure 2. *Phyllophaga xerophila* Saylor
A NEW HOPLOTHRIPS (TRICHOPTHIPS) FROM YUGOSLAVIA (THYSANOPTERA).

By J. C. Crawford,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The discovery of a new species of European thrips at the Port of New York is of interest in itself and also since it shows how the species living under bark of logs can be introduced and probably become established.

Hoplothrips (Trichothrips) pallicornis, new species.

Female (macropterous).—Length 1.85 mm. (distended 2.5 mm.). Brownish-yellow, with thorax and tube more distinctly brown and head deeper brown; legs concolorous with abdomen; first antennal segment concolorous with head, rest of antennae light yellowish-white; all wings infuscated; all major bristles pointed, only slightly tinged yellowish-brown; much pigment in head, thorax, and abdomen, orange by reflected light, blackish brown by transmitted light.

Head, measured from front of eyes, broader than long (248μ to 220μ), broadest just behind eyes, narrowed behind and with transverse anastomosing lines; postocular bristles 120μ long, situated near sides of head and about 40μ back of eyes; joints 3 to 8 of antennae pedicellate; sense cones short (32μ on segment 3) and thick; sense cone formula: 3, 1-2; 4, 2-2; 5, 1-1+; 6, 1-1+; 7, 1 dorsally; length of antennal segments (in microns):

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Prothorax 200μ long, 400μ wide; anterior angular bristles 120μ long; anterior marginals minute; midlateral 140μ; epimerals 168μ; postmarginals 140μ; coxals 120μ; forewings 1.28 mm. long, gray-brown, almost hyaline at base and also an elongate area extending apicad about three-eighths the length of the wing just back of anterior margin; postmarginal one-third of wing distinctly and abruptly lighter; forewings with 7 to 16 (usually 7 to 9) double fringe hairs; fore femora swollen, fore tarsi with a large tooth; abdomen faintly reticulated, with one pair of wing-retaining bristles on segments 2 to 7, these weak, almost straight; lateral marginal bristles long, 204μ on 7th segment, 180μ on 8th segment; bristles on 9th segment, inner 200μ, outer 140μ; tube 240μ long, sides straight, 116μ wide basally, 52μ wide at apex; terminal bristles 200μ long.

Male (brachypterous).—Length (somewhat distended) 1.8 mm. Color somewhat lighter than in female, with head not markedly darker than thorax; first antennal segment lighter brown than head; eyes small, about five facets in outline, directed forward; postocular bristles 140μ long; head from front of eyes slightly wider than long (220μ to 190μ); cheeks slightly curved; sense cones shorter than in female (18μ on segment 3); length of antennal segments (in microns):

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Length of prothoracic bristles (in microns): Anterior angulans 132, anterior marginals minute, midlateral 132, epimarginals 150, postmarginals 130, coxal 112. Forelegs greatly enlarged; tarsal tooth much larger than in female and broader basally. Bristles on 9th abdominal segment, inner 180µ, outer 88µ long; tube more dilated basally than in female, 240µ long, 108µ wide at base, 44µ wide at apex; terminal bristles 200µ long.

Female (brachypterous).—Length (distended) 2 mm.; color slightly lighter than in macropterous form, otherwise very similar.

Type locality.—Yugoslavia.

Types.—Cat. No. 52946, U. S. National Museum.

Paratypes in the collection of Dr. H. Priesner.

Described from 30 macropterous females, 6 brachypterous females, and 12 brachypterous males, mostly reared from nymphs taken at New York, N. Y., under bark of walnut logs.

Several pieces of this bark were brought in for examination on May 1, 1937, by Inspector O. G. Fitzgerald, Bureau of Entomology and Plant Quarantine, and Inspector C. E. Post, who examined the material, saved the colony containing a very few adults and many nymphs alive, and from these this large series was reared.

According to Dr. Priesner, this species is closest to propinquus Bagn., but has the bristles, especially the prothoracics, much longer and pointed, whereas they are somewhat narrowly rounded in propinquus; the wings are broader; the sense cones are thicker, and not hairlike at tips as they are in propinquus.

Dr. Priesner also says that while it would run to corticis in his key to the Thysanoptera of Europe, pallicornis is much larger, with the last two antennal segments dark and the tips of the preceding antennal segments dark; the femora are dark, and the 8th antennal segment is much less constricted at the base; moreover, the postoculars are farther from the eyes.

BOOK NOTICE.


The portions of this book of entomological interest comprise parts of the introductory matter, the sections dealing with insects (pp. 75–106, figs. 19–40) in chapter III on trout stream animals, and certain of the references in the bibliography. The principal insects discussed include Caddiceflies (spelled “Caddis” by Webster), Mayflies, Stoneflies, True-flies, Craneflies, and Alderflies. A key has been provided to five major groups of
insect larvae and nymphs found in trout streams which makes easy the placing of a given specimen in the correct group. There is also given a table of "recognition characters" of these five major groups in which the most distinctive character for each group is italicized. Life history data and considerable miscellaneous information likewise have been provided concerning a number of the principal species, notably: Hydropsyche, Chi-martha, Polycentropus, and Rhyacophila and others among the Caddisflies; Hexagenia, Bactis, Steononeuma, Caenis and others among the Mayflies; Perlä and Acroneuria and others among the Stoneflies; Chironomus, Palpomyia (the "punkie" or "no-see-um" of Thoreau's Writings), Chrysops, Simulium and Blepharocera among the True-flies; Tipula, Autocha and others among the Craneflies; and Corydalis, Chauliodes and Sialis among the Alderflies or Neuroptera. Brief consideration also is given to certain of the Coleoptera, notably the parnids, Psephenus and Elmis, and others. In the Hemiptera, as would be expected, appropriate attention has been given to the Waterstriders, the Water boatmen and the Backswimmers. In the Odonata, the Dragonflies and the Damselflies are discussed with particular reference to the effects of the presence of the immature stages of Cordulegaster, Lanthus and Argia in relation to improvement of game fish waters.

For the benefit of those who may desire information concerning the sections of the book on other than entomological themes, it may be added that there are chapters dealing in most instances in considerable detail with such subjects as the various more common species of trout and salmon; stream conditions, physical and chemical; trout stream animals (other than insects); food selection by trout; distribution of trout foods; propagation stocking and protection; and stream and lake management. There is also an appendix discussing such matters as names of trout; instructions for collecting fish scales; planting tables for streams and lakes; organization of stream and lake survey crews; methods of locating unnamed waters and waters bearing duplicate names; suggestive blank forms for use of survey crews, and the like. The bibliography contains 131 selected titles. Written by the son of an entomologist of world-wide distinction who is also a well known specialist in aquatic insects, and a joint author with his father on a previously published book "A Guide to the Study of Fresh-water Biology," it might be expected that the writer of this book would possess environmental and educational background such as would enable production of an excellent, if not notable, piece of work on a subject of this kind. Such an expectation, it may be added, can be considered as being fully realized.

W. R. W. AND J. S. W.
THE TYPE LOUSE, A LITTLE KNOWN SPECIES.

Although this celebrated louse is known universally to printers, the editor believes this to be the first mention of it made in entomological literature. The species is most often discovered by printers' devils during an early period of their novitiate and is never seen but once in a lifetime! Sometimes it is visible with one and again with both eyes. As this louse is extremely evanescent no description of it is possible. It is, however, discoverable as follows: A galley of standing type is separated in two portions by inserting a printer's rule and pushing the sections apart about one half inch.

As the only medium in which this louse is known to exist is the somewhat filthy moisture contained in the imposing stone sponge, a sufficient amount of this is squeezed into the space between the sections of type in the galley previously mentioned. The type louse seeker must then gaze intently at close range, at the enclosed liquid. Suddenly, and the more suddenly the better, the type louse exhibitor should jam the two sections of type together when, strange to relate, the immediate expulsion of the "louse" invariably excites the risibilities of all beholders—except the person who is seeing it for the first time!

It is believed that this is the only species of louse known which contributes directly to the "gaiety of nations."

—The Editor.

MINUTES OF THE 498TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 498th meeting of the Society was called to order by President Snodgrass at 8 p. m., Thursday, February 2, 1939, in Room 43 of the National Museum. There were 35 members and 6 visitors present. The minutes of the previous meeting were read and approved.

The President read a report by Dr. Craighead concerning the work of the National Park Service along the Potomac River and canal north of Georgetown. It was moved and seconded that a delegate be appointed to represent the Society on the Committee which is cooperating with the National Park Service. Discussion followed by Rohwer, Gurney, Orr and Ewing and the motion was passed.

The following were elected to membership in the Society:

James R. Dutton, Bureau of Entomology and Plant Quarantine, Washington, D. C.

Robert L. Furniss, 445 U. S. Court House, Portland, Ore.

George E. Powers, 1113 17th St. N. W., Washington, D. C.

The regular program of the meeting was composed of two illustrated talks by members of the Bureau of Entomology and Plant Quarantine:
Forest insect problems in Oregon and Washington.

R. L. Furniss.

Forest insect investigations in the Pacific Northwest primarily concern insects that attack mature and overmature stands of conifers. By far the most important problem in the killing of ponderosa pine by pine bark beetles, *Dendroctonus brevicomis* LeC. and associates. Considerable progress has been made in the control of these insects, especially by stand improvement through removal of trees that are susceptible to beetle attacks. In 1933 a fire burned and killed a 235,000 acre stand of Douglas fir in western Oregon, thus creating a tremendous salvage problem. The process of salvaging this fire-killed timber was illustrated by a series of lantern slides. Several of the more important insects contributing to the deterioration of the dead trees were also shown. (Author’s abstract.)

The Role of Insects in the spread of the Dutch Elm Disease.

C. H. Hoffman.

Two visitors, George P. Engelhardt of Hartsdale, N. Y., and Theodore R. Hupper of the University of Minnesota, greeted the Society.

Adjournment at 9.50 p. m.

Ashley B. Gurney,

Recording Secretary.

*Actual date of publication, March 24, 1939.*
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OF WASHINGTON

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editor.
A REVISION OF THE NEOTROPICAL GENUS XESTOBLATTA HEBARD (ORTHOPTERA; BLATTIDAE; PSEUDOMOPINAE).

By Ashley Buell Gurney, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Of the rich blattid fauna of tropical America there are few groups of more striking appearance and none of more remarkable abdominal specialization in the males than the genus Xesto- blatta Hebard. During recent years James Zetek, of the Bureau of Entomology and Plant Quarantine Laboratory in the Canal Zone, Panama, has made several valuable collections of roaches in connection with the trapping of trypetid fruit flies. The resulting material of Xesto- blatta includes such interesting additions to the genus, and the collections of the United States National Museum and the Academy of Natural Sciences of Philadelphia have the species so completely represented, that a revision appears to be justified.

The author is greatly indebted to Mr. Zetek for his interest in making the collections mentioned, which contain all the known Panamanian species of Xesto- blatta. J. A. G. Rehn has very kindly made specimens of the genus in the collection of the last-named institution, including the collection of Morgan Hebard, available for study and has given personal advice freely. All the previously known species are in the Philadelphia collections, including the types of seven species.

Of the 20 species here treated, the males of only 3 (castanea, poecila, and saneta) are unknown. Of these castanea and poecila may be easily identified because of their distinctive color. In this paper 8 species are described as new and the males of two other species are described for the first time. Aside from their great taxonomic value, the male genitalia and tergal specializations show much regarding the evolutionary development of the species, and the structures illustrated may interest students other than those engaged solely in the systematic study of Blattidae.

Specimens of Xesto- blatta are rare in collections, and until the recent work with traps in Panama a series of scarcely any species was available for study. A total of 88 specimens is recorded in this paper, 57 being in the National Museum and the remainder in the Philadelphia collections. The holotypes of 16 species
have been studied, of which 9 are in the National Museum. About 20 additional specimens in the two collections have not been recorded here because their broken condition, or the absence of males, does not permit proper characterizations of the species. It is clear that several additional species of *Xestoblatta* occur in tropical America.

The morphological terms used in this paper are essentially those of current taxonomists except that the first abdominal tergum is not called the "median segment" as has frequently been done. There are 10 abdominal terga, the supra-anal plate being the tenth, and the tergum bearing the conspicuous pit, as in *festae* for instance, is tergum 7 rather than 6.

In taxonomic literature the entire dorsal or ventral plate of an abdominal segment is frequently termed a tergite or a sternite, respectively. The author follows Snodgrass (1935, pp. 70-82) in referring to these entire plates as terga and sternae, tergites and sternites being preferred for subdivisions of the former. Snodgrass (1937) has described the male genitalia of roaches and his paper may be consulted for illustrations of phallosomes and other structures. Fig. 1, taken from Hebard (1916), illustrates the terminology of wing veins.

The recorded material shows that *Xestoblatta* is distributed from Costa Rica to Peru and southeastern Brazil; the additional specimens mentioned above extend the distribution farther, and it doubtless will be many years before we arrive at a nearly complete picture of the distribution of the group. Eight species are known from Panama and five from Colombia; two occur in both countries. The addition of Pará, Brazil, to the distribution of *immaculata* suggests that as larger collections become available, including males to make identifications positive, certain species will be found to extend over very wide areas. The receipt of two species, *ramona* and *braziliae*, from southeastern Brazil, suggests the richness of the now little known Brazilian fauna of *Xestoblatta*.

Little biological information concerning the species of *Xestoblatta* is available. All eight of the species in Panama have been taken in fruit-fly traps baited with sweet, fermenting solutions, and these roaches are undoubtedly active flyers.

The modifications of the terga of several species of *Xestoblatta* are the external portions of secretory glands, together with the structures associated with them. Such glands occur in several subfamilies of roaches and are frequently encountered in the Pseudomopinae, where they are often of a definite type in all the species of a genus, specific differences frequently being present. In some species of *Periplaneta*, no external specialization of the terga occurs, but during life eversible glands may be protruded from between certain terga (see Snodgrass, 1937, p. 55). The males of *Blattella germanica* (L.) have well developed
external organs, and Wille (1920) and others have described how
the female is attracted by the odor of the secretion and applies
her mouth parts to the organs during the preliminary phases of
the copulatory process. It is probable that the glands of
Xestoblatta have a similar function.

As early as 1908 (Shelford, pp. 3, 11) the dorsal openings of
glands were utilized in defining blattid genera, and the taxono-
mic use of these structures has now been developed to a high
degree (see Hebard, 1916; Ramme, 1923, p. 101; Rehn, 1926,
p. 2, 1931, pl. 34).

The Genus XESTOBLATTA Hebard.

X. carrikeri Hebard, by original designation).

Xestoblatta is a member of the group Ischnopterites of the
subfamily Pseudomopinae. The genus is in the main a rather
distinct aggregate, and most species may be readily placed
generically. The marginal field of the tegmen is often con-
spicuously pale in color, superficially much as in Periplaneta
australisae (F.) of the subfamily Blattinae; and this feature,
together with the frequent large size of the species, which are
among the largest of the Pseudomopinae, usually indicates
Xestoblatta.

Hebard (1916, 1921b, p. 124) has defined Xestoblatta and little
change in generic limits has occurred. Important generic
characters are as follows: Disk of pronotum without sulci;
tegmina and wings fully developed; discoidal sectors of tegmen
longitudinal; discoidal vein of wing conspicuously forked at
middle or just beyond; ulnar vein with or without incomplete
rami; intercalated triangle large and distinct; front femur with
ventro-anterior margin armed with heavy spines throughout,
the latter decreasing gradually in size apically; front femur with
three apical spines (see fig. 2); ventral margins of middle and
hind femora armed with moderately numerous, heavy, elongate
spines; middle and hind femora each with a single, elongate,
genicular spine; arolia present between equal tarsal claws;
pulvilli on first four tarsal segments; male abdominal terga
specialized or not.

It is difficult to present constant characters for the separation
of Xestoblatta from Symphioce Hebard. The latter genus, defined
by Hebard (1916, 1917), is, in the New World, most abundantly
represented in the West Indies, where Xestoblatta is not known
to occur. The general appearance of most species of Symphioce
is more delicate, the size is usually considerably smaller, speciali-
izations of the males are usually of a different type from those of
Xestoblatta, and it is clear that a group of species worthy of
separation from those of Xestoblatta are involved. Rehn (1933, pp. 426-427) has pointed out the difficulties in finding infallible characters for the separation of genera and he has found that even Blattella Caudell, which currently has been placed in the group Blattellites distinct from the Ischnopterites, lacks definite characters for separating all species from those of Symploce, though the genotypes do not suggest any such difficulty.

The genus Ischnoptera Burmeister, to which early authors assigned species of Xestoblatta, is more easily separated than Symploce. The presence of oblique pronotal sulci, the absence of a conspicuous fork in the discoidal vein of the wing, the spines of the anterior margin of the front femur abruptly differentiated into heavy and piliform types, and the differently specialized abdominal terga of the male are important characters of Ischnoptera separating it from Xestoblatta.

The African genus Euandrobblatta Rehn (see Rehn, 1922, p. 31) is a member of the stock including Symploce and Xestoblatta, but differs from the latter in the unbranched discoidal vein and very unequal tarsal claws.

When Hebard (1916) established Xestoblatta, one new species (carrikeri) was described and Ischnoptera nyctiboroides Rehn, festae (Griffini), and sancta and hamata Giglio-Tos were transferred to it. In 1920 Hebard described immacuiata and later (1921b) added considerable to the knowledge of the genus and described two new species (micra, poecila); he also proposed the name hoplites for the male identified in 1916 as festae. The species castanea has since been described and the name para proposed for the male previously identified as nyctiboroides (Hebard, 1926). Rehn (1932) definitely referred Ischnoptera peruana Saussure 1862 to Xestoblatta.

From a study of general habitus, color, number of rami of ulnar vein, male subgenital plate, paraprocts, and tergal specialization, it is seen that several developmental stocks are represented in Xestoblatta. On the basis of tergal specialization carrikeri, zetki, ecuadorana, micra, peruana, potrix, mira, panamae and festae may be arranged in that linear sequence. The species buscki is clearly very close to festae, on account of the type of subgenital plate, but the tergal specialization of buscki suggests affinities with the braziliac-ramona stock. Reference to the figures of the male structures will show the undoubtedly close relationship of zetki, ecuadorana, micra and peruana. Other groups are para and nyctiboroides, and hoplites; sancta and hamata; the last-named group is not so closely knit on the basis of tergal and genitalic specialization, but the relationship is shown by the number of rami of the ulnar vein and the proportions of the interocular area. There is no close relative of immacuiata and the exact positions of poecila and castanea are uncertain without males. The discovery of addi-
tional species may bridge gaps between species and species groups.

The following key should be used only as an aid. The structures of the male are the most important characters in recognizing the species. It is not possible at present to prepare a working key to the females of all species. Because of the condition of certain specimens, too much reliance should not be placed on the colors and measurements in the formal descriptions which follow the key. Body length varies with the degree of extension of the abdominal segments and in some species there is apparent variation in width of pronotum due to drying to different degrees of convexity following removal from alcohol, even though passed through xylol to prevent shrinkage. Structural characters are by this method excellently preserved, but certain colors, as those of the compound eyes or the color of the mesal area of the pronotum, may vary in different individuals of the same species.

Key to the Species of Xestoblatta.

1. Pronotum having a definite pattern formed by pale margins in striking contrast to the disk (figs. 5–8) ........................................ 2

Pronotum without so definite a pattern and without conspicuous pale margins as above .......................................................... 6

2. Disk of pronotum dark, marked centrally with a definite pale design (fig. 5) (Colombia).................................................................. poecila Hebard

Disk of pronotum dark, without pale central design ........................................ 3

3. Pale lateral margins of pronotum separated from dark disk by an evenly curved line (fig. 8), dark area of disk ovate; right stylus of male subgenital plate at least four times as long as basal width (figs. 31, 30) ........................................................................ 4

Pale lateral margins of pronotum separated from disk by an irregularly curved line (figs. 6, 7), dark area of disk roughly bell-shaped; right stylus not more than twice as long as basal width (figs. 37, 40) .................................................................................. 5

4. Left stylus of male subgenital plate about one-half as long as right stylus (fig. 31); pronotum with pale border extending along anterior margin (fig. 8) (Northern Brazil) ........................................ para Hebard

Styli subequal in length (fig. 30); pale border of pronotum interrupted anteriorly (British and French Guiana) ................................ nytetiboroides (Rehn)

5. Pronotum with dark area extending to a sharp point at anterior margin (fig. 6); male specializations as illustrated (figs. 26, 37, 59, 71) (Southeastern Brazil) ......................................................... ranona, new species

Dark area of pronotum with a broad anterior extension (fig. 7); male specializations (figs. 9, 21, 40, 58) not as above (Southeastern Brazil) .................................................... brasiliace, new species

6. Head, pronotum and tegmina very deep chestnut brown, practically black. (French Guiana) ......................................................... castanea Hebard

Coloration not nearly so dark as above ................................................................ 7
7. Male with tergum 7 (fig. 23) with a bilobed glandular pit, which is not covered by overlapping lobe of fifth tergum; left stylus (fig. 17) short; size small for genus (pronotum of only known female 3.9 mm. long, tegmen 15.6 mm.) (Colombia)                     *micro* Hebard  
Tergum 7 without unconcealed pit, or, if present (as in *peruana*), the left stylus is (fig. 35) long; size larger (males known in all species except *sancta*, of which the pronotum of the female is 4.5 mm. or more in length, the tegmen at least 20 mm.)                     8  
8. Ulnar vein of wing with less than 9 branches, usually not more than 6                     9  
Ulnar vein of wing with 9 or more branches                     17  
9. Fifth tergum of male having a prominent posterior lobe (figs. 14, 20, 22, 25)                     10  
Fifth tergum of male without posterior lobe (figs. 12, 15, 19, 26)                     13  
10. Right stylus of male complex, with several sharp projections (figs. 32, 34, 39)                     11  
Right stylus simple (figs. 33, 44) or with one lateral tooth (as in some specimens of *festae*)                     12  
11. Right stylus (fig. 34) with appendages, which are much longer than left stylus (Panama)                     *mira*, new species  
Right stylus (fig. 39) with appendages shorter than left stylus (Panama)                     *panamae*, new species  
12. Male with right stylus a continuation of a lobe of the subgenital plate, no clear line of demarcation (fig. 33); subgenital plate without conspicuous furcate projection between styli (Panama)                     *potrix*, new species  
Right stylus distinct from subgenital plate (fig. 44); subgenital plate with conspicuous furcate projection between styli (Panama, Colombia)                     *festae* (Griffini)  
13. Male subgenital plate with conspicuous projection between styli (fig. 42) (Panama)                     *buscki*, new species  
Male subgenital plate without projection between styli (figs. 16, 24, 29, 35)                     14  
14. Left stylus of male minute, much shorter than right stylus (figs. 16, 29)                     15  
Left stylus about as long as right stylus (figs. 24, 35)                     16  
15. Right stylus of male evenly curved dorsally (fig. 29); posterior margin of right paraproct broadly angulate (fig. 61) (Panama)                     *zeteki*, new species  
Right stylus unevenly curved (fig. 16); posterior margin of right paraproct not angulate (fig. 62) (Ecuador)                     *ecuadorana*, new species  
16. Right stylus with subapical dorsal thorn (fig. 24) (Colombia)                     *carrikeri* Hebard  
Right stylus with simple acute apex (fig. 35) (Peru)                     *peruana* (Saussure)  
17. Male with first abdominal tergum conspicuously specialized (fig. 13); interocellar space (fig. 4) much wider at occiput than at junction with interocellar area; pronotum and all except marginal field of
tegmina uniformly pale brownish-yellow (Panama, northern Brazil) ... *immaculata* Hebard
Male, where known, not with first tergum strikingly specialized; interocular space (fig. 3) narrower at occiput than at junction with interocellar area; coloration not as above ...

18. Disk of pronotum with lateral patches of dark buff well developed, giving an appearance such as frequently occurs in *Epilampra*; size of female medium for genus (male unknown), pronotum not known to exceed 5 mm. in length or tegmen 22 mm. (Ecuador) ... *santa* (Giglio-Tos)
Buff patches not so well developed, pronotum not suggesting *Epilampra* so strongly; size of female larger, pronotum and tegmen exceeding above measurements

19. Left lateral margin of subgenital plate armed with three spines (fig. 43) (Costa Rica) ... *hoplites* Hebard
Left lateral margin of subgenital plate not armed with spines (fig. 41) (Panama, Colombia, Gorgona Island) ... *hamata* (Giglio-Tos)

**Xestoblatta para** Hebard.

Figs. 2, 8, 10, 31.


Hebard’s type was first recorded as *nyctiboroides* (1916, p. 373) and later by Rehn (1918, p. 156). The latter (1932, p. 30) has since recorded four males and two females under the name of *para*. Like *nyctiboroides*, this is one of the small, dark species of the genus with distinct pale pronotal margin. In *nyctiboroides*, however, the pale margin does not extend along the entire anterior margin and the male styli differ decidedly. In the male type of *para* the ulnar vein of the wing has one ramus reaching the tip of the wing; in the female there are two complete rami and one very short, incomplete ramus.

Material examined:¹ Igarapé Assu, Pará, Brazil, January 23, 1912 (H. S. Parish), 1 male (type); Rio Purus, Amazon, Brazil, January (Roman), 2 males, 1 female.

**Xestoblatta nyctiboroides** (Rehn).

Fig. 30.


This species was placed in *Xestoblatta* by Hebard (1916) at the time the genus was established. It was confused with *para*, as

¹ The material of this and the following species recorded under this heading belongs to the Philadelphia collections unless marked by U. S. N. M., in which case it belongs to the U. S. National Museum.
discussed under that species, until Hebard (1926) recognized the distinctness of the two forms and identified the male recorded below as nyctiboroides. It is possible that this male does not belong to nyctiboroides, but any more definite association of sexes must await the receipt of more material. The supposed male has two complete rami of the ulnar vein; there are no incomplete rami.

Material examined: Demerara, British Guiana, 1901 (R. J. Crew), 1 female (type); Nouveau Chantier, French Guiana (Le Moult), 1 male.

**Xestoblatta poecila** Hebard.

_Fig. 5._


This species is distinct and readily recognizable by the pattern of the pronotum. It is a medium-sized species (length of pronotum 4.9 mm.), whose coloration suggests relationship to the _para-nyctiboroides_ stock.

Material examined: Villavicencio, Intendencia del Meta, Colombia, 1400 ft., December, 1918, 1 female (type).

**Xestoblatta carrikeri** Hebard.

_Figs. 1, 11, 24._


This, the genotypic species, is known only from the originally described pair, it was later listed by Hebard (1919) in the first paper of his studies on the Dermaptera and Orthoptera of Colombia.

The male styli are as in fig. 24 in caudal view. The left stylus is curved and tapers slightly to the blunt, somewhat enlarged apex; the right stylus has a moderate mesal swelling and a heavy dorsal thorn near the apex.

Material examined: Cincinnati, Santa Marta, Colombia, 4,500 ft., July 10, 1913 (M. A. Carriker, Jr.), 1 male (type), 1 female (allotype).

**Xestoblatta zeteki**, new species.

_Figs. 12, 29, 52, 61._

The nearest relatives of _zeteki_ are _micra_ and _peruana_; the species may be readily distinguished by the male characters illustrated.
Male (holotype).—Size medium to small for the genus; tegmina and wings extending beyond apices of cerci. Lateral margins of interocular space feebly diverging posteriorly, nearly parallel; width at vertex 0.8 mm., slightly narrower than distance between ocellar spots.

Wing with three complete rami and one incomplete one of ulnar vein. Abdomen specialized dorsally as in fig. 12; sixth tergum broadly emarginate; seventh with postero-lateral angles produced, a deep transverse glandular depression located medially; eighth tergum simple, nearly concealed by seventh; ninth with posterior margin broadly rounded, the postero-lateral angles conspicuously developed; supra-anal plate as illustrated, apex entire. Subgenital plate in ventro-caudal view as in fig. 29; left stylus minute; right stylus curved, tapering to a very fine point, borne on an incurved flap of subgenital plate. Left paraproct (fig. 52) bearing a hook with two well separated curved apical teeth. Right paraproct (fig. 61) in the form of an uneven plate, broadly angulate posteriorly, its meso-posterior angle forming a single tooth.

Coloration: Pronotum honey yellow; disk with darker patches on each side of mesal area. Tegmen amber, paler along costal margin and light yellow in marginal field, a darkened metallic luster conspicuous on posterior half. Wing transparent, pale buff, membrane darker anterior to axillary vein. Interocular area golden yellow. A distinct transverse band connecting antennal sockets darkened at extremities, feebly developed medially. Frontal pits each marked with a small spot of dark brown; remainder of head pale. Fourth and fifth segments of maxillary palpus pale brown; other segments pale. Antenna brown, paler near base. Legs pale; tibiae somewhat darker, with brown at bases of spines; each coxa with three weak brown spots, one near lateral margin about one-third the distance from base, one near apex in the area which receives the femur in repose, and one which is inconspicuous at base. Abdomen with terga 1–5 pale at bases, grading into dark brown, then narrowly margined posteriorly with yellow; terga 6–7 not so dark except near lateral margins; eighth and ninth terga pale brown; supra-anal plate yellow with white apical triangle and narrow basal areas of brown at its union with intersegmental membrane. Ventral surface of abdomen honey yellow, somewhat paler along lateral margins. Cerci dark brown ventrally, yellow dorsally. Left paraproct brown. Right paraproct yellow along lateral two-thirds of posterior margin, grading into brown on disk, which is intensified to black at mesal apex and apical tooth.

Measurements: Length of body 16.5 mm., of pronotum 4.2 mm., of tegmen 18 mm., of hind tibia 7 mm.; width of pronotum 5.8 mm.

Female (allotype).—General form as in male; width of interocular space 1 mm. Ulnar vein of wing with three complete and three incomplete rami. Abdominal terga unspecialized; subgenital plate simple, broadly rounded apically; supra-anal plate triangular, apex with small, sharp, triangular emargination.

Coloration: Differs from male as follows: Metallic luster in posterior half of tegmen darker; veins in posterior half of anal field more noticeably marked with yellow; subgenital plate uniform brown, slightly paler at lateral margins.

Measurements: Length of body 17 mm., of pronotum 4.6 mm., of tegmen 19.5 mm., of hind tibia 7.5 mm., width of pronotum 5.5 mm.

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Type.—No. 53124 U. S. National Museum.
The type and allotype, the only known specimens of the species, were collected by James Zetek in a fruitfly trap at the type locality during June, 1937.

This new species is named in honor of James Zetek, who has for many years taken an active interest in the insect fauna of Panama.

**Xestoblatta ecuatorana**, new species.

Figs. 16, 19, 50, 62.

This species is clearly of the same stock as peruana, from which it differs in the male genitalia. Closest relationship is shown to zeteki, as indicated by habitus and wing venation, and as comparison of the figures of male structures demonstrates.

*Male* (holotype).—General form as in zeteki; narrowest width of interocular area 0.7 mm.; ulnar vein with three complete and four incomplete rami. Abdominal terga as in fig. 19; sixth tergum broadly emarginate, briefly overlapping seventh: seventh with transverse oval pit; ninth with right postero-lateral angle abnormally abortive; supra-anal plate transverse, apex entire; subgenital plate as in fig. 16 in caudal view; left stylus minute, elongate-globular; right stylus tapering to a fine point, directed dorso-medially for about one-third its length, then medially, then dorso-medially again and nearly reaching to base of left cercus. Left paraproct (fig. 50) armed with three strong curved teeth. Right paraproct (fig. 62) without angular projection of posterior margin as in zeteki (fig. 61).

Coloration: Much as in zeteki, but tegmina more straw-colored and lateral patches on disk of pronotum more intensified. Compound eyes brown. Interocular area brown, paling posteriorly, the brown reaching part way onto interocellar area; facial band faint. Terga 1–7 pale at bases, brown along posterior margins except at lateral extremities; brown intensified near lateral margins, but lateral margins and lateral extremities of posterior margins pale yellow. Terga 8 and 9 brown, slightly lighter at lateral margins; supra-anal plate pale yellow, light brown basally at junction with intersegmental membrane. Sterna pale, dark spots at antero-lateral angles well developed; subgenital plate brown, pale at base of right stylus; styli and paraprocts light brown.

Measurements: Length of body 18 mm., of pronotum 4 mm., of tegmen 20.5 mm., of hind tibia 8 mm., of width of pronotum 5.7 mm.

*Female* (allotype).—General form as in male; narrowest width of interocular area 1.2 mm.; two complete and three incomplete rami of ulnar vein.

Coloration: As in male; compound eyes very dark brown; subgenital plate light brown, yellowish along lateral margins.

Measurements: Length of body 15.7 mm., of pronotum 3.8 mm., of tegmen 18.5 mm., of hind tibia 7 mm., of width of pronotum 5.7 mm.

A single female with the following data is considered a paratype: Puyo, Oriente, Ecuador, 900 meters, October 14, 1937 (E. J. Brundage, Jr.). It agrees in all essential respects with the allotype. There are two complete and
two incomplete rami of ulnar vein. The pronotum has the lateral patches little
developed.

Type locality.—Banos-Mera Trail, Rio Pastaza watershed, Ecuador.

Type.—No. 53125 U. S. National Museum.
The type and allotype were taken at type locality September 22, 1937, at an altitude of 1200 meters, by E. J. Brundage, Jr.

Xestoblatta micra Hebard.

Figs. 17, 23, 56, 63.


This is one of the smallest of the light-colored species and is about equal in size to para, the smallest of the dark species. The right stylus of the male type is weakly sclerotized at the apex and may be somewhat longer in fresh material than fig. 17 indicates. The left paraproct (fig. 56) is armed with two teeth at the apex. The right paraproct (fig. 63) is evenly convex along the posterior margin and the postero-mesal angle is acute.

Material examined: Las Mesitas, Cundinamarca, Colombia, 3200 ft., May, 1918, 1 male (type), 1 female (allotype).

Xestoblatta peruana (Saussure).

Figs. 15, 35, 57, 64.


Nothing is known concerning Saussure’s material except from his papers, and since the male genitalia are not described the present species may not be true peruana. It is almost certain that Saussure’s species belongs to Xestoblatta, however, and judging from the descriptions and locality data the present identification is probably correct. When first described, peruana was set apart from other species of Ischnoptera because conspicuous pronotal sulci were not present. Saussure (1864, p. 90, fig. 12) recorded a single specimen from Peru which lacked the abdomen, and utilized the absence of sulci in placing it in natural relationship to other species. Later the same author (1870, pp. 53-56) included peruana among species with “humeral vein” of wing bifurcate at the middle. Thus Saussure recognized the importance of two features later used by Hebard in defining Xestoblatta. Brunner (1865, pp. 129, 141) listed peruana among his “species incertae.” Hebard (1916, p. 372) mentioned peruana as being other than a true Ischnoptera and suggested the possibility of its being a member of Xestoblatta; Rehn (1932, p. 31) included it in the latter genus.
Male.—Size medium for genus; tegmina and wings well developed, extending well beyond apices of cerci. Interocular space 0.7 mm. wide, lateral margins nearly parallel; face even, no pronounced elevation of interocular area as in ramona and braziliæ. Ulnar vein of wing with four complete and two incomplete rami. Dorsal surface of abdomen (fig. 15) with seventh tergum specialized by the development of a glandular pit divided mediially by a low median longitudinal ridge. Caudal view of subgenital plate as in fig. 35; left stylus well sclerotized, curved and slightly spiral-like at the sharp apex; right stylus less heavily sclerotized, tapering to a fine point; left paraproct (fig. 57) bearing a strong, single hook, sharply curved at apex; right paraproct (fig. 64) with sharp tapering tooth at meso-posterior angle.

Coloration: In general straw-colored; disk of pronotum somewhat darker; interocular space pale reddish-brown; coxae conspicuously spotted with brown in same places as in zetekii; abdominal sterna 1–6 with similar spots at antero-lateral angles and near anterior margin in each lateral fifth; subgenital plate brown, pale yellow along apical margin and along posterior halves of lateral margins; cerci brown ventrally, pale dorsally.

Measurements: Length of pronotum 4 mm., of tegmen 18.5 mm., of hind tibia 7.5 mm.; width of pronotum 5.6 mm.


**Xestoblatta potrix**, new species.

Figs. 20, 33, 38, 45, 51, 65.

The male subgenital plate and styli of *potrix* are very different from those of other known species, but the specialization of the terga and the right paraproct show close relationship to *mira*. The supra-anal plate of *potrix* is less elongate than that of *mira*. The latter species is considerably smaller than *potrix*, and lacks a conspicuous dark facial band between the antennal sockets.

Male (holotype).—Size medium for the genus; tegmina and wings extending beyond apices of cerci. Lateral margins of interocular space slightly diverging posteriorly, width at narrowest point 0.7 mm., slightly narrower than distance between ocellar spots. Face and interocular area smooth and evenly convex, no prominent elevation as in ramona.

Ulnar vein of wing with two complete rami and one rather long incomplete one, the first complete ramus forked one-third the distance from the margin of wing. Abdominal terga as in fig. 20; fifth tergum with prominent, broadly rounded, median projection overlapping sixth and seventh terga; posterior margin of sixth tergum broadly emarginate; seventh with deep, oval, glandular pit bisected longitudinally by a low ridge; eighth tergum concealed by seventh; supra-anal plate transverse, feebly emarginate at apex. Subgenital plate as in fig. 33 in caudal view; left stylus with a tuft of strong setae in part passing through the loop of a strongly curved apical hook; right stylus (fig. 38) broadly joined to subgenital plate, notched apically, convex ventrally, slightly concave
dorsally, prominent setae borne as illustrated. Left paraproct (fig. 51) bearing an elongate arm with two curved apical hooks. Right paraproct (fig. 65) especially characterized by a large, heavily armed projection extending from beneath posterior margin. Left phallomere a large, well sclerotized, strongly recurved hook. Right phallomere a sclerotized appendage extending medially, partly concealed by membrane and bearing about seven dorsal teeth.

Coloration: Of same type as zeteki, differing as follows: Dark lateral patches of pronotum more intensified; interocular area black, paling to honey yellow at posterior extremity of occiput; interantennal band dark brown medially, extremities pale; compound eyes pale blue (probably due to method of preservation); supra-anal plate without white apical triangle; ventral surface of abdomen somewhat darker medially grading to brown on disk of subgenital plate, sterna with dark suffusion close to lateral margins and paling posteriorly; right stylus pale brown ventrally, whitish dorsally; left paraproct with arm deep amber, brown at base and at apical hooks; right paraproct brown, whitish along mesal two-thirds of posterior margin, arm projecting from beneath paraproct amber.

Measurements: Length of body 18 mm., of pronotum 4.4 mm., of tegmen 18.7 mm., of hind tibia 7.5 mm., width of pronotum 5.6 mm.

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Type.—No. 53126 U. S. National Museum.

Only the type is known; this was collected September–October, 1937, by James Zetek in a fruitfly trap.

Xestoblattata mira, new species.

Figs. 18, 22, 34, 66.

This is the smallest of the light colored species of Xestoblattata. It is related to potrix and panamae, probably more closely to panamae as there are suggestions of affinities in the right styli.

Male (holotype).—General form as in potrix; narrowest width of interocular space 0.7 mm. Rami of ulnar vein as in potrix except that both complete rami are simple. Abdominal terga as in fig. 22; pit of seventh tergum proportionately smaller than in potrix and with faint indication of longitudinal ridge. Subgenital plate as in fig. 34 in caudal view; left stylus small and conical; right stylus borne on a recurved fold of the subgenital plate, the first ventral appendage very slender and tapering to a simple point, the second stronger and briefly forked at apex, the base of stylus heavier and armed as illustrated. Left paraproct (fig. 18) bearing an arm which forks once near base. Right paraproct armed along posterior margin as in fig. 66, with a strongly armed projection extending from ventrad of the margin. Phallomeres differing slightly from those of potrix.

Coloration: Differing from zeteki as follows: Interocular area brown, paling posteriorly; facial band feeble throughout; compound eyes pale blue; abdominal sterna with conspicuous dark spot at each latero-anterior margin; right stylus brown, first ventral appendage pale; right paraproct brown, yellowish along margin included in fig. 66.

Measurements: Length of body 16.5 mm., of pronotum 3.5 mm., of tegmen 15 mm., of hind tibia 6 mm., width of pronotum 4 mm.
Type locality.—La Campaña (near Capira), Panama.

Type.—No. 53127 U. S. National Museum.

The single type was taken by James Zetek in a fruitfly trap October–November, 1937.

Xestoblatta panamae, new species.


Although differing markedly from festae in the male subgenital plate, panamae is closely related to that species with respect to tergal specialization, right paraproct and general habitus. Females of festae are smaller and differ in color of supra-anal plate, which is dark along the posterior margin and over much of the disk, while that of panamae is largely yellow.

Male (holotype).—Size medium; general form as in potrix; width of interocular area at narrowest point 9.5 mm.; ulnar vein with two complete and two incomplete rami. Abdominal terga as in fig. 14; fifth tergum with median projection overlapping sixth and seventh very much as in festae; posterior margin of sixth broadly emarginate medially, with blunt tooth each side of middle, each tooth bearing a tiny button-like knob; seventh with very deep glandular pit, posterior margin undulating as illustrated; supra-anal plate elongate, apex entire. Subgenital plate as in fig. 32 in ventro-caudal view; left stylus a simple tapering appendage, slightly curved near sharp apex; near left stylus and dorsad of it a short, oblong appendage is borne on margin of subgenital plate, this having two tufts of strong setae; right stylus (fig. 39) short, convex, armed with three strong teeth, borne on a twisted recurved fold of subgenital plate. Left paraproct (fig. 53) with short curved arm, bearing five short teeth. Right paraproct with clusters of small sharp teeth at caudomesal angle and near lateral extremity of posterior margin, a heavy-set cluster of teeth borne by an arm projecting from ventrad of posterior margin, the paraproct differing from fig. 67 in possessing four instead of three teeth in cluster on posterior margin.

Coloration: General coloration as in zeteki, but pronotum uniformly golden-yellow; tegmina of a rich deeper color than in zeteki, with a bluish metallic luster; compound eyes pale blue; interocular area brown, paling to yellow posteriorly, with three longitudinal stripes extending posteriorly into the yellow on the occiput; facial band poorly developed medially, obsolete at extremities; terga 2–5 with transverse area of brown each side of median line, not reaching any of the three margins, which are paler; abdominal sterna amber, somewhat darker on subgenital plate, with dark brown spots at latero-anterior angles of sterna as in mira. Paraprocts brown with darker teeth.

Measurements: Length of body 21.5 mm., of pronotum 4.6 mm., of tegmen 20.5 mm., of hind tibia 8 mm., width of pronotum 5.6 mm.

Female (allotype).—General form as in male; narrowest width of interocular space 1.3 mm. Ulnar vein with 3 complete rami and one incomplete ramus. Abdominal segments simple; supra-anal plate weakly emarginate; subgenital plate broadly rounded apically.

Coloration: As in male with the following exceptions: tergum 6 with similar
dark area each side, which reaches posterior margin; supra-anal plate yellow with a dark spot about as broad as width of cercus at anterior margin each side of median line, a touch of white at apex; paraprocts brown, pale yellow along posterior margins.

Measurements: Length of pronotum 4.8 mm., of tegmen 19.7 mm., of hind tibia 8 mm., width of pronotum 6.1 mm. (Abdomen detached.)

In addition to the type and allotype just described, three males and one female, of which the female abdomen is lacking and two male abdomens are detached but preserved, are considered paratypes. It is clear that the small teeth arming the left paraproct vary in number, there being five in the holotype (fig. 53), two in one paratype (fig. 55) and three in the other two paratypes (fig. 54). The number of teeth in the group borne on the posterior margin of the right paraproct is four, three, three and one, respectively. The paratypes agree with the holotype with respect to rami of ulnar vein. The pronotum of one male paratype is 6 mm. wide; the measurements do not differ from type and allotype in other respects. The interocular area of one male is a lighter shade of color and the longitudinal stripes are less distinct than in the remainder of the series.

Type locality.—Barro Colorado Island, Canal Zone, Panama.

Type.—No. 53128 U. S. National Museum.

The type, allotype and three paratypes were collected in a fruitfly trap by James Zetek, September–October, 1937. One male paratype was taken at type locality in a trap August–September, 1936. One male paratype is deposited at the Academy of Natural Sciences of Philadelphia, and one at the Museum of Zoology, University of Michigan.

Xestoblatta festae (Griffini).

Figs. 25, 44, 49, 68.


This species was originally described from a single specimen from Darien in Panama. Giglio-Tos (1898) included festae, together with his new hamata and sancta, in a section of Ischnoptera characterized by having only long spines along the anterior margin of the front femur and a furcate humeral vein of the wing.

Xestoblatta festae has been well described by Hebard (1921b, pp. 127–129, pl. 8, figs. 14–16) and may be easily recognized by the male specializations, though in other features it is hardly distinguishable from allied species. Hebard (1916) described a male as festae which later became the type of hoplites.

Allee (1926) and Hebard (1920, 1921a) have recorded specimens from Panama, and from the material at hand festae appears to be the commonest of the Panamanian species.

The following notes on variation are based on 12 males in the National Museum. In 11 specimens the left paraproct has
no appendage; only a small prominence, in some individuals scar-like, is present. One specimen has a simple arm tapering to a sharp apex. Fig. 47 is of a typical right paraproct. In five specimens there is a single tooth midway of the posterior margin, in two specimens two teeth, in three specimens three teeth, and one specimen has a group of four small teeth located there. In one male the sixth tergum has an abnormally developed projection each side of the median emargination. These projections are very suggestive of the structures of *panamae*.

Material examined: Barro Colorado Island, Canal Zone, Panama, December, 1936 January, 1937 (Zetek), 1 male (U. S. N. M.); June, 1937, fruitfly trap, 4 males, 2 females (U. S. N. M.); August–September, 1936, fruitfly trap, 5 males, 2 females (U. S. N. M.); (W. C. Allee), 1 female U. S. N. M.; April 5, 1924, 1 female; September–October, 1937, fruitfly trap, 3 females, 4 males (U. S. N. M.); Porto Bello, Panama, April 20, 1912 (A. Busck), 1 female (U. S. N. M.); Panama City, Panama, 1911, 1 female; Gatun, Panama, open country, July 8, 1920 (M. Hebard), 1 female; Paris Field, Cristobal, Panama, July 7, 1920 (M. Hebard), 1 male; Murindo, Choco, Colombia, November 16, 1918 (M. A. Carriker, Jr.), 1 male.

*Xestoblatta buseki*, new species.

Figs. 36, 42, 69.

This species shows nearest relationship to *festa* from which it differs in the male specializations and more conspicuous facial band.

*Male* (holotype).—Size medium for the genus; tegmina and wings well developed, extending beyond apices of cerci. Interoculur space with lateral margins nearly parallel; width at vertex 0.9 mm., slightly narrower than distance between ocellar spots.

Ulnar vein of wing with two rami reaching margin, three short incomplete rami going to anal vein. Abdomen without specializations of terga except as illustrated (fig. 36); sixth tergum broadly emarginate; lateral angles of seventh tergum noticeably produced; eighth nearly concealed; supra-anal plate barely emarginate at apex. Subgenital plate in ventral view as in fig. 42; left paraproct armed with slender curved hook with three sharp teeth at apex (which has only two visible in fig. 42); left styli gently curved, blunt at apex; right styli borne on an incurved fold of subgenital plate, curved, acute at apex; apical margin of subgenital plate with furcate projection between styli, strongly sclerotized. Two tufts of setae, one composed of setae closely grouped together and with their tips straight, the other group arranged in a dense row and their tips hooked, projecting from beneath left paraproct. Right paraproct specialized in the form of a plate (fig. 69) and with an armed appendage projecting from beneath its caudal margin. A slender, strongly curved phallosome extending from membranous folds.

Coloration: General coloration as in *festa*, pronotum with pale yellow lateral and anterior margins grading into the mottled brown disk. Tegmen cinnamon
brown, slightly paler along costal margin and with pale yellow in marginal field; shiny, with faint metallic luster. Wing transparent, brownish buff with noticeable blackish tinge from axillary vein anteriorly; costal margin grading into yellow. Head, head appendages, legs, and dorsal surface of abdomen as in *zeteki* with the following exceptions: Interocular space brown, paling toward occiput: band between antennal sockets marked at extremities; basal costal spot conspicuously developed. Ventral surface of abdomen pale along lateral margins, darker medially and toward apex; subgenital plate brown, with pale margins except apical forked projection. Right stylus brown. Cerci deep brown ventrally, pale dorsally excepting dark lateral margins along basal two-thirds.

Measurements: Length of body 19.5 mm., of pronotum 4.5 mm., of tegmen 19.5 mm., of hind tibia 8 mm.; width of pronotum 6 mm.

**Female (allotype).—** General form as in male. Interocular space 1 mm. wide, lateral margins parallel. Wing with two complete and no incomplete rami of ulnar vein. Abdomen with terga unspecialized; supra-anal plate broadly triangular, apex scarcely emarginate; subgenital plate unspecialized, broadly rounded at apex.

Coloration: Like that of male; subgenital plate brown, grading into yellow at lateral margins, dark brown at apex; on each side about one-third distance from lateral margin to median line a black spot near posterior margin of penultimate segment.

Measurements: Length of body 16.5 mm., of pronotum 4.5 mm., of tegmen 19.5 mm., of hind tibia 7.6 mm.; width of pronotum 6.5 mm.

In addition to the type and allotype described above, three specimens, two males and one female, and two male abdomens which were broken from the bodies during shipment and the remaining parts unassociated with them are considered paratypes. One male has 2 complete rami and an incomplete one of the ulnar vein; the other two complete and no incomplete rami. There are 3 complete and 1 and 2 incomplete rami of the two wings of the female paratype. The hook of the left paraproct of one of the detached abdomens has 4 teeth at the apex instead of 3 as in the other abdomens. The right paraproct of one abdomen has only 3 teeth in the basal cluster. The wings of the female paratype have 3 complete ulnar rami and 1 to 2 incomplete rami. No further variation in the paratypic material has been noted.

The separation of females from those of *festae* is somewhat uncertain, but the males differ strikingly in the features of the abdomen as shown by the figures.

**Type locality.**—Barro Colorado Island, Canal Zone, Panama.

**Type.**—No. 53129 U. S. National Museum.

One entire male paratype is deposited at the Academy of Natural Sciences of Philadelphia and one at the Museum of Zoology, University of Michigan.

All specimens were taken by James Zetek in a fruitfly trap.
at the type locality in June, 1937, except one male paratype which was taken in the same place and manner September–October, 1937.

The present insect is named in honor of August Busck, the author's colleague and friend. During his field work in Panama Mr. Busck collected many species of Blattidae for the National Museum, which were studied in 1920 by Hebard at the time of the latter's classic report on the Blattidae of Panama.

**Xestoblatta ramona**, new species.

Figs. 6, 26, 37, 59, 71.

This striking species is most closely related to *braziliac*, from which it differs in the color pattern of the pronotum and the structure of the male genitalia.

*Male* (holotype).—Typical in general form, well developed tegmina and wings, and light-yellow marginal field of tegmen, but size large for the genus. Head rather sharply triangular in frontal aspect. Interocellar space narrow (0.6 mm.), lateral margins briefly outcurved in anterior third, slightly diverging both at occiput and at junction with interocellar area, noticeably depressed and marked with transverse wrinkles in anterior fourth. Intercellular area somewhat elevated and at a marked angle with occellar spots. Legs typical of *Xestoblatta*. Pronotum (fig. 6) with sides somewhat hood-like, strongly sloping.

Ulnar vein with 5 complete and 5 incomplete rami. Abdomen specialized dorsally as in fig. 26; sixth tergum with a pair of hook-like folds on posterior margin; eighth tergum largely concealed by broadly produced posterior margin of seventh; supra-anal plate wide at apex, broadly and gently emarginate. Subgenital plate as in fig. 37; styli short and conical, armed dorsally with numerous, short, sharp spines. Left paraproct bearing a strong curved hook (fig. 59); a small lateral tooth near sharp apex of hook. Right paraproct hook-like, armed with blunt teeth along posterior margin as in fig. 71. Phallosomes projecting from membranous folds, the left one poorly developed and weakly sclerotized, the right one strongly sclerotized, curved and similar to the corresponding phallosome of *braziliac* (fig. 9) except that no horn is borne at the apex.

Coloration: General color dark, except for marginal field of tegmen and margin of pronotum, which are whitish yellow. Pattern of pronotum (fig. 6) with disk black, dark brown at the point touching anterior margin; lateral margin narrowly edged with black, shading to brown anteriorly above occiput. Tegmen very dark brown, with rich metallic luster in basal half, grading to pale brown at apex, marginal field of sharply contrasting whitish yellow. Wing transparent; general color buff; veins and membrane tinged with yellow, especially along costal margin. Face black, grading to pale brown on genae, on occellar spots, and around antennal sockets; clypeus reddish brown, yellow on each lateral third; labrum reddish brown; maxillary palpus with segments 1 and 2 dirty white, remaining segments blackish brown; antenna brown. Legs blackish brown; front coxa pale along lateral margin; all coxae with irregular pale areas near femoral joints and pale streaks in the areas receiving the femora in repose;
spines reddish brown. Abdominal terga 1-7 brown, somewhat darker along posterior margins; eighth and ninth terga pale brown; supra-anal plate slightly darker. Abdomen uniformly dark brown ventrally; dorsal surface of cerci pale medially, remainder dark brown; paraprocts dark brown; right phallosome reddish brown.

Measurements: Length of body 18.5 mm., of pronotum 5.3 mm., of tegmen 21.5 mm., of hind tibia 9.7 mm.; width of pronotum 6.8 mm.

**Type locality.**—Organ Mountains, Minas Geraes, Brazil.

**Type.**—No. 53130 U. S. National Museum.

In addition to the holotype, collected in April, 1935, there is one male paratype collected at Rio de Janeiro, Brazil, March—April, 1935. Both specimens were taken by Pauline Sandig. The paratype measures 22 mm. in length and the pronotum is 7.4 mm. wide. The right paraproct differs from that of the holotype in having only three teeth along the posterior margin; of these the lateral one is much larger than the corresponding one of the holotype.

The paratype is deposited at the Academy of Natural Sciences of Philadelphia.

*Xestoblatta braziliaca*, new species.

Figs. 7, 9, 21, 40, 58, 72.

This insect differs from the closely allied *ramona* in the pronotal pattern, the remarkable abdominal specializations of the male, and in minor color features.

**Male** (holotype).—General form as in *ramona*. Ulnar vein of wing with 6 complete and 6 incomplete rami. Dorsal surface of abdomen specialized as in fig. 21; sixth tergum with an obtuse angulation in each lateral third of posterior margin; seventh and ninth terga somewhat similarly modified but angulation more gradual; eighth tergum simple; supra-anal plate broadly but distinctly emarginate. Subgenital plate as in fig. 40, apex not oblique as in *ramona* (fig. 57); styli very similar to those of *ramona*; left paraproct armed with a simple, strongly curved hook (fig. 58); right paraproct (fig. 72) bearing sharp teeth along posterior margin; left phallosome well sclerotized, smooth, strongly hooked, blunt at apex; right phallosome (fig. 9) curved, covered with minute spines, apex bearing a strong thorn.

Coloration: Very similar to *ramona*. Pronotum (fig. 7) with disk nearly black, the latter with reddish tinge. Tegmen as in *ramona*. Head reddish brown; clypeus pale brown; ocellar spots pale yellow; antenna and apical 2 segments of maxillary palpus brown. Legs brown. Abdominal terga 1-5 pale brown; terga 6-9 yellowish; supra-anal plate yellowish, tinge with reddish brown. Sterna brown, 2-6 each with a dark spot on lateral fourth near anterior margin. Styli and right phallosome reddish brown; left phallosome and left paraproct pale brown; right paraproct dark brown anteriorly, pale on posterior margin of brown tooth.

Measurements: Length of body 22 mm., of pronotum 5.3 mm., of tegmen 21.5 mm., of middle tibia 5.7 mm.; width of pronotum 6.5 mm.
Type locality.—Espírito Santo, Brazil.
Type.—No. 53131 U. S. National Museum.
Only the male holotype is known.

**Xestoblatta castanea** Hebard.


Only the type of this very dark, rather large species is known. Its relationship to other species remains uncertain until the male is discovered.

The interocular space is broad (1.2 mm. at narrowest point), widening gradually toward the interocellar area. The tegmina and wings exceed the abdomen by a distance equal to the pronotal length. The eighth tergum has a heavy, rounded, marginal projection at each side.

Material examined: St. Jean du Maroni, French Guiana, 1 female (type).

**Xestoblatta hoplites** Hebard.

Figs. 28, 43, 47: 48.


The male was described by Hebard (1916) under the name *festae*, but the later association of sexes of *festae* made necessary the giving of a new name.

**Male.**—This sex has been described by Hebard (1916); the specialization of the subgenital plate is rather different from that of any other known species, but the specialized lateral margins of the seventh tergum (fig. 28) and the general form of the insect show relationship to *hamata*. The subgenital plate bears three teeth along its lateral margin (fig. 43); the left stylus is strongly curved and acute; the right stylus (fig. 47 in dorsal view) is borne on an incurved fold at the postero-lateral angle of the subgenital plate.

**Female.**—General form robust, in general agreement with male. Interocular space rather wide (average width 1.4 mm.), distinctly narrowed posteriorly. Five complete and 6 incomplete rami of ulnar vein of wing; supra-anal plate short, bilobate at apex; subgenital plate as in *hamata*.

Coloration: About as in *festae*; interocular space chestnut, not sharply delimited from the interocellar area; subgenital plate as in *hamata*.

Measurements: Length of pronotum 5.7 mm., of tegmen 23.5 mm., of hind tibia 9.6 mm.; width of pronotum 7.4 mm. (Abdomen preserved separately from body.)

Material examined: Borders of the Rio Machuca (Proc.), Costa Rica, 150 meters, January, 1907 (P. Biolley), 1 male
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(type); Costa Rica (U. S. N. M.), 1 female; Costa Rica, in quarantine at Seattle, Wash., December, 1934 (U. S. N. M.), 1 broken female.

**Xestoblatta sancta** (Giglio-Tos).

Fig. 3.


This insect, especially in the coloration of the pronotum, superficially resembles an *Epilampra* even more than does *festae*, which was originally described as a member of that genus. Hebard (1916) first assigned *sancta* to *Xestoblatta* and later (1924, p. 124) gave descriptive notes when recording the two specimens reported below. In the specimen from Chaguara-pata the discoidal vein of the wing is forked well beyond the middle; the ulnar vein has 5 complete and 5 incomplete rami. The species was originally described from 5 females from San José, Ecuador.

Material examined: Chaguara-pata, Chimborazo, Ecuador, April 5, 1922, 2,390 ft. (G. H. Tate), 1 female; Pasaje, Del Oro, Ecuador (F. Campos R.), 1 female.

**Xestoblatta hamata** (Giglio-Tos).

Figs. 27, 41, 70.


Hebard assigned *hamata* to *Xestoblatta* in 1916, and in 1921 he recorded two females from Colombia. Giglio-Tos had two females from Santiago, Ecuador, and one male from Gualaquiza, Ecuador. Giglio-Tos’ brief description of the male abdomen is insufficient to identify the present Panamanian male with certainty. The Panamanian female agrees closely with the Colombian females identified as *hamata* by Hebard.

In habitus and coloration *hamata* agrees with *hoplites* and *festae*; it differs from *hoplites* in the male specializations and in the narrower interocular space of the female, and differs from *festae* in its greater size and very different male characters.

**Male.**—Interocular space widest anteriorly; average width 0.8 mm., lateral margins slightly converging posteriorly. No prominent facial ridge. Ulnar vein of wing with 5 rami reaching margin of wing and 6 incomplete ones. First abdominal tergum weakly specialized, with strong folds diverging caudo-laterad from median point of anterior margin, the latter bearing setae medially one-third the longitudinal width of segment, a small whitish area of weaker sclerotization in median part of tergum. Terga 5–10 as in fig. 27; 5 and 6 not notice-
ably modified; tergum 7 greatly modified about as in hoplites (fig. 28). the lateral margins with narrow area elevated in a higher plane than other portions of tergite; tergum 7 with transverse glandular depression partially covered by a shelf-like portion which is itself largely concealed by the sixth tergum and which superficially resembles a separate tergum; eighth tergum with caudo-lateral angles broadly rounded; ninth with posterior margin deeply and broadly emarginate; supra-anal plate broad at apex, emarginate.

Subgenital plate (fig. 41) broadly emarginate at apex; a less heavily sclerotized plate originating at a point dorsal of the emargination; left stylus with small lateral arm midway of its length; right stylus visible in caudal view, borne on incurved fold at postero-lateral angle of subgenital plate, consisting of slender arm directed mesad, bearing several sharp teeth at apex; right paraproct (fig. 70) with prominent and smoothly rounded postero-mesal angle, posterior margin with single, heavy, curved tooth, two additional teeth projecting from beneath margin (left paraproct not clearly visible in present specimen).

Coloration: Interocular space pale reddish brown; subgenital plate chestnut brown; styli and right paraproct brown; color elsewhere very much as in festae.

Measurements: Length of body 19 mm., of pronotum 5 mm., of tegmen 22 mm., of hind tibia 9 mm.; width of pronotum 6.5 mm.

Female (Panama).—General form as in male, size slightly larger; interocular space with average width 1 mm.; supra-anal plate more triangular than in male, emarginate at apex; subgenital plate simple, broad at apex, with incurved apical margin.

Coloration: As in male; subgenital plate very dark brown in apical fourth.

Measurements: Length of body 22 mm., of pronotum 5.8 mm., of tegmen 25 mm., of hind tibia 10 mm.; width of pronotum 7 mm.

The Colombian female does not differ materially from the Panamanian one. The ulnar vein of wing has 5 complete and 5 incomplete rami. The measurements are as follows: Length of body 23.5 mm., of pronotum 5.8 mm., of tegmen 25 mm., of hind tibia 10.3 mm.; width of pronotum 7.6 mm.

*Xestoblatta hamata* may have been carried by winds from the mainland of southwestern Colombia to Gorgona Island, a distance of about 30 miles.

Material examined: Andagoya, Antioquia, Colombia, April 22, 1918 (M. A. Carriker, Jr.), 2 females; Gorgona Island, 2.59° N., 78.20° W., July, 1924 (Miss Cheesman), 1 female; Barro Colorado Island, Panama, December 1936–January, 1937 (Zetek) (U. S. N. M.), 1 male, 1 female.

*Xestoblatta immaculata* Hebard.

Figs. 4, 13, 46, 60, 73.

*Xestoblatta immaculata* Hebard, Mem. Amer. Ent. Soc., No. 4, pp. 80–81, pl. 4, fig. 16, 1920.

This species may be recognized from other described species of *Xestoblatta* by the very broad form, especially of the pronotum, the unusual shape of the interocular space, the immaculate surface, and the light-chestnut ground color. The male subgenital plate, styli, and phalomeres, first described by Caudell (1924,
pl. 4, figs. a and b), are distinctive of the species. The left paraproct (fig. 60) is a concave plate with broadly rounded posterior margin; from the posterior half of the disk a slender, gently curved spine extends mesad. The right paraproct (fig. 73) is an undulating plate greatly thickened along the postero-lateral margin; a strong, sharp spine projects postero-mesad. The first abdominal tergum (fig. 13) is specialized in the form of a bilobate pit; there is a longitudinal ridge dividing the lateral halves and each has a tuft of setae extending posteriorly over the swollen and smoothly rounded margin.

The tergal specialization, paraprocts, interocular space, and general habitus of immaculata suggest that the species belongs to a Xestoblatta stock which is rather far apart from the other species. The male recorded below from Pará agrees with Panamanian males and indicates a much wider distribution for the species than had previously been supposed.

Material examined: Alhajuela, Panama, March 10, 1912 (A. Busck) (U. S. N. M.), 1 female (type); Rio Chilibrillo, Panama, bat caves, August 24, 1923 (R. C. Shannon) (U. S. N. M.), 1 female, 1 nymph; same data, August 20, 1923, August 29, 1933, 1 male, 1 female; Chilibre River, Panama, August 29, 1923 (Zetek), 1 female; Porto Bello, Panama, February 28, 1911 (A. Busck) (U. S. N. M.), 1 nymph; same data, April 20, 1912, 1 nymph; Barro Colorado Island, Panama, June, 1937 (Zetek) (U. S. N. M.), 2 males; Pará, Pará, Brazil, July 20, 1926 (de Schauensee and Bond), 1 male.

SUMMARY.

Xestoblatta is known to include 20 species, of which 8 are here described as new. The diagnostic characters of the species, especially of the males, are discussed and illustrated. In addition to their importance in identification, these features suggest the natural lines of evolution within the genus. Notes on allied genera, the generic limits of Xestoblatta, and the biology and distribution of the species are presented.

LITERATURE CITED.


Caudell, A. N. 1924. Some insects from the Chilibrillo bat caves of Panama. Ins. Ins. Mens., Vol. 12, Nos. 7-9, pp. 133-136, pl. 4, figs. a, b.


Explanation of Plates.
Plate 13.

Fig. 1. Xestoblatta carrikeri Hebard. Outline of wing. CM, costal margin; C, costal veins; IT, intercalated triangle; Ax, axillary vein; M, median vein; A, anal vein; FD, fork of discoidal vein; D, discoidal vein; U, ulnar vein; Ms, mediastine vein; P, peripheral margin; R, radiate veins. (After Hebard, 1916.)

Fig. 2. X. para Hebard, male. Anterior view of front femur. (After Hebard, 1916.)

Fig. 3. X. sancta (Giglio-Tos), female. Interocular space, dorso-anterior view. Chaguaparapata, Ecuador.

Fig. 4. X. immaculata Hebard, female. Interocular space, dorso-anterior view. Rio Chilibrillo, Panama, August 29, 1923.

Fig. 5. X. poecila Hebard. Dorsal view of pronotum. (Redrawn from Hebard, 1921b.)

Fig. 6. X. ramona, new species. Dorsal view of pronotum. Holotype.

Fig. 7. X. braziliæ, new species. Dorsal view of pronotum.

Fig. 8. X. para Hebard, male. Dorsal view of pronotum. Rio Purus, Brazil.

Fig. 9. X. braziliæ, new species. Dorsal view of pronotum.

Fig. 10. X. para Hebard, male. Dorsal view of apical portion of abdomen. A. Seventh tergum. (After Hebard, 1916.)

Fig. 11. X. carrikeri Hebard, male. Same view. A, Depressed median specialization of seventh tergum; the eighth is concealed. (After Hebard, 1916.)

Plate 14.

Fig. 12. X. zeteki (Saussure), male. Dorsal view of apical portion of abdomen.

Fig. 13. X. immaculata Hebard, male. Dorsal view of mesal portion of first tergum, showing bilobed depression along anterior margin.

Fig. 14. X. panamæ, new species, male. Dorsal view of apical portion of abdomen. Holotype.

Fig. 15. X. peruana (Saussure), male. Same view.

Fig. 16. X. ecuadorana, new species, male. Caudal view of subgenital plate.

Fig. 17. X. micra Hebard, male. Caudal view of subgenital plate. (After Hebard, 1921b.)

Fig. 18. X. mira, new species, male. Dorsal view of apical portion of left paraproct.

Fig. 19. X. ecuadorana, new species, male. Dorsal view of apical portion of abdomen.
Fig. 20. *X. patrix*, new species, male. Same view. Tergum 8 concealed.

Fig. 21. *X. braziliae*, new species, male. Same view.

Fig. 22. *X. mira*, new species, male. Same view.

Fig. 23. *X. micro* Hebard, male. Same view.

Fig. 24. *X. carrikeri* Hebard, male. Caudal view of subgenital plate. (After Hebard, 1916.)

Fig. 25. *X. festae* (Griffini), male. Dorsal view of apical portion of abdomen. Barro Colorado Island, Panama, August-September, 1936.

Plate 15.

Fig. 26. *X. ramona*, new species, male. Dorsal view of apical portion of abdomen. Holotype.

Fig. 27. *X. hamata* (Giglio-Tos), male. Same view. Barro Colorado Island, Panama.

Fig. 28. *X. hoplites* Hebard, male. Same view. A, Latero-posterior production of seventh tergum. (After Hebard, 1916.)

Fig. 29. *X. zeteki*, new species, male. Ventro-caudal view of subgenital plate.

Fig. 30. *X. nyctiboroides* (Rehn), male. Caudal view of subgenital plate. (Redrawn from Hebard, 1926.)

Fig. 31. *X. para* Hebard, male. Caudal view of subgenital plate. (After Hebard, 1916.)

Fig. 32. *X. panamae*, new species, male. Ventro-caudal view of subgenital plate. Paratype. Barro Colorado Island, Panama, September-October, 1937.

Fig. 33. *X. potrix*, new species, male. Caudal view of subgenital plate.

Fig. 34. *X. mira*, new species, male. Same view.

Fig. 35. *X. peruan* (saussure), male. Same view.

Fig. 36. *X. buscki*, new species, male. Dorsal view of apical portion of abdomen. Holotype.

Plate 16.

Fig. 37. *X. ramona*, new species, male. Ventral view of apical portion of abdomen. Holotype.

Fig. 38. *X. potrix*, new species, male. Dorsal view of right stylus and associated structures.

Fig. 39. *X. panamae*, new species, male. Caudal view of right stylus. Same specimen as in fig. 32.

Fig. 40. *X. braziliæ*, new species, male. Ventral view of apical portion of abdomen.

Fig. 41. *X. hamata* (Giglio-Tos), male. Ventral view of apical portion of abdomen.

Fig. 42. *X. buscki*, new species, male. Same view. Paratype. Barro Colorado Island, Panama, June, 1937.

Fig. 43. *X. hoplites* Hebard, male. Caudal view of left stylus and left lateral margin of subgenital plate, showing the armament of that margin. (After Hebard, 1916.)

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2 As noted elsewhere, the writer has chosen to drop the use of the term "median segment" for the first segment of the abdomen; because of this fact the nomenclature of the segments does not agree with that used in Hebard's descriptions.
Fig. 44. *X. festae* (Griffini), male. Ventral view of apical portion of abdomen. (After Hebard, 1921b.)

Fig. 45. *X. potrix*, new species, male. Latero-caudal view of left stylus.

Fig. 46. *X. immaculata* Hebard, male. Caudal view of subgenital plate.

Fig. 47. *X. hoplites* Hebard, male. Caudal view of right stylus. (After Hebard, 1916.)

Fig. 48. *X. hoplites* Hebard, male. Dorsal view of left stylus. (After Hebard, 1916.)

Fig. 49. *X. festae* (Griffini), male. Dorsal view of apical portion of subgenital plate. (After Hebard, 1916.)

Plate 17.

Fig. 50. *X. ecuadorana*, new species, male. Dorsal view of apical portion of left paraproct.

Fig. 51. *X. potrix*, new species, male. Same view.

Fig. 52. *X. zeteki*, new species, male. Same view.

Fig. 53. *X. panamae*, new species, male. Same view. Holotype.

Fig. 54. Same. Same view. Paratype. Barro Colorado Island, Panama, September–October, 1937.

Fig. 55. Same. Same view. Paratype. Same data as in fig. 54.

Fig. 56. *X. micra* Hebard, male. Same view.

Fig. 57. *X. peruana* (Saussure), male. Same view.

Fig. 58. *X. braziliæ*, new species, male. Same view.

Fig. 59. *X. ramona*, new species, male. Same view. Holotype.

Fig. 60. *X. immaculata* Hebard, male. Same view. Barro Colorado Island, Panama, June, 1937.

Fig. 61. *X. zeteki*, new species, male. Dorsal view of posterior portion of right paraproct.

Fig. 62. *X. ecuadorana*, new species, male. Same view.

Fig. 63. *X. micra* Hebard, male. Same view.

Fig. 64. *X. peruana* (Saussure), male. Same view.

Fig. 65. *X. potrix*, new species, male. Same view.

Fig. 66. *X. mira*, new species, male. Same view.

Fig. 67. *X. panamae*, new species, male. Same view. Same specimen as in fig. 55.

Fig. 68. *X. festae* (Griffini), male. Same view. Barro Colorado Island, Panama, August–September, 1936.

Figure 69. *X. buscki*, new species, male. Same view. Paratype. Barro Colorado Island, Panama, June, 1937.

Fig. 70. *X. hamata* (Giglio-Tos), male. Same view.

Fig. 71. *X. ramona*, new species, male. Same view. Holotype.

Fig. 72. *X. braziliæ*, new species, male. Same view.

Fig. 73. *X. immaculata* Hebard, male. Same view.

(Figures 5–8 drawn by Mary Foley Benson.)
HOUSE INSULATION AND INSECT INFESTATIONS.1

By E. A. Back,

U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.

The increasing popularity of house insulation during the last 10 years has led to the use of numerous insulating materials of mineral, vegetable, and animal origin. Certain of these insulating materials have created such baffling insect problems for the entomologist and the pest-control operators that to-day all such materials are investigated carefully by well-informed builders and home owners to determine whether they would carry into a building an insect menace.

When house insulation first became the vogue, much animal matter in the form of cattle hair or mixtures of cattle hair and wool refuse of all sorts was used with no thought except for its value as insulation against heat or cold, or as a sound deadener. Insects were disregarded or were thought to have been kept out by chemical treatments of the insulating material.

In one instance the walls of a large house in the Northwest were insulated with sheep's wool, with the result that in a few years tremendous numbers of the webbing clothes moth (Tineola biselliella (Hum.) ) were emerging from about the floor edges and electrical fixtures. In Baltimore, Md., the ceiling of a sun porch was insulated with a layer of cattle-hair padding which became infested with Tineola, and after several unsuccessful fumigations with hydrocyanic acid gas the ceiling was ripped off and the insulation removed. The hair pads were found so thoroughly eaten by the moth larvae that the material would not hang together as strips (Pl. 18, A).

Samples of cattle-hair insulations from walls and floors have been received from various parts of the United States. Although the Tineola infestations in such materials usually are confined to the outer portions and naturally are always most severe at the edges or where wall openings, as about fixtures, permit the passage of insects, infestations extend inward farther and farther with the progress of time. The application of tarred paper to the top and bottom of the insulation pads has not seemed to deter the insects very much, if one can judge from the presence of excretal pellets (Pl. 18, B). Clothes moths and carpet beetles have every opportunity to reach insulations from around the uneven ends of the floor boards, which are concealed by the baseboards and quarter rounds. In one such instance the writer removed 181 pupal cocoons of Tineola biselliella from 4-3/8 running inches along the edge of some insulation, or an average

1Read at the Indianapolis meetings of the American Association of Economic Entomologists in December, 1937.
of about 41 cocoons to an inch. This edge is shown in (Pl. 19, C). In other instances Tineola larvae were found to have emerged from insulation in wall spaces and to have spun their cocoons on the underside of the trim in closely packed rows, about 25 cocoons to the running inch (Pl. 19, B).

Cattle-hair insulation has been found to harbor many larvae of the black carpet beetle (Attagenus piceus (Oliv.)). Larval skins on a hair insulation removed from between the rafters under an attic floor are shown in Plate 20, A. In loose-textured insulation of this type, in which the hair is well mixed with vegetable fibers, the larvae of Attagenus burrow in all directions and must do much feeding before they affect the physical appearance of the insulation, although a closer examination proves that the animal matter has been eaten. In insulations made of finer hair and of a denser texture the feeding of fabric pests may be confined chiefly to the outer surfaces and give to the insulation pads a pitted appearance. Feeding pits of A. piceus and the furniture carpet beetle (Anthrenus vorax (Waterhouse)) are shown in Plate 19, A. With such densely packed insulating material Tineola feeding tubes are usually on the surface only.

Many fabricated houses have been supplied with cattle-hair insulation carrying a guarantee that the insulation is moth-proof. One such house in Washington, D. C., became overrun with Anthrenus vorax several years after construction, and the larvae were found to be thriving in the insulation wherever it was examined. In the laboratory A. vorax larvae soon reduced pieces of this insulation to frass and vegetable fibers. In this case the insulation was removed and the house fumigated at the expense of the firm selling the building materials. The uninfested portion of a cattle-hair insulation pad and a portion in which larvae of Anthrenus vorax have eaten out sizable cavities and fluffed the insulation by burrowing about in it are shown in Plate 20, B.

Another house in the Middle West similarly insulated with cattle hair developed a heavy infestation of Tineola biselliella. Successive fumigations with hydrocyanic acid gas over several years failed to eradicate the insects. Control was finally accomplished by opening the walls and removing the infested insulation (Pl. 21). The house was again fumigated with hydrocyanic acid gas before the walls were repaired and then was reinsulated with material not fed upon by moths.

In at least one apartment house of ultramodern construction, having walls insulated with cattle-hair pads, infestations of the spider beetle Mezium americanum Lap. appeared and were very perplexing as to origin. While no large numbers of the beetles were found at any one time, the single specimens captured wandering here and there caused much concern. It
was thought at the time that they had come from the hair
insulation, for the building was very new and no other source
seemed probable. This spider beetle has since been found
developing in hair insulation from another building, but appar-
etly it was feeding upon other animal matter in the hair
rather than upon the hair itself, although this could not be
determined to complete satisfaction.

Insulations consisting only of vegetable fibers, such as flax and
jute, have never been found infested with clothes moths or
carpet beetles, although all mixtures of these fibers with animal
fibers, even when the animal content is as low as 10 per cent,
are readily fed upon, as evidenced by infested insulation received
from correspondents and by tests involving the confinement of
fabric pests with the insulations. In one instance an insulating
cardboard, said to contain only 1 per cent of wool fiber, was fed
upon slightly by Anthrenus vorax. It is very probable that
psocids thrive in vegetable fiber insulations, especially if these
become damp. Insulations of cottonseed hulls between bed-
rooms and attic have developed infestations of the red flour
beetle (Tribolium castaneum (Hbst.)), which within a year after
completion of construction have proved troublesome throughout
the house. In one house in which a product composed of a very
course vegetable fiber was used as insulation such hordes of
larvae of the larder beetle (Deremstes lardarius L.) appeared and
began to burrow in the walls of the first floor that the insulation
was removed because it was believed to be attracting the beetles.
Of course such attack upon vegetable insulation is accidental,
and the presence of the larder beetle larvae was due to other
causes not involving the insulation.

Silverfish (Lepisma spp.) are notorious pests of warm base-
ments. The use of flour pastes by plumbers in applying asbestos
insulations to heating systems undoubtedly encourages the
increase of silverfish. The writer has seen unpoisoned pastes
used in modern buildings as late as November, 1937.

Insulations consisting entirely of mineral substances have not
proved capable of supporting insect life. They may be found
apparently infested with Tineola, Attagenus, and Anthrenus
because insects are present among their fibers. Usually such
insects have been feeding upon normal foods near small openings
in floor or wall spaces and have retreated to rest, molt, or pupate
in the insulation, just as they would in any crack or crevice that
presented itself. If enough insects should die in such insulations
one can conceive of the insulation sheltering an active infesta-
tion, for the larvae of both clothes moths and carpet beetles
can mature by feeding upon the dead of their own species.

In experiments conducted from July to November, 1937, in
which 25 larvae of Anthrenus vorax were confined with each of
seven types of mineral insulating materials, generally known as
“rock wool,” no destruction occurred so far as could be detected, and although a few of the older larvae pupated and became adults, as they might have done even in an empty dish, none of the larvae hatching from eggs laid succeeded in developing.

From examination of an array of insulating materials from buildings over a period of 10 years it would seem safe to say that all insulations containing animal matter, particularly wool refuse and hair, are open to suspicion even though they are guaranteed to be treated to render them insect proof. Undoubtedly, sooner or later, they would become a source of room infestation, bring about a very general distribution of pests, and make insect sanitation difficult. Insulations of purely mineral substances are not fed upon by household pests, but may be used as places for nesting, molting, and pupation if they are near a food of the insects. This nesting habit is apparently of little practical importance taking a building as a whole, but it is sometimes contributory to the failure of fumigations to give entire satisfaction, because the vapors of fumigants, released in rooms and finding their way into wall spaces, escape with air currents and are not held long enough to penetrate the insulation to places where the insects lie hidden. Any material containing a farinaceous binder is likely to furnish food for *Attagenus* and *Anthrenus*.

Plate 18.—A, Portion of pad of cattle-hair insulation taken from sun-porch ceiling, crumbling beneath the continued attack of *Tineola biselliella* larvae, and filled with excrement and dead insects; B, portion of insulation material composed of cattle hair, vegetable fibers, wool refuse, and other odds and ends. Note the black frass pellets of *Tineola* showing distinctly about edges, but present in quantity wherever the larvae have been feeding. (About natural size.)

Plate 19.—A, Surface feedings of *Attagenus piceus* on dense cattle-hair insulation pad taken from under attic floor (natural size); B, cocoons of *Tineola biselliella* formed by larvae which have fed on hair insulation within walls and later spun their cocoons along the under edge of trim (twice natural size); C, edge of cattle-hair insulation installed between floors showing dense mass of *Tineola biselliella* cocoons and pupal skins (twice natural size).

Plate 20.—A, Insulation pad of mixed hair and vegetable fiber between layers of burlap, note cast skins of *Attagenus piceus* (about natural size); B, cross section of an insulation pad of cattle hair and vegetable fibers showing at left the dense texture of freshly cut, uninfested surface, and at right the same insulation after carpet beetle larvae have burrowed in the pad, fluffing it up and eating out a portion of the hair (natural size).

Plate 21.—Portions of brick veneer fabricated house, indicating manner in which moth-infested cattle-hair insulation was removed from walls, prior to fumigation and reinsulation with a mineral product.
CHARLES RUSSELL FLY
OBITUARY NOTICE: CHARLES RUSSELL ELY.

By J. S. Wade and Carl Heinrich.

Charles Russell Ely (1870-1939), American educator, biologist, chemist and former president of the Entomological Society of Washington, was born February 20th, 1870, at Columbus, Ohio. He was the son of Charles Wright Ely, formerly of Madison, Conn., and Mary (Darling) Ely, members of which family belonged to the Mayflower Society through descent from John Alden. His educational training comprised Bowen’s Preparatory School, graduated 1887; Yale University, B. A., 1891, M. A. 1897; Gallaudet College, M. A., 1892; and George Washington University, Ph. D., 1900. On December 25th, 1897, he was married to Louise Day Crane of Newark, New Jersey, who, with three daughters and four grandchildren, survive him. For forty-two years his father, Dr. Charles Wright Ely, was superintendent of the Maryland School for the Deaf at Frederick, Maryland, during part of which time the son became proficient in this specialized type of teaching. In 1892 he began his long career as instructor in Gallaudet College, Washington, D. C. He was instructor in natural science, 1892-1896; assistant professor, 1896-1899; professor, 1899-1912. Following the death of his father, Dr. Ely became principal for one year, 1912-1913, of the Maryland School for the Deaf, after which service he resumed his work at Gallaudet College, and during the remainder of his life continued there, first as professor of natural science, and later as vice president of that institution. During these years the results of Dr. Ely’s researches, notably in pedagogy, chemistry, and natural science, were published in numerous technical and professional periodicals. In the field of biology, he specialized particularly in Microlepidoptera and in control of forest insects, for several years being a collaborator in these fields with the United States Department of Agriculture.

Dr. Ely was a fellow in the American Association for the Advancement of Science; a member of American Institute of Chemists; Convention of the American Instructors of the Deaf; American Chemical Society; Entomological Society of America; Selective Service Board, District 11, Washington, 1917-1918; and of the Unitarian church. He became a member of the Entomological Society of Washington March 5, 1908, was its first vice-president in 1915; became president in 1916, and was reelected president for 1917. His first presidential address was entitled: "A Revision of the North American Gracilariidæ from the Standpoint of Veination"; his second presidential address was entitled: "Recent Entomological Chemistry and some notes concerning food of insects." For many years faithful in attend-
ance at our meetings, he contributed frequently to its programs, also participated actively in its deliberations. He died on February 22d, 1939, of heart disease, at his home in Washington, D. C. Funeral services on February 24th were conducted by Dr. Ulysses G. B. Pierce of All Souls’ Unitarian Church. Interment was in Fort Lincoln Cemetery near Washington, D. C. For further published biographical data see: Who’s Who in America, American Men of Science, Who’s Who in the Nation’s Capital, Who’s Who in the East, Proc. Ent. Soc. Wash. 38 (6): 113, June, 1936, and Washington (D. C.) Star, News and Post, February 23, 1939.

Dr. Ely’s chief entomological interest was in the smaller Lepidoptera, particularly of the families Pyralididae and Graciliariidae. He described several new species in these groups and gave us a revision of the North American Graciliariidae, which is the soundest piece of taxonomic work that thus far has been done on that family. While he was an enthusiastic collector and spent the greater part of his vacation periods in the field, chiefly at East River, Connecticut, he was not content merely to gather and assay insects. The new species he described had been reared by him and associated with their food plants and larval habits.

Personally he was a man of much charm, of even temper, unfailing courtesy and kindliness. His friends will long cherish his memory.

Publications by Charles Russell Ely on Entomological Subjects.

BOOK NOTICE.

A CONTRIBUTION TO THE BIOLOGY OF NORTH AMERICAN Vespine Wasps.

By Carl D. Duncan, Ph. D., Professor of Entomology and Botany, San Jose College, large 8 vo., paper, 272 pp., 54 plates (255 figs.), bibliog., $2.50. Stanford Univ. Press, Stanford University, Calif.

The very modest title of this fine publication fails to inform the reader of its unusually comprehensive and excellent content, as it deals in the most competent manner, not only with the biology but also with the morphological and systematic characteristics of the North American paper making wasps of the subfamily Vespinae.

The morphological section consists of a detailed treatment of the skeletal and muscular morphology. The systematic discussion includes a comparison of the morphological and biological characteristics of the North American genera. The biological section reports extensive observations on the habits, behavior, nest building and life history together with descriptions of the immature stages of *Vespula pennsylvanica*. The information contained in this latter section is based upon the author's personal observations over a period of 20 years and the collections of many entire colonies.

The illustrations, of which 196 are line drawings (the remainder being halftone illustrations), are of unusually fine quality. The line drawing seldom has been excelled in American entomological literature and exhibits care and skill in the character and placing of their index lettering. The halftones not only reproduce a set of remarkably fine photographs but the quality of their reproduction and printing leave nothing to be desired. In short—a valuable and informative book beautifully printed —W. R. W.

MINUTES OF THE 499TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 499th meeting of the Society was held at 8.00 p. m., Thursday, March 2, 1939, in Room 43 of the National Museum. President Snodgrass presided and 35 members and 12 visitors were present. The minutes of the February meeting were read and approved.

The President briefly outlined the recent work of the committee which is cooperating with the National Park Service on wildlife conservation.

President Snodgrass announced the death of Dr. C. R. Ely of Gallaudet College, Washington, D. C. Dr. Ely was an active entomologist for many years,
having published papers on Microlepidoptera, and was a former President of the Society. Mr. Cushman commented briefly.

There were two talks on the regular program, as follows:


For several years Mr. Englehardt has been studying the Aegeriidae, or clear-wing moths, of North America. An important phase of this work, which is now approaching completion, has been the investigation of life-histories and host-plant relationships, since the larvae live as borers and several species are of great economic importance. During June and July, 1938, the speaker traveled in Alaska, stopping at points of interest along the coast and visiting Fairbanks, Mt. McKinley National Park, and other places in the interior. The visitor in Alaska is impressed by the large amount of rainy weather and the abundance of insect life which appears in favorable locations on pleasant days. Mention was made of some of the more interesting aegeriids and other insects collected, as well as other forms of wildlife observed. Mr. Englehardt told of some particularly interesting experiences with bears and other large animals. (Author's abstract.)


The functional reactions of southern armyworm (*Prodenia eridania* Cram.) discussed were cell coagulation, phagocytosis, capsule formation, passive-active transformation, reversible build-up and storage, and responses to certain stomach poisons. It was emphasized that in all of these except glycogen storage the initial reaction involved the change from a passive to an active form of the cell. (Author's abstract.)

Adjournment at 10.00 p. m.

Ashley B. Gurney,
Recording Secretary.

*Actual date of publication, April 26, 1939.*
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September
by the
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under
Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October
3, 1917, authorized July 3, 1918.
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THREE NEW SPECIES OF APHIIDAE (HOMOPTERA).\textsuperscript{1}

By A. A. Granovsky.

Division of Entomology and Economic Zoology, University of Minnesota.

The supertribe Callipterea is of special interest to North American aphidologists. It consists of unusually interesting species of aphids, showing a wide range of variation of the morphological characters, peculiarity of habits and biology of the different species. Aphids of this group are known for their brilliant coloration and for that reason alone, not mentioning others, they have attracted the attention of many entomologists. On the other hand, most of them live upon the foliage of deciduous trees without much apparent injury to the plants from which they derive their food; they are either solitary in their feeding habits or form only small scattered colonies and consequently they are often passed unnoticed.

The aphids of this supertribe are well represented in the United States and Canada and the aphid fauna of this supertribe is considerably richer on the North American continent than it is in Europe, but, for the above mentioned reasons, they are still only partially known, and new species are added from time to time. No doubt there are many new species yet to be described and still more remains to be known about their interesting biology.

In this paper three new species belonging to this group of aphids, are described from three different host plants, namely, maple, birch, and oak, representing widely separated parts of the United States.

Drepanosiphum oregonensis, new species.

_Alive Viviparous Female._ (Plate 23, figures 1, 14, and 15.)

Average length of body from vertex to the tip of cauda 2.5987 mm. General color of body orange-yellow with greenish tinge. Head concolorous with the body and often shaded to brick red; ocelli are not ringed with dark brown circles; posterior margin of the head with distinct black line, extending from eye to eye. Vertex slightly convex with a few pairs of short hairs around median ocellus.

\textsuperscript{1} Paper no. 1675 Scientific Journal Series, Minnesota Agricultural Experiment Station.
Antennal tubercles well developed, distinctly diverting, with inner margin pale yellow and outer margin dusky brown to black. Eyes red and large with prominent ocular tubercles. Antennae of six segments. Length of antennae 4.155 mm. Comparative average lengths of antennal segments as follows: I—8.75; II—4.25; III—66.75; IV—54.0; V—45.0; VI—7.0 plus unguis 51.2. Antennal segment I slightly gibbous on inner side, pale yellow with distinct dusky or dark brown tinge especially on outer margin; segment II uniformly dusky with yellowish undertone; segment III pale yellow. The base of this segment is slightly swollen and marked with a very narrow pale band, which is followed by a black annulation, restricted to the base of the segment. Bases of segment IV and V slightly shaded with dusky brown. Distal end of segment III ringed with a narrow band, while the ends of segments IV and V with somewhat wider dark brown or black annulations, gradually paling toward middle of the segments. The base of segment VI short, almost black. Unguis dusky brown, about seven times as long as its base. Antennae very finely imbricated and provided with a few very short, fine setae. The basal third to one-half of antennal segment III carries a row from 8 to 18, normally 12 to 15 oval, ciliated secondary sensoria. The primary circular sensorium at the end of the segment V, and the circular sensorium with a few auxiliary sensoria at the base of the unguis are closely fringed with fine cilia. In addition to a few small auxiliary sensoria, closely placed to the margin of the primary sensorium, there is a single circular ciliated sensorium at each pole along the longitudinal axis of the primary one. The tip of rostrum dusky, not quite reaching to the second pair of coxae.

Prothorax orange-yellow to brick red, lateral margins shaded with dusky black. Thoracic lobes are well developed, deep orange with reddish tinge and often infuscated with a dusky brown, almost black coating. Legs moderately hairy. Fore femora orange, with inner margin almost black, and distally outer margin touched with dusky brown; meso- and meta-femora orange, and only slightly, if at all, infuscated. Tibiae yellow to orange, slightly fumose, bases of which are narrowly, but very strongly marked on outer margins with deep black. Tarsi distally and the entire claws dusky brown to black; pale empodium present. Wings hyaline, rather long and narrow; veins delicate without borders, ending in indistinct dusky triangular margins. Costa and subcosta yellowish brown; stigma long, pale yellow with dusky brown margins. Fore-wings with media twice branched, the base of media not reaching the subcostal vein; radial sector complete, moderately curved basally. Hind wings with media and cubitus present; hooklets, five to six.

Abdomen bright yellow with greenish undertone, sparsely clothed with fine hairs, but without transverse black bands, occasionally, however, dorsum may be uniformly and very indistinctly infumated. Lateral tubercles small, colorless with the abdomen, each carrying curved hair. The tubercles just in front of the cornicles are marked with a small, often indistinct, dusky patch. Cornicles yellow with black tips, cylindrical, with outer margins gently curved inward and with somewhat swollen inner margins in the middle. Each cornicle is distinctly constricted a short distance from the base and again toward the tip just before the dusky flanges. The average length of the cornicles is about 0.770 mm. and the width in the middle is about 0.1225 mm. Cauda knobbed, pear-shaped, placed on broad, somewhat elongated base, orange in color with the
knobbed part often dusky. Anal plate slightly dented. Both anal plate and cauda armed with a few stout curved hairs.

Described from the following material taken in Oregon:
(1) Three specimens mounted on two slides together with *Drepanosiphum platanoides* (Schrank), collected by Professor H. F. Wilson, November 3, 1914, in Corvallis, Oregon, on leaves of the broad leaved maple, *Acer macrophyllum* Pursh. (2) Four specimens taken by Professor A. C. Burrill, September 14, 1919, in Forest Grove, Oregon, on ventral side of leaves of *Acer macrophyllum* Pursh and mounted on two slides.

*Holotype.*—Alate viviparous female mounted with paratype, another alate viviparous female, on a slide bearing the author’s accession number 1416, is in the collection of the University of Minnesota, from material collected by Professor A. C. Burrill in Forest Grove, Oregon. The paratypes are in the U. S. National Museum and in the collections of the Utah Agricultural Experiment Station and the writer.

This species feeds singly on lower side of maple leaves and can readily be separated from *Drepanosiphum platanoides* (Schrank) and *Dr. braggii* Gillette by the following key to the American species of the genus *Drepanosiphum*:

**Key to the Alate Viviparous Females.**

1. Antennal segments uniformly dark brown to black. Segment III armed with 17 to 26 large oval or transverse sensoria and is longer than segment VI together with the unguis..........*platanoides* (Schrank).
   Antennal segments yellow or dusky, only at ends annulated with brown or black.................................................................2

2. The base of antennal segment III with black band, armed with 8 to 15 oval or circular sensoria. Segment VI together with the unguis shorter than the third segment ...............*oregonensis* new sp.
   The base of antennal segment III without black band, armed with 6 to 13 oval or transverse sensoria. Unguis alone is equal to or longer than the third segment..............*braggii* Gillette.

This is the third species of *Drepanosiphum* known to occur on the North American continent and all American species of this genus have been reported from the western parts of the United States and Canada. Only a few records are known from the eastern half of the United States on the occurrence of this genus.

**Calaphis coloradensis**, new species.

*Alate Viviparous Female.* (Plate 2, figures 4, 7, 11 and 17.)

Average length of body from vertex to the tip of anal plate, 1.54 mm. General color yellow-green or pale yellow with greenish tinge. Head distinctly concave
with a slight frontal protuberance, which carries median ocellus and a few capitate hairs on each side of the ocellus. Eyes red, with distinct ocular tubercles. Antennae of six segments, placed on prominent diverging tubercles. Inner margin of each tubercle provided with a few indistinctly capitate hairs. Length of antennae 2.872 mm. Comparative average lengths of antennal segments as follows: I-7; II-4; III-47.0; IV-39.45; V-32.14; VI-9.54 plus unguis 25.0. The unguis a little more than twice the length of its base. Antennae pale yellow; distal end of each segment strongly annulated with dark brown to black as follows: segment III only very narrowly ringed with strong black band; distal third of segment IV and distal two-thirds of segments V and VI ringed with dark brown to black, gradually paling toward the base of each segment; entire unguis dusky black. Segment III, approximately on its second quarter from the base, carries from 4 to 8, usually 5 to 6 secondary distinctly margined small circular sensoria, which are somewhat protruding from the surface of the segment, the base of the segment being free from sensoria. Sensorated area definitely fumose. Segment V with circular primary sensorium and segment VI with an elongated one, surrounded by a few auxiliary sensoria at the base of the unguis. Inner margin of segment I slightly gibbous. The entire length of antennae finely imbricated and provided with short, stiff slightly capitate setae. The tip of the unguis slightly enlarged and carries three hyaline sensory rods. Rostrum with its black tip not quite reaches to the third pair of coxae.

Prothorax yellow; meso-thoracic lobes orange-yellow without much, or with only slight, infumation. Thorax sparsely armed with capitate hairs. Femora of all pairs of legs yellow. Tibiae predominantly pale, only the bases of all tibiae strongly ringed with black and the tips of tibiae shaded with dusky brown. Hind tibiae much longer than the tibiae of other pairs. Tarsi black, small empodium present between the claws. Legs clothed with small bristle-like hairs. Wings hyaline, atomarius, due to the bases of minute hairs, rather narrow and delicate; veins somewhat heavy. Fore-wings with costal and subcostal veins pale, media quite heavy, twice branched, pale brownish with very faint brownish borders; cubitus and anal veins very heavy, dark brown and strongly bordered with smoky brown, especially the anal; radial sector only faintly indicated. The tips of all veins marked with dusky-brown triangles, which are very conspicuous and characteristic of the species. Stigma trapezoid, pale yellow, at the base with faint, and at the distal margin with much stronger, brown shadings. Hind wings with slender media and cubitus present without infumation; hooklets three.

Abdomen pale yellow to greenish-yellow, frequently with irregular unstable green patches, in mounted specimens, around the cornicles and toward the thorax. Lateral tubercles small, each with small hair, the entire abdomen clothed with a few indistinctly capitate hairs. Cornicles truncate, slightly constricted in the middle, the entire length distinctly imbricated, about 0.123 mm. long and 0.053 mm. wide, being somewhat broader at the base and again at the distal end, without distinct flange. Cauda yellow, slightly knobbed. Anal plate distinctly notched. Both anal plate and cauda provided with long, bristle-like hairs.

Described from 53 specimens collected in Colorado and Utah.
Apterous Viviparous Female. (Plate 23, figures 5, 6, and 12.)

Average length of body from vertex to the top of anal plate 1.610 mm. General color pale yellow, tinged with green and occasionally with very light brownish cast. Head broadly concave with the frons slightly elevated, carrying several pairs of long, stiff, distinctly clavate hairs, placed on conspicuous tubercles about the median frontal tubercle and on the inner margins of the antennal tubercles. Antennae of six segments with coloration as in the alate viviparous females. Length of antennae 2.958 mm. Comparative average lengths of antennal segments as follows: I–7; II–3.5; III–46.0; IV–38.89; V–31.63; VI–11.31 plus unguis 29.06. Segment III carries from 3 to 9, usually 3 to 5 rather small circular secondary sensoria, which are placed on distal part of the lower half of the segment, the base of the segment usually being free from sensoria. The sensorated area somewhat swollen and slightly infuscated. Segments V and VI with small primary sensoria. The entire length of antennae finely imbricated and sparsely armed with short capitate setae. Eyes red. Rostrum reaches beyond the middle pair, but not quite to the third pair of coxae.

Thoracic segments concolorous with or only a shade deeper than the rest of the body. Legs pale yellow with shadings as in the alate viviparous females and are clothed with simple and with a few indistinctly clavate hairs. Abdomen pale yellow, tinged with green and rarely shows slight brownish shadings over the dorsum. Entire body of the insect sparsely clothed with prominent clavate hairs. Cornicles truncate, finely imbricated, broadest at the base, constricted in the middle and again enlarged at the ends, about 0.123 mm. long, 0.053 mm. wide in the middle, and 0.086 mm. broad at the base. Cauda slightly swollen. Anal plate distinctly dented. Anal plate and cauda with a few slightly knobbed simple hairs.

Described from 116 specimens collected in Colorado and Utah.

Apterous Oviparous Female.

Average length of body from vertex to the tip of anal plate, including the slightly drawn out ovipositor, about 2.275 mm. General color pale greenish yellow to orange with dusky brown shadings over the thoracic segments and especially over the dorsum of the abdomen, usually forming distinct dusky black transverse bands. Body with clavate hairs. Eyes red. Head broadly concave, frons slightly protruding, provided with long capitate hairs. Coloration of antennae as in the apterous and alate viviparous females. Length of antennae 2.7057 mm. Comparative average lengths of antennal segments as follows: I–7; II–4; III–42.0; IV–34.87; V–30.75; VI–10.37 plus unguis 25.62. Segment III with similar placement of small circular secondary sensoria as in the apterous viviparous females, from 3 to 6 in number, usually 3 to 4. Rostrum reaches just beyond the middle pair of coxae. Legs as in the preceding forms, with the exception of the slightly swollen hind tibiae, about 1.136 mm. long and 0.070 mm. wide, proximal two-thirds of which are provided with numerous sensoria on inner margins. Legs armed mostly with clavate and with a few simple, bristle-like hairs. The bases of tibiae usually without distinct annula-
tions, which are commonly present in the preceding forms. Cornicles truncate, finely imbricated, pale yellow, tips slightly touched with dusky brown. Cauda indistinctly knobbed, tip dusky. Anal plate entire. Cauda with a few and anal plate with numerous bristle-like hairs. Ovipositor only slightly, if at all, elongated.

Described from 42 specimens all collected in Colorado and Utah.

Apterous Male.

Length of body from vertex to the tip of anal plate about 1.470 mm. General color greenish yellow with dusky brown to black shadings of the head, thoracic segments and the dorsum of the abdomen, and in addition forming short transverse black bands, often fused together over the abdomen, most conspicuous mediad. Entire body sparsely clothed with capitate hairs. Eyes red, ocular tubercles present. Head concave. Frons and antennal tubercles with long capitate hairs. Antennae of six segments, placed on conspicuous diverging tubercles. Length of antennae 2.8030 mm. Comparative average lengths of antennal segments as follows: I—7; 11—3; III—4.70; IV—3.43; V—3.00; VI—10.42 plus unguis 25.57. The vestiture and coloration of antennae as in the preceding forms. Usually coloration is somewhat darker than in other forms of the species and brownish black shadings may extend almost to the base of each segment. Usually the middle of segment III is shaded with much darker color than the surrounding areas. Segment III carries a row of from 8 to 15, usually 12 to 14, narrowly bordered, rather small in size, circular secondary sensoria, usually covering the lower three-fourths and occasionally the entire segment, the very base being free from sensoria. Segment V with the usual oval primary sensorium without auxiliary, and segment VI at the base of the unguis with a few well-bordered auxiliary sensoria. The tip of the unguis with four hyaline short sensory rods. Rostrum almost reaches the third pair of coxae. Bases of tibiae only gently touched with dusky black. Cornicles as in the aperous oviparous females. Cauda knobbed, anal plate rounded, both provided with long l ash-like hairs. Claspers black with a row of short thick slightly curved hairs. Genital organ pale yellow, about 0.350 mm. long, and 0.0875 mm. in diameter.

Described from 16 specimens collected in Colorado and Utah.

Host plants and feeding habits.—It is apparently common on western red birch, Betula fontinalis, and was taken on B. alba, feeding on the lower side of the leaves and terminal shoots of young growth. According to Dr. G. F. Knowlton this species in Utah sometimes heavily infests the terminal growth of western red birches.

Type locality.—Colorado and Utah.

The following material was used in description of this species:

1 slide. October 20, 1908, Manitou, Colorado, aperous oviparous females. C. P. Gillette.


1 slide. August 26, 1925, Providence Canyon, Utah, apterous viviparous females, G. F. Knowlton.


1 slide. June 7, 1929, Brigham Canyon, Utah, alate and apterous viviparous females, G. F. Knowlton.


1 slide. April 29, 1934, Logan Canyon, Utah, alate and apterous viviparous females, G. F. Knowlton and T. O. Thatcher.


**Holotype.**—Alate viviparous female, on slide bearing accession number 1417-A, of author's collection, Fort Collins, Colorado, leaves of *Betula* sp. June 14, 1909 (L. C. Bragg.)

**Allotype.**—Apterous male, slide with the accession number 1418, Fort Collins, Colorado, on *Betula* sp., Oct. 13, 1910 (L. C. Bragg) with another male and two oviparous females and three nymphs.

**Gynotype.**—Apterous oviparous female—on the same slide with allotype.

**Morphotype.**—Apterous viviparous female, slide number 1417-B, with the same data as holotype.

All the above listed types are in the collection of the University of Minnesota. Paratypes are in the collections of the University of Minnesota, U. S. National Museum, Colorado Agricultural Experiment Station, Utah Agricultural Experiment Station, Illinois Natural History Survey, and that of the author.

This species is usually confused with *Calaphis betulaecolens* (Fitch). It can readily be separated from *C. betulaecolens* by the fact that it has apterous viviparous females and apterous males, while *C. betulaecolens* is characterized by winged males and the absence of the apterous viviparous females. *C. coloradensis* is a smaller species and alate viviparous females have fewer small circular secondary sensoria with their characteristic placement, slightly above the base on segment III, as pointed out in the descriptions of various forms of species.

**Myzocallis meridionalis**, new species.

*Alate Viviparous Female.* (Plate 23, figures 2, 9, 10 ad 16.)

Average length of body from vertex to the tip of anal plate, 1.925 mm. General color of living specimens is pale yellow to light yellowish-green with dusky-black lateral stripes along the sides of the head and thorax, extending from eyes to the forewings. Mounted as well as stored specimens in alcohol usually turn dark, and sometimes almost black in color. This phenomenon hinders a detailed study of coloration of preserved material.

Head concolorous with the body. Frons definitely protruding, carries median ocellus and several curved hairs. Eyes from deep maroon red to black; ocular tubercles present. Antennae of six segments placed on prominent diverging tubercles. Length of antennae about 2.099 mm. or somewhat shorter, in some specimens about the length of the body. Comparative average lengths of antennal segments as follows: I—5; II—3; III—31.0; IV—20.43; V—20.31; VI—11.0 plus unguis 29.21. The unguis is more than twice the length of its base. Antennae of fully developed imagoes uniformly brownish-black, with the exception
of segment I, which is almost concolorous with the head; segment II dusky-black. Distal end of segment VI and unguis are slightly less infumated. Segment III, on its basal third, carries from 3 to 5 rather conspicuous circular secondary sensoria; segment V with small circular primary sensorium placed some distance below the distal end of the segment, and the usual oval primary sensorium at the base of the unguis. The tip of the unguis is provided with three short hyaline sensory rods. The entire length of antennae finely imbricated and provided with a few short simple hairs. Rostrum very short, only slightly reaching by its black tip beyond the first pair of coxae.

Prothorax and meso-thoracic lobes deep yellow, lateral margins dusky-black, and occasionally the dorsum of the prothorax and meso-thorax is also smoky. Bases of femora of all pairs of legs pale yellow, distally touched with smoky-black. Tibiae of all legs are black, somewhat lighter distally, and tarsi concolorous with the distal ends of tibiae. Legs are moderately clothed with fine hairs. Wings rather long and narrow. Fore and hind wings with black costal marigns. Costal and subcostal veins of forewing black; band between these veins is lighter in color; media twice branched; cubitus and anal veins with black heavy bases, paler distally; radial sector short and only faintly indicated. Stigma long and narrow, smoky-black on inner margin, and pale on outer margin. Hind wings with delicate media and cubitus; hooklets two or three.

Abdomen yellow with greenish tinge, provided with a few simple hairs. Lateral tubercles indistinct. Cornicles truncate, about 0.070 mm. long and 0.0525 mm. wide, slightly enlarged at the base and without flange. Cauda yellow, distinctly cleftate. Anal plate large, broadly and quite deeply dented. Both anal plate and cauda beset with long bristle-like hairs.

Described from 97 specimens collected in Texas, Georgia and Mississippi.

*Apterous Viviparous Female.* (Plate 23, figures 3, 8 and 13.)

Average length of body 2.215 mm. General color light yellowish-green to yellow with conspicuous black patch over the middle of the dorsum, formed by the fusion of three short broad transverse bars over the 3, 4 and 5th abdominal segments. Head and frons as in the alate forms. Antennae of six segments, coloration much as in the alate viviparous females, usually lighter colored distally. Length of antennae 2.1616 mm. Comparative average lengths of antennal segments as follows: I–5; II–3; III–32.83; IV–20.0; V–21.16; VI–11.33 plus unguis 30.2. Segment III on its basal third carries from 4 to 5 circular secondary sensoria. Segments V and VI with usual primary sensoria. The entire length of antennae imbricated and sparsely armed with short indistinctly capitate setae. Rostrum short, does not reach the middle coxae.

Prothorax faintly but distinctly infumated along the lateral margins; other thoracic segments concolorous with the body. Femoral basal half yellow, distally dusky-black. Tibiae black, with distal ends much lighter in color than the proximal parts. Tarsi nearly concolorous with the distal ends of tibiae. Abdomen greenish yellow with the above mentioned black patch. Lateral tubercles very small and indistinct. The entire body rather sparsely but con-
spicuously covered with very long, stout, somewhat curved and indistinctly clavate hairs. Cornicles, cauda and anal plate as in the alate viviparous females.

Described from 35 specimens collected in Texas, Georgia and Mississippi.

Host plants and feeding habits. This species feeds on lower side of leaves of several oaks, such as water oak, *Quercus nigra* L., white oak, *Q. alba* L., red oak, *Q. rubra* L., and willow oak, *Q. phellos* L. It is often found feeding on the same trees with *Myzocallis walshii* (Monell) or *M. bella* (Walsh), with which it can be easily confused.

Type locality.—Southern States—Texas, Georgia and Mississippi.

The following material was used in description of this species:

3 slides. November 21, 1904, College Station, Texas, alate and apterous viviparous females, C. E. Sanborn.
1 slide. November 24, 1908, College Station, Texas, alate viviparous females, C. E. Sanborn.
1 slide. November 25, 1908, College Station, Texas, alate viviparous females, C. E. Sanborn.
3 slides. December 26, 1926, Thomasville, Georgia, apterous viviparous females and nymphs, T. L. Bissell.
1 slide. December 22, 1931, Hattiesburg, Mississippi, alate and apterous viviparous females and nymphs, J. P. Kislanko.
1 slide. February 18, 1932, Parkinston, Mississippi, alate and apterous viviparous females and nymphs, J. P. Kislanko.
7 slides. January 12, 1934, Pinkerton, Mississippi, alate and apterous viviparous females and nymphs, J. P. Kislanko.
7 slides. January 12, 1934, Parkinston, Mississippi, alate and apterous viviparous females and nymphs, J. P. Kislanko.
9 slides. January 20, 1934, Hiburg, Mississippi, alate and apterous viviparous females and nymphs, J. P. Kislanko.
6 slides. February 14, 1934, Lyman, Mississippi, alate and apterous viviparous females and nymphs, J. P. Kislanko.

Holotype.—Alate viviparous female, on slide bearing accession number 1375–1 of author’s collection with another alate viviparous female, two apterous viviparous females and two pupae, February 14, 1934, Lyman, Mississippi, collected by J. P. Kislanko.

Morphotype.—Apterous viviparous female, on the same slide with another apterous viviparous female, two alate viviparous females and two pupae. Material collected February 14, 1934, on leaves of water oak, *Quercus nigra* L., Lyman, Mississippi, and sent in by J. P. Kislanko in relaxing fluid.
Holotype and morphotype are in the collection of the University of Minnesota. Paratypes are in the collections of the U. S. National Museum, Colorado Agricultural Experiment Station, Illinois Natural History Survey, Utah Agricultural Experiment Station, J. P. Kislanko and that of the author.

This species differs from Myzocallis walshii (Monell) in having the uniformly dusky-black antennae and tibiae of all legs, with distal ends of tibiae somewhat lighter in color, while M. walshii has annulated antennae and only fore tibiae are dusky, with proximal ends lighter in color; meso- and meta-tibiae of M. walshii are pale or only distally touched with dusky-black. M. walshii also lacks the apterous viviparous females.

Myzocallis bella (Walsh) differs from this species by having antennae pale yellow marked with slight infumation, which is intensified distally. Its unguis is only slightly longer than the base, while M. meridionalis has a much longer unguis which is more than twice the length of its base. Both species have black tibiae of all legs; however, distal ends of tibiae in M. bella are not lighter in color, but often are even darker than their bases.

Explanation of Plate 23.

Drepanosiphum oregouensis, n. sp.
Alate viviparous female:
1, antenna; 14, cauda and anal plate; 15, cornicle.

Calaphis coloradensis, n. sp.
Alate viviparous female:
4, antenna; 7, cauda and anal plate; 11, cornicle; 17, head.
Apterous viviparous female:
5, antenna; 6, cauda and anal plate; 12, cornicle.

Myzocallis meridionalis, n. sp.
Alate viviparous female:
2, antenna; 9, cauda and anal plate; 10, cornicle; 16, head.
Apterous viviparous female:
3, antenna; 8, cauda and anal plate; 13, cornicle.

All drawings with the exception of heads are made to the same scale and therefore are comparable. The heads of both species are drawn to lower scale and are also comparable.

NOTES ON COLEOPTERA FOUND IN RAISIN STORAGES.

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Raisin storages in Fresno and Tulare Counties of the San Joaquin Valley of California offer sources of food or shelter for a considerable assortment of beetles. Storage sheds are either
enclosed, or, more commonly, consist of a sheet-metal roof with open sides and ends. Raisins are stored in sweat boxes holding about 170 pounds each or in picking boxes which hold about 56 pounds. In the open sheds the sweat boxes are stacked about 15 feet high on moveable 4 by 6 timbers lying on the ground or on a plank floor resting on a foundation of timbers. Single stacks frequently are 100 feet long by 24 feet wide and contain as much as 500 tons of raisins, or 5 tons per linear foot. There may be a dozen or more stacks in a single yard. While the stacks are being built or broken down, some raisins fall from the boxes and lie about the edges, where they become wet and decay during the winter rains.

Each fall there is a migration from the raisins of full-grown larvae of the raisin moth (Ephestia figulilella Greg.) in search of hibernation quarters. Hibernation occurs largely in the soil at the edges of the stacks, in the soil under the stacks, and beneath the ground timbers. Several million larvae may thus leave the fruit of each stack; many succeed in entering hibernation quarters while many more are killed by the attacks of the parasite Microbracon hübneri (Say) or by the heat of the sun as they crawl on the surface of the ground around the edges of the stacks. The soil between the timbers under the roofs is never wet, while at the edges of the stack where rain drips from the roof it is more or less wet throughout the winter. Although larvae spin cocoons and hibernate in both these locations, the favored one is in the soil beneath the ground timbers. For their entire length the undersides of these timbers frequently are covered with a mass of larvae, cocoons, and webbing, often to a thickness of one-half inch or more. This material will be referred to hereafter as webbing. While most of the full-grown raisin moth larvae leave the fruit in the fall, all of the immature ones remain and suffer heavy mortality during the ensuing winter. Almost all the larvae hibernating in wet soil die, and mortality from parasitism and other causes is high even in the dry locations.

Beetles may be attracted to raisin storages because they offer an abundant source of food for those which feed on the stored raisins, or on the fallen, decaying ones about the edges, and for the predacious or saprophagous species. The storages offer a dry, convenient location for the hibernation or reduced winter activity of certain beetles of which the larvae are seldom or never in evidence.

For several years the writer has made occasional, sometimes detailed, notes on the Coleoptera involved in this association. The records obtained, while incomplete, seem to be of sufficient interest to justify compilation and they are recorded in the accompanying annotated list. With few exceptions the identifications were made either by the Division of Insect Identification, Bureau of Entomology and Plant Quarantine, or by com-
parison with specimens so identified. In a few instances the identifications were made by Mr. Roy E. Wagner of Fresno, who is recognized as the leading authority on San Joaquin Valley Coleoptera.

CARABIDAE.

Several species are noted occasionally, but only one appears to be consistently a part of the association.

1. *Plochionus pallens* (F.). Larvae, pupae, and adults of this beetle are frequent, both in webbing and soil beneath the stacks and in the fruit. Larvae have been fed in the laboratory on raisin moth larvae, though feeding may have been on those which died from other causes.

STAPHYLINIDAE.

Staphylinidae are abundant in the wet soil at the edges of stacks, particularly in the early spring during heavy mortality of hibernating raisin moth larvae. None have been taken from dry locations. Several unidentified species are involved.

COLYDIIDAE.

2. *Anchomma costatum* Lec. is rare in dry webbing beneath the stacks. Blatchley\(^1\) notes that members of this family are sometimes predacious.

SILVANIDAE.

Economically this is the most important family represented since it contains the saw-toothed grain beetle which is, at present, the major pest of stored raisins during the summer following harvest.

3. *Oryzaephilus surinamensis* (L.). The saw-toothed grain beetle becomes extremely abundant in raisins the summer after harvest. For example, the average population in one storage in July, 1937, was 213,000 per ton. Overwintering is entirely in the adult stage and may be in the fruit, clustered as dense mats on the outsides of boxes or in the webbing and soil beneath the stacks. In 1936 the species was encountered in small numbers in raisins on ranches.

CUCUJIDAE.

4. *Laemophloeus ferruginus* (Steph.). The rust-red grain beetle is of common occurrence, usually in small numbers, in

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\(^1\) Blatchley, W. S. Coleoptera of Indiana, 1386 pp. (1910).
stored raisins. In a survey in February and March, 1937, an average of 1,000 per ton was recorded from 1935-crop Thompson Seedless (Sultanina) raisins and 100 per ton from 1935-crop fruit of the Sultana variety. In Thompson Seedless raisins, which had been damaged by rain in the field and had become more or less moldy, the infestation averaged about three times as heavy as in sound ones. The maximum infestation recorded from a single sample of rain-damaged Thompson Seedless amounted to about 8,900 adults per ton. While possibly present, no larvae of this species have been recognized by the writer in dried fruits. Adults are commonly found in the field feeding on fallen, moldy, drying fruits, particularly figs.

**CRYPTOPHAGIDAE.**

At least two species of cryptophagids occur in raisin storages, only one of which has been identified.

5. *Cryptophagus inscitus* Casey. This species is almost always found in stored raisins and beneath the stacks during the fall, winter, and spring, but virtually disappears during the summer. The larvae feed on raisins, and in the spring of 1936 were, so far as known, for the first time sufficiently abundant to merit the status of an economic pest. Reproduction and development are most marked during the early spring months when other species in general are inactive. In a survey made in February and March, 1937, the infestation in Thompson Seedless raisins of the 1935 crop averaged 3,500 per ton, in the 1936 crop 553 per ton, and in 1936 Muscat 2,300 per ton. The infestation in sound 1936 Thompson Seedless averaged over eight times that in rain-damaged ones. An infestation of 57,700 per ton was recorded from one lot of good-quality 1935 Thompson Seedless.

The species is found in a variety of locations in the field, flies readily, and is introduced into storages with new-crop raisins in the fall.

**MYCETOPHAGIDAE.**

One species of *Typhaea* has been determined from collections from raisins and from dry webbing.

6. *Typhaea stercorea* (L.) is a common but not abundant species, both in raisins and in webbing beneath the stacks. In the fall of 1936 it was quite abundant in some lots of Zante raisins ("currants") during boxing of these raisins on ranches, and is found in a variety of locations in the field.

7. *Litarus balteatus* Lec. is of rare occurrence in dry soil webbing.
DERMESTIDAE.

Dermestids are always found in the webbing beneath stacks, and are numerous in raisins, particularly those a year or more old. They feed on dead raisin moth larvae and doubtless any other dead insects available. Because of the abundance of dead larvae in dry locations beneath stacks, dermestids find an adequate food supply at all times.

Except for an occasional rare specimen, only one species is involved. This seems unusual, since the writer has collected a number of other species from other locations, any one or all of which might be expected to frequent such food supplies.

8. *Trogoderma versicolor* (Creutz.) is the only abundant species. In February, 1936, an estimated total of 56,000 larvae and adults were in the webbing beneath a single 24- by 100-foot stack. In the February and March survey, 1937, 1935-crop Thompson Seedless averaged 1,100 dermestids per ton, of which 95 per cent were larvae; and Sultana of the 1935 crop contained 1,750 per ton, 97 per cent being larvae. At the same time none were found in 1936-crop raisins. In samples from 1936 Thompson Seedless taken monthly during 1937, only an occasional individual was present until August, in which month the dermestid population in an enclosed storage increased to an average of 500 per ton. In an open storage there were 900 per ton. In September the averages were 900 and 2,900 per ton, respectively. These were nearly all larvae; adults are not common in raisins but are frequently plentiful beneath the stacks.

In a series of these beetles two apparently distinct forms occur, one considerably larger than the other, and with little intergradation between. The nutritional or genetic causes of this diversity are unknown to the writer.

9. *Trogoderma* sp., near *sternale* Jayne. A single adult, possibly an aberrant specimen of *Trogoderma sternale*, or a new species, was collected in a raisin storage in August, 1931.

10. *Perimegatoma variegatum* Horn. Only one specimen has been collected, from webbing beneath a ground timber.

NITIDULIDAE.

Nitidulidae are plentiful in the San Joaquin Valley, being extremely abundant in decaying fruits, in moist soil beneath such fruits, and in grape pomace. Larvae, pupae, and adults usually are present among spilled decaying raisins beneath the drip from the roofs of open storage sheds.

11. *Carpophilus hemipterus* (L.). The dried fruit beetle is always the most abundant of the nitidulids about the edges of stacks of raisins. The writer has found larvae and pupae in
moist soil around storage stacks. In boxes of wet, fermenting raisins, the dried fruit beetle sometimes becomes very abundant. On warm, sunny, winter days it is often possible to detect boxes of wet raisins in the outer portion of a stack by the swarms of beetles flying about them. Since any box of raisins may contain a few spoiled berries, occasional beetles are found in samples of otherwise good-quality fruit.

12. *Carpophilus dimidiatus* (F.). The corn sap beetle ranks next in abundance to the dried fruit beetle and frequents the same type of food. It is occasionally encountered in raisins, and in soil at the edges of the stacks.

13. *Epuraea* sp. A single specimen was collected from webbing beneath a stack in May, 1935. This is the only specimen of this unknown species taken by the writer.

**Lathridiidae.**

14. *Enicmus protensicollis* (Mann.).

15. *Enicmus suspectus* Fall. Until recently the writer had been unable to distinguish the foregoing two species. Both occur as adults in stored raisins, and commonly are encountered, though never in large numbers. The writer has not found the larvae.

**Ptinidae.**


17. *Ptinus gandolphei* Pic. Both in 1936 and 1937 ptinid adults were frequently found in raisin samples, and were moderately abundant in dry webbing from beneath stacks at Kingsburg, Fresno County, Calif., in January and February, but they decreased in abundance thereafter. None have been found in samples collected from June to December, inclusive. The larvae are not known to the writer. *Trigonogenius globilum* is somewhat more abundant than *Ptinus gandolphei*.

**Bostriochidae.**

18. *Scobicia declivis* (Lec.). The lead cable borer occasionally is found during the winter and spring months, both in and on the outsides of boxes of raisins. It is occasional in the field but has caused considerable damage in wineries by boring through wooden wine casts and storage tanks. While fermenting raisins may be an attractive factor about storages, it is equally probable that the insect’s occurrence is purely accidental.

**Tenebrionidae.**

More species of darkling beetles are represented in raisin storages than of any other family. Without irrigation the
San Joaquin Valley is typically semidesert country, and as such supports a rich variety of desert forms. Other species of cosmopolitan occurrence as pests of food stuffs have become established in the course of years of commerce.

19. *Blapstinus rufipes* Casey. Adults of the fig darkling beetle are of common occurrence in stored raisins and in dry webbing beneath timbers. They have fed on raisins in the laboratory, but can not be regarded as a pest of raisins. Probably their occurrence about raisin storages is the result of search for hibernation quarters, and some are brought from ranches in raisins in which they were hibernating. The term “hibernation” is used to indicate reduced activity rather than complete inactivity. This is the most abundant species of *Blapstinus* in the Valley and is sometimes a serious pest of fallen figs in the orchards. The natural habitat of the larvae is imperfectly known. During most of the year the adults apparently do not fly, but a general flight early in the spring has been observed.

20. *Blapstinus dilatatus* Lec. This robust species is most often found associated with the fig darkling beetle, though always in much smaller numbers. Its occurrence in raisin storages is not common.

21. *Blapstinus sulcatus* Lec. During the winter of 1935–36 adults were abundant in the dry soil and webbing at the south end of a stack of Sultana raisins at Kingsburg. Digging a few inches in the soil beneath timbers turned up tight little clusters of tenebrionids, often several dozen in a cluster, mainly of this species, which quickly became active on exposure. Except for this single instance, *Blapstinus sulcatus* has been of rare occurrence and seldom has been encountered in studies of dried-fruit insects.

22. *Blapstinus* sp. near *pubescens* Lec. A few specimens were found on a single occasion at Kingsburg in January, 1936, in pieces of wrapping paper at the edges of a raisin stack within which raisin moth larvae had hibernated.

23. *Apsena rufipes* (Esch.). This species ranks next in abundance, both in field and storage, to *Blapstinus rufipes*, and has been found in the same locations usually associated with it. Because it is a relatively important pest of fallen figs, the writer suggests that the species be given the common name fig engraver beetle. This name describes the type of feeding on the surface of fallen figs.

24. *Anepsis bicolor* Casey. One individual only has been recovered from dry soil beneath a raisin stack.

25. *Hylocrinus longulus* (Lec.). This unusually soft-bodied tenebrionid is found rarely in soil and webbing beneath stacks.

26. *Ulus crassus* (Lec.). Occasional specimens are obtained from dry webbing. The species is often quite abundant in piles of decaying leaves and other vegetation in river bottoms.
27. *Cnemeplatia sericea* Horn. This minute species, with curiously modified front legs like those of a mole cricket, is quite common in dry soil beneath the overhanging edges of storage sheds, and less so in soil webbing. In August, 1937, it was found in abundance feeding on the surface of fallen, well-dried Mission figs. Sufficient damage resulted to justify regarding the species as a minor pest.

28. *Gnathocerus cornutus* (F.). One specimen of the broad-horned flour beetle was collected from stored raisins in a warehouse in June, 1937.


30. *Tribolium castaneum* (Hbst.).

Both the confused flour beetle and the rust-red flour beetle are found frequently in stored raisins and in dry soil and webbing. Both species develop to maturity on raisins. Laboratory records indicate that several years ago *Tribolium confusum* was occasionally abundant and caused some damage. Within the writer's experience populations of Tribolium have always been insignificant, with *Tribolium castaneum* slightly more abundant than *Tribolium confusum*.

31. *Palorus ratzeburgi* (Wissm.). One specimen of the small-eyed flour beetle was collected from soil-surface webbing at Kingsburg in May, 1935.

**Curculionidae.**

32. *Dinolepis pilosus* (Lec.). Occasional adults of this large weevil are found in boxed raisins. In the fall of 1935 a few lots of the Thompson Seedless variety were received at a storage house in a heavily infested condition. When the raisins were processed the beetles, being of about the same size as raisins, could not be screened out, necessitating expensive hand-sorting. There is no evidence of feeding on raisins; the insects enter the fruit on the ranches for hibernation and are transported thence to the storages.

In the above list 14 families, representing 26 genera and 32 species, exclusive of the Staphylinidae, are recorded, either because of their repeated occurrence in raisin storage situations or because of their close relation to the genera or species which have been found repeatedly. Eleven of these are known to be pests of raisins or other dried fruits; 6, including 3 of the above, are cosmopolitan species attacking stored grain or cereal products; 3 are scavengers; and 3, all of which are regarded as dried-fruit pests, infest fermenting fruits. The remainder occur either because of favorable locations for hibernation or for unknown reasons.
Many other species are of occasional occurrence. With time for more detailed study, this list could be considerably enlarged. The writer feels that such a study would establish the presence of several additional cosmopolitan storage pests as well as of numerous endemic species.

TWO NEW Aedes FROM GUAM (DIPTERA, CULICIDAE).

By Alan Stone,
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Recently there have been received for determination two apparently undescribed species of mosquitoes of the genus Aedes from the island of Guam. One of these belongs to the subgenus Stegomyia and is found throughout the island, causing considerable annoyance to man. The other is of the subgenus Aedimorphus and is closely related to several Oriental species. Several paratypes of each species have been sent to the British Museum and to Mr. O. H. Swezey of the Hawaiian Sugar Planters' Association.

Aedes (Stegomyia) pandani, new species.

Female.—Length 4.25 mm., wing 2.7 mm. Head scales behind eyes flat, pale yellowish, except for a broad patch of dark brown scales at each side of the pale vertical area; in many specimens another, smaller dark patch on each side just above lateral margin of head; pale yellow scales in a narrow line between eyes and on tori dorsally. Clypeus yellowish brown, bare. Palpus 0.45 mm. long, dark brown, with a few white scales at apex. Proboscis dark brown. Scales of mesoscutum dark brown, with a narrow, median stripe of golden-yellow scales, narrowest at posterior third, golden-yellow scales along lateral margins from anterior margin to wing base, and a narrow sublateral stripe of scales of the same color from posterior margin forward, parallel with median stripe and turned abruptly laterad to margin above anterior spiracle. Scutellum with flat scales, pale yellow except for a small patch of dark scales on each lateral lobe. Pleura yellowish brown. Patches of white scales on prothoracic lobes, proepisternum, upper third of sternopleuron, above mid-coxae, and on dorsal, anterior portion of mesepimeron. Postspiracular setae few; no lower mesepimeral bristles. Wing scales narrow, dark. Coxae mostly white-scaled; dorsal and anterior margins of femora I and II and dorsal surface of femur III, widening apically, dark brown; tibiae dark brown; tarsi dark brown, with white bands at bases of first two segments of tarsi I and II, usually not encircling the segments, and complete, white, basal bands on segments 1–4 on tarsus III; last segment of tarsus III with a few pale scales at base; claws of all legs untoothed. Abdomen dark brown, with broad, white, basal bands laterally, that on segment 6 extending somewhat onto dorsal surface; tergite 7 with a white median band; venter pale yellowish,
Male.—Ornamentation essentially as in female. Tarsal bands usually narrower. Palpus very slightly longer than proboscis, slender and tapering, brownish black, with four white bands, the basal two broadest. Claws of tarsi I and II elongate, toothed; those of tarsus III short, simple. Terminalia (Fig. 1 a): Style rather short and stout, the apex acute, and the appendage subapical, short; harpaginal fold with a moderate eminence bearing several stout setae; basal lobe densely hairy, extending ventrally from the harpaginal fold; phallosome with stout teeth; lateral lobes of ninth tergite broad, low, with rather long setae.

Type female and paratypes.—U. S. National Museum No. 53133.

Type locality.—Barrigada Area, Guam.

The type and 36 paratype females were collected at the type locality July 27, 1937, by R. G. Oakley. Additional paratypes, all from Guam, are as follows: Bred from larvae in axils of Pandanus dubius, July 25, 1938, R. G. Oakley, 23 females, 29 males; Mt. Tenjo, May 3, 1936, O. H. Swezey, 2 females; Mt. Chachao, May 16, 1936, O. H. Swezey, 2 females, 1 male; Inarajan, May 7, 1936, O. H. Swezey, 11 females; Piti, May 2, 1936, R. L. Usinger, 1 female; no specific locality, May 4, 1936, O. H. Swezey, 1 female, and 1911, D. T. Fullaway, 3 females.

This species would probably fall into the ~alba~ group of Edwards although the thoracic pattern is different from that of most of the members of this group. The species differs from most previously described species belonging to the subgenus in having golden scales on the mesoscutum rather than silvery-white ones. It apparently is closest to the two African, bamboo-inhabiting species, bambusae Edwards and angustus Edwards, but differs slightly from these in the color markings of the thorax and legs.

Mr. Swezey and Mr. Oakley report this species as being extremely annoying in the daytime, occurring all over the island, but particularly in the woods. The only known breeding place is in the water held in the axils of Pandanus leaves. No larvae have been submitted.

Aedes (Aedimorphus) oakleyi, new species.

Female.—Length 4.2 mm., wing 2.9 mm. All recumbent scales of head pale yellow, the dorsal scales slender, lanceolate, the sublateral and lateral scales broad, flat; numerous narrow, erect, brownish scales centrally; a few pale scales between eyes. Clypeus brown, bare. Palpus 0.35 mm. long, yellowish brown, with dark brown scales. Proboscis with dark brown scales, the scales of basal two-thirds, ventrally, mostly yellowish. Scales of mesoscutum narrow, coppery brown, with flecks of yellowish scales on shoulders, above spiracles, and on posterior half sublaterally. Scutellum covered with flat, pale yellow scales. Pleura pale yellow, with a few flat scales of the same color on lower sternopleuron
and upper mesepimeron. Postspiracular setae few; no lower mesepimeral setae. Wing scales narrow, dark. Coxae pale yellow, coxa I with a few brownish scales; femora and tibiae with brown scales anteriorly, pale yellow scales posteriorly, the line of demarcation not pronounced; a small patch of yellow scales at apex of tibia III anteriorly; tarsi dark brown, a few yellowish scales at the bases of some of the segments, but not distinct bands. Claws of tarsi I and II each with a minute tooth; of tarsus III simple. Abdomen dark brown, with pale, yellowish-brown basal bands, wider and paler laterally; scales of venter yellow.

Male.—Coloration essentially as in female; eighth abdominal segment entirely pale-scaled dorsally. Palpus brown, longer than proboscis by nearly one segment, the two apical segments with long hairs. Claws of tarsus I toothed, the others simple. Terminalia: Coxite with no distinct basal lobe, a few stouter setae on a slightly raised area; no regular row of hairs on coxite; style (fig. 1 B) much as in alboscutellatus but the inner proximal appendage broadening apically, with a minute retrorse spine visible from certain angles, and the apical spine longer and more slender.

Type female and paratypes.—U. S. National Museum No. 53176.
Type locality.—Root Farm, Guam.
The type and paratypes, 62 females and 19 males in all, were reared from a water drum at the type locality, October 3, 1938, by R. G. Oakley. No larvae have been received.

This species would run to Aedes alboscutellatus (Theobald) in the published keys to the Oriental species, but differs in having rather broad abdominal bands, no pale scales at base of costa, the recumbent scales of the head entirely pale, no patches of pale scales at the apices of the femora and the pale scales on the scutellum and apex of tibia III distinctly yellowish rather than silvery white. I take great pleasure in naming this species after Mr. Oakley, the discoverer of the species.

THE NORTH AMERICAN ANTS OF THE GENUS HARPAGOXENUS FOREL, WITH THE DESCRIPTION OF A NEW SPECIES (HYMENOPTERA : FORMICIDAE).

By Marion R. Smith,

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Harpagoxenus Forel, a genus of degenerate slave-making ants, has been known from only three forms, two of which occur in Europe and one in North America. The European H. sublaevis (Nyl.), the genotype, has been recorded from Finland, Denmark, Sweden, Germany, Austria, and Switzerland, and the variety hirtula (Nyl.) from Finland. The known hosts of sublaevis are three species of Leptothorax, namely, aectorum (F.), muscorum (Nyl.), and tuberum (F.).

The single North American species, Harpagoxenus americanus, was described by Emery in 1895 from specimens taken by Theodore Pergande in a nest of Leptothorax curvispinosus Mayr at Washington, D. C. Although this species was also taken by Wheeler and Schmitt in other localities, until recently almost nothing was known of its biology, especially concerning the ant's method of enslaving its host. In 1927 (see bibliography) both Sturtevant and Creighton published, almost simultaneously, excellent articles furnishing most of the details lacking in our knowledge of the slave-making habits of the species. Their careful observations indicate that the queen of americanus enters the nest of the host species, kills or drives away the host ants, and appropriates the brood. Later a mixed colony results. The americanus workers of this colony then raid from time to time other nests of the host species in a manner similar to that described for the queen. Although L. curvispinosus appears to be the preferred host, L. longispinosus Roger is also enslaved. On a few occasions colonies have been found containing americanus and both its slave species.
Besides the three regular castes (male, queen, and worker) of *americanus*, Sturtevant found ergatoid females similar to the worker in general appearance, but possessing from one to three ocelli, or else ocellus-like protuberances where the ocelli should be. This form, which he did not technically describe or figure, was very rare. It has not been noted in this species by other investigators. Sturtevant's observations led him to believe that such a form can and does function as an egg-laying queen.

The European *sublaevis* has a similar form. For years the early investigators could not find a normal queen of this species and they thus concluded that the ergatoid female alone functioned as a queen. Adlerz not only found males of *sublaevis* mating with these ergatoid females, but upon dissecting the latter he found that they possessed spermathecae and well-developed ovaries. Adlerz's observations seem to leave little doubt that these ergatoid females can and do function as queens. It is now known that normal queens occur in *sublaevis* but are rare as compared with the ergatoid females.

Recently I received from Quebec, Canada, 12 specimens of a new species of *Harpagoxenus* and 24 workers of its host species. Careful study has shown that the new species is represented by 3 queens and 9 specimens that should be considered ergatoid females, although there are some slight morphological differences in the structure of the thorax of the ergatoid forms. This variation of the thorax ranges from a form somewhat worker-like to the more complex queen-like type. The new species, although closely related to *H. sublaevis* morphologically, and also in its host relationship (both have *Leptothorax acervorum* for hosts), is so distinct that it and *sublaevis* can be readily distinguished by a number of striking differences.

**Harpagoxenus americanus** (Emery).


*Harpagoxenus americanus* (Emery) Wheeler, Ants, pp. 494, 495, 567 (1910; Creighton, Psyche 34 : 28 (1927), male (fig. 2).

**Worker.**—Length 2.5-2.75 mm. (fig. 1, C).

Head subrectangular, distinctly longer than broad, with very feebly emarginate or straight posterior border, rounded occipital angles, and moderately convex sides. Mandible rather small, convex, 3- to 4-toothed, apical tooth much larger than others. Anterior border of clypeus with a prominent and broad median emargination, which is distinctly broader than long; each side of emargination with an angular tooth or projection; posterior border of clypeus rounded, extending backward between frontal carinæ. Frontal area not clearly defined. Frontal carinæ prominent, longer than antennal scapes, and forming
rather deep and distinct scrobes into which the scapes rest when in repose. Antenna 11-segmented; scape stout, curved, strongly depressed; last three segments of funiculus greatly enlarged, ultimate segment slightly exceeding combined length of the two preceding segments, funicular segments 2–6 each clearly broader than long. Thorax, from above, with rounded humeral angles; promesonotal suture present but not always very distinct, mesoepinotal constriction especially pronounced laterally; epinotal spines rather short, acute, directed upward, backward, and outward. Petiole, viewed laterally, scalelike, with abruptly sloping anterior and posterior faces, which meet to form a sharp superior border; viewed posteriorly, sides of petiole converging dorsally toward the superior border, which is narrow laterally, entire or feebly emarginate; ventral surface of peduncle with a prominent tooth anteriorly. Postpetiole, from above, considerably broader than long; viewed laterally, lacking a ventral tooth. Gaster strongly constricted at base, and with feeble basal angles.

Mandibles, clypeus, dorsal surface of head, anterior surface of petiole, and gaster rather smooth and shining; cheeks, and sides of thorax longitudinally rugulose-punctate; antennal scrobes, dorsum of thorax, and dorsal surfaces of petiole and postpetiole finely punctulate, the thorax often with fine rugulae.

Hairs long and erect, moderately abundant, present on all parts of body except appendages; a few hairs sometimes present on coxae, trochanters, and bases of femora. Pubescence sparse, appressed, most easily discernible on appendages but also visible on other parts of body under certain lights.

Color varying from almost uniform deep brown to brownish black, with the mandibles, clypeus, antennae, coxae, trochanters, base of femora, and tarsi lighter; eyes, mandibular teeth, and edges of frontal carinae black.

**Queen.**—Length 2.7–3.5 mm.

Excluding the usual morphological differences and size, so similar to worker as to be easily associated. Wings whitish, pilose, with ciliated margins; veins pale, indistinct. Anterior wing with a discoidal, a cubital, and an open radial cell, as well as a fairly large but pale stigma.

**Male.**—Length 2.7 mm.

Posterior border of head and occipital angles strongly rounded. Eye convex, protuberant, occupying approximately one-half length of side of head. Distance between two lateral ocelli greater than that between either of them and median ocellus. Antennal scrobe extending from anterior end of frontal carina to above and somewhat behind eye. Antenna 12-segmented; scape approximately as long as first five funicular segments; first funicular segment pyriform. Clypeus strongly convex, its anterior border with a broad emargination. Mandible with a long, prominent, apical tooth, followed by a broad, blunt edge which is sometimes finely denticulate, sometimes toothless. Thorax with Mayrian furrows and parapsidal furrows; propleuron deeply concave laterally; epinotum without spines but often with a pair of blunt angulations. Wings like those of female. Petiole, viewed laterally, with a blunt superior border; ventrally with a longitudinal carina, which sometimes bears a small tooth anteriorly. Postpetiole distinctly broader than long; ventral surface without a tooth. Base of gaster scarcely wider than posterior border of postpetiole. Genital appendages not remarkably large; a pair of terminal cerci.
Head and thorax subopaque, with reticulate-punctulate shagreening; dorsum of thorax more finely sculptured and shining. Gaster smooth and shining, petiole and postpetiole almost smooth and glabrous.

Body with grayish, moderately long, sparse hairs, those on appendages shorter and suberect.

Color varying from deep brownish black to black; with mandibles, appendages, wings, apex of gaster, and genital appendages pale yellowish white; edges of mandibles brownish to black.

*Type locality.*—Washington, D. C. (Theodore Pergande).

*Hosts.*—Leptothorax curvispinosus Mayr, longispinosus Roger.

*Distribution.*—Pennsylvania: Beatty (Schmitt), Havertford (L. G. Wesson), near Philadelphia (F. L. Brown); New York: Bronxville (W. M. Wheeler), near Tuxedo (W. S. Creighton); Massachusetts: Naushon Island (Woods Hole) (A. H. Sturtevant); New Jersey: Near New Vernon, near Morris Plains, Belle Mead (A. H. Sturtevant); Virginia: Arlington County (J. C. Bridwell); Ohio: Jackson (L. G. Wesson).

The description of the worker is based on four cotypes, and numerous specimens from Arlington County, Va., and Jackson, Ohio. The male and queen are described from a number of specimens collected in Jackson, Ohio. The queen has not been previously described.

The characters which distinguish the worker of Harpagonexenus americanus from the ergatoid female of *H. canadensis* are given under the remarks dealing with the latter species.

Although *Leptothorax curvispinosus*, the preferred host of this species, has a very wide distribution (occurring over approximately the eastern half of the United States), *americanus* has a more limited and sporadic distribution. That intensive collecting will reveal the presence of this slave-making species in localized spots in other areas is hardly to be questioned. There is also the possibility that *americanus* may be found to enslave other forms of *Leptothorax* than the two mentioned above.

As Creighton has pointed out, it is inconceivable that this species could have arisen from an ancestor anything like that of either of its two hosts.

Harpagonexenus canadensis, new species.

*Simple ergatoid female.*—Length 4–4.25 mm. (fig. 1, A, B; fig. 2, A).

Head subrectangular, distinctly longer than broad, with very feebly emarginate posterior border, rounded occipital angles, and moderately convex sides. Eye convex, separated from base of mandible by a distance greater than eye’s widest diameter. Mandible rather small, less convex than that of *americanus*, masticatory border obliquely, concavely curved, toothless or very finely denticate. Anterior border of clypeus with a rather deep median emargination, which is narrow (much narrower than that of *americanus*); posterior border of clypeus
Fig. 1.—A, Simple ergatoid female of *Harpagoxenus canadensis* Smith; B, head of same; C, head of worker of *H. americanus* (Emery). Drawn by H. B. Bradford. No attempt has been made to show the finer details of sculpture.

broadly rounded, extending backward between frontal carinae. Frontal area not clearly defined. Frontal carinae subparallel, not strongly elevated, extending beyond apices of antennal scapes but not forming such deep and distinct scrobes as in *americanus*. Antenna 11-segmented; scape stout, curved, and strongly depressed; last three segments of funiculus greatly enlarged, ultimate segment exceeding the combined length of the two preceding segments, funicular segments 2–6 each clearly broader than long. Vertex with a distinct median and two extremely small, indistinct lateral ocelli. Thorax, from above, with distinct promesonotal, and mesoepinotal sutures, the mesoepinotal region strongly constricted; epinotum with a pair of moderately long, coarse spines which are directed upward, backward, and outward. Petiole, viewed laterally, with convex posterior surface, which meets the anterior surface in such a manner as to
form a bluntly angular node; ventral surface of peduncle with a short, blunt, anterior tooth, but no prominent midventral plate as in sublaevis; viewed posteriorly, sides of petiole converging toward superior border, which is narrow laterally and faintly emarginate. Postpetiole distinctly broader than long, broader anteriorly than posteriorly, and with pronounced angular humeri; lacking ventrally the prominent tooth or spine of sublaevis, but with a very weak anterior tubercle. Base of gaster much constricted, very little broader than the postpetiole, and with slightly angular humeri.

Mandibles, anterior surface of petiole, and gaster mostly smooth and shining, remainder of body subopaque; front of head with longitudinal striae, remainder of head, excepting clypeus, posterior border of head, and occipital angles, reticulate punctate, the cheeks, however, with longitudinal rugulae in addition; thorax, petiole, and postpetiole varying from reticulate punctulate to rugulose reticulate.

Hairs moderately long, suberect to erect, sparsely distributed over body and on coxae, trochanters, and femora, especially the ventral surfaces of the two latter. Pubescence rather long and coarse but sparse, closely appressed on the body, suberect on the appendages.

Head, gaster, and masticatory border of mandibles deep brownish black; thorax, petiole, postpetiole, and appendages lighter brown.

Intermediate ergatoid female.—Length 4.10 mm. (fig. 2, B).

Thorax, viewed from above, differing from that of the queen as follows:
Paraptera of mesothorax fused with scutum; anterior wings represented by black, sclerotized stubs; scutellum not clearly separated from preceding part of mesonotum, trapezoidal, wider anteriorly than posteriorly; paraptera of meta-thorax fused with metanotum, forming a trapezoidal area similar to scutellum but smaller; posterior pair of wings represented on each side by a small rough area, out of which projects a whitish appendage; epinotum like that of queen; petiole, viewed laterally, with posterior surface less convex than in the simple ergatoid female, and therefore more acutely angular. Sculpturing very similar to that of the simple ergatoid female but with a rather distinct row of transverse foveolate punctures anterior to the scutellum. This form represents an intermediate stage between the simple ergatoid female (which is decidedly more workerlike) and the more structurally complex queen. The drawings representing a dorsal view of the thorax of each of the three forms (fig. 2, A, B, C) show the differences between them.

Queen.—Length 4.5–5 mm. (fig. 2, C).

Larger than the ergatoid female. Also differing in the structure of the thorax. Similar in other ways except for the following differences: Anterior angles of head more protuberant. Posterior border of head more deeply emarginate. Ocelli larger and more conspicuous. Posterior surface of petiole less convex, thus causing the dorsum of the node to appear more acutely angular, when the petiole is viewed in lateral profile. Ventral surface of peduncle with a slight median plate, which ends in a blunt tooth anteriorly. Thorax, from above, with subangular humeri. Scutum of mesothorax bluntly angular anteriorly, forming an angle of considerably less than 90 degrees; parapsidal furrows present. Sculpturing similar to that of the ergatoid female but posterior surface of head more shining. Scutum and scutellum with a few weak but distinct longitudinal rugulae.

Type locality.—Quebec, Province of Quebec, Canada (Jos. I. Beaulne).

Host.—Leptothorax acervorum subsp. canadensis Prov., var.

Cotypes.—No. 53248, U. S. National Museum.

Described from nine ergatoid females and three queens which were collected from a fungus, Polyporus sp., on birch. Eight ergatoid females and two queens have been deposited in the U. S. National Museum, two ergatoid females and one queen in the Canadian National Collections, Ottawa, Canada, and one ergatoid female each in the American Museum of Natural History and the Museum of Comparative Zoology (Harvard University).

The ergatoid female of Harpagoxenus canadensis can be distinguished from the worker of H. americanus by the narrower and deeper median emargination of the anterior border of the clypeus, the shallower antennal scrobes, the toothless or finely denticulate mandibles, and the blunter, superior border of the petiole. It differs from the ergatoid female of H. sublaevis (Nyl.) in the following characters: Posterior border of head not so strongly emarginate; clypeus with a narrow median emargina-
tion on its anterior border; no erect hairs on the antennal scapes; antennal scrobes much shallower; petiole lacking the sharp lateral carinae; and postpetiole without the long, distinct, ventral tooth.

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A NEW REARED METEORUS FROM TASMANIA (HYMENOPTERA: BRACONIDAE).

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The following description is offered at this time in order to provide a name for a new species of Meteorus sent me by L. J. Dumbleton, of the New Zealand Plant Research Bureau, who is conducting studies in biological control involving this parasite.

Meteorus dumbletoni, new species.

This belongs in the same group as the Palearctic ictericus (Nees) and the Nearctic trachynotus Viereck, which are characterized especially by possessing an unusually long radial cell which virtually attains the extreme apex of the wing. From those two species it may be immediately distinguished by its blackish posterior legs. Structurally it appears to be almost identical with trachynotus, but the abdomen is more slender, in its widest part being distinctly narrower than the base of the propodeum, and the malar space is slightly longer.

Female.—Length about 4 mm. Head very slightly wider than thorax; temples strongly receding; occipital carina well developed, complete; eyes strongly convergent; face about as long as its width at base of clypeus, and entirely smooth; malar space more than half basal width of mandible; ocellocular line about twice diameter of an ocellus; antennae 30- and 31-segmented, respectively, in the two females at hand.
Notaulices sharply impressed, more or less foveolate; mesonotal lobes smooth; propodeum gradually declivous, irregularly rugulose reticulate, not excavated behind; mesopleuron mostly smooth, with a nearly complete foveolate longitudinal furrow; hind coxa smooth, with only weak setigerous punctures toward base; first abscissa of radius slightly shorter than second and less than half as long as first intercubitus; radial cell going practically to wing apex; recurrent vein entering first cubital cell; nervellus distinctly longer than lower abscissa of basella.

Abdomen slender; first tergite irregularly longitudinally striate, more than twice as long as broad at apex and with two distinct fossae before spiracles, its ventral margins completely separated; remaining tergites polished; ovipositor sheath about as long as abdomen.

Head entirely honey yellow except for the ocellar region, which is more or less piceous; antenna black, scape piceous; prothorax and mesonotum concolorous with head; remainder of thorax black or blackish; tegulae honey yellow; wings hyaline, membrane of stigma uniformly brownish yellow; anterior legs yellowish, their tibiae and tarsi more or less infuscated; middle legs piceous; posterior legs blackish; first tergite black, remainder of abdomen piceous except apical segments, which are brownish yellow.

**Male.**—Essentially like the female; antennae 32-segmented; scutellum blackish.

**Type locality.**—Hobart, Tasmania.

**Type.**—U. S. National Museum, No. 53341.

Described from two females and three males reared from *Tortrix postvittana* Walker on apple, in February, 1937. Two paratypes are returned to Dr. Dumbleton.

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**A NEW SPECIES OF HETEROGASTER FROM THE SOUTHERN PART OF THE UNITED STATES (HEMIPTERA: LYGAEIDAE).**

By H. G. Barber,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Although the genus *Heterogaster* is represented in the Palearctic Region by at least nine species, only one species, *H. behrensii* Uhler 1876, has hitherto been recognized from the United States. However, there occurs in Texas, a distinct member of the genus which has frequently been misidentified as *behrensii*. In order to make a name available it seems advisable to publish a description of this Texas species.

**Heterogaster flavicosta,** new species.

Color black. The following parts pale yellow: Apical half of tyulus, a small spot before base of head, narrow lateral margin posteriorly, a somewhat elongate fascia at base of pronotum and another short fascia at apex of scutellum, narrow
costal margin of corium, and connexivum at incisures. Clavus and corium dark castaneous. Membrane hyaline, transversely fuliginous at base. Antenna dark brown, apices of first three segments narrowly pale and fourth light brown. Legs with femora dark brown, bases broadly and apices more narrowly pale yellow; coxae, trochanters, and tibiae also pale yellow, tibiae with basal, median, and apical brownish bands.

Surface of head, pronotum, and scutellum coarsely and closely punctate, with pile long and sparse; head strongly transversely convex dorsally, not quite as wide as long. Antenna with second and fourth segments each slightly longer than third. Pronotum nearly one-third wider than long, shallowly impressed dorsally and laterally just behind middle; lateral margin very narrowly impressed. Scutellum very nearly as wide as long. Corium pilose, coarsely but sparingly and shallowly punctate between the veins. Venter closely and finely punctate. Genital segment of male and genital sclerites of female black. Length 6.00 to 7.00 mm.

Type locality.—Victoria, Tex.

Type, male; paratypes 5 males, 7 females, October 5, 1908, under post bark (J. D. Mitchell). U. S. National Museum Cat. No.

The remaining paratypes are as follows: Males: 3, Victoria, Tex., February 25, 1913 (J. D. Mitchell) and 1, January 14 (L. L. Scott, Quaintance, No. 6181); 1, Devil's River, Tex., May 2, 1907 (Bishopp and Pratt). Females: 2, Victoria, Tex., March 10 (E. A. Schwarz); 1, February 25, 1913, and 1, February 29, 1916, under willow bark (J. D. Mitchell); 1, January 14 (L. L. Scott, Quaintance No. 6181); 1, Corpus Christi, Tex., April 19, 1907 (C. S. Spooner); 1, San Diego, Tex., May 2 and 1, Devil's River, Tex., May 3, 1907 (E. A. Schwarz); 1, Opelousas, La., March, 1897 (C. F. Baker).

Besides the differences in color markings, Heterogaster flavicosta can be distinguished from the only other United States species, H. behrensii Uhler, by the more convex and more coarsely punctate head, and especially by the closely and finely punctate venter. The venter of behrensii is impunctate.

While flavicosta is southern in distribution, occurring so far as known only in Texas and Louisiana, behrensii is more northern in its range, having been recorded from Utah and California.

A NEW SPECIES OF VRILLETTA FROM CALIFORNIA (COLEOPTERA : ANOBIIDAE).

By W. S. Fisher,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The beetle described in this paper was submitted for identification by W. J. Brown, of the Division of Systematic Ento-
Vrilletta californica, new species.

Elongate, subcylindrical, feebly shining, uniformly dark brown, except the legs, which are slightly paler.

Head very strongly deflexed, and retracted into the prothorax, obliquely, acutely carinate above the antennal bases; front moderately convex; surface finely, densely granulose, rather densely clothed with long, recumbent, yellowish-white hairs, which do not conceal the surface; labial and maxillary palpi elongate, suboval, pointed at apices. Eyes small, finely granulated, separated from each other on the front by three times their longest diameter. Antenna short, 11-segmented; first segment elongate, subcylindrical; second segment round; third to eighth segments triangular, outer angles acute, the segments gradually becoming wider from the third to eighth; ninth to eleventh segments subequal in length, together as long as the preceding segments united, the ninth and tenth elongate-triangular, and the eleventh elongate-oval.

Pronotum as wide as elytra, distinctly wider than long; feebly flattened toward sides; sides broadly rounded; posterior angles broadly rounded and undefined; apical angles rectangular; disk strongly convex; surface finely, sparsely, irregularly punctate, rather densely, irregularly clothed with long, recumbent, yellowish-white hairs.

Elytra twice as long as wide, slightly wider behind the middle; sides feebly diverging from humeral angles to apical fifths, then arcuately converging to the tips, which are separately obliquely subtruncated; disk strongly convex. Each elytron with about ten feebly sinuate striae, which are finely, sparsely punctate, the intervals finely, densely granulose, and the surface rather densely, irregularly clothed with long, recumbent, yellowish-white hairs, which lie more or less transversely but do not conceal the striae.

Body beneath finely, densely granulose, rather densely clothed with long, recumbent, yellowish-white hairs.

Length 5-5.25 mm.; width 2-2.4 mm.

Type locality.—Solvang, Calif.

Type.—No. 53342, United States National Museum. Para-types returned to W. J. Brown.

Described from three specimens (one type) collected at the type locality, March 6, 1932, by A. T. McClay.

This species is allied to Vrilletia blaisdelli Fall, but it differs from that species in being uniformly dark brown without any indications of a pale spot on each elytron, and it differs from all the known species of this genus in having the pubescence on the upper surface of the body long, and lying in all directions, similar to a cowlick.
Recently I received for determination two workers and an ergatoid female of an ant very closely related to *Leptothorax (Mychothorax) hirticornis* Emery. These specimens were collected at Fort Lewis, Wash., by Falconer Smith. Wishing to see the type of *hirticornis*, which was described by Emery from a single worker with the remark "Washington, D. C.; ein arbeiter von Herrn, Pergande" (Zool. Jahrb. Syst. 8: 319, 1895) I contacted Dr. Carlo Menozzi of Chiavari, Italy, and through his kindness the specimen was lent me for study. I also secured the loan of a worker cotype of Wheeler's *Leptothorax (Mychothorax) hirticornis* subsp. *formidolosus*, which he described from five workers and an ergatoid female collected at Flagstaff Mountain, near Boulder, Colo., by T. D. A. Cockerell.

An examination of the type of *hirticornis* and two ergatoid females in the United States National Museum bearing the label "Hill City, South Dakota, number 157," and a handwritten label "*Leptothorax hirticornis* Emery, det. by Emery," convinces me not only that they are the same species but also that they belong to the same series. This is indicated by their structural characters, the same type of mounting, and the same hand-written number attached to all the specimens. As no one apparently has discovered *hirticornis* or any related form in the East since this species was described by Emery, the evidence seems rather conclusive that the type locality of *hirticornis* is not Washington, D. C., as published, but Hill City, S. Dak.

Further evidence leads me to believe that the specimens of *hirticornis* were undoubtedly given to Theodore Pergande by Henry Ulke, whose son Titus was collecting in the Black Hills of South Dakota in 1890 (see Proc. Ent. Soc. Wash. 2: 88, 1890).

As Emery's description is too brief to permit positive recognition of the species, I have redescribed the worker fully, and have also described for the first time the two ergatoid females of the series, which are now in the United States National Museum collection.

A careful examination of a worker cotype of Wheeler's *formidolosus* shows that this ant is identical with *hirticornis*. In his "Mountain Ants of Western North America" (Proc. Amer. Acad. Arts and Sci. 52: 515, 1917), Wheeler himself stated that the two specimens in the Pergande collection (now incor-
porated in the United States National Museum collection), which are mentioned above, are the same as his *formidolosus*.

The specimens from Fort Lewis, Wash., are so distinct from *hirticornis* that I have described them as a new species. The characters by which the two forms differ are given under the description of the new species.

In addition to all the specimens referred to above, I have received from Dr. Neal A. Weber four specimens which he had determined as *Leptothorax hirticornis* Emery. These specimens were collected by him from three nests of the Western mound thatching ant (*Formica rufa obscuripes* Forel). The three lots of specimens are as follows: An ergatoid female from Arvilla, N. Dak.; two workers from Towner, N. Dak.; and one worker from Towner, N. Dak. In my opinion these ants can not be the typical *hirticornis* because of their smaller size, less robust build, finer sculpturing, different coloration, less raised frontal region of the head, etc. Neither do they belong to my new species, since they differ from it in the shape of the head, the somewhat more robust build, the different type of pilosity, and the shape of the petiole and postpetiole. These ants may prove to be a new subspecies of *hirticornis*, but without a larger series of specimens for study I hesitate to describe them.

A study of *hirticornis* and related forms has brought to light the following points of interest: (1) That the type locality of *hirticornis* is not Washington, D. C., as originally given, but Hill City, S. Dak., and the collector is without doubt Titus Ulke; (2) that *hirticornis* and the forms related to it are apparently western in distribution; (3) that these ants have ergatoid females, as do some of the other species of *Leptothorax*, especially of the subgenus *Mycothorax*, and (4) that *hirticornis* may eventually be found living as an inquiline in the nest of another ant, probably *Formica rufa* subsp. *obscuripes* Forel. The geographical distribution of *hirticornis* and related forms may coincide with that of this host ant.

*Leptothorax (Mycothorax) hirticornis* Emery.


*Worker.*—Length 2.75 mm.

Head, exclusive of mandibles, one-fifth longer than broad, with faintly emarginate posterior border, feebly rounded occipital angles, and subparallel sides; vertex without ocelli; dorsal surface of head somewhat compressed on each side of frontal carinae, thus giving the head in these regions the effect of being considerably elevated. Eye rather small, moderately convex, approximately twice its greatest length from base of mandible. Antenna 11-segmented; scape when fully extended not attaining posterior border of head, first funicular
segment as long as combined lengths of the three succeeding segments, funicular segments 2-6 inclusive broader than long, last funicular segment longer than combined lengths of two preceding segments, and funicular club longer than rest of funicular. Frontal area triangular, smooth, slightly impressed. Clypeus prominent, anterior border broadly rounded, entire, posterior border extending well backward between frontal carinae; dorsal surface of clypeus faintly impressed medianly, especially toward the anterior border. Mandible with two large apical and four small, almost subequal teeth. Thorax from above distinctly broader anteriorly than posteriorly, with prominent, transverse pronotal ridge, rounded humeral angles, and very distinct mesoepinotal constriction; epinotal spines moderately acute, very short, approximately as long as their interbasal space, and not noticeably compressed. In profile, dorsum of thorax almost on same plane, with feebly convex or almost flattened surface; mesoepinotal constriction strong, distinct laterally and dorsally; base of epinotum somewhat convex, very slightly raised above preceding part of thorax. Petiolar peduncle from above one-fifth longer than broad, sides subparallel; in profile, anterior surface of node slightly concave, posterior surface shorter and descending, the two surfaces meeting to form an obtuse angle. Postpetiole from above not much broader than petiole, small, distinctly broader than long, and broader anteriorly than posteriorly, almost trapezoidal. From above, gaster rather large, subelliptical, much constricted basally, and without angles; the first gastric segment occupying almost entire surface of gaster.

Middle and posterior border of clypeus, frontal area, and gaster smooth and shining; remainder of body punctulate, subopaque. In addition to the punctulate sculpturing, the head and pronotum are somewhat rugulose reticulate, with the rugulae on front of head, at least, having a more longitudinal trend. In some lights the clypeus is shining, in others subopaque.

Hairs very short, erect, strongly clavate (almost capitate), present on head, eyes, scapes, thorax, femora, tibiae, metatarsi, and petiole; antennal funiculi, mandibles, under side of head, prosternum, coxae, trochanters, postpetiole, and gaster with slender, tapering, nonclavate hairs.

Ferruginous; dorsum of head infuscated, gaster with a broad, reddish-brown, transverse band; eyes and mandibular teeth black.

Workerlike ergatoid female.—Length 2.89 mm.

Very similar to worker but differing as follows: Vertex with three small ocelli. Thorax from above with pronotum, scutum, mesoparaptera, and scutellum fused, as also the metaparaptera and metanotum; metanotum separated from epinotum by a distinct foveolated constriction, the constriction also very noticeable laterally. A narrow, smooth, frontal streak extending from clypeus almost to anterior ocellus.

Queenlike ergatoid female.—Length 3.3 mm.

Differing from the worker as follows: Vertex with three small ocelli. Thorax more queenlike than that of the workerlike ergatoid female; from above, with the pronotum, scutum, scutellum, metanotum, and epinotum present, and rather distinctly separated from one another. In profile the scutum and scutellum higher than the metanotum and epinotum. Thorax laterally constricted in the mesoepinotal region. Vertex also with a narrow, smooth streak extending from clypeus toward anterior ocellus.
Type locality.—Hill City, S. Dak. (Titus Ulke?)

Other localities.—Flagstaff Mountain, near Boulder, Colo. (T. D. A. Cockerell).

The description of the worker is based on the single type specimen, from the Emery collection. The two ergatoid females are described for the first time from the specimens in the National Museum collection.

There is no available information on the biology of this species.

Leptothorax (Mycothorax) diversipilosus, new species.

Worker.—Length 2.6–2.8 mm.

Head, exclusive of mandibles, almost one-fourth longer than broad, posterior border straight or very faintly emarginate, occipital angles feebly rounded, sides almost subparallel, very feebly divergent anteriorly; vertex without ocelli; dorsal surface of head not noticeably compressed on each side of frontal carinae as with hirticornis. Eye rather small, moderately convex, approximately twice its greatest diameter from base of mandible. Antenna 11-segmented; scape when fully extended not attaining posterior border of head, first funicular segment at least as long as combined lengths of the three succeeding segments, last funicular segment longer than combined lengths of the two preceding segments, and antennal club slightly longer than remainder of funiculus. Frontal area not clearly discernible. Clypeus prominent, anterior border broadly rounded, entire, posterior border extending well back between frontal carinae; dorsal surface faintly impressed medianly toward anterior border. Mandible with two large apical teeth and four small, nearly subequal teeth. Thorax from above distinctly broader anteriorly than posteriorly, with prominent transverse pronotal ridge, rounded humeral angles, and distinct but not so strong mesoepinotal constriction as with hirticornis; epinotal spines moderately acute, very short, not noticeably compressed. In profile, dorsum of thorax almost on same plane, with feebly convex, almost flattened surface; mesoepinotal constriction, although visible dorsally and laterally, much less pronounced than with hirticornis, base of epinotum less strongly convex. Petiolar peduncle from above almost square, only one-sixth longer than broad, sides parallel. In profile, anterior surface of node straight, meeting the gently convex posterior surface in a slightly rounded angle; posterior surface gently concave before meeting the post petiole. Postpetiole broader than long, broader anteriorly than posteriorly, sides converging posteriorly, trapezoidal. Gaster similar to that of hirticornis.

Posterior border of clypeus, frontal area, an indefinite area on front, and gaster smooth and shining; scapes, head, thorax, legs excepting tarsi, petiole, and postpetiole finely and densely punctulate, subopaque. In addition, front of head and cheeks with very faint longitudinal rugulae.

Hairs short, erect, clavate (almost capitate), present on dorsal surface of head, tips of femora, tibiae, and metatarsi: slender, tapering hairs on clypeus, mandibles, antennae, under side of head, thorax, coxae, trochanters, femora excepting tips, tarsi excepting metatarsi, petiole, postpetiole, and gaster.
Dark ferruginous: base of gaster dark brown; eyes and mandibular teeth black. In some lights the body appears lighter than in others.

_Ergatoid female._—Length 3.1 mm.

Differing from the worker as follows: Vertex with three small ocelli. Thorax from above with pronotum, scutum, scutellum, metanotum, epinotum, and all sutures except that separating the metanotum and epinotum faint; the two latter areas separated by a foveolate constriction that extends across dorsum and down on to each side of thorax. Entire clypeus and a large spot on front shining. Body much darker than that of worker, the petiole and postpetiole deeply infuscated. Gaster almost entirely black.

_Cotype locality._—Fort Lewis, Wash., October 15, 1938 (Falconer Smith.)

_Cotypes._—No. 53284, United States National Museum.

Described from two workers and a single ergatoid female collected from the nest of the Western mound-thatching ant (Formica rufa subsp. obscuripes var. melanotica Emery). According to Falconer Smith, the nest of the host ant was found in the humid Transition Zone at approximately sea level. The vegetation in the vicinity was dominated by Douglas fir trees and low grass of the genus Poa and the area immediately surrounding the nest was covered by a layer of moss, Eryngium oregonum. Nothing is known of the biology of the species, but the fact that it was found in another ant’s nest indicates that it may be an inquiline.

The worker of this new species can be distinguished from the worker of _hirticornis_ by the following characters: (1) The variable type of pilosity, which suggested the specific name; (2) the less compressed frontal region of the head; (3) the proportionally broader petiolar peduncle; (4) the differently shaped pospetiole; (5) the narrower head; and (6) the darker coloration.

**MINUTES OF THE 500TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.**

The 500th meeting of the Society was called to order at 8 p. m., Thursday, April 6, 1939, in Room 43 of the National Museum. There were 32 members and 9 visitors present. The report of the previous meeting was read and approved.

President Snodgrass called attention to the historical significance of the present meeting, it being the 500th regular meeting of the Society. In observance of the occasion, Secretary Caffrey read the minutes of the first meeting which was held February 29, 1884.

Caffrey announced the receipt of a letter from Professor E. O. Essig in which it was suggested that the Society, or the Society in a joint meeting with another organization, might care to arrange for a lecture by Dr. Dora Else, the European
entomologist who is known for her work on physiology. The Washington Academy of Sciences had already been approached by Mr. Caffrey, and it was decided to go on record as being interested in a joint meeting of the two organizations if such could be conveniently arranged by the Academy. Musebeck discussed Dr. Else’s motion pictures which were shown at the Richmond meeting of the Entomological Society of America.

The President announced that J. A. Hyslop was to serve as Chairman of the Membership Committee. Other members are Alan Stone and H. S. McConnell.
The following three talks comprised the regular program:


Mr. Monteith described the important features relating to injury by and control of the more important insects affecting golf greens. These include Japanese Beetle and other Scarabaeidae, armyworms, cutworms, webworm and Chinch Bug. A few other invertebrates, such as earthworms, were also discussed. Because of the importance attached to strong stands of definite grass species on golf greens, insect injury often attracts much attention. In the control of these insects complicated situations arise which are both amusing and of great economic concern to greenskeepers. The speaker showed photographs and described incidents from his personal experience in various parts of the United States. (Secretary’s abstract.)

Discussion followed by Harris, Smith, McGovran, Dicke and Snodgrass.

2. The Tobacco Moth, a pest of increasing importance in cured tobacco. W. D. Reed, Bureau of Entomology and Plant Quarantine, Richmond, Virginia.

The tobacco moth, *Ephestia clivella* (Hbn.) was first recorded by Meaur in 1737 as infesting chocolate products in France. It is likely the moth was brought into this country during the colonial period in cacao beans, or their products, dried fruits, and other vegetable foods. Since that time, however, it has not built up destructive populations in these foods. Several factors in the biology of the insect probably explain the reason for its not becoming a pest of economic importance in this country prior to about 1930.

This phycid moth was first recorded by Mokrzechki as a pest of tobacco in the tobacco warehouses of Poland about 1909 and at intervals from then until about 1930, this investigator recorded it in tobacco from the Crimea, Bulgaria, the Caucasus, and Greece. During 1929 and 1930, an outbreak of the moth occurred in London warehouses infesting tobacco from Rhodesia. The insect was first found infesting cured tobacco in the United States in 1930 in warehouses containing flue-cured and imported cigarette types of tobacco. Since that time it has greatly increased in population and dispersed to practically all storage centers. This increase in population has taken place largely in open warehouses due to the fact that no entirely satisfactory control measures have been developed for use in this type of warehouse. The following were mentioned as factors in the increase of populations of the moth: (1) the large increase in the quantity of cigarette tobaccos in storage since about 1918, (2) the development
of strains of tobacco high in sugar content, (3) a greatly increased volume of open warehouses during recent years, and (4) the relationship of other foods of the moth to the infestation problem in tobacco.

Since about 1930 the moth has appeared in destructive numbers in the milder cigarette types of tobacco in Greece, Turkey, Rhodesia, Union of Soviet Socialist Republics, Bulgaria, England, and the United States.

In 1937 the first records of infestation in growers' pack houses on the farm were received from two localities in North Carolina.

During 1938 an outbreak occurred on the farms in North Carolina and Virginia. Moderate to severe infestations were found in six counties and light infestations in eight additional counties. (Author's abstract.)

Mr. Reed's talk was discussed by Snodgrass, Beinhart, Richardson, Becker, Cory, Cushman, Jones and Sasscer.


A coleopterous larva, apparently belonging in the Ozaenini (Carabidae), was removed, recently, from beneath the bark of a Pimavera log from Guatemala. Its close relationship to larvae of the Paussidae was discussed, showing its importance as an intermediate form between this family and the Carabidae. (Author's abstract.)

One of the visitors present, E. P. Darlington of New Lisbon, N. J., made a few remarks.

Adjournment at 9.50 p. m.

Ashley B. Gurney,
Recording Secretary.

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VOL. 41 JUNE, 1939 No. 6

DESCRIPTIONS OF THE THREE LARVAL INSTARS OF THE
JAPANESE BEETLE, POPILLIA JAPONICA NEWM.
(COLEOPTERA, SCARABAEIDAE).

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Since the publication of my 1921 description, the mature larva has been treated by several authors, particularly by Sim (U. S. Dept. Agr. Circ. 334, 1934, pp. 1-20, plates 1 to 8), but little attention has been given to the earlier larval stages,1 which are two in number as in most other scarabaeids. There is nothing in the literature to show whether or not the characters of the third instar,1 by which the species is recognizable, are present in the two earlier instars; and no attempt has been made to find characters by which the three instars can be separated from one another.

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1 The terms "stage" or "stadium" and "instar" have been applied as used by Sharp (Insects, Part I, Cambridge Natural History, vol. 5, 1895, p. 158), and as formulated by Folsom (Entomology with Special Reference to its Biological and Economic Aspects, 1913, p. 128): "During the growth of every insect, the skin is shed periodically, and with each molt, or ecdisis, the appearance of the insect changes more or less. The intervals between the molts are termed stages, or stadia. To designate the insect at any particular stage, the term instar was proposed and is much used; thus the insect at hatching is the first instar, after the first molt the second instar, and so on." This definition is repeated by Folsom and Wardle (Entomology with Special Reference to its Ecological Aspects, 1934, p. 170) and adopted by Imms (A General Textbook of Entomology, 1934, p. 188).
The following descriptions are based on material in the United States National Museum, consisting of 80 reared first larval instars, 25 reared second larval instars, and 25 reared third larval instars, submitted by C. H. Hadley, in charge of Japanese and Asiatic Beetle Investigations, Division of Fruit Insect Investigations, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, Moorestown, N. J.

**DESCRIPTION OF EPIPHARYNX AND RASTER OF THE THIRD LARVAL INSTAR.**

Epipharynx (fig. 3) a trifle wider than long, laterally rounded, anterior margin irregularly and slightly crenulate, medianly somewhat obtusely produced. Corypha (CO) united with acroparia (ACR). Epizygum (EZ) present. Plegmatium (PL) well developed on both sides, consisting of about 20 somewhat sinuous plegmata, a few of which may be interrupted. Proplegmatium absent. Acanthoparia (A) carrying about 20 setae, each placed at the exterior end of a plegma, the anterior 1 or 2 of the setae long, strong, and straight, the others shorter, cultriform, and decreasing in length posteriorly. Gymnoparia not developed. Chaetoparia (C) large, with coarse, moderately long setae toward pedium (P), especially on the right side, more slender ones toward acanthoparia, those nearest acanthoparia smallest and finest. Fused corypha-acroparia region (CO, ACR) bearing about 20 long, straight, stiff setae arranged in 2 irregular, more or less parallel rows on each side with some of the setae on the right side placed in the epizygum (EZ), and a few small, minute setae behind the long ones. Numerous sensilla interspersed between the setae of chaetoparia on both right and left sides. Haptomerum (HM) complete and distinct, with well sclerotized zygum (Z), about eight sensilla, and three heli (H). Zygum obliquely transverse, best developed on right side of epipharynx, somewhat arched, and carrying two or three moderately long and strong setae. Sensilla dark, ring-shaped, of two sizes, arranged in a transverse, somewhat curved, irregular row. Heli (H) large, strong, and arranged in a single, transverse row. Pedium (P) longer than wide, somewhat asymmetrical, and bent to the right. Lactotorma (LT) somewhat V-shaped, with long, rounded pternotorma (PTL); inner branch with both apotorma (AT) and epitorma (ET), a few strong setae interspersed between them. Dexiotorma (DT) slender, slightly sinuate, provided with heel-shaped pternotorma (PTD). Phobae absent. Haptolachus (HL) complete but most of its components weakly developed. Crepis (CR) thinly sclerotized, somewhat expanded behind end of lactotorma. Two well sclerotized nesia (N) present, the one (N) nearer inner end of dexiotorma somewhat larger than the other (N1), which is placed almost in the middle line; each with two sensory spots at apex. A few sensilla present in front of crepis, two of these more conspicuous and located anteriorly near middle line of epipharynx; two well developed sensilla in crepis to the right; four delicate, fixed hairs without cups.

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2 The terms "right" and "left" always refer to what belongs to the actual right and left side of the entire larva in dorsal view with the head pointing forward. In the figures of epipharynx and raster the structures mentioned in the text as right or left are therefore seen on the reverse, respectively, left or right, sides.
in a transverse row in upper left corner of haptolachus, and a cluster of about 6 similar hairs at base of outer nesium and tip of dexiotorma.

Raster (fig. 9) consisting of septula (S), a pair of palidia (P.A) and a pair of tegilla (TL). Septula triangular, approximately equilateral, extending from middle part of straight, transverse, basal line (BL) of lower anal lip (L.A.L) to about middle of venter of tenth abdominal segment. Palidia converging anteriorly; each palidium with six or seven pali of about same length, placed in a single, oblique, slightly irregular row; pali (fig. 22) ensiform, long, straight, and pointed, separated from one another at base by a distance about equal to their greatest width; tips of opposing pali crossing or meeting in foremost part of palidium and in hindmost part separated by a distance about equal to the length of a palus. Tegilla covering entire venter from outside of each palidium to corresponding barbula (B.A, fig. 10) and united in front of palidia into a large, continuous patch which extends to the long, thin setae on anterior margin (A.N); tegillar setae (TL, fig. 10) dense, well developed, but varying considerably in size; each tegillar seta (fig. 24) flat above its ring-shaped cup, and having a long inner cavity which is thread-shaped in most of its length but spindle-shaped near the cup; lateral edges extremely thin, finely creased, and slightly converging from base to tip.

Comparison of First, Second, and Third Larval Instars.

The three larval instars are identical in the relative length and width of all body areas, appendages, and setae, in the form and general arrangement of the setae, and in the presence and development of the taxonomically important structures of the epipharynx and raster. They differ in the actual length of the whole body and its component parts, including the setae, in the width of the cranium, and in features of minor importance pertaining to body details.

From a series of measurements of about 50 specimens of the first stage, 25 of the second, and 25 of the third (all specimens killed in boiling water and preserved in 75 per cent alcohol) it was found that in any one of the three instars the body, including the head capsule, is divisible into five combinations of segments of which three have the same mid-dorsal length and two, which are equal to each other, have a mid-dorsal length that is a fractional part greater (figs. 11, 12, 13). The measurements shown below represent averages for the material studied.

The three combinations of segments with shorter mid-dorsal length are: (1) head and thorax together; (2) first, second, and third abdominal segments together; and (3) seventh and eighth abdominal segments together.

The two combinations of segments with the mid-dorsal length a fractional part greater are: (1) fourth, fifth, and sixth abdominal segments together and (2) ninth and tenth abdominal segments together.
By measuring the mid-dorsal length of each of the five combinations in each of the three instars the following average results were obtained:

**First Instar:**
- Head and thorax together: 2 mm.
- First, second, and third abdominal segments together: 2 mm.
- Fourth, fifth, and sixth abdominal segments together: 2.25 mm.
- Seventh and eighth abdominal segments together: 2 mm.
- Ninth and tenth abdominal segments together: 2.25 mm.

Total mid-dorsal length from anterior margin of frons to anus: 10.5 mm.

**Second Instar:**
- Head and thorax together: 3.5 mm.
- First, second, and third abdominal segment together: 3.5 mm.
- Fourth, fifth, and sixth abdominal segments together: 4 mm.
- Seventh and eighth abdominal segments together: 3.5 mm.
- Ninth and tenth abdominal segments together: 4 mm.

Total mid-dorsal length from anterior margin of frons to anus: 18.5 mm.

**Third Instar:**
- Head and thorax together: 6 mm.
- First, second, and third abdominal segments together: 6 mm.
- Fourth, fifth, and sixth abdominal segments together: 7 mm.
- Seventh and eighth abdominal segments together: 6 mm.
- Ninth and tenth abdominal segments together: 7 mm.

Total mid-dorsal length from anterior margin of frons to anus: 32 mm.

The length of body of the first and second instars has never been recorded, and the length of body of the third instar, rated by different authors as "about an inch," "nearly 25 mm.," and "23 mm." has apparently not been exactly determined.

The average extreme width of the cranium, on the other hand, was correctly given by Davis in 1920 (N. J. Dept. Agr. Circ. 30, p. 19) as 1.2 mm. in the first instar, 1.9 mm. in the second instar, and 3.1 mm. in the third instar (fig. 23).

The form and arrangement of setae belonging to the raster are identical in all instars, as is generally the case with all setae on the body, but their actual length and thickness vary according to the instar, and the number of tegillar setae is considerably smaller in the first instar than in the second or third. The pali, on the contrary, are present in the same number of six or seven in all three instars. The measurements of their average length and width in all instars are proportionally as follows: 5 : 1 in the first instar; 7 : 1 in the second instar, and 8 : 1 in the third instar.

In the larvae of many Scarabaeidae, for instance, in those of *Phyllophaga*, some characteristic features are seen on the dorsal surface of the mandibles, such as patches of minute hairs or groups of sac-bearing punctures ("sensilla ampullacea"), which have proved to be of value for specific determination and
also differ in the various instars. But none is found in any instar of *Popillia japonica*. The mandibles of the *Popillia* larva (figs. 15, 16, 19, 20) are almost the same in all instars. The dorso-anterior mandibular region has invariably one long seta and two sensilla; the dorso-molar region is limited in front by a transverse series of about six densely set setae but is otherwise bare, and the dorso-exterior region is without hairs or other surface vestiture.

The subtriangular latero-exterior region between two apically converging carinae (figs. 15 and 19) carries in each instar six setae, distributed over the posterior half of the region, and a single strong seta anteriorly; however, in the third instar (fig. 19) there are in addition a great number of punctures and a few minute hairs.

The first instar is noticeably different from the two succeeding instars in having spiracles of the unusual type (figs. 5 and 6) peculiar to the first instar in the Scarabaeidae, and also by possessing a small, hard, mucronate process (MP, fig. 2) on each side of the metathorax in the scutellar area (fig. 11).

The number of spiracles (figs. 11, 12, 13) is the same in the three instars, namely, one pair of mesothoracic and eight pairs of abdominal spiracles. The mesothoracic spiracle (fig. 7) is somewhat larger than the abdominal ones (fig. 8). In the first instar each spiracle (figs. 5 and 6) has a round respiratory plate with an apparently bumpy surface and no bulla and no spiracular slit. In the second and third instars each spiracle (figs. 7 and 8) has a C-shaped respiratory plate (RP), with comparatively large, angulate-rotundate, irregularly distributed holes, and a bulla (B) surrounded by the plate and with a curved spiracular slit (S) in the middle. The concavity of the thoracic respiratory plate faces posteriorly, that of each abdominal plate anteriorly.

In conclusion, characters are given both for the identification of the larva of *Popillia japonica* in any stage, and for the recognition of its three instars.

**Characters for Identification of the Larva in Any Stage.**

Epicranial suture distinct, slightly elevated, and dark colored.

Antenna as long as cranium.

Cutting edge of mandible with a small tooth.

Stridulating structures present on mandible and maxilla, consisting of an area with granules arranged in fine transverse lines on ventral side of mandible, and a longitudinal series of six long, pointed spines on dorsum of stipes.

Epipharynx transversely striate on outer margin, with about 20 plegmata on each side; heli three; phobae absent.

Raster with two anteriorly converging rows of six or seven pali.

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3 It is probable that the two mucronate processes assist the hatching first instar in breaking through the eggshell, but information about how they function can be had only by direct observation of living material.
Characters for Recognition of First Instar.

Mid-dorsal length of body, with cranium included, 10.5 mm.
Width of cranium 1.2 mm.
Scutellum of metathorax bearing on each side a small process armed with minute, sharp, rigid points.
Spiracles each with round disc-shaped respiratory plate; no bulla, and no spiracular slit.

Characters for Recognition of Second Instar.

Mid-dorsal length of body, cranium included, 18.5 mm.
Width of cranium 1.9 mm.
Scutellum of metathorax not armed with a process on each side.
Spiracles each with C-shaped respiratory plate surrounding a large bulla with a curved spiracular slit.
Thoracic spiracle with concavity of respiratory plate facing posteriorly; abdominal spiracles with respiratory plates facing anteriorly.

Characters for Recognition of Third Instar.

Mid-dorsal length of body, cranium included, 32 mm.
Width of cranium 3.1 mm.
Scutellum of metathorax not armed with a process on each side.
Spiracles each with C-shaped respiratory plate surrounding a large bulla with a curved spiracular slit.
Thoracic spiracle with concavity of respiratory plate facing posteriorly; abdominal spiracles with respiratory plates facing anteriorly.

The differences in length and width of the bodies in the second and third instars are very marked and the separation of these instars exclusively by size is readily made, whereas the characters by which they differ from the first instar are the same in both. Less obvious is the difference in size between the first and second instars, but the first instar is so well marked by the structure of the metathoracic scutellar process and the form of the spiracles that the two instars are easily and definitely separated.

Explanation of Plates.

(Figures drawn by the author.)

*Popillia japonica* Newm.
Larval stages.

Plate 24.

Fig. 1. First instar: Unarmed part of mesothoracic scutellum corresponding to part of metathoracic scutellum which carries a mucronate process.

Fig. 2. First instar: Part of metathoracic scutellum armed with a mucronate process (*MP*); compare Fig. 11.
Popillia japonica
Fig. 3. Third instar (x17): Epipharynx.\(^4\) A, acanthoparia; ACR, acroparia; AT, apotorma; C, chaetoparia; CO, corypha; CR, crepis; DT, dexiotorma; ET, epitorma; EZ, epizygum; H, helus; HL, haptolachus; HM, haptomerum; LT, laeotorma; N, nesium to the right; \(N^1\), nesium in middle line of epipharynx; P, pedium; PL, plegmatium; PTD, pternotorma on right side of epipharynx; PTL, ptternotorma on left side of epipharynx; Z, zygum.

Fig. 4. First instar (x17): Raster and lower anal lip (LAL).

Fig. 5. First instar (x84): Mesothoracic spiracle.

Fig. 6. First instar (x84): First abdominal spiracle.

Fig. 7. Third instar (x38): Mesothoracic spiracle. B, bulla; RP, respiratory plate; S, spiracular slit.

Fig. 8. Third instar (x38): First abdominal spiracle.

Fig. 9. Third instar (x17): Raster and lower anal lip. AS, thin, long seta on anterior margin of venter; BL, transverse basal line of lower anal lip; LAL, lower anal lip; PA, palidium; S, septula; TL, tegillum.

Fig. 10. Second instar (x17): Raster and lower anal lip. BA, setae belonging to barbula; TL, tegillum.

**Plate 25.**

Fig. 11. First instar (x9): Notice mucronate process on metathoracic scutellum; enlarged in Fig. 2.

Fig. 12. Second instar (x9).

Fig. 13. Third instar (x9).

Fig. 14. First instar (x73): Three pali.

Fig. 15. First instar (x15): Right mandible, showing latero-external area with six setae.

Fig. 16. First instar (x15): Right mandible, dorsal view.

Fig. 17. First instar (x73): Tegillar seta.

Fig. 18. Second instar (x73): Three pali.

Fig. 19. Third instar (x7): Right mandible, showing latero-external area with setae and many punctures.

Fig. 20. Third instar (x7): Right mandible, dorsal view.

Fig. 21. Second instar (x73): Tegillar seta.

Fig. 22. Third instar (x73): Two pali.

Fig. 23. Craniums of first (No. 1), second (No. 2), and third (No. 3) instars, showing their relative widths.

Fig. 24. Third instar (x73): Tegillar seta.

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\(^4\)Explanation of the terms here applied to epipharynx and raster and also explanatory figures are given on pp. 175 to 181 of above mentioned paper by the author in Proc. Ent. Soc. Washington, vol. 38, no. 8, 1936.
A SYNOPSIS OF THE AMERICAN SPECIES OF CHIROTHRIPS HALIDAY (THYSANOPTERA).

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Species of the genus Chirothrips are usually found associated with various grass plants, where they may be found frequenting the heads, often in large numbers. Although Chirothrips manicatus (Haliday) appears abundantly in the heads of timothy in some sections of this country almost every year, but slight damage so far has been ascribed to it in North America. Recent studies (1936) by Hukkinen in Finland have shown that C. hamatus Trybom may cause severe damage to meadow foxtail (Alopecurus pratensis L.).

Very little is known concerning the biology of any members of this genus in North America. The writer has collected overwintering females of Chirothrips manicatus (Haliday), C. falsus Priesner, C. insolitus Hood, and C. crassus Hinds from such materials as leaf mold, grass sod, and moss. So far no males have been found during the winter months, but often the males of some species appear in numbers late in the summer.

Since the males of several species have not been described and the females of various species have been described in many scattered publications, this paper is written to bring together our present knowledge of this genus. Two apparently new species are described. A key is included for all the females and another key for the known males. Chirothrips falsus f. adusta Priesner and C. obesus var. hubbelli Watson are not treated in this publication, no specimens of these having been available for study.

Key to Females of American Species of Chirothrips.

1. First antennal segment greatly enlarged; basal width of head only slightly more than twice greatest width of first segment of antenna. 10
   First antennal segment not greatly enlarged; basal width of head about three times or more greatest width of first segment of antenna. 2

2. Second antennal segment simple or enlarged gradually distally; outer angle broadly rounded, not drawn out into a pointed process. 3
   Second antennal segment greatly enlarged distally; outer angle drawn out into a prominent, usually somewhat pointed process. 4

3. Second antennal segment simple, not at all enlarged distally; fourth antennal segment with forked sense cone. 5
   Second antennal segment enlarged gradually distally, with outer angle broadly rounded; fourth antennal segment with simple sense cone. 6

5. C. crassus Hinds

6. C. falsus Priesner
4. Sixth antennal segment almost equal in length to segments 4 and 5 together, being IV : V : VI : 26 : 20 : 44 microns respectively; setae at posterior angles of pronotum unusually long, more than 60 microns in length ........................................... insolitus Hood

Sixth antennal segment not nearly as long as segments 4 and 5 together; setae at posterior angles of pronotum not unusually long, seldom 60 microns in length ......................................................... 5

5. Head greatly produced in front of eyes; distance from anterior margin of eye to base of antenna equal to length of cheek...frontalis Williams

Head much less prominently produced in front of eyes; distance from anterior margin of eye to base of antenna not more than half length of cheek ................................................................. 6

6. Head distinctly produced in front of eyes; distance from anterior margin of eye to base of antenna equal to about half length of cheek (process at tip of second antennal segment without a strictly terminal seta). ................................................................. 7

Head very slightly produced in front of eyes; distance from anterior margin of eye to base of antenna less than half length of cheek........... 8

7. Mesosternum with its anterior margin deeply (15 μ) concave; fourth and fifth antennal segments as 37 : 29 ........................................... orizaba Hood

Mesosternum with its anterior margin not deeply concave; fourth and fifth antennal segments as 31 : 28 ........................................... productus Hood

8. Second antennal segment with a rather prominent, stout, sense-cone-like seta at tip of process, this seta curved abruptly forward; fifth antennal segment with a moderately long (10 μ) sense cone on outer surface; setae at posterior angles of pronotum short (21–27 μ) lenape Hood

Second antennal segment without such a prominent, stout, recurved seta at tip, with at most a very tiny hair at toothlike apex; fifth antennal segment with a small sense cone; setae at posterior angles of pronotum usually longer than 30 μ ........................................... aculeatus Bagnall

Process at tip of second antennal segment with a strictly terminal seta; setae at posterior angles of pronotum 40–60 μ long................. manicatus (Haliday)

10. Posterior pair of setae on vertex placed behind, opposite, or only very slightly in advance of median ocellus, opposite or behind middle of eyes................................................................. 15

Posterior pair of setae on vertex placed far in front of median ocellus, opposite anterior third of eyes......................................................... 11

11. Vertex of head usually with seven or eight pairs of setae; each posterior angle of pronotum with one prominent bristle. .................... spiniceps Hood

Vertex of head with not more than three or four pairs of spines; each posterior angle of pronotum with two or no prominent bristles........... 12
12. Each posterior angle of pronotum with two prominent setae; first antennal segment brown, concolorous with head; mature individuals with brown abdomen.

Mexicanus Crawford

13. General color bright lemon yellow, with head and distal third of each abdominal segment dark brownish gray, sides of thorax with orange subhydropodermal pigmentation, distal portion of abdomen darker yellow.

Xanthis Hood

14. Abdomen light yellow

Obesus Hinds

15. Pronotum not densely set with stout setae similar to those on vertex of head; mesoscutum with scallop-like thickenings.

Crassus Hinds

16. Vertex of head with 5 or 6 pairs of stout setae; posterior angles of pronotum each with two prominent bristles.

Cremulatus Hood

17. Vertex of head with 36 to 44 pairs of setae; posterior angles of pronotum each with two prominent bristles.

Texanus, new species

Key to Known Males of American Species of Chirothrips.

1. First antennal segment greatly enlarged; basal width of head only slightly more than twice greatest width of first antennal segment.  
   Fully mature individuals yellow to light brown.

2. Sculpturing on pronotum in smooth lines, not broken into scallops; second antennal segment without a seta at extreme outer apex.

Sculpturing on pronotum in distinct prominent scallops; second antennal segment with a small seta at extreme outer apex.

3. Second antennal segment barrel-shaped, not at all produced at outer angle.

Secalis Moulton

Second antennal segment not barrel-shaped, produced at outer angle.

Aculeatus Bagnall

4. Prothorax 1.35-1.55 times as broad as long.

Manicatus (Haliday)

Prothorax 1.10-1.21 times as broad as long.

5. Vertex of head with 3 to 8 pairs of setae; posterior pair of setae on vertex situated far forward opposite anterior third of eyes.
Vertex of head with at least 15 pairs of setae; posterior pair of setae on vertex situated opposite posterior portion of eyes ............................................ 8
6. Vertex of head with seven or eight pairs of setae; posterior angles of pronotum each with one prominently developed seta ............... spiniceps Hood
Vertex of head with only three pairs of setae; posterior angles of pronotum each with two prominent setae or with one weakly developed seta .................................................................................. 7
7. Posterior angles of pronotum each with two prominently developed setae; dorsal median length of head greater than width across cheeks............................................. mexicanus Crawford
Posterior angles of pronotum each with one weakly developed seta; dorsal median length of head less than width across checks........ crassus Hinds
8. Lateral projection in front of eye fully as long as cheek; pronotum, mesoscutum, and basal abdominal tergites not densely set with setae similar to those on vertex of head .......... sensitivus, new species
Lateral projection in front of eye shorter than cheek; pronotum, mesoscutum, and basal abdominal tergites densely set with setae similar to those on vertex of head ................. texanus, new species

Chirothrips falsus Priesner.
1927. Chirothrips simplex Hood, Jour. N. Y. Ent. Soc. 35 : 128-130, Pl. XIV, fig. 4.

Priesner described falsus from females collected in Mexico. Two years later, when Hood described and figured the female of simplex from specimens taken in Colorado, Nebraska, and Illinois, he pointed out in a footnote on page 128 of the above reference that the two were not unlikely the same. Specimens of falsus from Quatre Fuche, Alberta, Canada, North Dakota, South Dakota, Iowa, Colorado, Texas, Arizona, New Mexico, and Mexico are before the writer. The male which is described and figured below is from San Antonio, Texas and was collected from Bouteloua curtipendula (Michx.).

Male (brachypterous).—Length about 0.90 mm. Color almost uniformly dark blackish brown, thorax with orange subhypodermal pigmentation; tarsi, distal portion of fore tibia, and third antennal segment yellowish to yellowish gray; occipital pigment maroon.

Head (fig. 2) with its total median length slightly less than the greatest width, which is across cheeks, about 0.5 as long as pronotum, produced in front of eyes about 22 μ, lateral projection in front of eye about 5-6 μ, cheek about 16 μ long. Eyes about 0.5 as long as head, much narrower than their interval, in one specimen with dorsal length of 43 μ, dorsal width of 23 μ, and dorsal interval of 40 μ. Ocelli wanting. Antenna much as in female, segment II with median length of 25 μ, length of outer surface 24-28 μ, maximum diagonal length 33μ, distance
from tip of projection to pedicel of III 12–14 μ. Mouth cone extending 89 μ beyond posterior dorsal margin of head. Prothorax about 1.1 as broad as long, and almost 2.0 times as long as head; setae at posterior angles about 22 μ. Wing pads about 60 μ long. Lateral area on sternite III to VIII oval, that on sternite III about 19 μ by 23 μ. Lateral spines on segment IX of abdomen about 67 μ.

Measurements in mm.: Length 0.90. Head, total median length 0.085, width across eyes 0.092, width across checks 0.096, width across head projection 0.069, length of cheek 0.016; prothorax, median length of pronotum 0.162, greatest width 0.182, width across anterior margin 0.102; greatest width of mesothorax 0.208, of metathorax 0.182, of abdomen 0.248.

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<th>1</th>
<th>2</th>
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<td>26</td>
<td>26</td>
<td>17</td>
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<td></td>
<td>26</td>
<td>28</td>
<td>23</td>
<td>20</td>
<td>6</td>
<td>5</td>
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</tbody>
</table>

Total length of antenna 0.155 mm.

**Chirothrips aculeatus** Bagnall.


Due to the fact that the original description of *Chirothrips similis* Bagnall was inadequate to determine the species accurately, Priesner quite reasonably identified as *similis* the species which Bagnall later (1927) described as *aculeatus*. Williams (1914) and Morison (1928) have both questioned the validity of *similis* Bagnall, feeling that it is synonymous with *manicatus* (Haliday). Authentically determined specimens of *aculeatus* from Europe have been compared with specimens from California and Oregon, and found to be identical. A complete description of the male appears below.

**Male** (brachypterous).—Length about 0.97 mm. Color brownish, usually considerably paler than female.

Head with its total median length about equal to width, length in front of eyes about 18 μ; lateral process in front of eye rather abruptly rounded. Eyes about 0.5 as long as head and much narrower than their interval, in one specimen with dorsal length of 53 μ, dorsal width of 26 μ, and dorsal interval of 54 μ. Ocelli wanting. Antenna much as in female, but with segment II much less produced, with median length of 28 μ, length of outer surface 29 μ, maximum diagonal length of 36 μ, and distance from tip of projection to pedicel of III 7–9 μ. Mouth cone extending about 100 μ beyond posterior dorsal margin of head. Prothorax about 1.2 as broad as long and 1.8 as long as head; setae at posterior angles 30–40 μ. Wing pad small, about 39 μ long. Glandular areas on sternite III–VIII rather dome-shaped with basal portion toward anterior end, rather large, that
on 111 about 76 µ across and 46 µ long. Lateral setae on segment IX of abdomen about 92 µ.

Measurements in mm.: Length about 0.97. Head, total length 0.099, width across eyes 0.105, width across cheeks 0.109, length of cheek 0.023; prothorax, median length of pronotum 0.175, greatest width 0.205, width at anterior margin 0.129; mesothorax, greatest width 0.244; metathorax, greatest width 0.205; abdomen, greatest width 0.250.

Antennal segments

<table>
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<tr>
<th>Antennal segments</th>
<th>1</th>
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<tr>
<td>Length (µ)</td>
<td>23</td>
<td>28</td>
<td>33</td>
<td>29</td>
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<td>10</td>
<td>12</td>
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<td>Width (µ)</td>
<td>29</td>
<td>—</td>
<td>23</td>
<td>26</td>
<td>20</td>
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</table>

Total length of antenna 0.214 mm.

Specimens on which the above description is based were collected at Davis, Calif., on wheat heads, June 8, and at Gilroy on tomato, July 14, 1936, by S. F. Bailey.

**Chirothrips mexicanus** Crawford.

1909. *Chirothrips mexicana* Crawford, Pomona College Jour. Ent. 1: 114–115, fig. 5.


The female of *mexicanus* was first figured by Crawford in the above paper at the time the species was described from a unique specimen collected on tobacco flowers at Guadalajara, Mexico. There is one slide of *floridensis* Watson "from sweeping Bermuda grass, Seabreeze [Fla.], August 24, '19, J. R. W., Type" in the United States National Museum collection. This is a typical specimen of *mexicanus* Crawford. It should be noted that the name *floridensis* appeared as *floridenis* on page 21 in the original description but was spelled correctly in the key on the following page. Hood has already shown (1927) that *floridensis* var. *catchingsi* Watson is synonymous with *mexicanus*. Besides Mexico and the United States, *mexicanus* has been reported from the Philippines, West Indies, and South America, and Moulton (1928) described the male from specimens taken in Hawaii. The heads of the male and female are shown (Pl. 26, figs. 3, 6). The specimens from which the figures are drawn were collected at Tucson, Ariz., August 23, 1937 (Andre and Drake).
**Chirothrips spiniceps** Hood.


*Chirothrips spiniceps* was originally described from a series of females collected in Arizona, Texas, and Louisiana, the type locality being the region of Glendale and Phoenix, Ariz. It has since been found in North Carolina, and specimens are before the writer from Florida, California, and Virginia. The male is described below and both sexes are figured (Pl. 26, figs. 4 and 5). The specimens which formed the basis for this description were collected at Phoenix and Tempe, Ariz., on various grasses.

**Male** (brachypterous).—General color much lighter than in female, mature individuals yellowish with terminal segments of antennae and abdomen shaded with brown.

Head (fig. 5) with its total median length about equal to the width across eyes, strongly produced in front of eyes, vertex with seven or eight pairs of setae in addition to a larger posterior pair which is placed opposite about anterior third of eyes. Eye about 0.5 length of head, in one specimen with dorsal length of 53 μ, dorsal width of 33 μ, and dorsal interval of 46 μ. Ocelli wanting. Antennae much as in female, basal segments about 10 μ apart; segment II with median length of 26 μ, length of outer surface 33-36 μ, distance from tip of projection to pedicel of III 20 μ. Mouth cone extending about 86 μ beyond posterior dorsal margin of head. Prothorax about 1.3 times as broad as long and 1.7 times as long as head, with a single prominent seta at each posterior angle about 14 μ long. Glandular areas on sterna III-VII elongate-oval, that on III about 60 μ across and 26 μ long. Lateral setae on segment IX of abdomen 76 μ long.

Measurements in mm.: Length about 1.1. Head, total median length 0.108, width across eyes 0.106, greatest width across cheeks 0.108, length in front of eyes 0.040, length of lateral process in front of eye 0.016, length of cheek about 0.019; prothorax, median length of pronotum 0.180, greatest width 0.240, width at anterior margin 0.122; mesothorax, greatest width 0.287; metathorax, greatest width 0.257; abdomen, greatest width 0.297.

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<th>Antennal segments</th>
<th>1</th>
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<tr>
<td>Length (μ)</td>
<td>29</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>20</td>
<td>30</td>
<td>9</td>
<td>8</td>
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<tr>
<td>Width (μ)</td>
<td>43</td>
<td>—</td>
<td>23</td>
<td>26</td>
<td>21</td>
<td>17</td>
<td>7</td>
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</table>

Total length of antennae 0.185 mm.

**Chirothrips sensitivus**, new species.

**Female** (macropterus).—Length about 0.75 mm. Color light brown, with orange internal pigmentation in pterothorax; head darkest, legs about concolorous with body, the fore femur on inner surface, fore tibia, and tarsus paling to yellow; fore wing light brownish gray; antenna with segment I very light brown, distinctly lighter than head, II concolorous with I, III light brownish in pedicel shading to darker brown at apex, IV-VIII almost uniform brownish.
Head (fig. 7) with its total median length slightly less than greatest width, which is across eyes, and 0.54 as long as pronotum, lateral projection in front of eye about 14 μ; front narrow, rounded, not concave; vertex with about 14 pairs of setae behind antennae, posterior pair only very slightly larger and situated on same transverse line as front margin of median ocellus; the usual three pairs of small setae behind eyes. Eyes about 0.5 length of head, in holotype with dorsal length of 42 μ, dorsal width of 26 μ, and dorsal interval of 34 μ. Ocelli normal, median one smaller, about 6 μ in diameter, and 52 μ from anterior end of head, posterior pair about 9 μ in diameter, 20 μ apart, and 10 μ from median ocellus. Antenna with segment 1 broad, almost half as wide as basal width of head, 11 nearly straight on outer surface, its outer apical angle acute and with a rather strong terminal sense-conelike seta, the median length of this segment 25 μ, length of outer surface 35 μ, maximum diagonal length 42 μ, distance from tip of projection to pedicel of III 19 μ, sense cones on III and IV short, stout, and simple. Mouth cone broadly rounded, extending 82 μ beyond posterior dorsal margin of head.

Prothorax about 1.4 times as broad as long and 1.8 as long as head; pronotum with one prominent seta at each posterior angle about 26 μ in length. Pterothorax much wider than prothorax; mesoscutum with elevated scallops. Legs normal for genus.

Abdomen broader than metathorax but narrower than mesothorax; subbasal chitinized line on terga 1 and 11 broken into dark dashes or scallops; segment X not elongated or acute; setae grayish yellow.

Measurements of female (holotype) in mm.: Length about 0.75. Head, total length 0.082, width across eyes 0.085, greatest width across cheeks 0.089, length in front of eye 0.028, length of lateral process in front of eyes 0.013, length of cheek 0.014; interval between bases of antennae 0.002; prothorax, median length of pronotum 0.150, greatest width 0.222, width at anterior margin 0.090; mesothorax, greatest width 0.274; metathorax, greatest width 0.240; abdomen, greatest width 0.246.

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<th>Antennal segments</th>
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<tr>
<td>Length (μ)</td>
<td>26</td>
<td>25</td>
<td>23</td>
<td>26</td>
<td>17</td>
<td>25</td>
<td>13</td>
<td>10</td>
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<tr>
<td>Width (μ)</td>
<td>40</td>
<td></td>
<td>20</td>
<td>23</td>
<td>17</td>
<td>14</td>
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Total length of antenna 0.160 mm.

Male (brachypterous).—Length about 0.5 mm. Color much paler than that of female, yellowish brown, with basal portion of head, most of prothorax, and middle abdominal segments darker; legs with inner surfaces of middle and hind femora, tibiae, and all tarsi somewhat lighter; antennae paler than in female.

Head (fig. 10) with its total median length about 1.1 the width across eyes, produced in front of eyes for about 36 μ, lateral projection in front of eye about 19 μ long, front very narrow. Vertex with about 16 pairs of setae, the posterior pair placed opposite the posterior portion of eyes. Eyes rather small, flattened, less than 0.4 length of head and much narrower than their interval, in allotYPE each with dorsal length of 28 μ, dorsal width of 16 μ, and dorsal interval of about 39 μ. Ocelli wanting. Antennae much as in female with basal segments enlarged.
and only 1–2 μ apart, basal segment very broad with its greatest width slightly less than half basal width of head, II with its median length 23 μ, length of outer surface 27–30 μ, maximum diagonal length 40 μ, distance from tip of projection to pedicel of III 16 μ. Mouth cone extending about 66 μ beyond posterior dorsal margin of head. Prothorax about 1.4 times as broad as long and 1.8 times as long as head; single seta at each posterior angle about 13 μ. Wing pads small. Lateral setae on segment IX of abdomen about 62 μ.

Measurement of male (allotype) in mm.: Length about 0.54. Head, total length 0.079, width across eyes 0.069, greatest width across cheeks 0.075, length of cheek about 0.013; prothorax, median length of pronotum 0.142, greatest width 0.201, width at anterior margin 0.076; mesothorax, greatest width 0.208; metathorax, greatest width 0.178; abdomen, greatest width 0.188.

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<tr>
<th>Antennal segments</th>
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<tr>
<td>Width (μ)</td>
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<td>—</td>
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Total length of antenna 0.142 mm.

**Holotype.**—U. S. National Museum No. 53266.

**Type locality.**—Quincy, Fla.

Described from female holotype and male allotype collected from *Chloris* sp. at Quincy, Fla., in the summer of 1910 by A. C. Morgan.

*Chirothrips sensitius* is more closely related to *crenulatus* Hood than to any other American species but may be separated by the characters given in the key.

**Chirothrips texanus**, new species.

Female (macropterous).—Length about 1.2 mm. Usually bicolorous, with head, thorax, and legs, exclusive of yellowish tarsi, brownish with orange internal pigmentation, the fore tibia, all femora, and tips of middle and hind tibiae shaded with yellow; abdomen yellow, heavily shaded with orange; fore wing brownish, with a small colorless area distal to scale, darker apically and in distal half of posterior margin, veins distinctly shaded to beyond middle of wing. Antenna with segment I brownish, concolorous with head; II light brownish in basal third, distinctly lighter than I, shading to brownish yellow in distal portion; III light brownish yellow on pedicel, shading to brownish at apex, where it is but slightly lighter than IV–VIII, which are brownish, but perceptibly lighter than head and first antennal segment.

Head (fig. 8) with its total median length equal to or slightly less than its greatest width (which is just behind eyes) and about 0.5 as long as pronotum, distinctly produced in front of eyes, sides of process strongly converging posteriorly, surface of head without distinct striae behind posterior ocelli, frontal costa wide; vertex normally with about 36 to 44 pairs of short, stout setae, the posterior pair about same size as, or slightly larger than, the other setae on vertex, and situated between posterior ocelli within ocellar triangle; occiput
with two or three additional pairs of minute setae just behind eyes; cheeks nearly straight and parallel, about a sixth as long as head, almost continuous with margins of eyes. Eye about half as long as head, in holotype with dorsal length of 59 μ, dorsal width 30 μ, dorsal interval 55 μ. Ocelli of posterior pair widely separated, about 35 μ apart, much larger (12 μ in diameter) than median one (6.5 μ), the latter one 15 μ from either posterior ocellus and 69 μ from anterior end of head. Antenna about 1.5 times as long as head; segment I greatly enlarged, its greatest width (53 μ) being almost one-half that of basal width of head; II inverted foot-shaped, its axis 33 μ long and apical margin 42 μ, with sense-conelike seta at tip of process; III pyriform with a rather long, slender pedicel, and a prominent stout sense cone; IV and V subovale, longer than wide, IV with the usual prominent sense cone on outer apical margin; sense cone on outer surface of V small; VI nearly twice as long as wide, broadest below middle, rounded tapering to apex, sense cone on inner surface small; VII considerably longer and wider than VIII. Mouth cone typical, broadly rounded, extending about 93 μ beyond posterior dorsal margin of head.

Prothorax about 1.9 times as long as head and about 1.35 times as broad as long; pronotum without sculpture, closely set with short, stout setae. Each posterior angle with two prominent setae about 40–49 μ in length. Pterothorax nearly 1.2 times as wide as prothorax; mesoscutum without sculpture but closely set with numerous short, stout setae; metascutum with many similar setae. Wings nearly straight, the fore wing about 20 times as long as wide at middle, anterior vein with 4 + 3 setae in basal third and 1 + 1 beyond, posterior vein usually with 3 or 4 setae. Legs normal; fore femur with outer apical angle simple.

Abdome as broad as pterothorax, without sculpture, first seven or eight tergites with transverse patches of setae similar to those on head and thorax. Segment X not elongated or acute, its length about 67 μ, its greatest subbasal width 68 μ; setae pale yellowish, segment IX with median dorsal pair 66 μ, dorso-lateral pair 83 μ long, and X with setae about 126 μ in length.

Measurement of female in mm.: Length about 1.23. Head, total length 0.112, width across eyes 0.115, greatest width across cheeks 0.125, length in front of eyes 0.040, lateral length of head process 0.010, length of cheek 0.201, greatest width of head process 0.095, least interval between bases of antennae 0.009; prothorax, median length of pronotum 0.211, greatest width 0.278, width across anterior margin 0.132; mesothorax, greatest width 0.317; metascutellum, greatest width 0.140, median length 0.073; fore wings, length 0.822, width at middle 0.042; abdomen, greatest width 0.328.

Antennal segments.............. 1 2 3 4 5 6 7 8
Length (μ)........................ 26 33 36 33 26 36 13 10
Width (μ).......................... 56 — 26 26 23 20 7 5
Total length of antenna 0.215 mm.

Male (brachypterous).—Length about 0.8 mm. General color much paler than that of female, fully mature individuals light yellowish brown, with prothorax and tip of abdomen somewhat darker and head much darker; legs
about concolorous with darker portions of body, with tarsi paler, and middle and hind femora and tibiae somewhat paler along their inner surfaces; antennae paler than in female.

Head (fig. 9) about as broad as, or slightly broader than, total median length, about 0.6 as long as pronotum, distinctly produced in front of eyes, the sides of this projection converging posteriorly, frontal costa wide; vertex usually with about 24 pairs of setae; the usual three pairs of minute setae behind eyes. Eye about half as long as head, in allotype with dorsal length of 50 μ, dorsal width 21 μ, dorsal interval 52 μ. Ocelli absent. Antenna much as in female with segment 1 greatly enlarged and its greatest width (46 μ) slightly less than half basal width of head. Mouth cone extending 76 μ beyond posterior dorsal margin of head. Prothorax about 1.2 times as broad as long and 1.7 as long as head; setae at posterior angles about 16 μ. Lateral setae on segment IX of abdomen about 65 μ.

Measurements of male allotype, in mm.: Length about 0.82. Head, total length 0.102, width across eyes 0.099, greatest width across cheeks 0.102, length in front of eyes 0.042, lateral length of head process 0.010, length of cheek 0.020, greatest width of head process 0.082, least interval between bases of antennae 0.010; prothorax, median length of pronotum 0.175, greatest width 0.208, width across anterior margin 0.106; mesothorax, greatest width 0.238, metascutum, greatest width 0.175, median length 0.083; abdomen, greatest width 0.260.

Antennal segments.............. 1 2 3 4 5 6 7 8
Length (μ)...................... 26 29 33 23 20 25 7 8
Width (μ)...................... 46 — 23 26 20 17 7 5
Total length of antenna 0.172 mm.

Holotype.—U. S. National Museum No. 53265.
Type locality.—Denison, Tex.

Described from the following material: Holotype and female paratype, collected from cover sweepings, Denison, Tex., June 15, 1938, L. D. Christenson; male allotype and three female paratypes, from grass, Wichita Falls, Tex., August 26, 1936, Floyd Andre; one female paratype, from cover sweepings, Bangs, Tex., February 10, 1938, L. D. Christenson.

This species belongs near vestis Hood. Both have the posterior pair of setae on the vertex situated behind the median ocellus and a large number of setae on the vertex of the head, as well as numerous similar setae on the pronotum, meso and metascutum, and basal abdominal tergites. Chirothrips texanus may be separated from vestis by the presence of 36 to 44 pairs of setae on the vertex instead of 15 to 18 pairs, and by the presence of two large setae at each posterior angle of the pronotum.
Literature Cited.

Hood, J. D.

Hukkanen, Yrjo.

Morison, Guy D.

Williams, C. B.

Explanation of Plate 26.
(All setae omitted from antennal segments.)

Fig. 1. Head of Chirothrips falsus Priesner, female.
Fig. 2. Head of Chirothrips falsus Priesner, male.
Fig. 3. Head of Chirothrips mexicanus Crawford, male.
Fig. 4. Head of Chirothrips spiniceps Hood, female.
Fig. 5. Head of Chirothrips spiniceps Hood, male.
Fig. 6. Head of Chirothrips mexicanus Crawford, female.
Fig. 7. Head of Chirothrips sensitivus, n. sp., female.
Fig. 8. Head of Chirothrips texanus, n. sp., female.
Fig. 9. Head of Chirothrips texanus, n. sp., male.
Fig. 10. Head of Chirothrips sensitivus, n. sp., male.

GROUND BEETLES PREDATORY ON THE EGGS OF Aedes MOSQUITOES.

By H. H. Stage and W. W. Yates,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Although mosquitoes have many natural enemies, the records given herewith appear to be the first in which ground-inhabiting beetles are reported as preying upon Aedes eggs. During 1937, and again in 1938, considerable data on the egg-eating habits of these beetles were obtained in several widely separated areas in the Pacific Northwest. There is no doubt, however, that this list of species is only the beginning of a considerable number to be discovered eventually.

The breeding areas of most Aedes in the Pacific Northwest furnish a suitable habitat for numerous species of ground beetles because they are dry, or at most only moderately moist, for 8 to 10 months during the year. The soil may be clay, gravel, or sand but invariably it is well covered with humus of leaves, grass, and dead wood. Shelter from wind and sun usually is afforded by brush and trees. In an environment of this kind, ground beetles are numerous, and even in times of flood they are seldom destroyed, since the flood crest is reached gradually, allowing the beetles ample time to seek higher levels. By the time a new crop of eggs is deposited, the flood has receded and the area is dry enough for the ground beetles to take up residence again.
In our studies on the viability of eggs of *Aedes vexans* and *A. aldrichi* an egg-separating machine has been developed which in great measure separates eggs from the soil in which they are deposited. Immediately it was observed that parts of eggshells were nearly as numerous in the sifted soil as whole viable eggs. Moreover, when eggs were examined under a microscope it appeared as if the eggshells had been broken by some predator.

Simultaneously, also, eggs which had been placed in plaster of paris boxes several months previously, stored on the ground in nature, and loosely covered with leaves for protection had been partly reduced to mere shells. As the plaster of paris boxes filled with eggs were removed for test purposes, it was noted that small ground beetles sometimes frequented the shelter provided by the leaves. Were these, then, the foes which had been devouring the contents of the eggs?

As time permitted, during the seasons of 1937 and 1938, collections of living ground-inhabiting invertebrates, particularly carabid beetles, were made from several widely scattered localities from along the banks of the Columbia River to mosquito-breeding areas in the Cascade Mountains. These were isolated according to species and placed in the laboratory in jars containing soil, humus, and leaves. From time to time pill boxes containing *Aedes* eggs were placed under the leaves in the jars and regular inspections made. It was soon discovered that some of the species of beetles consistently devoured considerable numbers of eggs, some devoured eggs only occasionally, and some ignored them completely. The several species observed were invariably consistent in that beetles of the same species ate eggs, regardless of where they had been captured. It is rather surprising that of the several species of Staphylinidae taken none were shown to eat eggs.

Among the invertebrates tested as predators on *Aedes* eggs, the carabids *Trechus chalybaeus* Dej., *Agonum pusillum* (Lec.), *Pterostichus albidus* Lec., and *Bembidion* sp. were found to destroy the largest numbers, i.e., 8 to 15 eggs per individual per week. The following species, also carabids, destroyed fewer eggs, i.e., 2 to 6 per week each: *Bremius marginatus* (Fisch.), *Pterostichus amethystinus* (Mann.), *Anisodactylus californicus* Dej., *Agonum* sp., *Amara* sp., and *Bembidion* sp.; and the following forms were not found to destroy the eggs at all: The carabid *Harpalus cordifer* Notm.,¹ the earwig *Forficula auricularia* L., species of the coleopterous families Endomychidae, Staphylinidae, and Dytiscidae, and a species of centipede not identified.

In his review entitled "Mosquito Observations in Different Countries During the Past Three Years," given before the Tenth Annual Meeting of the New Jersey Mosquito Extermination Association in 1923, Dr. L. O. Howard notes, "In 1919,

¹ All carabid beetles determined by L. L. Buchanan.
Lischetti, of Buenos Aires, described a worm of the genus *Planaria* which destroys mosquito larvae down there. From his account it seems to be a very effective enemy and well worth careful investigation."

On rare occasions we have observed *Planaria maculata* Lindy,² a flat worm, 15 mm. in length, feeding on mosquito larvae in the laboratory. In restricted quarters, the worms easily captured the larvae by oscillating about the container. After a larva was captured it appeared unable to release itself, even with some assistance by the observer. In our limited observations the worms devoured from one to two larvae each per day.

² Determination made by Prof. Lawrence E. Griffin, Reed College, Portland, Oreg.

MINUTES OF THE 501ST REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 501st meeting of the Society was held at 8 p. m., Thursday, May 4, 1939, in Room 43 of the National Museum, with President Snodgrass in the chair and 30 members and 30 visitors present. The minutes of the April meeting were approved as read.

E. H. Siegler invited the Society to join the Insecticide Society at a picnic to be held at Beltsville, Md. Saturday, June 10, was the suggested date of the picnic. Discussion followed by McIndoo, and it was voted to accept the invitation.

There were three talks on the regular program by members of the Bureau of Entomology and Plant Quarantine:

1. Recent advances in bee culture., James I. Hambleton.
   Dr. Hambleton devoted most of his talk to a discussion of American Foul Brood. Some of the methods of controlling this disease were mentioned and special attention was given to resistance. Several state experiment stations and state universities have cooperated with the Bureau of Entomology and Plant Quarantine in the development of resistant strains of bees. (Secretary's abstract.)
   Following a question from McIndoo, Dr. Hambleton discussed the use of bee venom in treatment of rheumatism. There was further discussion by Siegler and Thone.

2. Insect enemies of the flower garden. C. A. Weigel.
   Dr. Weigel showed a film illustrating the more important garden pests, including the several stages in the life history of many of them. The accompanying discussion outlined the recommended control measures for each pest, and placed emphasis upon the critical features necessary for recognizing the species and understanding its biology. (Secretary's abstract.)

3. *La Biologie des Orthoptères.* 1938. (Lucien Chopard.)
   (A review of this book will be published separately in the Proceedings.)
   Snodgrass and Gurney commented on the natural affinities of the Cylindraceae.
   A visitor from Cuba, Dr. Osorio, was introduced to the Society.

Adjournment at 10.10 p. m

Ashley B. Gurney, Recording Secretary.

Actual date of publication, June 29, 1939.
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September
by the
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3; 1917, authorized July 3, 1918.
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Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

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By R. A. St. George,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

INTRODUCTION.

Mjöberg’s (3) general descriptions and figures of the larvae of Perimylops antarcticus Müller, Hydromedion nitidum Mjöberg, and H. sparsulum (Müller) came to the writer’s attention while he was reviewing literature relating to taxonomic descriptions of tenebrionid larvae. It was surmised that these extremely interesting and closely related larval forms contained structures foreign to the characterization of the larvae of the family Tenebrionidae as first diagnosed so ably by Schiodte (7) and as later revised by the present writer (5). This made necessary a thorough study of their morphology.

Such a study was made possible through the kindness of Dr. Carl H. Lindroth and Dr. Ivar Tragardh, of the Swedish Museum, when a single larval specimen of Perimylops antarcticus was sent to the writer for study and permission was given to describe it. The larvae of Perimylops and Hydromedion, mentioned by Mjöberg, together with that of the dytiscid Anisomera clausii Müller, were collected by Professor Erick Sorling, of Stockholm, Sweden, in 1904, while on an expedition to the island of South Georgia, which lies in the Atlantic Ocean about 300 miles east of Cape Horn. Both larvae and adults of Perimylops antarcticus were collected under stones and grass roots about tussocks which were abundant along the seacoast. The adults were described by Müller (4) as early as 1884. His material was collected by Dr. Clauss, a member of the German South Polar Expedition, the first of three that visited South Georgia Island. This visit extended from August 20, 1882, until July, 1883.
Description of the Mature Larva of Perimylops antarcticus Müll.

Length 7 mm.; color brownish black, with sterna of metathoracic and abdominal segments lighter; posterior margins of terga of meso- and metathoracic segments and anterior margins of first eight abdominal segments bearing a light corneous line. Larva elongate, with protruding sides, slightly depressed, about five times as long as wide; ninth abdominal segment narrower than eighth and provided with two large falcate, upward-curved urogomphi, anterior to the base of which are two similar but much smaller ones (fig. 13). Head, thorax, and abdomen with a few long and many short, fine setae, the former present mainly on lateral margins of segments.

Cranium rounded (figs. 9 and 13), nutant, exserted (only slightly withdrawn), about five-sixths as long as wide (from posterior margin of labrum to occipital foramen), broadest medianly, somewhat curved posteriorly, ventrally slightly flattened; a few yellowish setae and many fine hairs present.

Frons (fig. 9, f) indistinctly separated from clypeus (cl), limited by a lyriform frontal suture; on each side with one seta near base of antenna and another near postero-lateral margin of clypeus.

Epicranial halves (figs. 2 and 9, epc) separated dorsally by a short epicranial suture (fig. 9, eps) and ventrally by the gula (fig. 2, gu); dorsally (fig. 9, epc) with several fine hairs; ventrally (fig. 2, epc) in addition to these with a few setae (three of them located near base of antenna, one between it and maxilla, two in the ocellar group, and one near gula medianly).

Gula (fig. 2, gu) distinct, subtrapezoidal, wider than long, widest posteriorly.

Labrum (figs. 4 and 9, lab) pale brown, movable, well developed, transversely subrectangular, twice as wide as long; anterior margin slightly convex, anterior corners rounded; disc between center and lateral margins with one long seta on each side, and more laterally and anteriorly with two additional setae along each lateral margin; anterior margin medianly on ventral side with two medium-sized and two minute setae and on each antero-lateral margin with four stout, slightly curved spikelike setae (figs. 1 and 4).

Ocelli located near basal membrane of antenna, distinct, five on each side of head arranged in two groups, three in an anterior and two in a posterior group (fig. 13).

Antenna attached to a light-colored rim immediately behind dorsal mandibular fossa (fig. 13); basal antennal membrane (figs. 2 and 9, bm) well developed; three antennal articles present, all pale brown; basal article (fig. 2, 1) subcylindrical, about three times as long as wide, and about two-thirds as long as second article; second article (fig. 2, 2) apically on ventro-lateral side, bearing a small but distinct supplementary appendix beside the apical article (fig. 5, sa); apical article (fig. 2, 3) cylindrical and only about one-sixth as long as the second one; all three articles with numerous minute setae along the sides; apical article and supplementary appendix bearing minute tactile hairs at tip.

Mandibles rather light in color, with only the apical teeth darkened, slightly asymmetrical, both apically bifid (figs. 7 and 8, a1 and a2), with additional tooth (t) along each margin of cutting edge between apex and molar part; molar part (m) of both mandibles weak, and just above, near dorsal margin of cutting edge, with a small retinaculum (r) which appears to be composed of a few small
hairs; cutting edge on ventral surface slightly excavate; back of mandible rounded opposite cutting edge and molar part, and bearing two setae a little anterior to articulating fossa.

Maxilla dorsally almost completely covered by mandible (fig. 13, max), barely sclerotized; palpiger indistinct; palpus (fig. 2, mxp) with three articles, all light brown, anterior portions rather membranous; basal article transversely cylindrical, about one-fourth entire length of palpus, near apex with two setae, one near outer and the other near inner margin; second article subcylindrical, slightly longer than wide, apically with two setae; apical article conical, about twice as long as wide and about one-third longer than apical article of labial palpus, with soft tip bearing several tactile hairs.

Mala light brown, fused with stipites, somewhat rectangular, apically truncate with indications of an incision along anterior margin medianly (fig. 2, ma). Dorsally, in anterior part with several setae between inner and outer margins, remainder of dorsal surface without setae. Ventrally, in anterior part along inner margin with four or five short, strong setae and near this margin with a few smaller setae; along exterior margin with five or six setae; in addition two long setae, one placed medianly between palpus and inner margin, the other along exterior margin at posterior edge of palpus.

Stipites (fig. 2, sti) pale brown, with a well-developed seta near middle of exterior margin.

Cardo (ca) lightly sclerotized, subrectangular, divided into two parts, inner part adjacent to maxillary articulating area (mar) and slightly larger than outer part.

Maxillary articulating area (mar) slightly protuberant, membranous.

Submentum (fig. 2, sm) subrectangular, longitudinal; each side with a seta near end of transverse middle line.

Mentum (fig. 2, me) slightly wider than long, subrectangular, side margins free; each side medianly with one seta.

Prementum (fig. 2, pm) rather membranous, indistinctly separated from ligula (li), without setae.

Labial palpus (lp) only about one-third as long as maxillary palpus; with two articles, each article with anterior portion rather membranous; palpifer indistinct; basal article of palpus cylindrical, about a third wider than long; apical article conical, nearly twice as long as wide, apically with a soft tip bearing minute tactile hairs.

Ligula (fig. 2, li) rather membranous, broadly conical, slightly longer than wide, apically provided with two small setae.

Hypopharyngeal region (fig. 3) membranous, with many tactile hairs extending over entire area; inner part of prehypopleurum (prh) and lateral portion of posthypopleurum (poh) with a thickened sclerotized wall.

Epipharynx (fig. 1, eph) rather membranous but with a narrow sclerotized band (tb), or torna, posteriorly toward oesophagus, without paired teeth posteriorly and without paired hooks medianly; along anterior margin medianly

1 As “prementum” that part of the labium is designated which lies between the mentum and the ligula, and which morphologically consists of the median fused stipites labii and the labial palpifers.
with six sensory punctures (so), and just below them on longitudinal middle line, a few minute tactile hairs (seen only with the aid of a compound microscope); many fine tactile hairs extending over rest of area, except along the longitudinal line posteriorly.

Legs inserted widely apart, well developed, second and third pairs progressively slightly farther apart and a little longer than first pair; each leg consisting of five articles, tarsus and claw fused into a tarsungulus (fig. 13 and fig. 6, ta). Coxa (fig. 6, cox) membranous, longer than wide, bearing four short setae along exterior margin; trochanter (tro) about one-third longer than wide, with one long and one short seta on inner margin and two small setae inward on posterior face; femur (fe) about three times as long as wide, with four well-developed setae along inner margin and a few additional small setae along outer margin and posterior face; tibia (ti) four times as long as wide, about as short as femur, with six medium-sized setae along inner margin and many fine ones on outer margin and posterior face; tarsungulus (ta) rather weak, with a slightly broadened base and a falcate, testaceous tip; a single seta present near base.

Prothorax subtrapezoidal, about as long as head (fig. 9). Prothoracic presternum transverse (fig. 5, y), with an oviiform central area bearing two minute setae. Eusternum (eu), sternellum (stl), and poststernellum (z) rather membranous. Eusternum situated in front of legs, fused with sternellum, which is located between and behind them; sternellum transverse; both areas without setae. Poststernellum subtriangular, transverse, widest medianly, with a pair of minute setae.

Pchypopleural and posthypopleural areas (fig. 5, h_1 and h_2) poorly developed. Epipleurum consisting of a small triangular prepipleurum (ep), internally adjacent to eusternum, a larger, subtriangular medio-epipleurum (ep), and a small subtriangular postepipleurum (ep). Prothoracic tergal shield (fig. 9, ter) subquadrate, in each anterior corner bearing two long setae, and in each posterior corner two additional ones; entire tegum covered with minute setae arranged mainly in four or five rows.

Mesothorax and metathorax subrectangular, a little more than three times as wide as long, considerably shorter than prothorax. Presternal areas (fig. 5, y) of both segments paired, divided by pre-eusternum (peu), which is also partially divided and bears two minute setae in each part; remaining sternal and epipleural areas similar to those of prothorax. Mesothoracic and metathoracic tergal shields (fig. 9) with three well-developed setae along each lateral margin, also many minute setae present, as in prothorax.

First seven abdominal segments almost alike in size, the first two being slightly smaller than the following five, all transversely subrectangular. Sternal areas almost fused and membranous; epipleural area rather membranous and proterubent; hypopleural area indistinct, longitudinal; tergal areas (fig. 9, ter) covered by a transversely subrectangular shield, anteriorly marked by a line. Sternum on each side and posteriorly with a few medium-sized and several minute setae (fig. 10, ster); epipleurum (ep) with two large and a few minute setae; hypopleurum (hy) with one large and one small seta on each of first seven

1 For definition of term as applied here, see p. 85 of reference (1) under Literature Cited.
segments, and two large and several small setae on the eighth segment; tergum with one large seta near each lateral margin on first four abdominal segments and two large ones on fifth to eighth segments; first eight abdominal segments with many minute setae arranged in three or four transverse rows.

Ninth abdominal segment smaller than eighth (fig. 9) (urogomphi not included). Venter of segment membranous and transverse (fig. 10, stn). Tergum of segment terminating in a pair of large, corneous, upward-curving urogomphi (figs. 9 and 13), anterior to which is a pair of smaller similar projections. Tergum with several minute setae, the large urogomphi provided with four or five rather long setae; sternum with a few small setae in a transverse row along posterior margin.

Tenth abdominal segment (fig. 10, X) ventral, membranous, five-lobed, with four large and several small setae along posterior margin.

Spiracles (figs. 11, 12, and 13) annular, with nearly circular mouth piece, transversely directed, near pleural lobe in abdominal segments.

COMMENTS.

The foregoing description of the larva of *Perimylops* reveals the following differences which are not characteristic of the larvae of Tenebrionidae (5): Mandible provided with a weak molar part and with a retinaculum; cardo divided; clypeus indistinct; prothoracic coxae widely separated and antenna hairy. These structural characters indicate different affinities than do those of the adults of this and the closely allied genus *Hydromedion*. According to adult classification, Gebien (2) follows Müller (4) and Mjöberg (3) in placing these two genera near the end of the subfamily Helopinae of the family Tenebrionidae.

The above-mentioned larval characters are more common to the Zopheridae (1) and Boridae (6) than to the Tenebrionidae. The larva of *Perimylops antarcticus* differs from these families, however, by the absence of conical points or plates on the ninth sternum. Furthermore, the Zopheridae have a fused submentum and gula and a well-developed hypopharyngeal sclerome, which is foreign to *Perimylops*. The presence of the retinaculum on the molar part of the mandible suggests the Salpingidae through *Rhinosinus* (1).

*Perimylops* differs from the Boridae by the presence of a retinaculum on the mandible, the absence of the series of plates on the ninth sternum, the body not being markedly depressed, and the absence of a hypopharyngeal sclerome.

In view of the above-mentioned structural differences, it is evident that the genus *Perimylops* (and the closely related genus *Hydromedion*), although having strong affinities for these families, can not be included in them, but possesses sufficient distinguishing characters to warrant its being recognized as the larval type of a separate family.

For the larval form of the Perimylopidae, comprising the
genera *Perimylops* and *Hydromedion*, the following family
definition is outlined. It is based principally on the mature
larva of *P. antarcticus*, since the descriptions by Mjöberg (3)
of the larvae of *H. sparsulm* and *H. nitidum* are so brief that
they are of little value in this connection. *Perimylops* contains
only one species whereas *Hydromedion* contains eight. Of the
latter, the two mentioned above are the only ones known to the
writer.

**Family PERIMYLOPIDAE.**

Larvae elongate, subcylindrical to slightly depressed, somewhat hairy forms;
slightly narrowing posteriorly, with margins of terga, the sterna, and the slightly
protuberant epipleural areas provided with long setae; rest of body provided
with short setae; color yellowish-brown to black. Head extended. Labrum
distinct; clypeus indistinctly separated from frons; on each side with five ocelli
arranged in two transverse groups; antennae contiguous to mouth frame, con-
sisting of three setiferous articles, the second bearing a supplementary appendix
which is slightly shorter than the apical or third article. Mandibles slightly
flattened and asymmetrical, with apex bidentate; cutting edge bearing an
additional tooth on each (dorsal and ventral) margin, molar structure weak and
just above it each mandible provided with a small retinaculum. Ventral mouth
parts retracted; maxilla with obtuse mala which has an indication of a division
apically; maxillary palpus with three articles; cardo divided into two parts;
maxillary articulating area large and distinct; gula, submentum, and mentum
distinct; prementum broad, labial, palpus with two articles; ligula rather mem-
branous, large and conical. Epipharynx membranous, without paired teeth
posteriorly and without paired hooks medially; hypopharynx membranous
covered with tactile hairs, without a sclerome. Legs strong and five-jointed, two
posterior pairs being progressively slightly farther apart and longer; coxae
inserted widely apart. Prothorax with a transverse presternum, raised and
oviform in center. Tergal plates of thorax, like abdomen, covered with fine
setae arranged in three or four transverse rows. Terga of first eight abdominal
segments transversely subrectangular and bearing a fine seleritized line. Ninth
abdominal segment smaller than eighth (urogomphi excluded), terminating in a
large pair of corneus, upward-curving urogomphi, anterior to which is a similar
smaller pair. Spiracles annular, placed laterally near epipleurum.

**Literature Cited.**

(1) Böving, A. G., and Craighead, F. C. An illustrated synopsis of the
principal larval forms of the order Coleoptera. Ent. Amer. 11 (n. s.):
Entomological Society, 351 pp., 125 plates.)


1017-420. 1884.


Plate 27.

The larva of *Perinyllops antarcticus* Müller.

Figures drawn with aid of camera lucida, by the author.

Fig. 1. Epipharynx: ep, epipharynx; so, sensory organs; tb, transverse band.

Fig. 2. Head, ventral view: bm, basal membrane; ca, cardo; epc, epicranium; gu, gula; li, ligula; lp, labial palpus; ma, mala maxillaris; mar, maxillary articulating area; me, mentum; mxp, maxillary palpus; pm, prementum; sm, submentum; sti, stipites maxillaris; 1, 2, 3, first second, and third articles of antenna.

Fig. 3. Labial palpus and hypopharyngeal region, viewed from buccal cavity: lp, labial palpus; poh, postero-lateral part of hypopharynx; prh, prehypopharynx.

Fig. 4. Anterior portion of head: cl, clypeus; lab, labrum.

Fig. 5. Head and prothoracic and mesothoracic segments, ventral view: ep, epipleurum; ep1, pre-epipleurum; ep2, postepipleurum; eu, eusternum; h1, prehypopleurum; h2, posthypopleurum; pm, pre-eusternum; sa, supplementary appendix; stl, sternellum; y, pre sternum; z, post sternellum.

Fig. 6. Right prothoracic leg, posterior face: cox, coxa; fe, femur; ta, tarsungulus; ti, tibia; tro, trochanter.

Fig. 7. Right mandible, ventral view: a1, and a2, bicuspidate apex; m, molar part; r, retinaculum; t, teeth of cutting edge.

Fig. 8. Left mandible, ventral view. Explanation of letters as for figure 7.

Fig. 9. Larva, dorsal view: bm, basal membrane; cl, clypeus; epc, epicranium; eps, epicranial suture; f, frons; lab, labrum; ter, tergum.

Fig. 10. Eighth (VIII), ninth (IX), and tenth (X) abdominal segments, ventral view: ep, abdominal epipleurum; hy, abdominal hypopleurum; ster, sternal shield of abdominal segment; ter, tergal shield of abdominal segment.

Fig. 11. First abdominal spiracle.

Fig. 12. Prothoracic spiracle.

Fig. 13. Larva, lateral view; max, maxilla.
TEMNOSTOMA BOMBYLANS AND RELATED SPECIES
(SYRPHIDAE, DIPTERA).

By R. C. Shannon.

The species of Temnostoma are comparatively rare, wasp-like flies which inhabit dense forests and damp woodlands. The larvae bore in fallen logs and are characterized by a heavily sclerotized terminal segment which protects them from predatory insects which may invade their galleries. The adults are found only during the spring months. In low-land forests, they frequent shaded situations in which decaying logs occur. In cooler mountainous country, however, they seek the warmth of the open sun-exposed peaks.

In color and size, the flies resemble the yellow jacket and Odynerus wasps. Although their antennae are short, they habitually simulate the long antennae of the wasps by extending their fore legs and vibrating them.

The present account deals with the species which resemble the Odynerus wasps (i.e., those with a single yellow crossband on tergites 2 to 4) namely, trifasciatum Robertson, greenei, new species, barberi, new species, balyras (Walker) and obscurum Loew. This grouping of the species is a superficial one; another, based on structural differences, is given in the key.

Since 1878, various attempts have been made to synonymize the last three of the above named species with the very similar European form, bombylans, as well as with one another. Other attempts have been made to restore their specific status but a certain amount of confusion still exists in the literature.

The present review of the species is based on a study of the material in the U. S. National Museum; European material of T. bombylans (kindly loaned by Dr. C. H. Curran); an examination of the type of obscurum in the Cambridge Museum of Comparative Zoology; the C. W. Johnson collection in the Boston Society of National History; information on the type of balyras in the British Museum (received through the cooperation of Dr. John Smart) and material collected by the writer in North Carolina, 1936, and in Virginia and New York, 1939.

The pertinent data obtained from the literature are here summarized in chronological order. It should first be mentioned that the diverse opinions regarding the species have usually resulted from inadequate material, inaccessibility of the type specimens and the questionable value of certain characters given in the original descriptions, particularly that of the facial tubercle. This character proves to be a reliable one that is, however, confined to the males of only certain species.

Only publications dealing with the specific status of the species are cited here; faunal lists, etc., which merely include the names of species are omitted.
T. greenei, new species, has not been recorded previously and therefore is omitted in the following discussion.

1805. Fabricius (Syst. Anth., 189) described Milesia bombylans from the Pyrenees. (The genus Temnostoma was erected by St. Fargeau and Serville (Encycl. Method., 10) in 1828 and in 1910 Coquillett (Proc. U. S. Nat. Mus. 37, 612) designated bombylans as the genotype.)

1849. Walker (List Ill, 577) was the first to record a species of this group from America, giving it the name of Doros balyras. Although misplaced generically, the description, based upon a female from Trenton Falls, New York, suffices for its proper recognition. The salient characters given are: Antennae and mid and hind tarsi bright yellow, abdomen with four slightly arched yellow bands.

1864. Loew (Cent. V, 35) noted that his species, T. obscurum (type, a male from Saskatchewan, Canada) differed from the bombylans of Europe by the presence of a small facial tubercle.

1878. Osten Sacken (Cat. N. A. Diptera) lists obscurum as a synonym of balyras.

1886. Williston (Synopsis N. A. Syrphidae, 250) considered the facial tubercle of obscurum as a variable character and listed both balyras and obscurum as synonyms of bombylans.

1901. Robertson (Canad. Ent. 33: 285) stated that his species trifasciatum (3 males and 3 females from Illinois) differed from bombylans in that the female has only three instead of four yellow abdominal bands.

1913. Barber (Proc. Ent. Soc. Washington, 15,151) recorded a number of rearings of bombylans from wood-boring larvae, noted that several types of larvae existed in his material and suggested that possibly as many as four species of this group occur in the eastern United States. The adults which he reared prove to be T. balyras. Possibly his material contained larvae of the Vespula-like species of Temnostoma as well.

1922. Malloch (Ent. News, 33:278) after receiving information from Bezzi regarding the European bombylans, stated that this species was probably restricted to the Old World. He had, however, two American species which he discovered differed in the color of the abdominal hairs. One of these he correctly identified as trifasciatum. Meanwhile, Banks had informed him that the type specimen of obscurum had yellow abdominal hairs and in this respect it agreed with Malloch’s second species, which he accordingly identified as obscurum.

1925. Johnson (Proc. Boston Soc. Nat. Hist., 38:84), however, considered that Malloch’s obscurum (nee Loew) was conspecific with balyras. (This proves correct and is the first published recognition of balyras as a valid species since 1886.) On the other hand, Johnson resurrected the synonymy of obscurum with bombylans and with it included a previously
unknown species, the first record of a fourth species in America. The latter is described below as *T. barberi*.

1930. Curran (Bull. Amer. Mus. Nat. Hist., 61: 72), with European specimens of *bombylans* at hand, concluded that this species does not occur in America. The commoner New York species he considered might prove to be the *Doros balyras* of Walker, but being doubtful of the generic status of *balyras*, he decided that it should be called *obscurum* Loew until the type of *balyras* could be critically examined.

1933. Metcalf (Ann. Ent. Soc. Am., 26: 1) has given excellent figures and descriptions of the larvae and adults of *balyras* and *bombylans*. The latter proves to be the same species which Johnson had confused with the true *obscurum* when he synonymized the latter under *bombylans*; i. e., the species described below as *T. barberi*.

The synonomy may be conveniently summarized as follows:

*Temnostoma bombylans* (Fabr.) 1805.
- *T. bombylans* Malloch, 1922 (European material).
- *T. bombylans* Curran, 1930 (European material).

*Temnostoma balyras* (Wlk.), 1849.
- *T. balyras* Osten Sacken, 1878 (in part).
- *T. bombylans* Williston, 1886 (in part).
- *T. balyras* Johnson, 1925.
- *T. obscurum* Curran, 1930.
- *T. balyras* Metcalf, 1933.

*Temnostoma obscurum* Loew, 1864.
- *T. balyras* Osten Sacken, 1878 (in part).
- *T. bombylans* Williston, 1886 (in part).
- *T. bombylans* Johnson, 1925 (in part).

*Temnostoma trifasciatum* Robertson, 1901.
- *T. trifasciatum*, Malloch, 1922; Johnson, 1925; Curran, 1930.

*Temnostoma*, new species, described below.
- *T. bombylans* Johnson, 1925 (in part).
- *T. bombylans* Metcalf, 1933.

During this study, certain new and more useful characters were found which facilitate the correct identification of the species. The results confirm Malloch’s and Curran’s independent conclusions that *bombylans* does not belong to the American fauna, and agree with Malloch’s recognition of *trifasciatum* and Johnson’s identification of *balyras*. Further, it is shown that *obscurum* is a valid species and that the form which Johnson confused with *obscurum* and *bombylans* and which Metcalf called *bombylans* is a new species.

Detailed descriptions of all of the *Odynerus*-like (or *bombylans*-like) species are given below.
Key to the Species of Temnostoma.

1. Metasternum bare; a pair of yellow spots in front of scutellum (sometimes faint or absent in barberi).
   Male: Narrowest width between eyes equal to the space between the upper ocelli; face with a small tubercle ......................................................... 2
   Metasternum pilose; males with eyes separated by a space distinctly less than that between the upper ocelli ......................................................... 4

2. Width of pollinose line along the occipital orbit (the post lateral eye margin) decidedly narrower than width of first antennal segment; antenna dark brown; all femora extensively black; abdomen with three yellow crossbands, black areas with black hairs. (Resembles Odynerus leucomelas wasps) ........................................... barberi, n. sp.
   Width of occipital pollinose line decidedly broader than width of first antennal segment; antenna, fore femora and mid and hind legs bright yellow; abdominal hairs chiefly yellow....................................................... 3

3. Second and succeeding abdominal tergites bright yellow, each with black crossband. (Resembles the workers of yellow jacket wasps).

   Pictulum Williston
   These tergites blackish, each with a yellow crossband on the anterior half, the posterior portions becoming brassy posteriorly. (Resembles Odynerus wasps) ....................................................... greeni, n. sp.

4. Abdomen black, tergites 2 to 4, usually 2 to 5 in the female, each with a yellow crossband; facial profile of male straight or gently concave. (Moderate size; length 11 to 15 mm.; slender flies resembling Odynerus leucomelas wasps) ....................................................... 5
   Abdomen with additional yellow crossbands present on the posterior margins of these tergites; male with a small facial tubercle. (Larger, 13 to 20 mm., and more robust flies resembling the queens of the Vespula wasps) ....................................................... 12

5. Males ................................................................................................................. 6

6. Females ............................................................................................................. 9

7. Face with a small tubercle; antenna and last two segments of mid and hind tarsi dark; yellow hairs predominating on the abdomen................. obscurum, Loew.
   Face without tubercle...................................................................................... 7

8. All femora black except extreme bases and apices; only two pairs of mesonotal spots; abdominal hairs black and brownish intermixed.
   bombylans (Fabr.)
   Mid and hind femora on basal one-third or more yellow, at times entirely yellow; three pairs of mesonotal spots present.......................................... 8

9. Last tergite with only coarse black hairs beyond the crossband; the abdominal crossbands broader than apex of hind tibia.......................... trifasciatum Robt.
   Last tergite with only fine yellow hairs; crossbands narrower than apex of hind tibia................................................................. balyras (Wlk.)

10. Fifth tergite with absolescent or no yellow crossband; trifasciatum Robt.
    Fifth tergite with a conspicuous and uninterrupted yellow band
10. Yellow abdominal bands 2 to 4 practically straight, not attenuated
at ends .......................................................... *obscurum* Lw.
All crossbands arcuate, their ends attenuated and curved backward.
11. Last tergite with yellow hairs .................................. *balyras* (Wlk.)
Last tergite with black hairs .................................. *bombylans* (Fabr.)
12. Yellow marking on transverse suture of mesonotum entire ........ 13
This marking interrupted, represented by two spots .................. 14
13. Femora yellow. (Resembles yellow jacket queens) *excentricum* (Harris).
Femora extensively infuscated, at least the fore femur. (Resembles
*Vespula rufa consobrina* queens) ................................ *aequale* Lw.
14. Last black abdominal band with submedian interruptions, being
reduced by three black spots, one median and one on each side.
(Resembles yellow jacket queens) .................................. *alternans* Loew
This band with a median interruption. (Resembles the queens of
*Vespula rufa consobrina*) ............................................. 15
15. Abdominal pile black except along lateral margins. *nipigonensis* Curran
Apical half of abdomen with yellow pile .................................. *venustum* Will.

DESCRIPTIONS OF SPECIES.

**Temnostoma barberi**, n. sp.


**Male.**—Ocellar triangle black with a yellow pollinose area below; space
between eyes equal to that between the upper ocelli; frontal triangle broadly
pollinose with a median shining black triangular area above antennae; antenna
yellowish brown, face black, bordered by broad pollinose stripes which are a
continuation from the pollinose area of the frontal triangle; a small facial tuber-
cle present; width of the pollinose line bordering the post lateral eye margin
much less than that of the first antennal segment.

Mesonotum black with a median pair of fine longitudinal grayish stripes on
anterior two-thirds and four pairs of yellow spots, one pair on the humeri, one
along the transverse sutures, one anterior to the post alar calli and one before
the scutellum; the last two pairs are at times faint, occasionally absent; pleural
black with a yellow spot on the mesopleura; metasternum bare (rarely one or
two hairs present).

Legs: Fore coxa yellow, fore femur black, yellow at base and apex; fore tibia
yellow basally, black beyond; fore tarsus black; mid femur black, yellow at base
and apex; the tibia yellow on basal half, brownish beyond; first three tarsal
segments yellow, last two darkened; hind femur with basal fourth and apex
yellow, remainder black; tibia yellow on basal third and apex, remainder dark-
ened; first two tarsal segments yellow, the last three darkened.

Abdomen black with three yellow crossbands, the first (on the second tergite)
is nearly as broad as the length of the first tergite, the ends broader than the
middle; the second and third fasciae (on third and fourth tergites respectively)
with their ends sharpened posteriorly, thereby producing an arcuate effect to
the bands; second and fourth tergites longer than broad, the third a little broader
than long; all of the black areas of the abdomen with black hairs.
Wing: Anterior portion, above the fourth vein infuscated. Squamae white; halteres reddish yellow.

Female. Front and face black with a yellow pollinose stripe extending from the level of the lower ocellus to the oral margin; facial tubercle absent; abdomen with four yellow fasciae; all of the tergites broader than long; otherwise similar to the male.

Length.—9 to 13 mm.; wing: 6 to 10 mm.

Type.—A male, U. S. National Museum No. 51913. Allotype in the collection of the Boston Society of Natural History. Paratypes, 4 males and 15 females, in both collections.


Curiously this species apparently has not been collected in Maryland or Virginia although Barber may have had it represented in his larval material which was found in these States. Judging by the known records, it is chiefly northern in distribution.

Although T. barberi is very similar to bombylans, balyras, obscurum and trifasciatum in general appearance, its structural characters indicate that it is more closely allied to greenet and pictulum. In addition it possesses two characters which are peculiar to it, the very narrow occipital pollinose line and the sternites of the male are subquadrate in form. The other species mentioned above have the sternites distinctly broader than long.

Apparently only Johnson and Metcalf have recorded barberi but in both instances under the name bombylans. The male of the latter, however, has the eyes practically touching, lacks the facial tubercle, the sternites are decidedly broader and the cross-band on the second tergite is the narrowest of the three. The female of barberi is distinguished from the female of bombylans by the narrow occipital pollinose line and the bare metasternum. Finally, barberi is the only species among the Odynerus-like forms, aside from greenet, which shows a pair of yellow spots in front of the scutellum although they are at times faint or absent. (See also discussion under obscurum.)

The species has been named after Mr. Herbert S. Barber, who initiated my study of the group.
Temnostoma greenei, new species.

Male.—Occipital pollinose stripe bright yellow, about twice as broad as width of first antennal segment; narrowest distance between eyes a little greater than space separating upper ocelli; ocellar triangle black, a yellowish pollinose area below, followed by a black one; pollinose area on frontal triangle divided in two arms, each continuing down to the oral margin; median facial stripe black, much narrower at oral margin than below the antennae; a small facial tubercle present; antenna and arista bright yellow.

Four pairs of yellow mesonotonal markings, one pair on the humeri, one on the transverse sutures, one in front of the post alar calli and one prescutellar; scutellum grayish yellow on post margin; side of thorax with a yellow stripe extending from the upper margin of the mesopleura to the lower one and onto the sternopleura.

Fore femur and basal fourth of tibia bright yellow, remainder of front leg black; mid and hind legs bright yellow.

First abdominal tergite shining black, the second with a basal black band followed by a broader yellow one which is nearly twice as broad at its ends as at the middle, posterior portion of the tergite black, gradually becoming dull brassy towards the posterior margin; third and fourth tergites with the yellow band nearly straight and of fairly uniform width, in other respects similar to the second except that the brassy color is a little more pronounced; abdominal pile chiefly yellow; all sternites distinctly broader than long.

Wing infuscated along anterior half, faintly so beyond the fourth vein; squamae whitish, halteres yellowish.

Length.—13.5 mm., wing 6 mm.

Type.—A male, U. S. National Museum No. 53444.

Type locality.—College Park, Maryland, May 17, 1936.

Named after Mr. C. T. Greene, the collector.

T. greenei is intermediate between barberi and pictulum. Although its color pattern is more pronounced than that of barberi, it does not equal that of pictulum. All of the yellow markings of the latter are brighter than those of greenei, particularly on the abdomen. In pictulum, the posterior margins of tergites 2 to 4 are bright yellow; there are, therefore, four strongly contrasting crossbands on each of these tergites. Pictulum in fact resembles the workers of the yellow jacket wasps while greenei approaches the Odynerus type of coloration.

Temnostoma bombylans (Fabr.)


Male.—Antenna dull yellow; facial tubercle lacking; the median black facial stripe broader than the adjoining pollinose ones; only two pairs of yellow markings present on the mesonotum, the humeral and the transverse suture pairs; mesopleura with a vertical yellow stripe; front leg black except extreme apex of femur and base of tibia; mid femur black except apically, tibia and first three tarsal segments yellowish, the last two dark brown; hind femur black except
Description based on one male and one female from Austria (in the collection of C. H. Curran).

_T. bombylans_ has been reported from many European countries and from Siberia and Japan as well. Curran suggests that the "bombylans" of the Old World may consist of two or more species.

_Temnostoma obscurum_ Loew.

_T. obscurum_ Loew, Cent. V, 1864.
_T. baryras_ Osten Sacken (nee Loew), Cat. N. A. Dipt., 1879.
_T. bombylans_, of American authors (nee Loew).

Description of the type: Male—Occipital pollinose stripe as broad as the second antennal segment; the facial pollinose stripe which continues from the frontal triangle to the oral margin is broader than the black median stripe; a small facial tubercle present; antenna and arista brownish; mesonotum with a single longitudinal gray stripe which is as broad as the yellow area on the humerus; all the yellow thoracic spots (as noted for _barberi_) present save the prescutellar pair; metasternum pilose; last two segments of mid and hind tarsi darkened.

First abdominal tergite opaque black on basal half, shining dark blue beyond; the second with an opaque black band on the anterior margin, which is followed by an arched yellow one; this in turn is bordered by an opaque band and lastly a dark blue one is present on the posterior margin, this being the broadest of the four bands; third tergite similar to the second except that the yellow band is nearly straight and the posterior band covers the apical half of the segment; the fourth tergite likewise with a nearly straight yellow band followed by a very narrow opaque one, while the shining area covers the apical two-thirds of the tergite. All of the tergites broader than long with fine yellow hairs except that a few black ones are intermixed on the fourth; hypopygium with yellow hairs only; forceps about twice as long as broad. First sternite about four times as broad as long; width of the second about three times its length; the third and fourth each about two and one-half times as broad as long; venter entirely pale pilose.

_Female._—Authentic females of _obscurum_ have not, as yet, been recorded. A female in the Cambridge Museum of Comparative Zoology agrees very closely with the type male but the pollinose line along the occipital orbit is obscured by grease which prevents absolute identification. The color of the antennae and legs is the same as in the type and it also possesses the peculiar abdominal
coloration and pattern that is found in the type specimen, except that it has the yellow crossband on the fifth tergite, common to the females of this group.

The facial tubercle of the male and dark antennae and tarsal segments gives *obscurum* a superficial resemblance to *barberi* from which it may be distinguished by the broad occipital pollinosity, the pilose metasternum and the abdominal markings. The yellow abdominal crossbands are peculiar to *obscurum* in that the second and third are practically straight and of almost equal width throughout their entire length (the fourth band in the female above noted is likewise nearly straight and uniform in width). The facial tubercle of the male and the color of the antennae and tarsi separate it from *balyras* and *trifasciatum*. Moreover, the abdomen of the male is broader than in the other species, being very similar in form to the females of the group. Finally, aside from *balyras*, it is the only species of the subgenus with yellow hairs predominating on the abdomen.

**Type and type locality.**—The only authentic specimen known of this species is the type male in the Cambridge Museum of Comparative Zoology, from Saskatchewan, Canada (Endicott).

The female noted above was collected at Gold Rock, Rainy River District, Ontario, July, 1905. (H. H. Newcomb, ex collection of C. W. Johnson.)

**Temnostoma balyras** (Walker).

*T. balyras* Osten Sacken, Cat. N. A. Diptera, 1879.
*T. bombylaeus* Williston, Syn. N. A. Syrphidae, 1886.

The distinguishing characters of this species are: Antennae bright yellow; no facial tubercle; fore legs yellow at base and apex of femur and at base of tibia, remainder black; mid and hind legs yellow except that both femora are black except at base and apex and usually there is a broad, dark brown ring on the distal half of the hind tibia; metasternum pilose; abdominal pale bands rather strongly arched; abdominal hairs yellow.

Apparently the commonest and most wide spread species of *Temnostoma*, ranging from Ontario to North Carolina; also reported by Metcalf from Illinois. 

**Type.**—In the British Museum.

**Type locality.**—Trenton Falls, New York.

**Temnostoma trifasciatum** Robertson.

Robertson noted only one salient character for *trifasciatum* in his brief description, namely, that the female has only three yellow crossbands on the abdomen. Not infrequently, however, there is a rudimentary band on the fifth tergite. Malloch used the color of the abdominal hairs which serves to distinguish both sexes from its nearest ally, *balyras* (Walker).

**Male and female.**—Facial tubercle absent; occipital pollinose line broader than width of first antennal segment; antenna bright yellow; fore femur yellow on basal half, darkened beyond except that the apex is yellow; remainder of fore legs black; mid legs bright yellow; hind femur and tibiae each with a dark preapical area, remainder of hind leg yellow; metasternum pilose; last tergite with only coarse black hairs beyond the crossband; width of the abdominal crossbands broader than apex of hind tibia.

**Type locality.**—Carlinville, Illinois. Also occurs in Virginia, Pennsylvania and New York.

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**A NEW SPECIES OF SIALIS (MEGALOPTERA, SIALIDAE) FROM KENTUCKY.**

*By Lee H. Townsend,*

*College of Agriculture, University of Kentucky.*

Ross\(^1\) has recently published a taxonomic study, based on the characters furnished by the genitalia, of the nearctic species of the genus *Sialis*. These structures proved the best characters for separation of species. Ross made no attempt to homologize the parts of the genitalia but merely applied descriptive terms to them. The present writer has used the same descriptive terms. By referring to the drawings one can understand the location and relation of these parts.

**Sialis nina**, n. sp.

This species is in the *infumata* group having the terminal plate (fig. 2, t) produced only along the vertical axis. The male would run in Ross's key (l.c.) to the couplet with *velata* and *itasca*, but can be readily separated from these species by the convexity of the lateral plates, the different shape of the terminal plate, and the absence of a basal lobe on the genital hooks. The terminal plate is distinctly wider at the base than at apex, whereas in *velata* and *itasca* this plate is not widest at the base. The eighth sternite (fig. 5, δ) of the female is distinctive, being different from that of any other known female.

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Dr. H. H. Ross checked and approved all determinations used in this paper and to him the writer expresses sincere appreciation.
Male.—Length 12-14 mm. Black with the exception of certain head markings which are light orange. These markings are relatively constant but not absolutely so and are as follows: A narrow margin around each compound eye; one bar along each side of the meson and extending from the caudal margin of the head approximately half way to the antennal bases; behind each compound eye are several dots or broad, short bars, the last extending toward the caudal margin of the head; several dots are arranged each side of the meson on the vertex; between the bases of the antennae are several spots which may be confluent. These markings or similar ones probably occur in many species of the genus, the real distinguishing feature being the genitalia. Wings are dark brown.

General structure.—Head dull and coarse in appearance. Vertex concave slightly along meson. Pronotum dull and coarse with a transverse depression in the posterior region.

Abdomen and genitalia as in figs 1 to 4, and 6. Ninth sternite narrow, tapering to a point on each side as indicated in fig. 1. This sternite is produced ventrally in the midregion (figs. 2 and 6, 9). Lateral lobes (1) short and rather broad with apical margin produced and apex a blunt tooth. In some views the apex of each lateral plate appears to be slightly knobbed. Genital plate (g) situated below terminal plate (t) and of the shape indicated in fig. 4, g. The genital plate gives rise to a pair of long, bent arms (fig. 3, gh) which project forward toward the ninth sternite. The two arms are closely appressed, thicker at the base but have no expanded basal lobe. Terminal plate (fig. 2, t) with a small, angular incision at apex; the plate is broadest at the base, narrowing as indicated toward the apex.

Female.—Length 14 mm. Color and general structures as in male.

Abdomen and genitalia as in fig. 5. Seventh sternite wider than long as indicated in figure. Eighth sternite (δ) is different from any that have been described for the genus. It is wide and short with a median shallow depression. Each side tapers laterally from the mesal region ending in a rounded apex. The appearance as indicated in the figure should serve to recognize the species.

Holotype, male.—Lexington, Kentucky, along North Elkhorn Creek: April 1, 1938, Paul O. Ritcher and Lee H. Townsend.

Allotype, female.—Same data as holotype.

Paratypes.—Eleven males. Same data as holotype.


Paratypes deposited as follows: one male, U. S. National Museum Cat. No. 53110; three males, Illinois State Natural History Survey, Urbana, Illinois; seven males, Kentucky Agricultural Experiment Station, Lexington.

In addition to the above species the writer desires to record two additional species of Sialis from Kentucky as follows:

Sialis velata Ross, one male, Tyrone, Ky., April 22, 1893. H. Garman.

Ross (l. c. p. 74) records one species from Kentucky as follows:

*Sialis mohri* Ross, two males, near Mammoth Cave, Ky., May 2, 1874.

**Explanation of Figures.**

All are figures of *Sialis nina*, n. sp.

1. Ventral aspect, terminal abdominal region of male.
2. Caudal aspect, terminal plate, lateral plates, and ninth sternite of male.
3. Lateral aspect, genital hook, terminal and lateral plate.
4. Ventral aspect, apex of abdomen of male.
5. Ventral aspect, terminal abdominal region of female.
6. Left lateral aspect, terminal abdominal region of male.

Abbreviations.—g, genital plate; gh, genital hook; l, lateral plate; t, terminal plate; 8, eighth sternite; 9, ninth sternite.
MINUTES OF THE 502d REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The Society's 502d meeting was held at 8 p. m., Thursday, June 1, 1939, in Room 43 of the National Museum. President Snodgrass presided and 24 members and 5 visitors were present. The minutes of the May meeting were read and approved.

The two following talks comprised the regular program:
1. Some new developments relating to the control of screwworms.—E. C. Cushing.

A brief summary was given of the recent research work of members of the Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine, leading to the discovery of diphenylamine and other chemicals as larvicides against the screwworm fly Cochliomyia americana C. & P. The advantages of diphenylamine over previously recommended materials for protecting animals against infestations by screwworms was described. Reference was also made to the work of the Division in studying the factors which induce screwworm flies to oviposit on wounds, and the development of resistance in animals to screwworm attack. (Author's abstract.)

2. Mosquitoes, transmission of Encephalomyelitis or Brain-fever.—F. C. Bishopp.

Discussion of the two talks followed by McGovran, Stone, Bishopp, Shannon, Hall, Mrs. DeBord and Wood.

A non-resident member, Raymond C. Shannon of the Rockefeller Foundation, greeted the Society and discussed several interesting features of his work with mosquitoes in Brazil. One of the most vital health problems in South America to-day is brought about by the presence in northeastern Brazil of Anopheles gambiae Giles, a native of Africa and one of the most important transmitters of malaria. In addition to Africa, it occurs in southern Arabia and Greece. A. gambiae is particularly important because adults feed mainly if not entirely on man and the larvae occur especially in such pools and ditches as are found near towns.

The species was found at Natal, Rio Grande do Norte, in March, 1930. This infestation was exterminated, but gambiae has since been found in the state of Ceará. Should this mosquito become established in either the Parnaiba or San Francisco River systems, the results might be very serious indeed. Control measures are now under way.

Until recently, yellow fever has been considered a house disease, spread only by the domestic mosquito, Aedes aegypti (L.). In 1932 a special type of the disease, called jungle yellow fever, was discovered in Brazil. During the epidemic no traces of aegypti were found in the area concerned. Investigation showed that two species of forest-living mosquitoes, Aedes leucocelaenus Dyer and Shannon and Haemagogus capricorni (Lutz), were involved in the transmission of yellow-fever in the jungles.

Mr. Shannon also described some interesting methods of capturing mosquitoes by the use of trap animals and other aspects of his work. (Secretary's abstract.) Remarks followed by Stone, Bishopp and Woke.

Adjournment at 9:45 p. m.

ASHLEY B. GURNERY,
Recording Secretary.
BOOK REVIEW.


Entomologists, teachers, general workers, and specialists alike will welcome this substantial contribution from Dr. Chopard, who, in the words of his introduction, has tried to collect and present in this book all that is actually known of the biology of orthopterous insects. It is fortunate that the author is skillful, both as a compiler and as an investigator. Best known as a taxonomist, especially of crickets, Dr. Chopard has made major studies of the comparative anatomy and biology of the Orthoptera and their allies. Even in recent years, general entomological books have appeared which failed to review properly the work of investigators on other continents. In the separate index of authors cited are more than 400 names, and those of Allard, Caudell, Cleveland, Ford, Fulton, Hancock, Hebard, Hubbell, Lutz, Morse, Nabours, Parker, Rehn, Scudder, and other Americans appear frequently in the text. Bibliographies follow the several chapters; some of these are subdivided for the convenience of readers desiring specialized literature. The completeness of bibliographies and the thoroughness of the subject and author indices are noteworthy features of the book. The abundant and well-prepared illustrations also merit commendation.

This volume by Dr. Chopard, of the National Museum of Natural History, Paris, is the most recent of a series including volumes on insect teratology by Cappe de Baillon, on Diptera by Seguy, Surcouf, and Senevet, on Coleoptera by Portevin, Bertrand, Lesne, and Planet, and on the cave fauna of France by Jeannel, in addition to others.

This volume compares favorably with three German works in the Biologische Studienbücher series: Biologie der Schmetterlinge, by Hering, 1926; Biologie der Hymenopteren, by Bischoff, 1927; Biologie der Hemipteren, by Weber, 1930. Dr. Max Beier’s studies, 1933 and 1934, of the German Orthoptera in the Biologic der Tiere Deutschlands series and Dr. Uvarov’s familiar handbook, Locusts and Grasshoppers, 1928, are among the most important previous works on Orthoptera.

Included in the introduction is a sketch of the classification, in which the Orthoptera fall into 6 suborders: Dictyoptera (Blattidae, Mantidae); Grylloblattodea (Grylloblattidae); Ensifera (Tettigoniidae, Gryllidae, Gryllacrididae, Prophalangopsidae); Tractaclyloidea (Tridactylidae, Cylindrachetaeidae); Acridoidea (Acrididae, Acrydiidae); Phasmoidea (Phasmidae). It should be noted that, in accordance with the morphological studies of Carpentier, the true mole crickets (Gryllotalpinae) are grouped with the Gryllidae, apart from the Tridactylidae. Although distinct from the Orthoptera, the Dermaptera are also treated. Because of the unusual interest attached to Arixenia and Hemimerus, this action is fortunate.

Unlike Weber’s work on Hemiptera, the first chapter of which deals with anatomy, Chapter I of Chopard’s book treats of geographical distribution.
Although certain genera are boreal, Orthoptera are essentially southern. Thus, while about 200 species occur along the north side of the Mediterranean Sea, only about 50 are in the neighborhood of Paris, and Burr listed only 31 in his British handbook of 1936. Correspondingly, Hebard places 82 species and races on the Alberta list while 255 are known from Arizona. Chopard notes that the division of the East Indies by Wallace’s Line, which is often used to indicate the Australian affinities of the islands to the east of the Straits of Bali, as opposed to Indo-Malayan affinities, does not apply well to the Orthoptera. The distribution of Orthoptera in geologic time is reviewed, with careful attention to the recent researches of Zeuner.

Chapter II, on various habitats of Orthoptera, discusses the faunas of deserts, of mountains, and of other situations, and includes a thorough treatment of cave-dwelling, myrmecophilous, termophilous, aquatic, and parasitic species. At the end of the book is a list of parasitic and commensal Orthoptera. Chopard discusses some interesting examples of semi-aquatic Orthoptera, and mentions certain walking-sticks in Brazil and Fiji which have for many years been described as aquatic; this “myth” was rather effectively discredited by Uvarov in 1935. There are no truly parasitic Orthoptera known, but some species are associated with definite vertebrate species in burrows and caves. Certain Dermaptera, namely Arixenia, which occurs in the bat caves of the East Indies, and Hemimerus, occurring on rats (Cricetomys) in tropical Africa, are more nearly parasitic, but here, too, actual parasitism is not clearly proven. Orthoptera which construct shelters are considered in Chapter III, and the species discussed range from subterranean crickets and forms living in hollow plant stems to the American leaf-rolling gryllacridine, Camptonotus, whose habits were described by Caudell and McAtee more than 30 years ago.

Chapters IV and V are devoted to reproduction in the Orthoptera. Different means employed by one sex to display itself, as the peculiar hovering flight of the male Carolina locust, and actual mating positions and the structure and transfer of spermatophores, to the knowledge of which Boldyrev and Gerhardt have contributed much, are discussed in detail. The development of Hemimerus, the embryo of which is nourished by a special type of placenta, is given special attention. Any one who is concerned with the identification of insect material intercepted by foreign plant quarantine officers as is this reviewer, will appreciate the illustrations of roach oothecae and other orthopterous egg cases and eggs.

Chapters VI, VII, and VIII deal with development and activity, the production of sound, and autotomy and regeneration. In Chapter IX, on reflexes and means of defense, is included a discussion of the strange cataleptic habits of the walking-stick Carausius, which is used so much as an experimental animal. There is a full discussion of autohemorrhage and repellent glands. Glands which serve to attract the opposite sex, as Hancock’s glands in Oecanthus, are treated in Chapter IV. Chapter X is concerned with reactions to external factors.

Some of Nature’s “oddities” are the leaflike mantids, walking-sticks, and katydids. These, as well as the probable significance of their strange adaptations, receive attention in Chapter XI, on homochromy and mimicry. Chapter XII, dealing with variation and heredity, discusses normal variation and correlated changes, such as brachypterism and accompanying differences in pronotal shape, which are important to taxonomists. The work of Nabours on heredity
and variation in grouse-locusts is reviewed. During the past 20 years there have been few discoveries in insect biology that are more important than the phases of locusts. Although Saussure vaguely suggested, long ago, that solitary grass-hoppers might have gregarious forms, a definite theory was first proposed by Uvarov in 1921 and later amply substantiated by the investigations of Faure in South Africa, and those of other workers. Faure's experiments with Melanoplus mexicanus mexicanus (Sauss.) in Minnesota in 1932 strongly suggest that the highly destructive Rocky Mountain Locust, Melanoplus spretus (Walsh), is the migratory phase of our common mexicanus. The thirteenth and last chapter, on rudiments of social life, covers the beginning of family life as it appears, for instance, in the American log-dwelling roach, Cryptocercus, whose symbiotic relationships have been so fully investigated by Dr. Cleveland, and in certain earwigs that exhibit maternal care of eggs and young.

Ashley B. Gurney.

Actual date of publication, October 27, 1939.
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The regular meetings of the Society are held in the National Museum on the first Thursday of each month, from October to June, inclusive, at 8 p.m.

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EIGHT NEW CHRYSOMELIDAE (COLEOPTERA) FROM THE DOMINICAN REPUBLIC.

By Doris H. Blake.

The following new species of Chrysomelidae are among those collected by P. J. Darlington in the Dominican Republic in the summer of 1938.

Galerucella constanzae, n. sp.

Fig. 2.

Oblong oval, about 4.5 mm. long, not shining, covered with fine hairs, the elytra with conspicuous punctuation; pale yellow brown with dark antennae, a dark spot across top of head, 6 spots on pronotum, and 4 dark vittae on each elytron, abdomen dark, and legs with dark rings about femora and tibiae.

Head pale with dark mouthparts and a dark spot on either side of median line extending to the tubercles; covered with fine pubescence and densely punctate. Antennae extending a little below humeri, dark with the base of the first six joints pale, third joint longest. Prothorax twice as broad as long, much depressed on the sides and canaliculate down middle; sides somewhat angulate, a sharp tooth at apex and another at basal fourth; surface dull, densely punctate and pubescent; two small spots at the middle of the anterior margin and four large spots, one on each lateral margin and two in the middle extending to the basal margin. Scutellum pale, pubescent. Elytra oblong, smoothly convex with only a short intrahumeral depression, the pale vittae appearing slightly elevated, surface densely and coarsely punctate, and covered with a fine pubescence; each elytron with four black vittae none of which reach the apex, the first two between the suture and the intrahumeral depression being so closely placed that only a very fine light line is visible between them, then a wide pale vitta extending down from the intrahumeral depression to the apex, followed by the third and fourth dark vittae arising from the humerus and with a similar very narrow pale line between, the suture and margin with pale edges. Body beneath shining and covered with fine pubescence, pale with dark shadings on breast, dark coxae, and dark abdomen (except at the tip). Legs pale with dark rings about the middle of the femora and tibiae and dark spots at the joinings. Claws finely toothed. Length 4.5 to 5 mm. Width 2.2 to 2.5 mm.

Type.—Male, and 1 paratype, female, M. C. Z. Cat. No. 23630. 2 paratypes (1 male, 1 female) U. S. Nat. Mus. Cat. No. 53279.

Remarks.—This species is closely related to the other vittate species of Galerucella. *G. oteroi* Blake from Cuba has fewer pronotal spots and wider pale elytral vittae. *G. maculipes* Blake from Cuba, besides being differently marked, has transverse depressions on the elytra. *G. varicornis* Weise from Cuba is also transversely depressed and has different pronotal marks. *G. venustula* Suffrian from Cuba is finely punctate and without large pronotal spots. *G. obliterate* Oliv. has fewer elytral vittae.

**Galerucella chrysura**, n. sp.

Fig. 1.

Oblong oval, about 4 mm. long, dark brownish black, densely pubescent with irregular whitish elytral vittae, the hair at apex of elytra and sometimes along the sides with a golden lustre.

Head deep brown or black above, pale brown on lower front, densely covered with pale pubescence and densely punctate above tubercles, and with a median line. Antennae extending a little below humeri, pale reddish brown with apex of each joint sometimes dark, third joint longer than others. Prothorax nearly twice as wide as long, with deep concavities on each side and a channel in the middle; sides angulate, a nodule near base and apex; densely punctate and covered with short pale hair; black with the margin deep brown. Scutellum dark, pubescent. Elytra oblong, a deep intrahumeral depression, a transverse one before the middle and another before the apical narrowing, a callosity on each elytron at the apical curve that obscures the margin below at that point when viewed from above; dark brown, densely pubescent, the pubescence on the prominences at the humeri, base, middle and before the apex thicker and darker brown, a narrow interrupted vitta of white pubescence near suture, another pale and more scantily pubescent vitta beginning in the intrahumeral depression and running down the side, along the sides irregular patches of whitish pubescence, at the apex the hairs whitish and often with a golden lustre. Body beneath dark, shining, with a fine pale pubescence; legs light brown with a dark ring around the middle of the femora and sometimes another one around the tibiae. Claws finely toothed. Length 3.8 to 4.5 mm. Width 1.5 to 1.8 mm.

*Type.*—Male, and 1 paratype (female), M. C. Z. Cat. No. 23631. 2 paratypes (males), U. S. Nat. Museum Cat. No. 53280.


*Remarks.*—This is the second species of its kind to be described from this island. The other species, *G. conjuncta* Blake, from Haiti, is a wider species, lacking the transverse elytral depressions, and with more conspicuous and regular white lines on its elytra, and it has a pale prothorax. *G. chrysura* is the only one
so far known from the West Indies with a dark prothorax. The metallic golden hairs at the apex make it easily distinguished. *G. walcotti* Bryant from Porto Rico has a similar depression across the elytra but a pale prothorax and different elytral pattern.

**Oedionychis megalopia, n. sp.**

Fig. 3.

Elongate oblong, 4.2 mm. long, brownish gray, antennae pale, each elytron with 7 small brown spots.

Head shining, pale yellowish gray with a large puncture on either side near the eye, followed by a row of punctures forming a groove along the side of the eye to the groove above the tubercles; a median line down vertex. Interocular space about one-third the width of the head, eyes large. Antennae entirely pale, extending nearly to the middle of the elytra, third joint a little shorter than fourth, remainder approximately equal. Prothorax about twice as wide as long with wide explanate margin, somewhat recurved; a slight basal depression; surface smooth, shining and yellowish gray. Scutellum entirely pale. Elytra narrowly elongate, not very convex, with well marked humeri and an intrahumeral depression, surface shiny, finely punctate, gray, with elongate brown spots, placed as follows: a humeral spot, one in the middle near base, in line with this another one at middle and a large one at apical third; on the side, one below humeral spot, and one at the middle; still another one between lateral and median spot slightly below them. Body beneath pale, finely punctate, legs a little darker.

*Type.—Male, M. C. Z. Cat. No. 23632.*


*Remarks.—*Only one specimen of this was collected. It is the only pale *Oedionychis* so far recorded from this island, and belongs to the group with large eyes and narrow elongate form. In coloration it reminds one of Suffrian's *Oedionychis 10 = punctata*, but the spots in that species appear to be not only differently placed but fewer in number and in that one the pronotum is also spotted.

**Hemilaectica graphica, n. sp.**

Fig. 5.

Elongate oblong, 4.5 mm. long, shining and finely punctate, pale yellow brown, with deeper brown markings on the head, pronotum, and across elytra; prothorax with a rather poorly marked and shallow basal groove, limited at the ends, elytra with numerous faint costae.

Head pale, shining, with a dark brown band across vertex above tubercles, tubercles well marked, slightly produced, a carina down lower front, occiput densely punctate, a large fovea on either side near the eye; interocular space
about one-third the width of the head, eyes very large and closely set. Antennae extending half way down elytra, entirely pale, first and fourth joints longer than others. Prothorax not twice as wide as long, with arculate sides and nearly straight basal margin; a wide shallow basal depression limited at the sides, and a slight depression anteriorly on either side; surface shining, finely punctate, a row of coarser punctures of a deep brown color about anterior angle and a tiny but conspicuous spot at apex, color pale yellow brown with five larger dark brown spots, one in the middle, two anteriorly and two at the ends of the basal groove. Scutellum pale. Elytra elongate, somewhat depressed and with numerous faint ridges extending rather irregularly to apical narrowing; intrahumeral depression well marked; surface finely and densely punctate, shining; yellow brown with pale yellow apex and a lighter band edged with irregular graph-like markings of dark brown across the middle of the elytra. Body beneath entirely pale, shining, and with fine pubescence. Hind tibiae grooved and with a short spur, claws widely dentate. Length 4.5 mm.; width 2 mm.

Type.—Female, M. C. Z. Cat. No. 23633.


Remarks.—This is the first species of the genus to be described from outside of Cuba. It agrees with the Cuban species in its long antennae, the very shallow and inconspicuous basal groove on the prothorax, the irregular costae on the elytra, the spur on the hind tibiae, dentate claws, and open anterior coxal cavities, as well as in general features of coloration. It is more elongate and the eyes are larger and more closely set than in the other species.

Batonota pubescens, n. sp.

Fig. 7.

Subtriangular, 8–10 mm. long, reddish or yellowish brown, usually more or less covered with a white or yellowish powdery, sometimes cottony, exudation that clings to the short pubescence; antennae pale with last two joints dark and outside apices of joints 5, 6, and 7, with a dark spot; body beneath shining black with two reddish spots on vertex of head, sometimes the sides of the breast and usually the edge of the abdomen reddish; legs yellowish except at base. Elytra with spine of medium length and coarse semistriate punctures, the intervals between being raised.

Head entirely concealed from above, dark, with the two prominences above tubercles reddish, sometimes lower front with reddish tinge, vertex and front rugosely punctate, eyes surrounded by a fringe of hairs; the prosternum opposite eye without a deep excavation. Antennae extending to the anterior edge of elytra, first five joints slender, not very pubescent, remainder much wider and with fine pubescence, 5th, 6th, and 7th joints with a dark spot on the outer edge at the apex, remainder pale with the last two joints dark. Prothorax reddish brown, often with darker brown areas in the basal half, somewhat convex with a ridge down the middle and a depression on either side at base, and a wide
explanate margin, basal margin above scutellum nearly straight or at most only slightly curved, not notched to form an inverted V; surface rugosely punctured, wrinkled and uneven, with short pale pubescence. Scutellum rounded, triangular, reddish or yellowish. Elytra widest at anterior produced angle of explanate margin, thence narrowing slightly and broadly rounded at apex, the explanate margin produced forwardly and laterally and not much rounded anteriorly but going off at nearly right angles from the side of the prothorax and forming in some specimens almost a knob at the end; from the humerus to this knob a diagonal carina; the sutural spine of moderate length; surface with deep coarse semi-striate punctures, on sides and at apex the punctuation becoming more confused; intervals between more or less subcostate; a pronounced rounded costa on either side running from the spine to the base; two moderately pronounced ones running parallel to the suture from below spine nearly to the apex, and two or more running from the humerus along the convex sides; surface shiny and with fine short hairs usually longer on anterior margins; on most specimens a white or yellowish exudation that frequently gives a gray color to the beetle and covers all but the raised portions of the prothorax and elytra and coats the pubescence. Body beneath shiny black with the sides of the breast sometimes and the extreme edge of the abdomen usually reddish. Legs pale brown except at the base of the femora. Abdomen with a fine pubescence along the edge of each segment. Length 8.2 to 10.4 mm. Width 7 to 8.8 mm.

Type.—Male, and 27 paratypes, M. C. Z. Cat. No. 23634. 6 paratypes, U. S. Nat. Mus. Cat. No. 53281.


Remarks.—Two species of Battanota with a long spine have been described already from Haiti. Concerning B. rugosa Wagener, Spaeth, with the type in his possession, writes that the type locality was erroneously given as Haiti, and that the species is the same as the South American B. ensifera. B. aculeata Boh., described from Santo Domingo, must be closely related to the present species, but I have been unable to find specimens of it to compare either in the National Museum or at New York or Cambridge. B. aculeata is described as nigropiceous, with the sides of the abdomen having a rufotestaceous margin. In color, at least, the two species are unlike. Neither does Boheman’s description of the elytral ridging exactly match, as in B. pubescens all of the intervals are more or less costate. Moreover, Boheman, while noting a very fine elytral punctuation on B. aculeata does not mention at all the pubescence which is such a striking characteristic of B. pubescens. This is accentuated on most of the specimens that Mr. Darlington collected by the whitish exudation that clings to every hair. This deposit can not be mold as Mr. Darlington states that it was on the beetles when he caught them. I find traces of a similar substance on specimens of other species of Battanota in the collection.
Paratrikona variegata, n. sp.

Fig. 4.

Roundedly ovate, convex, about 8 mm. long, reddish or yellowish brown above with irregular dark piceous markings on the prothorax and along the convex sides of the elytra and in the middle, body beneath dark with the tibiae, tarsi, and all but the last one or two antennal joints pale. Margins widely explanate, the gibbosity on the elytra not prolonged into a spine; prothorax usually densely punctate, elytra coarsely and subseriately punctate.

Head entirely concealed from above, dark reddish or piceous, front punctate, the prosternum deeply excavate on either side of the eye, forming a prominent angle. Antennae pale with the last joint and sometimes the last two or three joints dark, the first five joints slender and shiny, the remainder much thicker and with fine dense pubescence. Prothorax rounded in front, not at all excavate over head, widened broadly in the middle where it is nearly twice as broad as long, thence narrowed to base with sinuate margin; slightly convex, and with irregular humps, surface shiny and usually rugosely and densely punctate, each puncture with a fine short hair; in one specimen the surface smooth and polished and with only obsolete punctuation; in color usually paler yellowish or reddish brown anteriorly and about the margin, and deep brown or piceous on the sides and in the middle, but the coloring variable. Scutellum rounded triangular, often finely punctate. Elytra with wide explanate margin, very rugosely punctate and produced anteriorly to the middle of the prothorax in a rounded lobe; elytra widest a little below humeri, thence gradually narrowed and rounded at the apex. Humeri prominent, a short thickened callous running from the humerus into the margin and another at the middle and smaller ones at intervals to the apex. The sutural gibbosity on basal half of the elytra rising up into a pronounced hump which is not at all attenuated into a spine, in this respect resembling P. turritella Blake and not P. turritera Boh. Surface shiny and with deep coarse subseriate punctures, interstices with fine scattered punctures; color reddish or yellowish with an irregular piceous marking extending from the humerus nearly to the apex, and a blotch about the sutural gibbosity and another below the middle near the suture, these markings more or less conspicuous in different specimens. Body beneath entirely black and shining except the tibiae and tarsi, which are usually paler reddish brown. Claws approximate, simple. Length 7.5 to 8 mm. Width 7 to 7.3 mm.

Type.—Male, and 6 paratypes, M. C. Z. Cat. No. 23635. 2 paratypes U. S. Nat. Mus. Cat. No. 53282.


Remarks.—This species is closely related to P. turritera Boh. but has not so prolonged an elytral gibbosity and is more coarsely punctate. It also has distinct pronotal and elytral dark markings. It is smaller than the Cuban species, P. turritella Blake. P. ovata Blake is a more ovate species and lacks dark markings.


7. Batonota pubescens  8. Paratrikona rubescens
Paratrikona rubescens, n. sp.

Fig. 8.

Roundly ovate, about 9 mm. long, deep red, the prothorax with darker markings, undersurface picaceous, antennae pale with the last two joints dark; surface shining, prothorax densely punctate, elytra very coarsely and subseriately punctate. Elytra with a sutural gibbosity similar to that of P. variegata.

Head entirely concealed from above, entirely dark, punctate between the eyes, the prosternum deeply excavate opposite the eye. Antennae pale yellow with the last two or three joints dark, first five joints slender and shiny, remainder much thicker and finely pubescent. Prothorax not quite twice as wide as long, widely rounded anteriorly without excavation above the head, with an explanate margin, slightly convex, a wide heart-shaped callosity in the middle and smaller callosities about sides, surface very shiny and densely and coarsely punctate; reddish about margin, deepening to picaceous except on the most raised portions. Scutellum rounded triangular, shiny, impunctate. Elytra similar to P. variegata in shape and in regard to the sutural gibbosity, which is not drawn out into a spine; in color entirely deep red without dark markings, the punctures even coarser than in P. variegata. Under surface entirely dark and shining, claws approximate, simple. Length 8.5 to 9 mm. Width 7 to 7.5 mm.

Type.—Male, and 1 paratype, M. C. Z. Cat. No. 23636.

Type locality.—Jarabacoa, 1500-4000 ft., Dom. Rep., collected in August, 1938, by P. J. Darlington.

Remarks.—This species is very closely related to P. variegata. It is a little larger, the prothorax is a little wider anteriorly and not so visibly pubescent, the elytra are without dark markings and of a deep red instead of yellowish brown, the sutural gibbosity is a little higher and the punctures even coarser and fewer. The aedeagus is similar but the tip is a little less rounded. Mr. Darlington writes that while P. variegata when alive is about the same yellowish brown color as in the dried specimens, P. rubescens when alive is "rather deep red with conspicuous white blotches irregularly arranged. It was a very unusual and attractive color pattern. I found the two specimens on a single little shrub in heavy forest and searched very carefully for similar shrubs and more specimens but could not find any." Only a slight trace of the white markings remains on the dried specimens.

Asteriza darlingtoni, n. sp.

Fig. 6.

Roundly ovate, convex, shining black with red hyaline margin, the prothorax and elytra with large, irregularly shaped, yellow patches that in life are probably golden or iridescent. Antennae pale with the last joint dark. Legs reddish, femora mostly black except at apex.

Head entirely concealed from above, densely punctate over front, shining
black with two pale yellow spots above antennal bases. Antennae pale with three basal joints shining, remainder covered with short fine hairs, the tip of the last joint darkened, 3d and 4th joints subequal and long, 5th to 9th gradually wider and short. Prothorax about twice as wide as long at base, thence gradually narrowing to a rounded front that entirely conceals head, situate on the basal margin; a wide reddish hyaline margin, and a shining black, somewhat convex disc, with pale yellow spots, two anterior, three lateral, and five median; surface shining, with very fine scattered punctures, a deeply indented one on either side of middle in four of the five specimens. Scutellum tiny, rounded triangular, shining black. Elytra rounded convex, wider at the base than prothorax with wide margin with a reddish edge; humeri prominent, a thickening running into the margin from the humerus and also at the middle of the elytra; surface shining black with large irregularly shaped blotches of yellow; deep coarse but not dense punctures from the suture to the middle, these more or less striate but on the sides becoming denser and confused. Body beneath shining black with the apex of the femora, tibiae, and tarsi reddish; claws simple and widely divergent. Length 8 to 10.4 mm. Width 7.5 to 8 mm.

Type.—Male, and 2 paratypes, M. C. Z. Cat. No. 23637. 2 paratypes, U. S. Nat. Mus. Cat. No. 53283.


Remarks.—This is the second species of the genus to be described. The other, A. flavicorns Oliv., described from Guiana, is very similar in size and coloring but the elytra are more closely punctate and do not have such large pale blotches. The aedeagus also differs in being less acutely tipped than in A. darlingtoni. When specimens were soaked in water, some of the original living colors returned and the yellow elytral spots became golden with green and blue iridescence.

TWO NEW SPECIES OF TACHINIDAE PARASITIC UPON HEM-LOCK SAWFLY LARVAE IN NORTH AMERICA (DIPTERA : TACHINIDAE).

By David G. Hall,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In the course of studies of the hemlock sawfly, Neodiprion tsugae Middleton, by field workers of the Bureau of Entomology and Plant Quarantine, two new species of Tachinidae, one representing an undescribed genus, have been reared in numbers as parasites of the sawfly larvae. These are described at this time to make names available for use in economic and biological papers.
TSUGAEAE, new genus.

Male and female.—Head height approximately two-thirds head width; length of head at antenna nearly twice length at vibrissa; bucca narrow in male, slightly wider in female; epistoma short, as wide as clypeus, and warped slightly forward; eye large, slightly oblique, strongly pilose; frontale narrowing toward lunule, striate; frontal width over one-third head width in both sexes, the margins gradually diverging from vertex to lunule, with a few scattered hairs outside frontal rows of bristles which diverge anteriorly and reach to base of third antennal segment; inner vertical bristles straight, reclinate; outer vertical bristles one-half to two-thirds as long as inner; postvertical and postocellar bristles weak, proclinate; frontoorbital bristles, two proclinate and one reclinate in both sexes; ocellar bristles strong, proclinate; facial carina absent; clypeus deeply impressed, wide, slightly dished; parafaciale almost three times as wide opposite lunule as below, bare; faciale rounded, very slightly bowed, bristled fully one-third the distance from the vibrissa to the antennal base in male and about one-half the distance in female; vibrissae at oral margin, widely separated in both sexes but more widely so in male; proboscis about half head height; haustellum about half as long as proboscis; palpus somewhat shorter than length of head at vibrissa, stout, filiform; antennal base well above middle of eye with head seen in profile, the bases approximated, first segment protruding slightly beyond profile of head, short, second segment short, third segment wide, fully four times as long as second, reaching nearly to oral margin; arista with penultimate segment elongate, apical segment thickened on basal half, micropubescent; back of head evenly rounded or slightly bulging.

Thorax with four humeral bristles; propleura bare; preintraalar bristles three; posthumeral bristle present; preacrostichal bristles three; predorsocentral bristles three; presupraalar bristle one; sternopleural bristles four; pteropleural bristle about one-third as long as upper squamal lobe; prosternum with one or two small setae laterally; postalar declivity bare; tympanic pit bare; post-acrostichal bristles three; postdorsocentral bristles four; postintraalar bristles three; intrapostalar bristle well developed; scutellum with one discal bristle and three lateral bristles of which the intermediate one is weak, and with erect, decussate, apical bristles.

Legs with hind coxa bare posteriorly; anterior tibia with anterodorsal and posterodorsal rows of bristles; hind femur with anterodorsal row of bristles.

Wing with costal spine small or absent; third costal section nearly as long as fifth; only third vein with setulae and this with but two at base; apical cell closed in wing margin; fourth vein without apical section or fold, the angle obtuse, the apical cross-vein nearly straight; anterior cross-vein at middle of second section of fourth vein, oblique; posterior cross-vein gently arcuate; last section of fifth vein less than half as long as preceding section; upper squamal lobe small, bare, rounded; lower squamal lobe large, bare, posterior margin wide, truncate.

Abdomen with scutellar depression extending to hind margin of first segment; first segment with median marginal bristles; second and third segments each with one or two pairs of median discal bristles; fourth segment with scattered, erect, marginal rows of bristles; sternites covered by tergites.

Male genital segments retracted, small, second segment of medium size, globose.
Genotype.—*Tsugaea* nov, new species.

Remarks.—This form runs to *Ceratochaeta* in Stein's (1) and Baer's (2) keys, to *Exorista* in Coquillett's (3), to *Tryphera* in Lundbeck's (4), and to *Zenillia* in Curran's (5). It is a *Zenillia* in the sense of Aldrich.

Villeneuve kindly forwarded specimens of *Ceratochaeta prima* Brauer and Bergenstamm, the genotype, and of *Ceratochaeta setigera* Brauer and Bergenstamm, for comparison with this form. According to Villeneuve, *prima* has four dorsocentral bristles, *setigera* three. *Tsugaea* differs from *Ceratochaeta* by having an intrapostalar bristle and by having the apical cell closed in the wing margin. There are additional less obvious differences, but these will suffice to separate the two genera.

Coquillett's conception of *Exorista* covered all forms of tachinid flies having pilose eyes, the bend of the fourth vein not appendiculate, the faciace not setose for more than one-half the distance from the vibrissa to the antennal base, and the hind tibia often ciliate. This combination of characters covers a considerable number of distinct genera not closely related to *Exorista*.

The species of the Palearctic genus *Tryphera* are so different from the species here described that it is only necessary to point out that *Tryphera* has the apical cell petiolate and has but three dorsocentral bristles.

*Tsugaea* differs from *Zenillia* in having proclinate frontoorbital bristles in both sexes, four sternopleural bristles, the eyes widely separated in both sexes, the penultimate aristal segment elongate in the male, and in other characters which are less obvious. In Aldrich and Webber (7) the males would apparently go to *Madremyia* and the females to *Phryxe*. Aldrich believed these genera to be closely related and he considered *Phryxe* to be only a subgenus of *Zenillia*. *Tsugaea* differs from *Phryxe* in having proclinate frontoorbital bristles in both sexes, four sternopleural bristles, and the penultimate aristal segment less elongate. It differs from *Madremyia* by having the penultimate aristal segment shorter, by having four sternopleural bristles, by the less ciliate faciace, and by having proclinate frontoorbital bristles in both sexes. *Phryxe* is placed in the tribe Lydellinii and *Madremyia* in the tribe Frontinini by Townsend. *Madremyia* males have a double row of frontal bristles, but do not have proclinate frontoorbital bristles.

The genus *Tsugaea* is most closely related to *Phyllophorocera* Townsend and *Masiceropsis* Townsend, and it will run to the latter genus in Townsend's (6) keys. The types of both these genera are in the National Collection. That of the former does not have proclinate frontoorbital bristles in the male, the faciace is less ciliate, and the male claws are short. *Tsugaea* differs from *Masiceropsis* in that the eyes are distinctly pilose, the faciace is
less ciliate, the third antennal segment is over three times as long as the second, and there are median marginal bristles on the first abdominal segment and median discal bristles on the intermediate abdominal segments. *Masiceropsis* was considered a synonym of *Achaetoneura* Brauer and Bergenstamm by Webber (8) and *pauciseta* (Coquillett), the genotype, a synonym of *Achaetoneura archippivora* (Williston).

**Tsugae nox**, new species.

**Male.**—Head with bucca 0.15 eye height, black, silvery pollinose, with black hair; frontale black, 0.25 frontal width; vertex black, shining or but slightly pollinose; frontal width 0.36 head width at vertex, 0.41 at lunule; clypeus brown to black; parafaciale black, silvery pollinose; palpus brown to black; antenna black; back of head black, mostly shining but with some indication of silvery pollen, and with two rows of postocular ciliae and abundant whitish hair.

Thorax black, mostly shining, with some silvery pollen, and with indications of darker longitudinal stripes in certain lights; preaparteron yellow, white pubescent; greater ampulla white or tawny pubescent; other thoracic sclerites at wing base black; scutellum with apex orange to brown on apical third or less; postscutellum whitish pubescent.

Legs black, slightly silvery pollinose; anterior tibia with one posterior bristle near apical third; middle femur with two pairs of anterior bristles near middle, one anterodorsal bristle toward middle, one ventral bristle near apical third, two posterior bristles, one near middle and one near apical third, and one posterodorsal bristle near basal fourth; posterior femur with about four anteroventral bristles and two ventral bristles on basal half; hind tibia with an anterodorsal row of bristles, two anteroventral bristles on apical half, and a row of posterodorsal bristles, two of which are longer and stronger than the rest; tarsi as long as tibiae.

Wing hyaline, milky in certain lights, rather brownish basally; subcostal sclerite orange brown to black, black pilose; basicosta black; squamal lobes yellow to yellow orange, rims orange brown.

Abdomen black, each segment shining on apical half or more, basally silvery pollinose, the pattern changeable in shifting lights.

Male genital segments shining black, with scattered, black hair.

**Female.**—Similar to male except for normal sexual differences, and in having bucca 0.25 eye height; vertex more silvery pollinose; frontale 0.50 frontal width, narrowing toward lunule, and frontal width 0.40 of head width at vertex, 0.50 at lunule.

Length, 4-6 mm.

**Type.**—Male, No. 53377, U. S. National Museum.

**Type locality.**—Sweet Home, Oreg.

**Type host.**—*Neodipiron tsugae* Middleton.

**Remarks.**—A series of 56 specimens of this species was reared at Sweet Home, Oreg., during April, May, and September, 1935, and 1936, mostly by R. L. Furniss, of the Bureau of Entomology and Plant Quarantine.
Diplostichus sellersi, new species.

Diffs from the genotype, jonithrix (Htg.) in both sexes by being smaller and more shining black, in each abdominal segment being shining black on the apical half or more, in the presence of two anterodorsal bristles on the middle tibia, and in the greater length of the head at insertion of antennae; male with but two reclinate frontoorbital bristles; female without white pleural pile and the frontal width at narrowest is greater in relation to the full head width.

Length 4–7 mm.

Type.—Male, No. 53378, U. S. National Museum.

Type locality.—Sweet Home, Oreg.

Type host.—Neodiprion tsugae Middleton.

Remarks.—The type series was reared during April and September, 1935 and 1936, mostly by R. L. Furniss. One specimen of a series from Tahoe National Forest, California, reared from Neodiprion sp. (Hopk. U. S. 21,068B) (King Coll.), can not be separated from the others.

The genus Diplostichus has hitherto been known only from the Palearctic Region.

Literature Cited.

A NEW BAT BUG FROM THE EASTERN UNITED STATES (HEMIPTERA-HETEROPTERA: CIMICIDAE).

By Harry G. Barber,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

From time to time during the past two or three years there have been submitted to the Bureau of Entomology and Plant Quarantine for determination numerous specimens of a bug which had been collected in the Eastern United States either in bats' nests or in quarters frequented by bats. These specimens agreed fairly well with the description of Cimex pilosellus Horvath and at first were thought to belong to that species; but more careful investigation shows that they represent a distinct, though closely related, species which is described below.
Color testaceous to dark reddish brown; antennae, legs, and frequently the elytral pads paler. Head, pronotum, and abdomen with rather long ochraceous setae. Head just over a third wider than long (.60 x .84 mm.); disk of vertex rugulose, sparsely punctate; tylus broadly spatulate, truncate in front, outer angles distinctly rounded. Antenna with stout basal segment about one-fourth as long as second, second and third segments equal, fourth considerably shorter than third; lengths of segments as follows: I-.16, II-.60, III-.60, IV-.44 mm. Eye one and two-thirds longer than wide, a little longer than basal segment of antenna. Pronotum two and one-half times wider than long (.56 x 1.40 mm.), widest before middle, lateral margin evenly rounded, edge narrowly expanded, expansion a little less than width of an eye; projecting anterior angles rounded; along posterior margin lightly calloused, truncate before base of scutellum, surface behind base of head and toward anterior angles rather coarsely and roughly punctate, posteriorly smooth; marginal setae mostly of two lengths, the longer ones semi-erect, distinctly longer than width of eye, the shorter ones nearly horizontal, and located on extreme edge. Scutellum about three times as wide as long, nearly one-half the length of pronotum, smooth. Each elytral pad not quite twice as wide as length at their attachment, coarsely, evenly punctate, each puncture with a long, semi-erect seta; these as well as marginal
setae equal in length to submarginal setae of pronotum; commissural or inner margin broadly rounded, posterior margin gently rounded. Abdomen with dorsum distinctly transversely striate, strigae with rather long, inclined setae; marginal setae semi-erect, but little if any shorter than submarginal setae of the pronotum. Abdomen of male slightly asymmetrical. Fore femur not strongly incrassate, about two and one-half times as long as wide. Length 3.50 to 4.00 mm.

Type, male, and 54 paratypes males and females: Allentown, Pa., Mar. 1939, in attic frequented by bats. Other paratypes as follows: 12, Lancaster, Pa., July 26, 1937; 1, Reading, Pa., June 8, 1934; 4, Masontown, Pa., Oct. 10, 1933; 2, Clifton, Cincinnati, O., May 9, 1932; 1, Walton, N. Y., Aug. 26, 1934; 2, Rensselaerville, N. Y., June 15, 1921; 4, Ramsey, N. J., June 10, 1938; 3, Newark, Delaware, July 26, 1938; 1, Wilmington, Del., Apr., 1939; 7, Smyrna, Del., Aug. 20, 1936; 2, Con- toocock, N. H., Aug. 16, 1936; 1, Nelson Co., Va., June 28, 1916; 1, Harrisonburg, Va.; 1, Bowman's Bluff, N. C., July 16, 1898 (misidentified as C. pilosellus by Horvath); 2, Grady Co., Ga., June 24, 1935. All taken either in bats' nests or in places frequented by bats. U. S. National Museum Catalogue No. 53750.

Fig. 2—Cimex pilosellus Horvath.
Cimex adjunctus is closely related to C. pilosellus Horvath 1910, (Fig. 2), originally described from British Columbia from six specimens taken on the bat Myotis longierus at Okanagan Landing. Although none of Horvath's original series is in the collection of the U. S. National Museum, there is a typical female specimen of C. pilosellus from a nearby locality, Anarchist Mt., British Columbia, collected by C. J. Spencer on July 10, 1931, from the bat Lasionycteris noctivagans. Later in his "Revision of the American Cimicidae" Horvath, 1912, gave additional records for C. pilosellus based on specimens contained in the collection of the U. S. National Museum. A reexamination of this material shows that more than one species is involved in the lot, and that the one from Bowman's Bluff, N. C., is C. adjunctus.

Besides the reddish-brown color and smaller size, as compared with pilosellus, adjunctus differs by its larger eyes, shorter antennae, less incrassate femora, differently shaped elytral pads, and especially by the greater length and different arrangement of the marginal setae of the abdomen, as well as in the strigate character of the tergum.

MINUTES OF THE 503D REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 503d meeting of the Society was held at 8 p. m., Thursday, October 5, 1939, in Room 1605, South Building, U. S. D. A. President Snodgrass presided and 35 members and 16 visitors were present.

The meeting was not held in the National Museum because of the need of special equipment, and in order to allow more time for the special program the regular business was omitted.

President Snodgrass announced that the first number of the Memoirs of the Entomological Society of Washington, prepared by Miss Grace Sandhouse on the North American bees of the genus Osmia, has been published and was available for sale.

The special program consisted of a series of motion pictures, shown by R. G. Richmond, of the Bureau of Entomology and Plant Quarantine, demonstrating the current methods of control of grasshoppers and Mormon crickets in the Western States. The pictures were filmed by members of the Bureau and showed the biology of several of the more important species and the different steps in extensive control programs involving, in certain cases, all States west of the Mississippi River. Following the films, which were accompanied by explanation in sound, Mr. Richmond discussed the subject matter and emphasized the very large scale nature of the control programs.

Adjournment at 9.40 p. m.

Ashley B. Gurney, Recording Secretary.

Actual date of publication, November 30, 1939.
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September
by the
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.
Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3, 1918.
THE

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Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

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THE SPECIFIC IDENTITY OF THE AMERICAN DATE MITE; 
DESCRIPTION OF TWO NEW SPECIES OF 
PARATETRANYCHUS.

By E. A. McGregor,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In 1914 Banks described a mite occurring on the date palm at El Centro in the Imperial Valley of California. He gave it the name Tetranychus simplex. As a result of a study of Bank's type slides, the writer in 1919 synonymized T. simplex Banks with T. viridis Banks, the latter, from pecan in Texas, having been described in 1894. No males were present on Banks' slides of these two species, and no female anatomical differences could be found to separate them. At the same time the writer transferred viridis to Paratetranychus, a genus created in 1910 by Zacher to include tetranychids with complex tarsal claws.

In 1922 a mite referred to Ewing from dates in the Coachella Valley, Calif., was considered by him to be distinct from Paratetranychus viridis Banks, and was described by him as P. heteronychus.

In July, 1921, the late F. S. Stickney, of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, commenced a study of the mite attacking cultivated dates, and this project was continued, with interruptions, until late in 1934. In the final report on his studies Dr. Stickney desired to have established the specific identity of the mites attacking the date and other palms, as well as various grasses in the Coachella and Imperial Valleys. As one phase of this study he desired to know whether or not the mite attacking dates in the Imperial Valley is distinct from the date mite at Indio. Early in 1933 the writer undertook a study of the anatomy and distribution of the mites attacking dates.

At the time when Banks described viridis and simplex, the male genital characters of mites were not being employed.

Through the kindness of C. B. Nickels, in charge of the Bureau of Entomology and Plant Quarantine station at Brownwood, Tex., specimens of both sexes of a mite from pecan foliage in Texas were recently sent to the writer, who has made a comparative study of Banks' *simplex* and the pecan mite. The females of the latter mite appeared to be identical with those of *viridis*, based on Banks' description and the study of the type specimens, but the male pecan mite (Plate 29, fig. 10) was found to be distinct from the mite of dates (Plate 29, figs. 4 and 5). This demonstrates that the present writer was in error in reducing *Paratetranychus simplex* to synonymy with *P. viridis*, and he herewith restores Banks' *simplex* to valid specific status.

Since a mite, assumed to be the date mite, was known by Dr. Stickney to infest certain grasses, it became necessary to devote some attention to the mites occurring on various monocotyledons. In the course of this work mites were collected by Dr. Stickney and the writer from date and other palms, grasses, bamboo, etc., from many localities in eight counties of southern California, and two counties of Arizona. These studies of distribution and anatomy have been completed, and the data that follow constitute a report on the findings.

**ONLY ONE SPECIES ON DATES.**

In the course of these studies mites were microscopically examined from 57 distinct collections from date fruits and foliage. The localities were distributed throughout the Coachella and Imperial Valleys. Especial efforts were made to have in these collections ample material from the type localities of both *Paratetranychus simplex* Banks and *P. heteronychus* Ewing. H. W. Gray and L. C. Cordill, of the Division of Date Palm Scale Control, Bureau of Entomology and Plant Quarantine, sent the writer many collections of mites that had been intercepted in the course of their examination of date palms over a wide area in the Imperial Valley.

The writer attaches much significance to the fact that in all these collections from dates only one species of mite has been represented. The date mites from the Indio district have always proved to be identical with those from or near El Centro. It appears to be sufficiently established that the date mite of the Coachella Valley is the same as the date mite of the Imperial Valley. This is natural, since there are no barriers separating these districts.

Ewing's original description of *Paratetranychus heteronychus* agrees in all particulars with the anatomy of the mite on date at El Centro, which was the type locality of Banks' *P. simplex*. Furthermore, if the microscope equipment that Banks was using in 1914 is taken into consideration, his description of
P. simplex applies equally well to the P. heteronychus described by Ewing.

As the writer has shown that Banks' date mite (Paratetranychus simplex) is distinct from his pecan mite (P. viridis), the resurrection of simplex becomes necessary. He has shown that Ewing's P. heteronychus is identical with P. simplex. Since the name simplex has priority over heteronychus, the latter is here-with reduced to synonymy.

Bank's original description of Paratetranychus simplex was altogether too brief and unspecific to define the species properly. Ewing's description of the synonym, P. heteronychus, is given in considerable detail, and should serve most taxonomic needs. However, it seems best to rewrite the description of this species, taking into consideration the diagnoses of both Banks and Ewing as well as the data obtained by the present author.

Paratetranychus simplex Banks.

Plate 29, Figures 1-9; Text Figures 1, 2.

Female.—General body color usually flesh to pale amber, with few olive-amber markings (more greenish when feeding on grasses). Frequently spots along margin of abdomen, which vary in color according to the nature of the food plant. One perfect and one imperfect eye cornea on each side, these deep carmine. Body oval, fully one and one-half times as long as broad, rounded behind, averaging 0.304 mm. in length and 0.187 mm. in width. Almost no trace of suture between cephalothorax and abdomen. Twenty-six dorsal body setae, pale, not arising from tubercles. Forelegs pale salmon color; other legs flesh color. Mandibular plate somewhat narrowed anteriorly and rounded in front, with no emargination. Thumb of palpus one-third again as thick at base as axial length; terminal digit varying in length from one-third to one-half again its thickness at base (this structure being proportionately longer in immature individuals); on upper distal corner of thumb two pin-shaped digituli which are slightly longer than the terminal digit; fusiform dorsal sensilla situated at mid-point of thumb, slightly longer than terminal digit; thumb bearing three additional bristles, as usual. Foreleg about two-thirds length of body to front of cephalothorax, relative lengths of joints as follows: Coxa, 20; trochanter, 16; femur, 41; patella, 25; tibia, 27; tarsus, 41. Tip of tarsus bearing a single stout claw, curving more strongly toward its tip, bearing ventrally near its base a deflexed claw of the usual six subequal spurs; deflexed spurs slightly more than half as long as main claw. The usual series of four tenent hairs arising in pairs at sides of claw base. The collar trachea consisting of a rather short, nearly straight tube, which increases slightly in caliber toward its inner end. Egg spherical, without stalk, pale amber in color.

The eggs are deposited on the surface of the dates and among the fibrils of webbing which the females fabricate copiously. They are at first translucent-white to pale amber in color.

1 Average measurements of a large series of individuals.
Paratetranychus simplex Banks and *P. viridis* Banks.

Figure 1, Tarsal appendages (viewed laterally).
2, Eye cornea.
3, Tip of palpus of female and its appendages (viewed laterally).
4 and 5, Penis (lateral view).
6, Egg.
7, Collar tracheae, showing individual variation.
8, Female (dorsal view).
9, Fleshy spur on upper surface of second joint of palpus of male.
10, Penis of *P. viridis* Banks.
Male.—Body smaller, narrower, and more wedge-shaped than in female; legs, especially the forelegs, proportionately longer than in female, and of salmon color. Palpal spur and supporting tubercle present as usual. Penis of general type of that of Tetranychus bimaculatus; inner lobe rodlike, somewhat longer than shaft; basilar lobe represented by an obtuse prominence; shaft fairly stout, but over twice as long as its basal thickness, tapering gradually backward and bent upward and forward slightly beyond the 90-degree angle; hook short, about one-fourth as long as shaft, expanding terminally to form the barb, which is less than one-fourth as long as the shaft; the barb bearing a blunt inner and a sharp outer point, the latter being somewhat upturned. Thumb of palps bearing a terminal digit that is twice as long as thick. Tarsal claw of foreleg differing from those of other three pairs of legs, as is usual with red spider males; the deflexed claw, instead of being split into six spurs, consisting apparently of a single simple claw which resembles and equals the main claw. Length of male, 0.224 mm.; width, 0.148 mm.\(^1\)

---

**Fig. 2.**

*Paratetranychus simplex* Banks.

1. Tip of palpus of male and its appendages (viewed laterally).
2. Tarsal appendages of leg I of male (lateral view).

A MITE CLOSELY ALLIED TO AND EASILY MISTAKEN FOR THE DATE MITE.

In the course of the study of mites on grasses and other monocotyledons, previously mentioned, a species came to the writer’s attention which strongly resembles the date mite. In fact, these two species are so much alike that they can not be

\(^1\) Average measurements of a large series of individuals.
distinguished with a hand lens. This mite, which occurs very commonly on grasses throughout southern California and Arizona, proved to be an undescribed species, for which we propose the common name "grass mite." It is herewith described.

Paratetranychus stickneyi, new species.
1, Tip of palpus and its appendages (viewed laterally).
2, Fleshy spur on second joint of palpus of male (lateral view).
3, Collar trachea.
4, Tarsal appendages of female (lateral view).
5, Penis.
Paratetranychus stickneyi, new species.

Fig. 3, Figures 1-5.

Female.—Body outline and proportions similar to those of *P. simplex* Banks; color usually more greenish than in that species, and with abdominal spots blackish and more conspicuous. Twenty-six dorsal body setae, not arising from tubercles. Mandibular plate rounded anteriorly. Thumb of palpus in length equaling its thickness at base; upper distal angle of thumb removed from terminal finger by a distance equaling thickness of the latter, resulting in distal face of thumb being more than twice as thick as terminal finger; the latter only slightly, if at all, spatulate in profile; dorsal sensilla spindle-shaped, fully as long as terminal finger but more slender; other appendages of thumb arranged as usual. Tip of tarsus bearing a single stout claw which is provided ventrally, near its base, with a deflexed claw which is cleft to its base into six subequal spurs (tarsal appendages closely resembling those of *Paratetranychus simplex*). Collar trachea consisting of a rather short, nearly straight tube, which is expanded at inner end a little more abruptly than in *P. simplex*. Egg pale, nearly globular, but very slightly compressed dorsoventrally; without stalk.

Male.—Body much as in *Paratetranychus simplex*. Penis differing substantially from that of the latter; inner lobe rodlike, nearly twice as long as shaft; basilar lobe consisting of an obtuse prominence; shaft very stout, a little less than twice as long as its basal thickness, in profile with subparallel sides, narrowing very abruptly distally into the hook; hook one-third as long and one-fifth as thick as shaft, bent upward about 90° from axis of shaft, expanding terminally to form the very prominent barb, whose length is nearly half that of the shaft; posterior portion of barb produced into an acuminate, slightly downward-directed point; anterior portion of barb produced into an equally prominent rounded boss. Tarsal claw of foreleg closely resembling that of *P. simplex*; the ventral deflexed claw consisting of a single talon-shaped spur, resembling and equaling the main claw; the tarsal arrangement of legs II, III, and IV just as in the female.

Type slide.—Cat. No. 1236, U. S. N. M.

The type material is from Whittier, Calif., August 20, 1933, from Bermuda grass (*Cynodon dactylon*). This mite has been collected from 32 scattered localities in eight counties in southern California, as well as in Arizona. Most of these collections were from Bermuda grass, but this mite was also taken from various native and introduced grasses. The author has rarely failed to find this mite on Bermuda grass, and its occurrence on this plant is almost universal. The mite thrives best where the Bermuda grass is in a struggling condition through lack of moisture, and occurs only sparingly where the plants are in a thriving condition. The mite thrives best where the Bermuda grass is in a struggling condition through lack of moisture, and occurs only sparingly where the plants are in a thriving condition. Although the date mite (*Paratetranychus simplex*) is found rather often on grasses, the grass mite (*P. stickneyi*) has never been found on species of date palms, even when infested grasses occurred nearby.

1 This is true for several species of spinning mites.
The present species is probably closest to *Paratetranychus simplex* Banks. The two species may be distinguished as follows:

*Paratetranychus simplex* Banks.—General body color of female usually flesh to pale amber; spots, if any, usually inconspicuous. Thumb of palpus in female one-third again as thick at base as axial length; terminal finger two-thirds as thick as tip of thumb. Penis with shaft twice as long as its basal thickness, tapering gradually backward, and bent upward and forward a little beyond 90°; hook short, about one-fourth as long as shaft; barb less than one-fourth as long (tip to tip) as shaft, the outer point being directed somewhat upward.

*Paratetranychus stickneyi* McGregor.—General body color of female usually greenish amber; abdominal spots usually blackish. Thumb of palpus in female with basal thickness not greater than its axial length; terminal face of thumb over twice as thick as terminal finger. Penis with shaft very stout, less than twice as long as its basal thickness; sides of shaft subparallel, narrowing very abruptly distally; hook bent upward about 90° from its axis; hook relatively long, about one-third as long as shaft; barb strongly developed, nearly one-half as long (tip to tip) as shaft, the outer point being directed slightly downward.

THE OLD WORLD DATE MITE.

In 1932 André¹ pointed out that the mite of dates in Algeria differed significantly from *Paratetranychus heteronychus* Ewing, especially in the tarsal arrangement of leg I of the male and in the male genital structure. André concluded, from his review of the American literature, that the Algerian date mite is probably *P. simplex* Banks.

Dr. Stickney and the writer were anxious to compare the date mite of America with the mite attacking dates in Africa and Asia. They were fortunate in obtaining specimens collected on dates at Basrah, Iraq² and at Biskra, Algeria.³ These date mites were studied critically by the writer in an attempt to determine the origin of the mite attacking dates in the United States. As a result of this study the conclusion has been reached that the mites from Iraq and Algeria are identical. In the details of the male genitalia and the tarsal appendages of Leg I of the male the Asio-African mite differs from *Paratetranychus heteronychus* (as described by Ewing), and from its synonym, *P. simplex*, as revealed through the present studies. In the above and other details the date mite of Iraq and Algeria is divergent from other known species, and it seems advisable, therefore, to describe the species as new to science, as follows:

² Collected and sent by V. H. W. Dowson, of the Hills Brothers Eastern Company.
³ Supplied through the courtesy of M. Delassus, Chef du Service de l'Inspection de la Défense des Cultures l'Algerie.
Paratetranychus afrasiaticus, new species.

Fig. 4, 1-4.

Female.—Body 0.293 mm. long (to tip of mandibular plate) by 0.182 mm. wide (as received). Preserved specimens pale in color (described as yellowish to greenish by other workers). Twenty-six dorsal abdominal setae (including pair at posterior end), not arising from tubercles. Mandibular plate about twice as long as wide; rounded anteriorly, without emargination. Relative length of joints of foreleg: Coxa, 20; trochanter, 19; femur, 45; patella, 31; tibia, 28; tarsus, 46. Terminal finger of palpus fairly ample, in profile with subparallel sides, bluntly rounded at end, not much longer than thick; dorsal sensilla spindle-shaped, narrower than but as long as terminal finger. Arrangement of tarsal claw similar to that of Paratetranychus simplex, except that the ventral spurs about equal the main claw in length.

Male.—Body 0.234 mm. long (to tip of mandibular plate), 0.267 mm. to tip of palpi. Tarsal appendages of legs II, III, and IV similar in arrangement to those of female; tarsal claw of leg I consisting of the simple main claw, which is

Fig. 4.

Paratetranychus afrasiaticus, new species.

1, Tip of tarsus of foreleg of male, showing structure of claw (lateral view).

2, 3, and 4, Three drawings of penis.

(1, 2, and 3 are from specimens collected in Iraq; 4 is from material collected in Algeria.)
only slightly curved, and the usual ventral deflexed member, which is noticeably stouter and a little longer and more curved than the main claw; this ventral deflexed claw appears simple when viewed in exact profile, but actually is left almost to its middle into either two or four spurs (light refraction makes this point difficult to determine.) Penis with inner lobe apparently rodlke; shaft very thick, its greatest thickness from two-thirds to three-fourths its length, narrowing rather abruptly posteriorly, with a pronounced convexity at upper midpoint of shaft; hook deflexed upward almost 90 degrees from axis of shaft, and terminating in a clearly developed barb, the antero-posterior length of which is only about one-fifth that of the shaft; barb with a proximal, inconspicuous, rounded boss and a distal, acute point that is directed noticeably downward.

**Type slide.**—Cat. No. 1298, U. S. N. M.

The type material is from Biskra, Algeria, June 25, 1937, from dates, collected through the courtesy of M. Delassus.

The Old World date mite is perhaps closest to *Paratetranychus simplex* Banks. The two species may be distinguished as follows:

*Paratetranychus simplex* Banks.—General body color of female pale amber to flesh color. Tarsal claw of leg I of male with ventral deflexed member resembling the main claw, and apparently unsplit. Penis with shaft over twice as long as its basal thickness, and with no noticeable convexity at upper midpoint; barb of penis with blunt inner and sharp outer point, the latter upturned.

*Paratetranychus afrasiaticus* McGregor. General body color of female yellowish green. Main tarsal claw of leg I of male very little curved, with ventral deflexed member which is noticeably stouter and a little longer than the main claw; ventral member divided almost to its middle. Shaft of penis only about one-fourth to one-third again as long as its basal thickness, and with a strong convexity on its upper surface. Barb of penis with sharp outer point that is directed downward.

The importance of the date mite as a pest of growing dates in Iraq was noted by both Buxton\(^1\) and Ramachandra.\(^2\) The bunches of green dates become enshrouded in webbing spun by the mites, and the resulting effect, or disease, is called “toz.” Ramachandra describes the Iraq mite as “greenish yellow,” whereas the American species, when feeding on dates, is hardly at all greenish. This acarid occurs throughout Iraq and is considered the worst date pest in that country. This mite is also one of the major pests of dates in Algeria, according to Delassus and Pasquier\(^3\) and André.\(^4\)

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4. See footnote 1, page 254.
TWO NEW SPECIES OF CHRYSPS (DIPTERA : TABANIDAE) FROM PANAMA.

By G. B. Fairchild,

_Junior Entomologist, Gorgas Memorial Laboratory, Panamá, R. de P._

**Chrysops alleni**, n. sp.

♀ Length—5.6 mm., of wing, 5.5–6.5 mm.

Frons slightly wider than high, grey pollinose. The black callus at least twice as wide as high, almost lenticular in shape, and about ½ as wide as the total width of the frons. Ocelli black, prominent. Fronto-clypeus shining yellow, cheeks greyish yellow, pollinose, except below, where they are shining yellowish brown. Eyes with a typical _Chrysops_ pattern. Antennae a little longer than fore femora, the segments, beginning from the first, have length ratios of 1.75, 1, and 3. The first two segments are cylindrical, yellow, sparsely black haired, especially the apex of the 2d segment, 3d segment yellow basally, the annulate portion black.

Thorax steel grey pollinose, with 3 black shiny stripes, a median and a dorsolateral pair. Scutellum steel grey pollinose. Sides of thorax steel grey pollinose, except antecalar tubercle, and a stripe on the pleuron, which are black.

Fore coxae, at least basal half of all femora, apical halves of fore and hind tibiae, all of fore tarsi and apical segments of mid and hind tarsi black, rest of legs reddish to yellowish brown.

Wing (Fig. 1) hyaline with the following dark markings. Costal cell and stigma brown. An apical spot in the form of a dark narrow shading extends along the costa from the stigma to the apex. A narrow, somewhat broken, dark, crescentic band extends from the distal end of the stigma to near apex of the 4th posterior cell. Another more or less parallel band includes the veins forming the distal ends of the basal cells, and the distal end of the anal vein. In addition, there is a brownish streak down the middle of the 1st posterior cell from its base to beyond the fork of the 3d vein. The cross veins at the apex of the discal cell, and the fork of the 3d vein are all somewhat infuscated.

The abdomen is dorsally steel grey on the first two segments, with a dark spot beneath the scutellum on the first, and a broad inverted black V on the second, which reaches the anterior but not the posterior margin of that segment. The 3d to last segments are black with broad grey hind margins, somewhat wider in the middle and at the sides. Beneath, the abdomen is blackish with indistinct grey hind margins to the segments.

The male differs from the female in being considerably darker throughout. The fronto-clypeus is black, divided vertically by a broad pollinose yellow stripe. The dorsum of the thorax is nearly black, the usual lines indistinct, the scutellum dark grey to black. The abdomen is nearly black, the light hind margins to the segments being narrower than in the female and having a yellowish tinge. The wings are essentially as in the female, but marked smoky throughout, so that the pattern is not so conspicuous.


This species was first collected in a small patch of mangrove and salt marsh grass on the tide flats near the ruins of Old Panama and later taken in some quantity by Paul Allen of the Canal Zone Health Department in Matutela Swamp, an area of mangrove and mud fill on the west side of the Canal opposite Corozal. Mr. Allen found the species very annoying because of its numbers, but rather slow to bite.

This species seems most nearly related to *Chrysops caloptera* Hine of which I have seen two females from Morales, Guatemala, determined by Hine, in the U. S. National Museum collection. *Caloptera* has the frontal callus yellow, nearly as wide as the frons, the first two antennal segments subequal in length and together equalling or surpassing the third segment. The thoracic stripes are obsolete and the abdomen is black with narrow light posterior borders to the segments. The wings are darker than in *alleni*, more streaked, and with a dark spot in the discal cell.
Chrysops chiriquensis, n. sp.

♀ Length—8 mm., of wing, 8 mm.

Frons slightly wider than high, yellowish grey pollinose. The black or slightly yellowish callus nearly twice as wide as high, and almost as wide as the frons. The ocelli are black, and situated upon a large bare ocellar tubercle which is beset with long hairs. Fronto-clypeus shining brown, darker laterally, and with a narrow vertical median pollinose stripe. Antennae slightly longer than fore femora; the segments, beginning with the first, have length ratios of 1.37, 1, and 2.25. The first segment is dirty yellowish brown and slightly swollen, the second is darker and practically cylindrical, and the 3d is yellow only at the extreme base, the rest black. Only the terminal 4 or 5 annulations are clearly visible. The two basal segments of the antennae are rather thickly beset with black hairs.

Thorax black above, with a pair of very short yellowish dorsolateral lines on the anterior end, and clothed with sparse long greyish hairs. Pleura brownish with dark hairs. Legs dull reddish to yellowish brown throughout, except apices of femora and tarsi, which are blackish. All legs clothed with black hair, which on the hind tibiae forms rather prominent fringes.

Wing (Fig. 2) hyaline except as follows. Costal cell, basal half of first basal and basal 3d of second basal cells black. Cross-band broad, filling out half of 3d and all of 4th and 5th posterior cells, the apex of anal cell, and fading out proximally in the axillary cell. The outer border of the cross-band is fairly even, but there is a slight projection in the first submarginal cell. The hyaline crescent reaches the costa, the apical spot thus being separated from the cross-band. The apical spot is drop-shaped, and extends just to the apex of the wing.

The first segment of the abdomen (Fig. 3) is black, or with considerable yellow on the sides; the second is yellow, with a thick, black mid-dorsal inverted V, which reaches the anterior but not the posterior margin, and there is a small black diagonal mark extending from the hind margin on each side towards the center. The 3d to 5th segments are black, with a yellow W-shaped mark in the middle of each, and the 6th and 7th segments are black, with a narrow yellow hind margin. Beneath, the abdomen is blackish, with a pair of yellowish parallel lines, and is clothed with grey hairs.

Holotype ♀, Boquete, Chiriqui province, Panama, 3–4000 feet elev., V-7–39. 3 ♀ Paratypes, Sta. Emilia, Pochuta, Guatemala. 1000 metres, Feb.–March, 1931. In Dr. J. Bequaert's collection. Holotype to be deposited in the Museum of Comparative Zoology. This species seems nearest Chrysops alivagus O. S. and C. subcaecutiens Bell., but differs from both in the slender antennae and differently marked wings and abdomen. The pollinose stripe on the fronto-clypeus would seem to indicate a relationship with the North American forms with this character. The specimens mentioned by Hine under subcaecutiens (Occ. Papers Mus. Zool. Univ. Mich. No. 162, p. 20. 1925) as coming from Boquete, are in all probability this species, as he mentions the dark crossband as reaching the
hind margin in almost full intensity, a character which subcaecutiens lacks, according to Pechuman (Rev. Ent. VII, fasc. 2–3, pp. 138–140, fig. 2, July, 1937).

DESCRIPTIONS OF ONE NEW GENUS AND THREE NEW SPECIES OF DIAPRIIDAE (HYMENOPTERA).

By Robert M. Fouts.

The descriptions of the very interesting and distinctive new genus and two of the new species presented in this paper are based on material submitted to the author for identification by Mr. C. F. W. Muesebeck of the United States Bureau of Entomology and Plant Quarantine. One species, that from Cabin John, Maryland, has as its representative one specimen collected in 1916 by the author.

XENOPRIA, new genus.

Head rather thick, about as wide as, or a little wider than, long (vertex to base of mandible); frons below antennal ledge shallowly excavated; head with a few fine scattered punctures; antenna 13-jointed in both sexes, with short whitish hairs, in the female clavate, with transverse club joints (except the terminal one), in the male filiform, all the joints longer than thick, the fourth joint with a slight triangular projection before middle; pronotum visible from above as a narrow line medially, bluntly angulate laterally; mesonotum subconvex; notauli complete; scutellum flattened, wider than long, with a curved line of three or five foveae all along its front margin, the middle one the furthest forward; the outer depressions are smaller than the others and may be absent, fused with those adjacent to them, in which case only three are in evidence; scutellum itself with a row of closely set punctures along the posterior margin and with one or several small ones laterally; propodeum more or less distinctly areolate, deeply emarginate posteriorly; abdomen 7-segmented in both sexes, in the female about one and one-half times as long as the thorax, in the male a little shorter, narrower than the thorax in both sexes; petiole about twice as long as wide in the female, with or without a complete median carina, but always with one near the apex, this ridge near the tip not or imperceptibly higher than its extension forward, or, in case there is no such extension, than the surface of the sclerite, its apparent greater height being due to the depression of adjacent areas on either side; petiole in the male nearly three times as long as wide, cylindrical, with or without a complete median carina, in either case present posteriorly as in the female; second tergite widest behind the center, narrowing slightly posteriorly, strongly anteriorly, elevated slightly over the petiole as in Spiniparius, with a narrow median linguiform incisure on basal fourth or fifth and with a small depression on either side near the anterior margin; tergites 3–5 broadly transverse, without sculpture; 6 and 7 much narrower, not or scarcely wider than long; from a side view a line formed by the surface of the sixth and seventh tergites turns sharply downward, forming nearly a right angle with the surface
of the fifth; the tip of the abdomen itself does not curve downward, the surface of the terminal sternites being approximately horizontal in normal position; in the male the upper surface of the abdomen curves evenly downward from the apical one-third of the second tergite to the apex of the fifth; the surface of the sixth and seventh tergites, as in the female, forms an angle with that of those preceding, this angle, however, not so acute as in the female; femora distinctly but not strongly thickened; tibial spur curved, bidentate at tip, nearly attaining the tip of the first tarsal joint; tarsal claws edentate; front wings rounded apically; subcosta terminating slightly before middle of wing in a small oblong stigma which is not or scarcely longer than wide; basal vein present, sharply or more or less indistinctly indicated; radius straight, oblique, shorter than the stigma; medius sometimes present distally as a pale brownish line.

Distinctive characters of this new genus are: 13-jointed antennae in both sexes; scutellum with three or five foveae at base, and with a row of closely placed punctures along the posterior margin; complete notauli; an aracelate propodeme, emarginate posteriorly; a subcosta terminating just before the middle of the wing in a small oblong stigma; a seven-segmented abdomen in both sexes, the second tergite elevated slightly above the petiole and with two small depressions on either side of a median incisure at base.

The three included species, hereinafter described, are, although obviously very closely related, readily distinguishable from one another. *Punctata* differs from the other two in having the petiole strongly punctate and *nigripes* differs from *columbiana*, the genotype, in having the antennae and legs blackish or very dark brown.

**Xenopria columbiana**, new species.

*Female.*—Length 2.5 mm. Head distinctly wider than long, slightly longer than thick (Fig. 3), about one and one-fourth times as wide as thick; antenna as shown in Fig. 1, the club joints thickly, and the others more sparsely, covered with short whitish hairs; thorax one and one-half times as long as wide, a little wider than the head or abdomen, one and one-fourth times as wide as thick; scutellum with five depressions at base, the three median ones subequal in size and depth, the lateral one on each side decidedly smaller (Fig. 4); scutellum with two small punctures on each side, one, situated close to the edge and half way from base to apex, the other one a little further in from the edge near the corner, as far from the posterior as from the lateral margin; enclosed areas on propodeme larger and more clearly defined than in *nigripes*, the ridges separating them, however, low, not as prominent as in the male; abdomen slightly more than one and one-half times as long as the thorax; petiole about twice as long as wide, nearly half as long as the second tergite, with a complete median carina from base to apex, above and on sides more or less irregularly wrinkled, not punctate as in *punctata*; second tergite 1.6 times as long as wide, 3.3 times as long as the following five segments combined; sixth tergite punctate; black; pedicel and funicle reddish-brown; club, coxae, femora, and last tarsal joint, and venation, dark brown; rest of legs stramineous or light brownish.

*Male.*—Length 2.4 mm. Similar to the female but differs in some particulars:
head 1.2 times as wide as long, slightly wider than the thorax; antennae filiform (Fig. 5); scape with a few short hairs; other joints rather thickly covered with whitish hairs which are shorter than the diameters of the joints to which they are attached; fourth joint with a small tooth-like projection as shown in Fig. 6; thorax 1.8 times as long as wide, scarcely wider than thick; areolae on propodeum larger than in the female, the ridges higher; abdomen 1.45 times as long as the thorax, scarcely narrower than the thorax; petiole 2.7 times as long as wide, without a complete median carina but with several complete sinuous ones dorsally and laterally and with a few irregular and incomplete ones medially above, these ridges low and smoothly rounded; second tergite 1.6 times as long as wide, about three times as long as the five following joints together; black; antennae dark brownish, the pedicel somewhat lighter brown; legs golden brown, the coxae and femora somewhat darker.

Variations.—In either sex there may be only three large scutellar foveae, the outer two being enlarged and including the space ordinarily occupied by the small one on either side.

Type locality.—McLeod Meadow, Kootenay National Park, British Columbia.

The type series consists of four females and five males recorded as being Stratiomyid parasites. The host material was collected on Sept. 15, 1937, by Mr. G. R. Hopping and removed to Vernon, B. C., the parasites emerging on Dec. 28, 1937, and Jan. 3, 1938.

Type, allotype, and three paratypes deposited in the collection of the U. S. National Museum, Cat. No. 53262.

Xenopria nigripes, new species.

Female.—Length 2.1 mm. Head 1.1 times as wide as long, 1.2 times as wide as thick, distinctly narrower than the thorax; antenna as in columbiana (see Fig. 1); thorax 1.45 times as long as wide, 1.2 times as wide as the abdomen, 1.14 times as wide as the head, 1.3 times as wide as thick; scutellum with five basal foveae, the center one wide, much wider than the two on either side of it; within the border of this large central fovea, on either side, is a smaller longitudinal depression or furrow; scutellum with a small puncture posteriorly on each side; propodeum as in punctata; abdomen one and one-half times as long as the thorax; petiole twice as long as wide, with a median carina only at apex, medially with some small longitudinally directed wrinkles, laterally with several longitudinal carinae which become lost in a wrinkled area anteriorly; the surface, in spite of the wrinkles, is shining, not subopaque as in punctata; second tergite 1.45 times as long as wide, 1.8 times as long as the petiole, 3.6 times as long as the following segments together: sixth tergite finely punctate; black; pedicel and flagellum dark brown, the tip of the former lighter brown; coxae black, femora and tibiae, except at apices, very dark brown; rest of legs and venation lighter brown.

Variations.—The lateral scutellar foveae may be fused or united with those adjacent to them, the result being that only three are in evidence; the petiole may be somewhat more strongly sculptured, more strongly carinate laterally and with a distinct median carina on apical half.
Type locality.—Saratoga, Wyoming.

The six female specimens comprising the type series emerged Aug. 16 to Sept. 22, 1937, from cages which had been placed on the trunks of *Pinus flexilis* that had been killed by *Dendroctonus ponderosae* Hopk., and were recorded in the files of the Bureau of Entomology and Plant Quarantine under Hopk. U. S. No. 31507–t–18. Mr. Muesebeck informs me that since a large variety of insects and other Arthropods were obtained in the cages referred to above, it is impossible even to guess at the host association of the Diapriids.

Type and two paratypes deposited in the collection of the United States National Museum, Cat. No. 53263.

*Xenopria punctata*, new species.

Female.—Length 2.0 mm. Head as wide as long, 1.4 times as wide as thick, as wide as the thorax; antenna clavate (Fig. 7), covered, as in *columbiana*, with short whitish hairs; scutellum with five basal foveae, three large ones and a small one on either side; areolae on propodeum small and shallow but distinct, the raised lines being polished and therefore readily distinguishable from the somewhat wrinkled surfaces of the areolae; thorax 1.8 times as long as wide, 1.35 times as wide as thick, slightly wider than the abdomen; petiole twice as long as wide, densely punctate dorsally, subopaque, punctate and with a few longitudinal wrinkles laterally, without a median carina except shortly at apex; second tergite 1.6 times as long as wide, 2.2 times as long as the petiole, about 2.75 times as long as the five following segments together; sixth tergite with an obscure fine sculpture; coloration as in *columbiana*.

Type locality.—Cabin John, Maryland.

Description based on the holotype collected, Aug. 22, 1916, by the author.

Explanation of Plate 30.

(Figures 1–6 are of *Xenopria columbiana*; Fig. 7 of *X. punctata*.)

Fig. 1.—Antenna of the female (pubescence not shown).
Fig. 2.—Abdomen of the female.
Fig. 3.—Profile of female head.
Fig. 4.—Propodeum of the female.
Fig. 5.—Antenna of the male.
Fig. 6.—Fourth antennal joint of male (from above).
Fig. 7.—Antenna of the female.
BOOK REVIEW.


The original edition of this book appeared in 1928. In its second edition, this most admirable work has received extensive revision together with about 70 pages of additional matter. Among the many valuable improvements noted are the inclusion of keys to the orders of insects treated both for the adult and immature stages. A more complete discussion of insect-borne plant diseases is given together with a table of some of the more important diseases. The chapter on the control of insects has been brought well up to date and reflects the rather general changes that have occurred in recent years, both in the use and character of insecticides. In this section of the book, each important insecticide is discussed, including its history, chemical and physical nature, active principle, field of usefulness, dosages and method of preparation. The compatibility of insecticides with other spray materials and their advantages and disadvantages, as compared with other insecticides, are excellently explained.

The terminology has been modernized in the discussions on morphology, phylogeny and development, and these have been made considerably more comprehensive in scope.

In the admirable discussions of particular insect pests, much beneficial rearrangement of material has occurred. This section of the book, embracing chapters XI to XXIII, inclusive, and comprising 578 pages, begins with a discussion of defoliating species and ends with insects that affect the health of man. In this portion of the work the matter is arranged with reference to the character of the injury inflicted by the insect rather than the more usual ordinal arrangement. For practical purposes this is both logical and convenient and is a system which should commend itself both to the grower and the worker in applied entomology.

Another valuable and time saving feature of this edition is the introduction of an easily understood system of cross-references in the case of such species as are treated in two or more portions of the book as enemies of different crops, as for instance, the 12-spotted cucumber beetle which is also discussed as the Southern corn rootworm.

The standard of excellence in illustration was unusually high in the original edition of this work but it has been further enhanced in the present edition by the addition of many new figures of most excellent quality. In the very complete index, a most laudable feature is the printing in bold face type of the page upon which the principal discussion of each species occurs.

This is a handsome, substantial volume, comprehensive in content and which seems destined to be considered the standard text on the economic entomology of North America.

—W. R. W.

Mr. Walton has written all that precedes and it remains for me (Howard) to add my hearty endorsement of all that he has written and to congratulate
Messrs. Metcalf and Flint strongly for the splendid job they have done. This big second edition of their masterly work shows me two things: first, that applied entomology is advancing very rapidly, and, second, that in spite of this rapidity the students of to-day have an infinite amount more done for them by their teachers than used to be done when I was student and later. A young man who has this great book does not have to go into the library and dig for hours and hours in search of original sources. He is given an absolutely up to date starting point. And what an immense advantage that is! It makes me very sorry indeed for the old times.

Again my warmest congratulations to the writers of this book and to the present generation of students.

—L. O. Howard.

MINUTES OF THE 504th REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 504th meeting of the Society was held at 8 p. m., Thursday, November 2, 1939, in Room 43 of the National Museum. President Snodgrass presided, with 37 members and 12 visitors present. The minutes of the October and June meetings were read and approved.

The following new members were elected:

Pablo J. Anduze, Division Malariologhia, Ministerio de Sanidad, Caracas, Venezuela.

Graham B. Fairchild, Gorgas Memorial Laboratory, Ancon, Canal Zone.

Under Notes and Exhibition of Specimens, Mr. Van Dine reported the occurrence of the pear psylla in the Pacific Northwest. The known distribution of this insect has hitherto been restricted to the eastern part of the United States, but in the summer of 1939 it was found in a limited area east of Spokane, Washington. The infested area is chiefly in the State of Washington, although it includes a few localities directly east of the Idaho-Washington State line. Careful surveys of the remainder of Washington and of Oregon have failed to reveal the presence of this insect at any other points.

B. A. Porter mentioned the occurrence of Comstock's mealybug as a serious pest in apple orchards. This species has been known for some time in the United States as a pest of catalpa but in recent years has become of serious importance in a number of apple orchards in Virginia, West Virginia, Ohio and other eastern states. (Author's abstracts.)

The regular program consisted of a symposium on fruit insects, and was comprised of the following talks by members of the Bureau of Entomology and Plant Quarantine:


The survey method is being used by the Division of Fruit Insect Investigations of the Bureau of Entomology and Plant Quarantine in the determination of insects that may be suspected of being vectors of the phony peach disease and peach mosaic. Two mobile laboratory units are being employed for the purpose. One is covering the southeastern United States where phony disease is found, and the second is surveying the southwestern United States where peach mosaic...
disease occurs. The insect suspects are determined by comparing the distribution of the species found in the peach orchard with the known areas of the natural spread of the diseases. The list of suspects is narrowed down considerably by further comparing the population levels of the insects with the rate of spread, or the incidence of the diseases. The survey method lends itself to considering large numbers of insects, making first qualitative collections and then quantitative studies. Both surveys have entered the second phase of the work.

The mobile laboratory units and typical locations that have been selected as sampling stations in peach orchards were illustrated by lantern slides. The work on the relation of insects to the transmission of peach diseases is organized in cooperation with the Divisions of Domestic Plant Quarantines and Insect Identification, and with the Bureau of Plant Industry. (Author’s abstract.)


A series of slides was shown illustrating the laboratory-field method used at the Vincennes, Indiana, laboratory. This method consists of spraying the fruit in the orchard as is done in commercial practice. The sprayed apples are then brought to the laboratory and artificially infested with a known number of codling moth larvae. In this way it is possible to eliminate many of the variables which cause difficulty in the interpretation of results of tests carried on entirely in the field. The method also gives a running picture of the behavior of the spray treatments under test through the season, which leads to a much better understanding of the materials tested. (Author’s abstract.)


A summary of recent developments was given. The area of continuous infestation is increasing at the rate of 10 to 15 miles per year. In addition a number of isolated infestations have been found at various points. In the older-infested area the infestation has diminished. Present control measures were reviewed briefly and mention was made of the increasing part apparently played by certain diseases in the natural control of this insect. (Author’s abstract.)

Discussion followed by Poos, Van Dine and Anderson.

Adjournment at 9.55 p. m.

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Actual date of publication, December 29, 1939.
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OF THE

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WASHINGTON

VOLUME 48

Published by the Society
Washington, D. C.
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WASHINGTON, D. C.
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September
by the
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under
Act of August 24, 1912.
Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October
3, 1917, authorized July 3, 1918.
THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON
Organized March 12, 1884.

The regular meetings of the Society are held in the National Museum on the
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Published monthly, except July, August and September, by the Society at
Washington, D. C. Terms of subscription: Domestic, $4.00 per annum;
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NOTES ON CERTAIN GENERA OF NORTH AMERICAN GRASSHOPPERS OF THE SUBFAMILY OEDIPODINAE, WITH THE DESCRIPTION OF A NEW GENUS AND SPECIES (ORTHOPTERA: ACRIDIDAE).

By Ashley Buell Gurney,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The comparatively full extent to which the grasshoppers of the United States are now known is indicated by the fact that of approximately 130 genera, only 3 have been described during the past 20 years which were not based at least in part on previously known species. Within the Oedipodinae, only one such genus (Coniana Caudell 1915) has been described since 1900. The receipt of a new species of Oedipodinae from New Mexico and the Mexican State of Durango, which represents a well marked new genus, is, therefore, of unusual interest. While it is true that most of the species and genera of Nearctic Acrididae have been described, much work remains to be done before the limits of many genera are satisfactorily known, thus permitting the definite generic assignment of certain species and the preparation of reliable keys.

The writer is indebted to J. R. Parker of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, and his associates at the Bozeman, Montana, laboratory, for making material of the new genus available and for the notes accompanying the specimens collected in New Mexico. Acknowledgment is also made of the privilege of studying the collections of Morgan Hebard and the Academy of Natural Sciences of Philadelphia. James A. G. Rehn of the latter institution has kindly placed those collections at the writer's disposal and has generously contributed numerous helpful suggestions.

The new genus is allied to Hadrotettix and the Group Anconiae. A discussion of related genera follows the description. The preparation of a key distinguishing several genera seems advisable, and the author has chosen, somewhat arbitrarily, to treat those usually placed at the end of the subfamily, beginning with Trimerotropis. In Bruner's key (1905, p. 114), they are so placed and the relationship to other genera is indicated, but naturally several nomenclatorial changes and additions of new
genera have since been made. It should be noted that in that key Xeracris and Shotcellia would go in the first part of the subfamily, near Arphia Stål and Chortophaga Sauss., because of the narrow metasternal interspace. This character is important, but not worthy of the great importance assigned to it by Bruner. Trepidulus McNeill is actually closely related to Derotmema Scudd., because of the structure of the prozonal disk, which has conspicuous lateral prominences near the posterior margin, but in Bruner's key it falls near Anconia. With the exception of Trimerotropis, Circotettix, and Aerochoreutes, the genera in the following key agree in lacking definite lateral carinae of the pronotum, the disk rounding evenly into the lateral lobes except on the metazona, where there are rounded shoulders; the median carina of the pronotum is never carinate and is usually poorly developed or obsolete, except in the above genera, which are variable in these features. Actually, the generic limits of Trimerotropis and certain other genera will remain uncertain until much fuller studies than the present one are made, but the following key to one section of the Oedipodinae is made in the light of present information with the hope that it will be helpful. The most useful keys to the Oedipodinae, including Middle and Far Western genera, are those of Scudder (1897), Bruner (1905), Beamer (1917), Henderson (1924), and Hebard (1934, 1936), but a revised key containing all North American genera is much to be desired.

**Key to the new genus Shotcellia and related North American genera.**

1. Posterior margin of disk of pronotum broadly rounded, about as in fig. 5

- Posterior margin of disk of pronotum less broadly rounded, varying from a condition about as in fig. 4 to distinctly acute. (Inner apical spurs of hind tibia not extremely long, as is true of Spani-acris (fig. 3), some specimens of which may appear to come here)       

2. Tegmen with intercalary vein (fig. 9)      

- Tegmen without intercalary vein (fig. 8)       

3. Wing with swollen radiate veins; radiate field usually enlarged (fig. 13)       

- Radiate veins normal; radiate field usually not enlarged (fig. 12)       

4. Wing (fig. 12) with heavy dark band reaching to anal angle, without taenia extending toward base; inner surface of hind femur dark blue to apical third, except for narrow pale margins (fig. 17); median carina of prozona of pronotum subobsolete, rarely cut by anterior sulcus; antennae unusually long and enlarged

**Hadrotettix Scudder**

- Wing banded or not, but if so not as above and usually with taenia; inner surface of hind femur rarely approaching above condition; median carina of prozona usually carinate and cut by anterior sulcus, rarely subobsolete behind anterior sulcus or indistinctly cut by sulcus; antennae variable

**Trimerotropis Stål**
5. Not all superjacent radiate veins of wing swollen (fig. 13); fastigium of male longer than wide. Circotettix Scudder

- All superjacent radiate veins swollen; male fastigium as wide as long. Aeroboreutes Rehn

6. Fastigium with lateral carinae strongly and abruptly convergent anterior to compound eye and then narrowly separated at apex (fig. 4); anterior margin of pronotum usually with two definite median adjacent convexities, these more developed in female than in male; apex of female subgenital plate with median projection; no wing band present. Cibolacris Hebard

- Fastigium with lateral carinae converging gradually, widely separated at apex (fig. 7); anterior margin of pronotum without convexities; apex of female subgenital plate without median projection; wing band usually indicated. Heliastus Saussure

7. Hind femur very broad, inner surface with strong black pattern in basal two-thirds (figs. 1, 16). Shotwellia, new genus

- Hind femur slender, not colored as above. Xeracris Caudell

- Metasternal interspace quadratine in female, elongate in male. Neraacris Caudell

8. Metasternal interspace transverse in female, quadratine or transverse in male.

9. Fastigium markedly produced in front of eyes, about as in Shotwellia (fig. 5); inner apical spurs of hind tibia moderately short (fig. 2). (Latero-posterior angles of lateral lobes of pronotum not produced caudad.) Anconia Scudder

- Fastigium moderately produced in front of eyes and differently shaped, with lateral carinae converging rather abruptly and foveolae prominent; inner apical spurs of hind tibia long (fig. 3). Spaniacris Hebard

10. Compound eyes extending dorsad of level of vertex in lateral view (fig. 6), most markedly so in male; lateral lobes of pronotum not produced caudad; posterior margin of disk of pronotum bluntly, obtusely angulate; male with anterior margin of pronotal disk much elevated above level of principal sulcus in lateral view, female less so. (Approximate measurements of female: length of body 35 mm., of hind femur 27 mm., of tegmen 30 mm.) Coniana Caudell

SHOTWELLIA, new genus.

Generic description.—Size medium; form rather slender (male) to moderately robust (female); winged in both sexes. Head with vertex elevated above level of pronotal disk; face strongly (male) to moderately (female) retreating. Fastigium of vertex broadly excavate; lateral carinae raised and strongly but gradu-
ally converging anteriorly, separated at apex by distance subequal to width of first antennal segment. Foveolae visible from above, gently convex. Antennae moderately stout.

Pronotum with median line of disk nearly straight in lateral view; median carina cut by principal sulcus and imperfectly cut by two sulci of prozona; median carina distinct but scarcely raised on metazona, absent or subobsolete on posterior half of prozona; anterior margin fairly strongly (male) to slightly (female) convex; posterior margin broadly rounded; disk of lateral lobes broadly and shallowly concave, posterior margin not produced. Lateral carinae not indicated on prozona, very broadly rounded on metazona. Prosternum with a low transverse carina (male) or broadly and transversely convex (female). Mesosternal interspace quadrate or subquadrate; metasternal interspace elongate.

Front and middle legs of medium size; hind femur very broad, dorsal carina moderately, ventral carina strongly, lamellate; genicular lobes unarmed; Brunner’s organ present.¹ Hind tibia with spines on external margin sparse; no external spines at apex; apical spurs of moderate length; inner spurs subequal. Tarsal claws simple; arolium very small.

Tegmen with intercalary vein well developed; cells in apical third elongate rectangular and regularly arranged, a few irregularly arranged subquadrate cells at apex. Wing well developed, of moderate width; margin of axillary field slightly lobate, of radial field evenly convex; radiate veins not swollen.

Abdomen moderately compressed. Female subgenital plate with posterior margin sinuate, a short, broadly triangular median projection. Ovipositor valves well extended and of moderate size.

The genus is named in honor of Robert L. Shotwell, of the Bureau of Entomology and Plant Quarantine, whose field studies of the grasshoppers of the West have been helpful in establishing a sound basis for work in biology and control.

Genotype.—Shotwellia isleta, new species.

¹ Rehn (1923, p. 44) points out that this tooth has no diagnostic value, and Slifer and Uvarov (1938) show that with the exception of the Pneumorinae and Proscopinae Brunner’s organ occurs in all the subfamilies of Acrididae.
Shotwellia isleta, new species.

Figs. 1, 5, 9, 10, 14-16, 18.

Male (holotype).—(Wings unspread.) Vertex evenly convex; dorsal level of eyes equal to that of vertex (fig. 1); frontal costa (fig. 10) shallowly sulcate ventrad of median ocellus, not developed on lower portion of face; (antennae missing); genae only moderately convex. Metazona (fig. 1) with disk nearly level; shallowly punctate on disk and lateral lobes. Meso- and metasterna as in fig. 14. Anterior sulcus poorly developed, scarcely cutting median carina; posterior sulcus of prozona well developed, except on disk, and intersecting carina with a low cut. Tegmen about as in female (fig. 9). Wings reaching tips of tegmina when closed. Front and middle femora smooth, convex dorsally and ventrally. Front and middle tibiae each with a cluster of small, well spaced, ventral spurs along apical third. Hind tibiae with number of external and inner spines 6–8 and 9–9, respectively; dorsal inner spur slightly shorter than ventral spur; external spurs slightly shorter than inner ones, and subequal to each other; ventral inner spur with several prominent setae on lateral surfaces. Claws and arolium about as in female (fig. 18). Subgenital plate bluntly conical at apex; cercus about 2½ times as long as basal width, gradually tapering to blunt apex; supra-anal plate with smooth surface, the apex broadly triangular.

Coloration: General coloration pale brown (about as the average color of cork); compound eyes slightly darker; principal sulcus of pronotum, lateral extremities of sulcus anterior to it, spurs of front and middle tibiae, apices of hind tibial spines and spurs, and apices of tarsal claws black. Metazona tinged with reddish brown. Hind femur of same ground color, with pattern of black on inner surface as in female (fig. 16); apical lobes largely dark; two well marked dorsal bands of which the apical one is poorly developed and the basal one obsolete on external surface. Hind tibia fuscous at base, then an indefinite annulus of dirty white followed by yellow in the distal two-thirds. Tegmen as in female (fig. 9), with dark pattern grading from black at costal margin of largest band to pale fuscous in less developed areas. Abdomen slightly paler beneath; lateral surfaces of basal segments dark brown at base.

Measurements: Length of body 21.5 mm., of pronotum 4.5 mm., of tegmen 20 mm., of hind femur 11.7 mm., of hind tibia 10 mm.; greatest width of pronotum (caudal, including lateral lobes in perspective from above) 4.6 mm.

Female (allotype).—Differing from male as follows: Eyes slightly less prominent; fastigium with lateral carinae converging rather more strongly; frontal costa narrowing above antennal bases more gradually; median carina of prozona not cut by anterior sulcus, intersection by second sulcus scarcely indicated; anterior margin of pronotum only slightly convex; tegmen as illustrated (fig. 9); meso- and metasterna as in fig. 15; external and inner hind tibial spines 8–8 and 9–9, respectively; cercus triangular, less than twice as long as basal width; abdomen more compressed, ovipositor simple; scoop of dorsal valve well developed and with sharp, untoothed carinate margins.

Coloration: General coloration slightly darker than male. Wing transparent throughout, very pale yellow at base, then nearly colorless, grading into cloudy fuscous, the apex of anterior field nearly colorless. Sulci of pronotum, external apex of hind femur, and base of hind tibia less marked with dark than in male.
Measurements: Length of body 30 mm., of pronotum 5.8 mm., of tegmen 26 mm., of hind-femur 14.8 mm., of hind tibia 11 mm.; greatest width of pronotum 6 mm., of tegmen 4.5 mm.

In addition to the type and allotype described above, there is one female paratype which differs essentially from the allotype only in larger size and minor color features. Number of external and inner spines of hind tibiae 8–8 and 9–9, respectively. Pronotal sulci not darkened. Transverse fuscous band distad of the principal band considerably wider than in the allotype and practically fused with the three subapical spots. General color of the abdomen darker. Antennae (missing in allotype) dark brown. Measurements: (Abdomen abnormally distended), length of pronotum 6.8 mm., of tegmen 31 mm., of hind femur 18.6 mm., of hind tibia 14.4 mm., greatest width of pronotum 7.2 mm., of tegmen 5.7 mm.

**Type locality.**—Vicinity of Isleta Indian Reservation, Bernalillo County, N. Mex.

**Type.**—No. 53956, U. S. National Museum.

The type and allotype were collected at the type locality August 22–24, 1938, by Q. A. Hare, during surveys conducted by the Division of Cereal and Forage Insect Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. Collections were made in range areas where dominant established grasses included *Bouteloua eriopoda* Torr., *Hilaria jamesii* (Torr.) Benth., *Muhlenbergia torreyi* (Kunth) Hitchc., and *Scleropogon brevifolius* Phil. In certain areas Bermuda grass (*Cynodon dactylon* (L.) pers.) and sedges (*Carex* sp.) were also dominant. The paratype was taken at Gomez Palacio, Durango, Mex., in May, 1918, by August Busck.

The type locality is in the Rio Grande Valley where the Upper Sonoran and Lower Sonoran Life Zones merge. Bailey (1913) has mapped and discussed the life zones of New Mexico, and says (p. 14), “The Rio Grande Valley from the Texas line north to Socorro is mainly Lower Sonoran, and traces of the zone extend north to Las Lunas and into the lower Puerco Valley.” Typically, the Upper Sonoran is the plains zone of short grasses, while the Lower Sonoran is that of the creosote bush (*Covillea*) or southern desert shrubs. Gomez Palacio is near the Durango-Coahuila border about 300 miles south of Presidio, Tex., and nearly 700 miles from the type locality. It is in a small area of the short grass zone in which irrigation has permitted the growing of cotton. To the north desert extends to the Rio Grande, while northwestward is a vast area of *Covillea* association in Chihuahua (See Shelford, 1926).

**Remarks on Shotwelia and Allied Genera.**

In the current arrangement of American Oepipodinae, comprising about 50 genera, those from *Trimerotropis* on are grouped
at the end of the subfamily and include about a dozen Nearctic genera. To *Trimerotropis* there are now referred about 50 species and races. The nearest allies are *Conozoa* Saussure, *Circotettix*, and *Hadrotettix*. The genera preceding them include *Trachyrhachis* Scudder, *Psinidia* Stål, and their allies, but they need not be confused with *Trimerotropis* and are not discussed here. The need for a careful study and generic delimitation of *Trimerotropis* is exemplified by *T. bilobata* R. & H. and other species which are nearly as typical of *Conozoa* as of *Trimerotropis*; this fact was recognized by Rehn and Hebard (1906, p. 382) in describing *bilobata*. Most species of *Circotettix* are easily separable, generically, from *Trimerotropis*, as indicated in the key. However, Hebard (1928, p. 261) has pointed out the close affinities of *C. verruculatus* (Kirby) and *T. suffusus* Scudd. (of which *T. obscura* Scudd. is a synonym according to Hebard, 1929, p. 362), and the wings are very similar in these two species. *Hadrotettix* is represented by only *trifasciatus* (Say) in this country, but a second species, *nebulosus* Scudd. of uncertain status, is recorded from Sinaloa, Mexico. Scudder (1900) assigned two other species to *Hadrotettix, mundus* Scudd. which belongs to *Trimerotropis* and *gracilis* Bruner, a synonym of *T. pistrinaria* Sauss. (See Hebard, 1929, p. 356; 1931, p. 165.) In some individuals of *T. strepsa* McNeill the median carina is so poorly developed as to make separation from *Hadrotettix* on this character alone uncertain. Only rarely does the hind femur of *Trimerotropis* approach in breadth that of *Hadrotettix*. In breadth and degree of lamellation of the ventral carina *Hadrotettix* is suggestive of the Hippisci. *Hippiscus* Saussure and its allies are discussed by Hebard (1928, p. 236).

*Circotettix* and *Aerochoreutes* are the American genera of the group called the Bryodemae by Bey-Bienko (1930). The Old World genera considered by Bey-Bienko are *Bryodema* Fieb., *Angaracris* B.-B., *Uvaroviola* B.-B., and *Compsorhipis* Sauss.; the last genus was mistakenly given as *Cosmorrhipis* Sauss.; in error for *Cosmorrhipis* J. & B., which was treated as a synonym of *Compsorhipis* by Kirby (1910, p. 262) and more recently by Bey-Bienko (1932). Of the Old World genera, one species of *Bryodema* alone occurs in Europe and Bey-Bienko considers it a relic of a postglacial westward invasion from Siberia. The other forms are all Asiatic, and he believes that the group, including the American genera, had its origin on the ancient continent of Angara. Schuchert (1931) has given a map showing Angara in the Upper Cretaceous; that this group is ancient is indicated by the fact that Pongrác (1928) has described a fossil species of *Bryodema* from the Lower Miocene of Croatia. Except for the approach to *Trimerotropis* indicated above, *Circotettix* and *Aerochoreutes* are rather different from other American Acrididae, and if Bey-Bienko’s belief be correct this
might explain the presence here of such a distinctive group, but in view of the convergence with *Trimerotropis* the two genera may actually be of American origin.

Rehn (1921) discussed the species of *Circotettix* (genotype, *undulatus* (Thos.)) and described *Aerochoreutes* (genotype, *carlinianus* (Thos.)). As there treated, *Circotettix* includes seven species and two additional races, while *Aerochoreutes* is composed of two races of *carlinianus*. The widely distributed *C. verrucullatus* (Kirby) was not included by Rehn and may require other generic status following study of *Trimerotropis*, though for convenience it is referred to *Circotettix* in current literature. The best single character distinguishing *Aerochoreutes* from *Circotettix* is that of all the dorsal radiate veins being swollen or not, as stated in the key. The genera are very close and it is difficult to depend on other features as single separating characters in all individuals.

The groups *Heliasti* and *Anconiae* have been discussed by Hebard (1937), the former including *Heliastus* and *Cibolacrís*, the latter composed of *Anconia*, *Xeracris*, *Coniana* and *Spaniacris*. The *Heliasti* and *Anconiae*, though then not so called, were earlier reviewed by Caudell (1915). *Heliastus* has two species occurring in the United States, *benjamini* Caud., and *subroseus* Caud., and several others further southward. *Cibolacrís* includes one known species, *parviceps* (F. Walk.), of which the typical race occurs in Mexico and two others, *arida* (Bruner) and *californica* (Thos.), are in the United States. Of the *Anconiae*, *Anconia* alone contains more than a single species; this genus has been discussed by Rehn (1919). *Spaniacris* was proposed by Hebard (1937) to replace the preoccupied *Ramona* Bruner.

*Anconia* stands somewhat apart from the other genera of *Anconiae* on the basis of the structure of the vertex and ovipositor. In *Xeracris*, *Coniana* and *Spaniacris* the apical hook of the lower valve of the ovipositor in ventral view is much narrower at base than the main body of the valve, the dorsal valve is short and the scoop greatly excavate, while the female subgenital plate is also specialized differently from that of *Anconia*. *Xeracris* is readily separated from *Coniana* and *Spaniacris* by the narrower metasternal interspace, but is much more closely related to them than to any other genera.

Among the New World genera which suggest *Shotwellia* in possessing a low median carina of the pronotum, though strikingly different in several other features, is *Sphingonotus* Fieb. In the above key *Sphingonotus* runs to *Trimerotropis*, and is easily separated from *Shotwellia* by the much broader metasternal interspace and the narrower hind femur. *Sphingonotus*, which is not definitely known from the mainland of North America, has been omitted from the key because of difficulty in
supplying constant characters to separate it from Trimerotropis. On the basis of genotypes, T. maritima (Harris) of the eastern part of the United States and the Palearctic S. coeruleus (L.), the two genera are amply distinct. In Sphingonotus the median carina of the prozona posterior to the anterior sulcus is obliterated and in most species a second sulcus cuts the median line of the disk anterior to the sulcus dividing prozona and metazona. In certain species of Trimerotropis, as T. strenua McNeill, some individuals occur the median carina of which is sufficiently obsolete as to make generic separation confusing. Hebard (1929, p. 357) has already suggested that certain species now assigned to Trimerotropis are not congeneric with maritima and that generic revision is needed.

Sphingonotus is chiefly a genus of the Old World, where it contains many species, and Bey-Bienko (1932) notes the resemblance of certain robust species to Compsorhipis, one of the Bryodemae. The following American species of Sphingonotus are known: brasilianus Sauss. (Brazil); cubensis Sauss. (Cuba); fusco-irroratus (Stål) (Ecuador, Galapagos Islands); haitensis (Sauss.) (Jamaica, Hispaniola, Puerto Rico). Bruner (1906, p. 188) recorded haitensis from Mexico, but Rehn and Hebard (1938, p. 213) believe the identifications to be incorrect. The latter authors discuss haitensis and cubensis in detail, placing jamaicensis Sauss. as a synonym of haitensis and indicating that cubensis is a distinct species rather than a subspecies of coeruleus as originally described. Hebard (1920) has discussed fusco-irroratus. Kirby (1910, p. 278), in his catalogue, incorrectly assigned Dissosteira venusta (Stål) to Sphingonotus and on that basis recorded the genus from California. This species is not closely related to Sphingonotus.

Shotwellia has a combination of characters which, individually, are suggestive of several related genera: The head and pronotum of Anconia; the metasternal interspace of Xeracris; the hind legs of Hadrotettix. The ovipositor is not specialized and is similar to that of Hadrotettix.

To summarize the foregoing discussion, it is evident that Trimerotropis and Hadrotettix are closely related, and Circo-tettix and Aerochoreutes may represent a peculiar offshoot from a stock common with that of Trimerotropis in case they are of American origin. Sphingonotus and Shotwellia may be tentatively arranged following Hadrotettix and preceding the Heliasti and Anconiae.

There are several genera now referred to the subfamily Acridinae which are so suggestive of Oedipodinae as to merit consideration in identification work with the oedipodine genera discussed in this paper, though none is to be confused with Shotwellia. The author refers particularly to Zapata Bruner, Aulocara Scudd., Drepanopterna Rehn, Goniatron Bruner,
Ligurotettix McNeill, and Heliaula Caudell. The transfer of Heliaula to the Acridinae has only recently been suggested by Hebard (1937, p. 378), though the single species, ruja (Scudd.) was originally placed in the Acridinae previous to the description of Heliaula. Rehn (1923) has discussed Goniatron and Ligurotettix in detail. Mills and Pepper (1938, figs. 24, 25) have illustrated the female subgenital plates of Aulocara and Drepanopterna, which, together with other characters, separate those genera. Hebard (1926) gives a key to the acridine genera north of Mexico, subject to changes in the literature since its preparation.

Summary.

Shotwellia isleta, a new genus and species of Oedipodinae from New Mexico and Durango, is described. A key to the genera usually arranged at the end of the subfamily, beginning with Trimerotropis, is given and the genera are discussed. Shotwellia shows relationship to Hadrotettix and the Anconiae in particular.

Literature Cited.

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Pongrác, A.
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Schuchert, Charles.
Scudder, S. H.
Shelford, V. E.
Slifer, Elinor H., and Uvarov, B. P.

Explanation of Figures.

Plate 1.

Fig. 2. *Anconia integra* Scudder, male, inner view of apex of hind tibia and first tarsal segment. Phoenix, Ariz., Sept. 29, 1900.
Fig. 3. *Spaniocris deserticola* (Bruner), male, same view as in fig. 2. Indio, Calif., June 5.
Fig. 4. *Cibolacris particeps arida* (Bruner), female, dorsal view of head and pronotum. Tempe, Ariz., Aug. 27, 1918.
Fig. 5. *Shotwellia isleta*, new species, male holotype, same view as in fig. 4.

Plate 2.

Fig. 6. *Spaniocris deserticola* (Bruner), male, lateral view of head and pronotum. Indio, Calif., June 5.
Fig. 7. *Heliastus benjamini* Caudell, female holotype, dorsal view of head. Huachuca Mts., Ariz., Aug. 16, 1903. (Type designated in 1912.)
Fig. 8. Same, female, portion of left tegmen. Cochise County, Ariz. Abbreviations: *h*, humeral vein; *d*, discoidal vein; *m*, median vein; *au*, anterior ulnar vein; *iv*, intercalary vein. Terminology after Saussure's *Prodromus Oedipodiorum*, 1884.
Fig. 9. *Shotwellia isleta*, new species, female allotype, left tegmen.
Fig. 10. Same, male holotype, anterior view of head.
Fig. 11. *Coniana snowi* Caudell, male, lateral view of head and thorax. Phoenix, Ariz., July 20, 1913.

Plate 3.

Fig. 12. *Hadrotettix trifasciatus* (Say), female, left wing. Gainesville, Tex., Sept. 26, 1922.
Fig. 13. *Circotettix undulatus* (Thomas), male holotype, left wing. "Col. Terr" (Type selected by Rehn in 1921.)
Fig. 14. *Shotwellia isleta*, new species, male holotype, ventral view of meso- and metasternum.
Fig. 15. Same, female allotype, same view.
Fig. 16. Same, female paratype, inner surface of right hind femur.
Fig. 17. *Hadrotettix trifasciatus* (Say), female, same view as in fig. 16. Same specimen as in fig. 12.
Fig. 18. *Shotwellia isleta*, new species, female allotype, apex of left hind tarsus.

(All drawings by the author.)
2. Anconia

3. Spaniacris

4. Cibolacris ♀

5. Shotwellia ♂
PLATE 2

6. Spaniacris

8. Heliastus

7. Heliastus

9. Shotwellia

10. Shotwellia

11. Coniana
12. Hadrotettix

13. Circotettix

14. Shotwellia ♂

15. Shotwellia ♀

16. Shotwellia

17. Hadrotettix

18. Shotwellia

[15]
THE MALE, NYMPH, AND LARVA OF IXODES DENTATUS MARX (ACARINA : IXODIDAE).

By Carroll N. Smith,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Ixodes dentatus Marx has heretofore been represented in the literature by descriptions and illustrations of the female only, the male and immature stages having been unknown. Although named and illustrated by Marx, the first published description was by Neumann (1899). Banks (1908) published additional drawings of the female, and Nuttall, et al. (1911) included the description from Neumann and Marx’ illustrations in their monograph of the genus.

The description of a variety of this species, Ixodes dentatus var. spinipalpis Hadwen and Nuttall (1916). The female, nymph, and larva were described from specimens taken in British Columbia. Originally separated from the typical I. dentatus on the basis of female characters only, the nymphs and larvae are also distinct from those of the typical dentatus collected by the writer in Massachusetts.

During the summer of 1938 the station of the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, at Vineyard Haven, Mass., collected 17 males, 23 females, 160 nymphs, and 1,490 larvae of typical Ixodes dentatus from cotton-tail rabbits on the island of Martha’s Vineyard. Although an abundant supply of material in all stages was thus available for comparison, the following descriptions of the female, male, nymph, and larva were made from specimens reared from a single engorged female, to eliminate all possibility of uncertainty as to their association. The female is here redescribed for the sake of completeness, particularly in comparison with the variety spinipalpis.

Ixodes dentatus Marx 1899.

Female (figs. 1, 2, and 3).—Capitulum, length 0.66 mm. from tip of hypostome to a line drawn between tips of posterior lateral angles of basis capituli; basis capituli, width 0.44 mm., dark brown, posterior margin straight, posterior lateral angles prominent, bluntly pointed, ventral surface with heavy, sharply-pointed auriculae projecting ventrally and posteriorly from behind base of palpi. Porose areas circular, flattened at posterior margin, lateral dimension 0.12 mm., antero-posterior dimension 0.10 mm., the interval between the porose areas 0.08 mm. wide. Palpi robust, 0.60 mm. long, segment II distinctly longer (0.28 mm.) than segment III (0.22 mm.), segment I with a sharp spur on ventral surface. Hypostome lanceolate, tapering from middle to a blunt point, 4 rows of teeth on each side, with extra small teeth in short rows at tip. Chelicerae with 5 teeth on external digit, one tooth at apex of internal digit, 2 teeth on dorsal process.

Scutum 1.14 mm. long, 0.98 mm. wide, dark brown, broadest slightly before
center, broadly and evenly rounded, cervical angles short, cervical grooves wide and shallow, meeting lateral carinae posteriorly, lateral carinae heavy, very slightly curved. Surface shiny, with many coarse punctations, especially numerous posteriorly, and a few short hairs.

Legs lighter brown than scutum, moderately robust, tarsus I 0.52 mm. long, metatarsus I 0.30 mm. long. Coxae slightly separated (unfed specimen), each bearing a number of long pale hairs; coxa I with a long internal spur projecting 0.12 mm. beyond its posterior margin, all coxae with a short external spur, diminishing in length progressively from I to IV.

Stigmal plates small, oval, 0.20 mm. by 0.24 mm., macula circular, located anteriorly from center, goblets small, 2 rows at narrowest and 6 rows at widest point.

Body light brown, oval, broadest behind middle, finely punctate, with sparse, short, pale hairs. Marginal groove extending around posterior margin from lateral angles of scutum. Vulva between coxae IV, genital groove widely divergent, anal groove rounded in front of anus, parallel behind.

Considerable variation was observed in the porose areas of the females, as they ranged in shape from almost circular to sharply pointed triangular.

Male (figs. 4 and 5).—Capitulum 0.40 mm. long. Basis capituli dark brown, greatest width (0.28 mm.) immediately behind base of palpi, slightly narrowed posteriorly; posterior margin gently convex, cornua short; ventrally with a small blunt tooth on lateral margin behind base of palpi. Hypostome rounded at tip, tapering gradually from near center, armed with a row of 11 crenulate plates on each side, each plate with a prominent tooth at outer margin and 5 scallops. Palpi fairly robust, 0.30 mm. long, bearing a few pale hairs, segment II 0.14 mm. long, segment III 0.12 mm. long, segment I with a broad ventral prominence.

Scutum 1.34 mm. long, 0.84 mm. wide, reddish brown, punctations moderately coarse, numerous, with sparse, short hairs. Cervical grooves distinct, converging and then widely diverging, fading out before reaching center of scutum, cervical angles long, rounded. Pseudo-scutum distinguishable, slightly darker than rest of scutum.

Legs light brown, tarsus I 0.36 mm. long, metatarsus I 0.22 mm. long. Coxae slightly separated, bearing long pale hairs, coxa I with a long internal spur, projecting 0.10 mm. beyond posterior margin, coxae II to IV each with a small spur at internal angle, all coxae with a short spur on external angle, slightly smaller on coxa I than on others.

Stigmal plates of medium size, oval, 0.22 mm. dorso-ventrally, 0.24 mm. antero-posteriorly, macula small, oval, antero-ventral from center. Goblets small, from 2 to 6 rows.

Marginal fold very light brown, moderate, marginal groove deep, arising 0.22 mm. behind cervical angle. Venter yellow, with large punctations and numerous short, pale hairs. Plates moderately sclerotized, punctations coarse and numerous, a few pale hairs. Pregenital plate cordate, emarginate anteriorly, extending to opposite center of coxae II; median plate 0.60 mm. long, 0.18 mm. wide at anterior end, 0.48 mm. wide near posterior end, then abruptly tapered; adanal
plates subrectangular, gently curved, 0.18 mm. wide at anterior end, 0.12 mm. wide at posterior end, 0.30 mm. long; anal groove rounded in front of anus, diverging posteriorly, anal plate 0.28 mm. long, 0.22 mm. wide at posterior end.

Individual males varied in the shape of the stigmal plate, which was sometimes flattened dorsally, and in color, which ranged from brown to black. In some specimens the stigmal plate was surrounded by a sclerotized area, and in some the anal plate was incomplete at the sides. There was also considerable variation in the length of the internal spurs on coxae II to IV.

Nymph (figs. 6 and 7).—Capitulum 0.34 mm. long, basis capituli yellowish brown, 0.24 mm. wide at base of palpi, subrectangular, posterior margin nearly straight, postero-lateral angles salient laterally; palpi 0.26 mm. long, bearing scattered, pale hairs and a fringe of hairs at tip, segments II and III of equal length, segment I with a blunt ventral prominence; auriculae much less prominent than in female, present as laterally projecting salients at base of palpi; hypostome with 4 rows of teeth on each side at tip, inner row extending one third, second row one half, third row two thirds, and outer row the entire length, of hypostome.

Scutum light reddish-brown, 0.58 mm. long, 0.64 mm. wide, widest slightly anterior to center, broadly rounded posteriorly, cervical grooves very broad and shallow, lateral carinae indiscernible, a few moderately large punctations and short pale hairs.

Legs yellowish brown, tarsus I 0.34 mm. long, metatarsus I 0.16 mm. long, coxae slightly separated, each with a few long pale hairs, coxa I with a long internal spur, projecting 0.06 mm. beyond posterior margin, coxae I to IV each with a short external spur.

Stigmal plate circular, 0.14 mm. in diameter; stigma small, circular, central; goblets small, 3 to 4 rows.

Body yellow, scattered hairs on dorsum and venter, particularly on marginal fold, marginal groove extending from lateral angles of scutum around posterior margin, genital groove divergent, anal groove rounded in front of anus, parallel behind.

Larva (figs. 8 and 9).—Capitulum 0.19 mm. long, basis capituli light yellowish brown, 0.14 mm. wide, posterior margin straight, no cornua, palpi 0.14 mm. long, auriculae present as slight lateral protuberances, the basis capituli indented behind them, hypostome tapering from anterior third, rounded at tip, 3 rows of teeth on each side.

Scutum light yellowish-brown, 0.30 mm. long, widest (0.36 mm.) slightly in front of middle, postero-lateral margins straight and tapering, rounded at back, a very few punctures and short pale hairs, cervical angles short and rounded, cervical grooves shallow, converging and then diverging, no lateral carinae.

Legs yellow, tarsus I 0.22 mm. long, metatarsus I 0.11 mm. long, coxae slightly separated, each with a few long hairs, coxa I with a long internal spur.

Body oval, yellow, a few short, pale hairs on dorsum and venter, anal groove rounded in front of anus, divergent behind.
Described from female Br #41A, male Br #41B, nymph Br #29A, and larva Br #3A, all reared from one parent female Br #3. These five specimens and additional reared material from the same lots are deposited in the United States National Museum under Bishopp No. 27354, the accession number of the parent female, from cotton-tail rabbit, West Tisbury, Mass., June 1, 1938, C. N. Smith, collector.

As pointed out by Nuttall (1916), the female of *Ixodes dentatus* differs from that of the variety *spinipalpis* in possessing a shorter shield, more rows of teeth on the hypostome, and a much longer, more slender internal spur on the first coxa. I am not certain that the cornua or the auriculae of the basis capituli are sufficiently different to serve as distinguishing characters. Hadwen and Nuttall named their variety *spinipalpis*, as there was a ventral spine on segment I of the palpi, a character not mentioned or figured in the original description of *Ixodes dentatus*. Since the type of *dentatus* is now without palpi, and has been so since 1908 at least, it is impossible to check on this character, but as our specimens agree with the type otherwise, and all show a distinct ventral spine on segment I, it appears safe to assume that segment I of the type had such a spine.

Both the nymph and the larva differ from those of *spinipalpis* in possessing a shield which is wider than long, in the absence of posteriorly-projecting cornua, in the greatly reduced auriculae, and in the much longer and more slender internal spur on coxa I. The nymph also has more rows of teeth on the hypostome, and lacks a lateral carina.

**References.**


Ixodes dentatus Marx.
(Drawn by H. B. Bradford.)

Fig. 1. female, dorsal.
Fig. 2. Female, ventral.
Fig. 3. Anterior leg of female.
Fig. 4. Male, dorsal.
Fig. 5. Male, ventral.
Fig. 6. Nymph, dorsal.
Fig. 7. Nymph, ventral.
Fig. 8. Larva, dorsal.
Fig. 9. Larva, ventral.
REPORT OF THE TREASURER FOR THE YEAR 1939.

This annual report constitutes the last for the outgoing Treasurer. During the months of October, November, and most of December, because of his illness, his duties were assumed by Paul Oman, who carried out the obligations most gladly and efficiently. For so doing he deserves the sincere gratitude of the Society. A summary of the receipts and expenditures for the calendar year 1939 follows:

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<th><strong>Receipts.</strong></th>
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<td>Cash on hand (Jan. 1, 1939)</td>
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<td>To H. L. &amp; J. B. McQueen, Inc., for printing Proceedings (Nos. 1-9, vol. 41) and separates</td>
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Cash on hand (Jan. 1, 1940) | 7.64 |
Outstanding obligations | none |

**$1,739.62**
**Publication Fund.**

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<td>accumulated dividends, 1927-1938</td>
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Respectfully submitted,  
H. E. Ewing,  
Treasurer.

The Committee on Audit has examined the Treasurer's financial accounts and found them correct for the year 1939.  
Respectfully submitted, January 12, 1940.  
Leslie W. Orr,  
W. B. Wood,  
Auditing Committee.
REPORT OF THE CORRESPONDING SECRETARY OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON FOR
THE CALENDAR YEAR 1939 (TO NOVEMBER 30,
1939).

Correspondence:
Approximately 450 letters and other communications have been handled.
(This includes 37 individual advertising letters sent to foreign prospects).

Reserve publications:
Statement of the inventory and sales of Proceedings and Reprints:

Proceedings.
1. Copies of Proceedings on hand January 1, 1939 ........................................ 30,743
2. Copies of Proceedings acquired during 1939 (to No. 8) .................................. 335
3. Copies of Proceedings available (total of 1 and 2) ........................................ 31,078
4. Copies of Proceedings sold during 1939 .......................................................... 106
5. Copies of Proceedings on hand ................................................................. 30,972

Reprints
1. Reprinted articles on hand January 1, 1939 .................................................. 471
2. Total copies reprints available Jan. 1, 1939 .................................................... 13,973
3. Copies of reprints sold during 1939 ................................................................. 163
4. Copies of reprints on hand during 1939 .......................................................... 13,810

Sales of Proceedings and Reserve Reprints.¹
1. Total number of sales ............................................................................................ 28
2. Total number of complete sets sold ...................................................................... 0
3. Orders exceeding $20.00 net value ........................................................................ 1
4. Total net value of sales ..................................................................................... $81.42

Report on Memoir No. 1.
1. Total copies of Memoir No. 1 printed ................................................................. 300
2. Total copies of Memoir No. 1 sold ....................................................................... 66
3. Total copies of Memoir No. 1 on hand ............................................................... 234

Members and Subscribers:

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The resignations of 5 members were accepted during the year.

Respectfully submitted,

D. J. Caffrey,
Corresponding Secretary.

¹ Includes sale of Say's "Entomology" for $15.00.
² Includes subscribers in Germany, Austria and Poland, whose copies will be held until the end of the war or such time as mail can move freely.
MINUTES OF THE 505TH REGULAR MEETING OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 505th meeting of the Society was held at 8 p. m., Thursday, December 7, 1939, in Room 43 of the National Museum. President Snodgrass was in the chair, with 43 members and 11 visitors present. The report of the previous meeting was read and approved.

Upon the recommendation of the Executive Committee, L. A. Hetrick, Virginia Agricultural Experiment Station, West Point, Virginia, was elected to membership.

The Corresponding Secretary, D. J. Caffrey, submitted a report, to November 30, 1939. (See Corresponding Secretary’s Report.

A preliminary report was given by the Acting Treasurer, P. W. Oman; a final report will be published separately.

The Nominating Committee, comprised of F. C. Bishop, Chairman, R. A. Cushman and B. A. Porter, submitted the following nominations for 1940:

President ...................................................... C. F. W. Museebec
First Vice-President........................................... Lee A. Strong
Second Vice-President....................................... H. E. Ewing
Recording Secretary ........................................ Ashley B. Gurney
Corresponding Secretary ................................... D. J. Caffrey
Treasurer ..................................................... William B. Wood
Editor .......................................................... W. R. Walton
Executive Committee ....................................... R. E. Snodgrass

To represent the Society as Vice-President of the
Washington Academy of Sciences.......................... Austin H. Clark

It was announced that Dr. Strong had declined to accept the Presidency during 1940 because of ill health. The above nominees were unanimously elected.

President Snodgrass reported the recent receipt of an announcement from the Department of State concerning the 8th American Scientific Congress which will be held in Washington May 10–18, 1940, in connection with the celebration of the 50th Anniversary of the founding of the Pan American Union.

It was announced that the Washington Academy of Sciences plans the publication of a series of monographs, preferably of about 175 pages each, which may be submitted by members of the Academy or affiliated societies.

The regular program constituted a discussion of the work of the Division of Truck Crop and Garden Insect Investigations:

3. Problems in experimental technique for research on truck crop and garden insects. L. B. Reed.

After the talks, which were supplemented by slides and exhibit material, discussion followed by McIndoo, Siegler, Cory and Hyslop.

A non-resident member, R. G. Nagel of Milwaukee, Wis., and L. A. Hetrick, newly elected, were introduced to the Society.

Mr. Museebec commented upon the desirability of adopting a future resolution regarding the recent death of C. N. Ainslie.

Adjournment at 10 p.m.

Ashley B. Gurney,
Recording Secretary.

Actual date of publication, January 30, 1940.
ANNOUNCEMENT

Prices for back volumes and single numbers of the Proceedings of the Entomological Society of Washington are as follows, until further notice:

Vols. 1–19, per volume ........................................... $2.00
per number ...................................................... .50
Vols. 20–41 per volume ...................................... 4.00
per number ...................................................... .50

Complete sets, Vols. 1–41 (1884–1939) Inclusive .......... $117.00
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7–8 of Vol. 25 and Nos. 8–9 of Vol. 36.

Note: Nos. 1–4 of Vol. 9 and Nos. 1–4 of Vol. 19 (each of
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AND SUBSCRIBERS ON ORDERS OF $10.00 OR OVER.

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Sandhouse, issued as Memoir Number 1 of the Society, is now available.
Postpaid to non-members and institutions ................ $3.00
To members of the Society ................................ $2.50
This is a revisionary study of the genus Osmia with keys for identification,
descriptions and distribution records for known N. American species.

(Make checks, drafts, etc. payable to the Entomological Society of Washington.)

D. J. CAFFREY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
Washington, D. C.
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September
by the
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3, 1918.
THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

Organized March 12, 1884.

The regular meetings of the Society are held in the National Museum on the first Thursday of each month, from October to June, inclusive, at 8 p.m.

Annual dues for members are $3.00; initiation fee $1.00. Members are entitled to the Proceedings and any manuscript submitted by them is given precedence over any submitted by non-members.

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Honorary President ........................................ L. O. Howard
President .................................................. C. F. W. Muesebeck
First Vice-President ...................................... Lee A. Strong
Second Vice-President .................................... H. E. Ewing
Recording Secretary ..................................... Ashley B. Gurney
Corresponding Secretary ................................ D. J. Caffrey
Treasurer .................................................. W. B. Wood
Editor ..................................................... W. R. Walton
Executive Committee ..................................... R. E. Snodgrass, E. A. Back, S. B. Fracker

Nominated to represent the Society as Vice-President of the Washington Academy of Sciences .................. Austin H. Clark

PROCEEDINGS

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published monthly, except July, August and September, by the Society at Washington, D.C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

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CHARLES N. AINSLIE.
OBITUARY NOTICE.

At noon, December 5th last, Mr. Charles N. Ainslie, a veteran member of this Society, died at his home in Sioux City, Iowa.

His body was interred at his boyhood home in Rochester, Minnesota.

For a period of 24 years Mr. Ainslie served as a research worker of recognized ability in what is now the Federal Bureau of Entomology and Plant Quarantine. Although in his 83rd year Mr. Ainslie had revisited Washington unaccompanied, in June of last year, and had been active and in full enjoyment of all his faculties until November 25th when he sustained a stroke resulting in his death as above recorded.

Charles Nicholas Ainslie was born October 13th, 1856, in the farm home of his maternal grandparents at Hagaman's Mills (now Hagaman), Saratoga County, New York. He was the second son of George Ainslie, a native of Scotland, who emigrated to America in 1831.

His mother was Mary J. Hagaman, descendant of a Dutch family that had settled in the Mohawk Valley previous to 1700. His father was graduated in theology at Princeton and became a missionary to the Choctaw Indians at Goodwater, Oklahoma, immediately prior to the outbreak of the Civil War. Like many other abolitionists, at the outbreak of hostilities he was compelled to flee northward, accompanied by young Charles, to the Hagaman home in New York State.

In 1861, the father located as a clergyman at Rochester, Minnesota, and shortly afterward brought his family there and established residence on a farm. Rochester at that time was 50 miles beyond the end of the railroad and this part of the journey was by stage coach.

The Ainslie home was located on a farm of 100 acres, and here Charles became familiar with farm life under rather primitive conditions. Here, too, he began an intimate contact with nature which was to color all of his subsequent life.

In a brief autobiography of his early life,¹ published informally

¹ At the Turn of a Century, Chas. N. Ainslie, 1938.
in limited edition and distributed personally to relatives and friends, he has given an interesting account of these early years. He witnessed there the annual great flights of the passenger pigeon and was shocked by the pitiful scenes of slaughter of this beautiful bird, soon to cause its extinction. He saw his mother attempt to control the swarms of house flies then regarded as a necessary evil, by closing all doors and windows and then sprinkling sugar on a shovelful of live coals. When the fumes had stupefied the flies they were swept up and destroyed.

Mr. Ainslie received his primary education from his father and stepmother, both of whom had been school teachers. This evidently was efficient as, when he was ready to enter high school, he was well grounded in Latin and Greek and was admitted without examination. He had also acquired a knowledge of both vocal and instrumental music, to which he remained devoted as an avocation throughout adult life. For a period of 26 years he directed the choir of his church and later took up the study of the violoncello and played in an orchestra of 50 pieces which acquired local fame.

In 1873 he was awarded a scholarship at Beloit College and was matriculated in the fall of that year. He was graduated in 1877 and returned to Rochester, where for a time he engaged in quarrying building stone on his father’s farm. At this time he discovered a fossil shell which was named in his honor by the State Geologist.

Mr. Ainslie owned one of the first high-wheeled bicycles seen in his locality, and tells of riding it and similar wheels some 7,000 miles without accident.

He entered the banking business as a clerk in 1881 and eventually became assistant cashier. Apparently it was early in this period that he became seriously interested in entomology and through this interest became acquainted with the famous Dr. Otto Lugger, then State Entomologist of Minnesota. He tells of Dr. Lugger’s intention to have had him appointed as his assistant, but the sudden and untimely death of Lugger in 1901 deprived him of this privilege. It was not until 1906, when Mr. Ainslie was in his 50th year, that opportunity came for his entry into professional entomology. At that time the late Professor F. M. Webster was seeking entomological talent in order to expand his work in the Federal Bureau of Entomology, with the insect pests of cereal and forage crops. Webster, who had previously gained considerable respect for Ainslie’s ability, offered him a position on his staff. Ainslie promptly accepted, at a loss in salary, and reported for duty August 1st of that year.

Up to that time Professor Webster’s staff had consisted of but 2 men, viz: William J. Phillips and George I. Reeves, both of whom had been appointed in the fall of 1904, or soon after Webster’s own appointment.
Early in 1907 there began the most general and disausstro outbreak of greenbug ever known in America. In the resulting activities, Ainslie took an active and important part, being engaged in field surveys throughout the Mississippi Basin from Oklahoma northward to the Canadian boundary. An account of his work at this time may be found in Department of Agriculture Bulletin 110.

In 1908 an insect entirely new to economic entomology appeared in vast numbers in northeastern New Mexico, where it threatened to destroy great areas of valuable range. This afterward became known as the range caterpillar (Hemileuca oliviae Ckll.). Mr. Ainslie was detailed to conduct the first investigations of this then unknown pest.

How excellently he accomplished this mission is a matter of history and was further demonstrated when, during the period 1913–1916, his data were made the basis of extensive biological and other control experiments with the insect.

Although in his work on the range caterpillar, as in most of his subsequent investigations, Mr. Ainslie had worked entirely alone, subsequent observation of the insect by a large staff of investigators proved that not only were his findings entirely accurate but very little of importance could be added to the biological information that he had reported.

So favorably had this impressed Professor Webster, that when, in 1909, the Governor of Utah appealed to the Department for expert assistance in the investigation of a newly discovered pest now known as the alfalfa weevil, he dispatched Mr. Ainslie to Salt Lake City to initiate a biological study of this pest.

Mr. Ainslie remained on this project until 1912 when he was transferred to Elk Point, South Dakota, to investigate such enemies of growing wheat as the western army cutworm, the hessian fly and similar pests. A few years later he transferred to Sioux City, Iowa, where he was located for the remainder of his career.

Early in this period Mr. Ainslie conducted the first serious studies that had been made with the grass stem sawfly (Cephus cinctus Norton) which has since become a very serious enemy of spring wheat in the prairie Provinces of Canada. The results of these studies are reported in Bulletin 841 of the United States Department of Agriculture.

During his entomological career, Mr. Ainslie published something more than 30 titles, but these record only a mere fragment of his contribution to entomology. He was a true naturalist in the broader sense and no insect or similar creature was too small or obscure to escape his sharp vision and keen sense of curiosity. The result was a constantly increasing hoard

of specimens and data concerning the intimate habits of species to which few entomologists would have given a second thought. His contributions of this kind, as well as many species of potential or present economic importance, to the collections of the National Museum are both valuable and extensive, and it seems perfectly safe to assert that future workers with the insect fauna of his region will encounter few insect pests of field crops which, at some previous time, had not been scrutinized and recorded by "C. N. Ainslie." Although no less than 13 species of insects have been named in his honor during his lifetime, it is more than probable that many additional species new to science will be discovered among the accumulation of unworked material deposited under his label in the Museum collections.

When, in 1926, Mr. Ainslie reached the statutory retirement age of 70, he was, at the request of the Chief of his Bureau granted two years extension of service, and this was again renewed at the end of the period, but he was finally retired with mutual reluctance October 31st, 1930. Even then, however, his usefulness to the service was recognized by appointment as Collaborator without salary, which permitted him to retain such instruments and other equipment as would facilitate his further studies. This pleased him greatly for, as he expresses it in his autobiography, "This sitting-back-in-your-arm-chair may suit some elderly people but it is utterly foreign to my idea of the attitude a red-blooded person should assume, even at the age of fourscore." This statement is characteristic of Mr. Ainslie's courageous and outspoken character. In 1884 he married Ada Gooding of Rochester, Minnesota, and 3 sons were born to them. The eldest, George G. Ainslie, who became well known for his studies in the economic species of the genus *Crambus*, died in Washington, D. C., in 1930. The remaining sons, Arthur and Kenneth, survive him, but Mrs. Ainslie died in 1928.

Until the last, Mr. Ainslie wrote a beautifully legible, print-like hand, and when stricken was devoting much of his time to pinning and labelling Micro-hymenoptera destined for the National Museum. In person he was tall and spare, and while somewhat stern in countenance, was possessed of a fund of dry Scottish humor that belied this appearance. He was a highly respected and valued member of the Entomological Society of Washington, which mourns his loss.

A list of Mr. Ainslie's publications is being published elsewhere.—W. R. Walton and D. J. Caffrey.
SOME NEW AMERICAN PYRALIDOID MOTHS.

By Carl Heinrich,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The following descriptions are offered in response to requests for determinations. One new genus and five new species are described.

**Family Phycitidae.**

**Subfamily Phycitinae.**

**RIBUA**, new genus.

*Genotype.*—*Ribua innoxia*, new species.

Antennae simple and pubescent in both sexes. Labial palpus obliquely ascending in the male, porrect in the female (the third segment down-curved). Maxillary palpus minute, filiform. Fore wing with nine veins; 4 and 9 absent; 2 from cell just before lower outer angle; 3 and 5 closely approximate at base; 6 from below upper angle of cell; male with costal fold. Hind wing with six veins; 4 absent and 7 and 8 fused to costa (rarely with 8 represented as a short spur at costa); 2 and 3 parallel; 3 and 5 connate; cell slightly less than one-half the length of wing. Abdomen of male with a pair of simple, lateral, sensory hair tufts on eighth segment (fig. 6).

Male genitalia with uncus broad, only slightly narrowed beyond base and with apex bluntly rounded. Gnathos terminating in an asymmetrical process with two short, curved hooks. Transstige represented by a narrow band with a flattened central process which fuses with apical process of gnathos. Harpe with costa very slightly produced at apex, otherwise simple; apex evenly rounded. Anellus a shield-like, slightly curved plate, somewhat wider than long. Aedeagus straight, moderately stout, smooth. Penis with cornutus developed as a narrow, weakly sclerotized, flattened and slightly curved, elongate band, otherwise unarmed. Vinculum long, broad; terminal margin broadly rounded.

Female genitalia with bursa copulatrix membranous; signum consisting of a pair of minute, closely approximate, bluntly pointed and flattened spines (rarely a single spine). Ductus bursae a flattened and sclerotized tube for most of its length; the dorsal side of the tube extended at genital opening into a flat triangular plate behind the opening, the ventral surface of the tube longitudinally wrinkled toward genital opening. Ductus seminalis from near end of bursa.

Larva normal for the subfamily (the rings about the bases of setae IIb of mesothorax and III of eighth abdominal segment strongly sclerotized and darkly pigmented). Skin finely granulate, granulations dark. Many muscle attachments on dorsum of body indicated by rather conspicuous whitish pits. Setal arrangements on head and body similar to those of *Plodia* and *Ephestia*.

Pupa with tenth abdominal segment terminating in a pair of well separated, short, stout, ventrally curved spines (fig. 7).

Remarks.—This genus is closest to *Plodia* Guenée, from which
it differs as follows: Labial palpus of male obliquely ascending rather than porrect (third segment not bent forward); tufts on eighth abdominal segment simple; apical process of gnathos bifurcate and asymmetrical (a single, simple, short hook in Plodia); anellus fusing with gnathos; ductus seminalis from near end of bursa; tenth abdominal segment of pupa terminating in a pair of hooks; larva with many muscle attachments of abdomen conspicuously marked, body tubercles darkly pigmented (very pale in Plodia).

Ribua innoxia, new species.

Plates 6, 7; Figures 1–1c, 6, 7, 9.

Male.—Head dark grayish fuscous (in some specimens a few red scales near bases of antennae). Labial palpus dark grayish fuscous finely speckled with grayish white and more or less shaded with red toward apex. Fore wing ash-gray obscurely marked and shaded with blackish fuscous; an ill-defined, dark basal patch; beyond this a faint indication of a narrow, pale band, slanting obliquely outward from costa to inner margin and outwardly shaded by blackish fuscous; subterminal line obscure, pale, straight and parallel with termen, narrowly shaded inwardly and outwardly by dark scaling; the veins faintly indicated by dark scaling; a scattering of dull reddish scales on the wing, especially along the fold, on upper vein of cell and bordering the subterminal line; all markings obscure and the dark shadings more or less diffused; cilia ashy gray. Hind wing dull white with a narrow smoky-fuscous shade along costa and termen, most conspicuous toward apex; veins very faintly indicated by dark scaling; cilia dull white with a fuscous basal band.

Alar expance 12–15 mm.

Genitalia (figs. 1–1c) with vinculum nearly twice as long as tegumen; prongs of apical process of gnathos (fig. 1a) separated (space between them U-shaped).

Female.—Similar to the male in color and markings.

Alar expance 12–16 mm.

Genitalia (fig. 9) not exhibiting any marked specific characters.

Type and paratypes.—No. 53432 U. S. National Museum.

Type locality.—Cuba.

Host.—Fungus on pineapple.

Remarks.—Described from male type and 16 male and 16 female paratypes reared at New Orleans, La. (April to July, 1933 and 1938) from larvae taken on pineapples from Cuba. The larvae are frequently intercepted by quarantine inspectors of the Bureau of Entomology and Plant Quarantine on shipments of Cuban pineapples. According to J. M. Singleton, of the Foreign Plant Quarantines Division, "Whenever the larva is found, it is invariably closely associated with pineapples heavily infested with the pineapple mealybug (Pseudococcus brevipes Ckll.) and deposits of the sooty-mold fungus resulting from the honeydew secretions of the mealybug. No evidence of
feeding by the larva on the pineapple itself has been noticed, and it was at first thought that the larva feeds on the mealybug; but since it has been observed that it is found only when the fungus is present, and not on pineapples having the mealybugs but no fungus, it now appears that the larva is more closely associated with the fungus than with the mealybug. The larvae, as well as the mealybugs with the attendant fungus, are always found near the base of the pineapple fruit, the smaller-sized pineapples usually being involved. The full-grown larva is of blackish color, similar to that of the deposits of the sooty-mold fungus with which it is found, and it is sometimes rather difficult to detect on the pineapples. It seems that the number of larvae found on a pineapple varies with the amount of fungus present, and as many as eight full-grown larvae have been taken from one small pineapple which had an unusually heavy mealybug infestation with a large amount of fungus present.

The larva is easily confused with that of Ephestia cautella (Walker) which is intercepted occasionally on pineapple. Indeed there are few reliable and consistent characters to separate larvae of innoxia from those of any of the Ephestia species.

Ordinarily the larva of innoxia is recognizable by its darker (smoky-brown) abdomen; but as there are frequent pale examples, especially among immature larvae, it is not always possible to distinguish an innoxia caterpillar by its color. In mature larvae the muscle-attachment pits offer a good character. These pits can be distinguished in some Ephestia larvae but they are fewer and less distinct than in larvae of innoxia.

The moths (especially the males) are easily identified by their genitalia, and the pupa by the hooked processes on the anal segment. These are not found on any phycitid of the Ephestia-Plodia groups as far as I know. This pupal character, however, is generic and would not distinguish innoxia specifically.

There is another species or race of Ribua on the pineapple in Puerto Rico. Its larvae have been intercepted several times by the Division of Foreign Plant Quarantines, and a couple of moths have been reared. The male genitalia show what appear to be specific differences from innoxia; but the moths themselves are in too poor condition for description.

**Minola supposita**, new species.

Plates 6, 7; Figures 2–2d, 12.

*Male.*—Labial palpus dark grayish fuscous, sprinkled with whitish scales on outer side of basal segment and on inner sides of all segments. Head dull ochaceous fuscous. Thorax dark grayish fuscous with a shading of dull red, semilustrous. Fore wing very dark grayish fuscous with a powdering of white scales on basal and mid costal areas and very faintly in the area bordering
termen; antemedial line narrow, slanting from inner third of costa to just before middle of inner margin and slightly notched at vein 1b, pale ashy gray bordered inwardly from top of cell to inner margin by a dull-red triangular patch which has an obscure, straight, blackish line along its inner edge; inner margin from base to antemedial line narrowly bordered with reddish scales; subterminal line nearly parallel with termen, slightly outcurved between vein 6 and fold, narrow, pale gray and inwardly margined by a narrow black line; a conspicuous blackish-fuscous patch between costa and cell and outwardly bordering the antemedial line; a similar dark shade on costa near apex; these blackish patches shading into the dark central area of wing and enclosing the triangular white-dusted area between midcosta and cell; two black dots at outer angles of cell, the upper dot about half the size of the lower; some obscure, dull-red shading in terminal area, especially toward tornus; along termen a narrow black line more or less broken at the vein ends; cilia semilustrous grayish fuscous with a fine, pale, median line. Hind wing pale smoky fuscous with veins, terminal margin, and apical area darker; cilia slightly paler with a dark subbasal line. Eighth abdominal segment simple.

Alar expanse 16–20 mm.

Genitalia (figs. 2–2d) similar to those of caliginella (Hulst) except transtilla broader at apex and arms of anellus stouter.

Female.—Essentially like the male in color and pattern.

Alar expanse 16–19 mm.

Genitalia (fig. 12) differing from those of caliginella in that there are no patches of small spines in bursa near junction with ductus bursae.

Type and paratypes.—In Canadian National Collection.

Paratypes.—No. 53433 U. S. National Museum.

Type locality.—Vancouver, British Columbia.

Food plant.—Cotoneaster.

Remarks.—Described from male type and 4 male and 8 female paratypes all reared from larvae feeding on Cotoneaster, collected by H. Glendenning at the type locality ("24–VI–1938") and referred by Dr. J. McDunnough with request for a name. The species is very close to and congeneric with Mineola caliginella (Hulst), from which it differs in its generally darker color and the genitalic characters noted in the foregoing description. Both caliginella and supposita eventually may need a different generic placement; for in both the ventral tuft is lacking from the eighth abdominal segment of the male and the basal joint of the male antenna is simple and not triangularly produced as in typical Mineola and Acrobasis. However, until the genera Acrobasis and Mineola can be revised the two species had better remain in Mineola, with which they agree in genitalic characters.
Family Galleriidae.

Subfamily Macrothecinae.

Alpheias conspirata, new species.

Plate 7; Figures 5-5b, 11.

Male.—Labial palpus ashy gray below, blackish fuscous with interspersed brownish scales above. Face, head, and thorax brownish fuscous, more or less suffused with black. Fore wing ashy gray obscurely and diffusely marked with blackish fuscous and sparsely sprinkled with dull reddish-brown scales; the dark markings form an ill-defined angulate basal patch, a black line along costal margin from base to middle, a short costal dash just beyond basal patch, an obscure transverse subterminal band continued from the apices of two subapical costal dashes and extending parallel with termen to inner margin near tornus (very poorly defined), a small black spot at end of cell, and a row of small black dots on termen; cilia dark gray, paler at extremities. Hind wing pale smoky fuscous with a dark line along termen; cilia paler.

Alar expanse 9–11 mm.

Genitalia (figs 5–5b) with clasper rudimentary; aedeagus short, rather narrow; penis very finely spined toward apex.

Female.—Like the male in color and markings.

Alar expanse 10–14 mm.

Genitalia (fig. 11) with genital plate a very narrow, transverse, sclerotized band along ventral edge of genital opening. Ductus bursae broadly sclerotized for a very short distance near genital opening, otherwise membranous.

Larva.—Ocelli I and II approximate, separated from and at right angles to III, IV, and V; ocelli III, IV, and V in a vertical line, more strongly pigmented than I and II. Prespiracular and dorsal shields of prothorax fused and with setae IV and V on the lateral margin. Mesothorax with setae 1a, 1b, 11a, and 11b on a single sclerotized plate. A pigmented, sclerotized ring around the base of seta III on abdominal segments 1 to 8 inclusive. Crochets 26 to 30, arranged in a transverse ellipse. Head and sclerotized plates of body pale brown. Full-grown larvae 9–10 mm. long.

Type and paratypes:—No. 53434 U. S. National Museum.

Type locality.—Mexico.

Food plant.—Pineapple.

Remarks.—Described from male type and 2 male and 4 female paratypes (reared July 12, 1937) from larvae on pineapple from Mexico (larvae intercepted at quarantine station, Brownsville, Tex.), one male and one female paratype from larvae from Vera Cruz, Mexico (Brownsville and Laredo interceptions, July, 1938), and one male paratype from larvae from Oaxaca, Mexico (Laredo interception, July 11, 1938).

The larvae are frequently intercepted on shipments of pineapples from Mexico by quarantine inspectors of the Bureau of Entomology and Plant Quarantine. Mr. O. D. Deputy states: “Every car of pineapples inspected (at Brownsville, Tex.) usually yielded several of the larvae after a reasonable amount
of inspection, and often when one insect was taken from the fruit two or three other larvae were also found, suggesting that the adult lays several eggs on each infested fruit." Mr. Singleton, who has studied the insect, says: "The presence of the larvae on the pineapple is usually indicated by a light web near the base of the fruit, but they, themselves, are usually rather hard to find due to the fact that they secrete themselves under the bases of the leaves usually adhering to the stem of the fruit after it is cut in the field. However, the larvae are sometimes found near the blossom end of the fruit." According to both Deputy and Singleton, the larva does little or no damage to the pineapple itself, but is more or less of a scavenger, feeding on dried particles of the fruit.

Pupation takes place under the larval web on the fruit.

This species is distinguished from all other known species of the genus by its suffused pattern and the lack of clearly defined, white antemedial and subterminal lines on the fore wing. There are two other described Mexican species (gitonalis Ragonot and buccalis Ragonot), neither of which is represented in the National Collection; but if the descriptions are at all accurate, conspirata could not be either one. Alpheias conspirata is, as far as I know, the only member of the genus that has been reared. Presumably many of the structural characters given in the foregoing larval description are generic rather than specific; but the sum of the characters plus the association with pineapple should identify the caterpillar.

**Family Pyraustidae.**

**Subfamily Pyraustinae.**

**Evergestis nolemitis,** new species.

Plates 6, 7; Figures 4–4b, 8.

Male.—Labial palpus grayish fuscous, white above and shading to white on underside of basal segment. Head grayish fuscous margined laterally with white. Thorax pale-grayish fuscous sparsely sprinkled with white scales. Fore wing grayish heavily dusted with white (giving the entire wing a pale bluish-gray color), with the transverse lines white, a gray shade between postmedial and subterminal lines, and two conspicuous blackish spots in the area covered by the gray shade; transverse antemedial line inwardly oblique, irregularly dentate, outwardly margined by a fine dark line; transverse postmedial line obscure from cell to costa, a contrasting white line only from lower outer angle of cell to inner margin, sharply outcurved at inner margin, inwardly margined by a narrow, obscure dark line; subterminal line irregularly dentate, diffused and broken between vein 6 and apex, sharply incurved from vein 6 to vein 2 and enclosing between veins 3 and 5 a conspicuous blackish spot, sharply outangled at the fold, the area within the angle black scaled and more or less contrasted against the ground color; a fine, short, inwardly curved, blackish dash on outer fifth of costa; terminal edge white with small black dots between the
vein ends; cilia pale gray basally, white outwardly and with a fine subterminal dark line; a few of the scale ends black. Hind wing white with a broad smoky border along termen; terminal margin white with black dots between the vein ends from apex to vein 1c; cilia white, slightly darker basally and somewhat black dusted apically between apex and 1c, pure white at anal angle.

Alar expanse 19–22 mm.

Genitalia (figs. 4–4b) with tegumen rather narrow and uncus and gnathos correspondingly narrow at their bases. Harpe narrowed just beyond base. Penis with an elongate cluster of short, stout cornuti.

**Female.**—Like the male in color and pattern.

Alar expanse 19–23 mm.

Genitalia (fig. 8) with signa densely spined.

**Type and paratypes.**—No. 53+35 U. S. National Museum. Paratypes also in Los Angeles Museum and John L. Sperry Collection.

**Type locality.**—San Felipe Wash, San Diego County, Calif.

**Food plant.**—Unknown.

**Remarks.**—Described from male type, 7 male and 10 female paratypes from the type locality (type and 7 paratypes collected by J. A. Comstock, February 21, 1938, and 10 paratypes collected by Grace H. and John L. Sperry, February 20, 1938), and three female paratypes from the Barnes Collection, labeled "Narrows, Calif. 3–15–26."

The new species is close to *lunulalis* Barnes and McDunnough, from which it is distinguished by its gray rather than brown ground color, the conspicuous blackish spots in the outer area of the fore wing, its narrower tegumen, uncus, and gnathos, its numerous cornuti (which seem to be completely absent in *lunulalis*), and its spinose signa. In *lunulalis* the signa are covered with fine disk-like granules rather than spines.

**Subfamily Nymphulinae.**

**Nymphula broweri**, new species.

Plates 6, 7; Figures 3–3b, 10.

**Male.**—Blackish fuscous. A few white scales on palpi and sides of head. Fore wing with a fine white line from costa beyond middle to slightly below vein 5, straight from costa to vein 5 and from there somewhat outbent; in some specimens indications of a pale, transverse, median line; a couple of white scales on each of veins 4 to 7 near termen; cilia dark fuscous at apex and tornus, slightly paler than ground color of wing and with a dark basal band, white between veins 7 and 3 and with a dark dash at end of vein 4. Hind wing with the faintest indication of a pale, curved, transverse postmedian line, more clearly indicated on under surface of wing; cilia slightly paler than wing with a dark (blackish) basal band. Sternite of eighth abdominal segment produced at caudal end into a stout curved hook.

Alar expanse 10–12 mm.

Genitalia (figs. 3–3b) figured from type. Uncus stout, laterally constricted
at middle, broadening at apex. A cupped, ventro-lateral process (fig. 3, X) projecting from each side of tegumen near base. Penis with one moderately large, strongly curved cornutus, and a cluster of 6 to 8 smaller, straight cornuti.

**Female.**—Like the male in color and markings.

Alar expanse 10–12 mm.

Genitalia (fig. 10) with wide genital opening. Ductus bursae finely scobinate toward genital opening, flattened and broadly sclerotized near junction with bursa copulatrix. Bursa with a few very small, widely spaced spines scattered over inner surface.

**Larva.**—Without tracheal gills. Head dark brown; ocelli without pigment under the lenses, I and II larger than the others, III and IV small and closely approximate; frons broad, triangular, extending nearly to incision of dorsal hind margin of epicranium. Prothoracic shield blackish brown, very large, extending laterally to include the prespiracular setae. Thoracic segments pale smoky fuscous except ventral surface of prothorax and mesothorax and the intersegmental skin between prothorax and head, which are dull white; coxae of thoracic legs white with sclerotized areas dark brown; prothoracic coxae touching, likewise mesothoracic coxae; thoracic spiracle greatly reduced, apparently functionless. Abdomen sordid white; setae very fine and short, tubercles minute and unpigmented; spiracles small, round, pale but apparently normal; eighth segment with a decided dorsal hump; prolegs very short and broad, merely low humps on ventral surface of abdomen; crochets irregularly biordinal, 46–50, arranged in two transverse rows, the crochets of the caudal row much shorter than those of the cephalic row. Length of full-grown larva about 10.

**Pupa.**—With spiracles on abdominal segments 2, 3, and 4 enlarged and protruding; other abdominal spiracles vestigial.

**Type and paratypes.**—No. 53436 U. S. National Museum. Paratypes also in collection of A. E. Brower.

**Type locality.**—Southwest Harbor, Maine.

**Food plant.**—Cephalozia fluviatilis (Nees).

**Remarks.**—Described from male type and 45 male and 3 female paratypes from the type locality, all collected by A. E. Brower on various July dates, and one male paratype from Lakehurst, N. J., collected by Otto Bucholz ("VI–2," No. 312). A few of the specimens were reared by Mr. Brower, but the labels do not indicate which they are.

This species is like no other North American *Nymphula* and could be confused only with dark and suffused specimens of *oblitaleralis* (Walker). The latter, however, always show some trace of a discal spot on the fore wing and have quite different genitalia; the penis has one long, thin, flattened, sinuate cornutus and lacks the cluster of smaller cornuti, the uncus is more slender, and the ventro-lateral projections from tegumen are hook-like rather than cupped. *N. broweri* is superficially similar to some tropical species of *Diatthrausta* but is easily separable from that genus on venation.

I take pleasure in naming the species after its collector.
Concerning the habits of the species, Mr. Brower states that he has found it only "about the water holes out in the middle of two large sphagnum bogs, one near Southwest Harbor and the other way up in Aroostook County, Maine, near Patten. The moths rest on Utricularia and grasses. They fly with a fluttering flight over the water, often settling on it. The larvae in their cases which I collected were from the shallow pools and were from \( \frac{1}{2} \) to 4 inches below the surface. They cling to submerged portions of the plants, mostly sedges, and apparently they pupate attached to these plants. The moths have a rather long period of flight and have never been common. I am not certain of the larval food, but after watching the moths for 3 years and collecting the larval material this year (1938) I believe the food is Cephalozia fluitans (Nees), Spruce of the Jungermanniaceae, determined by C. Neville Jones of the Arnold Arboretum. I have been unable to get larvae from the deep water holes where the moths are most common. I reared the moth from the larvae collected."

Explanation of Plates.

Plate 6.

Figs. 1–1c. Ribua innoxia, new species. 1, Ventral view of male genitalia with aedeagus omitted; 1a, apical part of gnathos; 1b, anellus; 1c, aedeagus.

Figs. 2–2d. Mineola supposita, new species. 2, Ventral view of male genitalia with aedeagus omitted; 2a, gnathos; 2b, transtilla; 2c, anellus; 2d, aedeagus.

Figs. 3–3b. Nymphula broweri, new species. 3, Ventral view of male genitalia with aedeagus and one harpe omitted; 3a, anellus; 3b, aedeagus.

Figs. 4–4b. Evergestis nolentis, new species. 4, Ventral view of male genitalia with aedeagus omitted; 4a, anellus; 4b, aedeagus.

Plate 7.

Figs. 5–5b. Alpheias conspirata, new species. 5, Ventral view of male genitalia with aedeagus omitted; 5a, anellus; 5b, aedeagus.

Fig. 6. Ribua innoxia, new species. Eighth abdominal segment of male showing hair tufts.

Fig. 7. Ribua innoxia, new species. Pupa, lateral view of abdominal segments 7 to 10.

Fig. 8. Evergestis nolentis, new species. Female genitalia.

Fig. 9. Ribua innoxia, new species. Female genitalia.

Fig. 10. Nymphula broweri, new species. Female genitalia.

Fig. 11. Alpheias conspirata, new species. Female genitalia.

Fig. 12. Mineola supposita, new species. Female genitalia.

(The drawings accompanying this paper were made under the supervision of the author by Mrs. Eleanor A. Carlin, of the Bureau of Entomology and Plant Quarantine.)
A NEW SPECIES OF UTETHEISA FROM NEWFOUNDLAND (LEPIDOPTERA: ARCTIIDAE).

BY J. F. GATES CLARKE,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The species described below was contained among a lot of miscellaneous insects collected by Commander G. S. Stephenson, U. S. N., and submitted for determination by Dr. F. C. Bishopp, Bureau of Entomology and Plant Quarantine. Superficially it is strikingly similar to the other North American species (U. bella (L.) and U. ornatrix (L.) ) but in genitalic characters it is conspicuously different.

Utetheisa idae, new species.

Pl. 8, Figures 1–2a.

Labial palpus white; first and second segments shaded with pale orange to light scarlet outwardly; third segment black outwardly. Antenna fuscous. Head, thorax and abdomen white; head with a large black spot in front and another on vertex, orange between antennae; collar orange in middle, with a black spot on each side and shaded with orange laterally; tegula orange basally, edged inwardly and outwardly with black; apex black; thorax with a small black median spot anteriorly; abdomen with a lateral row of indistinct black spots. Fore wing white to slightly yellowish, with five transverse rows of orange-red to scarlet spots, alternating with similar rows of black spots; apex with two short black dashes followed by a series of six or seven small black spots around termen to tornus; cilia white, shaded with blackish fuscous. Hind wing white, with a black border; apex broadly solid black; from hind margin, at vein two, a large quadrate inward expansion of the black border; at the end of cell, on discocellulars, two transverse black dashes. Legs white, shaded with blackish fuscous.

Male genitalia: Harpe broadly expanded and truncate at cucullus; at middle of harpe a prominent, pyramidal protubercance; from base, extending over edge of costa near base, a large fleshy, hairy protubercance; from the inner margin, for almost the entire length of the harpe, a conspicuous, expansible scale tuft, the scales of two kinds, short, broad, somewhat cupped scales and long, hair-like scales expanded and flattened distally. Anellus a broad, V-shaped band, finely scobinate at apex. Aedeagus moderately stout, straight, with an elongate scobinate patch laterally; vesica armed with two small groups of short, stout cornuti. Vinculum a broad U-shaped scobinate band. Uncus long, slender, beaked.

Female genitalia: Sternite of eighth segment strongly sclerotized and deeply incised on posterior edge to accommodate genital opening. Ductus bursae broad, flattened, strongly sclerotized, convoluted and studded with small spines at junction with bursa copulatrix. Bursa copulatrix asymmetrical, with a large, posterior evagination on the right side at the extremity of which is the inception of the ductus seminalis; signa two, small, toothed oval plates. Alar expanse 37–43 mm.
1 Utetheisa idae
Type.—U. S. National Museum No. 53751.

Type locality.—Swain’s Island, Newfoundland.

Food plant.—Unknown.

Remarks.—Described from the male type and five female paratypes all collected by Commander G. S. Stephenson, U. S. N., in July, 1937. One paratype is deposited in the Canadian National Collection; the remainder are in the U. S. National Museum.

This species differs from the other North American species and their forms by having the apex of the hind wing solid black and not bisected by the ground or some other light color.

The genitalia differ from all others I have seen (including those of Asiatic and European species) by the broad expansion of the cucullus of the harpe of the male. The female genitalia are typical of the group and possess the long, slender, tubular glands opening on the dorsal surface of the membrane between the ovipositor lobes and the collar. These glands are found on many other species of Arctiidae also.

This species is named in honor of my mother.

The drawings were made by Mrs. Eleanor A. Carlin, artist of the Bureau of Entomology and Plant Quarantine.

Explanation of Plate 8.

1-1d. Male genitalia: 1, ventral aspect with aedeagus removed; 1a, lateral aspect of aedeagus; 1b, dorsal aspect of left harpe; 1c, anellus; 1d, transtilla.

2-2a. Female genitalia: 2, ventral aspect; 2a, dorsal aspect showing tubular glands.

BOOK NOTICE.

The Principles of Insect Physiology; by V. B. Wigglesworth, Reader in Entomology, London School of Hygiene and Tropical Medicine. 8vo., buckram, 434 pp., 316 illustrations, bibliog. New York, E. P. Dutton & Co., 1939. $8.00 less 20%.

In this book the author has produced a work entirely worthy of his high reputation in the realm of Natural Science. As a reference book it is of the highest value and as a text book for class instruction it will prove indispensable. In addition to a complete discussion of all phases of insect physiology it contains ample and invaluable bibliographic material. The illustrations are appropriate and of excellent quality and the volume is substantially made and durably bound.—w. r. w.
A NEW STOMATOThrips FROM THE UNITED STATES (Thysanoptera).

By J. C. Crawford, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The genus *Stomatothrips* was described by Hood in 1912 based on a single species found in the United States and Mexico. In 1925 he added a second species from the West Indies. The herein-described species adds a third to the genus, the species of which appear to be not often collected.

**Stomatothrips brunneus**, new species.

*Female* (macropterous).—Length (somewhat distended) 1.8 mm. Dark reddish-brown including legs, abdominal segment 2 light yellowish brown. Head wider than long, eyes ventrally prolonged caudad; ocelli with deep-red crescents; frontal costa narrowly notched; postocular bristles about 4 pairs, weak, short, except a strong one, which is next to innermost and situated back of posterior ocellus, 28 μ; a few other scattered weak bristles on dorsum of head; mouth cone reaching beyond middle of prosternum; antenna with segments 1–2 light reddish-brown, 3–4 light yellow with 4 narrowly brown at apex, 5–9 dark brown; sense areas on 5 and 6 linear, respectively 22 and 19 μ long, on 7 oval, hardly 4 μ long; fore wing dark brown with a hyaline band beyond scale and a subequal one near apex, the intermediate brown area lightened in its third and fourth ninths; fore vein with 20 spines, hind vein with 13; legs about concolorous with body, with mid and hind tibiae blackish-brown, darker than their femora.

Measurements (in microns):

- Head, length 156, width 188; bristles on abdominal segment 9, both pairs 180, on segment 10, 180, ovipositor 366.

Antennae:

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*Type locality.*—Lafayette County, Ark.

*Type.*—Cat. No. 53970, U. S. National Museum.

Described from one specimen taken "in peach orchard soil October 13, 1936," with the following data: No. T1609, from W. F. Turner. This specimen lacks both posterior wings and the right fore wing.

Differs from *flavus* by its dark color, shorter antennal segments, with segment 4 only about .6 the length of 3, 5 over .7 as long as 4, 8 about half as long as 7; sensory area on antennal segment 7 not linear; posterior margins of basal abdominal segments not whitish, etc.
TWO NEW GENERIC NAMES FOR SOUTH AMERICAN COLEOPTERA.

By Lawrence W. Saylor,
Bureau of Biological Survey, U. S. Dept. of Interior.

The generic name of Anomalonyx has been used in three different instances, in each case for a genus of beetles. Anomalonyx was first proposed by Weise in 1903 for a genus of African Chrysomelidae (Dtsch. Ent. Z., p. 334). For the two later homonyms I propose the following new names:

ANOMONYX, new generic name.
Anomalonyx Moser 1921, Ent. Ztg., Stett., Vol. 82, p. 156 (non Weise 1903).

This genus of scarabaeid beetles is monobasic, including only Anomalonyx uruguayensis Moser.

ANOMALONYCHUS, new generic name.

Denier designated Lyttajumosa Germar, described from Brazil, as the genotype; this species also occurs in Argentina.

BOOK REVIEW.
The Bark and Timber Beetles of North America North of Mexico. The taxonomy, Biology, and Control of 575 species belonging to 72 genera of the superfamily Scolytoidea, by W. J. Chamberlin, pages I–IV and 1–513, 321 numbered text figures and numerous others not numbered; 8.5 x 10.75. Published in photolitho offset by O. S. C. Cooperative Association, Corvallis, Oregon. Price—pressboard $5.50; cloth, $6.50.

Teachers and students of forest entomology as well as foresters and entomologists engaged in field work should be glad to welcome this volume to their reference libraries. The work, as the author frankly states, is largely a compilation in which the author's aim was the "bringing together in one volume all the available information on the family ... with the thought of treating, from both the taxonomic and biological viewpoints, the whole superfamily Scolytoidea as found in North America north of Mexico."

The first 91 pages are concerned with the discussion of such biological subjects as seasonal and life histories, habits of bark beetles and ambrosia beetles, their relations to their host trees and to other factors in their environment such as insect competition for food, parasites, predators, fungi, climate, etc. Then follows a brief discussion of various methods of artificial control, to which only 10 pages of text are devoted. The reviewer believes that considerably more space might profitably have been devoted to a fuller discussion of these practical aspects.
The main body of the book is devoted to the taxonomy of the superfamily. This comprises a total of 367 pages and is by far the most valuable portion of the volume. It contains keys to the 2 families, 5 subfamilies, 72 genera and 575 species of Scolytoidea occurring in America. Both genera and species are described, briefly but usually adequately, and many are illustrated by figures. One attractive and useful feature is that frequently a small figure, illustrating some characteristic structure, appears opposite each division of the keys. The characterization of each species is followed by a citation of its known distribution, a list of its known hosts, and a short account of its habits, when such data are available in the literature.

The figures are all reproduced by the offset method, and when the originals have been pen and ink drawings or clear zinc-line cuts, the results are good. The offsets from either wash drawings or from halftone reproductions of the same, are often not so successful and quite a number are blurred and of little or no value. Most of the illustrations are taken from other publications but a few are original.

The treatment of the taxonomy of the group is followed by a bibliography of 30 pages comprising nearly 450 titles of articles. This list of itself is of considerable value to the student of the group. While the reviewer has detected a few minor omissions, he has not noted any omissions of great importance. The bibliography is followed by an index of 13 pages, which not only furnishes ready reference to the discussion in his own book, but also gives reference to the original description or to a later revision.

This book, while often quite technical, should be of great value to any one concerned with the activities of bark beetles in our American forests. While the forester or control man may not receive much help from the section on control, a careful study of the section on biology will give him a better insight into many of the known facts in the lives of the beetles which may enable him to understand why certain methods of control fail while others are successful. Also an intelligent use of the keys and descriptions will enable him to recognize many of the forms which he may find about him. The technical entomologist will at once realize the value of having keys and brief descriptions of all of the known American species under one cover.

The reviewer might, if he thought it desirable, point out various minor defects in the book, such as mistakes in the spelling of scientific names, numerous typographical errors, or even what he considers errors in judgment or interpretation, etc.; but he believes the good points so far outweigh the defects, that mention of the latter may well be omitted.

M. W. B.
A NEW NAME: ELMIDAE (COLEOPTERA).

By Paul Musgrave,
Huntington, W. Va.

Some months ago a monograph appeared which should be of great assistance to workers in the field of aquatic biology and more particularly to the coleopterist. This monograph, "A Monographic Revision of the North American Species of Stenelmis (Dryopidae: Coleoptera)," by Dr. Milton W. Sanderson of the Department of Entomology of the University of Arkansas, was published in The University of Kansas Science Bulletin, Vol. XXV, No. 22, p. 635-617, June 1, 1938. The genus Stenelmis has been a very difficult one for the taxonomist and Dr. Sanderson has done a remarkably good job in devising a key for the identification of the many species.

As so frequently occurs, however, when a great many species are described, the name given one of the eighteen new forms is a homonym and therefore a new name is required. The new name proposed below is in recognition of the very excellent work of Dr. Sanderson.

Stenelmis sandersoni, nom. n.

Stenelmis tarsalis Sanderson 1938. J. Delève having described Stenelmis tarsalis from Belgian Congo in 1937 (Bull. et Ann. Soc. ent Belgique, 77, p. 151) the new name is proposed for the species described from Winchester, Virginia, on page 675 of Sanderson's monograph on Stenelmis.

MINUTES OF THE 506TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 506th meeting of the Society was held at 8 p. m., Thursday, January 4, 1940, in Room 43 of the National Museum, with 45 members and 10 visitors present, and President Muesebeck presiding. The report of the December meeting was approved.

The following new members were unanimously elected:
- Donald DeLeon, 209 Forestry Building, Ft. Collins, Colo.
- Carl F. Dorsey, Department of Entomology, University of Maryland, College Park, Maryland.
- A. E. Pritchard, Division of Entomology, University of Minnesota, St. Paul, Minnesota.

The President announced the appointment of W. R. Walton and D. J. Caffrey to prepare an obituary notice of the late C. N. Ainslie.

The following committees for 1940 have been appointed:
Auditing—W. B. Wood, Chairman; L. W. Orr.
Program—P. W. Oman, Chairman; L. G. Baumhofer, Floyd F. Smith.


Under Notes and Exhibition of specimens, W. H. Anderson reported and exhibited a prothetelous larva of the White-fringed Weevil which showed pupal characteristics. A. B. Gurney called attention to the fact that the well-known Spanish entomologists, Candido Bolivar and his father Ignacio Bolivar, are now located in Mexico where the former is resuming entomological research.

C. F. W. Muesebeck remarked on some interesting Cecidomyiidae recently received from C. R. Neiswander of the Ohio Agricultural Experiment Station and a valuable collection of aphids presented to the National Collection by E. O. Essig of the University of California. J. A. Hyslop noted the frequent occurrence of prothetically among larvae of Elateridae. R. G. Nagel mentioned his observations of prothetically in *Tribolium*, and H. S. Barber and R. E. Snodgrass discussed certain aspects of prothetically.

The regular program of the meeting was as follows:


3. Report on special programs of the A.A.A.S.

Report on a symposium on speciation held jointly by the American Society of Geneticists and the American Society of Zoologists. E. A. Chapin.

Dr. Chapin reported on the symposium presided over by Dr. Dobzhansky at which the following presented formal papers on speciation as related to their particular fields of research: Sewall Wright, University of Chicago; Ernst Mayr, American Museum of Natural History; Lee R. Dice, University of Michigan; W. P. Spencer, Wooster College; Theodor Dobzhansky, California Institute of Technology. (Author's abstract.)


At the annual meeting of the Entomological Society of America, I had the pleasure of listening to an address by Andrey Avinooff, Director of the Carnegie Museum in Pittsburgh. Prof. Avinooff is a Russian, born at Tulchin in 1884. He is a linguist and an artist, being Associate Professor of Fine Arts at Pittsburgh University. As most of you know, he is a specialist in the Lepidoptera and came to this country about 1920; he accepted the position of Associate Curator of Entomology in the Carnegie Museum in 1922.

The talk was to have been entitled, "The Adventures of a Lepidopterist in Jamaica." While in New York, just prior to the meetings, a suitcase containing lecture materials was stolen, and another lecture, the exact title of which I do not remember but which concerned "patterns in Nature," was given. Although he gave examples in the fields of zoology, botany, and even geology, most of the lecture was devoted to the patterns of Lepidoptera.

Prof. Avinooff admitted that his lecture was pure speculation and did not even
attempt to explain the association of patterns on natural objects with his peculiar conception as to the basic plan of these patterns. He conjured from nowhere in particular a third dimension and then started to develop these various patterns by cutting planes through an hypothetical solid. If you will imagine a solid mass of one color shot through at intervals by cylindrical rods of another color it will be seen that by cutting through with a plane at different angles the same basic elements can be modified to produce almost any variation that one finds in Nature.

There Dr. Avinoff left us suspended, with a very nice explanation of patterns and no way of showing how these patterns were at all connected with the origin or development of patterns on natural objects. But he is a very convincing speaker, and I doubt that many who heard the talk have not tried to fit his pattern into some theory or system so that his basic method of creating patterns could be applied to the patterns we see on natural objects. In our type of scientific work, such a talk cannot but help arouse thoughts that some day may lead somewhere. (Author's abstract.)


Dr. Smith's paper was commented upon by Muesebeck.

Adjournment at 10 p. m.

Ashley B. Gurney,
Recording Secretary.

Actual date of publication, February 29, 1940.
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THE NEARCTIC SPECIES OF ISEROPUS (HYMENOPTERA: ICHNEUMONIDAE).

By R. A. Cushman,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Under the generic name Iseropus Foerster there have appeared in American literature the specific names inquisitor (Say), inquisitoriella (D. T.), coelebs (Walsh), orgyiae (Ashm.) investigatrix (Walsh) and viduiformis Vier. Of these viduiformis properly belongs to Tromatobia Foerster,¹ and investigatrix, as I have already indicated,² is the female of Epiurus alboricta (Cress.).

Concerning the somewhat involved synonymy of the others I wrote in 1918.³ In that paper I showed that the true (inquisitor Say, preoccupied) = inquisitoriella (D. T.) is an Epiurus, while the species usually referred to under those names is the one described by Walsh as Pimpla coelebs. This species is a very common parasite in the cocoons of the tussock-moth (Hemocampa leucostigma [S. and A.]).

In the same paper I synonymized with coelebs, Bassus cylindricus Prov., Pimpla (Itoplectis) orgyiae Ashm. and Pimpla (Epiurus) bruneifrons Vier. In synonymizing cylindricus I followed Davis,⁴ who, after examining the type, declared it to be the same as Pimpla inquisitor (Say). Henry K. Townes, who has recently studied the type, now says (in litt.) that cylindricus is synonymous with Pimpla aquilonia Cress.

In synonymizing orgyiae and bruneifrons I must acknowledge error. It is to correct this error and to bring forward a new species and a new variety that this paper is presented.

The following generic description should distinguish Iseropus from the most closely related genera, Scambus Hartig, Epiurus Foerster and Tromatobia Foerster.

¹ (Pimpla [Iseropus] viduiformis Vier.) = Tromatobia viduiformis (Vier.) (New combination.)
Generic Description.

Head in front view transversely elliptical, in dorsal view strongly transverse; clypeus distinctly emarginate apically; thorax stout, in side view with ventral margin of mesosternum convex; abdomen fusiform in both sexes, widest at about the middle, tergites 2–5 with distinct elevations and impressions; ovispositor strongly compressed, subsagittate at apex, about half as long as abdomen; stigma narrow, less than a third as broad as long, with radius distinctly before middle; apical abscissa of radius strongly sinuate; upper angle of areolet acute; nervellus strongly redivous and broken far above middle; front legs in male normal, femur not concave and tibia not strongly curved. Clypeus in female brown; face and clypeus in male entirely or medially pale; face and orbits in female and frontal orbits in male black.

The species of this genus are gregariously parasitic within the cocoons of Macrolepidoptera, such as species of *Hemero-campa* and *Malacosoma*, the host being still in the larval stage when attacked and the parasitic larva feeding externally.

Key to North American Species.

1. Temple strongly convex, nearly reaching outside tangent of eye; second recurrent at or not far beyond middle of areolet; nervellus broken at or above upper fourth; clypeus strongly impressed and broadly emarginate apically; face of male pale only medially; pale annulus of hind tibia in female distinct only on inner side.................. *californicus*, new species

   Temple strongly receding; second recurrent far beyond middle of areolet; nervellus broken below upper fourth; clypeus weakly impressed and narrowly emarginate apically; face of male entirely pale; pale annulus of hind tibia in female distinct on all sides..........................2

2. Male genital sheath (fig. 1a) long, the apical portion attenuate, distinctly exserted beyond apex of abdomen, each valve not excised on dorso-mesal margin; apical fourth or less of hind tibia black, the tarsal joints narrowly black apically; male with scape beneath and front and middle tibiae entirely white....................... *coelebs* (Walsh)

   Male genital sheath (fig. 1b) short, not attenuate apically, hardly exserted, each valve deeply excised on dorso-mesal margin; nearly or quite apical third of hind tibia black, tarsal joints broadly black apically; male with scape beneath at most partly white and apices of front and middle tibiae reddish at least below.........................3

3. Temples nearly flat; female with maxillary palpus, front coxa except base and the trochanter white, front and middle tibiae largely so.... *orgyiae* (Ashm.)
Temple more strongly convex, especially posteriorly; female with maxillary palpi reddish or fuscous, front coxa and trochanter reddish, front and middle tibiae largely reddish.

4. Face of male brownish ............................................. bruneifrons (Viereck) (typical)
   Face of male yellow ............................................. bruneifrons septentrionalis, new variety

Fig. 1.—Genital sheath (gs)—a. Iseropus coelebs (Walsh); b. Iseropus bruneifrons septentrionalis Cushman.

Iseropus coelebs (Walsh).

Pimpla, Iseropus or Epinurus inquisitor authors, not Say, and inquisitoriella authors, not Dalla Torre, part.


In the last reference cited I synonymized the California species, orgyiae (Ashmead) and bruneifrons (Viereck) with coelebs. More recent study has brought out some characters that may or may not be of specific significance, but which render advisable the recognition of the various forms as distinct. The most useful of these are employed in the key to species.

The following description is drawn from a typical pair of specimens in the National Museum, the male labeled as a neotype of Pimpla coelebs (Walsh).

Female.—Length 8.5 mm., antenna 6 mm., ovipositor sheath 3 mm.

Head in dorsal view with temples strongly sloping, weakly convex, their cephalo-caudad length half that of eye; diameter of a lateral ocellus equal to length of postocellar line and slightly shorter than ocellocular line; vertex, frons and temples polished, impunctate (except along occipital carina), with sparse, short, white pubescence; face about as long as broad, sparsely punctate medially, impunctate laterally, with longer, denser pubescence; eyes distinctly, though shallowly, emarginate opposite antennae; clypeus polished, weakly impressed and narrowly emarginate at apex; malar space very short.

Thorax polished, very weakly punctate, and rather densely clothed with
whitish hairs; propodeum polished and slightly coriaceous posteriorly and medially between the long median carinae, lateral areas sparsely and pleural areas densely punctate, spiracles circular and situated close to the pleural carinae; second recurrent vein far beyond middle of areollet; postnervulus broken at about lower third; nervulus broken at or a little below upper third.

Abdomen densely punctate, elevations of middle tergites polished and nearly impunctate on top, as are also the apices of the tergites; first tergite scarcely as broad at apex as long, dorsal carinae reaching about three-fourths of way to apex; ovipositor sheath slightly more than half as long as abdomen.

Black; Clypeus and underside of flagellum pale brown, antenna darker above, with apices of flagellar joints narrowly pale; palpi, tegula, wing base and humeral angle of pronotum, white; legs bright ferruginous, front coxa piceous at base, apically whitish, as are also the front trochanter and the front tibia and tarsus anteriorly; hind femur black at extreme apex above, hind tibia white with subbasal and apical blackish annuli, the latter occupying somewhat less than a fourth of the length, tarsus white, each joint narrowly tipped with blackish, the apical joint entirely blackish; the same color pattern faintly repeated in red and white on middle leg; wings hyaline.

Male.—Differs from female principally in color of head and of front and middle legs; entire face below antennae; clypeus, scape below, and usually two small spots at apex of scutellum yellowish; front coxa entirely, middle coxa and trochanter in front, and front and middle tibiae entirely, whitish. The clypeus is even less impressed and less deeply emarginate than in the female. The apical portion of the genital sheath (Fig. 1a) is long, narrow and distinctly exserted, the valves entire above.

The above two specimens are selected from a large series reared by L. O. Howard, under Bureau of Entomology No. 205, from Hemerocampa leucostigma (S. and A.) at Washington, D. C., in the course of his study of the parasites of that insect, reference to which is cited above. The following specimens have been examined: The approximately 200 of both sexes of the series mentioned above; about 100 other specimens from the District of Columbia and nearby points in Maryland and Virginia, taken at various times and by various collectors, mostly reared from the tussock moth; 6 reared by A. N. Caudall from Olea sp. at Rosslyn, Va.; 4 reared by W. E. Pennington from the tussock moth at Hagerstown, Md.; 5 from Baltimore, Md., reared from the tussock moth by D. C. Clark; 6 from Harrisburg, Roxboro, and North Cumberland, Pa. (P. R. Myers); one from Flatbush, N. Y. (J. L. Zabriskie); one from Bear Mt., Salisbury, Conn. (A. Stone); one reared by George Dimmock, under his No. 1421b, from Malacosoma americana (F.) at Springfield, Mass.; 4 bearing “Gip. Moth Lab.” Nos. 820, 822 T and 2051 (probably Massachusetts); 3 from Canada (C. F. Baker); one
pair taken in copula by C. P. Gillette at Ames, la.; 4 from Sioux City, la., "attacking tussock moth" (C. N. Ainslie); 4 from "tussock moth," Lincoln, Neb. (C. H. Gable); one, Onaga, Kans. (Crevecoeur); 4 from Victoria, Tex., "reared from mud mason cell" by J. D. Mitchell; one from Mound, La. (F. C. Bishopp); and 5 from Pysiton, Coleta and Langdale, Ala. (H. H. Smith). There are also two series taken in Quarantine at Philadelphia, Pa., and Charleston, S. C., in the holds of banana ships from Guatemala. These may have invaded the ships at the United States ports, although the rather numerous specimens (7 and 9) casts some doubt on this explanation, and they may have come from Guatemala.

The above data show the distribution of the species to cover approximately the eastern half of the United States and southern Canada, with possible extension into Central America.

Among the 200 or more specimens preserved of those reared by Dr. Howard in 1895–1896 in connection with his study of the parasites of *Hemerocampa leucostigma*, and discussed by him under the name *Pimpla inquisitor* Say, there are six females and five males of the form described below as *bruneifrons* var. *septentrionalis*. In 1907 F. D. Couden reared 42 specimens from one of the host, eight of which are *septentrionalis*. There is also a series of seven reared at Baltimore, Md., on Sept. 23, 1904, two of which are *septentrionalis*. In 1925 I collected a few cocoons of the tussock moth containing parasite larvae, which produced adults of *coelebs*, *septentrionalis* and *Epiurus nigri/rons* Vier. From some of the cocoons both *coelebs* and *septentrionalis* emerged and from others both *coelebs* and *E. nigri/rons*.

**Iseropus orgyiae** (Ashmead). New combination.


The female differs from that of *coelebs* (Walsh) in the more extensive black of the hind tibia and tarsus; and from *bruneifrons* (Vier.) in the nearly flat temples, white maxillary palpi, front coxa and trochanter and largely white middle tibia.

The male differs from *coelebs* in the short, blunt genital sheath, the greater extent of black on the hind legs, the pale reddish apices of the front and middle tibiae and the entirely blackish scape; and from *bruneifrons* in the weakly convex temples.

**Type locality.**—Alameda, Calif.  
**Host.**—*Hemerocampa vetusia* var. *gulosa* (Hy. Edw.).  
**Type.**—U. S. Nat. Mus. No. 3323.

In addition to the type series consisting of one female and
three males, there are in the National Collection two females reared from the type host at Mountain View, Calif., by E. M. Ehrhorn; and two males reared from Orgyia under Bureau of Entomology No. 51460 also at Mountain View. These specimens are all somewhat larger than the types.

**Iseropus bruneifrons** (Viereck). New combination.


*Iseropus coelebs* (Walsh) Cushman, Proc. Ent. Soc. Wash., 20: 10-12, 1918,

In its typical form this species is known only from the type series, of which three females and two males are in the National Museum and are the basis of the following description.

**Female.**—Differs from *coelebs* Walsh in having the temples longer and more strongly convex, especially posteriorly; the face slightly, but distinctly broader than long; the palpi reddish to piceous, the legs darker ferruginous, the front legs not at all white, the white of the middle tibia reduced to a narrow annulus, and the hind tibia and tarsal joints more broadly black.

**Male.**—Differs from *coelebs* in the short, blunt genital sheath (fig. 1b), with dorso-mesal margin of each valve deeply excised, the more strongly convex temples, the brownish face, clypeus and underside of scape, the greater extent of black on the hind tibia and tarsus, and the apically reddish front and middle tibia.

**Host.**—*Hemerocampa oslari* (Barnes).

**Type locality.**—Summerdale, Calif.

**Type.**—U. S. Nat. Mus. No. 12273.

Apparently differs from the variety *septentrionalis* only in the brown color of the face of the male; and I am inclined to believe that this is abnormal.

**Iseropus bruneifrons septentrionalis**, new variety.


*Iseropus coelebs* (Walsh) Cushman, Proc. Ent. Soc. Wash., 20: 10-12, 1918,

Except for the color of the face and clypeus and underside of scape in the male I fail to find any character by which to distinguish this form from the typical *bruneifrons*. In this variety the face and clypeus are pale yellow and the scape either piceous or partly yellow below.
Type locality.—Saulte Ste-Marie, Mich.
Type host.—Hemerocampa pseudotsugata McD.
Holotype, allotype and paratypes.—U. S. Nat. Mus. No. 53566.
Paratypes.—Canadian National collection.

The range of this variety extends entirely across the continent in the northern tier of states and southern Canada, where it replaces coelebs on the same sorts of hosts. In the east it overlaps the range of coelebs as far as the District of Columbia, where I have reared it on occasion from the same host cocoon as coelebs.

There appears little doubt that the "Pimpla inquisitor" of the Fise reference is this form.

Described from the following specimens: 2 ♂, 1 ♂, Nerepis, N. B., Aug. 19–22 (A. G. Leavitt); one ♀, Quebec Province, June 18, 1915, A. B. Gahan; 2 ♀, 5 ♂, Blue Hill, Me., Hopkins U. S. No. 111031, reared July 25, 1912, from "Clisiocampa (?) sp. on pine" (A. Busck); 1 ♀, 1 ♂, Orono, Maine, Me. Agr. Exp. Sta. lot 1825 sub 15, reared July 15, 1920, from Ctenucha virginica (Charp.); 1 ♀, Durham, N. H. (Weed and Fiske); 1 ♀, Mt. Greylock, Mass., Aug. 27, 1899; 2 ♀, 1 ♂, Ithaca, N. Y., reared July 16, 1916, from ("Arsilone albovenosa") = Simyra heurici (Grrt.) on cattail (P. W. Claesien); 1 ♀, Vincetown, N. J., Aug. 20, 1924 (J. B. Cronin); 1 ♂, Riverton, N. J., Aug. 5, 1927 (C. H. Ballou); 1 ♀, 2 ♂, North East, Pa., Quaintance No. 11022, reared May 26, 1916, from "Orgyia" (H. Backus); 2 ♀, 1 ♂, Harrisburg, Pa., May 29–June 12, 1908 (P. R. Myers); 1 ♂ N. Cumberland, Pa., May 16, 1905 (Kirk and Champlain); 1 ♀, 1 ♂, Pittsburgh, Pa., Aug. 20, 1928, (H. A. Scullen); 1 ♀, Baltimore, Md., reared Sept. 23, 1904, from Hemerocampa (D. C. Clarke); 6 ♀, 5 ♂, identified by the Bureau of Entomology No. 205 as a part of the material reared at Washington, D. C., by L. O. Howard during 1905–1906 from Hemerocampa leucostigma during his study of the parasites of that host and treated under the name "Pimpla inquisitor"; 2 ♀, 7 ♂, Washington, D. C., reared Sept. 4–5, 1907, from Hemerocampa leucostigma (F. D. Couden); 3 ♀, 4 ♂, Washington, D. C., reared July 18, 1925, from Hemerocampa leucostigma (R. A. Cushman); 1 ♀, Ohio (♀), Aug. 7 (F. D. DeGant); 2 ♀, 2 ♂ (including holotype ♀ and allotype ♂), Saulte Ste-Marie, Mich., reared Sept. 9, 1937, from Hemerocampa pseudotsugata McD.; 1 ♂, Detroit, Mich., July 13, 1933 (G. Steyskal); 1 ♀, Milwaukee, Wis.; 1 ♀, Cass Co., Minn., reared July 19, 1937, Minn., reared July 19, 1937, from Malacosoma disstria Hbn. L. W. Orr); 1 ♀, Colorado (C. F. Baker); 1 ♀, 9 ♂, Seaview, Wash., Quaintance No. 17012, reared Sept. 12, 1918, from "tussock moth" (H. K. Plant); 1 ♀, Seattle, Wash., reared by
C. V. Piper from *Notolophus badia* (Hy. Edw.); 1 ♀, Newport, Ore., Aug. 20, 1929 (R. E. Dimick).

**Iseropus californiensis**, new species.

Differs from *coelebs* (Walsh) principally as follows.

**Female.**—Length 11 mm., antennae 7 mm., ovipositor 3 mm.

- Head from above with temples broad and strongly convex, their cephalo-caudal length distinctly more than half that of eye; diameter of a lateral ocellus shorter than postocellar line, which is equal to ocellocular line; face broader than long, very sparsely, weakly punctate medially; clypeus deeply impressed and deeply emarginate at apex; propodeum dorsally highly polished, almost without punctures or other sculpture; spiracles slightly elliptical, distant from the pleural carina by about their length; recurrent vein originating at about middle of areolet; postnervulus broken not far below middle; nervellus broken above upper third; first tergite fully as broad at apex as long, dorsal carinae not reaching three-fourths of way to apex; ovipositor barely half as long as abdomen.

- Clypeus piceous; palpi fuscous, the maxillary palpus pale toward apex; humeral angle of pronotum not pale; legs darker throughout, front legs without white, hind femur not black at apex, its tibia and tarsus largely blackish with rather obscure annuli, the median one not entirely encircling the tibia, the tarsal joints whitish basally, middle leg with color pattern similar to that of hind leg but less distinct; wings slightly brownish stained.

**Male.**—Length 9 mm., antennae 7 mm.

- Differs principally in color, clypeus and a broad median band on face yellowish; hind legs with pale markings more distinct and more extensive.

**Type locality.**—Yosemite, Calif.

**Type host.**—*Malacosoma constricta* (Stretch).

**Holotype, allotype and paratypes.**—U. S. Nat. Mus. No. 20190.

**Paratypes.**—California Academy of Sciences.

- Described from 6 females and 4 males, including holotype female and allotype male, reared by H. G. Dyar from *Malacosoma constricta* and one female and two males reared by D. W. Coquillett from *Malacosoma californica* (Pack.) at Los Angeles, Calif.
TWO NEW NEARCTIC TABANIDAE AND SOME NEW RECORDS AND CORRECTIONS (DIPTERA).

By Alan Stone,
Entomologist, Division of Insect Identification, Bureau of Entomology and Plant Quarantine.

The purposes of this paper are to describe a new Tabanus and a new Stonemyia, to make certain corrections to the writer’s revision of the Nearctic Tabaninæ,¹ and to present new distributional records for some Tabaninæ.

Tabanus kisliuki, new species.

(Figs. a–c.)

Medium sized, light orange brown, the abdomen with a median row of pale triangles; wing hyaline, the costal cell infuscated; legs entirely orange brown, the fore tibia not paler basally.

Female.—Length 14.5–18.5 mm. Eye bare, purple in life, with two green bands. Frons about 4.5 times as high as width at basal callus, slightly widened above, thinly covered with gray pollen; basal callus orange brown, flat, slightly higher than wide, the dorsal margin irregular; median callus narrow, tapering at both ends, narrowly joined to basal callus; subcallus and upper genae brown. Antenna orange, the first two segments darker and clothed with short black hair; basal portion of third segment somewhat longer than high, with a distinct dorsal angle and only a slight excision; annulate portion about as long as basal portion. Clypeus and lower genae pale gray, with white hair. Second palpal segment slender, yellowish orange, with short black hair.

Mesoscutum reddish brown, with faint gray lines in the usual pattern; black hair on prescutal lobe, the rest of mesonotum with fine, semierect, dark hair and longer, silky, recumbent, white hair. Pleura, sternum, and coxae grayish brown, with mostly white hair. Wing hyaline, the costal cell yellow brown. Legs entirely orange brown, with dark hair; fringe of hind tibia not pronounced.

Abdomen orange brown, the tergites with narrow, pale, posterior bands, which expand medially to form a row of whitish triangles and are widened laterally; sternites orange brown, somewhat darker posteriorly, with narrow, pale, posterior bands.

Male.—Coloration essentially as in female, except clypeus and entire genae brownish, with light-brown hair and fine hair of thorax all light brown. Large and small facets of eye not sharply or greatly differentiated. Palpus about 2.5 times as long as thick, acute apically.

Holotype.—Female (Ohio State Museum). Paratypes, one female, one male (Ohio State Museum), two females (U. S. National Museum No. 53930).

Type locality.—Helena, Miss.

Remarks.—The holotype and four paratypes were collected at Helena, April 14, 1916, by Max Kisliuk, Jr., and I take pleasure in naming the species in his honor. One paratype was also collected by him at Ocean Springs, Miss., April 18, 1916.

This species would run to couplet 69 of the writer’s key to the females of Nearctic species of *Tabanus*, but is considerably smaller and quite different in appearance from either *catenatus* Walker or *giganteus* Degeer. The species which it most closely resembles is *ruforfrater* Walker, but *kisiuki* may be distinguished by the colored costal cell, more slender, attenuated palpus, entirely orange-brown antenna, and somewhat more orange abdomen. There is much less difference in the color of the two sexes in this species than there is in *ruforfrater*.

**Stonemyia albomacula**, new species.

(Figs. d-f.)

Large, black, the mesonotum of female clothed with pale-yellow pile; wing dark brown; a patch of pale-yellow hair on middle of posterior margin of second tergite.

Female.—Length 14.5 mm. Eye bare. Frons slightly less than three times as high as wide, slightly widened at vertex, entirely chocolate brown; ocellar tubercle darker, the ocelli pale yellow; region above antennae slightly protuberant. First two antennal segments black, with black hair; third bright orange, the last segment of flagellum darkened; clypeus and genae chocolate brown, with blackish hair. Palpus black, with black hair, the second segment 1.75 mm. long, slightly swollen basally, tapering to an acute apex. Proboscis black, shorter than height of head.

Entire thorax and legs dark brown to black, the mesonotum somewhat paler and clothed with dense, recumbent, pale-yellow hair; a patch of pale-yellow hair on anterior margin of upper squama. Wing entirely brown, yellower anteriorly, except base of cell R₁; center of other cells pale, but this probably due to failure of wing to get fully colored before death of fly; trace of a stump at base of vein R₂+₃. No distinct fringe on hind tibia. Abdomen dark brown to black, with black hair; hind margin of tergite 2 with a transverse patch of pale-yellow hair medially, and some pale-yellow hairs at each side; hind margin of sternite 2 with pale hairs at each side.

Male.—Coloration as in female except that there is no pale hair on the mesonotum, the pale hair on the squama is somewhat yellower, the median patch of pale hair on tergite 2 is narrower and longer, the pale hair on the side of the second sternite is more abundant, and in two specimens there are pale hairs laterally on the hind margin of sternite 4. One male has a few pale hairs on the prescutal lobe. Second palpal segment slender, porrect, the apical half turned downward slightly.

Type locality.—Bass Lake, Madera County, Calif.

Remarks.—The holotype and one paratype were collected at the type locality June 7, 1938, by J. R. Warren; one paratype was caught at the same time and place by N. F. Hardman; one paratype was captured at Yosemite, Calif., altitude 3,880–4,000 ft., June 14, 1938, by J. R. Warren. The specimens were sent to the writer for determination by Mr. T. H. G. Aitken, who kindly granted permission to retain type material at the U. S. National Museum. This species is as large as californica (Bigot) and strikingly different in color from all other described species.

New Distribution Records.

These are only those records that appear to be of particular interest as representing distinct extensions of the known range, either geographically or seasonally, of certain species, or recent collections of little known species.


*Stenotabanus daedalus* Stone. Eight miles northwest of Gainesville, Fla., September 21, 1938, E. S. Thomas, collector. This specimen, in the Ohio State Museum, is only the second seen by the writer. The type was collected at Gainesville nearly 24 years earlier.

*Stenotabanus psammophilus* (Osten Sacken). Islamoranda, Upper Matecumbe Key, Fla., July 20, 1939, P. W. Oman, collector. Twelve specimens of both sexes were collected. These represent no great extension of known distribution, but were collected more than a month later in the year than any specimen previously seen.

*Tabanus fairchildi* Stone. Lillooet, British Columbia, September, 1939, A. W. A. Phair, collector.

*Tabanus truquii* Bellardi. El Centro, Calif., April; Somerton, Ariz., June 2, 1938, C. R. Deonier, collector; Stillwater, Okla., August 3 and 22, 1938, R. W. Kaiser, collector. These represent a northern and western extension of the known range of the species, and the latter date is considerably later in the year than any previous record.


*Tabanus philipi* Stone. Del Norte County, Calif. This
specimen was sent to the writer from the Deutsches Entomologisches Institut and has been returned to that collection.


**Corrections.**

The following changes should be made in the writer's paper "The Horseflies of the Subfamily Tabaninae of the Nearctic Region, U. S. Dept. Agr., Misc. Pub. 305, 1938." Those followed by "(CBP)" were brought to the attention of the writer by Dr. C. B. Philip.

Page 7, line 7. For "median callus; either" substitute "median callus, and either."

Page 19, line 14. For "Pinellas County" substitute "Monroe County."

Page 42, couplet 73, second line. Delete "black" and for "apenx" substitute "apex."

Page 47, couplet 143, third line. For "markins" substitute "margins."

Page 65. The holotype and allotype of *Tabanus euryceras* are in the collection of Dr. C. B. Philip, and not in the collection of the University of Kansas (CBP).

Page 71. *Tabanus texanus* was described from a pair so that line 13 should read, "Cotypes.—Female and male, . . ." (CBP).

Page 99. The type number should be 51969 rather than 51968.

Page 119. In caption for figure 56 for "Front view of head and palpus" substitute "Antenna and front view of head."

Page 146. Paratypes of *Tabanus hearlei* are also in the collection of C. B. Philip (CBP).

Page 148, line 3. For "or" substitute "on."

Page 148, lines 6–7. For "Paratypes, females" substitute "Paratype, female" (CBP).

Page 155. Paratypes of *Tabanus liorhinus* are also in the collection of C. B. Philip (CBP).

Page 156, line 1. For "Red Lake Falls, Minn." substitute "Salmon Lake, Nicola Dist., British Columbia" (CBP).

Page 159, line 2. For "University of Minnesota collection" substitute "collection of C. B. Philip" (CBP).


Page 162. Delete "(New synonymy)" after the citation for *Tabanus canadensis* under *Tabanus septentrionalis*. Dr. Philip published this synonymy in 1931 (CBP).
Explanation of Figures.

a. Frons of *Tabanus kisliuki*, new species, female.
b. Antenna of *Tabanus kisliuki*, new species, female.
c. Palpus of *Tabanus kisliuki*, new species, female.
d. Frons of *Stonemyia albomacula*, new species, female.
e. Antenna of *Stonemyia albomacula*, new species, female.
f. Palpus of *Stonemyia albomacula*, new species, female.
NOTES ON NORTH AMERICAN DOLICHOPSYLLID SIPHONAPTERA.

By Irving Fox,
Department of Zoology and Entomology, Iowa State College.

Through the courtesy of the authorities of the United States National Museum, the writer has had the opportunity to study their extensive collections of fleas and to report upon some of them below. Particular thanks are due to Dr. H. E. Ewing, of the Bureau of Entomology and Plant Quarantine, in whose honor the following new species is named, for his helpful advice and assistance.

FAMILY DOLICHOPSYLLIDAE.

Amphipsylla ewingi, new species.

(Pl. 10, Fig. 1.)

Male.—Head subangulate in front, preantennal region with four rows of bristles. Uppermost row consisting of seven bristles, the next row below this one reduced to but one bristle, the remaining two rows consisting of two bristles each. Eye vestigial, but the vestiges large and pigmented. Postantennal region with three rows of bristles. Uppermost row consisting of two bristles, the middle row of four or five, and the lowermost or submarginal row of seven. Labial palpus five-segmented, reaching beyond one-half the length of the fore coxa. Pronotal ctenidium consisting of about ten spines on a side. Three antepygidial bristles present on a side, the middle the longest, and the lowermost shorter than the uppermost. Modified segments.—Process of clasper not well set off from posterior abdominal tergites in the single specimen at hand. Movable finger more or less subquadrate distally, bearing on dorsal margin a single bristle and on posterior margin about nine bristles of which one is short, broad, heavily pigmented and spiniform (Fig. 1.). Spring of penis not completing a single turn.

Type host and type locality.—“Alaska short-tailed mouse” at Golovin, Alaska.

Type slide.—U. S. N. M. No. 53585.


The genus Amphipsylla Wagner is circumpolar in distribution, but most of its species occur in the palearctic region. The above described new species is the second to be reported from North America. In 1905 Rothschild described Ceratophyllus
pollionis from Alberta which was subsequently reduced to the status of a subspecies of *Amphipsylla sibirica* Wagner 1898. The two forms may readily be separated by differences in the structure of the movable fingers.

**Opisodasys spatiosus**, new species.

(Pl. 10, Fig. 2.)

*Male.*—Frontal tubercle small, acuminate. Ocular row consisting of three bristles. Frontal row reduced to but one bristle above which are two or three others near antennal groove. Numerous small setae above eye near antennal groove. Postantennal region of head armed with but a single bristle in addition to the marginal row of about five. Labial palpus extending beyond the apex of the fore coxa, reaching almost to the apex of fore trochanter. Pronotal ctenidium consisting of about 12 spines on a side. Three antepygidial bristles present on a side, one of which is aborted, and of the remaining two, one is about twice as long as the other. *Modified segments.*—Process of clasper broad, armed with two bristles at its apex. Movable finger armed with two spiniform bristles, between which is located a third much smaller one (Fig. 2). Manubrium conspicuous, widely expanded distad. Penis slender without a distal process. Spring short, not completing a single turn.

**Type host and type locality.**—“Chiricahua red squirrel” at Chiricahua Mts., Arizona.

**Type slide.**—U. S. N. M. No. 53586.

**Type material.**—Male holotype collected by W. P. Taylor from the “Chiricahua red squirrel” at Chiricahua Mts., Arizona, August 18, 1933, and male paratype bearing the same data in the United States National Museum.

This species may be readily distinguished from the four other North American members of its genus, whose males are known, by the structure of the movable finger. *O. robustus* Jordan 1925, from Arizona and New Mexico, is known only from the female.

**Ceratophyllus quebecensis**, new species.

(Pl. 10, Figs. 3 and 4.)

*Male.*—Frontal tubercle prominent and acuminate. Ocular row consisting of three bristles of which the middle is shortest. Frontal row consisting of five short bristles. Postantennal region armed with two bristles in addition to a submarginal row of five. Labial palpus reaching to about four-fifths the length of the fore coxa. Pronotal ctenidium consisting of 15 or 16 spines on a side. Three antepygidial bristles present on a side, the middle robust and well developed, the other two aborted. *Modified segments.*—Process of clasper prominent, more or less rounded distally, where it is armed with three bristles. Movable
finger shaped as is shown in Fig. 3, its posterior margin armed with four bristles. Penis long and slender, ending in a curved process. Spring not long, not completing a single turn. Sternite VIII broad and conspicuous, its apex armed with about four bristles.

Female.—General structure as in male. Receptaculum seminis very similar to that of C. difinis Jordan, but differing in details, as is shown in Fig. 4.

Type host and type locality.—"Eider down" at St. Mary’s Island, Quebec.

Type slide.—U. S. N. M. No. 53587.

Type material.—Male holotype and female allotype from "eider down" at St. Mary’s Island, Quebec, collected June 30, 1938 by H. S. Peters, in the United States National Museum.

This species may be readily separated from the other North American members of its genus by the male and female genitalia.

Orehepeas dieteri (C. Fox), new comb.

(Pl. 10, Figs. 5 and 6.)


Male.—Frontal tubercle small and acuminate. Ocular row consisting of three bristles, the middle much reduced. Frontal row represented by a single bristle near the antennal groove. Numerous small setae situated above eye. Post-antennal region with two bristles, one long and one short, near the antennal groove and a marginal row of about five bristles. Labial palpus extending beyond the apex of the fore coxa. Pronotal ectenidium consisting of about nine spines on a side. Two antepygidal bristles present on a side, one almost twice as long as the other; above the long antepygidal bristle is a very slender bristle. Modified segments.—Process of clasper sclerotized in such a way as to give the appearance of being bent at apex towards movable finger. Movable finger long and broad, armed with four spiniform bristles of which the lowermost three are more or less evenly spaced while the uppermost is set off from the others (Fig. 6). Penis long and slender, not ending in a process. Spring short, extending only slightly beyond the penis and not completing a single turn.

Female.—Chaetotaxy of head as in male. Labial palpus extending to apex of fore coxa. Three antepygidal bristles present on a side, middle the longest, uppermost the shortest. Sternite VII divided by a deep sinus into two lobes of which the lower extends further distad than the upper. Receptaculum seminis as in other species of the genus (Fig. 5).

Type host and type locality.—Bobcat, Lynx rufus at Los Angeles Co., California.

Type slide.—U. S. N. M. No. 41820.

Type material.—Described from the male holotype and female allotype in the United States National Museum. Originally described as a subspecies of O. nepos (Rothschild),
this species is more closely related to *O. latens* (Jordan). From both of these it differs in the male by the shape of the process of the clasper and the movable finger, and in the female by the fact that the upper lobe of sternite VII does not extend so far distad as the lower lobe.

**Orchopeas labiatus** (Baker).

(Pl. 10, Fig. 7.)


*Ceratophyllum labiatus* Jordan, 1929, Novitates Zool. 35 : 29.


This species was unfortunately based upon a single female which has not yet been brought into alignment with its opposite sex. According to Jordan (1929), its closest allies are *O. nepos* (Rothschild) and *O. caedens* (Jordan), if it is not identical with one of these species. The differences in sternite VII are slight but sufficient to warrant the maintenance of *O. labiatus* as a separate species. Its status should be elucidated when the common Idaho species of *Orchopeas* are known. Details of the structure of sternite VII which has not been illustrated before are shown in Fig. 7.

**Opisocrostis ornatus**, new species.

(Pl. 10, Fig. 8.)

*Male.*—Preantennal region of head armed with an ocular row of three bristles of which the middle is situated higher than the other two. Frontal row consisting of three widely separated bristles. Bristles of second antennal segment very long. Postantennal region armed with a single bristle in addition to a marginal row of three or four. Labial palpus long, extending beyond the apex of the trochanters by a segment. Pronotal ctenidium consisting of nine or ten spines on a side. One well developed antepygidal bristle present on a side. Modified segments.—Process of clasper broad and lobular, armed with about nine weak bristles on the dorsal margin. Movable finger acuminate at its apex, armed with a number of bristles on its posterior margin as is shown in Fig. 8. Penis broad and heavy appearing, truncate distally. Spring long, but not completing a single turn.

*Type host and type locality.*—Prairie-dog, *Cynomys gunnisoni*, at Saguache Co., Colorado.

*Type slide.*—U. S. N. M. No. 53588.

*Type material.*—Male holotype collected from the prairie-dog, *Cynomys gunnisoni*, at Saguache Co., Colorado, by S. C.

This species is closely allied to *Opisocrostis tuberculatus* (Baker) from which it differs particularly in the structure of the male genitalia.

**EXPLANATION OF PLATE NO. 9.**

Fig. 1.—*Amphipsylla ewingi*, new species, movable finger.
Fig. 2.—*Opisodasys spatiosus*, new species, movable finger.
Fig. 3.—*Ceratophyllus quebecensis*, new species, movable finger and sternite VIII.
Fig. 4.—*Idem*. receptaculum seminis.
Fig. 5.—*Orchopeas dieteri* (C. Fox), receptaculum seminis and sternite VII.
Fig. 6.—*Idem*, process of clasper and movable finger.
Fig. 7.—*Orchopeas labiatus* (Baker), sternite VII of female.
Fig. 8.—*Opisocrostis ornatus*, new species, process of clasper and movable finger.

**A NOTE CONCERNING THE LARVA OF A BEETLE, BOROS SCHNEIDERI (PANZER), A EUROPEAN SPECIES.**

By R. A. St. George,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Following the author's publication of a technical description of the North American beetle larva *Boros unicolor* Say,1 Dr. Ivar Tragårdh, of the Experiment Station at Stockholm, Sweden, through the courtesy of Dr. Carl H. Lindroth, sent to the writer, for study, a single larval specimen of the European species, *Boros schneideri* (Panz.)(Pl. 9, figs. 1–3).2 Dr. Tragårdh thought this larva would be of interest to the writer because it agreed very well with the description and figures of the North American species mentioned above (Pl. 9, figs. 4 and 5).

The writer's comparison of the morphological details of the larvae of both the European and the North American specimens revealed them to be almost identical, even to the arrangement of their setae. This remarkable similarity of the immature stage of these two species is not surprising in view of the fact that Say,3 in 1826, had also noted the mature adult of *B. unicolor* Say to be "very closely allied to that of *B. elongatus* Herbst," a synonym of *B. schneideri* (Panz).

---

2 Specimen collected by Anton Jansson on the island of Gotska Sandö, Örebro, Sweden.
Inasmuch as these two species are so similar and a detailed description of one of them has already been given, it does not appear advisable to present here a technical description of the European species, *B. schneideri* (Panzer). For the benefit of those who do not have access to the above mentioned paper concerning the North American species, the following family characterization of **Boridae** Herbst is given as presented in that paper with the exception of a slight addition to that portion relating to the presence of protuberances on the urogomphi and to a difference in color, since it serves adequately as a general description of the larva of *B. schneideri* Herbst:

Larva elongate, depressed, with subparallel sides, well sclerotized, smooth, shining, with few and short setae, color (castaneous to) testaceous. Head extended. Labrum distinct; clypeus fused with frons; on each side with five ocelli, arranged in two transverse groups; antenna contiguous to mouth frame, consisting of three setiferous articles, the second bearing a minute apical supplementary appendix. Mandibles slightly flattened, asymmetrical, with apex tridentate, cutting edge bearing two additional small teeth, molar structure strong, protruding, and with carinate grinding surface. Ventral mouth parts retracted; maxilla with entire and obtuse mala, maxillary palpus with three articles; cardo divided into two parts; maxillary articulating area large and distinct; gula, submentum, and mentum distinct, prementum⁴ broad, labial palpus with two articles; ligula large, subconical, and hairy. Epipharynx semi-membranous, bearing two hooks and many minute teeth; hypopharynx with sclerome. Legs all alike, strong and five jointed; coxae inserted widely apart. Prothorax with very large pre sternum, consisting of a median spatulate part and two lateral subtriangular parts. Tergal plates of mesothorax, meta thorax, and the first eight abdominal segments anteriorly with subtransverse, medianly obsolete linear groove with raised front margin; tergal plate of eighth abdominal segment about twice as long as that of ninth (excluding urogomphi); tergal plate of ninth abdominal segment heavily sclerotized, transversely sub rectangular, bearing a pair of slightly flattened, backwardly directed, falcate urogomphi; one pair of well-sclerotized pits present on the ventral side of the tergal plate in the margin between the bases of the urogomphi (the latter sometimes provided with a series of more or less prominent wart-like protuberances on margins). Spiracles annular. First thoracic spiracles dorso-laterally seated in the pre-epipleurum of mesothorax; second thoracic spiracle present in epit epleurum of metathorax but vestigial; abdominal spiracles dorso-laterally placed in the terga of the first eight abdominal segments.

The following character is the only one noted which will serve to separate the two above-mentioned species of *Boros* Herbst.

⁴ As “prementum” that part of the labium is designated which lies between the mentum and the ligula, and which morphologically consists of the median fused stipites labii and the labial palpifers.
In color B. schneideri is somewhat darker than B. unicolor, being castaneous rather than testaceous. Just how constant a character this is can not be determined without access to a series of specimens which are unavailable to the writer at the present time.

Not only in structure but also in habit are these two species similar. Both occur under the bark of dead or dying pines. The specimen which Dr. Trägårdh loaned for study was removed from Scotch pine (Pinus silvestris L.). The larva of the North American species previously described was taken from shortleaf pine (Pinus echinata Mill.). It has also been taken from other species of dead pine.

Since the European specimen so closely resembles the known North American species and since it is the only species of the genus which is known to occur in Sweden, there can be little doubt that the larva is Boros schneideri (Panzer). The only other species in the genus in addition to the two mentioned above is B. sibiricus Motsch., which is known to occur only in Siberia, Russia.

Subsequent to the preparation of this note, there has come to the writer's attention two papers published on the same subject by European scientists. The more comprehensive one is by U. Saalas of Finland, the other by Anton Jansson of Sweden. It appears that both men have known for some time that the European specimens which have been collected at intervals since 1912 in Finland and in Sweden, are B. schneideri, especially since on one occasion an adult was taken in association with numerous larvae. Apparently no adults have been reared.

Both Saalas and Jansson commented upon the remarkable similarity which exists between the European and North American species, and also on the present writer's1 description and illustrations of B. unicolor. Both also noted a minor difference between the two species but on account of the lack of mature larval material of the North American form, they were uncertain as to its validity. This difference concerns the shape of the posterior margin of the ninth abdominal segment. In B. schneideri, it is scalloped in a triangular way, while in B. unicolor, it is more rounded. Saalas also points out that in the former species this margin lacks the distinct black wart-like protuberances at the base of the urogomphi on the outer margin which are quite typical in the case of the latter species. Further,

that the urogomphi of the European form is bent inwards more than is the case with the North American form.

In addition to the writers figures of B. unicolor, Saalas had access to eight immature larvae which he secured while on a trip through this country during the summer of 1928.

Since reviewing the two above mentioned papers, the writer has carefully compared the single larval specimen at hand of B. schneideri with several mature and immature larvae of B. unicolor to determine whether or not the characters noted above by Saalas and Jansson will separate the two species.

With reference to the shape of the posterior margin of the ninth abdominal segment, it was found that there occurs a sufficient variation within the mature larvae of the American species as to make it difficult to be certain of the form concerned when using this character to distinguish between the two species. In general, however, it was noted that the urogomphi of most of the B. unicolor larvae appeared to be bent inward slightly less than those of B. schneideri, which made the scalloped portion of the posterior margin of the former species appear more rounded than that of the latter. Another way of expressing it is to say that the urogomphi in the case of B. schneideri are bent inward sufficiently so that the posterior scalloped margin between them is curved to form an acute angle, while the urogomphi in B. unicolor are bent in such a manner as to cause the margin to form an obtuse angle. The tubercles along the posterior margin also appear to vary in prominence in the latter species. However, with reference to the presence of wart-like protuberances at the base of the urogomphi on the outer margin, it was found that these were more or less prominent but constant in larvae of all ages in the American species. Since Saalas has noted that his series of larvae of the European form uniformly lack such protuberances on this portion of the urogomphi, this character and that relating to a difference in color, should be adequate to separate the two species of Boros.

Explanation of Plate 10.

(Figures drawn with aid of camera lucida by the author.)

Fig. 1. Boros schneideri. Right mandible, ventral view; a1, a2 and a3, tridentate apex; t, teeth of cutting edge; m, mola part with carinate grinding surface.

Fig. 2. Boros schneideri. Larva, dorsal view.

Fig. 3. Boros schneideri. Left antenna, dorsal view; bm, basal membrane; 1, 2 and 3, first, second, and third articles; sa, supplementary appendix on second article.

Fig. 4. Boros unicolor. Left antenna, dorsal view. Explanation of figures and letters as in fig. 3.

Fig. 5. Boros unicolor. Right mandible, ventral view. Explanation of letters as in fig. 1.
MINUTES OF THE 507TH REGULAR MEETING OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 507th meeting of the Society was called to order by President Muesebeck at 8 p. m., Thursday, February 1, 1940, in Room 43 of the National Museum. There were 39 members and 14 visitors present. The report of the January meeting was read and approved. The President discussed the financial condition of the Society.

Under Notes and Exhibition of Specimens, Austin H. Clark commented upon several eastern butterflies which only in recent years have been taken in Virginia, or which have unusual areas of distribution. Mr. Clark exhibited specimens of the species discussed.

The regular program included the presentation of two talks by members of the Bureau of Entomology and Plant Quarantine, the second one being the Address of the retiring President of the Society:


The speaker exhibited several pairs of forceps and scissors, the points of which had been specially prepared for unusually delicate work. Equipment for handling fluids in very small amounts was also shown, and the different aspects of micromethods in anatomical and other research were discussed. (Secretary's abstract.)

2. The anatomical basis of experimental work on insect behavior. R. E. Snodgrass.

Mr. Snodgrass devoted most of his talk to a discussion, illustrated by blackboard drawings, of the coordination between the nervous and muscular systems of the insect body. The several senses, and the known anatomical structures which enable the insect to receive stimuli and to react in different parts of the body were discussed. (Secretary's abstract.)

Comments followed by Yeager.

Adjournment at 9.45 p. m.

ASHLEY B. GURNEY,
Recording Secretary.

Actual date of publication, March 30, 1940.
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September

BY THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.
Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3 1917, authorized July 3, 1918.
THE
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THE NEARCTIC SPECIES OF ELAPHROTHRIPS BUFFA
(THYSANOPTERA : PHLABOTHRIPIDAE).

By Floyd Andre,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The genus Elaphrothrips was established by Buffa in 1909, at which time he described E. uniformis as new and transferred from Idolothrips Haliday five other species, namely, quadriruberculatus Bagnall, assimilis Bagnall, longiceps Bagnall, coniferarum Pergande, and flavipes Hood, the last two having been described previously from the United States. In the same publication, seven pages later, Buffa described Dicaiothrips, including in it his new species D. bottegii and transferring to it Idolothrips Schötti (Heeger); but Hood (1927) suppressed this genus as a synonym of Elaphrothrips. Buffa did not designate a type for either genus but Bagnall (1910, p. 370) fixed the type of Dicaiothrips when he said, "The type of the genus is undoubtedly Idolothrips Schötti (Heeger) Uzel, described from Brazil ..." even though Buffa misidentified schötti (Heeger). As early as 1916 Bagnall pointed out that Idolothrips Hinds, Bagnall, and others (not Haliday) was in reality Elaphrothrips Buffa.

As will be observed in the synonymy given for various species treated in this paper, some have been included by different writers in Idolothrips Haliday, Giaionothrips Zimmermann, Dicaiothrips Buffa, and Elaphrothrips Buffa. Hood (1927) greatly clarified the matter when he pointed out that the character used for separating Dicaiothrips from Elaphrothrips (the curved or straight bristle at the apex of the fore femur of the male) was invalid, for he found, after a careful study of the males of several species, that the bristle occurred in either form in males of E. tuberculatus (Hood). This discovery led him to declare Dicaiothrips a synonym of Elaphrothrips, and, even though this was apparently done without a study of the genotypes of the two genera, it has been generally accepted.

Members of the genus are large though somewhat variable in size; in fact, Elaphrothrips tuberculatus (Hood) is the largest thysanopteron known to occur in America north of Mexico. The genus is rich in tropical species, about 30 species being recorded.
for America south of the United States. Those described from the Neotropics are badly in need of revision, and with the exception of those which have been described and figured by Hood few are recognizable at present on the basis of the available descriptions. Furthermore, the types of a number are not accessible to American workers.

All the species treated in this paper overwinter as adults. Nymphs of *Elaphrothrips parallelus* Hood and *E. blatchleyi* Hood occur as late as October and December. A number of the species feed on fungus spores, which may be observed in the intestinal tracts of slide-mounted specimens. Food conditions, no doubt, partially account for some of the extreme variation in size found in this genus.

**ELAPHROTHIRPS** Buffa.


Head two to three times as long as wide, projecting in front of eye, this projection seldom longer than wide; cheeks subparallel, slightly rounded, or straight and diverging, usually flaring to eyes, often with several prominent lateral setae, which are more strongly developed in the male than in the female. Eyes moderately large, more or less protruding, finely and closely facetted; ocelli developed. Vertex often produced; antoeocular and postocular setae usually well developed, though the latter sometimes minute especially in males, often an additional prominent pair of dorsocephalic setae between postoculars and base of head. Antenna eight-segmented, elongate; VIII usually pedicellate, clearly separated from VII. Mouth cone broadly rounded. Prothorax along median line of pronotum usually less than half as long as head, and (inclusive of coxae) nearly twice or more as wide as long, its surface usually sculptured, epimeron not fused with pronotum; antero-marginal, antero-angular, midlateral, epimeral, postero-marginal, and coxal setae developed, the last three pairs usually prominent and often arising from low tubercles. Fore leg with femur often enlarged, its apex with either a curved or straight seta in male; fore tarsus with well developed tooth in male, with or without toothlike projection in female. Wings present or absent; when present, of rather even width, with or without a conspicuous median vein, the fore wing with a number of accessory setae on posterior margin. Abdomen long and slender in both sexes, tapering to tube; tube usually proportionately longer and more slender in female than in male, its surface without clothing of setae.

**Type**.—*Ibidothrips coniferarum* Pergande, 1896; by present designation.

Although *Thrips schotti* Heeger, 1852, is recorded in the literature as the genotype of *Elaphrothrips*, this designation can not be accepted since *schotti* was not one of the originally included species.
Key to Nearctic Species of Elaphrothrips Buffa.

1. Females ............................................................................................................. 2
   - Males ............................................................................................................... 7

2. Tube short and stout, not more than half dorsal median length of head, and only 3.0 times as long as basal width; head with its dorsal median length 2.8 times or more greatest width; frontal costa distinctively notched. .......................................................... parallelus Hood
   - Tube not especially short and stout, as long as or only slightly shorter than dorsal median length of head, and at least 3.6 times as long as basal width; head with its maximum dorsal median length 2.6 times greatest width; frontal costa shallowly concave to concave but not distinctly notched .......................................................... 3

3. Fore femur with a tubercle on apical half of lower surface ................................ 4
   - Fore femur without a tubercle on lower surface ............................................ 5

4. Head broadest across eyes; antennal segments III–VI yellow basally.
   - Tuberculatus (Hood)
     - Head broadest at basal third; yellow area at base of antennal segments III–VI with a dark gray-brown band or cloud of varying width .......................................................... blatchleyi Hood

5. Head with its median dorsal length about twice greatest width; all tibiae and tarsi yellow; wings, when present, without brown median streak or vein .......................................................... flavipes (Hood)
   - Head with its median dorsal length at least 2.3 times greatest width; only distal portion of fore tibia yellow to brown; wings, when present, with brown median streak or vein .................................................. 6

6. Postocular setae distinctly longer than interocellars; head with median dorsal length at least 2.5 times the greatest width .......................................................... armatus (Hood)
   - Postocular setae distinctly shorter than interocellars; head with median dorsal length only 2.3 times the greatest width .......................................................... coniferarum (Pergande)

7. Tube short and stout, not more than half median dorsal length of head; frontal costa distinctly notched; eyes small, not more than 0.20 as long as head .......................................................... parallelus Hood
   - Tube not especially short and stout, at least 0.65 as long as median dorsal length of head; frontal costa shallowly concave to concave, not distinctly notched; eyes larger, more than 0.20 as long as head .......... 8

8. All tibiae and tarsi yellow .......................................................... flavipes (Hood)
   - All tibiae and tarsi dark brown to black .......................................................... 9

9. Postocular setae longer than dorsal length of eye; cheeks with small, inconspicuous setae .......................................................... armatus (Hood)
   - Postocular setae shorter than dorsal length of eye; cheeks with prominent setae .......................................................... 10

10. Median ocellus placed far forward, in advance of frontal costa .................... coniferarum (Pergande)
— Median ocellus not placed in advance of frontal costa

11. Head widest at eyes; ventral surface of segment IX of abdomen with a pair of strong, brown, prominent, downwardly-directed setae.

*Elaphrothrips paralellus* Hood


*Female* (macropterous).—Length about 3.2-3.8 mm. Color blackish brown to black, legs mostly concolorous with body excepting distal portions of fore tibia and tarsus, which are dark brown. Fore wings clear. Antenna with segment I concolorous with head, basal portion of II concolorous with head shading to dark yellowish brown toward apex, III yellowish brown except for darker brown cloud in apical sixth, IV yellowish brown in basal two-thirds, dark brown beyond, V yellowish brown in basal two-fifths, remainder concolorous with segments VI-VIII, which are dark brown.

Head (Fig. 5) with its median dorsal length 2.8 times greatest width which is just anterior to collar, narrowest just behind eyes, lateral length of process in front of eye 40 microns, its greatest width 135 microns. Vertex not overhanging frontal costa, the median ocellus directed more forward than upward; dorsal and lateral surfaces of head striate, the lateral margin of head with about five small setae arising from small prominences, the largest of these setae, situated farthest forward, about 26 microns in length. Postocular setae pointed, about 100 microns in length and 115 microns apart, anteocular setae 60 microns in length. Eye protruding, but rather flattened, its dorsal length 132 microns, dorsal width 66 microns, dorsal interval 100 microns. Ocelli small, the posterior pair each 16 microns in diameter, 73 microns apart, and 90 microns from median ocellus, which is about 14 microns in diameter. Postocellar setae about 25 microns in length and situated 17 microns behind the ocelli. Mouth cone broadly rounded, extending 190 microns behind posterior dorsal margin of head.

Prothorax with its median dorsal length 0.28 that of head and (inclusive of coxae) about 2.4 times as wide as long, its dorsal surface finely sculptured, the median apodeme prominent, anterior marginal 26 microns, anterior angulars 36 microns, midlateral 66 microns, epimera 96 microns, posterior marginals 89 microns, coxals 49 microns. Pterothorax about as wide as prothorax across coxae. Fore wing 1.4 mm. long and 90 microns in width at middle with 20-24 accessory hairs on posterior margin near apex, the two prominent subbasal setae 39 microns and 132 microns in length. Fore tarsus with a small, downwardly directed, toothlike projection.

Abdomen somewhat broader than pterothorax, only 1.1 times as wide as prothorax across coxae. Tube unusually short and stout, only half or less as long as head and only 3.0 times as long as greatest width near base.

Measurements of female, in mm.: Head, median dorsal length 0.726, width across eyes 0.237, width across cheeks immediately behind eyes 0.218, greatest width across cheeks 0.243, width across basal collar 0.230, distance from front margin of eye to frontal costa 0.077; prothorax, median dorsal length of pro-
notum 0.198, width (including coxae) 0.480; mesothorax, greatest width 0.486; metathorax, greatest width 0.480; abdomen, greatest width 0.550; tube, length 0.422, greatest subbasal width 0.140, least apical width 0.064.

Antennal segments......... I II III IV V VI VII VIII
Length (microns)........... 89 92 224 172 135 99 69 66
Width (microns)............. 53 46 40 43 36 33 32 20

Total length of antenna 1.027 mm.

Measurements of male, in mm: Head, median dorsal length 0.614, width across eyes 0.224, width across cheeks immediately behind eyes 0.200, greatest width across checks 0.236, width across basal collar 0.230, distance from front margin of eye to frontal costa 0.060; prothorax, median dorsal length of pronotum 0.186, width (including coxal) 0.410; mesothorax, greatest width 0.384; metathorax, greatest width 0.378; abdomen, greatest width 0.384; tube, length 0.288, greatest subbasal width 0.096, least apical width 0.051.

Antennal segments......... I II III IV V VI VII VIII
Length (microns)........... 76 86 191 149 125 96 69 63
Width (microns)............. 46 40 36 36 33 32 30 20

Total length of antenna 0.876 mm.

This species is immediately distinguished from the other known North American species of Elaphrothrips by the short, stout tube, the long head, and the deeply notched frontal costa. As Hood (1924) pointed out, the subequal width of the prothorax, pterothorax, and abdomen is itself a character that makes parallelus recognizable to the unaided eye.

Elaphrothrips parallelus was described from a single female collected in miscellaneous sweepings at Punta Gorda, Fla. A series of specimens of both sexes are before the writer from the type locality and from Hudson, Fla. (collected by P. W. Oman).

Elaphrothrips flavipes (Hood).

1927. Elaphrothrips flavipes (Hood). Hood, Ent. Amer. 7 : 238-239.

Female (macropterous).—Length 3.0-3.3 mm. Color blackish brown, legs concolorous with body except for the tibiae and tarsi, which are yellow, the tibiae sometimes slightly clouded with brown basally. Wings clear. Antenna with segments I and II concolorous with head except distal portion of II, which is light brown, III yellow, sometimes very slightly clouded with brown at apex,
IV yellow except for tinge of brown in apical portion, V yellow with apical fourth light brown, VI yellow on basal third and dark brown beyond, VII and VIII dark brown.

Head (Fig. 3) with its median dorsal length about twice greatest width, produced in front of eyes, the lateral length of this process about 20 microns and its greatest width 140 microns; vertex conically produced, its apex overhanging and surpassing the frontal costa; dorsal and lateral surfaces striate, the cheeks with about six rather stout setae arising from small prominences, the largest of these being about 33 microns in length; postocular setae pointed, about 132 microns long and 155 microns apart; anteocular setae about 100 microns long and 90 microns apart. Eyes protruding and rounded, longer ventrally than dorsally, measuring as follows: dorsal length 132 microns, dorsal width 82 microns, dorsal interval 115 microns, ventral length 168 microns. Posterior ocelli each about 17 microns in diameter, situated 73 microns apart and about 89 microns from median ocellus. Postocellar setae 45 microns in length and situated 20 microns behind each posterior ocellus. Mouth cone broadly rounded, extending 200 microns behind posterior dorsal margin of head.

Prothorax with its median dorsal length about 0.40 that of head and (inclusive of coxae) about 2.1 as wide as long, with sculpturing evident over most of surface, the median apodeme prominent; anterior marginal setae smaller than anterior angulars, their respective lengths being 42 microns and 53 microns, midlaterals 66 microns, epimera 90 microns, posterior marginals 73 microns, coxals 50 microns. Pterothorax wider than prothorax. Fore wing 1.4 mm. long and 130 microns wide at middle, with 23–27 accessory setae, the longest of the subbasal setae 125 microns in length. Fore tarsus with a small toothlike projection.

Abdomen broad, wider than pterothorax and about 1.6 times as wide as prothorax across coxae. Tube as long as or only slightly shorter than head, rather evenly tapered from base to near apex, where it is more noticeably narrowed, about 3.8 times as long as greatest width near base.

Measurements of female, in mm.: Head, median dorsal length 0.534, width across eyes 0.260, width across cheeks immediately behind eyes, 0.233, greatest width across cheeks 0.260, width across basal collar 0.247, distance from front margin of eye to frontal costa 0.060; prothorax, median dorsal length of pronotum 0.225, width (including coxae) 0.480; mesothorax, greatest width 0.616; metathorax, greatest width 0.630; abdomen, greatest width 0.770; tube, length 0.493, greatest subbasal width 0.137, least apical width 0.060.

<table>
<thead>
<tr>
<th>Antennal segments</th>
<th>I</th>
<th>II</th>
<th>III</th>
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<th>V</th>
<th>VI</th>
<th>VII</th>
<th>VIII</th>
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<td>122</td>
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<tr>
<td>Width (microns)</td>
<td>50</td>
<td>46</td>
<td>40</td>
<td>40</td>
<td>37</td>
<td>36</td>
<td>32</td>
<td>20</td>
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Total length of antenna 0.900 mm.

Measurements of male, in mm.: Head, median dorsal length 0.475, width across eyes 0.230, width across cheeks immediately behind eyes 0.205, greatest width across cheeks 0.224, width across basal collar 0.205, distance from front margin of eye to frontal costa 0.054; prothorax, median dorsal length of pronotum 0.198, width (including coxae) 0.416; mesothorax, greatest width 0.428;
metathorax, greatest width 0.435; abdomen, greatest width 0.531; tube, length 0.352, greatest subbasal width 0.105, least apical width 0.051.

Antennal segments .......... I II III IV V VI VII VIII
Length (microns) .......... 76 76 142 125 112 92 69 76
Width (microns) .......... 53 43 40 43 36 31 26 18

Total length of antenna 0.780.

The types of *flavipes* were collected from dead oak leaves in Illinois. Since the original description appeared, it has been found rather widely in the Eastern States, apparently always in fallen leaves. Specimens are before the writer from Tennessee, Iowa, Missouri, Virginia, and Illinois. The specimen figured (Fig. 3) was collected at Ottumwa, Iowa, February 1, 1934 (in dead leaves).

*Elaphrothrips flavipes* may be recognized immediately by the yellow tibiae.

**Elaphrothrips tuberculatus** (Hood).


Female (macropterous).—Length 3.6–4.5 mm. Color blackish brown to black, legs concolorous with body except the articulations, all tarsi, and distal end of fore tibia, which are dark brown. Wings clear except for a faint light-brown streak in basal half of fore wing. Antenna with segments I and II concolorous with head except for the distal portion of II, which is sometimes lighter, III yellow in basal two-thirds, dark brown in apical third, IV and V yellow in basal half, dark brown beyond, VI yellow in basal fourth, dark brown in apical three-fourths, VII and VIII dark brown.

Head (Fig. 4) with its median dorsal length about twice greatest width, which is across eyes, lateral length of process in front of eyes 42 microns, its greatest width 165 microns. Vertex conically produced, its tip not reaching frontal costa, the median ocellus directed more forward than upward, dorsal and lateral surfaces of head finely striate, with six to nine rather prominent, stout, dark-brown setae on each lateral margin, these arising from slight prominences, the longest of these setae about 66 microns in length. Postocular setae pointed, about 181 microns in length and 150 microns apart, antecocular setae about 165 microns in
length and 93 microns apart. Eye protruding and rounded, longer dorsally than ventrally, measuring as follows: dorsal length 190 microns, dorsal width 110 microns, dorsal interval 105 microns, ventral length 164 microns. Posterior ocelli 36 microns in diameter, about 55 microns apart and 100 microns from median ocellus. Postocellar setae 36 microns in length and situated 40 microns behind ocelli. Mouth cone extending 232 microns behind posterior dorsal margin of head.

Prothorax with its median dorsal length about 0.40 that of head and (inclusive of coxae) about twice as wide as long, with sculptured surface, the median apodeme almost reaching anterior margin; antero-marginal and antero-angular setae small, scarcely visible in noncaustically treated specimen, mid-laterals 83 microns, epimerals 160 microns, postero-marginals 165 microns, coxals 96 microns. Pterothorax considerably wider than prothorax. Fore wing 2.24 mm. long and 178 microns in width at middle, with 36-42 accessory setae, the sub-basal setae 118, 135, and 403 microns in length respectively. Fore femur with a prominent tubercle about two-thirds the distance from base to apex. Fore tarsus with a toothlike projection.

Abdomen broader than pterothorax and about 1.5 times as wide as prothorax across coxae. Tube as long as or only slightly shorter than head, about 4.7 times greatest width near base, rather evenly tapered from base to apex.

Measurements of female, in mm.: Head, median dorsal length 0.660, width across eyes 0.329, width across cheeks immediately behind eyes 0.280, greatest width across cheeks 0.288, width across basal collar 0.274, distance from front margin of eye to frontal costa 0.090; prothorax, median dorsal length of pronotum 0.288, width (including coxae) 0.590; mesothorax, greatest width 0.740; metathorax, greatest width 0.781; abdomen, greatest width 0.890; tube, length 0.708, greatest subbasal width 0.150, least apical width 0.082.

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<th>Antennal segments</th>
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<td>106</td>
<td>254</td>
<td>205</td>
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<td>125</td>
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<tr>
<td>Width (microns)</td>
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<td>50</td>
<td>50</td>
<td>50</td>
<td>46</td>
<td>33</td>
<td>32</td>
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Total length of antenna 1.137.

Measurements of male, in mm.: Head, median dorsal length 0.808, width across eyes 0.343, width across cheeks immediately behind eyes 0.274, greatest width across cheeks 0.280, width across basal collar 0.288, distance from front margin of eye to frontal costa 0.096; prothorax, median dorsal length of pronotum 0.410, width (including coxae) 0.740; mesothorax, greatest width 0.836; metathorax, greatest width 0.863; abdomen, greatest width 0.795; tube, length 0.617, greatest subbasal width 0.137, least apical width 0.075.

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<th>Antennal segments</th>
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<th>VII</th>
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<td>Length (microns)</td>
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<td>95</td>
<td>280</td>
<td>228</td>
<td>191</td>
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<tr>
<td>Width (microns)</td>
<td>66</td>
<td>50</td>
<td>50</td>
<td>53</td>
<td>46</td>
<td>36</td>
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Total length of antenna 1.205 mm.
The femoral tubercle of the female immediately distinguishes that sex of *tuberculatus* from the female of all other species found in the United States except *blatchleyi* Hood. It may readily be separated from *blatchleyi* by the differently shaped head and the antennal coloration. Males may be distinguished from the other related species by the pair of prominent setae on the ventral surface of the ninth abdominal segment and the shape of the head.

Originally described from white oak in Illinois, this species has been recorded from Iowa, Missouri, Maryland, D. C., Florida, Arkansas, North Carolina, and New York. Often it occurs abundantly on dead oak leaves still attached to broken branches. Specimens before the writer are from Iowa, Illinois, Virginia, and Maryland.

**Elaphrothrips blatchleyi** Hood.


**Female** (macropterous).—Length 3.6-4.5 mm. Color coal black, legs black except for articulations and tarsi, which tend to be somewhat lighter and usually blackish brown. Wings colorless without any indication of a median vein and with only a very slight tinge of brown in the region of the subbasal setae. Antenna with segments I and II dark brown, III yellow in basal sixth, the next two-sixths gray brown sometimes followed by a narrow band of yellow, the remainder of the segment blackish brown, IV dark brown at extreme base, otherwise yellow in basal third, blackish brown beyond, V-VIII darkish brown except for a somewhat gray brown band near the base of V.

Head (Fig. 1) with its median dorsal length twice greatest width, produced in front of eyes, the lateral length of this process about 26 microns, its greatest width 135 microns. Vertex elevated but not reaching frontal costa, the median ocellus directed more upward than forward; dorsal and lateral surfaces of head finely striate, cheek with about six yellowish setae which arise from small tubercelike prominences, the largest of the setae 50 microns in length; postocular setae pointed, 148 microns long and placed 155 microns apart; antecocular setae 120 microns long and 83 microns apart. Eye slightly protruding and rounded, longer dorsally than ventrally, measuring as follows: dorsal length 158 microns, dorsal width 73 microns, dorsal interval 112 microns, ventral length 138 microns. Posterior ocelli each about 33 microns in diameter, situated 51 microns apart and about 84 microns from median ocellus. Postocellar setae 34 microns in length and 16 microns behind each posterior ocellus. Mouth cone broadly rounded, extending 168 microns behind posterior dorsal margin of head.

Prothorax with its median dorsal length about 0.4 that of head and (inclusive of coxae) about 2.6 times as wide as long, closely sculptured over most of dorsal surface, median apodeme prominent; anterior marginals 53 microns, anterior angulares 66 microns, midlateralis 76 microns, epimerales 149 microns, posterior marginals 205 microns, coxals 89 microns. Pterothorax wider than prothorax. Fore wing 1.7 mm. long and 170 microns wide at middle, with 30-36 accessory setae near end of wing, the subbasal setae 83, 87, and 200 microns long. Fore
femur with a small tubercle at apical third of lower surface. Fore tarsus often with a small toothlike projection.

Abdomen broad, wider than pterothorax and about 1.3 times as wide as prothorax across coxae. Tube as long as or only slightly shorter than head, rather evenly tapered from base to near apex, where it is more noticeably narrowed; about 4.0 times as long as greatest width near base.

Measurements of female in mm.: Head, median dorsal length 0.548, width across eyes 0.262, width across cheeks immediately behind eyes 0.243, greatest width across cheeks 0.275, width across basal collar 0.256, distance from front margin of eye to frontal costa 0.058; prothorax, median dorsal length of pronotum 0.205, width (including coxae) 0.480; mesothorax, greatest width 0.605; metathorax, greatest width 0.600; abdomen, greatest width 0.645; tube, length 0.525, greatest subbasal width 0.120, least apical width 0.064.

Antennal segments......... I II III IV V VI VII VIII
Length (microns)........... 79 82 168 119 100 79 69 66
Width (microns)............ 54 44 43 46 43 37 29 18

Total length of antenna 0.808 mm.

Measurements of male in mm.: Head, median dorsal length 0.480, width across eyes 0.230, width across cheeks immediately behind eyes 0.230, greatest width across cheeks 0.237, width across basal collar 0.218, distance from front margin of eye to frontal costa 0.045; prothorax, median dorsal length of pronotum 0.186, width (including coxae) 0.435; mesothorax, greatest width 0.492; metathorax, greatest width 0.490; abdomen, greatest width 0.480; tube, length 0.403, greatest subbasal width 0.090, least apical width 0.058.

Antennal segments......... I II III IV V VI VII VIII
Length (microns)........... 72 80 155 125 105 79 69 69
Width (microns)............ 50 40 43 43 36 33 26 17

Total length of antenna 0.780.

The type series of *blatchleyi* was collected from dry foliage and branches of a felled cedar tree at Dunedin, Fla. Additional specimens were obtained near the type locality at Clearwater, Fla. (P. W. Oman and Floyd Andre), where nymphs, pupae, and adults were beaten from the dead branches of a living cedar tree October 10, 1939.

The presence of the cloud or band in the yellow area in the basal portion of the intermediate antennal segments is distinctive.

**Elaphrothrips coniferarum** (Pergande).


**Female** (macropterous).—Length about 2.6–3.7. Color coal black; legs concolorous with body, tibiae dark brown in apical portions, tarsi dark brown; the fore wing with a brownish washed streak in basal third; antenna with segment I nearly black, II black in basal portion, becoming dark brown in apical half, III yellow in basal two-thirds and dark brown in apical portion, IV yellow in basal half, dark brown beyond, V with basal third yellow, remainder dark brown, VI–VIII dark brown except base of VI, which is somewhat lighter.

Head (Fig. 6) with median length about 2.3 times greatest width, broadest across eyes, narrowest near base, lateral length of process in front of eye 30 microns, its greatest width 140 microns. Vertex conically produced, its tip overhanging and surpassing frontal costa, median ocellus at tip of vertex, directed forward; dorsal and lateral surfaces of head finely striate, with about nine dark-brown setae on each lateral margin, these arising from slight prominences and varying in size, the longest being 30 microns long. Postocular setae pointed, about 53 microns in length and 152 microns apart; anteocular setae about 110 microns in length and 100 microns apart. Postocular setae pointed, about 53 microns in length and 152 microns apart; anteocular setae about 110 microns in length and 100 microns apart.

The slightly protruding and rounded, longer dorsally than ventrally, measuring in microns as follows: dorsal length 164, ventral length 137, dorsal width 80, dorsal interval between the eyes 105. Each posterior ocellus about 29 microns in diameter 62 microns apart, the median one subequal to them and situated 120 microns from the posterior pair. Postocular setae 33 microns in length and about 23 microns behind the posterior ocelli. Mouth cone extending 192 microns behind posterior dorsal margin of head.

Prothorax with its median dorsal length about 0.40 that of head, and (inclusive of coxae) about 1.5 times as wide as long, most of its dorsal surface sculptured, the median apodeme stout; antero-marginals and antero-angulars minute, midlateral 16 microns, epimerals 73 microns, postero-marginals 72 microns, coxals 53 microns. Width of pterothorax greater than width of prothorax across coxae. Fore wing 1.68 mm. long and 142 microns at middle, with 26–32 accessory hairs near end of wings, the subbasal setae 46, 44, and 132 microns in length. Fore tarsus with a small toothlike projection.

Abdomen slightly wider than pterothorax and about 1.2 times as wide as width of prothorax across coxae. Tube slightly shorter than median length of head, rather evenly tapered from base to near apex, where it is then abruptly narrowed, about 5.0 times as long as greatest width near base.

Measurements of female, in mm.: Head, median dorsal length 0.620, width across eyes 0.258, width across cheeks immediately behind eyes 0.230, greatest width across cheeks 0.256, width across basal collar 0.230, distance from front
margin of eyes to frontal costa 0.059; prothorax, median dorsal length of pronotum 0.262, width (including coxae) 0.493; mesothorax, greatest width 0.540; metathorax, greatest width 0.545; abdomen, greatest width 0.595; tube, length 0.569, greatest subbasal width 0.128, least apical width 0.058.

Antennal segments

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Total length of antenna 0.820 mm.

Measurements of male, in mm.: Head, median dorsal length 0.621, width across eyes 0.256, width across cheeks immediately behind eyes 0.218, greatest width across cheeks, 0.237, width across basal collar 0.217, distance from front margin of eyes to frontal costa 0.058; prothorax, median dorsal length of pronotum 0.275, width (including coxae) 0.512; mesothorax, greatest width 0.518, metathorax, greatest width 0.525; abdomen, greatest width 0.518; tube, length 0.505, greatest subbasal width 0.100, least apical width 0.057.

Antennal segments

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Total length of antenna 0.822 mm.

Pergande (1896), in describing *coniferarum*, said, "Described from numerous specimens. Found in the vicinity of Washington, D. C., during the spring and early fall on green and dry branches, and during the late fall and winter under the loose bark of *Pinus inops*, *Juniperus virginiana* and *Abies* sp." A few years later Hinds (1902) redescribed the species and published four figures of it, listing the same food plants as given by Pergande and adding Massachusetts to its distribution. Since then it has been reported from Virginia, New Hampshire, and Maryland. Besides the specimens Pergande had at the time of its description, there is before the writer a large series from dead pine collected at Emporia, Va. (P. W. Oman). The specimen figured and described is from red cedar, March 24, 1884.

The short postocular setae and the length and shape of the head are the defining characters.

**Elaphrothrips armatus** (Hood).


**Female** (macropterous).—Length 2.8–3.8 mm. Color blackish brown to black; legs concolorous with body except articulations, all tarsi, and distal portion of fore tibia, which are somewhat lighter; antenna with segments I and II, except distal portion of latter, concolorous with head, III yellow except for dark-brownish apical sixth to fourth, IV yellow on basal two-thirds, dark brown toward tip, V yellow on basal half, blackish brown beyond, VI–VIII blackish brown. Fore wing with dark brown median streak in basal half.

Head (Fig. 2) with its median dorsal length about 2.5 times greatest width, lateral length of head process in front of eye 20 microns, its greatest width 122 microns. Vertex conically produced, its tip overhanging and surpassing the frontal costa, the median ocellus at tip of vertex, directed forward, dorsal and lateral surfaces of head finely striate, lateral margin of head with five or six small setae, the largest of these, the pair closest the eye, about 14 microns in length. Postocular setae pointed, 172 microns in length and 106 microns apart, antecocular setae about 132 microns long and 63 microns apart. Eye protruding and rounded, measuring as follows: dorsal length 137 microns, dorsal width 69 microns, dorsal interval 96 microns. Posterior ocelli about 15 microns in diameter, situated 56 microns apart and 85 microns from median ocellocus, which is subequal to them in diameter. Postocellar setae 26 microns in length and situated about 23 microns behind ocelli. Mouth cone extending 201 microns behind posterior dorsal margin of head.

Prothorax 0.43 as long as dorsal length of head and (inclusive of coxae) about 2.1 times as wide as long, its dorsal surface with fine sculpturing, the apodeme prominent but not reaching anterior or posterior margin of prothorax; antero-marginal and antero-angular setae small, about 26–30 microns in length, mid-laterals 56 microns, epimera 148 microns, postero-marginals 83 microns, coxals 56 microns. Pterothorax slightly wider than prothorax across coxae. Fore wing usually short, seldom reaching beyond sixth abdominal segment, about 1.00 mm. long and 55 microns wide at middle, with 8–12 accessory setae, the subbasal setae 43, 49, and 138 microns in length. Fore tarsus with small toothlike projection.

Abdomen slightly wider than prothorax and about 1.4 times as wide as width of prothorax across coxae. Length of tube slightly less than median dorsal length of head, rather evenly tapered from base to near apex, where it is more abruptly narrowed, about 3.8 times as long as greatest width at base.

Measurements of female, in mm.: Head, median dorsal length 0.560, width across eyes 0.230, width across cheeks immediately behind eyes 0.192, greatest width across cheeks 0.224, width across basal collar 0.218, distance from front margin of eye to frontal costa 0.045; prothorax, median dorsal length of pronotum 0.211, width (including coxae) 0.456; mesothorax, greatest width 0.468; metathorax, greatest width 0.480; abdomen, greatest width 0.640; tube, length 0.460, greatest subbasal width 0.120, least apical width 0.058.
Antennal segments........ I II III IV V VI VII VIII
Length (microns).......... 69 76 155 124 115 102 73 66
Width (microns).......... 49 46 43 46 40 30 27 17
Total length of antenna 0.750 mm.

Measurements of male, in mm.: Head, median dorsal length 0.637, width across eyes 0.224, width across cheeks immediately behind eyes 0.173, greatest width across cheeks 0.200, width across basal collar 0.197, distance from front margin of eye to frontal costa, 0.058; prothorax, median dorsal length of pronotum 0.230, width (including coxae) 0.450; mesothorax, greatest width 0.461; metathorax, greatest width 0.452; abdomen, greatest width 0.442; tube, length 0.371, greatest subbasal width 0.100, least apical width 0.051.

Antennal segments........ I II III IV V VI VII VIII
Length (microns).......... 79 80 178 145 122 93 73 76
Width (microns).......... 46 43 40 43 34 30 30 30
Total length of antenna 0.843 mm.

The type series was collected from the galls of *Gnorimoschema gallaesolidaginis* Riley on *Solidago canadensis*, from miscellaneous sweeping and from *Plantago rugelii* in Illinois. Since then *armatus* has been reported from Iowa, Maryland, Virginia, and Mississippi. Specimens from the above States as well as North Carolina are before the writer.

This species may be distinguished by its long head and long postocular setae.

**Literature Cited.**

**Bagnall, R. S.**

**Buffa, Pietro.**

**Hinds, W. E.**

**Hood, J. D.**

**Pergande, Theo.**
Explanation of Plate 11.
(Setae omitted from antennal segments.)

Fig. 1. Head of *Elaphrothrips blatchleyi* Hood, female.
Fig. 2. Head of *Elaphrothrips armatus* (Hood), female.
Fig. 3. Head of *Elaphrothrips flavipes* (Hood), female.
Fig. 4. Head of *Elaphrothrips tuberculatus* (Hood), female.
Fig. 5. Head of *Elaphrothrips parallelus* Hood, female.
Fig. 6. Head of *Elaphrothrips coniferarum* (Pergande), female.

THE MALE OF HELIOTHRIPS HAEMORRHOIDALIS (BOUCHÉ) (THYSANOPTERA).

By J. C. Crawford,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In 1833 Bouché described this species, now a world-wide pest, and since then it has been the subject of repeated studies. In spite of all the intensive studies, the male appears never to have been found. The finding of a male, as one of only two specimens taken, seems remarkable, and especially because of its peculiar ninth abdominal segment it is here recorded and described.

This species occurs in greenhouses in the outer portions of the temperate zones and in the open in between these regions; thus, in the United States it is known to occur out-of-doors in Georgia and Florida. So it is of interest to record that Mr. W. S. Fields and I took this species on both rhododendrons and azaleas in the open at Sunken Meadows, Long Island, N. Y., September 9 and 10, 1935, on an estate where there were no greenhouses and where it seemed unlikely that the species had become established only that year.

*Heliothrips haemorrhoidalis* (Bouché).

*Male* (macropterous.—Length 1.22 mm. Very similar to the female in general structure and sculpture; with 3 basal abdominal segments (except lateral margins of 3) light brown, remaining abdominal segments light yellowish; 9th abdominal tergite with a pair of discal bristles, a pair of postangulares and a pair of short, more heavily thickened post-marginals, all light yellow; mesocephalad of the postmarginals, 2 pairs of heavier thorn-like spines, one pair placed directly behind the other; of these 2 pairs the anterior pair is the heavier and longer, brown and pedicellate (fig. 1); depressed areas on ventral abdominal segments 2–6, transverse, brown, contrasting with the surrounding yellow, successively shorter.

Measurements (in microns):
Postangulares on 9th abdominal segment 40, discals 28, postmarginals 14, anterior pair of thorn-like spines 20, posterior pair 12; depressed area on ventral 3, 82 long, 20 wide.
Described from one specimen taken with one female from the calyx end of a Eugenia fruit from Santa Marta, Colombia. Collected at the port of New York, April 5, 1939, by Mr. A. O. Plummer.

Fig. 1.—Heliothrips haemorrhoidalis. Male. Apical part of ninth abdominal segment. Diagrammatic.

TWO NEW REARED SPECIES OF BASSUS (HYMENOPTERA: BRACONIDAE).

By C. F. W. Muesebeck, Bureau of Entomology and Plant Quarantine.

Recently a long series of specimens belonging to a species of Bassus was received from S. M. Dohanian, of this Bureau, who had reared the material in connection with studies on filbert insects. The species proves to be new and is described here in order to provide a name for use in a paper being prepared by Mr. Dohanian. Another closely related undescribed species of Bassus is also treated.

Bassus nucicola, new species.

Most similar to acrobasis Cushman, but distinguished from that species by its mostly red thorax, black posterior trochanters, and weaker notaulices.

Female.—Length usually 5 to 7 mm. Head about as wide as thorax; temple convex, bulging conspicuously opposite middle of eye; face rather flat, completely polished; clypeal foveae slightly below level of lower eye margins; malar space at least as long as second segment of antennal flagellum; third segment of labial palpus slightly longer than thick; antennae usually 34- to 37-segmented.
Notaulices very weak, not sharply defined, meeting posteriorly in a median longitudinal impression that usually does not attain posterior margin of mesoscutum; scutellum flat; propodeum convex, not regularly areolated but with a well-defined transverse carina separating the dorsal face from the posterior declivity; surface of propodeum mostly smooth, with some irregular wrinkles mediually; mesopleural furrow without a suggestion of foveolation; metapleuron smooth; second cubital cell usually with a short petiole, rarely sessile; radial cell uniformly very narrow; mediella as long as basal abscissa of basella.

Abdomen at least as broad as thorax, first tergite about as broad at apex as long, mostly smooth but provided with two prominent dorsal longitudinal keels extending to slightly beyond the middle; second tergite much broader than long, longer than third, smooth and shining, with a shallow transverse groove across the middle, this groove sometimes foveolate; sutural articulation nearly always finely foveolate; third and following tergites smooth, the third usually with a shallow transverse impressed line slightly basal of the middle; ovipositor sheath about as long as body.

Red; head, including antennae, black; palpi usually black; prosternum, and often mesosternum, black; tegulae yellowish red; wings deeply infumated, veins and stigma brownish black, extreme apex of anterior femur and base of anterior tibia sometimes reddish; middle coxa and femur entirely, and usually apical segment of posterior trochanter, red; posterior tibia reddish brown, black on at least apical fourth and with an incomplete blackish annulus near base, posterior tarsus black; abdomen completely red.

Male.—Differing in no essential characters from the female.

*Type locality.*—Sacramento, Calif.

*Type.*—U. S. National Museum No. 54123.

*Host.*—Melissopus latiferreanus (Wlsm.).

Described from 108 specimens reared from the above host in oak-apple galls and acorns by S. M. Dohanian, of the Bureau of Entomology and Plant Quarantine.

**Bassus pini,** new species.

Like *nucicola* this species is very similar to *acrobasidis* Cush. It resembles the latter in color more closely than does *nucicola* but may be distinguished by the mostly rugose metapleuron, by the usually black tegulae and posterior trochanters, and by having the posterior tibia black at its extreme base.

*Female.*—Agrees with the foregoing description of *nucicola* except as follows: Temples bulging only slightly opposite middle of eyes; clypeal foveae barely below level of lower eye margins; face strongly convex, minutely punctate; notaulices rather sharply impressed anteriorly; propodeum mostly rugose reticulate; mesopleural furrow deep posteriorly and sometimes with a suggestion of foveolation; metapleuron coarsely rugose at least on lower half; petiole of second cubital cell sometimes longer than first abscissa of radius; radial cell widening more conspicuously toward margin than in *nucicola*; mediella not quite so long
as basal abscissa of basella; dorsal keels on first abdominal tergite extending at least to apical fourth; transverse groove on second tergite very weakly impressed, not foveolate; sutiform articulation rarely foveolate, and then very finely so; third tergite with transverse impression exceedingly weak or wanting. Black; propodeum usually black, but occasionally, together with the metapleura, red; tegulae usually, and anterior and middle legs, black; basal segment of posterior trochanter usually black; hind tibia black on basal and apical thirds, middle third reddish.

_Type_ locality.—Bar Harbor, Maine.
_Type._—U. S. National Museum No. 54124.
_Host._— _Rhyacionia comstockiana_ (Fernald).
Described from twelve specimens including both sexes, three reared from the above host at the type locality, July 1936 and 1937, five reared by J. B. Polivka from the same host in Sciota County, Ohio, in June, 1936, one specimen labeled as reared from _Rhyacionia frustrana_ at Nantucket, Mass., July 15, 1932, one from _Rhyacionia comstockiana_, Ithaca, N. Y., June 25, 1917, one from Charter Oak, Pa., recorded as reared June 24, 1915, from _"Ectria sp. in Pinus pungens,“_ and one from Dunn Loring, Va., May 27, 1914, reared from _"Ectria sp. on Pinus taeda.”_

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MINUTES OF THE 508TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 508th meeting of the Society was held at 8 p. m., Thursday, March 7, 1940, in Room 43 of the National Museum. There were 46 members and 14 visitors present, and President Muesebeck presided. The minutes of the February meeting were accepted as read.

Louis Vargas, of the Institute of Health and Tropical Disease, Mexico City, was elected to membership in the Society.

Under Notes and Exhibition of Specimens, L. J. Bottimer described his home-made insect cabinet. He has personally constructed wooden drawers of uniform size and unit cardboard trays of convenient sizes to go within them. The whole system is housed in a wooden cabinet, thus providing a compact, modern place for the safe, economical keeping of a private collection.

A few comments were made by Bridwell.

E. A. Back exhibited a board about 10 feet long which had been split open to show the almost entire excavation by the Carpenter bee, _Xylocopa_. The board, which was secured locally, was the result of many years of habitation by the bees.

A. B. Gurney noted the incidence of considerable variation in the wing venation of a psocid, _Lachesilla nubilis_ (Aaron), as shown by a series from Kansas in which 5 of 17 specimens were abnormal.

W. H. Anderson gave the main features of entomological interest associated with a recent visit to Arizona and southern California. Certain weevil studies were the principal concern of his trip.
E. N. Cory discussed an interesting example of insectphobia, in which a lady was greatly disturbed by the presence in her home of psocids, which actually were not sufficiently numerous to be serious.

The regular program was as follows:

1. The biology of Dinapate wrightii Horn. A. C. Davis. (This paper will be published in full later.)

Discussion followed by Barber, Bridwell and Anderson.

2. The biology of the American dog tick and experiments in its control. Carroll N. Smith.

The life history of the American dog tick, Dermacentor variabilis (Say), was briefly reviewed, and the technique of experimental rearing briefly described. Biological studies were based on a comparison of field observations with data gained by rearing under outdoor conditions. Seasonal abundance studies indicated that larvae and nymphs normally engorge soon after hatching or molting, or soon after emerging from hibernation, seldom attaining their full potential longevity. Adults, on the other hand, apparently held over for a much longer period before engorging. No estivation was apparent. Studies on the persistence and migration of adults made by marking ticks were described. Marked ticks were recaptured at least once each month from April to September, when activity ceased. A strong tendency to move to roadsides and concentrate there was noticed, and investigations of other possible causes of roadside concentration were discussed. Movements of engorged females were traced, selection of oviposition places apparently being haphazard. Habits of larvae and nymphs were studied in an experimental meadow plot set up on a greenhouse-type table. They were found to be continually active in seeking their hosts, not passively waiting on vegetation as in the case of adults. The distribution of this species in the United States and its economic importance, largely resulting from its role as a vector of Rocky Mountain spotted fever, were discussed.

Research on methods to eradicate ticks, being conducted at the Vineyard Haven, Mass., station of the Bureau of Entomology and Plant Quarantine, were described. The methods being tested are the control of field mice serving as hosts for the immature ticks, systematic dipping of domestic animals serving as hosts for the adult ticks, establishment of parasite colonies, and the use of sprays against ticks on vegetation. A satisfactory method of controlling ticks on individual dogs by semi-weekly dipping in a derris mixture was given. (Author's abstract.)

A few comments were made by F. C. Bishopp.

Adjournment at 10.10 p. m.

Ashley B. Gurney, Recording Secretary.

Actual date of publication, April 27, 1940.
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THE
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A NEW GENUS OF GALERUCINAE (COLEOPTERA) FROM THE WEST INDIES.

By Doris H. Blake.

Among specimens of Galerucinae collected by P. J. Darlington in 1938 in the West Indies were several obviously distinct species that did not fit into any described genus. Later other species were found in the collection of the National Museum. The group is evidently related to Luperus but differs strikingly in two characters of the male, first, in an abnormal development of the antennae, second, in a small, deep notch near the apex of the middle tibiae. Two species apparently belonging to the same group, Luperus malachioides and Luperus placidus, were described from Cuba by Suffrian, who placed them rather doubtfully in Luperus. He did not mention the distinctive characters of the antennae and legs, which indicates that he probably had only female specimens for study. Material in the collections at Cambridge and Washington has been identified in the past as Luperus malachioides and placidus respectively, but probably represents only one species, and on the basis of the distinctive characters given by Suffrian seems to be the more densely punctate malachioides rather than the sparsely punctate placidus. Without authentic material of Suffrian’s species it is hardly possible to be certain of their identity.

The monotypic genus Oroetes, described by Jacoby from Central America, resembles the group just discussed in its strongly notched middle tibiae and in having unusually developed antennae, but the abnormally developed joints are the 2nd and 3rd instead of the apical joints (in one species of the West Indian genus, however, the 3rd joint is the abnormal one). Oroetes differs from the West Indian genus in striking peculiarities of the head and prothorax. In the middle of the front of the head is a small horn, and on the pronotum is a median tubercle with a tiny hole in front of it. Moreover, the insect is about twice as big as any of the West Indian group.

The modification of the antennae as a secondary sex character is well known in the Galerucinae. Maulik has summarized in the Fauna of British India the genera of Asia and Africa (9)

having this characteristic. In the Western Hemisphere, this peculiarity has appeared in such genera as Cerotoma, Metacoryna, Malacorhinus, Oroetes, and (contrary to Maulik’s assertion that it does not occur in the Halticinæ) in Allochroma teapense Jac., and A. guatemalense Jac. and Suetes niger Jac. Its occurrence in these genera is usually sporadic and not common to all the species. In the West Indian genus, however, all but one of the species present some peculiarity in the male antennæ.

The material examined from the collections at Washington and Cambridge represents ten different species, one of which is here doubtfully identified with Luperus malachioides Suffrian, all the others being new. The genus so far is known from Cuba, Puerto Rico, Hispaniola and Jamaica. No doubt other representatives will be found in the West Indies.

ECTMESOPUS, n. gen.

Small, slender beetles from 2 to 4 mm. long, with long slender legs, usually pale yellow or reddish with lustrous green, blue or violet elytra. Head smoothly rounded, without depressions or protuberances, frontal tubercles not pronounced. Antennæ usually not much over half the length of the beetles, in one species nearly the length. Usually some abnormality in the apical antennal joints, 7, 8, 9, 10 or 11 of the male. In one species, the one with the long antennæ, this abnormality in the 3rd joint. Prothorax from one-fourth to one-third wider than long, with the sides only slightly curved, often nearly straight, narrowly margined and with a small seta-bearing pore at the corners, hind margin nearly straight; the disk not at all depressed or deeply punctate, but usually smoothly rounded and polished. Elytra wider than the prothorax with a small humeral prominence, and usually a little wider in the apical half. Beneath with epipleura gradually disappearing towards the apex. Anterior coxal cavities open. In the male the front tibiae frequently stout and the middle tibiae with a deep notch on the inside near the apex. Tibiae with a tiny spur, extremely hard to detect in some specimens. First joint of the hind tarsi equal to or longer than the following. Claws with a small basal tooth. (ἐκτυμέσος a cutting out, ποδός leg.)

Type species, Ectmesopus darlingtonii, n. sp.

Key to the Species.

1. Prothorax entirely dark without any pale areas; joints 8, 9, 10 of male antennæ deformed; Jamaica.......................................................... Ectmesopus tristis, n. sp.

2. Prothorax pale or pale with dark markings................................. 2

3. Prothorax pale with dark markings............................................. 3

4. Prothorax entirely pale.......................................................... 7

5. Elytra shining green with a broad irregular pale band; Puerto Rico.......................................................... Ectmesopus zonatus, n. sp.

6. Elytra entirely dark.................................................................... 4

7. Antennæ extending much below the middle of the elytra, in male the 3rd joint very tiny, in both sexes the 4th joint very long; Dominican Republic.......................................................... Ectmesopus longicornis, n. sp.
Antennae not reaching beyond the middle of the elytra, mostly not so far as the middle...........................................5
5. Prothorax with a broad often T-shaped median marking extending nearly the whole length; 10th joint of male antennae slightly enlarged; Cuba..................................................occipitalis, n. sp.

Prothorax with lateral dark marks..........................................................6
6. Prothorax with a vitta on either side, this sometimes very short, sometimes well marked and extending down whole side; 10th joint of male antennae much enlarged; Puerto Rico..................vitticollis, n. sp.

Prothorax with sides near margin sometimes deep brown; antennal joints in male not deformed or enlarged; Dominican Republic..................angusticollis, n. sp.

7. Notch in middle tibiae of male not deep, little more than an emargination; male antennae not deformed or enlarged or unlike those of the female; Dominican Republic............................................angusticollis, n. sp.

Notch in middle tibiae of male deep, forming a sharp tooth on upper inside margin; last joints of male antennae either deformed or enlarged..........................................................8
8. Antennae of both sexes very similar up to the last joint and in male the last joint enlarged; Cuba...........................................malachioides (Suffrian)

The 10th antennal joint and sometimes others of the male deformed.........9
9. Antennae dark with the last 2 or 3 joints pale, joints 6, 7, 8, 9, in male triangular, 10th much enlarged; Haiti..................darlingtoni, n. sp.

Antennae not bicolored, joints 6 to 9 in male not at all triangular..........10
10. Head, thorax, legs and antennae pale yellowish; 10th antennal joint in male much enlarged; Dominican Republic..................pallidus, n. sp.

Head, thorax and legs reddish, antennae with dark outer joints; 10th joint in male constricted and not any longer than 9th; Puerto Rico.............................................crassicornis, n. sp.

Ectmesopus crassicornis, n. sp.

Fig. 1.

About 3.5 mm. long, oblong oval, reddish brown with violet elytra. Antennae reddish at base with dark outer joints. In the male the three apical joints much enlarged and the 10th as if deformed. The tibiae of the middle leg in male deeply notched near apex.

Head smooth, shining, reddish brown with slightly produced frontal tubercles. Antennae extending well below humeri, pale reddish at base with dark outer joints. Third joint shorter than fourth. In the male, antennae much enlarged towards the end, the 10th joint twisted and with a constriction near the apex. Prothorax about a third wider than long, slightly wider before the middle and a little narrowed near the base. Disk polished, rounded, entirely reddish brown, minutely and sparsely punctate. Scutellum reddish. Elytra considerably wider than prothorax, distinctly and thickly punctate, lustrous violet. Body beneath entirely reddish brown, lightly pubescent. Anterior coxae open, all tibiae with a tiny spur, in the males, the middle one with a notch on the inside near the apex. Claws with a basal tooth. Length 3.0–3.8 mm., width 1.5–1.7 mm.
Type.—Male, and 1 paratype (male), in Museum of Comparative Zoology, No. 23823.

Type locality.—Porto Plata, Dominican Republic, collected by Hurst.


Remarks.—The males of this species are most striking because of the great enlargement and deformity of the last apical joints of the antennae, but the females are not so easily distinguishable from the other similarly colored species. E. crassicornis is closely related to a Cuban species belonging to this group which I believe is Suffrian’s Luperus malachioides. In the latter species the apical joints of the male antennae are not noticeably enlarged, although the last joint is somewhat swollen. The Cuban species does not appear so deeply reddish and with so deeply violaceous elytra and the aedeagus is different from that of E. crassicornis. Both species in their distinct elytral punctuation are unlike the others of the group.

Ectmesopus pallidus, n. sp.

Fig. 2.

About 4 mm. long, oblong oval, pale yellow with shining violet elytra and dark breast and abdomen. Males with a notch near the end of the middle tibiae and with greatly enlarged 10th antennal joint.

Head smoothly rounded with frontal tubercles somewhat produced, above these, fine punctures on vertex of head. Antennae extending half way down elytra, pale yellow, with apices of each joint a little darker. In male, joints 3, 4, 5, and 6 about equal, 7, 8, and 9 shorter, 10th greatly enlarged and viewed from below with two scooped out concavities. Prothorax scarcely a fourth wider than long, with sides slightly rounded, disk smooth, polished, entirely yellow, not distinctly punctate. Scutellum pale. Elytra wider than prothorax, lustrous violet, ? punctate (the elytra too much wrinkled in the single specimen to show punctures). Body beneath pale with breast and abdomen dark brown, front tibiae stouter than posterior tibiae, and the middle tibiae of the male with a deep notch near the apex. Tibiae with tiny spur. Anterior coxal cavities open, claws with a basal tooth. Length 4 mm., width 1.5 mm.

Type.—Male, in Museum of Comparative Zoology, No. 23824.

Type locality.—Foothills, Cordillera Central, Dominican Republic, south of Santiago, collected in June, 1938, by P. J. Darlington.

Remarks.—Only one specimen of this is known and this is immature with the elytra much wrinkled.
Ectmesopus tristis, n. sp.

Fig. 3.

About 3.5 mm. long, oblong oval, shining violet black. Male with 8th and 9th antennal joints enlarged and 10th joint much diminished, middle tibiae of male deeply notched.

Head shining black, frontal tubercles distinct with a transverse depression above, occiput polished and rounded. Antennae extending below humeri, 3rd joint shorter than 4th, in male the antennae stout and very hairy, 7th joint shorter and broader than 6th, 8th much enlarged, 9th somewhat enlarged, 10th very short and tiny. Prothorax about a third wider than long with sides nearly straight, disk in the two specimens known somewhat depressed, possibly these specimens either not fully hardened or crushed, surface polished, impunctate and entirely dark. Scutellum dark. Elytra entirely dark, shining with a violet lustre, extremely finely and sparsely punctate. Body beneath shining dark violet, lightly pubescent, middle tibiae of male notched, all tibiae with tiny spurs. Length 3.5 mm., width 1.5 mm.

Type.—Male, and 1 paratype (female), U. S. N. M. Cat. No. 53983.

Type locality.—Mandeville, Jamaica, collected in April, 1906, by E. P. Van Duzee.

Remarks.—Both specimens are somewhat shrivelled as if immature, but the entirely dark coloring as well as the unique shape of the male antennal joints make this species quite distinct from others of the group.

Ectmesopus vitticollis, n. sp.

Fig. 4.

From 3 to 4 mm. long, oblong oval, shining, reddish yellow, usually with picose markings on occiput of head, a short vitta on either side of prothorax, a dark line along edge of femora and tibiae, and blue or violet elytra, breast and abdomen more or less dark. Antennae of male with 10th joint much enlarged.

Head smooth, polished, impunctate, pale, usually with a broad picose band from back of eyes running over occiput, mouthparts edged with picose, frontal tubercles not very distinct. Antennae yellowish brown, extending below humeri, 3rd joint shorter than 4th, 5th and 6th gradually longer, in the male the 9th broad and 10th much enlarged and viewed from beneath with a concavity extending over half the length. Prothorax about a fourth wider than long with sides slightly curved, disk smooth, polished, very finely and indistinctly punctate, pale yellow with a short picose vitta on either side usually extending to the middle, sometimes nearly to the base, occasionally only a faint trace of this. Scutellum shining black. Elytra wider than prothorax, shining violet, minutely and sparsely punctate, a slight transverse impression at basal fourth. Body beneath pale with breast and sides of abdomen and sometimes entire abdomen dark. Legs pale, often with coxae and outer edge darkened. Anterior coxal cavities open. On first tarsal joint of the forelegs of the male a dark membranous
pad near the base with a rough alutaceous appearing surface. The tibiae of the middle leg of the males deeply notched near the apex, all tibiae with a tiny spur at the apex. Claws with a basal tooth. Length 3–4 mm., width 1.5–2 mm.

_Type._—Male, and 17 paratypes (9 males, 8 females), U. S. N. M. Cat. No. 53984. Two paratypes (male and female) in Museum of Comparative Zoology, No. 23827.

_Type locality._—Ponce, Puerto Rico, collected by R. G. Oakley on July 20, 1934, on _Peiranisia_, a segregate of _Cassia._

**Ectmesopus zonatus**, n. sp.

Fig. 5.

About 3.5 mm. long, oblong oval, shining yellow brown, with a piceous occipital band running behind eyes, and a piceous vitta on either side of the prothorax; elytra with the base and apical half lustrous green, an irregular pale yellow brown band in the middle, femora with a piceous streak on edge.

Head smooth with frontal tubercles indistinct, pale, a dark band running up on occiput from behind the eyes. Antennae extending below the humeri, 3rd and 4th joints about equal and a little shorter than 5th, the two basal and two apical joints a little paler than the rest. Prothorax nearly a fourth wider than long, smooth, without distinct punctuation, pale with a piceous vitta on either side. Scutellum shining black. Elytra wider than prothorax, shining, very finely and sparsely punctate, yellow with a broad basal green band extending over humeri and down suture in a point, and a broad apical band covering nearly half of elytra. Body beneath pale, lightly pubescent. Femora with a dark edge above. Tibiae with tiny spur at apex. Length 3.7 mm., width 1.8 mm.

_Type._—Female, in Museum of Comparative Zoology, No. 23825.

_Type locality._—Maricao Forest, Puerto Rico, 2–3000 ft., collected May 30–June 2, 1938, by P. J. Darlington.

_Remarks._—Although only one specimen of this species is known, and that a female, I have little doubt, because of its close relationship to _Ectmesopus vitticollis_, that the male will show secondary sex characters similar to others of the genus.

**Ectmesopus occipitalis**, n. sp.

Fig. 6.

About 2.5 mm. long, elongate oblong, yellow brown with dark, often metallic markings, a dark occipital band over back of head and on the prothorax a median vitta, often broadly T-shaped, elytra lustrous green or blue. In male the 10th antennal joint enlarged and the middle tibiae with a deep notch.

Head pale with a broad dark occipital band extending to tubercles, polished, nearly impunctate except for a few sparse punctures and wrinkles above tubercles. Antennae dark brown extending below humeri, third joint a little shorter than fourth, in males the 10th joint enlarged. Prothorax about a fourth wider than long, a bit wider anteriorly, polished, impunctate, a broad median dark
marking, often T-shaped and with a bluish lustre, extending nearly the length of the prothorax. Scutellum dark. Elytra polished blue or green with distinct but not dense punctures. Body beneath pale, the breast deeper brown, legs pale with apex of tibiae and tarsi darker, middle tibiae of male notched. Length 2.4–3.2 mm., width 1.2–1.8 mm.

Type.—Male, and 2 paratypes (females), U. S. N. M. Cat. No. 53985.

Type locality.—Cojimar, Habana, Cuba, collected July 29, 1928, by S. C. Bruner.

Other localities.—Soledad, Cienfuegos, Cuba, collected in May, 1936, by P. J. Darlington.

Remarks.—While the tenth antennal joint of the male is the only one distinctly enlarged, the last five joints are all heavier than in the female.

Ectmesopus angusticollis, n. sp.

Fig. 8.

About 3.5 mm. long, oblong oval, shining yellow brown with lustrous blue or violet elytra. Antennae, frequently the sides of prothorax, tibiae and tarsi darker. Middle tibiae of male emarginate near apex.

Head shining, smoothly rounded, impunctate, pale yellow or reddish. Antennae extending below humeri, third joint shorter than fourth, usually deeper brown than head. Prothorax about a fourth wider than long with sides nearly straight, polished, nearly impunctate, yellow brown, sometimes with the lateral edges deeper brown. Scutellum reddish or dark brown. Elytra lustrous blue, green or violet, finely and sparsely punctate. Body beneath and legs pale, tibiae and tarsi frequently brown. In male the front tibiae stout and the middle tibiae emarginate on the inside near the apex. Tibiae with tiny spur, claws with basal tooth. Length 3–3.8 mm., width 1.4–1.6 mm.

Type.—Male, and 5 paratypes, U. S. N. M. Cat. No. 53986.

Type locality.—Duarte, Santo Domingo City, Dominican Republic, collected July 21, 1917, by Harold Morrison.

Other localities.—San Pedro de Macoris and La Romana Central, Dominican Republic, collected July 15, 1917, by H. Morrison; S. Francisco Mts., Dominican Republic, collected by A. Busck; Constanza, 3–4000 ft., Villa Altagracia, Porto Plata, San José de las Matas, 1000–2000 ft., Mt. Diego de Ocampo, 3–4000 ft., Dominican Republic, collected in June, 1938, by P. J. Darlington; Porto Plata, Dominican Republic, collected by Hurst.

Remarks.—This species differs from the others of the group by not having any abnormal antennal joints in the male. The notch in the middle tibiae of the males is not so pronounced as in the other species, although there is a distinct emargination at that point. The most striking specific character is the narrow prothorax with nearly straight sides.
1. Ectmesopus crassicornis
2. E. pallidus
3. E. tristis
4. E. vitticollis
5. E. zonatus
6. E. occipitalis
7. E. malachoides Suffrian?
8. E. angusticollis
9. E. darlingtoni
10. E. longicornis
Ectmesopus darlingtoni, n. sp.

Fig. 9.

About 3 mm. long, oblong oval, with reddish yellow head, prothorax and legs, and lustrous violet elytra; breast and abdomen dark, antennae dark with the last 2 or 3 joints pale, in male the 10th joint much enlarged, and joints 6, 7, 8, and 9 widened and triangular in shape.

Head entirely pale reddish yellow, smoothly rounded, polished with a few minute punctures across occiput, tubercles well defined. Antennae extending nearly to the middle of the elytra, darker brown than the head, with the last two or three joints pale; in the female, joints 3–7 about equal, 8 and 9 a little shorter, 10th long. In the male, joints 3 and 4 about equal, 5, 6, 7, 8, 9 growing wider at the apex, so as to become triangular in shape and somewhat serrate appearing, 10th very much enlarged and beneath with two concavities. Prothorax about a third wider than long with sides nearly straight, smooth, polished, entirely reddish yellow. Scutellum pale. Elytra shining violet, very finely punctate, a little depressed at basal fourth. Body beneath pale with the breast and abdomen dark. Legs pale, middle tibiae of the male deeply notched. Length 2.9–3.2 mm., width 1.6 mm.

Type.—Male and 2 paratypes (females) in the Museum of Comparative Zoology, No. 23826. 1 paratype (female) in the National Museum, U. S. Cat. No. 53987.

Type locality.—Port-au-Prince, Haiti, and vicinity, collected Oct. 6, 1934, by P. J. Darlington.

Remarks.—The bicolored antennae distinguish this species from closely related ones of similar coloring, and the widely triangular antennal joints of the male are unlike those of any of the other species.

Ectmesopus longicornis, n. sp.

Fig. 10.

About 2.5 mm. long, elongate oblong, shining yellow brown with the antennae and sides of the prothorax and sometimes the middle and the body beneath deep brown, and the elytra blue or green. Antennae very long, in male the 3rd joint very short and the middle tibiae notched.

Head smooth, rounded, polished, a few fine punctures above frontal tubercles, pale with the occiput tending to become deeper brown. Antennae nearly as long as body, deep brown, the 3rd joint very short in the male, longer in the female, antennal joints all slightly heavier in the male. Prothorax about a fourth wider than long, widest anteriorly with nearly straight sides, smooth and polished, with the middle of the disk a little depressed, yellow brown with the sides and often the middle deeper brown. Scutellum dark. Elytra lustrous green or blue, minutely and sparsely punctate. Body beneath brown, lightly pubescent, legs pale, tibiae with minute spur. Middle tibiae in male notched, anterior tibiae stout, claws with a basal tooth. Length 2.3–2.7 mm., width 1–1.3 mm.
Type.—Male and 2 paratypes (females), U. S. N. M. Cat. No. 53988.

Type locality.—Camp Perrin, Haiti, collected Aug. 2, 1925, by W. A. Hoffman.

Other localities.—San José de las Matas, 1000–2000 ft., Dominican Republic, collected in June, 1938, by P. J. Darling.

Remarks.—In this species the apical joints of the antennae in the males are not abnormal, but instead the third joint is unusually short while that in the female is not. The male also has slightly heavier antennae. The antennae differ from those of other members of the group by being nearly as long as the beetle.

THE DISCOVERY OF THE WORKER CASTE OF AN INQUILINOUS ANT, EPIPHEIDOLE INQUILINA WHEELER.

By Marion R. Smith,
Buerau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In 1904, the late Dr. W. M. Wheeler described an inquilinous ant, *Epipheidole inquilina* (Bull. Amer. Mus. Nat. Hist. 20 : 15–17), which he had collected from three nests of a harvesting ant, *Pheidole pilifera* subsp. *coloradensis* Emery. Both the host ant, and its inquiline were found in the vicinity of Colorado Springs, Colo. One colony contained 3 males and numerous soldiers and workers of *coloradensis*, and many males of *inquilina*; a second colony contained a few soldiers and workers of the host species and a single virgin queen of the inquiline; and a third colony, many soldiers and workers of *coloradensis* and a dealated queen, numerous virgin queens, a few males, and a peculiar gynandromorph of *inquilina*.

Two features concerning the ants forcibly impressed Wheeler, (1) that no worker caste of the inquiline could be found, and (2) that the host queen was missing in each of the colonies examined. Wheeler very naturally inferred that the ants had lost their worker caste because of their inquilinous or parasitic nature. He also came to the conclusion that the mother queen of *coloradensis* must have been replaced by a queen of the inquiline just as queens of such inquilinous genera as *Anergates* and *Sympheidole* replace the queens of their host species.

The above-mentioned facts as well as the unusually small size of the queen of *inquilina* and its different habitus led Wheeler to erect the monobasic genus *Epipheidole* for the reception of this species, although he was apparently unable to find any outstanding characters by which it could be clearly distinguished from *Pheidole*. He remarked that if the worker of *inquilina* had been present the taxonomic relationships of this species might
be more clearly understood. So far as known no additional specimens of this interesting inquiline have been collected since the date of Wheeler's article. It might be mentioned, however, that Wheeler was not the first formicologist to see a queen of *inquilina*. Emery (Zool. Jahrb. Syst. 8: 290, 1895) mentions having received from Theodore Pergande some Nebraskan specimens of *Pheidole pilifera* (Roger) among which he detected an unusually small or microgynic queen. This he erroneously thought was a small, abnormal queen of *pilifera*. Emery's remarks concerning this queen are as follows: "Mit diesen Soldaten und einigen Arbeiterinnen sandte mir Herr Pergande ein flügelloses, aber geflügelt gewesenes Zwergweibchen von kaum 3½ mm., mit wenig entwickeltem Thorax und dicken, stumpfen, beulenartigen Metanotumdornen." Emery, having had no opportunity to see these ants in actual life as had Wheeler, failed to grasp the morphological significance of the queen and consequently did not fully describe or figure it. Wheeler, however, referred to the specimen in his publication, pages 2–3, as follows: "There can be little doubt that this insect was a female of *Epipheidole inquilina* described below as occurring with *Pheidole pilifera var. coloradensis*.

Recently while arranging the ants in the National Museum collection I encountered 7 specimens of *inquilina* among the Nebraskan collection of *Pheidole pilifera* referred to above. Five of these specimens, 4 queens and 1 worker, bear the following labels: "Nebr.; Nov. 11, '83; Collection T. Pergande." Two other specimens, both queens, bear labels as follows: "Nebr.; May '83; Collection T. Pergande."

Through the courtesy of Mr. Nathan Banks of the Museum of Comparative Zoology, Cambridge, Mass., I have been able to examine 4 queen cotypes of *Epipheidole inquilina* Wheeler. These bear the label "Broadmoor, Colorado Springs, Colorado; Aug. 11, '03." On comparing the Nebraskan queens with these I find that the Nebraskan specimens differ mainly in that each queen has the frontal region of the head more protuberant, the vertex more depressed, and the occipital lobes more angularly pronounced. In addition the color is a much deeper brown. These characters, although perfectly obvious, do not in my opinion warrant considering the specimens of new subspecific or specific rank.

Although there is only 1 worker of *inquilina* in the Nebraskan collection, this specimen is so similar to the queen of *inquilina* in its morphological characters and so different from the worker of *pilifera* that I have no hesitancy in assigning it to *inquilina* and describing and figuring it as such. As there are no definite locality or collector labels on the specimens of *pilifera* and *inquilina*, I wished to determine, if possible, where these were collected, and by whom. Upon investigating the matter I
learned from old records in the National Museum that Lawrence Bruner was collecting insects in Nebraska during the period covered by the labels and was in intimate contact with Pergande at this time. Seeking to corroborate these apparent facts I wrote to Prof. Myron H. Swenk, Chairman of the Department of Entomology of the University of Nebraska, about the matter. Prof. Swenk replied as follows: "I think there is practically no doubt but that the specimens in the National Museum collection from the Theodore Pergande collection that bear only the labels Nebraska, May, 1883, and Nov. 11, 1883, were collected by Lawrence Bruner, and very probably at West Point, Nebr. The chirography on the label examined is practically that without question of Lawrence Bruner, and we know that Bruner was at West Point, Nebr., in May of 1883, making preparations for a trip through the Rocky Mountains, from which he had returned to Washington by October 30 of that year, and probably returned to West Point in time to have collected these ants there on November 1."

The single worker of *Epipheidole inquilina* is described and illustrated below (Fig. 1). For purpose of comparison the *Pheidole pilifera* worker is also illustrated (Fig. 2). The outstanding characters by which the workers of the two species can be distinguished are given in a summary at the conclusion of the description of the worker of *E. inquilina*.

**Epipheidole inquilina** Wheeler.


queen, male. Pl. 2, figs. 12-14 (queen); 15-17 (male).


Worker.—Length 2 mm. (Fig. 1).

Head, excluding mandibles and eyes, subquadrate, approximately as broad as long, with deeply emarginate posterior border, angular occipital lobes, and weakly convex, somewhat subparallel sides. Eye oval, prominent, strongly convex, placed nearer to the anterior angle of the head than to the posterior angle. Clypeus moderately convex, anterior border rounded, entire, posterior border narrowly rounded and extending well back between the frontal carinae. Frontal carinae subparallel. Frontal area not clearly defined. A weak but distinct frontal groove extends from the region of the frontal area back to the posterior border of the head. Antenna 12-segmented; scape slender, slightly enlarging toward apex, funiculus with a distinct, 3-segmented club, the last segment of which exceeds the combined length of the two preceding segments. Thorax from above more robust than that of the *Pheidole pilifera* worker, especially from the mesonotum backward; promesonotal suture distinct; meso-epinotal region with a deep and rather broad constriction; epinotum with a pair of large, somewhat finger-shaped spines. Petiole viewed anteriorly violin shaped; from behind the petiolar node appears blunt, entire, horizontal above, and with somewhat subparallel sides. Postpetiole from above approximately
as long as broad, with distinctly but not strongly angulate lateral borders; side of postpetiole converging anterior to, and posterior to, the angulations. Anterior tibial spurs present, spurs of middle and hind tibiae absent. Gaster oval, subtruncate at base, but without well defined angular humeri. Mandibles, clypeus, frontal area and region posterior to it, posterior part of pronotum, most of mesonotum, anterior part of petiole, dorsal surface of postpetiole, and gaster, shining; remainder of body densely punctate, dull. Cheeks, region between eyes and frontal carinae, and front, with a few weak, longitudinal rugulae. Epinotum also somewhat rugulose, especially in the region of the mesoepinotal constriction. Posterior dorsal surface of head with a few scattered foveolae.

Hairs pale yellowish or grayish, sparse, suberect to erect; pilosity of appendages shorter, denser, and more appressed.

Mandibular teeth and eyes black; body brown with lighter appendages and gaster, the latter somewhat infuscated posteriorly.
Fig. 2. Worker of the host ant, *Pheidole pilifera* (Roger).

(Drawings by H. B. Bradford. Each drawing x 76).

Described from a single worker in the National Museum collection bearing only the label “Nebr.; Nov. 11, ’83; Collection T. Pergande.” Apparently collected by Lawrence Bruner at West Point, Nebr.

The worker of *inquilina* bears such a strong resemblance to that of *Pheidole pilifera* that it could be easily mistaken for that species. It can be distinguished, however, by the following characters: (1) The deep emargination of the posterior border of the head; (2) the rather pronounced, angular occipital lobes;
(3) the faint, yet distinct, frontal groove running from the region of the frontal area to the posterior border of the head; (4) the convex, protuberant eyes, which clearly stand out above the general surface of the head; (5) the more robust thorax; (6) the presence of a distinct promesonotal suture; (7) the large, peculiar, somewhat finger-shaped epinotal spines, which are very blunt at their ends; and (8) the more robust petiolar and postpetiolar nodes. Of the characters mentioned numbers 1, 4, and 7 are the most distinct.

After carefully studying the worker of inquilina and the workers of pilifera I feel quite certain that the former species must have arisen from a Pheidole ancestor, either that of its host species or a very closely related form, most probably the former. Although this ant has many characters in common with Pheidole (Wheeler, Emery, and others have been unable to find any very clear-cut generic characters by which the species can be distinguished from its host genus) it would seem unwise to synonymize the genus with Pheidole. The species apparently has no soldier caste, and it has almost completely lost its worker caste. Furthermore, the small size of the queen, its peculiar habitus, as well as that of the worker, and the habit of living as an inquiline in the nest of another ant seem to me to justify recognition of a distinct genus for this species.

It is difficult to conceive that inquilina is such a rare ant that one may not expect to collect it on various occasions in the future. Its host is one of the most common and widely distributed ants of the genus Pheidole in the United States, occurring in all sections except perhaps a few of the extreme Western and Southwestern States. A careful search by formicologists for inquilina in the future might help to solve the question as to whether colonies of pilifera containing this inquiline are always queenless, and, if so, by what method or methods this comes about.
A NEW PARASITE OF ANTHRENUS VORAX WATERHOUSE.

By E. A. Back,
U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.

When the writer was engaged in the Federal investigations of the Mediterranean fruitfly (Ceratitis capitata (Wied.)) in the Hawaiian Islands he watched with interest the results of the expeditions conducted by the Hawaiian Department of Agriculture and Forestry into Africa and Australia to discover and introduce into Hawaii parasites of this pest. When D. T. Fullaway liberated a small culture of the introduced Opius humilis Silv. in the Kona coffee district the writer asked Frederick Muir how soon this parasite might be expected to be of practical importance. He was surprised to learn that Mr. Muir hoped for results within two years. During the second season after the liberation of the parasite, adult Opius could be seen flying by the thousands among the coffee trees, and many batches of infested coffee berries showed a parasitization of the fruitfly running between 90 and 99 per cent.

The foregoing experience has made unusually interesting to the writer his discovery of numerous instances of parasitization of the furniture carpet beetle (Anthrenus vorax Waterhouse) during the past summer and fall by a bethylid since described by C. F. W. Muesebeck as Laelius voracis Muesebeck. The parasitized carpet beetle larvae were found originally during May and June, 1939, in widely separated storage houses in Washington, D. C., but have since established themselves in the laboratory through the introduction of infested rugs, furs, and clothing, and have made difficult the rearing of vorax by the usual method in infested merchandise held in storage boxes. From one to four parasites develop in a single well grown vorax larva. Parasitized larvae appear as indicated in Figure 6, their shape being altered somewhat by the developing parasites. The well grown parasite larvae leave the host through openings made in the venter at about the union of the abdomen and thorax as indicated in Figure 5. In Figure 4 is shown a larva of the closely related Laelius tricarinatus Ashmead which died during the process of emerging from a larva of Anthrenus verbasci L.

The white cocoons (Figs. 1–3) are usually spun by the larvae beneath or just to one side of the host, although they may be spun in cast larval skins of vorax if these happen to be close to the parasitized host.

Since the furniture carpet beetle was first discovered estab-
lished in Washington, D. C., in 1915, no instance of its parasitization has been detected until this year in spite of the fact that thousands of specimens have been sent to the Federal Bureau of Entomology and Plant Quarantine for identification from all parts of Washington and vicinity, and cultures of vorax have been maintained continuously in storage rooms at the Department of Agriculture for over 15 years. In some instances cultures of Anthrenus vorax in brushes, which had been active for two and three years, were completely destroyed by Laelius voraxis during the summer of 1939. In one instance every bristle hole in a brush contained cocoons of the parasite. It is always interesting to record the first appearance of a parasite attacking a pest of prime importance, and in this instance it is especially so because for nearly 25 years the furniture carpet beetle has been spreading actively, apparently without being checked by any parasite.

HERIADINE BEES FROM THE BELGIAN CONGO.

By T. D. A. Cockerell.

Heriades paehyaeanthus, sp. n.

Male.—Length about 7.5 mm., anterior wing 5; black, including mandibles and tegulae, the long antennae (reaching scutellum) obscurely brownish beneath; pubescence white, long and abundant on front (where directed upward), sides of face, and lower half of clypeus except in middle; head broad, but facial quadrangle much longer than broad; mandibles robust, tridentate, the cutting edge very oblique; labial palpi stout; clypeal margin denticulate; upper margin and broad middle of clypeus shining, the shining area shaped rather like the skull of a long-horned ox; vertex with dense large punctures; tegulae minutely punctured; mesothorax with large dense punctures, the intervals shining; scutellum prominent, conspicuously shining but well punctured; axillae stout, spined, but the spines thick and not long; postscutellum entirely dull, but base of metathorax with a broad shining band; wings greyish, not brown, in some lights appearing somewhat milky; stigma dusky red, not very dark, not very robust; nervures brown; basal nervure little arched, falling considerably short of nervures; second cubital cell rather short, receiving first recurrent nervure some distance from base, and second near end; hair on inner side of hind tarsi fulvous; abdomen closely punctured, third tergite conspicuous shining, fourth dull; tergites 2 to 4 with narrow marginal hair-bands, and white hair at apical sides of first; basal area of first sharply defined; apical margin strongly concave; genitalia pale reddish; second ventral segment elevated, with a very long dense fringe of white hair.

Belgian Congo (Katanga); Elisabethville, Sept. 11–17, 1931 (J. Ogilvie). A distinct species, perhaps best compared with *H. nitescens* Ckll., from which it is known by the shorter second cubital cell, wings not brownish, and much stouter axillary spines. *H. chlorops* Ckll. and *H. bevisi* Ckll. are much smaller, with brownish wings. The shining mark on clypeus is suggestive of *H. crassulus* Ckll.

**Heriades debilicornis**, sp. n.

*Male.*—Length about 6.4 mm., anterior wing 3.5; robust, black, including mandibles, the unusually short antennae with the flagellum red beneath, the tegulae dusky rufous, pubescence white, dense at sides of face and front, and on apical part of clypeus except a median line; head large, circular seen from in front; mandibles very broad, with a very stout apical tooth, and a transverse cutting edge, which is undulate with the suggestion of two small teeth (mandibles approaching the type of *H. pellucidus* Ckll. and *H. usakensis* Ckll.); clypeal margin nearly simple, with a pair of transverse shining callosities; clypeus dull and very minutely sculptured, seeming to have a slight median ridge, but this is illusory, due to a median line being free from hair; supraelypeal area dull; vertex shining, well punctured; mesothorax shining, with rather small punctures, and a distinct median groove; scutellum shining, somewhat angular in middle; axillae unarmed, sculptured like scutellum; truncation of metathorax polished; wings greyish hyaline; stigma small, dusky reddish; nervures brown; basal nervure nearly reaching nervulus; second cubital cell receiving first recurrent nervure far from base, the second nearer apex; hind coxae very robust; hind femora stout; hair on inner side of hind tarsi fulvous; abdomen with the tergites shining, the fourth more finely punctured than second and third; six visible tergites, the sixth not modified; basin of first tergite small but well defined; first four tergites with very thin, more or less imperfect apical hair-bands.

Belgian Congo (Katanga): Sakania, Sept. 1931 (J. Ogilvie). Apparently allied to *H. sulcatiferus* Ckll., but does not have the frontal depressions, and the wings are not strongly dusky. The specific name is suggested by the relatively short slender flagellum; the scape is large and robust.

**Heriades communis** Cockerell.

This species is very common in the Katanga country. I find that the females have a sharp strong spine on the first abdominal sternite, not mentioned in the original description. Frequently it can not be seen, owing to the position of the abdomen and legs, but it is clearly visible in a series of specimens from Elisabethville, Tenke, Biano, Kafubu Mission, and Katanga Mission.

**Heriades pellucidus** Cockerell.

Heriades centralis Benoist.

Belgian Congo: South of Bukavu, Aug. 28, 1931, 2♂ (L. Ogilvie, J. Ogilvie), 2♀ (Cockerell, A. Mackie). These are not H. communis Ckll., but they seem to agree well with H. centralis, described from Kindu, and to confirm the suggestion of Benoist that H. burgeoni Benoist, from the same place, is the female of H. centralis. There remains, however, some doubt whether this species is to be separated from H. impressus Schletterer.

Noteriades chapini (Cockerell).

Belgian Congo: Elisabethville, Sept., 1931, 9♂ (J. Ogilvie).

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BOOK NOTICE.
The Problems of Insect Study, by Paul Knight, Assistant Professor of Entomology, University of Maryland; second edition, quarto, paper, illustrated, bibliography, 132 pp. Edwards Bros., Inc., Ann Arbor, Mich., 1939. $2.50.

Although the author of this interesting and valuable book states frankly that it "contains nothing that has not been published many times" the manner in which the subject matter is marshalled and presented is refreshingly original and effective.

The work consists in six parts or chapters as follows: I, The Insect Problem; II, Man Surveys The Damage; III, Man Counts The Gains; IV, Man Appraises A Competitor; V, Man Classifies the Hexapods; VI, Tentative Solutions.

An Appendix follows containing a bibliography together with a list of common and scientific names of important insects.

This book presents a rapidly drawn but faithful picture of the entire science of entomology in a way that may readily be assimilated by the uninstructed. Although this is a task that would seem difficult under the most liberal of spatial limitations, the author has succeeded within the scope of somewhat more than 100 pages, in producing what impresses the writer as the very best epitome of the subject that has come to his notice.

W. R. W.

---

MINUTES OF THE 509th REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.
The 509th meeting of the Society was held at 8 p. m., Thursday, April 4, 1940, in Room 43 of the National Museum. There were 41 members and 13 visitors present, and President Muesebeck presided. The report of the previous meeting was accepted as read.

The President commented upon recent sales of literature by the Corresponding Secretary, D. J. Caffrey.

Under Notes and Exhibition of Specimens, President Muesebeck spoke briefly concerning Braconidae of the genus Elasmosoma. Species of this genus
occur associated with ants, and are very rare in collections. An unusually large series was recently collected in Ohio and has been deposited in the National Museum.

The regular program was as follows:

1. Insect contamination of food products. K. L. Harris, Food and Drug Administration.

Interstate movement of foods adulterated with filth is prohibited by law. Insects in food constitute filth. Arbitrary standards of food cleanliness are not set up, but the Food and Drug Administration expects the product to be prepared by the best commercial practice. High standards of purity work to the producer's own advantage in gaining public approval. In reducing infestations found in foods, the Bureau of Entomology and Plant Quarantine is often of material assistance in developing methods of pest control. Moreover, the activities of the Administration stimulate interest in the Bureau's control investigations. The ever-normal granary is building up an enormous insect control problem.

Whole insects, their fragments, and excreta may be found in foods. Methods of extracting the filth and determining its origin, even after severe grinding and cooking, have been developed. In addition to insect filth, a continuous surveillance for decomposition and rodent infestation is maintained.

(Author's abstract.)

A. B. Gurney mentioned finding a specimen of Blastophaga pseudes (L.) in canned figs a short time previously, and spoke briefly concerning the habits of Blastophaga and allied fig-insects. B. J. Howard noted that edible figs usually do not contain fig-insects, though these insects serve as pollinators during the growth of the flower-bearing receptacle which develops into the fruit.

2. Wireworms and some of their habits. M. C. Lane, Bureau of Entomology and Plant Quarantine.

Mr. Lane gave an enthusiastic account of his work with wireworms, particularly as related to problems in the Northwest. Many species living in unusual habitats or with interesting life histories were discussed. (Secretary's abstract.)


Motion picture films, illustrating all stages in the life history of the White-fringed beetle, together with control measures now being practiced, were shown. Mr. Richmond followed the films with a brief résumé of various phases of work with this pest. (Secretary's abstract.)

Comments were made by Hyslop, Wadley and Hetrick.

Adjournment at 10.15 p. m.

Ashley B. Gurney,
Recording Secretary.

Actual date of publication, May 28, 1940.
ANNOUNCEMENT

Prices for back volumes and single numbers of the Proceedings of the Entomological Society of Washington are as follows until further notice:

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D. J. CAFFREY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September
by the
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under
Act of August 24, 1912.
Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October
3 1917, authorized July 3, 1918.
THE
ENTOMOLOGICAL SOCIETY
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Organized March 12, 1884.
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ENTOMOLOGICAL SOCIETY OF WASHINGTON.
Published monthly, except July, August and September, by the Society at
Washington, D. C. Terms of subscription: Domestic, $4.00 per annum;
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editor.
HIGHLAND SYRPHIDAE (DIPTERA) OF NORTH CAROLINA.

By R. C. Shannon.

Brimley in his "Insects of North Carolina, 1938" lists 172 species of Syrphidae for the State. A collection of 71 species, of which 20 are not included in Brimley's list, was made by the writer in the western mountains of the State at altitudes of 4,000 to 5,000 feet, in late April and early May, 1936.

These higher peaks are southern outposts of the Alleghenian and Canadian life zones. It is therefore not surprising, particularly as the material was collected shortly after the advent of spring, that most of the 20 additional species have been recorded previously only from these life zones.

The two most remarkable distribution records are those of Epistrophe albipunctatus Curran, hitherto known only from the Pacific Northwest, and Psilota thatuna Shannon, previously known only from Idaho. The new species of Sphegina described below, is closely related to S. infuscatus Loew, an Alaskan species.

In the following list the species noted without locality record were collected at both Highlands and Bryson City. Also the species not listed by Brimley are marked with an asterisk and their known range of distribution is given.

List of Species.

Subfamily syrphinae.

Melanostoma obscurum Say, 6 Males, 1 Female.
Melanostoma angustatum Will., 1 M., Highlands.
Melanostoma pictipes Bigot (previously recorded as mellinum Linn.), 1 M., 3 F.
Platycheirus quadratus Say, 1 M., Highlands.
Syrphus torus O. S., 2 F.
Syrphus rectus O. S., 5 F.
Syrphus knabi Shn., 3 M.
*Syrphus vitripennis Meig., 6 M., 3 F. (New York to Canada.)
Metasyrphus wiedemannii Johns. (as americanus), 1 M., 1 F., Highlands.
Metasyrphus vinelandi Curran, 1 F., Highlands. (New England.)
Metasyrphus laxus O. S. (as Didea laxa), 3 M.
Metasyrphus amalopis O. S., 7 M., Bryson City.
Metasyrphus lapponicus Zett., 1 M., Highlands. (New York to Canada.)
Metasyrphus ochrostomus Zett., 1 F., Highlands. (Canada.)

The local form apparently differs from the Northwestern one only in having more pronounced yellow and black bands on the abdominal sternites.

Epistrope cinctellus Zett., 2 M., 2 F., Highlands. (New York, New England.)
Didea fuscipes Lw., 15 M., 1 F. (as D. fasciata fuscipes).
Chrysotoxum perplexum Johns., 7 M., Highlands. (Maryland to Maine.)
Chrysotoxum pubescens Lw., 2 M.
Sphaerophora cylindrica Say, 1 F.
Mesograma boscii Macq., 2 M. (as Toxomerus boscii).

Subfamily chilosinae.

Pipeza festiva Meig., 1 F.
Heringia salax Lw., 2 M., 1 F.
Psilota thatuna Shn., 2 M. (Idaho.)
Chrysogaster nitida Wd., 1 F.
Cartosyrphus capillatus Lw., 7 M.
Cartosyrphus caltha Shn., 3 M., Highlands.
Ferdinandea nigripes O. S., 7 M., Highlands. (New York, New England.)
Rhingia nasica Say, very common.
Neoascia distincta Will., 13 M., Highlands.
Sphegina rufiventris Lw., 2 M., 6 F.
Sphegina flavimanna Mall., 2 F., Highlands. (Maryland to Maine.)
Sphegina lobata Lw., 1 F., Bryson City.

Sphegina brimleyi, n. sp.

Male.—Front nearly three times as long as broad, black, lightly covered with brownish and grayish pruinosity and with rather conspicuous erect pile; the two basal antennal segments black, third brownish; arista pubescent; upper half of face blackish, lower half yellowish; distance between lower eye margin and the oral margin less than width of third antennal segment.
Mesonotum blackish with brownish pile, inner notopleural depression distinct; fore and mid legs yellowish, the tarsi darkening apically; hind femur yellowish on basal fifth, reddish brown beyond; hind tibia reddish brown, yellowish basally and apically, the apex truncate ventrally; hind tarsi dark.
First two abdominal tergites black, the last two reddish brown; second tergite but little longer than twice its basal width; fourth sternite subquadrate, about one and one-third times as broad as long; posterior margin transverse, thinly clothed with pile and without spinules.
Wings slightly infuscated.

Female.—Width of front about one and two-thirds times its length; distance between lower eye margin and oral margin equal to width of third antennal
segment; basal abdominal segment dark, remaining ones reddish brown; basal width of second tergite one and one-half times the length, the posterior width one and one-fourth times the length. Otherwise similar to the male.

Length: 6 to 6.5 mm.; wing 6 to 6.5 mm.

Type.—A male, U. S. National Museum No. 51912. Allotype and two female paratypes, U. S. N. M. No. 51912; type locality, Highlands, 5,000 feet altitude, North Carolina. One paratype from Bryson City, 5,000 feet altitude, North Carolina.

The present species is closely allied to S. infuscata Loew as shown by the fairly conspicuous frontal pile, rather short second abdominal segment, the absence of spinules on the fourth sternite of the male and the straight posterior margin of this sclerite. S. infuscata differs from brimleyi in having a broader front with even more conspicuous pile; the face entirely black and the fourth sternite nearly twice as long as broad.

Brachyopa flavescens Shn., 1 F., Bryson City. (Virginia to New England.)
Brachyopa perplexa Curr., 2 M., 2 F., Bryson City. (New York to Ontario.)
Brachyopa notata O. S., 11 M., 2 F. (Pennsylvania to Canada, Alaska.)
Myiopelis variipes Lw., 1 M., 3 F., Highlands.
Chatomymia aerea Lw., 1 M.
Cynorhinella longinasa Shn., 7 M. (New Hampshire). Only a single specimen of this species has been recorded previously, the type specimen, a female (1924). The male has a mere suggestion of a prominence on the posterior part of the femur. The male of the genotype of Cynorhinella, bella Williston has a prominent toothlike projection in this position.

Subfamily xylotinae.

Cynorrhina nigra Will., 7 M., Bryson City. (New York to New Brunswick and Nova Scotia.)
Cynorrhina pictipes Bigot, 1 F., Highlands.
*Cynorrhina confusa Johns, 1 M., Highlands. (New York, New England.)
Cynorrhina unbratilis Will., 2 M., Highlands.
Cynorrhina badia Wlk. (as C. intersistens Wlk.) 1 M., Highlands.
Brachypalus aurus Wlk. (as B. frontosus Lw.), 3 M., 1 F.
Criorhina verbosa Harris, 3 M.
*Criorhina nigriventeris Walton, 2 M., 5 F., Highlands. (Pennsylvania, New England.)
Xylotomina metallica Wied., 1 F., Highlands.
Xylotomina baton Wlk., 1 M., 2 F.
Xylotomina chalybea Wd., 5 F.
Xylotomina pigra Fabr., 2 M.
Xylotomina vecors O. S., 12 M.
*Xylotodes inarmatus Hunter, 8 M., 1 F., Highlands. (Idaho, Maine, Ontario.)
Xylotodes metallifera Bigot (as Brachipalus rileyi Will.), 1 M., Highlands.
Teuchocnemis lituratus Lw., 5 M.
Syritta pipiens Linn., 2 M.
Temnostoma balyras Wlk., 2 M., 2 F.
Temnostoma barberi Shn., 1939. 1 M., Highlands. (Previously recorded as T. babylans Fabr.)
*Temnostoma temnustum Will., 5 M., Hemlock forests near Bryson City. (New York, New England.)
Temnostoma alternans Lw., 1 F., Bryson City.
Sphecomvia vittata Wd., 3 M., Highlands.

Subfamily sericomynae.

Sericomyia chrysotoxoides Macq. Very common.

Subfamily eristalinae.

Helophilus fasciatus Walk. (as H. similis Macq.), 1 F., Highlands.
Mallota cimbiciformis Fall., 1 M., 1 F.
Mallota postica Fabr., 4 M., 2 F., Highlands.
Eristalis tenax Linn. By far the commonest species in the region.
Eristalis saxorum Wd., 1 F., Highlands.
Eristalis transversus Wd., 2 M., 4 F.
Eristalis arbustorum Linn., 2 M., 2 F.

TWO NEW HYMENOPTEROUS PARASITES OF SUGARCANE BORERS IN INDIA.

By C. F. W. Muesebeck,
Bureau of Entomology and Plant Quarantine.

Recently two new parasites of Scirpophaga larvae in sugarcane were submitted for determination by Dr. M. C. Cherian, of the Agricultural Research Institute, Coimbatore, India. They are described here in order to make the names available for use in papers dealing with biological studies involving them. At the same time it seems desirable to correct the generic placement of a described Indian species with which one of the new forms is compared.

Family bethylidae.

Goniozus fulvicornis (Rohwer), new combination.


This species, the type series of which was reared from Cryptophlebia carpophaga Wlsm. in India, does not possess the venational and propodeal characters that distinguish Trissomalus. It unquestionably belongs in Goniozus.
Goniozus indicus, new species.

Goniozus indicus Ashmead, Indian Museum Notes 5: 178, 1903 (not described).

This appears to be most similar to fulvicornis Rohwer, resembling that species especially in having an unusually smooth head. It may be immediately distinguished, however, by the absence of a transverse carina defining the upper limit of the propodeal declivity, and by the much smaller eyes.

Female.—Length 3.0–4.5 mm. Head nearly parallel-sided, smooth and shining with some scattered punctures on the frons, these becoming more abundant toward the clypeus; eye shorter than the distance between it and posterior margin of head; temple strongly convex; distance between median ocellus and one of the lateral ocelli twice the diameter of an ocellus; median keel on clypeus not extending upon frons; mandible smooth and shining; antenna not quite as long as head, pedicel slightly longer than first segment of flagellum, the latter narrowed at base and about as long as broad at apex, the following segments, except the apical one, at least as broad as long.

Thorax more slender than in fulvicornis, narrower than the head; pronotum nearly as long as broad on posterior margin, very finely coriaceous anteriorly, smooth and polished posteriorly; mesoscutum polished with only a few scattered punctures on posterior half; scutellum likewise polished with a few punctures along the lateral margins of the disk; propodeum narrowing gradually caudad, smooth and polished down the middle, coriaceous laterally, posterior declivity not abrupt and not delimited above by a carina; branch of basal vein longer than upper absicissa of basal vein and very nearly or quite as long as lower absicissa.

Abdomen smooth and polished.

Black; antennae brownish yellow, darker apically; wings subhyaline, stigma and prostigma brown, veins yellowish; all coxae, anterior femora and all tibiae and tarsi yellowish brown, middle and posterior femora piceous.

Male.—Like the female except for the larger eye, which is longer than the distance from it to posterior margin of head; antennae definitely longer than head; distance between median ocellus and a lateral ocellus not longer than diameter of an ocellus; wings more uniformly hairy than in female.

Type.—U. S. National Museum No. 54195.

Type locality.—Coimbatore, India.

Hosts.—Scirpophaga auriflua Zell. on sugarcane; Chilo sp. and Diatraea venosata (Walk.).

Described from the following material: Two females and three males, including holotype, reared in April and May, 1936, by P. Israel from Scirpophaga in sugarcane; one female and one male reared in March, 1937, from the same host by the same investigator; three females, labeled “Ex Chilo sp. on Cholam,” reared in March, 1937, by P. Israel; four females reared from Diatraea venosata Mar. 2, 1936, “C. K. S. collector”; also five
females reared by L. de Niceville at Champaran, Northern India, in 1901, from a larva of *Scirpophaga auriflava*.

Ashmead's manuscript name has been adopted for this species.

**Family braconidae**

*Rhaconotus cauliscola*, new species.

Apparently closely allied to *formosanus* Watanabe and *choenobivorus* Rohwer, but differing from both in the sculpture of the second tergite, in the maculate stigma and in the shorter ovipositor. In those respects it also differs from *scirpophagae* Wilkinson, a parasite of the same host; and it may further be distinguished from that species by the presence of costulae on the propodeum connecting the three longitudinal carinae.

**Female.**—Length about 4 mm. Head granularly rugulose, very weakly so on the inner orbital area; vertex with an indication of a carina from ocellar triangle to occiput; temple not half as wide as eye; ocellocellular line twice diameter of an ocellus; antenna very slender, slightly longer than body, about 35-segmented.

Mesoscutum and scutellum finely granular and rather dull; propodeum with two large basal areas limited by the longitudinal carinae and arched costulae, these areas conspicuously smooth and contrasting strikingly with the remainder of the propodeum, which is closely rugulose; second abscissa of radius less than twice as long as first.

Abdomen a little longer than head and thorax combined; first tergite stouter than usual in *Rhaconotus*, a little broader at apex than long, finely longitudinally rugulose aciculate; connate second and third tergites longitudinally aciculate except for a transverse polished area at base which narrows laterally and a transverse, crescentic, delicately punctate area across the middle, apical margin smooth; fourth and fifth tergites longitudinally aciculate, narrowly smooth at apex; sixth tergite delicately longitudinally rugulose on basal half, transversely lineolate on apical half; ovipositor sheath about half as long as abdomen.

Usually dark red with thorax mostly piceous, the smaller specimens often lighter in color; antennae brownish yellow; legs including coxae uniformly yellow; wings subhyaline; stigma pale at extreme base and at extreme apex, brown centrally.

**Male.**—Like female in all essential characters.

**Type locality.**—Coimbatore, South India.

**Type.**—U. S. National Museum No. 54196.

**Hosts.**—*Scirpophaga* sp. and *Chilo* sp.

Described from four female specimens reared by P. Israel at the type locality from *Scirpophaga* sp. in sugarcane, two of them Apr. 16, 1936, and two, including the holotype, May 25, 1936; and four males reared by P. S. Nathan from *Chilo* sp. at the type locality Apr. 25, 1932.
A NEW SPECIES OF XYLECHINUS CHAPUIS FROM MONTANA
(COLEOPTERA, SCOLYTIDAE).

By M. W. Blackman,
Bureau of Entomology and Plant Quarantine.

In 1923 the writer\(^1\) described *Xylechinus americanus* Blkm., from spruce and pine in Maine and northern New York. This is the only species of the genus heretofore reported from America, north of Guatemala. Several species have been recorded from Central America and from South America, and one from Europe. In the present brief paper a second North American species is described—this one from Montana. Both the North American species appear to be much more closely related to the European species *Xylechinus pilosus* Knoch, the genotype of the mono-basic genus *Xylechinus* Chapuis than to those from Central America and South America.

**Xylechinus montanus**, new species.

*Female.*—Piceous brown, with cinereous scales and hairs, antennae and legs lighter brown; 2.43 mm. long, about 2.4 times as long as wide; closely allied to *Xylechinus americanus* Blkm.

*Frons* convex, somewhat flattened between eyes; frontal rectangle about 1.08\(^2\) times as long as wide; epistoma lighter in color, transversely impressed, divided by an elevated, sharp, median carina, which extends from margin to the poorly developed, arcuate, transverse impression; epistomal margin darker in color, thickened, its middle third produced to form a strongly emarginate epistomal process, surface moderately shining, finely, densely granulate-punctate, with moderately stout and short, cinereous hairs; subopaque on vertex, with finer and shorter hairs. *Eye* moderately finely granulate, long oval, slightly more than three times as long as wide, slightly wider above, inner line sinuate, subemarginate. *Antenna* with scape club-shaped, twisted; funicle 5-jointed, about equal to scape in length; club connate, slightly flattened, scarcely longer than funicle or scape, with three straight sutures, only the first having a septum, first and second joints subequal in length. *Pregula* lighter in color, moderately large, with a scant anterior fringe of hairs of moderate size.

*Pronotum* very slightly wider than long (viewed from a point perpendicular to its middle); posterior outline bisinuate, widest behind, with sides rather weakly arcuate and converging on posterior two-thirds, then constricted, broadly rounded in front; disk transversely impressed in front, surface moderately shining, finely and moderately closely punctured, with the interspaces reticulate on central disk, feebly granulate anteriorly and laterally; median line

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\(^2\) Derived by dividing the distance from the upper margin of eyes to the lower ends of the epistomal process by the distance between the eyes.
narrow, feebly elevated, extending from base to transverse impression; clothed with rather short spatulate or scalelike, cinereous setae, directed toward median line.

_Elytra_ distinctly wider than pronotum, about 1.7 times as long as wide; basal margins separately, strongly arcuate, strongly elevated and crenulate, with a partial second row of teeth behind the marginal row; sides nearly straight and subparallel on anterior two-thirds, very narrowly rounded behind; striae strongly impressed (more strongly than in _americanus_), of moderate width, shining, with deep, very close, moderately coarse punctures; interspaces wider, but with the second and fourth slightly narrower than the others and subequal to striae, convex, finely punctate and granulate; surface shining, but mostly concealed by semirecumbent, short, thick, cinereous setae, each interspace with a middle row of slightly longer and thicker, erect, cinereous setae, the posterior ones notably longer. _Declivity_ arched, with interspaces 1, 3 and 9 distinctly elevated; first interspace widened, second interspace greatly narrowed; striae narrower, with punctures smaller. Abdominal sternites 1, 2, and 5 subequal and each about as long as segments 3 and 4 combined; clothed with moderately abundant, cinereous hairs, sparser on first two segments.

_Male._—Similar but slightly stouter; frontal rectangle slightly narrower, 1.1 times as long as wide, setae somewhat coarser; pronotum wider, sides more strongly arcuate on posterior three-fourths, and more sharply constricted anteriorly, sculpture coarser; elytral striae wider, with coarser punctures, second and fourth interspaces narrower than striae, second interspace nearly obsolete on declivity.

This species is closely allied to both the eastern species _Xylechinus americanus_ Blkm. and to the European _X. pilosus_ Knoch, but it is plainly distinct. The striae are wider and deeper and the strial punctures are coarser, especially in the males. The second and fourth discal interspaces of the elytra are notably narrower than the first and third. On the declivity the first, third, and ninth interspaces are more strongly elevated and the second interspaces notably narrowed, not only in the males but to a lesser extent in the females also.

_Type locality._—Sula, Mont.

_Additional localities._—Anaconda, Glacier National Park; MacDonald Lake, Columbia Falls, Mont.

_Host._—Engelmann spruce (_Picea engelmannii_ Engl.).

_Type host._—Larix occidentalis Nuttall.

_Holotype, allotype, and 10 paratypes._—U. S. N. M. No. 54024.

_Type material._—Holotype and 4 paratypes.—Sula, Mont., _Picea engelmannii_, D. DeLeon, Coll.; allotype, Anaconda, Mont., _Picea engelmannii_, H. E. Burke, Coll.; 3 paratypes, Glacier National Park, _Larix occidentalis_, D. DeLeon, Coll.; 3 paratypes, MacDonald Lake and Columbia Falls, Mont., _Picea engelmannii_.

Joseph Brunner, Coll,
Figures.

Comparison of the fore tibiae and the antennae of *Xylechinus montanus*, n. sp., and *X. americanus* Blkm.
1. Fore tibia and tarsus of *X. montanus*.
2. Fore tibia and tarsus of *X. americanus*.
3. Antenna of *X. montanus*.
4. Antenna of *X. americanus*.

Drawings by Miss Hazel S. Bowen under the author's direction.

FOUR NEW HERCOSTOMUS FROM UTAH (DOLICHOPODIDAE: DIPTERA).†

By F. C. Harmston and G. F. Knowlton.‡

Four apparently undescribed species of long-legged flies of the genus *Hercostomus* are described and figured in this report.

**Hercostomus utahensis**, n. sp.

Figs. 3-4.

*Male.*—Length, 3 mm.; of wing, 2.6 mm. Face moderately wide, silvery pollinose; front and occiput densely silvery pollinose, completely hiding the ground color; antennae black, closely resembling those of *H. truncatus* n. sp. (fig. 6) in general form; lateral and inferior orbital cilia wholly black.

Dorsum of thorax and abdomen shining bronze-green; pleurae and lateral margins of abdomen dusted with white pollen; hypopygium (fig. 4) moderately large, black, its outer lamellae elongate-triangular, yellow, with narrow blackish apical border, fringed with yellowish cilia.

Fore and hind coxae yellow, the former with black hairs and bristles on anterior surface; middle coxae concolorous with pleura, their tips narrowly yellowish; femora and tibiae yellow; fore tibiae without the row of short, sharp

† Contribution from the Department of Entomology, Utah Agricultural Experiment Station.
‡ Research assistant and research associate professor, respectively.
bristles commonly found in species of this genus; fore and middle tarsi black from the tip of first joint; hind tarsi black, yet the first joint brownish on basal half; joints of fore tarsi as 10-5-4-3-3; of middle tarsi as 14-7-5-4-3; of hind tarsi as 10-11-6-4-3. Calypters and halteres yellow, the cilia of the former black.

Wings (fig. 3) grayish hyaline; anal angle prominent.

*Female.*—Face wider than in male; otherwise similar to male except for sexual differences.

Described from nine males and four females all collected in Utah. Holotype male, allotype female and eight paratypes (five males and 3 females) taken at Moab, July 19, 1939; two paratypes at Monticello, July 19, 1939, and one paratype at Cedar City, July 12, 1939, all collections by G. F. Knowlton and F. C. Harmston.

*Taxonomy.*—This species resembles *H. currani* Van Duzee but differs in *currani* having the hypopygial lamellae broadly-crescent shaped and rounded at apex, whereas in *utahensis* the lamellae (fig. 4) are elongate-triangular with sharply pointed tip. The wings of *currani* are strongly tinged with brown appearing uniformly smoky; *utahensis* has clear, grayish hyaline wings.

*Hercostomus stanfordi*, n. sp.

*Male.*—Length, 3.4 mm.; of wing, 3.2 mm. Face narrow, silvery pollinose; front and occiput greyish pollinose, completely hiding the ground color; antennae (fig. 8) yellow, the third joint scarcely longer than wide, slightly brownish on its apical half, somewhat pointed at tip: arista long, black, tapering; lateral and inferior orbital cilia white, about two or three of the uppermost being black.

Dorsum of the thorax bronze-green, thickly dusted with greyish pollen, yet not completely hiding the ground color: pleurae dark green, thickly dusted with pollen; abdomen shining bluish-green, its lateral margins silvery pollinose; hypopygium (fig. 9) black, large; outer lamella small, oval, white, translucent, with a few black, hair-like bristles along apical margin.

Coxae, femora, tibiae and tarsi pale yellow, except the extreme base of the middle coxae, which is slightly brownish; joints of fore tarsi as 9-4-3-2-2; of middle tarsi as 12-9-5-3-2, of hind tarsi as 10-12-8-5-3. Calypters and halteres pale yellow, the former with black cilia.

Wings (fig. 2) greyish hyaline, typical for the genus, yet the anal angle only moderately prominent.

Described from five males; all taken in Utah; the holotype collected at Cedar City, July 12, 1939; one paratype in Logan Canyon, July 4, 1937; one paratype in Monticello, August 27, 1938, all by G. F. Knowlton and F. C. Harmston. Two paratypes from Delta, July 5, 1938, taken by G. S. Stains.

*Taxonomy.*—*H. stanfordi*, n. sp. traces in the Curran key

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<sup>3</sup> Named in honour of Dr. J. S. Stanford of the Zoology and Entomology Department, Utah State Agricultural College.
Hercostomus posterior

Male.—Length, 3.3 mm.; of wing, 3 mm. Face moderately wide, silvery pollinose; front blue-green, not shining, lightly dusted with greyish pollen; antennae (fig. 7) black; third joint slightly longer than wide, minutely pubescent; lateral and inferior orbital cilia black.

Thorax and abdomen shining bronze-green, the surfaces of both very lightly dusted with greyish pollen; pleurae concolorous with dorsum, except its surface thickly dusted with whitish pollen; hypopygium (fig. 1) black, its outer appendages unusual for the genus, consisting of a pair of long, tapering, ribbon-like lamellae which are fringed with long, delicate, whitish cilia.

Coxae, femora and all their hairs and bristles black; tibiae yellow, the apical one-fourth of posterior pair blackened and slightly thickened; fore and middle tarsi black from the tip of first joint; posterior tarsi wholly black; joints of fore tarsi as 9–4–4–3–3; of middle tarsi as 14–7–5–4–3; of posterior tarsi as 9–10–6–5–4. Calypters and halteres yellow, the former with black cilia.

Wings typical of the genus; greyish hyaline.

Described from holotype male taken at Kanosh Canyon, Utah, June 20, 1939, by G. F. Kuowlton and F. C. Harmston.

Taxonomy.—This species traces to H. ovaticornis Van Duzee in the Curran key (Amer. Mus. Novitt., No. 682, p. 4, 1933), differing, however, in possessing long, tapering, ribbon-like hypopygial lamellae; also the third antennal joint is distinctly pointed at tip. The hypopygial lamellae of ovaticornis are small and fringed with black hairs and the third joint of antenna is broadly rounded anteriorly.

Hercostomus truncatus, n. sp.

Male.—Length 3 mm.; of wing, 2.6 mm. Face narrow, silvery pollinose; front and occiput densely greyish pollinose, completely hiding the ground color; antennae (fig. 6) black, third joint slightly longer than wide, somewhat pointed at tip; lateral and inferior orbital cilia entirely black.

Dorsum of thorax shining, dark-green, with bronze reflections, slightly pollinose; pleurae thickly dusted with greyish pollen; abdomen shining, dark-green, with coppery reflections, the lateral and ventral margins lightly dusted with greyish pollen; hypopygium (fig. 5) large, black; outer lamellae small, triangular, yellow with apical margin narrowly darkened, fringed with fine yellowish cilia.

Fore coxae yellow, their anterior surface with black hairs and bristles; middle and hind coxae concolorous with pleurae, their tips narrowly yellowish; femora yellow, the posterior pair with a brown apical spot above; tibiae yellow, the posterior pair somewhat darkened and thickened on apical fifth, especially on
inner surface; fore and middle tarsi yellowish, becoming somewhat brownish toward the apices; posterior tarsi black; joints of fore tarsi as 7-3-3-2-2; of middle tarsi as 12-6-5-4-3; of hind tarsi as 9-11-8-5-4. Calypters and halteres yellow, the former with black cilia.

Wings of plain structure, greyish hyaline.

Described from holotype and one paratype male, both taken in Kanosh Canyon, Utah, July 28, 1939, by G. F. Knowlton and F. C. Harmston.

**Taxonomy.**—*H. truncatus*, n. sp. resembles *H. humilis* Loew, but is easily separated from it by the difference in the form of hypopygial lamella. In *humilis* the lamellae are large, crescent-shaped and densely fringed with coarse black hairs, whereas in *truncatus* the lamellae are small, triangular and fringed with fine yellowish cilia except at the outer corners, where the cilia are larger and brownish. The posterior femora in *humilis* are wholly yellow; in *truncatus* the posterior femora possess a conspicuous brown spot above at apex. From *exilis* Loew, which also possesses the hind femora with a brown apical spot, *truncatus* may be separated by the form of hypopygial lamellae and coloration of the antennae. The antennae in *truncatus* are wholly black; in *exilis* the first and second joints, together with the base of the third joint are reddish-brown. *Exilis* has kidney-shaped hypopygial lamellae, whereas in *truncatus* the lamellae are triangular.

Holotypes and allotypes of the new species deposited in the U. S. National Museum; paratypes in the Utah Agricultural Experiment Station insect collection.

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NOTES ON DINAPATE WRIGHTII HORN (COLEOPTERA: BOSTRICHIDAE).

By A. C. Davis.

The recent publication of a paper on Dinapate by Michelbacher and Ross (8) reminded the writer of some data in his own files. The present paper was largely written in 1930, and laid aside in the hope that further data would be obtained.

Since the discovery of the beetle Dinapate wrightii Horn by W. G. Wright and its description by Horn (5) in 1886 several papers have appeared, each containing biological notes as well as collecting data, and each contributing a few facts to our knowledge of its life history and habits. These scattered papers were brought together in 1922, by Comstock (2), who quoted largely from the more important contributions up to that time and gave an excellent summary of the facts then known concerning the life history, habits, and distribution of the insect. The beetle is found boring in the fan palm (Washington filifera Wendl.) in the canyons on each side of the Colorado Desert, Calif. (formerly the upper end of the Gulf of California), and at least as far south as Catavina, Lower California, about 300 miles south of Palm Springs, Calif. The comparative inaccessibility of its habitat, the extreme size of its host, and its nocturnal habits all make the beetle difficult to observe in spite of its large size; and its roving disposition seemingly precludes the possibility of rearing it under ordinary artificial conditions. For this reason the biological notes in all the published papers are fragmentary. The present paper is no better in this respect, but certain hitherto unrecorded facts have come under observation and are here offered as a contribution to our more complete knowledge of the insect.

The distribution of Dinapate is not well known. The type material probably came from Palm Canyon, in the mountains on the northwestern border of the Coachella Valley near Palm Springs, Calif. The beetle also occurs in Murray, Andreas, and Taquitz Canyons, which are in reality branches from the Palm Canyon wash, and in Chino Canyon farther to the north. It is said to occur at Seven Palms, on the eastern edge of the valley, northeast of Palm Springs. It has been taken by the writer at Thousand Palm Canyon, almost due east of Palm Springs, and it was taken by W. Benedict in the hills northeast of Indio, approximately 5 miles south and 17 miles east of Palm Springs, on the eastern border of the valley. It is said also to occur in the canyons opening into the Borego Valley, some 40 miles south of Palm Springs. Hubbard (6) spoke of its presence in Lower

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1 Reference is made by number to the list of references cited.
California, but this seems to have been surmise only, one that was justified by the recent finding of the beetle by Michelbacher and Ross (8). There are no geographical barriers of importance and, according to Goldman (4, p. 316, pls. 106, 107), there are three species of Washingtonia palm indigenous to Lower California, as well as one or two closely related species any or all of which might serve as hosts for the beetle. In looking through the literature one gains the impression that this once extremely uncommon insect is becoming more abundant. In Palm Canyon, for example, Hubbard (6) in 1897 experienced great difficulty in finding a properly infested trunk. He apparently did not observe any exit holes in the living trees, and, writing on March 13, 1897, says "I am sure now that they [the beetles] do not oviposit in bare trunks or in healthy trees, although it is possible that the beetles kill the tree in which they oviposit.

In 1917, however, Garnett (3) notes that "A great many of the standing trees have exit holes visible in them, but usually only two or three per tree, most of them situated within ten or twelve feet of the ground, although a few were noted near the tree crown."

In May of 1928 young palms were not uncommon in the canyon, and these all appeared to be healthy, but almost all the older trees showed exit holes in the 10 or 12 feet below the crown, some of them seeming to be pretty well riddled, although still alive.

From 1917 to 1930 the beetle assumed the proportions of a minor pest in the village of Palm Springs. A number of large palms have been transplanted into the village and these were, of course, somewhat weakened in the process. In 1917 Wymore (9) wrote that 90 per cent of these trees had been injured by the attacks of the beetles, and that some of them had died. These trees have been attacked every year since that time. I have myself seen the results of the attacks of the beetles upon these trees, and have heard several accounts of attempted control. The most popular method of control employed about 1928, was to climb up to the bud with a ladder, clear the frass from the burrow with a wire, and pour in water. The beetle soon backed out and was killed by pulling off its head and thorax. The last-mentioned procedure is almost as painful to coleopterists who hear of it as it was to the beetles. It seems probable that the eggs may be laid in the burrows in the bud as well as under the fibers of the leaf bases as described by Hubbard, since in most of the fallen logs that have been seen by the writer the portion near the crown was reduced to coarse powder while the part farther down remained fairly solid. There is good authority for the fact that the beetle has attacked the date palms in the Coachella Valley. In any case, as remarked by Campbell (7), "Hubbard's fears that the insect was about to become extinct are quite
unsounded.” In fact, it appears that there is far more danger of the host becoming extinct, at any rate in the vicinity of Palm Springs, especially since most of the fruiting palms are subject to the attack of a moth that bores into the fruit stems, cutting down the production of seed.

On May 13, 1928, in company with Mr. O. Petty of Fullerton, Calif., I made a trip to Palm Canyon. A fallen infested log was located without difficulty, and a number of living larvae and pupae and eight living adults were secured. This log was reduced almost to powder by the boring of the larvae, and about 6 feet of the top part could be pulled apart without difficulty with the hands. The larvae and pupae were placed in holes in fragments of the log and brought away. Adults developed and emerged later from all the pupae, and some of the larvae succeeded in pupating. Although we did not know it at the time, the officials in charge of the Indian reservation have forbidden collecting of any sort within the reservation in which Palm Canyon and the adjacent canyons are located. For this reason the next trip was made on June 2, 1928, to Thousand Palm Canyon, on the eastern side of the Coachella Valley and almost due east of Palm Springs. We arrived in the canyon about 5 P. M., located a fallen trunk that showed fresh emergence holes, and then made camp. From my field notebook I take the following: “1000-Palm Canyon, VI/2-3/28. This canyon is very different from Palm Canyon, being much more open. Very little water in it. There are very few young palms in this canyon at present, and some of these have been attacked. A few may be seen at the upper end of the wash. I saw few of the older palms that were not attacked by Dinapate near the tops, and some are dying. There are many dead palms, some not very old. The palms here have not been ‘fired’ as much as those in Palm Canyon, but some are badly burned.” As is usual in this place, the wind was blowing so hard that it was impossible to sleep, so we attacked the log by the light of gasoline lanterns. A number of living larvae and pupae and about 30 adults were taken by 1:30 A. M., by which time we had worked into the basal part of the trunk, which was too tough and fibrous to be split with the axes and wooden wedges. A short search by lantern light discovered another trunk. This one was thoroughly dried out and was easily taken apart, the interior for 15 feet below the crown being for the most part nothing but a mass of frass. Three adults were taken from this log. The logs lying in the sun all day heat up even to the center, and the frass and tough fiber apparently act as insulating material to hold the heat. Even in the very early morning, when it had become unpleasantly cool, the interior of the logs was warm to the touch. The larvae taken were all large with one exception, which
was about half the size of the rest. The pupae and larvae were packed carefully in boxes with frass about them. One pupa transformed about 6 A.M. After daybreak an examination of the first log showed that several adults had emerged from the basal part between 1.30 and 6 A.M. The beetles are fully hardened and colored upon emergence, and apparently take flight almost at once. On a later trip (August 4), a number of additional holes were seen in this log.

The larvae, pupae, and several newly transformed, uncolored adults were kept under observation for some time. As many as possible of the larvae were placed in burrows in fragments of palm log brought back from the canyon. A section of palm log about 2 feet in length was obtained, 3/4 inch holes bored in it, and the remaining larvae introduced. Most of these soon burrowed in out of sight, and could be heard at work within the log for some weeks, but all eventually died. Most of the pupae were able to complete development and a number of the larvae succeeded in pupating, but none of these finally transformed into adults.

The eggs of Dinapate have never been described. In such females as were chopped into in opening the logs and in a couple of injured ones that have since been dissected there were no eggs in the ovaries. It is probable that the females live free, feed for a time, and perhaps copulate before development of eggs takes place.

Little is known of the early larval stages of Dinapate. The mature larva was described by Horn, and Comstock gives figures of it and the pupa in his paper. When the larger larvae are healthy they are quite active. When chopped out of the trunk of the palm they wriggle about, and attempt to bite when picked up. When fully grown and preparing to pupate the larva is white, having voided the contents of the intestine. It rests in the pupal cell, becomes soft and flaccid, and finally is nearly inactive, moving with difficulty. The body becomes shorter and greater in diameter, and rather shapeless. All the larvae under observation went through the final stages of pupation late at night, and were not seen at this time.

The pupa, when first formed, is semiopaque, white, the sides of the abdomen slightly darker. After a few hours the eyes turn darker, and finally become nearly black. After about 6 days, the tibial spines, tarsal claws, and mandibles turn darker at the tips, and the darkening progresses from apex to base as the pupa grows older. Just before emergence the eyes and mandibles are black, the antennae light brown, the center of the meso- and metathoracic segments and the tip of the abdomen light brown, the apical third of the elytra along the suture light yellow brown, the tibial spines and tarsal claws dark brown, and the tibio-femoral joints brown. The remainder of the pupa is a light
golden yellow. The pupae are fairly active, wriggling when disturbed. At emergence the pupal skin splits along the dorsal midline and is slipped back off the body. The pupal stage is probably rather short—from 4 weeks or less to 6 weeks under normal conditions. One pupa collected in Thousand Palm Canyon was apparently newly formed, having but slight traces of color. This one finished pupation on June 13, 10 days later.

The newly emerged adult is rather light in color. The eyes and mandibles are black, the head light brown in front of and between the eyes and light yellow back of the eyes. The thorax is dark brown, the elytra light creamy yellow with a faint brownish tinge on the humeri and along the apical fifth of the suture. The abdomen is yellow, brownish at the sides and apices of the segments. The tibiae and femora are edged with brown, the tibial spines dark brown. The wings are not folded for the first few days, and protrude from beneath the elytra. After about 24 hours the elytra have turned brown, and the insect becomes gradually darker until, in from 1 to 4 weeks, it is fully hardened, and dark mahogany brown, nearly black. One specimen was fully colored in 3 weeks, but still rather soft. Another was fully hardened in about a month, but never attained the dark, rich color of the others. For the first week after emergence from the pupa the beetles are quiet, but after that they become quite active, working upon the exit hole, especially at night. The snap of their mandibles is distinctly audible for 10 or 12 feet.

Our experience with the adult beetles was about the same as that of Martin (7), who says “They at once begin trying to fly and spend their strength against the wire netting of the cage, the sexes paying no attention to each other, from which I surmise that they seek mates from some other brood. When daylight comes they try to hide, putting their head into any dark corner, where they remain all day without motion.” Several adults were kept alive in a box with fragments of palm log. During the day they put their heads into some corner, or beneath something, and remained quiet. If disturbed they wriggled from side to side with a rolling motion. If disturbed further, they would back rapidly for several inches and immediately return to their original positions. At night they became active, walking about and attempting to chew their way out of the box. Two specimens succeeded in doing so, starting in the corners where their mandibles could get a purchase. As there were only four corners in the lower, darker part of the box there was some competition, resulting in the loss of one or more legs by three specimens. The beetles attack one another at times seemingly without reason and regardless of sex. Their strong mandibles are capable of snipping off the leg of another beetle with very little effort. Sometimes the beetles would attempt to bite when picked up. Most of them
were helpless when turned upon their backs. Only one was observed to attempt to right itself by opening the elytra, and even this one had a great deal of difficulty. No attempt at feeding was observed, but it is possible that had proper food been available they would have eaten it. When placed upon a palm log the beetles paid not the slightest attention to one another but roamed aimlessly about, snapping the mandibles, until they found a hole or depression, into which they would crawl head first and remain quiet. The clicking of the mandibles seems to be produced by placing the points together under tension and suddenly releasing one side, when the other side flies to its closed position with a click that can be heard for 15 feet or more. Immature beetles in pupal cells that had been opened down one side for observation have been observed to make this sound. What its function may be other than a manifestation of the habitual "ill temper" of the insect is not known.

**Literature Cited.**

(1) Campbell, Roy E.

(2) Comstock, John A.

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1918. Notes on *Dinapate wrightii* Horn (Col.). Ent. News 29 (2) : 41–44, pl. II.

(4) Goldman, Edward A.

(5) Horn, George H.

(6) Hubbard, H. G.

(7) Martin, J. O.

(8) Michelbacher, A. E., and Edward Ross.

(9) Wymore, F. H.
1928. On *Dinapate wrightii* Horn. Pan-Pacific Ent. 4(3) : 143.
MINUTES OF THE 510TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

The 510th meeting of the Society was held at 8 p. m., Thursday, May 2, 1940, in Room 43 of the National Museum. President Muesebeck presided, and 38 members and 14 visitors were present. The minutes of the April meeting were approved as read.

The following new members were elected:
Lee H. Townsend, University of Kentucky, Lexington, Ky.
W. V. Balduf, University of Illinois, Urbana, Ill.
J. M. Singleton, Bureau of Entomology and Plant Quarantine, Washington, D. C.
George W. Barber, Bureau of Entomology and Plant Quarantine, New Haven, Conn.
S. M. Dohanian, P. O. Box 346, Eugene, Ore.

The President announced the appointment of Harold Morrison to represent the Society at the meetings of the Eighth American Scientific Congress to be held in Washington May 10-21, 1940.

C. A. Weigel suggested a picnic to be held in June together with the Insecticide Society of Washington. There was discussion by Cushman and the joint picnic was approved.

F. C. Bishopp commented on the health of the Society’s Honorary President, L. O. Howard.

P. W. Oman commented upon the recent transference to the National Museum of the E. D. Ball Collection of Homoptera. Comprising some 70,000 specimens, largely North American representatives of the families Cercopidae, Membracidae, Cicadellidae, and Fulgoridae, the collection is of particular importance in taxonomic studies on these groups because of the large amount of type material included and the valuable biological information associated with many of the specimens. It is estimated that the collection contains representatives of 2,300 species, of which probably one-half are represented by either types or paratypes. The number of holotypes in the collection is approximately 650. (Author’s abstract.)

L. A. Hetrick briefly discussed the habits of a sawfly which he had observed attacking Loblolly Pine, and exhibited specimens which were to be deposited at the National Museum.

The following talks comprised the regular program:


   Mr. Pratt showed a large number of fine illustrations of small aquatic animals ordinarily encountered in water from ponds and other natural sources. These animals included hydras, crustaceans, worms, and many insects. Photographic methods were also discussed. (Secretary’s abstract.)

2. Malaria and anopheline mosquitoes in Panama. L. E. Rozeboom, Johns Hopkins University.
Dr. Rozeboom gave an illustrated discussion of his experiences while in Panama several years ago. His work at that time with the Gorgas Memorial Laboratory gave him first-hand contacts with many public health problems, especially among the native people. The habits and importance of various mosquitoes were discussed. Among the interesting illustrations were figures of the eggs of several species of Anopheles. These eggs have in recent years become of increasing importance in identification work. (Secretary’s abstract.)

A visitor, A. O. Foster of the Bureau of Animal Industry, was presented to the Society by F. C. Bishopp.

Adjournment at 9.45 p. m.

Ashley B. Gurney,
Recording Secretary.

Actual date of publication, June 28, 1940.
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Corresponding Secretary,

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*Washington, D. C.*
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PROCEEDINGS
OF THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Published Monthly Except July, August and September

BY THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON, D. C.

Entered as second-class matter March 10, 1919, at the Post Office at Washington, D. C., under Act of August 24, 1912.

Accepted for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized July 3, 1918.
THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

Organized March 12, 1884.

The regular meetings of the Society are held in the National Museum on the first Thursday of each month, from October to June, inclusive, at 8 p.m.

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Published monthly, except July, August and September, by the Society at Washington, D. C. Terms of subscription: Domestic, $4.00 per annum; foreign, $4.25 per annum; recent single numbers, 50 cents, foreign postage extra. All subscriptions are payable in advance. Remittances should be made payable to the Entomological Society of Washington.

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THE IDENTITY OF THE ANT CAMPONOTUS (MYRMENTOMA) CARYAE (FITCH).

By Marion R. Smith,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

In 1854 Asa Fitch, then State Entomologist of New York, described all three castes of a new North American ant under the name Formica caryae (Trans. N. Y. State Agr. Soc. 14: 855–859). His descriptions of the various castes are too brief to permit the species to be easily recognized, although his notes on the nesting sites and habits are of some assistance. Fitch cited no type locality but simply stated that he had encountered the ants under loose scales of hickory trees while searching for insects or while preparing these trees for fuel. In his general account he further remarked, "Hickory and walnut trees whilst growing are also a favorable resort for these insects and we have one American species which appears to be a constant resident upon them." It is unfortunate that he refers to caryae as living on walnut trees, and it is even more unfortunate that he went so far as to apply the common name, "the walnut ant," to this species, for his unpublished notes in regard to his cotypes record specifically that he found the ants in burrows in bitter walnut firewood and hickory, and also under the shaggy bark of hickory. Sudworth’s "Check List of Forest Trees of the United States" (page 52, 1927) states that the name bitter walnut is applied to Hicoria cordiformis (Wangenheim). Undoubtedly, Fitch in using the term "walnut" referred to some form of hickory of the loose-bark type.

Seventeen cotypes of Camponotus (Myrmentoma) caryae (Fitch) are in the United States National Museum. These consist of 8 workers, 2 females, and 7 males, although some of the specimens are represented only by fragments. Each pin bears a square paper label with a single or a double red line and Fitch’s handwritten number but no other data.

Through the kindness of Dr. R. D. Glasgow, State Entomologist of New York, and his assistant, Mr. K. F. Chamberlain, I was able to secure data pertaining to the original cotype series of caryae which was composed of 61 specimens, all from Salem, Washington County, N. Y. Twenty-seven, bearing
Fitch numbers 5039–5065 inclusive, were taken January 29, 1855, “in burrows in bitter walnut firewood” or “in the house in cavities in bitter walnut wood”; 29 specimens, with Fitch numbers 5249–5277 inclusive, April 2, 1855, “in burrows in bitter walnut firewood” or “in burrows in a hickory limb”; and 5 specimens, with Fitch numbers 8135–8139 inclusive, February 4, 1851, “under shaggy bark of hickory trees in orchard.”

The ants of the subgenus *Myrmentoma* form small colonies of only a few hundred individuals in living or dead wood or in insect galls. The timid workers live largely on honeydew, which they lap from the surface of plants. Some of the forms are crepuscular. Others, such as *rasilis* Wheeler, *decipiens* Emery, and *nearcticus* Emery, have been recorded as infesting either beehives or houses, where they show a predilection for sweets.

*Camponotus* (*Myrmentoma*) *caryae* is of more than usual interest in that it is the first of 21 North American forms of the subgenus to have been described. A great deal of confusion has existed in the literature in regard to these. At various times they have been referred to *marginatus* (Latre.) or *fallax* (Nyl.) and more recently to *caryae* (Fitch). Emery, Buckley, and Wheeler, who described all the forms except one, overlooked Fitch’s *caryae* until 1917, when Wheeler (Psyche 24: 26–29), who had examined Fitch’s cotypes in the United States National Museum, declared the ant described by Emery as *Camponotus marginatus* var. *nearcticus* (Zool. Jahrb. Syst. 7: 675, 1893) to be synonymous with *caryae*. He also stated that all the North American forms closely allied to *caryae* should be removed from their previous assignments to *fallax* (Nyl.) and be associated with *caryae* as subspecies or varieties. His studies and suggestions have been commonly accepted. Recently I had an opportunity to compare cotypes of *caryae* with cotypes of *nearcticus* (loaned me through the kindness of Dr. Carlo Menozzi); and I found that, although these two forms are very similar structurally, they are not identical. The worker and female of *caryae* have numerous elongate, piligerous foveolae on their cheeks, clypeus, and mandibles; these parts consequently have an opaque, rough, bristly appearance. Such sculpturing and pilosity are not exhibited by the worker and female of *nearcticus*, although each of these has a few long, erect hairs on the clypeus.

The form which should have been synonymized with *caryae* is that described by Emery as *Camponotus marginatus discolor* var. *cnemidatus* (Zool. Jahrb. Syst. 7: 678, 1893). I have been able to compare worker cotypes of *cnemidatus* (also loaned me by Dr. Menozzi) with worker cotypes of *caryae* and have not been able to find any difference of significance; I am therefore synonymizing *cnemidatus* under *caryae*. The cotypes of *cnemidatus* were collected at Washington, D. C., by Theodore
Pergande. No remarks were made as to the nesting sites and habits of this species.

I agree with Wheeler's association of all the eastern forms of Camponotus (Myrmentoma) with caryae but am inclined to think that some, at least, of the western forms are distinct.

The wide distribution of the ants of this subgenus, their abundance in certain regions, the economic importance of certain species, and their morphological variation have led me to attempt to revise the entire complex. It is hoped that this work can be completed in the near future.

**Camponotus (Myrmentoma) caryae** (Fitch).


*Camponotus (Camponotus) caryae* (Fitch), Wheeler, part, Psyche 24: 27, 1917.


*Camponotus (Myrmentoma) caryae* (Fitch), Emery, Gen. Insect., Fasc. 183: 117, 1925.


*Worker media.* Length 6.07-6.09 mm. (figs. 1, 2).

Head distinctly narrower anteriorly than posteriorly; including mandibles, slightly longer than broad, with feebly convex or straight posterior border, rounded occipital angles, and moderately convex sides. Mandible small, 5-toothed. Clypeus feebly carinate except toward anterior border, where there is also a small, but distinct, median emargination. Frontal area triangular, broader than long, but poorly defined. Eye oblong, weakly convex, approximately twice its greatest diameter from base of mandible. Antennal scape extending approximately one-third its length beyond posterior border of head; all segments of funiculus clearly longer than broad, the last segment approximately the combined length of the two preceding segments. Thorax short, not robust; dorsum in profile forming a low arch; thorax from above widest near middle of pronotum, gradually narrowing toward the laterally compressed epinotum, where the thorax is narrowest of all. Petiole convex in front, flattened or very feebly convex behind, with rather sharp superior border; petiole from behind highly arched. Gaster with 5 visible dorsal segments.

Shagreening on gaster fine, that on the thorax less so, and that on the head coarsest of all. In addition to shagreening of head, the mandibles, clypeus, and cheeks bear rather numerous, foveolate, piligerous punctures, which give the head in this region an opaque, coarse, bristly appearance.
Pubescence grayish, extremely fine, not obscuring the ground surface, most distinct on gaster and appendages, especially the appendages, where it is longer, coarser, appended. Pilosity sparse, present on lower and dorsal surfaces of head; a transverse row of hairs on epinotum where base and declivity meet, a row on upper border of petiole, and two rows on each gastric segment, one row slightly anterior to middle, the other at the posterior edge; short, erect hairs at tips of antennal scapes, femora, and tibiae, and several hairs each on mesonotum, coxae, trochanters and lower surfaces of femora and gaster.

Brownish black to black, with the mandibles, clypeus, anterior border of cheeks, and appendages lighter. Funiculi, tarsi, and articulations of legs paler than rest of appendages. Posterior border of each gastric segment pale.

Redescribed from 4 worker cotypes bearing the Fitch numbers 5052, 5059, 5272, and 5275.

*Worker minor.* Length 5.3—5.6 mm.

Smaller and more slender than the worker media. Also differing from it in the following respects: Head narrower in proportion to its length; clypeal emargination feeble; mandibles, clypeus, and cheeks with sparser and more finely foveolate, piligerous punctures, thus causing the anterior border of the head to appear more shiny and less bristly.

Redescribed from 2 worker cotypes bearing the Fitch numbers 5064 and 5277.

*Female.* Length (head and thorax only) 5.4 mm.

Excluding the usual morphological differences between castes, the female differs from the intermediate worker as follows: Sides of head less convex, and more convergent anteriorly; clypeus more convex, and lacking the median carina; pit on each side of clypeus deeper; frontal furrow more distinct. Wings pale but not clearly transparent, of the usual formicine type (that is, with a cubital and a radial but no discoidal cell); veins very light brown or yellowish. Pilosity and pubescence similar to those of worker except for more hairs on the mesonotum. Hairs present on scutellum.

Redescribed from 1 female cotype bearing the Fitch number 5266.

*Male.* Length 6.3—6.5 mm.

Posterior border of head broadly and rather evenly rounded, cheeks straight, subparallel. Eye oblong, convex, less than its greatest diameter from base of mandible. Frontal carinæ divergent for approximately half their length, then subparallel throughout the posterior half. Frontal area poorly defined. Frontal furrow weak, extending at least through length of frontal carinæ. Clypeus convex, feebly carinate or ecarinate, and without distinct median emargination at its anterior border. Antennal scape approximately as long as first 7 or 8 funicular segments. Mandible elongate, triangular, toothless except for 3 more or less sharp apical points. As viewed from above, mesonotum almost entirely obscuring pronotum; mesonotum widest at point of insertion of front wings, without notaulices (Mayrian furrows) but with parapsidal sutures. Wings similar to those of female. Petiole low, wedge shaped, with excised superior border. Gaster with 6 visible dorsal segments. Stipes longer than broad.

Head, thorax, petiole and gaster rather finely shagreened and shining. Clypeus and cheeks with sparse but coarse piligerous punctures. Mandible lacking the coarse striation and punctulation of worker and female.

Pubescence not materially different from that of worker. Pilosity similar,
except that the erect hairs on mesonotum are more numerous, and in addition, there are hairs on the scutellum.

Shining black; mandibles, funiculi, tarsi, and articulations of the appendages lighter. Gaster with pale posterior border to each segment.

Redescribed from 5 co-types bearing Fitch numbers 5251, 5262, 5263, 5264, and 5965.

Type locality.—Salem, Washington County, New York.

Host.—Hicoria cordiformis (Wangenheim) and probably other species of Hicoria.

Fitch gives the following lengths for the various castes of this ant: Worker, 5 to 8 mm.; female, almost 12.5 mm. to tip of wings; and male (wings not included), 7.5 mm.

Although this ant resembles nearcticus in size, form, and color, it is clearly distinguished from that species by the nature of the pilosity and sculpturing on the anterior part of the head.
NOTES ON Aedes nigromaculis (Ludlow), A. increpitus Dyar and Culex territans Walker in California (Diptera, Culicidae).

By Thomas H. G. Aitken,
University of California.

Aedes nigromaculis (Ludlow).

Aedes nigromaculis apparently has a much wider distribution in California than was previously suspected. In January of 1939 the writer reported for the first time the presence in this State of Aedes flavescens (Müller) and nigromaculis (Warm Springs, Fall River Valley, Shasta County, June 20, 1937). It was suggested at that time that these species would probably be found in Lassen and Modoc counties, as they occur in the irrigated arid regions of eastern Oregon.

Confirmation of the presence of A. nigromaculis in California has been established during the past summer (1939) by its discovery in a number of localities throughout the great interior valley. On May 11, five perfectly preserved female mosquitoes were captured at Lemon Cove, Tulare County, as they attempted to bite in the bright sunshine (3.00 p. m.). On May 25, the writer collected fifteen extremely large larvae in a roadside irrigation overflow about nine miles west of Modesto, Stanislaus County, on State Highway No. 132, near the San Joaquin River; associated with these were larvae of Aedes dorsalis (Meig.). Because of their large size and sluggish movements these larvae were at first thought to belong to the genus Theobaldia. Microscopic examination showed them to be nigromaculis; this preliminary identification was confirmed following the emergence of males and females. The descriptions of the adults (both sexes) by Dyar (1928) and Matheson (1929) agree well with the specimens at hand. There appears, however, to be some variation in the larvae. These writers state that the anteantennal tuft is in three; this condition was found in only one instance; there were more than three hairs to the tuft, usually four or five. The pecten of the air tube is stated to have the three last teeth stouter and widely detached, followed near the tip of the tube by a minute tuft; the writer found that the number of large teeth removed from the remainder of the pecten varied from two to six; furthermore the hair tuft was occasionally opposite (even with) the last tooth. The pecten teeth averaged 19 in number. The comb scales of the eighth segment were found to vary in number from 4-14; in one specimen the right and left patches were composed of four and eight scales respectively. The upper and lower head hairs are considered to be single; in four instances the upper head hairs on one side were two-branched (that is,
the hair came out singly and branched into two long hairs near the base), and in another instance one lower head hair branched. The lateral abdominal hair tufts one to five were in most cases in two's, occasionally in three's; these hairs on segment six were single.

As the summer progressed, additional localities were discovered. The following list indicates the known distribution of *Aedes nigromacululis* in California to date (see map):¹

¹During the past season (1940) this mosquito was encountered in large numbers in numerous new localities in the central valleys; it was particularly abundant in eastern Shasta and in Modoc counties.
10. Santa Rosa Indian Reservation, Kings Co., Sept. 29, 1939, S. Dommes.

In California the adults of this species are liable to be confused with *Aedes taeniorhynchus* (Wied.), *A. squamiger* (Coq.) and *A. dorsalis*. Whereas *taeniorhynchus* and *nigromaculis* both have a distinctly banded proboscis and basal tarsal bands, the former does not have the dorsal longitudinal pale abdominal stripe of the latter. The fact that *taeniorhynchus* is restricted to the southern Californian salt marsh (in this State) decreases the possibility of confusion. The wing scales of *squamiger* are broad and inflated in appearance. *Aedes dorsalis* superficially has the mesonotal and abdominal markings of *nigromaculis*, but the tarsi are banded both apically and basally, and only rarely does the proboscis take on the appearance of being ringed. The median mesonotal band of *nigromaculis* is much more clear cut and darker in color than that of *dorsalis*. Collections of *dorsalis* should always be carefully examined in the laboratory, as cursory examinations in the field show that the two species are remarkably similar. The large and very white basal tarsal bands of *nigromaculis*, however, are in great contrast to the smaller, yellow-appearing basal and apical bands of *dorsalis*.

Freeborn's (1926) key to larvae of the Californian *Aedes* separates four species having a pecten with detached teeth, *cataphylla* Dyar, *ventrovittis* Dyar, *vexans* (Meig.) and *cinereus hemiteleus* Dyar. In this key only the last two mentioned species are liable to be confused with *nigromaculis*; the latter may be distinguished by having the anal saddle completely ringing the segment and the upper and lower head hairs usually single.

*Aedes nigromaculis* and *dorsalis* have been shown by several workers (Madsen et al., 1935, 1936; Herms, 1939) to transmit the virus of equine encephalomyelitis in the laboratory. The occurrence of both of these species in the San Joaquin Valley is

---

2At the time of the Stockton collection, a large flight of *nigromaculis* was observed.

3In many of the specimens from Marysville the proboscis ring is very pale or non-existant.
significant inasmuch as during the past year there have been several human cases reported from this area (Howitt, 1939).

The writer has gone through the University's extensive mosquito collection (which contains many *dorsalis*) built up by Professors Herms and Freeborn during the early years of the California mosquito survey without finding a single specimen of *nigromaculis*, which suggests that this species may have been relatively recently introduced into the State. If this be true, it will be interesting to observe the rate of its spread and its effect on the *dorsalis* population which occupies the same habitat.

**Aedes increpitus** Dyar.

Until recently the supposed range of this species in California has been the northern coastal mountains and the valleys and lower levels of the Sierra Nevada, where it has been collected somewhat extensively in the Yosemite and Lake Tahoe regions; Freeborn (1926) cites Pacific Grove, Monterey County, as the southernmost coastal record (I. McCracken, July 2, 1903). Further substantiation of its presence in the northern coast range is the collection of one female specimen from the Bohemian Grove, Sonoma County, May 29, 1939 (H. F. Gray). Through the efforts of Mr. R. W. Burgess this species is now known to occur in coastal southern California. *Aedes increpitus* was discovered March 13, 1939, just south of Long Beach, Los Angeles County; the larvae of this species, along with those of *A. squamiger* (Coq.) and *Theobaldia inornata* (Will.), *inreputis* in the minority, were found breeding in a deep, open, salt marsh pool apparently containing fresh, clear seepage water; *Salicornia* and other low vegetation surrounded the pool. Burgess was of the opinion that the associated area was subject to the influence of high tides.

**Culex territans** Walker.¹

Larvae of *Culex territans* were unknowingly collected by the writer (and preserved in alcohol) May 11, 1939, at Bridge Inn, Tulare County, from shady side pools of the Kaweah River; Bridge Inn is situated on the river where it leaves the Sierran foothills. A second trip was made to the above locality with the hope of finding additional material. Three or four specimens of *territans* were separated from a large collection of

¹ Recently, larvae of *C. territans* were collected by W. C. Reeves, at Riverside, Riverside Co., May 30, 1940; also San Luis Obispo, San Luis Obispo Co., July 31, 1940, Aitken, Reeves & Dommes.
Culex stigmatosoma Dyar and C. tarsalis Coq.

larvae brought back to the laboratory; one of these matured into an adult female. The writer was surprised to discover that the tarsal bands were quite distinct, the scales being white; these rings are ordinarily brown. The knees are white scaled, as are the apical and basal tarsal rings; these are most pronounced on the hind tarsi, the terminal joints of which are almost entirely pale scaled. The tarsal bands of the pro- and meso-thoracic legs tend toward brownish.

The larvae agree fairly well with the descriptions of this species. The upper and lower head hairs and anteanternal tuft multiple (feathered); a pair of hairs in front of and between upper head hairs. Antennal tuft multiple (feathered) and distad of the middle of the antenna, which is slightly narrowed at this point. Lateral abdominal hair tufts appear to be double on segments one to five and single on six; there is probably some variation here as the hairs are missing in certain cases, caused by abrasion. Matheson (1929) states that the lateral abdominal tufts are double on segments one and two and single on three to six. Air tube proportions 1 x 6, pecten on basal third of about 15 teeth; distad to pecten arise three single long hairs staggered outwardly, followed by a tuft of two to three hairs. Anal segment longer than broad, the saddle completely ringing the segment, a single lateral apical hair; dorsal brush of three long hairs on each side, the anterior two having a common origin; Matheson states there are two hairs on each side. Anal gills as long or longer than anal segment. Comb scales of eighth abdominal segment in a triangular patch, each scale spatulate and with a terminal row of equal, deep dentations.

Culex territans.—Ranges along the Atlantic seaboard, through the Mississippi Valley and into southern Canada. Mail (1934) reports it from Laurel, Montana (east of the Continental Divide). Until now, a unique captured by Dyar (1922) has been the sole record from the Pacific Slope (Little Truckee River, Calif., near the Nevada line, May, 1921). It is unfortunate that no males are to be had at this time from the new Tulare County locality. Although there appears to be certain discrepancies between the Californian and eastern forms, the writer feels that under the present circumstances it is better to report these specimens as territans.

Selected References.

Aitken, T. H. G.


Dyar, H. G.


DESCRIPTIONS OF NEW NORTH AMERICAN PLECOPTERA:¹

By John F. Hanson,
Amherst, Massachusetts.

The following two species are described from material loaned to me by Dr. C. P. Alexander of the Massachusetts State College, Mr. Nathan Banks of the Museum of Comparative Zoology at Harvard University, Mr. P. P. Babiy of Cornell University, and Dr. Ashley B. Gurney of the Bureau of Entomology and Plant Quarantine, to all of whom I am deeply grateful for making this work possible. Both species belong to the genus Dictyopterygella, known to be present on this continent only since 1937, with the description of D. knowltoni Frison.

Dictyopterygella washingtoniana, sp. nov.
Figs. 1, 2, 3, 7.

Male.—General color brown, abdomen and pterothorax darkest. Length of body 14 mm.; wings extending to apex of abdomen. Head with two distinctly separate yellow spots. Pronotum with median yellow stripe. Spinulae present on ninth and tenth tergites. Subanal lobes greatly produced into boot-shaped structures.

Head with a yellow area within the ocellar triangle and another slightly larger

¹ Contribution from the Department on Entomology, Massachusetts State College, Amherst, Massachusetts.
and distinctly separate one in the occipital region. Lateral ocelli slightly farther from each other than from median ocellus or from compound eyes. Antennae dark brown, slightly lighter at base, about 45-segmented.

Thorax brown except for a median longitudinal yellow stripe of uniform width on the pronotum. Pronotum narrower than head, transverse and rectangular or slightly narrowed posteriorly, with a variable pattern of prominent embossings at the sides of the median stripe. Legs uniformly brown. Wing membrane clear, veins brown. Wings not brachypterous, venation (fig. 1) very similar to that of *Isogena*. In fore wing cubito-anal crossvein situated at about its own length beyond the apex of the anal cell, tips of branches of radial sector turned cephalad.

Abdomen uniformly dark brown to black. Subanal lobes remarkably produced rearward and approximated closely along the mesal line, in lateral view (fig. 7) somewhat boot-shaped, being turned upward at the tip; hairy. Tergites nine and ten bearing blunt spinulae. Posterior margin of tenth tergite evenly rounded, not cleft. Ninth sternite very slightly produced over tenth sternite. Cerci light brown, 20- to 25-segmented.

*Female.*—Similar to male in color and general morphological details. Longer than male; body length 18 mm. No spinulae on abdominal tergites. Subgenital plate very broad, evenly rounded or truncate at apex, and produced almost to apex of ninth abdominal sternite.

**Holotype, male.**—Lakes of the Clouds, Mt. Washington, N. H., altitude 5000 feet, June 17, 1936 (*Alexander*); type in Mass. State College Collection. Allotopotype, female.—June 24, 1930 (*Darlington*); type in M. C. Z. Paratopotypes.—7 males (*Alexander*); 2 males, June 23–24, 1930 (*Darlington*); 1 male, no date given (*Emerton*); 2 males, 2 females, July 4, 1907 (from Cornell Collection, collector unknown); 7 males, 32 females, June 30, 1939; 11 males, 24 females, July 1, 1939 (*Marion Smith*); 21 males, 13 females, June 17, 1939 (*D. Arenberg*).

**Dietyopterygella hudsonica**, sp. nov.

Figs. 4, 5, 6.

*Male.*—General coloration dark brown. Length of body 12 mm. A triangular yellow area in ocellar triangle distinct from a transverse yellow area in occipital region of head. Wings brachypterous, anal fan of hind wing relatively large. Spinulae present on ninth and tenth abdominal tergites. Subanal lobes extremely produced rearward, approximated, together subcylindrical.

Head with a yellow triangular area within the ocellar triangle distinctly separated by the postfrontal sutures from a much larger, transverse, yellow area in the occipital region. A distinct yellow spot on the frons at base of each antenna. Lateral ocelli slightly farther from each other than from median ocellus or from compound eyes. Antennae light brown, about 45-segmented.

Thorax brown. Median longitudinal yellow stripe of pronotum widest near its posterior end, lateral embossings not very prominent. Pronotum narrower than head, slightly transverse, narrowed posteriorly. Legs uniformly light
Explanation of Plate.

Fig. 1. *Dictyoptygella washingtoniana*, sp. nov., venation.
Fig. 2. Same, male terminalia, dorsal view.
Fig. 3. Same, male terminalia, ventral view.
Fig. 4. *Dictyoptygella hudsonica*, sp. nov., male venation.
Fig. 5. Same, male terminalia, dorsal view.
Fig. 6. Same, male subanal lobe, lateral view.
Fig. 7. *Dictyoptygella washingtoniana*, sp. nov., subanal lobe, lateral view.
brown. Wings brachypterous; fore wings 8 mm. in length, extending to the second abdominal segment; hind wings 6 mm. in length and extending to the fourth abdominal segment. Venation (fig. 4) abnormal; intercubital crossveins absent except for one in the left hind wing of the holotype, subcosta extends nearly to apex of wing, anal fan of hind wing relatively large. Cubito-anal crossvein of fore wing situated at a distance of about its own length distal of apex of anal cell.

Abdomen uniformly dark brown, cerci light brown. Subanal lobes remarkably produced rearward, approximated, together subcylindrical; glabrous. Tergites nine and ten each bearing an area of spinulae. Posterior margin of tenth tergite evenly rounded. Ninth sternite very slightly produced into a truncate subgenital plate. Cerci light brown, longest cercus of holotype broken off at twentieth segment.

Holotype, male.—Baker Lake, Can., lat. 64° N., long. 95° W, Aug. 10, 1936 (Dutilly); type in U. S. N. M. No. 53247.

Both species described above are easily distinguished from a specimen of D. knowltoni (Centennial, Wyo., about July 1, 1936, Blake), loaned to me by the U. S. National Museum. They differ from it in the absence of lateral protuberances which give to the subanal lobes of D. knowltoni the mushroom appearance, mentioned by Frison. D. hudsonica differs from D. washingtoniana in having brachypterous wings, subcylindrical subanal probes, and a broad transverse yellow area on the occiput; while D. washingtoniana has normal wings, boot-shaped subanal probes, and a small occipital yellow area.

D. hudsonica is apparently very closely related to the European D. septentrioronis Klp. from which, as well as I can judge from the literature, it differs only in the shape of the subanal lobes which are expanded into a knob at the tip in D. septentrioronis but not in D. hudsonica. I have been unable to obtain a specimen of D. septentrioronis for comparison. Since the possibility of a species of North American Plecoptera being identical with a European species is very slight, I am describing the present specimen as new.

TWO NEW SPECIES OF THE GENUS HERMETIA (STRATIO-
MYIIDAE—DIPTERA).

By Charles T. Greene,
Bureau of Entomology and Plant Quarantine.

The larvae of the genus Hermetia are scavengers, feeding mostly in decayed vegetable matter but often breeding in decayed animal matter. So far as known they are not carriers of disease. The larvae have been found in various kinds of decayed fruits and garbage, also in trunks of decaying palm trees, sauerkraut, raw rubber, camp latrines, outdoor toilets,
human cadavers, beehives, and filter-press cakes. There is, furthermore, a record of *Hermetia illucens* (L.) found thriving in stored vinegar containing 6.3 per cent of acetic acid.

The larval skin in *Hermetia* is unusually tough and thick and is unaffected by very strong disinfectants. Crude oil and powdered lye used in some large latrines had very little effect on the larvae.

This paper describes two new species of *Hermetia* from the Canal Zone.

**Hermetia panamensis**, new species.

*Male* (Pl. 15, Fig. 1).—Length 13 mm. Front broad, slightly wider at bases of antennae, general color pale brownish yellow, with outer angles near antennae the dark brown, pile yellow; middle hump bare in the center, brownish; on each side of the front, at about the middle, a large, shining-black, triangular depression; ocellar triangle black; ocelli pale yellow; vertex brownish black, with longer, much darker pile. Sides of face and cheeks dark brown, with dark-yellow pile; central portion of face, in profile, projecting triangularly, the upper surface yellow, bare and narrow, tapering slightly towards the outer end, which is rounded; the sides black, with long black pile; at a certain angle the orbit, along sides of the face, appearing to have a broad white line. Proboscis black laterally, yellow along lower edges, pile brown. Eyes black, with short, white pilosity. First segment of antenna deep reddish brown, about four and one-half times as long as broad, slightly narrower at base; second segment of same color, about as long as broad; third segment about as long as first and second segments combined and composed of six annuli, the two basal ones dark yellowish red, the first annulus half as long as wide and the second nearly as long as wide, the four remaining ones black, each nearly as long as wide; on inner side of third, fourth, and fifth annuli a sagittate silvery area; style long, deep reddish black, with velvety pubescence along both edges, tapering slightly at outer end and rounded at tip, as long as the three antennal segments together. Prothorax black, anterior edge broadly yellow; dorsum of mesothorax black, with numerous, long, black and golden hairs; long golden pile on sides of thorax from humerus to transverse suture and along posterior edge; pleuron with long blackish pile extending from transverse suture to postalar callus; dorsum with a broad median stripe of golden pile extending to the transverse suture, where it broadens to cover the posterior portion of the dorsum, and an equally broad dark stripe on each side extending to the transverse suture; humeri yellowish brown, bare; postalar callus yellowish brown, with golden hairs. Scutellum black, with outer edge reddish, black portion with golden pile and golden hairs, reddish edge with black hairs; postscutellum black, with long golden pile on each side, middle bare. Pleura and sternum black, with numerous, long, black hairs and long golden pile along sutures below base of wing. Haltere with knob and apical half of stem white, basal half of stem black. Legs black, first three segments of anterior and middle tarsi white. Abdomen composed of five segments; first segment black, with lateral edges narrowly yellow, about as long as wide, with dorsum finely striated transversely and with
nearly equal and narrowed considerably towards apex; ventral side of first segment black, transversely striated, hairs long and yellow; second segment brownish black on each side, otherwise yellowish red; segments 3 to 5 reddish, with short yellow hairs.

Hypopygium (fig. 1 a) small, yellowish, red; dorsal plate, and lamella on each side, dark brown; hairs on lamella black, the three apical ones yellow; forceps pale yellow, hairs black; the reddish apical hooks curved inward.

Type locality.—Mandingo, Canal Zone.

Described from one specimen reared from a larva found in the decaying trunk of a coconut palm tree, July 1926, by James Zetek under No. Z-2651.

Type male.—U. S. National Museum No. 54121.

This species differs from all others belonging to this genus in the shape of the abdomen and the thoracic markings.

Larva (Pl. 15, Fig. 2).—Length 16 mm., width 4 mm., slightly flattened. Dark yellowish brown, with entire dorsal and ventral surfaces finely granulose. Eleven segments in addition to the head; the first four segments tapering towards the head; segment 1 about half as long as wide; segment 3 one-third as long as wide; segments 2 and 4 to 9 each about one-fourth as long as wide; segment 10 narrow, about one-fifth as long as wide; segment 11 nearly as long as its basal width and tapering slightly towards caudal end, which is sinuous and slightly concave on the dorsolateral edge as viewed from above. Head heavily sclerotized and about twice as long as its greatest width; central portion raised, pale yellow, pointed at the anterior end and with a faint, narrow groove at posterior end; the head each side of this raised portion yellowish brown; a flattened lobe on each side at the base; an elliptical brownish lobe on each side at the cephalic end; antenna shining black, with three cylindrical segments; the basal one apparently rigid, about half as long as its diameter; second segment about as long as its diameter; third segment conical, slightly longer than its basal diameter. (For arrangement of the reddish-yellow bristles see fig. 3.) First thoracic segment with two elevations on each side, the posterior one a little the larger, somewhat oval in shape and bearing the anterior spiracle near the front end; anterior spiracle small, nearly circular, with two narrow, pale-yellow slits, each located on an elliptical raised lobe; each lobe and the outer ring or peritreme dark brown, the upper slit straight, the lower one bent near the middle. Posterior spiracles largely pale yellow, located inside the upper half of a transverse pocket on the posterior dorsolateral edge of the caudal segment; the two spiracles separated by a distance equal to the width of one spiracle; each spiracle nearly circular, the entire edge with a series of transverse lines resembling the milling on the edge of a coin, central portion or tympanum microscopically wrinkled, with an inverted,
transverse, brownish, wrinkled opening in the middle. Segments 1 and 11 each with one lateral bristle on each side; segment 11 with two bristles on posterior edge; segments 2 to 10 each with two bristles laterally. The bristles are located on the ventral side as follows: Segments 1 to 3 each with a transverse row of four bristles; segments 4 to 10 each with a row of six; segment 11 with three pairs, the two basal pairs close together, the apical pair widely separated, each bristle near the outer edge of the segment. Anal opening located ventrally in middle of basal half of last segment.

Pupa (Pl. 15, Fig. 3).—Pupation takes place within the larval skin without any outward change in appearance. The intersegmental integument becomes rigid. The adult emerges through the opening described below. Near the anterior edge of the second and fourth segments is a transverse rent or splitting; segments 2 to 4 with a longitudinal splitting down the middle of the dorsum connecting the two transverse splits. When the adult is ready to emerge a transverse rent appears near the anterior edge of the second segment dorsally, another near the anterior edge of the fourth segment, and a longitudinal break connecting these two.

**Hermetia cingulatus**, new species.

Female (Fig. 3).—Length 12 mm. Front broad, slightly wider at bases of antennae, where it is pale yellow, with yellow pile; central portion blackish, with blue reflection and black pile; middle hump bare and darker yellow; upper portion of front pale yellow, with long yellow pile; ocellar triangle black; ocelli dark yellow. Face pale yellow below, brownish yellow above; pile long, whitish on lower part of face; a few short black hairs below bases of the antennae; the inner orbits with a broad white line. Cheeks black, with long white pile. Proboscis white, with long yellowish hairs. Eyes bare, brownish black. First segment of antenna black, about three times as long as broad, slightly narrower at base; second segment yellowish brown, slightly wider than long; third segment black, with a brownish reflection, about twice as long as first and second segments together, composed of six annuli, the two basal ones slightly longer than wide; the four apical annuli about as long as wide; a silvery sagittate area on the inner side of the two apical annuli; style black, with velvety pubescence along the edges, long, flattened, rounded on outer end, almost as long as the three antennal segments together. Prothorax pale yellow, blackish at base, with a few pale-yellow hairs; dorsum of mesothorax shining black, with blue reflection; with numerous short black hairs slightly intermixed with golden hairs and with long golden pile around the edges that is longest in front of the transverse suture; humeral callus yellow and bare; postalar callus yellowish, with numerous black hairs; transverse suture brownish, located in a broad depression; scutellum bluish black on basal half, with short black hairs, apical half yellow, with yellow hairs; postscutellum black, with long yellow hairs. Pleura pale gray; sternum black, with long yellow hairs, deeply and broadly depressed anteriorly, the outer ends of this depression, which reaches to the pleural suture, blackish and bare. Halteres yellowish white. Legs pale yellowish white, trochanters slightly brownish. Wing transparent, pale luteous on basal half; outer half nearly opaque, dark brown. Abdomen with first three segments yellowish white above.
and below; last two segments blackish brown above and below; paler in the middle of dorsum; penultimate segment with a narrow, pale-yellowish, vertical line in middle of basal half.

_Type locality._—Barro Colorado Island, Canal Zone.
_Type and paratypes._—U. S. National Museum No. 54122.

Described from four specimens collected by James Zetek. Three specimens, including type, dated June 14, 1939, and recorded under Z. No. 4453; one specimen dated April–May, 1939, under Z. No. 4420.

This species differs from all other known species of _Hermetia_ in color, in the depression in which the transverse suture is located, and in the broad depression on each pleuron.

UNITED STATES RECORDS OF TROPICAL AMERICAN LEPIDOPTERA.

By J. F. Gates Clarke,
_Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture._

During the past several years a few species of Lepidoptera, not hitherto recorded from the United States, have been submitted for identification. It seems desirable to publish records of the following so that they can be added to our North American lists. The newly recorded North American localities should be considered as extensions to the known areas of distribution for the species in question rather than records of their introduction. They can not be classed properly as introduced species.

**Phalaenidae.**

_Eriopyga mulina_ (Schaus).

Mr. S. E. Crumb, of Puyallup, Wash., transmitted two specimens of this species under his numbers 558 and 559. One of these is a female, the first of this sex to come to hand. Both specimens were reared from larvae collected by Mr. Crumb at Superior, Ariz., and found feeding on filaree (_Erodium cicutarium_ (L.)). The moths emerged May 18 and 23, 1938. Mr. Crumb states _in litt._ "... the species of this section of the genus are general feeders on herbs, the decisive factor in the choice of food being the proximity of a layer of fallen leaves or debris in which the larvae may find concealment."

This species was first described by Schaus from Jalapa, Mexico, as _Taeniocampa mulina_ (Trans. Amer. Ent. Soc., vol. 21, p. 237, 1894) and subsequently by Dyar from Zacualpan, Mexico, as _Hyssia pseudochroma_ (Proc. U. S. Nat. Mus., vol. 44, p. 288, 1913). In addition to the two male types there is a male from Guatemala in the U. S. National Museum collection.
Tarachidia heonyx Dyar.

In material sent by Mr. Rollin H. Baker of College Station, Tex., there was one specimen of this species from Brewster County, Tex. This species was described (Proc. U. S. Nat. Mus., vol. 44, p. 297, 1913) from Cerritos, San Luis Potosi, Mexico. In addition to the type there are two other specimens from Mexico in the U. S. National Museum collection.

Geometridae.

Drepanodes epionata Guenee.

In material submitted for identification by Mr. John L. Sperry, of Riverside, Calif., were two males of this species from the United States, the first, I believe, recorded from this country. One specimen was collected at Brownsville, Tex. (23-X-35); the other is from the Baboquivari Mountains, Ariz. (27-IV-38). Both were collected by Grace H. and John L. Sperry.

I have made slides from the Arizona male and from West Indian specimens in the U. S. National Museum collection and have no doubt about their identity.

Papilionidae.

Papilio andraemon bonhotei Sharpe.

Although this species has been reported from the United States previously,¹ the receipt of two specimens on June 4, 1940, seems worth recording at this time.

Through Mr. J. H. Matteson, of Miami, Fla., we received a male and a female collected at Miami, Fla., May 3, 1940, by William Sawyer. Both are in good condition and undoubtedly belong here. Mr. Austin Clark concurs with me in this opinion.

This species does not appear in our recent list of the Lepidoptera of North America, owing, perhaps, to the doubtful nature of Holland’s record, but there seems to be little doubt that the species is established within our boundaries and should be added to our list.

A NEW SPECIES OF LISSONOTA (HYM., ICHNEUMONIDAE).

By R. A. CUSHMAN,

Bureau of Entomology and Plant Quarantine.

The new species described below is published at this time in order that the name may be available for use in an economic paper on the host species.

Lissonota inconstans, new species.

This species shows remarkable variation in color even in a genus notable for specific variation.

Similar to pleuralis (Cresson), from which it is immediately distinguishable in the female by the fact that the inner orbits are never pale throughout nor are the frontal orbits pale; and in the male by the invariably black cheeks and malar space and partly black face; in both sexes, also, the temples are much broader than in pleuralis, in which they are notably narrow and strongly receding.

Female.—Length 6-9 mm., antenna 4-6 mm., ovipositor sheath 4-6 mm.; holotype, length 8 mm., antenna 5.5 mm., ovipositor sheath 5.5 mm.

Head mat, in front view distinctly broader than long; cheeks slightly convex; eyes slightly diverging below; face medially elevated, its width at top slightly greater than length of eye; malar space about three-fourths as long as basal width of mandible; clypeus strongly rounded at apex; temple strongly convex, about two-thirds as long as short diameter of eye; postocellar line twice as long as diameter of an ocellus and nearly twice as long as ocellocular line.

Thorax shining, finely punctate, with pronotum and propodeum mat; notaulices impressed, especially just behind anterior margin; propodeum longer before than behind carina and with rather distinct diverging median carinae; areolet sessile; abscissa little longer than intercubitella and hardly a fifth as long as apical abscissa of radiella; nervellus weakly broken below middle and slightly incisive.

Abdomen mat, with faint scattered punctures basally; first tergite a little longer than broad, with a faint, slightly rugulose transverse impression near apex and with a median longitudinal impression flanked by slightly raised ridges; ovipositor slender, cylindrical.

Black, with thorax partly, apical margins of tergites and the legs largely, red; clypeus apically, mandibles, a dot above each eye, margins of mesoscutum from notaulices to tegulae, humeral angle of pronotum, tegula, costa, and subalar tubercle whitish; lower margins of pronotum and propleura, mesoscutum except a median longitudinal black streak, scutellum, mesopleura and metapleura largely, and mesosternum red; apex of hind tibia, hind tarsus entirely and apical joints of other tarsi blackish; wings hyaline with brown venation; tergites 1-6 progressively more broadly red, others entirely black; venter white, sternites blackish. The red color varies in extent from almost entirely covering the thorax and very broad tergal bands to almost complete absence. In some specimens there is a larger or smaller orbital mark on the face, while others lack both this and the supraorbital spot. The front and middle coxae are sometimes partly straminaceous.

Male.—structurally like female except in the usual sexual differences of longer antennæ, larger eyes and ocelli, shorter malar space, and more slender abdomen. Never so extensively red as the reddest female, frequently not at all red, tergites at most narrowly yellowish apically; clypeus entirely, facial orbits broadly, and two oblique spots in middle of face whitish; lower margins of pronotum and propleura, frequently a streak on lower edge of mesopleuron, and the front and middle coxae and trochanters also whitish. Variation consists in the more or
less frequent lack of the median facial and supraorbital spots, entire lack of red on thorax, and presence or absence of either or both red and white on mesopleuron.

The holotype and allotype are selected from about the mean of the color variation.

Host.—Melissopus latiferreanus (Walsingham).

Type locality.—Santa Barbara, Calif.

Type.—No. 54294, U. S. National Museum.

Paratypes.—California Academy of Sciences; Canadian National Collection.

Forty-eight females (including holotype) and 22 males, all reared by S. M. Dohanian in March and April, 1939 and 1940, from the host in its various food plants, Catalina cherry, acorns, filbert nuts, and walnuts, at various localities in California and Oregon, principally Santa Barbara, Calif., and Polk County, Oregon. Other localities are Albany, Springfield, Woodburn, Eugene and vicinity, Washington County and Benton County, Oregon; and Vallinais, Calif. The principal food plant of the host in California is the Catalina cherry and in Oregon acorns.

BOOK REVIEWS.

The Spider Book, by John Henry Comstock, revised and edited by W. J. Gertsch, Assistant Curator, Department of Entomology, American Museum of Natural History. Large 8 vo., cloth, 729 pp., 771 illus., N. Y., Doubleday Doran Co., 1940, $6.00.

Between spiders and insects there exists a systematic relationship and an economic status sufficiently close that the issuance of a new book on spiders is a matter of considerable interest to the student of insects as well. The original first edition of Comstock's Spider Book treating of North American forms, was published in 1912, and, since it supplied a definite need, it attained great popularity and within a few years became internationally known as the definitive work on spiders. Appearing at a time when arachnology was the property of a few trained systematists, it opened the way to a new appreciation of spiders and their near relatives, since for the first time it brought together in concise form a wealth of information on the structure, habits, and classification of the American arachnids. It also corrected many erroneous impressions about these common animals and emphasized the interest and the keen enjoyment in store for all who study them. The 1912 edition has been out of print for a number of years, and an occasional copy coming to light now and then in the stock of rare book dealers become in the nature of a collector's item and commanded excellent prices.
Its loss has been keenly felt by the younger generation of students throughout the country, who, deprived of this classic source of information, have voiced repeatedly the wish for a reprint. Recognizing the desirability of making this splendid work again available to the public, Dr. W. J. Gertsch, of the American Museum of Natural History in New York, has undertaken this revision. In doing so, his keynote has been conservatism. To alter in any radical way either the form or the limits of the original edition was deemed inadvisable. Also, it was deemed inexpedient to incorporate into the book any controversial matter, debatable nomenclature, or any radical departures from the original standard. Those well-known chapters which treat of the morphology and habits of spiders remain unchanged; although there was much that could have been added to them, it was found that they are still adequate in their original form. Numerous changes, however, have been made in the sections on the classifications of spiders and their relatives, but not with the objective of making the work complete in the sense that every species or even every genus be diagnosed. Such proved to be impracticable, in 1913, and is even less feasible to-day due to the enormous increase in the number of genera and species now known from the geographical area covered by the book. Only those changes have been made which have seemed compatible with the purpose of the book as an introduction to fill the needs of students. It has seemed desirable, likewise, to include accounts of the near relatives of spiders, of other orders of the class Arachnida, since some of these, as the harvestmen, the mites, and the pseudoscorpions are fairly common, while others, as the scorpions and the whipscorpions, abound in warmer areas. In addition to the introductory matter, there are sections of this book treating of spiders and their near relatives, their external and internal anatomy, and their life history. There are included discussions of methods of study, development, food, silk, types and methods of building webs, and nests as well as pairing and motherhood of spiders. Formal technical treatment of the order Araneida covers the superfamilies Avicularioidea or tarantulas, and the Argiopoidea or true spiders, and comprises pages 218 to 708 inclusive. The bibliography contains approximately 180 titles and includes only those books and papers to which reference has been made in the text. The abundance of spiders, the great variations in the habits of the different species, and the high development of instinctive powers of many of them, render spiders excellent examples for study of animal behavior, and this new edition of a well-known work will be a welcome addition to the study-table of all such students. —J. s. w.
MINUTES OF THE 511TH REGULAR MEETING OF THE ENTOLOGICAL SOCIETY OF WASHINGTON.

The 511th meeting of the Society, held Thursday, June 6, 1940, in Room 43 of the National Museum, was called to order at 8 p. m. by Treasurer W. B. Wood. The report of the May meeting was read and accepted. There were 28 members and 18 visitors present.

The following were elected to membership in the Society: P. C. A. Antunes, Servicio Malaria do Nordeste, Caixa Postal 354, Fortaleza, Ceara, Brasil. Herbert Spencer, P. O. Box 112, Ft. Pierce, Florida. T. H. G. Aitken, Division of Entomology, College of Agriculture, University of California, Berkeley, California. J. F. Hanson, Fernald Hall, Massachusetts State College, Amherst, Massachusetts.

Austin H. Clark called attention to a recent manual of the butterflies of Kansas by William D. Field (Bull. Univ. Kans., Biol. Ser., Vol. 39, No. 10, 328 pp., 1940). Mr. Clark also said that. (Author’s abstract.)

L. A. Hetrick exhibited pine twigs on which sawflies (Xyela sp.) had formed galls. The species of this genus are of unusual interest and among the most primitive of all Hymenoptera, and Mr. Hetrick hopes to rear adults for identification.

The regular program consisted of two talks by members of the Bureau of Entomology and Plant Quarantine:

J. H. Matteson of Miami, Florida, had recently sent for identification a male and a female of Papilio andraemon bonhotei Sharpe taken May 3, 1940, by Peter Sawyer at Miami. In 1902 (Ann. Carnegie Mus., Vol. 1, p. 489), W. J. Holland recorded this subspecies from southern Florida in the vicinity of Miami. It had then been recently described from the Bahamas by Emily Mary Sharpe. Dr. Holland’s record was overlooked by Barnes and Benjamin in their list of North American Lepidoptera published in 1926, and by J. H. McDunnough in his recent list. It was also omitted from the revised edition of The Butterfly Book by Dr. Holland himself. The subspecies is, however, included in J. A. Grossbeck’s list of the butterflies of Florida (Bull. Amer. Mus. Nat. Hist., Vol. 37, p. 6, 1917) and in Mr. Clark’s account of the North American swallow-tails (Ann. Rep. Smithsonian Inst. for 1935, p. 396, 1936). These recently acquired specimens confirm Dr. Holland’s original record, and Papilio andraemon bonhotei Sharpe should be accorded a place in our lists of North American butterflies. (Author’s abstract.)


Dr. Richardson discussed the properties of methyl bromide and the history of its use as an insecticide. The results of his experimental work with it as a control for meally bug and red spider will be published elsewhere. (Secretary’s abstract.)

Comments followed by Wood.


Mr. Sasscer showed many fine photographs of scenes in Puerto Rico, St. Thomas and St. Croix. These included tropical vegetation, mountain scenery, experiment stations and other objects with which he came in contact on his recent trip. (Secretary’s abstract.)

A visitor, H. H. Keifer, briefly discussed his recent survey of blueberry mites in several Eastern States. W. J. Baerg, another visitor, remarked on interesting dipterous parasites of tarantulas in Arkansas. Wood announced that F. W. Poos had been appointed to the position of Corresponding Secretary on account of an extended absence from Washington of D. J. Caffrey. He also announced the recent death of Willis Stanley Blatchley.

Adjournment at 9.40 p. m.

Ashley B. Gurney,
Recording Secretary.

Actual date of publication, October 31, 1940.
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THE IMMATURE STAGES OF THE EUCHARIDAE.

By C. P. Clausen,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The immature stages of the Eucharidae are of special interest because of the high degree of specialization which they have attained to enable them first to reach the host stages upon which they are to develop and then to continue their development upon or within them. Their form and habits show a close relationship to the Perilampidae, to which the adults are linked taxonomically. During the past twenty years the writer has had the opportunity of examining one or more of the immature stages of 12 species, representing 8 genera, and these, with the forms described by other authors, provide a basis for a brief comparative study.

The Egg.

The eggs of the Eucharidae are all of the stalked type, with the stalk at the anterior end. The range in size is not so great as might be expected from the difference in size of the adult females of the various species. Several species of Eucharis and Kapala, which are of large size, deposit eggs measuring 0.18 mm. in length, while the smallest egg thus far observed is that of Kapala sp., which is 0.12 mm. long. In lateral outline the egg body is distinctly more convex on what is believed to be the dorsum than on the venter. The stalk ranges in length from less than one-fourth that of the main body in Parapsilogaster montanus Gir. (Ishii, 1932) to twice its length in Psilogaster antennatus Gahan. Egg clusters found by W. A. McCubbin and A. S. Mills in the buds of Sorjania diversiflora at Barceloneta, Puerto Rico, which were almost certainly those of a Eucharid, showed the stalk to be three times the length of the egg body. In all species the stalk remains quite turgid after deposition of the egg.

Acknowledgments are extended to A. B. Gahan for determinations and for descriptions of those species which are new (Proc. U. S. Nat. Mus. 88: 425–458, 1940).
The First Instar.

In the earlier attempts to study the characters of eucharid planidia the specimens used were either freshly killed or slide-mounted individuals which had only recently hatched and were not appreciably distended by feeding. The small size of these larvae and their heavily sclerotized segmental bands, combined with the tendency of each segment to telescope into the one preceding it, made it extremely difficult to observe the detailed morphological characters, or even to determine the exact number of segments. It was found later that the exuviae were perfectly adapted for this purpose. In all species except *Stilbula tenuicornis* (Ashm.) the exuviae are found adhering to the venter of the second and third instars. They lie perfectly flat, with at least the first seven segmental bands widely separated, so that they can be detached and mounted directly in balsam. The head is detached from the remainder of the exuviae and remains attached by the mandibles to the skin of the host.

Detailed studies have been made of the first exuviae of *Eucharis scutellaris* Gahan (Fig. 1) and *Chalcura deprivata* (Walk.) (Fig. 2), and the general characters found in these two
occur also in all other species examined. The number of segments in each case has been found to be greater than previously believed. Following the head there are twelve segments represented by sclerotized bands, the last of which is only lightly sclerotized and represents the segment comprising the caudal sucker. The lesser number recorded in other species is probably due to an inability to distinguish the minute telescoped posterior abdominal segments, particularly the last five.

The head capsule is of the form shown in the illustration and is heavily sclerotized dorsally and laterally. It bears two pairs of minute sensory setae dorsally. The mandibles are heavy and comma-shaped.

The first segmental band is much larger than those following, with its ends markedly curved cephalad. The succeeding bands are almost straight, with a progressively greater curve caudad on those to the sixth abdominal segment. Pleural plates are present on the bands of the thoracic and first five abdominal segments. The plates of the first thoracic segment are quadrangular in outline and represent the lateroposterior portions of the band, while on the following segments they comprise the entire lateral portions of the band. The line of demarcation between the pleural and dorsal plates is faint and can be seen in the exuviae but not in living or mounted planidia. In Eucharis scutellaris the lateroposterior portion of each plate of the third thoracic to the fifth abdominal segments, inclusive, is produced into a sharply pointed, posteriorly directed process which on the posterior segments is almost spine-like. On the inner posterior margin of the plates there is a broadly rounded "tooth" which becomes more pronounced on the successive segments and on the fifth of the abdomen it is much enlarged, almost equal in length to the terminal process, and is united with it for the greater portion of its length.

Except on the first two thoracic segments, the pleural plates of Chalcura deprivata have the lateroposterior areas produced into long curved processes which are distinctly spine-like. Those of the third thoracic and the first four abdominal segments are one to one and one-half times the length of the plate itself. The posterior margin of the plate of the third thoracic segment has three small teeth, while there are only two on each of the following two segments. The third, fourth, and fifth abdominal segments have each a single sharp tooth at the inner posterior margin of the plate, the one on the fifth segment being spine-like and equal in length to the terminal process and forming with it a pair of parallel spines four times the length of the plate itself. In Parapsilogaster laeviceps Gahan (Fig. 3) the terminal portion of the plate of this fifth abdominal segment is curved posteriorly and a pair of spines, five times the length of the plate, arise from the middle of the posterior margin. The inner tooth of the
fourth abdominal segment is also equal in length to the outer one. This species is distinctive also in having pleural plates on the sixth abdominal segment and in the enlargement and projection posteriorly of the lateral portions of the band of the seventh segment. Ishii describes and figures the planidium of Kapala foveatella Gir., which is stated to have a long bladelike “appendage” at each posterior-ventral corner of the band of the fifth abdominal segment, which extends beyond the end of the abdomen. These “appendages” are very evidently extensions of the pleural plates similar to, though more highly developed than, those of P. laeviceps and C. deprivata. The planidium of Schizaspidia antennata Gahan has the pleural plates of this segment produced into heavy, curved, spinelike structures one-third the length of the entire body. In mounted specimens they project ventrally almost at right angles to the body axis. Exuviae were not available for a detailed examination of this structure. In the planidia of the various species which have been examined the pleural plates of the fifth abdominal segment show a much greater variation in form that those of any other segment.

The sclerotized bands of the planidium of Stilbula cyniformis (Rossi) figured by Parker and Thompson (1925) lack the pleural plates of the first four segments. In cast skins these plates have a tendency to curl inwards, rendering them invisible or indistinct.

The sensory setae and spines of the body occur upon the segmental bands. In Eucharis scutellaris, Kapala terminalis Ashm., Parapsilogaster laeviceps and Chalcura deprivata there are four pairs of setae on the dorsal plate of the first thoracic segment and one pair on each of the four following segments and on the eighth abdominal segment. The pleural plates of the second thoracic segment bear each two setae and those of the first and third abdominal segments only one. The setae of the first four body segments are usually minute, while those of the second and third abdominal segments may be nearly twice the length of the band itself, as in C. deprivata. In this species and Stilbula manipurensis Clausen the caudal spines on the eighth abdominal segment are twice the length of the band, whereas in P. laeviceps they are only half its length. The positions of the spines and setae on the segmental bands, as shown in figures 1 and 2, may vary slightly between species, but their number is consistent in all species of which series of exuviae have been available for examination. Wheeler and Wheeler (1937) mention and figure a single pair of setae, approximately equal to the bands in length, at the posterior dorsal margin, near the median line, of each thoracic band of Orasema costaricensis W. & W. and O. sixaolae W. & W.
The existence of an open tracheal system in eucharid planidia is still open to question. In the description of *Stilbula manipurensis* (Clausen, 1928) it was stated that a single pair of spiracles is present at the anterior lateral margin of the plate of the first thoracic segment. It is now believed that this is erroneous, and the minute "openings" observed were more probably the bases of setae which had been broken off. Neither Ishii nor Wheeler and Wheeler, in their descriptions of the planidia of a series of species, mention the presence of spiracles. In the related Perilampidae a single pair is said to occur dorso-laterally at the anterior margin of the second band of some species and on the intersegmental membrane in the pleural area of others.

The late first instar larva bears little resemblance to that which has just emerged from the egg. The body is enormously distended, being one thousand or more times as large as before. The dorsal and lateral views of *Schizaspidia convergens* (Walk.) are shown in figure 4 and, for comparison, an unfed planidium, drawn to the same scale, is represented at a. This is unquestionably a first instar larva rather than a second, as a close
examination showed the mouthparts in motion and one individual reattached itself to the host and resumed feeding. The intersegmental membranes are stretched so widely that the sclerotized bands, which previously had completely enclosed the dorsum and sides of the body, are now only small darkened markings on the median dorsal line and extend over only one-fifth the body width. The greatest separation occurs between the first and second bands and there is here an apparent segment which lacks a band. The bands of the five posterior abdominal segments show little or no separation and this minute conelike portion of the body projects caudad from the dorsum of the greatly distended intersegmental area between the fourth and fifth abdominal segments. The head, now very small in relation to the remainder of the body, is situated slightly ventrad of the hemispherical first thoracic segment.

Incomplete descriptions and illustrations of larvae of other species in this stage of development, particularly those of Orasema viridis Ashm. by Wheeler, O. costaricensis by Wheeler and Wheeler, and Stilbula cyniformis by Parker, indicate a comparable increase in size with a consequent equal separation of the segmental bands.

The Second Instar.

Larvae of this instar have been found only in Stilbula tenuicornis and Kapala terminalis. That of the first-named species (Clausen, 1923), is of nine distinct "segments," with the integument unsclerotized. The head is small and situated beneath the hemispherical first thoracic segment. The early second instar larva of K. terminalis (Fig. 5) is 1.0 mm. in length and indistinctly segmented, only two divisions of the thorax being visible, and there are no abdominal constrictions. The mandibles are minute and unsclerotized. The single pair of spiracles is situated near the anterior lateral margin of the second thoracic division.

Parker (1932) found the cast skin of the second instar of Stilbula cyniformis, from which he concluded that the body is oval in outline and without visible segmentation. Two pairs of spiracles were noted.

The Third Instar.

In the present study it has been possible to examine mature larvae of one or more species of Stilbula, Schizaspidia, Eucharis, Chalcura, and Kapala. That of Stilbula tenuicornis (Fig. 9) is 6.0 to 7.0 mm. in length, opaque glistening white in color, with visible segmental lines only between the head and thorax, between the first and the combined second and third thoracic segments, and between the thorax and the abdomen. The thorax is bent
ventrally so that the head is distinctly ventral and directed caudad. The abdomen is almost cylindrical, with a trace of intersegmental lines immediately after the molt which disappear quickly, and terminates in a small hemispherical button which is markedly ventral in position. The integument lacks sensory setae or spines and is thickly set with minute papillae. There are eight pairs of spiracles, rather than the single pair mentioned in the original description, of which the first, situated on the second thoracic division, is large, while the remainder are minute.

Parker has described and figured the larva of *S. cyniformis*, which is similar to the above except that the head is much larger and does not lie so far beneath the thorax, the second thoracic division is not nearly so arched dorsally, the dermal papillae or tubercles occur only on the dorsum and sides, and the anal button is more terminal in position. The first two pairs of spiracles are much larger than those following.

The larva of *Schizaspidia convergens* (Fig. 8) is distinguished particularly by the marked dorsal projection of the first thoracic division. Nine abdominal segments, exclusive of the terminal button, are indicated by dorsal constrictions, while the ventral line is almost straight and lacks any trace of segmentation. The exuviae of the first instar adhere diagonally to the venter of the third and fourth abdominal segments.

The larva of *Chalcura deprivata* (Fig. 7) differs from that of *Schizaspidia convergens* only in a reduction in size of the thoracic divisions and a greater curvature in the posterior abdominal region, and the first exuviae lies transversely on the venter of the second and third abdominal segments. In this species and *S. convergens* there are indications that an additional pair of abdominal spiracles is present, but this could not be determined conclusively.

The third instar larva of *Eucharis scutellaris* (Fig. 6) is more nearly normal hymenopteriform than those previously discussed. Segmentation is distinct, though only ten body segments exclusive of the terminal button are indicated, and the first thoracic segment is relatively small and unmodified. There are

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2 Gahan has called attention to the great similarity of the adults of *S. tenuicornis* and *S. cyniformis* and indicates the possibility that the former may be merely a geographical race of the European species. Aside from the characters of the mature larva mentioned above, there are several differences in habit which distinguish them. *S. tenuicornis* oviposits only in the buds of trees, whereas *cyniformis* does so in the seed receptacles of a composite plant. The first instar larva of *tenuicornis* molts prior to transfer from the host larva to the pupa and consequently the exuviae are not found on the venter of the succeeding instars but remain attached to the larval exuviae of the host. In *cyniformis*, according to Parker, the successive exuviae are found upon the remains of the host pupa in the pleural area at the point where the larva had fed, indicating that the molt takes place after transfer to the pupa, rather than before.
nine pairs of spiracles, of which those of the mesothorax are much the largest.

In *Kapala terminalis* the thoracic segments are large and modified in much the same way as in *Schizaspidia convergens*. Larvae which are not fully fed have the posterior portion of the abdomen sharply curved ventrally and tapering gradually to the apical button. At maturity this distinctive body form becomes less conspicuous.

Brues (1919) gives a description of a single mature larva of *Psilogaster fasciiventris* Brues which was on the point of transforming to the pupal stage. He mentions a "large vesicular swelling" at the anterior end of the body, indicating a thoracic formation similar to that found in *Schizaspidia convergens*. The exuviae of the first instar was found adhering to the venter of the abdomen immediately behind the head.

The third instar of *Orasema* appears to have distinctive characters not present in the genera already discussed. In describing the immature stages of *O. viridis* Wheeler (1907) mentions the existence of a semipupal stage, separated by a molt from the third stage. The third instar larva has been referred to as "tuberculate" or "pustulate" because of the row of large, almost spherical tubercles on each side of the body just above the lateral margins. The advanced semipupa as figured by him may well be a fully fed third instar larva with the body greatly distended and the lateral tubercles consequently much reduced in relative size and appearing only as rounded elevations.

Wheeler and Wheeler describe the mature larva of *O. costaricensis* (Fig. 10), which is identical in general form with the pustulate larva mentioned above. The nine pairs of segmental pustules occur on a line immediately above the spiracles, and, in addition, the meso- and meta-thorax bear an additional pair below this line. The head is small and situated ventrally. The nine pairs of spiracles occur on the last two thoracic and the first seven abdominal segments. The described and figured semipupa appears to be a transient stage not separated by a molt from the mature larval stage.

The occurrence of the pustulate form of larva in *Orasema* and not in the genera previously discussed may be correlated with the habits of the host and the relationship between host and parasite. *Solenopsis* and *Pheidole*, the usual hosts of *Orasema*, produce naked pupae, and consequently these pupae, and the eucharid larvae of different stages of development which they bear, are accessible to the worker ants and are tended by them. *Odontomachus, Camponotus, Formica*, and *Myrmecia*, the hosts of the other eucharid genera and species discussed, pupate within cocoons, and because of this habit the third instar parasite larvae are never accessible to the worker ants.
The Pupa.

The pupae of the Eucharidae follow closely the general body form of the adults. The abdomen of the female is very large as a result of the great mass of developing eggs which it contains. In Stilbula tenuicornis, Eucharis scutellaris, and others, it is exceptionally long and is widest in the posterior region, whereas in Orasema it is nearly spherical. In the above two species and O. viridis the abdomen bears transverse ridges of uniform elevation intersegmentally on the dorsum and sides of the abdomen. The pupa of Psilogaster fasciventris described by Brues has vesicular swellings over the entire body and the abdominal ridges are broken medially on the dorsum and bear conical "teeth" or projections at the ends of each portion. These are most highly developed on the anterior segments. Schizaspidia convergens, Chalcura deprivata, and Kapala terminalis have these projections limited to the lateral areas. Orasema coloradensis Wheeler, as described by Wheeler, has a series of prominent pustules evenly spaced over each abdominal ridge, while O. costaricensis has only a median dorsal row of pustules on the posterior thoracic and the petiolar regions.

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EXPLANATION OF FIGURES.

1. The head and segmental bands of the first larval exuviae of Eucharis scutellaris Gahan.
2. The same of Chalcura deprivata (Walk.).
3. The bands of the fifth to ninth abdominal segments of Parapsilogaster laeviceps Gahan.
4. Dorsal and lateral views of the fully fed first instar of Schizaspidia convergens (Walk.), showing the wide separation of the segmental bands of the first seven body segments and (a) an unfed first instar drawn to the same scale.
5. The early second instar of Kapala terminalis Ashm., lateral view, with the first larval exuviae still enveloping the posterior portion of the body.
6. The third instar of Eucharis scutellaris Gahan.
7. The third instar of Chalcura deprivata (Walk.).
8. The third instar of Schizaspidia convergens (Walk.).
9. The third instar of Stilbula tenuicornis (Ashm.).
10. Dorsolateral view of the third instar larva of Orasema costaricensis W. & W., showing the tuberculate processes. (Redrawn, after Wheeler and Wheeler, 1937.)

OEDIONYCHIS FASCIATA (FABR.) AND CLOSELY RELATED SPECIES.

By Doris H. Blake.

Several closely related species of Oedionychis in the West Indies with similar coloration have been more or less confused. It is the purpose of this paper to describe some of the variation in coloring in the individual species that has contributed to this confusion as well as to point out the distinctive characters for separating the species.

Oedionychis fasciata (Fabr.).

Figs. 1, 2, Plate 16.

Alitica fasciata Olivier, Ent., vol. 6, 1808, p. 675.


On the Island of Haiti there is only one species that fits this description. This is a beetle from 6 to 8 mm. long, the largest of
the group at present included under the name *fasciata*. The head, prothorax, body and anterior femora are pale yellow brown, the antennae and anterior pairs of tibiae and tarsi vary from yellow brown to deep piceous, the posterior femora and elytra are violet blue with a pale yellow brown elytral band slightly before the middle, which is usually narrowed and broken at the suture. In the majority of specimens examined, this fascia extends from the lateral margin, where it is widest, to the middle of the elytron or a little beyond where it tapers out, leaving the suture widely violet blue. Occasionally the pale fascia widens so as to cover the whole basal half of the elytra. Sometimes there is a darker spot about the scutellum or the dark blue may extend up the suture and about the scutellum.

The distinctive characters of this species are its large size, the densely and distinctly punctate head, the usually interrupted, pale elytral fascia, and the dark blue hind femora and large aedeagus.

Excepting two old specimens in the collection of the Museum of Comparative Zoology, which are labelled simply *Cuba*, all specimens examined have come from Haiti, and I am inclined to believe this species is confined to that island.

**Oedionychis dimidiata** (Oliv.).

Fig. 6, Plate 16.

*Altica dimidiata* Olivier, Ent., vol. 6, 1808, p. 676.


Olivier’s description, translated, is this: Antennae black, head and thorax smooth shining yellow. Scutellum yellow. Elytra very finely punctate, at base yellow, from the middle to the apex cerulean, shining. Body yellow with the posterior legs violet. It is a little larger than *A. bicolor*. The antennae are dark. The head, thorax, scutellum and basal half of the elytra are of a shining yellow, the rest of the elytra and posterior legs are a beautiful violet. Below the body and four anterior legs are yellow. Habitat St. Domingo.

This species is apt to be confused with some forms of *Oe. fasciata* in which the basal half of the elytra is more or less yellow. It is a little smaller and less robust, and the aedeagus is noticeably shorter. It differs from the bicolored form of *Oe. cineta*, in which the apex only is dark, by having dark violet hind legs.

**Oedionychis cineta** (Oliv.).

Figs. 4, 5, 7, Plate 16.

*Altica cineta* Olivier, Entomologie, vol. 6, 1808, p. 675.

*Oedionychis cineta* (as synonym of *bicolor*) Gemminger & Harold, Cat. Coleop., 1876, p. 3527.

The gist of Olivier's description of *Altica cineta*, translated, is this: Oval, of a pale fawn color, elytra violet with a white band. Smaller and shorter than *A. fasciata*. Antennae pale, joints 4, 5, 10, and 11 black. Head, thorax and scutellum pale rufous. Elytra smooth, shining, blue, with a median fascia dilated a little towards suture. Body beneath immaculate, testaceous... The posterior femora are much enlarged and of the color of the body. Habitat St. Domingo.

The typical color form of this species, which is usually smaller than *A. fasciata*, ranging from 4.8 to 6 mm. in length, is yellow brown with violet blue elytra having a median pale band that is not narrowed but usually becomes wider near the suture and is not interrupted. The legs are pale, not with violet colored hind femora as in *fasciata*. The head differs from that of *fasciata* in being impunctate and shiny over the occiput in contrast to the distinctly punctate occiput of *fasciata*. The antennae are not always typical in being pale with the 4, 5, 10 and 11th joints dark, but may be entirely dark except for the basal joints or pale except for the apical joint.

Darlington collected at Port-au-Prince, Haiti, on Oct. 2 and 6, 1934, a series of eight typical specimens of *cineta*, and two specimens (dated Oct. 6), which I am inclined to think may be color forms of this species, having elytra with the basal half pale and only the apex dark. On one of these two specimens there is a little blue about the scutellum and on the humerus a dark ridge that together appear to be the remnants of a basal dark blue band. This color variation is similar to that found in *Oe. fasciata*. Besides these specimens, Darlington also collected on Oct. 2, 3, and 6, 1934, at the same place, six pale yellow specimens. Of these six, three have a very faint violet lustre, and one, although entirely pale yellow, has an even paler trace of an elytral fascia, such as is found in typical *cineta*. This pale form I described as *Oe. lantanae* from three entirely pale females collected by Hoffman in Haiti. Hoffman also collected typical specimens of *cineta* in the same series. Unfortunately, in all the collections examined from various museums, I have not found a male of either typical *cineta* or the entirely pale *lantanae*. The only male specimen that I have seen is one of those collected by Darlington in which the basal half of the elytra is pale. Until more males are available the status of *Oe. lantanae* can not be regarded as settled but it seems very probable that it is only a color form of *cineta*.

**Oedionychis purpurella**, n. sp.

Fig. 9, Plate 16.

From 5 to 6 mm. long, broadly oblong oval, shining yellow brown with lustrous violet elytra.
Head smoothly rounded over occiput, polished, a deep fovea on either side next to the eye and a row of smaller punctures leading from it to the groove above the tubercles. Interocular space about half the width of the head. Antennae half the length of the beetle, 3d and 4th joints approximately equal, yellow brown, in one specimen, the female, the last three joints darker. Prothorax over twice as wide as long with arcuate sides narrowed anteriorly, polished and with exceedingly fine scattered punctures; yellow brown, in one specimen traces of two spots near the middle. Scutellum yellow brown. Elytra broad and somewhat convex with small humeral prominences and a very short intrahumeral depression; surface lustrous violet with fine scattered punctures more distinct near the base. Body beneath entirely pale yellow brown, shining, lightly pubescent. Length 4.9–6.2 mm., width 3.9–4.5 mm.

Type.—Male and 3 paratypes (2 males, 1 female) U. S. N. M. Cat. No. 54010.

Type locality.—Mariani, Haiti, collected 20 Oct., 1924, by W. A. Hoffman on Lantana camara.

Remarks.—This is a slightly smaller species than Oe. cineta, with less conspicuous elytral punctuation and a differently shaped aedeagus. It differs from the description of Oe. bicolor (Linn.)¹ in having pale yellow brown and not blue hind femora. Chrysomela bicolor as briefly described by Linnaeus is rufous with the elytra and posterior femora cerulean. The habitat given by Linnaeus is simply America. DeGeer,² writing in 1775, gave the habitat as Surinam and described the antennae as black. Fabricius³ stated that the beetle occurred on Cytisus cajan (Cajanus indicus, chick pea), and Olivier⁴ gave the habitat as St. Thomas. Contrary to DeGeer's description, Olivier's beetle had pale rufous antennae. In most collections the West Indian species agreeing with Olivier's description is identified as Oe. bicolor (Linn.). It occurs in Puerto Rico and the Virgin Islands (St. John, St. Thomas, St. Croix, Virgin Gorda).

Oedionychis pseudofasciata, n. sp.

Fig. 3, Plate 16.

From 5.5 to 7.5 mm. long, oblong oval, yellow brown with lustrous violet blue elytra having a pale median band; hind femora violet blue; tibiae and tarsi dark.

Head shining yellow brown with dark mouthparts, sometimes deep brown behind the eyes and over the occiput; densely and usually quite distinctly punctate across vertex, tubercles clearly marked, interantennal area not prominent. Antennae extending about to the middle of the elytra; 3d and 4th joints approximately equal, the two basal joints always dark, remainder sometimes

¹Linnaeus. Syst. Nat. ed. 12, 1767, p. 593.
³Fabricius, Syst. Ent., 1775, p. 112.
⁴Olivier, Ent. vol. 6, 1808, p. 677.
pale yellow but in dark specimens deep brown or black. Prothorax a little less than 2½ times as broad as long with arcuate sides; disk polished, nearly impunctate, yellow brown without markings. Scutellum pale brown except in specimens having a dark occiput and antennae, then frequently piceous. Elytra very lustrous with minute punctures, violet blue with a broad yellow brown band usually not broken at the suture in pale specimens, but in specimens having a dark occiput and antennae this fascia often narrow and interrupted. Body beneath pale and shining, hind femora deep blue, tibiae and tarsi of all legs piceous. Length 5.5–7.4 mm., width 2.8–3.6 mm.

**Type.**—Male and 3 paratypes (1 male, 2 females), in Museum of Comparative Zoology.

**Type locality.**—Jaronu, Cuba, collected by L. C. Scaramuzza, 27 May, 1931.


**Remarks.**—This Cuban species, which has always gone under the name of *Oe. fasciata* and which is closely related to it, is smaller and more slender. The markings are also slightly different. As a rule, except in dark specimens, the elytral fascia is broad and not interrupted at the suture. In dark specimens the fascia may be broken and in these cases the head has dark areas over the occiput. In *Oe. fasciata* the head is always pale. The aedeagus of *Oe. pseudofasciata* is smaller and more slender than that of *fasciata*. At first glance the pale yellow antennae of some specimens are strikingly different from the dark antennae found in dark specimens. In the type series taken at Jaronu, however, one male has dark, the other pale antennae, and the two females have dark antennae. Suffrian described this species at length under *Oe. fasciata*. He was inclined to identify Illiger's *Haltica interrupta* with this species. Illiger described the head as reddish yellow, the antennae black, and the fascia as interrupted. I have not seen this color combination in this species. Considering the fact that there are several closely related species with similar coloration, one can not determine from Illiger's description, which does not give any habitat, which beetle was described.

5 Illiger, Mag. 6, 1806, p. 94.
1. Oedionychis fasciata
2. Oe. fasciata typical form
3. Oe. pseudofasciata
4. Oe. cincta typical form
5. ?Oe. cincta color var.
6. Oe. dimidiatata
7. Oe. lantanae (?cincta color var)
8. Oedionychis bicolor
9. Oe. purpurella
A NEW SPECIES OF ACTENODES (COLEOPTERA: BUPRESTIDAE).

By W. S. Fisher,
Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

This species has been confused in most collections with acornis Say, and since a number of collectors who have loaned the writer material for study are anxious to have a name for it, the following preliminary description is given, so that the name will be made available for use in economic papers. The species will be fully described in the writer's Revision of the North American Chrysobothrini.

Actenodes simi, new species.

Moderately elongate, slightly convex, bronzy black, with a faint cupreous or purplish reflection; beneath bluish black, with a distinct greenish or violaceous tinge, and more strongly shining than above. Antenna bluish black to greenish black in the male, uniformly cupreous with a bronzy green tinge in the female, extending beyond the anterior margin of the pronotum, with the intermediate segments compact, and as long as wide. Eyes separated from each other on the occiput by one-fourth or less their own width at widest part. Pronotum twice as wide as long; sides obliquely converging from apical angles to posterior angles; surface coarsely, transversely rugose, coarsely punctate between the rugae. Elytra slightly uneven, densely scabrous, transversely rugose basally. Length 9.5 to 15 mm.

Type locality.—Brigantine, New Jersey.

Type, allotype, and paratypes.—In United States National Museum, No. 54368. Paratypes in the collections of R. C. Casselberry and J. N. Knall.

Described from 230 specimens (one type). Type, allotype, and 21 paratypes collected at the type locality on June 15, by R. J. and M. B. Sim, and 207 paratypes from the other localities listed above, including 172 collected by R. C. Casselberry at Seaside Park and Ocean City, New Jersey, on June 16 and July 10.

This species resembles acornis Say, but it differs from that species in having the antenna longer and extending beyond the anterior margin of the pronotum, the fourth segment of the antenna only slightly triangular and only a little wider than the third segment, and in not having the outer segments of the antenna transverse.
The descriptions in this paper are preliminary, but they are published now in order to establish names that are needed for use in economic reports. More complete data for these and other United States species of \textit{Cylindrocopturus}, accompanied by keys and illustrations, can, it is hoped, be given in a future paper. To make more intelligible certain comparative statements on the following pages, two changes in status should be recorded. After studying the types, the writer believes that \textit{Cylindrocopturus dispersus} Csy. (eastern part of the United States) and \textit{C. obscurellus} Csy. (Colorado, New Mexico, and Arizona), now placed as synonyms of \textit{C. longulus} Lec. (California), are distinct species.

The three new species here described share several characters which are enumerated at this point and for the most part not referred to again.

Scales overlapping, covering derm, most of pronotal scales feebly concave, elytral scales forming at least a double row on each interval except first, where they are in a single row. Rostrum finely punctate, as long as pronotum or a little longer. Antenna black or piceous, club twice as long as wide. Interoocular space always narrow, but individually variable, ranging from about one-sixth to one-twelfth width of an eye. Elytral intervals without tubercles or high ridges, usually convex, at least in places, except interval 1, which is normally flat and depressed. Male with rostral punctures a little larger than in female, and with a distinct concavity at base of abdomen, the concavity reaching base of ventrite 1; base of abdomen of female convex to flat, occasionally feebly concave, but the concavity almost never reaching base of ventrite 1.

The color pattern is formed, basically, of white marks on a dark background and, on an elytron, consists of a "posterior bar" (often the most conspicuous dorsal mark) beginning near suture at about apical third or two-fifths and extending first transversely and then obliquely forward to interval 8, usually broken about middle; an "anterior bar" (nearly always diffuse and often either absent or merged with a sprinkling of other white scales toward base) beginning on interval 8 just posterior to humerus and extending obliquely backward toward suture, the area between the two white bars often appearing as an oblique, blackish bar; frequently a "sutural line," often indistinct or broken, connecting the two white bars; a humeral spot on base of interval 6, or on bases of 6 and 7. Usually also
there are scattered white scales basally and apically. Interval 1 usually tessalated in apical half or more. On the pronotum the basic pattern consists of three whitish lines, one median and one on each side margin, the lines irregular, often poorly defined or largely absent, the median line, when present, narrow and usually well defined basally and apically, but much dilated and very diffuse at middle.

The writer was fortunate in having for study exceptionally fine series (more than 1,700 specimens in one case) furnished mostly by R. L. Furniss, C. B. Eaton, and D. DeLeon, all of the Division of Forest Insect Investigations of the Bureau of Entomology and Plant Quarantine.

*Cylindrocopturus furnissi*, new species.

Average length about 2.5 mm. (extremes, 2–3 mm.); average width about 1.05 mm. Ground color above usually dark cupreous, appearing more fuscous than cupreous in natural light, occasional specimens lighter cupreous, some of the scales on such specimens, especially along suture, with a greenish tinge. Pronotal white scales very few to moderately numerous, the whitish lines usually vague and much broken. Elytra usually with a distinct, medially broken posterior bar, a less distinct sutural line, a feeble anterior bar, a small humeral spot, and a sparse sprinkling of scales basally and apically; by an increase in the proportion of white scales, the markings become larger, the scaly sprinkling more profuse, the posterior bar occasionally complete, and the pronotal lines evident; by a reduction in the proportion of white scales, the dorsal color becomes almost entirely dark, relieved only by a small humeral spot and a much reduced posterior bar. Underside whitish, often with opalescent tinges on middoe of abdomen basally, cupreous scales extremely variable in number, usually numerous laterally, and apparently always present on metepisternum, and usually also on sides of ventrites 1 and 2, and on at least middle of ventrites 3 and 4; ventrite 5 in female subevenly clothed with whitish or whitish and cupreous scales; ventrite 5 in male usually with mixture of whitish and cupreous scales except on a scaleless, semielliptical, apical area, the apical margin with very short, black, erect hairs. Femora with whitish and cupreous scales, the latter more abundant in apical halves and often condensed in antemedian and apical patches or incomplete annuli. Rostrum about seven times as long as thick just anterior to antennal socket. Prothorax wider than long (about 11 to 9). Elytral intervals usually nearly flat or feebly convex, sometimes rather strongly convex, the second, especially on declivity, often more strongly convex than the others; usually a feeble impression just mesad of humerus and a vaguely defined, flattened area on flank posterior to humerus. Median lobe of male genitalia much narrowed toward the bluntly lanceolate apical portion, where it is hardly more than a third as wide as at middle.

*Type locality.*—La Grande, Wash.

Type, male, and 260 paratypes, male and female, Cat. No. 54391 U. S. National Museum.
The type series was selected from about 500 specimens reared from twigs of Douglas fir, Pseudotsuga taxifolia, at the type locality by R. L. Furniss (Hopk. No. 31798a) during 1939; and from a small series from same locality and host, F. P. Keen and R. L. Furniss, VI-23–1935 (Hopk. No. 20578-A).

Specimens of furnissi, not included in the type series, are at hand from other localities as follows:

*Washington:* Tenino (Hubbard and Schwarz).

*Oregon:* Aurora Mills (1893); Oswego (VII–18–1935, R. L. Furniss, Pseudotsuga taxifolia, Hopk. No. 31654–A); Lane County (July 10, 1923, J. S. Boyce, Pseudotsuga taxifolia, Hopk. No. 10640a); St. Helens (A. D. Hopkins, Pseudotsuga taxifolia, Hopk. No. 113).

*California:* Gasquet Ranger Station (V–21–37, R. L. Furniss, reared from twigs of Pseudotsuga taxifolia, Hopk. No. 31716–A).

*C. furnissi* is closely related to *dispersus* Csy., the latter, according to specimens examined, ranging from Ontario (type locality) to North Carolina and west to Ohio. *C. dispersus*, which doubtless breeds in species of Pinus, has the dorsal scales more scattered than does *furnissi*, the dorsal aspect being more speckled. The posterior bar is usually reduced to the portions on intervals 2, 3, and 4 and a spot on 8 or on 7 and 8, and the underside averages paler than in *furnissi*. Though these differences seem none too convincing, the writer believes there can be no reasonable doubt that *furnissi* is distinct.

*Cylindrocopturus deleoni*, new species.

Average length about 3 mm. (extremes 2.8–3.5 mm.); average width about 1.2 mm. Ground color above dark cupreous, the first interval in basal third lighter cupreous, the pale scales on pronotum few, mostly located in a condensed spot or short line opposite humeral spot and in a large, transverse, very diffuse median patch; elytra with rather numerous white scales, posterior bar distinct and often complete or nearly so, anterior bar diffuse, a tessellated sutural line from basal third to apex, interval 6 often irregularly tessellated from base to declivity, surface in front of anterior bar (except for a dark sutural area at basal fourth) and behind posterior bar (except for an area at top of declivity divided by the sixth interval) with a sprinkling of white scales, the general aspect often decidedly speckled. Under surface whitish, scales medi ally, especially at base of abdomen, more or less opalescent; cupreous scales rather numerous laterally, scattered or loosely grouped here and there, and often present medially on venterites 2, 3, and 4, often absent or nearly so on venterite 5 of female; venterite 5 of male without scales in a medioapical area (as in *furnissi*), the apical margin with minute black hairs; femora speckled, dorsal surface of each with or without antemedian and apical patches (or incomplete annuli) of dark scales. Rostrum a little more strongly arcuate in male than in female, a trifle longer relatively than in *furnissi* (about eight times as long as thick just anterior to antennal socket), punctures a little coarser than in *furnissi*. Prothorax slightly wider than long (more elongate than in *furnissi*) and a little more
narrowed anteriorly. Elytra apparently a little longer relatively and more narrowed posteriorly than in furnissi, intervals usually convex; surface flattened or lightly impressed in a common area posterior to scutellum, a small impression at humeral spot, a vaguely defined flattened area on flank behind humerus, and a small flattened area on intervals 6 and 7 where posterior bar crosses. Median lobe of male genitalia about as in furnissi, but with apical narrowed portion longer.

_Type locality._—Little Medicine, Wyo.
_Type, male and 69 paratypes, male and female, Cat. No. 54392 U. S. National Museum._

The type series was reared from roots and root collar of a 3-inch Pinus contorta between November 18, 1939, and May 25, 1940, by D. DeLeon (Hopk. No. 31562 V–2). Specimens of deleoni, not included in the type series, are at hand from other localities as follows:

_Wyoming:_ Vicinity of canyon of Yellowstone (Wickham collection, IX).

_Idaho:_ Cedar Mountain (July 5, 1899, A. D. Hopkins, Pinus ponderosa, Hopk. No. 253).


Notes accompanying the Hopkins number on the two Idaho specimens state: "Fungus gall infested with coleopterous larvae on yellow pine." Though thus apparently differing in habits from deleoni, as represented by the type series, these Idaho specimens seem indistinguishable on morphological characters.

C. deleoni is close to furnissi but differs in its larger size and more tapering form, furnissi being a "chunkier" species. In addition, deleoni has on the average a greater proportion of white scales (resulting in a more speckled aspect above and on femora), more convex elytral intervals, and a more evident postscutellar impression.

_Cylindrocopturus eatoni_, new species.

Average length about 2.6 mm. (extremes 2–3.2 mm.); average width about 1.1 mm. Color above dark cupreous, with a plentiful sprinkling of pale or white scales, these usually forming on pronotum a rather broad but not sharply defined lateral stripe, at least in basal half, the median line represented by a patch or short line of scales at base and at apex, each line joining a loose aggregation of pale scales at middle, the latter sometimes arranged so as to enclose an immaculate median spot; white scales on elytra more numerous than usual, nearly the entire area in front of anterior bar with a more or less profuse sprinkling, the declivity with a similar sprinkling, the general dorsal aspect often being white-speckled, with dark areas as follows: Outer face of humerus, a small area next to suture at basal fourth, the oblique bar between the anterior and posterior white bars, and an indefinite area just behind posterior bar. Posterior
bar broken, or complete or nearly so; sutural interval often tessellated nearly throughout. Underside white or nearly so as a rule, cupreous scales when present largely confined to sides of meso- or metathorax. Apical portion of ventrite 5 not so convex transversely as in the two preceding species, often appearing nearly flat in male, in which sex the apical scaleless area is much narrower and the fine black hairs on apical margin considerably longer than in *furnissi* and *eatonii*; female with similar but shorter hairs on ventrite 5. Femora pale, the apical half of dorsal surface of each with some cupreous scales which are sometimes scattered and sometimes grouped into antemedian and apical patches or incomplete annuli. Rostrum slender, about nine times as long as thick just in front of antennal socket, punctures fine in male, extremely fine in female (finer than in the two preceding species). Prothorax transverse (about 6 to 5). Elytra with postscutellar area not or faintly impressed, interval 1 less depressed than in the two preceding species, other intervals convex. Median lobe of male genitalia feebly narrowed apically and there half to two-thirds as wide as at middle.

**Type locality.**—Big Springs Plantation, Lassen National Forest, Calif., Hopk. No. 32631e.

Type, male, and 270 paratypes, male and female, Cat. No. 54393 U. S. National Museum.

At least 1,700 specimens have been seen or studied. They were reared by Charles B. Eaton from twigs of ponderosa and jeffrey pine at the type locality, Hopk. No. 32631a, b, c, e (1939) and Hopk. No. 32330a (1938). A few specimens from Lassen National Forest bear label "Miller 287," and 2 specimens were collected by H. E. Burke at Yreka, Calif.; none of these latter 2 lots is included in the type series.

By the shape of ventrite 5 and by the male genitalic structure, *eatonii* belongs near *obscurellus* Csy. (type locality, Colorado). The latter, judging by a small series at hand (12 specimens), is usually a darker species with a complete and more conspicuous posterior bar and more nearly parallel-sided elytra. The single male of *obscurellus* that is sufficiently matured for genitalic study has the median lobe less arcuate in side view, and the lateral margins toward apex (in dorsal view) more emarginate than in average *eatonii*. These apparent differences may not be significant, but at least until adequate material of *obscurellus* is available *eatonii* should be treated as a distinct species.

The more extensively white-speckled dorsum, the usually unicolorous white underside, the better developed lateral whish line on pronotum, and especially the structure of ventrite 5 in male, distinguish *eatonii* from *furnissi* and *deleoni*. 
BOOK REVIEWS.


The original edition of this well-known general text on entomology appeared in 1924. In this the author states the objects of this work as: "First, to aid the student in laying a firm foundation for his entomological studies; and second, to make available, so far as possible, in the limited space of a handbook, a knowledge of the varied phenomena of the insect world." In this new edition opportunity was taken to revise and extend the discussion of the hymenopterous Superfamilies Ichneumonoidea, Proctotrupoidea and Chalcidoidea, together with keys thereto, with a view to extending its usefulness to students of insect parasitology.

This admirable work has long been recognized as the standard general text on entomology from the American viewpoint. In this ninth edition, some 20 pages of new matter have been added, and a very noticeable improvement over the former edition is the adoption of a pure white book paper instead of the cream stock used in the eighth edition. The result is a decided increase in legibility and reading comfort. This improved edition of a favorite textbook is certain of a hearty welcome from both students and educators.

—W. R. W.

Introducing Insects, by James G. Needham, Emeritus Professor in Entomology in Cornell University, with illustrations by Ellen Edmonson. 12 mo., cloth, 129 pp., numerous illus., The Jaquaes Cattell Press, Lancaster, Pa., 1940, $1.50.

This volume contains a well-conceived, non-technical introduction to economic entomology and its study.

By following the lines of every-day contact with insect pests of the household, such as a wormy apple, a moth-eaten garment and fleas on the family dog, the reader's interest is whetted for the ready reception of useful entomological information presented in a pleasant and painless form. The illustrations are numerous, appropriate and of unusually excellent quality. It is highly recommended as a means of acquainting the lay public with the rudiments of entomology.

—W. R. W.
MINUTES OF THE 512TH REGULAR MEETING OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON
OCTOBER 3, 1940.

The 512th meeting of the Society was held at 8 p. m., Thursday, October 3, 1940, in Room 43 of the National Museum. President Muesebeck was in the chair, and 44 members and 14 visitors attended. The report of the June meeting was approved as read.

The following individuals were elected to membership in the Society:

William D. Field, Bureau of Entomology and Plant Quarantine, Washington, D. C.
Bryant E. Rees, Bureau of Entomology and Plant Quarantine, Washington, D. C.

Under Notes and Exhibition of Specimens, R. E. Snodgrass gave a short discussion of the relationships of apterygote insects, illustrated by blackboard drawings. S. A. Rohwer described the Rocky Mountain Conference of Entomologists held at Cameron Pass Camp, Colorado, August 18-23, 1940. At that meeting informal discussions were held, and various aspects of taxonomy contributed the principal theme of the program, which was arranged in part by C. F. W. Muesebeck of our Society.

Mr. Muesebeck announced that the collection of Central American Coleoptera assembled by the late Ferdinand Nevermann, of San Jose, Costa Rica, has recently been obtained by the Bureau of Entomology and Plant Quarantine and is now available to specialists on Coleoptera at the National Museum. It contains approximately 33,000 specimens, representing 2,800 named species, and in addition about 10,000 unidentified beetles. Types, cotypes, or paratypes of nearly 400 species are included. This collection will be of much assistance, because Central American species of Coleoptera have been poorly represented among the available reference material at the Museum.

Two members of the Bureau of Entomology and Plant Quarantine presented illustrated talks on the regular program:


Mr. Hall emphasized the importance of accurate illustrations in scientific papers and briefly described several methods by which an artist may obtain correct proportions of an insect. He showed the ease with which a cross-lined eyepiece and a corresponding background on a drawing board may be utilized in getting correct outlines. Different methods of shading, with special attention to economy of time, were discussed. (Secretary’s abstract.) Comments followed by Cushman and Fennah.

2. An experimental attempt to change physiologically the resistance of an insect to some insecticides (a discussion of an investigation carried on by
J. F. Yeager, E. R. McGovran, Sam C. Munson, and E. L. Mayer). J. F. Yeager. (Dr. Yeager's paper will be published elsewhere.)

A few remarks were made by Rohwer.

A visitor, R. G. Fennah, an English entomologist in the Lesser Antilles of the West Indies, was presented to the Society. Mr. Fennah briefly presented in a very entertaining way the chief aspects of economic entomology in St. Lucia and nearby islands.

Adjournment at 10.10 p. m.  

Ashley B. Gurney,  
Recording Secretary.
ANNOUNCEMENT

Prices for back volumes and single numbers of the Proceedings of the Entomological Society of Washington are as follows until further notice:

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D. J. CAFFREY,
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Address: Bureau of Entomology and Plant Quarantine,
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THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON

Organized March 12, 1884.

The regular meetings of the Society are held in the National Museum on the first Thursday of each month, from October to June, inclusive, at 8 p. m.

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GRACE A. SANDHOUSE
In Memoriam

The following resolution was adopted by the Entomological Society of Washington on December 5, 1940:

The Entomological Society of Washington learns with deep sorrow of the death on November 9 of Grace A. Sandhouse.

Miss Sandhouse had been a member of the Society for the past fifteen years, during which time she was a regular attendant at its meetings, and was always ready to serve in any capacity.

While lamenting the untimely ending of so promising a career, the Society is proud of the eminence attained by Miss Sandhouse in the short span allotted to her; and congratulates itself in having been privileged to publish her chief scientific contribution as its first Memoir.

To her family the Society extends deepest sympathy and hopes that this expression of appreciation and regard may lighten in some measure the burden of their sorrow.

Signed: R. A. Cushman,
L. M. Russell.
GRACE A. SANDHOUSE.
By R. A. CUSHMAN and LOUISE M. RUSSELL.

In the death on November 9, 1940, of Grace Adelbert Sandhouse the Entomological Society of Washington has lost one of its most faithful members and the science of Hymenopterology one of its most promising younger workers.

Coming to the Division of Insect Identification of the Bureau of Entomology and Plant Quarantine in 1926 as Specialist on bees she rapidly increased the scope of her work to include all of the Aculeata (except the ants) and the sawflies.

Miss Sandhouse was born on June 1, 1896, at Monticello, Iowa, and died at St. Luke's Hospital, Denver, Colorado, on November 9, 1940. Her undergraduate education was obtained at the University of Colorado, from which she graduated in 1920. There her natural interest in zoology was, under the influence of Professor Cockerell, turned toward the taxonomy of the bees. From 1922 to 1924 she held a fellowship at the same school, receiving the degree of Master of Arts in 1923. During this period her first contributions appeared. In 1924–1925 she held a teaching fellowship at Cornell University, completing the residential requirements for the degree of Doctor of Philosophy.

Industrious, determined and courageous despite the hopeless illness of her last few years, and blessed with an orderly mind, a retentive memory for taxonomic characters and a keen judgment of the significance of such characters, Miss Sandhouse accomplished a vast amount of work. The collections in her charge were beautifully arranged and labelled, and the catalog of the literature of her groups virtually up-to-date. Great quantities of material from all parts of the world submitted for determination received her painstaking attention and accurate identification. Despite all this she found time and energy to produce important contributions to the taxonomy of the groups in which she was interested. Essentially feminine in the best sense, with her professional associates in the Division of Insects at the National Museum, all men, she was a scientist among scientists.

Aside from her profession her interests were many. The ordinary pursuits of the woman in the home she enjoyed and pursued. Socially she was a pleasant companion, a delightful guest and a gracious hostess; and she devoted a considerable portion of her time and income to humanitarian and charitable pursuits.

Miss Sandhouse was a member of the Entomological Society of America and of the American Association for the Advancement of Science, and the Entomological Society of Washington, and of the American Association of University Women, the Women's Auxiliary of the American Legion and the Alpha Delta Pi sorority.
Bibliography

Grace Adelbert Sandhouse, 1896–1940.


Completed but as yet unpublished.

Type species of the genera of bees.
The American bees of the subgenus Halictus.
SYNOPTIC REVISION OF THE BEETLE GENERA COTALPA AND PARACOTALPA OF THE UNITED STATES, WITH DESCRIPTION OF A NEW SUBGENUS.

By Lawrence W. Saylor,


Taxonomically the scarab beetles of the United States belonging to the Subfamily Rutelinae have been relatively neglected. The major papers treating the group have been those of Casey in 1915 and Ohaus in 1934. The work of Ohaus, an especially valuable contribution, deals with the Tribe Rutelini of the world; keys to genera, general bibliographical references, and the history of the group, as well as lists of the described species in each genus, are given.

Ohaus treats the groups Cotalpa and Paracotalpa as subgenera of the genus Cotalpa. Though I have the greatest respect for Dr. Ohaus’s judgment in rutelinid taxonomy, I am unable to accept his point of view in the present case; the facies of these segregates are very distinct, although to look at a summation of the differences in a key would lead one to think them closely related. The mouth parts and male genitalia are for the most part very similar. The males of both genera may be separated from the females by the fact that one claw of the front tarsus is much enlarged, whereas in the females both claws are more nearly the same size. Considering the characters of both genera in their entirety, the two are better differentiated than many genera that Ohaus accepts; they may be distinguished by the following characters:

Glabrous above. Basal thoracic margin complete or very nearly so.

Clypeus nearly rectangular, the angles narrowly rounded. Large claw of male cleft (not obvious in worn specimens); female claws entire

Hairy above, usually densely so. Thorax with basal margin obvious only at the sides. Clypeus usually semicircular, rarely (deserta, new sp.) rectangular. Claws entire in both sexes

Cotalpa (sensu str.) Burm.

Paracotalpa Ohaus.


Genus COTALPA Burmeister.

(Genotype: C. lanigera Linn.)


This genus belongs to the Subtribe Areodina, which is characterized by having the clypeus separated from the forehead
by an entire clypeal suture, and the mandibles broadly rounded and neither pointed nor reflexed dorsally at the apex. *Cotalpa* is distinguished from the other three American genera in this subtribe by the following combination of characters: 10-segmented antennae; labrum three times wider than long and projecting slightly beyond the clypeus; mesosternum with at most a very small and rounded projection between the coxae, or none at all.

In the females, the apical tooth of the front tibia is more elongate than in the male and runs more nearly in a line with the axis of the tibia (see figure). The shape of the front tarsal segments also differs in the two sexes.

**Key to the United States Subgenera.**

Apex of mentum slightly, widely emarginate. Mandible with outer edge nearly straight, outer apex without any tooth below. ...................... *Cotalpa* sensu str. Burm.

Apex of mentum bisinuate, produced at middle into a very short and widely rounded lobe. Mandible with outer margin curved slightly, and the outer apex with a strong triangular tooth placed vertically below the apex. ...................... *Ciocotalpa*, new subgenus.

**Ciocotalpa**, new subgenus.

Very similar in all respects to *Cotalpa* Burmeister except as follows: The apex of the mentum is produced at the middle into a small, broadly rounded lobe, instead of being emarginate. The outer edge of the mandible is slightly rounded instead of straight. The outer apex of the mandible has a very strong triangular tooth on the under side, instead of entirely lacking such a tooth. The thorax is about two and one-half times broader than long in most specimens, instead of about twice as wide as long.

*Genotype.—Cotalpa consobrina* Horn.

**Ciocotalpa consobrina** (Horn).

*Cotalpa* (*Cotalpa*) *consobrina* Horn, Ohaus, Gen. Insect., fasc. 199 A., 1934, p. 36.

This species is common in various parts of Arizona, to which State it is apparently restricted. Dark phases occur commonly, in which the dorsal surface is considerably darker than the usual unicolorous testaceous, and the thorax may have a very strong copperish tinge. The small tooth on the largest front male tarsal claw is very commonly lost through wear.
Subgenus COTALPA, sensu str.

Key to the Species.

1. Sides of clypeus parallel. Puncturation of elytra very coarse, subrugose, visible even to the naked eye; elytra duller than the thorax. Thorax very highly metallic, the sides faintly rugose, the disc smooth; front angles bluntly and obtusely rounded. Kansas... *subcribrata* Wickham.

   Sides of clypeus usually convergent anteriorly, rarely subparallel. Elytra smooth and finely punctate, no more coarsely punctate than the thorax. Thorax and elytra equally shining. Sides of thorax smooth to very highly rugose.............................................. 2

2. Sides of thorax very noticeably coarsely rugose and subgranulate. Pygidium usually nude or nearly so on disc. Front thoracic angles rectangular or nearly so. Dorsal surface highly polished, unicolorous yellow-testaceous, the head and thorax frequently somewhat reddish. Legs testaceous, the tarsi black. Utah, Nevada, New Mexico, Arizona........................................... *flavida* Horn.

   Sides of thorax smooth or nearly so, at most very faintly rugulose. Pygidium usually noticeably hairy ................................................................. 3

3. Size smaller (averages 20 mm. long, 12 mm. wide). Upper surface unicolorous light testaceous with a very highly metallic sheen. Common in eastern United States from Maine to the Carolinas, west through Minnesota and Iowa, and south to Louisiana and Texas................................................................. *lanigera lanigera* Linn.

   Size larger and noticeably more robust (averages 24 mm. long, 15 mm. wide). Thorax dark with strong greenish cloudings, and submetallic. Elytra much darker testaceous, somewhat dull, puncturation coarser than in the above. Sides of clypeus at times subparallel basally. Indiana, Iowa, Wisconsin, etc.......................... *lanigera obesa* Casey.

**Cotalpa subcribrata** Wickham.

*Cotalpa subcribrata* Wickham, 1905, Jour. N. Y. Ent. Soc. XIII, p. 3.

This is a rather common species in the region of Medora, Kans. The length of the last segment of the maxillary palpus varies considerably: it may be from three to four times as long as wide, and the point of greatest width may be at or beyond the center of the segment. The depth of the groove on this segment also varies, and the segment is much smaller and more elongate in the female than in the male. In some specimens there are two shallow but distinct foveae on each side of the front just behind the clypeal suture, but this is a variable character, more than half of the specimens examined having this area quite flat. A single example in the United States National Museum collections from “Lovelady, Texas, IV–30–06,” may be this species, but
it is a little larger, and the elytra, though rugose, are not so much so as in the Kansas specimens.

_Cotalpa flavida_ Horn.


In his original description of this species Horn mentions that the sides of the elytra in the females are highly angulate anteriorly to the middle, and that they possess a large tubercle at the point of angulation. This is apparent in some females of this species, but not in all; it is also equally noticeable in some females of _lanigera_ and _consobrina_. According to Casey, the basal thoracic margin is widely interrupted, but in the specimens I have seen it is very narrowly, or not at all, interrupted.

Recorded from Utah and Nevada; in addition specimens from New Mexico, and a fair series from Arizona, have been examined.

_Cotalpa lanigera lanigera_ Linn.


_Cotalpa (Cotalpa) lanigera_ Linn., Ohaus, 1934, Gen. Insect., facs. 199 A., p. 36.


_Cotalpa molaris_ Casey, 1915, l. c., p. 90 (NEW SYNONYMY.)

_Cotalpa tau_ Wickham, 1905, Jour. N. Y. Ent. Soc., XIII, p. 2. (NEW SYNONYM.)

An examination of the types and paratypes in the Casey collection of _molaris_ and _vernicata_ indicates that they are not separable from the common _lanigera_, the two types of _vernicata_ appearing to be merely robust females.

The type of Wickham’s species is at the U. S. National Museum, in the Casey collection; a careful study of it convinces me that it is merely a variant of _lanigera_. The markings on the elytra are nearly bilaterally symmetrical but those on the thorax are not at all so; a specimen of _consobrina_ from very near the locality where _tau_ was taken halfway bridges over the differences between the oddly colored _tau_ and the typical _lanigera_. This specimen of _consobrina_ is marked on the elytra just as is _tau_, but the markings are only half as dark. I believe the color in both specimens is due to some greasy exudate from the body or to solutions that they may have been originally collected in; it is well known that various solutions may considerably change the color of highly iridescent specimens.
Cotalpa lanigera obesa Casey.

*Casey, Mem. Coleop. VI, p. 90.*

I have examined the type series of eight specimens in the Casey collection and the few characters given in the key may possibly mark out a subspecies or form worthy of recognition. I am not at all convinced of the validity of the subspecies, but additional material is desirable.

**Genus PARACOTALPA Ohaus.**


**Key to the Species of Paracotalpa.**

1. Entirely black dorsally. Clypeus very broad and truncate, sides parallel, the angles very narrowly rounded; suture hardly obvious. Elytra with very dense and minute punctures over the entire surface, intermixed with the larger rugose punctures. Punctures of thorax not contiguous on the disc but very rugosely so at sides; front margin distinctly bisinuate. Dorsal surface with very little hair. **Mentum very slightly emarginate at apex. (San Diego region of Calif.)**

2. Entire thorax densely, rugosely, and granulately punctate, with long, erect, whitish hair. **Mentum deeply emarginate apically. Elytra rugosely punctate, the punctures rather sparse. Head, thorax, scutellum, and pygidium varying from dull green to a dull greenish blue; elytra always reddish, strongly shining, the hair varying from moderately dense to rather sparse; the striae always quite obvious. Idaho, Oregon, Washington, Utah, and California.**

3. Elytra yellowish (never at all reddish) and strongly metallic, sparsely punctate, with long, erect, whitish hairs. **Thorax, head, and pygidium a brilliant green, with very long hair, that of the head somewhat shorter. Punctures of thorax variable but usually more coarse and frequently more rugose than in ursina. Mentum deeply emarginate apically. Arizona and California.**

**Granicollis** LeConte.

Size and color variable, never exactly as above. **Elytra but rarely yellowish (rotunda), but with very little pubescence and that usually**
short, also the head and thorax piceous with bluish tinge, usually reddish to piceous. Mentum very slightly emarginate apically (ursina and subspecies) .................................................. 4

4. Entire dorsal surface black, with bluish tinge, with very sparse hairs, the insects appearing at first glance to be glabrous above. Ventral surface and legs also piceo-bluish. (Central and Coastal California). ........................................... ursina piccola, new subspecies.

Color variable, never entirely black dorsally .................................................................. 5

5. Elytra distinctly yellowish (in life a lemon yellow), usually very sparsely hairy, nearly glabrous. Thorax and head piceous with bluish tinge and long, erect brownish hair. Punctures on thoracic disc not contiguous, and usually relatively shallow. (San Bernar-
dino and Tulare Counties, California). ................................................... ursina rotunda Casey.

Elytra distinctly reddish or black, never yellowish .................................................................. 6

6. Thorax, head, and scutellum very distinctly greenish .................................................................. 7

Thorax, head, and scutellum black, with a bluish tinge, only very rarely with a greenish tinge and that then very faint. Body hairs varying from whitish to brown to very nearly piceous. Elytra usually reddish, rarely semipiceous. (Central and Southern California, generally distributed) ........................................... ursina ursina Horn.

7. Elytra black, with sparse to dense whitish hair (San Diego region of California) ursina nigricollis Casey.

Elytra red, with sparse to dense whitish hairs (San Diego region of California) ursina rubripennis Casey.

Paracotalpa deserta, new species.

Elongate-oval; black, the head, thorax, and legs with a bluish tinge. Nearly glabrous above. Head very densely, coarsely, and semirugosely punctate, the punctures of clypeus much coarser than those on front. Clypeus rather long, the sides parallel, the apex semitruncate with the angles very narrowly rounded; suture very indistinct, made out only with difficulty. Antenna black, the club equal to the funicle. Mentum of the same type as in ursina: disc somewhat shallowly and widely concave on apical half, and the apex very shallowly and angularly emarginate. Outer edge of mandible straight, apex rounded. Thorax with base margined only at sides, the lateral margins evenly rounded, ciliate, semicrenate; front angles produced and rectangular, hind angles very distinct but obtuse; front margin slightly produced in middle, so that the apical margin is distinctly bisinuate; disc with very dense and coarse, variolate punctures, these contiguous and rugose at middle of base and at the sides, with a very few minute punctures scattered over the disc and near the hind angles. Thorax nude except for the lateral marginal hairs and about two dozen long and erect hairs arranged in the form of a loose, wide-mouthed V on the center of the disc the point of the V being situated nearly at the middle of the base. Elytra finely rugose, glabrous; disc with scattered coarse punctures, the entire surface also with extremely dense and fine punctures; no striae indicated, not even the sutural. Pygidium with distinct bluish sheen, and disc with moderately dense and long erect hairs, the surface entirely covered with minute granular rugosities.
Abdomen and undersides with dense, long, whitish hairs. Legs and claw characters as in ursina. Length 17-18 mm. Width 915 mm.

The Holotype and Paratype, both females, and from the Saylor Collection, are from “San Diego, California” and “Desert, S. California,” respectively. The holotype will be deposited on loan in the United States National Museum, and the paratype remains in the Saylor Collection.

This very distinct species can be confused with none of the described species of the group; the color, shape of clypeus, elytral puncturation, and bisinuate front thoracic margin are especially distinctive.

**Paracotalpa granicollis** Haldeman.


*Cotalpa (Pocalta) pubicollis* Casey, 1915, l. c., p. 98; Fall, 1932, Jour. N. Y. Ent. Soc. XL, p. 204. (NEW SYNONYMY)


This relatively common species occurs over a wide range: Washington, Oregon, Idaho, Utah, and California. The record for the last-named State is based on a specimen taken in the Westgard Pass Plateau region in Inyo County, Calif., on May 27, 1937, by William Reeves, and presented to me by the collector. I have not as yet seen specimens from Nevada, though I should expect the species to occur there. An examination of Casey’s types of *pubicollis* indicates that that so-called species was based on the phase of the species having a more bluish tinge to the thorax—a character not of specific import.

**Paracotalpa puncticollis** Leconte.


*Cotalpa (Pocalta) Leconte, Casey, 1915, Mem. Col., VI, p. 94.


The distinctive coloring and other characters mentioned in the key will readily separate this pretty species. It is rather uncommon in collections and has been recorded previously only from Arizona; I collected a female specimen at Keys Ranch, near Cottonwood Springs, Mojave Desert, California, in April, 1936, in the vicinity of a group of cottonwood trees.
Paracotalpa ursina ursina Horn.


Cotalpa (Pocalta) laevicauda Casey, l. c., 1915, p. 95. (NEW SYNONYMY.)


Cotalpa (Pocalta) brevis Casey, 1915, l. c. p. 95. (NEW SYNONYMY.)

Cotalpa (Paracotalpa) brevis Casey, Ohaus, 1934, l. c., p. 39.

? Cotalpa (Pocalta) leonina Fall, 1932, Jour. N. Y. Ent. Soc., XI, p. 204. (See note at end of this paper.)

This well known species is widely distributed in the State of California and is most commonly met with early in the year from March through May or June. The individuals in one locality vary considerably in the density and color of the pilosity, in size, and even slightly in the color of the elytra. An examination of Casey's types of laevicauda and brevis, as well as considerable series in my own collection convinces me that these names are not entitled to specific or even varietal standing. I have collected very extensive series of this species in several parts of central California; the males fly easily and commonly while the heavier females are most frequently found crawling on the ground or resting on shrubs or grasses. The habitats most commonly frequented by the species seem to be grassy hillsides near cottonwood trees and stream sides; I have watched the adults feed upon flowers of California poppy and several other herbaceous plants. Apparently the species digs a good deal, since many specimens are found that have the teeth of the front tibiae worn nearly away. On dull days neither sex appears to do much flying, but rest on the ground or slowly crawl over bushes.

The following subspecies are in most cases quite unlike the typical form in general facies, but since they are fairly close in all the essential characters, I believe it is better to give them subspecific, rather than specific, standing.

Paracotalpa ursina piceola, new subspecies.

Robust-oval, entirely black, the thorax with bluish tinge; sides of the elytra in the humeral region with a slight reddish tinge. Head, thorax, and at times the bases of the elytra with rather sparse, long, erect whitish hairs; otherwise glabrous above. All other characters of shape and punctuation of the dorsal surface, body, mouth parts, and the male genitalia, are essentially the same as in typical ursina. Length 16-17 mm. Width 9-9.8 mm.

The Holotype female from "Lewis Creek, Monterey County, California, coll. April, 1932, Saylor Collection," will be deposited on loan in the United States National Museum. The two para-
types, one of each sex, also from the Saylor Collection, will remain there; they are from "Smith R., California." I do not know just what locality the labels on the paratypes mean; I do not believe it means the Smith River in northern California, but more probably refers to a ranch in central coastal California. This subspecies is very distinctively marked off from the typical form in color as well as by the much less densely-hairy dorsal surface.

**Paracotalpa ursina rotunda** Casey.

*Cotalpa (Pocalta) rotunda* Casey, 1915, Mem. Col., VI, p. 96; Fall, 1932, Jour. N. Y. Ent. Soc., XL, p. 204.


*Cotalpa (Pocalta) seriata* Casey, 1915, l. c., p. 96; Fall, 1932, l. c. p. 204. (NEW SYNONYMY.)

This is a rather distinctive subspecies which so far has been recorded only from San Bernardino and Tulare Counties in central California. The larger size, relatively glabrous elytra, and the yellowish elytra will readily indicate the subspecies. I have a series collected on March 13, at Lemon Cove, Calif.; at the time of collection the elytra were a bright lemon yellow.

**Paracotalpa ursina nigripennis** Casey.

*Cotalpa (Pocalta) nigripennis* Casey, 1915; Mem. Col., VI, p. 97; Fall, 1932, Jour. N. Y. Ent. Soc., XL, p. 204.


The subspecies varies considerably in the amount of elytral hair; a densely haired specimen and a glabrous one look quite different, but all other characters are exactly the same, and apparently the glabrous individuals are only rubbed or worn specimens. I have seen Casey's types and also several other specimens from Blaisdell's collection and that of the California Academy of Sciences, from which two collections Casey's original specimens came; Blaisdell tells me that this subspecies was formerly common near Poway, San Diego County; it is, however, rather rare in collections.

**Paracotalpa ursina rubripennis** Casey.

*Cotalpa (Pocalta) rubripennis* Casey, 1915, Mem. Col., VI, p. 97; Fall, 1932, Jour. N. Y. Ent. Soc., XL, p. 204.

The remarks under *nigripennis* also apply here in their entirety, since the two forms appear to be color varieties at the most, but so distinctively marked as to be considered worthy of a name. Rare in collections but apparently locally common in certain regions of San Diego County, Calif.

**Status uncertain.**

*Paracotalpa leonina*, Fall.


Fall, in describing this form, was apparently very uncertain of its validity himself, since he held it in his collection for more than forty years before proposing a name for it. The description was based on an individual collected in Antelope Valley in the northern part of Los Angeles County, Calif. It is surprising that no other of the many collectors in this region has found this beetle. The characters Fall uses,—the “finer and denser punctuation and longer denser pilosity of the thorax,” are highly variable in any series of typical *ursina* and are not considered as of specific import. The only concrete character Fall offers for the separation of the species is the form of the prothorax, which he says is “widest at the apical third whereas in *ursina* the point of greatest width is about the middle”; since I can very nearly match his *leonina* in all characters, even the shape of the thorax, in my series of *ursina*, I do not believe the species is valid, but since I have not seen the type, I hesitate to make a more definite statement at the present time.

**Explanation of Figures.**

Figure 1. *Cotalpa lanigera* (L.)
2. *Cotalpa* (*Ciocotalpa*) *consobrina* Horn.

a. Mentum.
b. Mandible.
c. En-face view of mandible.
d. Front tibia of male.
e. Front tibia of female.
THREE NEW SPECIES OF DELTOCEPHALUS
(HOMOPTERA: CICADELLIDAE).

By P. W. Oman,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The three species herein described are from the western part of the United States. Two of these are forms for which names have been requested on numerous occasions, and one, *grex*, has frequently been included in material submitted for identification in connection with a survey of the insects associated with peach mosaic disease in the Southwestern States.

I am indebted to Dr. M. T. James, of the Colorado State College, Fort Collins, Colo., for the privilege of examining the types of *Deltocephalus vanduzei* Gillette and Baker and to Mr. L. D. Tuthill, of the Iowa State College, Ames, Iowa, for the comparison of specimens with the types of *Deltocephalus fuscinervosus* Van Duzee.

**Deltocephalus grex**, n. sp.

Related to *durus* Beamer and Tuthill but less robust, the aedeagus lacking a basal sheath and with a pair of small vanelike processes on the distal portion. Length 3–4 mm., greatest width 1 mm.

Color extremely variable, with nearly all markings occasionally absent. Typical color and markings as follows: Ground color sordid yellowish white; face with irregular fuscous marks along sutures and with broken transverse bars of fuscous on clypeus; crown with a pair of small fuscous spots at the apex, a larger, irregular fuscous spot on each anterolateral margin, and traces of two pale-brown spots on each side of median line near posterior margin; pronotum with six pale-brown stripes, the two lateral ones narrower and frequently indistinct; veins of forewing rather distinct by contrast with the infuscated margins of the cells; thorax and abdomen mostly fuscous; legs irregularly banded with fuscous.

Head shorter than in *durus*. Form comparatively slender, forewings extending well beyond tip of abdomen. Posterior margin of seventh sternite of female truncate or occasionally very shallowly emarginate medially. Male plates broad basally, triangular in outline. Style and aedeagus as illustrated (fig. 1, A, B).

Holotype male, allotype female, and numerous paratypes of both sexes from Kirkland Junction, Ariz., May 31, 1935 (Oman). Types in the collection of the U. S. National Museum (cat. No. 54388). There are also at hand several hundred specimens from various localities in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Texas, Utah, and Washington.

This species, one of the commonest leafhoppers in the western part of the United States, has heretofore been commonly mis-identified as either *fuscinervosus* Van Duzee or *vanduzei* Gillette and Baker. However, in both these species the aedeagus is of
the simple, curved type illustrated for *vanduzei* by DeLong and Sleesman\(^1\) which is quite different from the aedeagus found in *grex*, illustrated by these authors under the name *fuscinervosus*, and on this basis *grex* may be differentiated from them with certainty. DeLong's illustrations\(^2\) on plate 19 appear correct for *fuscinervosus*, while the illustrations labeled *vanduzei* apply to *grex*, but on plate 29 the illustration labeled *fuscinervosus* apparently is of *grex* while that labeled *vanduzei* appears to be of *fuscinervosus*.

**Deltocephalus dorsti**, n. sp.

Related to, and easily confused with, *grex*, but slightly more robust; in general form somewhat intermediate between that form and *durus*. Aedeagus broader and with larger vandelike processes than in *grex*. Length 3–3.75 mm.

Color and markings as in *grex* but the fuscous spots on the crown usually smaller and evidence of the occurrence of extremely pale variants lacking.

Form rather variable with respect to degree of robustness, the more robust individuals usually with short wings which, especially in female examples, frequently do not extend to the tip of the abdomen. Posterior margin of seventh sternite of female broadly and shallowly emarginate medially. Male plates a little larger than those of *grex*, otherwise similar. Style and aedeagus as illustrated (fig. 1, C. D).

Holotype male, allotype female, and numerous paratypes of both sexes from Brighton, Utah, September 1, 1933 (Davis and Dorst). Types in the collection of the United States National Museum (cat. No. 54389). Specimens from the following localities are also at hand. Arizona: Littlefield, Colorado: Pingee Park, Utah: Duck Creek Spring. Heber City, Logan, Morgan, Orton, Providence, Richfield, Salt Lake City, Snyderville, Springville, and Strawberry Dam.

I take pleasure in naming this species for Mr. Howard E. Dorst, who has done much to increase our knowledge of the leafhopper fauna of Utah.

**Deltocephalus playensis**, n. sp.

Related to *minus* Van Duzee but larger and more robust. Markings on crown, when present, similar to those of *balli* Van Duzee. Length of female 3 mm., of male 2.75 mm.

Ground color of female sordid yellowish white, of male pale sordid yellow, usually with traces of pale green. Face marked with broken transverse bars which form a broad irregular band between the antennal sockets. Markings of crown extremely variable, sometimes completely absent, sometimes fused to form an irregular, fuscous, submarginal band, typically consisting of a pair of

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\(^2\) Ohio State Univ. Studies 2 : x + 129 pp., illus., 1926.
fuscous spots at the apex and an elongate, irregular, fuscous dash above each ocellus. Males usually more heavily marked than females. Thoracic sternites mostly fuscous. Legs slightly infuscated basally, otherwise unmarked. Abdomen dorsally, and basal portion ventrally, fuscous. Wings hyaline.

Crown of female bluntly angled anteriorly, median length about equal to that of pronotum. Crown of male not angled, shorter than pronotum. Forewings extending well beyond tip of abdomen in both sexes. Posterior margin of female seventh sternite broadly and shallowly emarginate medially, with a short toothlike process at the base of the emargination. Male plates short, broad basally, and triangular in outline. Distal portion of style rather slender and tapering to a subtruncate tip, ventral surface faintly dentate. Aedeagus simple, rather stout basally, tapering gradually to a slender, upturned, distal portion.


Explanation of fig. 1. A, dorsal view of style and aedeagus and B, lateral view of aedeagus of Deltocephalus grex; C, dorsal view of style and aedeagus and D, lateral view of aedeagus of Deltocephalus dorsti.
OBITUARY NOTICE OF WILLIS STANLEY BLATCHLEY.

By J. S. Wade.

Willis Stanley Blatchley (1859-1940), American naturalist, writer, poet and philosopher, was born at North Madison, Connecticut, U. S. A., on October 6, 1859, son of Hiram Silliman and Sarah J. (Hall) Blatchley. Brought by his parents to Hendricks County, Indiana in 1860, his early life was spent on a farm. After usual attendance during his boyhood in rural schools, 1867-1876, he spent several years thereafter during his young manhood in working his way, by intervals of teaching, through the Danville, Indiana, Normal School and later through Indiana University where he was graduated A. B., at the age of 28, in 1887. He married Miss Clara A. Fordice, daughter of the Honorable A. O. Fordice of Russellville, Indiana, on May 2, 1882. (Died December 7, 1928.) Their children were Raymond S., born in 1883, and Ralph F., born in 1885. He served as head of Science Department of Terre Haute High School, 1887-1888; was assistant in the Arkansas State Geological Survey, 1889-1890; and was a member of the Scovell Geological Expedition into Old Mexico to make a survey of the natural history of the Volcano Orizaba region in 1891. Meanwhile, as opportunity offered, he had continued graduate work and received A. M. degree from Indiana University in 1891, his major thesis being on "The Butterflies of Indiana." In addition to teaching in winter, his next work was that of summer assistant in the U. S. Fish Commission, making collections in the streams and lakes of Indiana and Ohio, 1892-1893.

Having established permanent residence at Indianapolis, Indiana, he began in 1894 his long service as State Geologist of Indiana, and, by reelection at four year intervals, he continued in this capacity for 16 years, 1894-1911. In addition to routine official duties of this position, he spent much additional time in collecting and working over great quantities of highly diversified geological and zoological material. Summer months were spent principally on various expeditions, notably, and indicative of the versatility of his interests, surveys of the clay and coal bearing counties of Indiana in 1895; exploration and mapping of the caves of Indiana, 1896; geological studies of Lake and Porter Counties, Indiana, 1897; Ethnological explorations in Florida, 1899; investigations of the lakes and of the marl deposits of northern Indiana, 1900; assembling data for a study of the mineral waters of Indiana, 1901; preparation in the Indiana State House of a display of the natural resources of Indiana, and studies of the Orthoptera of Indiana, 1902; investigations of petroleum and lime industries of Indiana, 1903; gathering data for clays and clay properties of Indiana, 1904;
investigations of roads and road materials of Indiana, 1905; preparation of a report on the oil fields of Illinois, 1906; and special studies of the Coleoptera of Indiana, 1906–1910, inclusive. The 16 Annual Reports published during these years 1894 to 1911, inclusive, were devoted mainly to economic geology, but there were published therein several monographs and other important papers on the zoology of the State. These 16 reports aggregated 15,139 octavo pages of text, 557 plates, and 44 folded maps, 38 of these maps being colored. According to the U. S. Government document entitled, "Mineral Resources of the United States," it was due in part, at least, to the advertising of the Natural Resources of Indiana in these volumes, that the annual value of their output increased from $16,860,674 in 1895, to $44,971,003 in 1910.

At the age of 51 the termination of his official work as State Geologist of Indiana marked the beginning of a new epoch in Dr. Blatchley's career, as the remainder of his life was spent in fulfilling an ambition of a sort to make him the envy and despair of countless other students everywhere who have dreamed, albeit hopelessly, of similar fascinating and delightful achievements. During the 29 years that followed, most of his time was spent in travel, collecting, and exploration, varied at convenient intervals with prolonged periods of intensive study and writing. In these years his rambles included oft repeated, long continued, collecting trips throughout most of the then unsettled portions of Florida, 1911, et seq.; in northern Wisconsin, 1912; in Alaska, western Canada, and the Pacific Northwestern United States, 1913; in New England, 1915, 1919, and 1929; in Brazil, Uruguay, Chili, Bolivia, Peru, and Cuba, 1922–23; in Panama, the Southwestern United States and the northern Pacific Coast areas, 1927–28; in Alabama and other southern regions, 1931. Inter-spersed, were numerous other trips over widely separated portions of the United States and other countries to attend scientific meetings, deliver lectures, or to study material in libraries or in museum collections. In addition to his permanent home in Indiana, he purchased in 1913, a winter residence in Florida, where he spent a considerable portion of each year thereafter. He received the honorary degree of L.L.D. from Indiana University in 1921.

Due to failing health and impaired vision, the last few years of his life were comparatively inactive as regards travel or intensive entomological collecting and study, though the output of publication, based on accumulated material, continued at irregular intervals. In evidence that the will and the urge for more travel persisted despite these handicaps, the writer of this notice regretfully declined an invitation from Dr. Blatchley, who was then in his 76th year, to accompany him on a 5-months' expe-
dition "down under" to Australia, New Zealand and the South Sea Islands.

One of his hobbies since childhood was the study of philately, and during the period 1934-40 he spent many pleasant hours in the arrangement, in order in a series of albums, of a large and valuable collection of stamps, representing unworked accumulations of decades and particularly rich in United States stamps. To this collection "many hundreds had been added by donations from fellow scientists from all parts of the world." Deeply interested in all living things, he spent otherwise leisure time during Florida winters in study of its flora, and in arranging various displays of fruits, leaves, flowers, and seeds of rare plants for exhibit at flower shows and the like.

He died, after a brief illness, at his home in Indianapolis, Indiana, on May 28, 1940, at the age of 80 years, 7 months, and 22 days.

Dr. Blatchley's published works during the years 1885 to 1940, inclusive, comprise a total of 251 titles. These range in scope from short newspaper or popular magazine articles, to the compilation of four enormous entomological works, monographic in scope, entailing long-continued toil and pains in their preparation. Indeed the preparation of any one of these might well be considered a life-time task for an average entomological worker. The material in each of these monographs was assembled slowly over a long period of years. That of "The Coleoptera of Indiana" (1386 pages, 595 illus., 1910), was some four years in preparation of the final draft, "The Rhynchophora of North Eastern America" (with Charles W. Leng, 682 pages, 155 illus., 1916), and "The Orthoptera of North Eastern America" (784 pages, 246 illus., 1919), were each two years in preparation of final draft, while "The Heteroptera of North Eastern America," (1116 pages, 215 illus., 1926), was six years in preparation. His scientific writings also include a considerable number of other works less comprehensive in character, some of which are largely revisionary in scope. Among the more noteworthy are those on Gryllidae, 1892; Butterflies, 1893; Indiana Cave Fauna, 1897; Orthoptera of Indiana, 1903; Indiana of Nature, 1904; The Clays and Clay Industries of Indiana, 1905; Indiana Weed Book, 1912; A Century of Geology in Indiana, 1917; Chrysomelidae of Florida, 1924; Scarabaeidae of Florida, 1927; Interesting Birds I have Known, 1929; and Fishes of Indiana, 1938.

In addition to technical writings, he also published seven volumes dealing in a semi-popular way with various phases of natural history phenomena or with his own personal activities and explorations. These are: "Gleanings from Nature," 1899; "A Nature Wooing at Ormond by the Sea," 1902; "My Nature
Nook,” 1931; “In Days Agone,” 1932; and “South America as I saw It,” 1934. Being a naturalist of the old school—of which we have only too few in these days—it is needless to say that he was interested in every phase of natural history phenomena, with the result that there is in these popular volumes much that is reminiscent of some of the finer passages in the writings of such of the old time naturalists as Richard Jeffries, Gilbert White, Henry Thoreau, John Burroughs, or Bradford Torrey. Saturated with the writings of these and others of their kind, it is readily understandable that his own literary productions would take on resemblance to them. Apropos of this, in one of a collection of old letters written over a term of years to the writer of this notice, in commenting on a paper concerning Thoreau, published not long before by the writer, Dr. Blatchley wrote: “Next to David Starr Jordan, Thoreau has influenced my life—though unconsciously to me—more than any other man.”

Among his writings was still another of a character sufficiently remarkable to be worthy of special mention here. Autobiographical in scope, and entitled “Blatchleyana, and “Blatchleyana II,” it was published in two parts in 1931 and 1940, respectively. It contains a detailed chronology of his life, a complete bibliography of his publications, much miscellaneous biographical matter, excerpts from his published works, and complete lists with citations of descriptions of the 472 species and varieties of insects described by Dr. Blatchley. Of these 377 were Coleoptera, 66 Hemiptera and 29 Orthoptera. Grateful acknowledgment is made to “Blatchleyana” for a considerable portion of the biographical material here presented.

A passionate lover of books, he gradually accumulated a large and increasingly valuable library, which became particularly strong in entomological and ornithological rarities. In 1935, arrangements were made for the entomological library to form a special collection thereafter in the library of the Department of Entomology, Purdue University, Lafayette, Indiana. His insect collection, consisting of many thousands of specimens, the accumulation of many decades of intensive collecting and exchange, also was placed in fireproof quarters and made available to future students through the Department of Entomology of Purdue University. Included in this are holotypes of 470 new species of insects described in his writings. Duplicates from his insect collection previously had been deposited from time to time in the U. S. National Museum in Washington, and the British Museum in London.

He developed wide acquaintance among leading scientific and other workers particularly over the Western Hemisphere, and appears to have been singularly gifted in making and retaining friendships. Something of the versatility of his interests
may be indicated in that some of the more valued of these friends—to mention only some of those who have passed on—were individuals identified with such widely varying activities as were those of David Starr Jordan, Barton W. Evermann, Theodore Roosevelt, and—held in particular affection—a fellow townsman and "Your elderly playmate," James Whitcomb Riley. The existence since 1934 of the W. S. Blatchley Nature Study Club in Indiana is an indication of the veneration and regard in which he was held by his immediate contemporaries.

A prolific writer and a careful methodical worker, he appeared to have a genius for particularly difficult tasks—those requiring enormous patience and persistence in successful completion. Considering all the conditions under which he worked, his accomplishments were great. He will doubtless be best remembered by his entomological achievements and American Entomology has been left richer in inspiration to research and endeavor by the example of his life and work.

MINUTES OF THE 513TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON
NOVEMBER 7, 1940.

The 513th meeting of the Society was held at 8 p.m., Thursday, November 7, 1940, in Room 43 of the National Museum. There were 39 members and 7 visitors present, and President Musebeck presided. The minutes of the previous meeting were approved.

The following new members of the Society were elected:
H. J. Conkle, Bureau of Entomology and Plant Quarantine, Washington, D. C.
R. G. Fennah, Citrus Pests Investigation, St. Lucie, B. W. I.
W. A. Shands, Bureau of Entomology and Plant Quarantine, Washington, D. C.
Peter C. Ting, Bureau of Entomology and Plant Quarantine, Washington, D. C.

President Musebeck announced that T. H. Frison, Chief of the Illinois State Natural History Survey, had invited the Society to send a representative to the dedication of the new Natural Resources Building on the campus of the University of Illinois. This building, to house the Illinois State Geological and Natural History Surveys, will be dedicated November 15, 1940. Mr. Musebeck said that it would be convenient for him to attend the dedication.

Under Notes and Exhibition of Specimens, R. A. Cushman spoke briefly of his visit to Canada, during the past spring, to study types of Ichneumonidae, especially those of Vierbeck at Ottawa and of Provancher at Quebec. Of the latter he reported that the collection is now housed in the new Provincial Museum in Quebec, and that it is being transferred into trays in a new cabinet. Considering the facts that the collection has formerly been in the charge of persons who did not appreciate its value, that it has been moved several times
and that for many years it was exposed as an exhibition collection it is in surprisingly good condition. (Author's abstract.)

A. B. Gurney noted a recent trip to the Academy of Natural Sciences of Philadelphia, mentioning the importance of consulting the collections of that institution in connection with his taxonomic problems, and the pleasure of renewing acquaintances with entomological workers there.

L. A. Hetrick, of the Virginia Agricultural Experiment Station, reported that on October 29, 1940, he made an examination of group killings of loblolly and shortleaf pines at Jarratt, Sussex Co., Va. At least 200 pines, 10 to 25 years old, had been killed during the past summer. Pitch tubes, adult galleries, larval mines, emergence holes, and dead adult beetles found in the galleries, proved that the primary invader of these apparently healthy trees had been *Ips calligraphus* Germ. This species does not commonly attack trees that are in a vigorous growing condition. All of the areas of group killings by *calligraphus* were near a pine processing plant now in its second year of operation. During the autumn months adults of *calligraphus* infest freshly cut wood stored on a yard adjacent to the plant. Adult beetles emerge the following spring or summer from wood that has not been processed during the winter. It was learned that there was a heavy carry-over of freshly cut wood from the fall of 1939 into the summer of 1940. Although freshly cut wood had continued to come to the plant each week during the past summer, this wood was not stored but was processed immediately. Such a procedure provided no available food for emerging adults on the wood yard. Evidently the great numbers of emerging beetles flew off to the nearest growing pines and successfully attacked them. After one generation in the standing trees, freshly cut wood was again being brought onto the yard for winter storage and the adult beetles were apparently attracted back to this food supply. An examination of green wood on the yard showed that it was heavily infested with *calligraphus*. In order to reduce the chances of possible recurrence of *Ips* killings of growing pines during the summer of 1941, it was suggested that 50 or 100 cords of freshly cut wood be placed on the yard each week during warm weather. This green wood would act as a sort of trap to attract adult beetles emerging from wood that became infested prior to cold weather in the autumn of 1940. Processing of this "trap wood" after three or four weeks would destroy most of the beetles and their broods. (Author's abstract.)

The regular program was as follows:


   This book is a group of essays, mostly by English writers and edited by Julian Huxley. Dr. Anderson outlined the substance of several chapters, which deal with the bearing upon systematics of such subjects as cytology, genetical theory, ecology, paleontology, embryology, natural hybridization, *Drosophila* work, geographical differentiation and museum practices. (Secretary's abstract.)

   A few comments concerning the New Systematics were made by Muesebeck.

2. Studies of insects in relation to Elm Phloem Necrosis Virus.
   D. E. Parker, Bureau of Entomology and Plant Quarantine.
Mr. Parker gave an interesting discussion of this comparatively little known disease, describing the scouting and experimental work in which he has had a part. Numerous photographs taken in Ohio of trees in the infected area and of cages on experimental plots demonstrated the symptoms of the disease and methods followed in studying its development and transmission. (Secretary's abstract.)

Remarks followed by Oman, Anderson, and Hetrick.

3. Cooperative Japanese beetle work in Maryland.
   George S. Langford, University of Maryland.
   Mr. Langford described the status of the Japanese beetle in Maryland, and enthusiastically outlined the several types of control which seem likely to be effective. His talk was accompanied by a motion picture used in extension work among the farmers of the State. This picture reviewed life history, types of injury, methods of control and other aspects of the Japanese beetle problem. (Secretary's abstract.)
   McIndoo made a few remarks.

Adjournment at 10.15 p.m.

Ashley B. Gurney,  
Recording Secretary.

Actual date of publication, December 31, 1940.
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