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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON

VOLUME 45

Published by the Society
WASHINGTON, D. C.
1943

ACTUAL DATE OF PUBLICATION VOLUME 45

Number 1—pages 1–28 inclusive........................*January 30, 1943*
Number 2—pages 29–56 inclusive........................*March 6, 1943*
Number 3—pages 57–78 inclusive........................*March 31, 1943*
Number 4—pages 79–98 inclusive........................*May 3, 1943*
Number 5—pages 99–130 inclusive........................*June 3, 1943*
Number 6—pages 131–162 inclusive........................*June 30, 1943*
Number 7—pages 163–182 inclusive........................*October 27, 1943*
Number 8—pages 183–206 inclusive........................*November 25, 1943*
Number 9—pages 207–234 inclusive........................*December 30, 1943*

PRESS OF
H. L. & J. B. McQUEEN, INC.
WASHINGTON, D. C.

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VOL. 45 January, 1943 No. 1

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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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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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 45 JANUARY, 1943 No. 1

ANTS OF THE GENUS TETRAMORIUM IN THE UNITED STATES WITH THE DESCRIPTION OF A NEW SPECIES.

By Marion R. Smith,
Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

Tetramorium Mayr is an Old World genus of ants containing over 300 described forms which are found in Europe, Africa, Asia, and the islands of the Eastern Hemisphere. No species is known to be indigenous to the United States or any part of continental America. Some of the Old World species, however, have been widely distributed by commerce and are now well established in the warmer sections of the globe and also in greenhouses in the more temperate regions.

Recently I was much surprised to find a new species of *Tetramorium* in a collection of ants received from R. H. Crandall of Wilawana, Pa. The six workers representing this species bear the label, "Prescott, Ariz., May 12, 1935, R. H. Crandall." In reply to a request for more information on the ants Mr. Crandall wrote that the specimens were collected 10 miles south of Prescott in a locality about a mile from the main highway and under some ponderosa pines at an altitude of more than a mile. He believes they were collected from the soil beneath a stone, as most of his collecting on May 12 was of that nature.

Previous to the receipt of the new ants, four species of *Tetramorium* were known to occur in the United States, all of which were undoubtedly introduced. The most common of the four forms is the well-known pavement ant, *Tetramorium caespitum* (L), which is now thoroughly established in many of our larger towns and cities, especially in those States bordering the Atlantic Ocean. There is every reason to believe that this species was brought in by the early colonists. The next most common species is the so-called Guinea ant, *T. guineense* (F), which is also well established in many of the more important towns of the South, especially in Florida and along the Gulf Coast. It is sometimes found in greenhouses in our more northern localities. *T. simillimum* (F. Smith) is occasionally found under circumstances similar to those under which *guine-*

ense is encountered, but to my knowledge it is not so abundant in the United States as is *guineense*. The fourth species, *pacificum* Mayr, is present in at least one California locality.[1] That the four forms mentioned above were introduced is suggested by their common occurrence in or near urban centers or in greenhouses and nurseries, and by the frequent interception of all four species in shipments of plants or plant products from other countries.

It is possible that the new species from Arizona was also introduced, perhaps with the food or other supplies of camels, many of which were imported into the Western States from Africa during 1856 and 1857. Africa is known to contain more species of *Tetramorium* than any other region of the world.

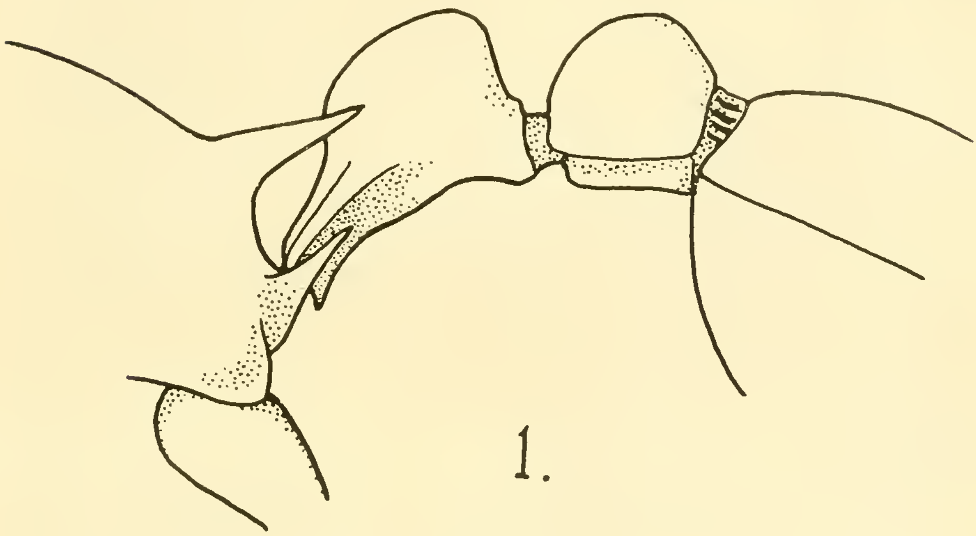
Except in the case of *caespitum* the habits of these introduced species are not well known. This ant infests houses, steals seeds from seed beds, gnaws into the roots of certain flowers and vegetables, and attends plant lice. I know from personal observation, however, that *guineense* also infests houses; and outdoors it often attends honeydew-excreting insects. All the introduced forms should be regarded as potential house pests.

The species of *Tetramorium* occurring in the United States may be distinguished by means of the following key which applies to workers only.

1. Without an antennal sulcus 2
   With an antennal sulcus 3
2. At least the basal half of the first gastric segment longitudinally rugulose, subopaque; antennal scape unusually long and thick, extending past the posterior border of the head; humerus rounded; dorsal surface of clypeus with a median impression; epinotal spines not short and stubby; sculpturing of head, thorax, petiole, and postpetiole rugulose reticulate .... *rugiventris*, new species.
   Basal half of first gastric segment smooth and shining; antennal scape not unusually long and thick or attaining the posterior border of the head; humerus angular; dorsal surface of clypeus without a median impression; epinotal spines short and stubby; head and thorax longitudinally striated .... *caespitum* (L.).
3. Hairs on head, thorax, petiole, and postpetiole short, erect, enlarged apically; head longitudinally rugulose with alveoli between the rugulae; length 1.75–2.25 mm. .... *simillimum* (F. Smith).
   Characters not as described above 4

[1] The California form differs from specimens which I consider to be typical *pacificum* (collected at Somo Somo, Fiji, by W. M. Mann) in its lighter color, less compressed petiole, and broader petiole and postpetiole; but it does not seem to be sufficiently distinct to warrant naming it.

4. Petiolar node, in profile, subrectangular (fig. 2); reddish yellow with gaster brownish to blackish . . . . *guineense* (F.).
   Petolar node, in profile, somewhat similar to that of *guineense* but with the anterodorsal angle lower and more rounded and the posterodorsal angle more acute (fig. 1); light brown or yellowish brown . . . . *pacificum* Mayr.



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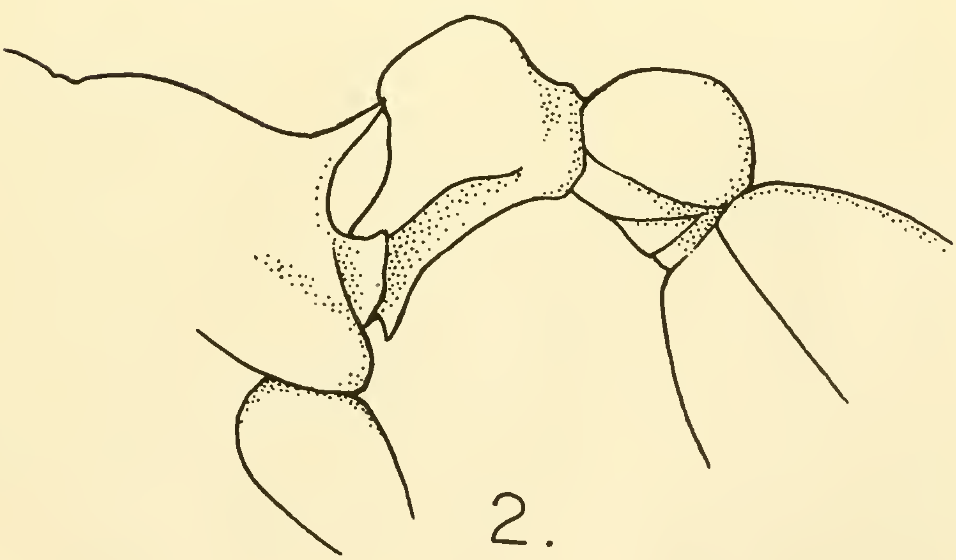

2.

EXPLANATION OF FIGURES.

Profile view of petiole and postpetiole of (1) *Tetramorium pacificum* Mayr; (2) *Tetramorium guineense* (F.)

Illustrations by Mrs. Mary Foley Benson.

Tetramorium rugiventris, new species.

Worker. Length 4.25 mm.

Head, excluding eyes and mandibles, approximately one and one-sixth times as long as wide, subrectangular, with weakly convex sides, rounded posterio angles, and very feebly rounded or straight posterior border. Mandible unusually large, subtriangular, with 2 prominent apical teeth and at least 4 smaller, indistinct teeth. Anterior border of clypeus rounded, not emarginate, and without teeth; posterior border extending well back between the frontal carinae and ending in a more or less straight, transverse suture; posterior half of clypeus with a pronounced median impression. Frontal area not well defined. Frontal carinae widely separated, short, but forming a prominent lobe over the base of each antennal scape. No antennal sulcus. Antenna 12-segmented, the last 3 segments forming a rather distinct club, which is shorter than the rest of the funiculus; scape unusually long and thick, extending beyond the posterior border of the head, strongly bent at base. Eye moderately large, more than its greatest diameter from base of mandible. Thorax, from above, with rounded humeral angles; promesonotal sutures indistinct or absent; mesoepinotal suture represented by a prominent constriction; thorax widest in region of humeral angles. Epinotal spines well developed but not unusually long or acute. Spurs of front leg strongly pectinate, spurs of middle and hind legs simple. Femora not strongly incrassated as with *guineense* and *pacificum.* Petiole weakly pedunculate; from above, with a node which is approximately seven-eighths as wide as long, rounded in front, and subparallel on the sides; ventral surface of peduncle with a prominent tooth. Postpetiolar node oval, widest posteriorly, approximately one and three-fifths times as broad as the petiolar node. Gaster rounded at the base, the first segment occupying almost all the gaster.

Mandibles and clypeus with coarse, longitudinal rugulae, the rugulae of the former especially strong. Frontal region of head longitudinally rugulose, elsewhere rugulose reticulate. Thorax coarsely rugulose reticulate except on the meso- and metapleurae. Petiole and postpetiole coarsely rugulose reticulate above. At least the basal half of the first gastric segment with coarse, longitudinal rugulae among which are scattered prominent, piligerous punctures. Antennal scape with very fine rugulae in addition to weak alveoli. Region between and below epinotal spines finely alveolate and shining. Coxae, femora, and tibiae with fine alveoli.

Hairs appearing grayish or yellowish according to the nature of the light, rather coarse, and moderately long and abundant, covering all parts of the body except the meso- and metapleurae, most erect on the thorax; each funicular segment with a whorl of suberect hairs.

Dark reddish brown, approaching black; mandibles, funiculi, and tarsi lighter.

Type locality.—Prescott, Ariz.

Holotype.—United States National Museum No. 56398.

Paratypes.—Three in the United States National Museum, one in the American Museum of Natural History, and one in the Museum of Comparative Zoology (Harvard).

Described from the holotype specimen which was collected at the type locality on May 12, 1935, by R. H. Crandall. The five paratypes bear the same labels as the holotype. They differ from the holotype in their slightly smaller size, darker color, and more clearly defined frontal area.

This very characteristic species is readily recognized by its unusually long and robust antennal scape, impression on the dorsal surface of the clypeus, large mandibles, shape of the petiole and postpetiole, the prominent longitudinal rugulae on the basal half of the first gastric segment, and the peculiar type of sculpturing which somewhat resembles that of the ants of the genus *Myrmica.*

PHEIDOLE (MACROPHEIDOLE) RHEA WHEELER, A VALID SPECIES.
(*Hymenoptera: Formicidae.*)

MARION R. SMITH,
Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

In 1908 (Amer. Mus. Nat. Hist. Bul. 24: 452) Wheeler described *Pheidole rhea* from an unusually large (14.3 mm.) wingless female now in the Cornell University collection, collected at Nogales, Ariz., by Oslar. In 1915 (Amer. Mus. Nat. Hist. Bul. 34: 403) he synonymized *rhea* with *fimbriata* Roger after comparing the Nogales female with winged females, soldiers, and workers of *fimbriata* collected at Cuatololapan, Vera Cruz, Mexico, by A. G. Ruthven. That Wheeler later recognized the error is indicated by numerous specimens of soldiers and workers in his collection which bear his handwritten label, *rhea.* At my request, L. G. Wesson, Jr., kindly checked Wheeler's description of *rhea* with the specimens of *fimbriata* collected in Mexico by Dr. Ruthven and now in the Museum of Comparative Zoology at Harvard, and he found that they are not the same species. He stated, furthermore, "Comparing majors (soldiers) with those of *fimbriata* shows that the differences between the desc iption of the female *rhea* and female *fimbriata* are virtually the same differences as between the majors of the two forms."

Pheidole fimbriata was described by Roger (1863, Berlin Ent. Ztschr. 7: 196) from two soldiers (in the Paris Museum) measuring 7.5 and 7.8 mm., respectively, from the Rio Paraguary. According to Emery (1921, *in* Wytsman, Genera Insectorum, fasc. 174 a: 81) this species, which is the type of the subgenus *Macropheidole*, ranges from Argentina into Mexico. There are no authentic records, however, of its presence in the United States. On the other hand, *rhea* has been collected at numerous localities in Arizona and Mexico. The known records are as follows:

Arizona: Nogales, 3,880 feet, rolling hills and grass, Robt. G. Wesson; Pinal Mountains, October 7, 1924, 4,000 feet, H. C. Millender; Cleator, 1936, R. H. Crandall; Sabino Canyon, October 4, 1937, R. H. Crandall; Atascosa Mountains, October 2, 1938, R. H. Crandall; Stratton, Santa Catalina Mountains, 6,000–7,000 feet, July 27, 1917, W. M. Wheeler; Blue River, August 24, 1914, E. G. Holt; Sabino Basin, Santa Catalina Mountains, July 8–12, 1916, collector ?; Sabino Canyon, Santa Catalina Mountains, July 23, 1917, W. M. Wheeler; Sabino Canyon, 3,700 feet, Robert G. Wesson; Baboquivari, 3,700 feet, mesquite and grass, Robert G. Wesson; Atascosa Mountains, in canyon, 4,600 feet, both in shade and sun, Robert G. Wesson.

Mexico: Escuinapa, Sinaloa, J. H. Batty; Guayamas, April 15, 1921, J. C. Chamberlin; San Pedro, Nolasoc Island, Gulf of California, April 17, 1921, E. P. Van Duzee.

In an attempt to show that *rhea* is entitled to distinct specific rank, I show below in parallel columns the more significant differences between it and *fimbriata*, in the soldier and worker castes, following which I describe the soldier and worker of *rhea* in detail.

SOLDIER.

P. rhea.	*P. fimbriata.*
Head with fine, dense, longitudinal rugulae which tend to converge on each posterior corner; the interspaces alveolate, thus giving the head, in some lights, a subopaque appearance.	At least the anterior half of the head with coarse, well-spaced longitudinal rugulae, with no pronounced sculpturing in the inter-spaces; posterior part of head with semicircular or transverse rugulae which have a tendency to become reticulate.
Eye small, but not extremely so (with approximately 15 ommatidia in its greatest diameter).	Eye extremely small (with approximately 11 or 12 ommatidia in its greatest diameter).

Scape short, unusually slender, and somewhat compressed basally.	Scape short, but not unusually slender and not compressed basally.
Ventral surface of petiole and postpetiole without tufts of short, erect, dense hairs.	Ventral surface of petiole and postpetiole each with a tuft of short, erect, dense hairs.
Epinotal spines remarkably long, and with acute tips.	Epinotal spines well developed but neither remarkably long nor with acute tips.

WORKER.

Eye prominent (with 11 or 12 ommatidia in its greatest diameter).	Eye extremely small (with 6 or 7 ommatidia in its greatest diameter).
Ventral surface of petiole and postpetiole without tufts of short, erect, dense hairs.	Ventral surface of petiole and postpetiole each with a tuft of short, erect, dense hairs.
Epinotal spines unusually long and acute.	Epinotal spines short.
Superior border of petiole transverse, straight.	Superior border of petiole transversely rounded.

Pheidole (Macropheidole) rhea Wheeler.

Pheidole rhea Wheeler, 1908, Amer. Mus. Nat. Hist. Bul. 24: 452.
Pheidole fimbriata Roger; Wheeler (not Roger), 1915, Amer. Mus. Nat. Hist. Bul. 34: 403.

Soldier.—Length 5.5 mm.

Head subrectangular, widest anteriorly, with the sides subparallel in the anterior half and converging in the posterior half; posterior border deeply emarginate, forming strongly rounded posterior corners. A well-defined frontal furrow extending posteriorly from the frontal carinae. Antennal scape short, when laterally extended attaining the eye, slender, basally compressed. Frontal area impressed. Clypeus with a longitudinal carina or protuberance; anterior border with a distinct emargination which is neither wide nor deep. Mandible subtriangular, stout, convex exteriorly. Eye small, with approximately 15 ommatidia in its greatest diameter. Pronotum large, strongly sloping anteriorly from the promesonotal suture, where the thorax reaches its greatest height; humeral angles rounded. Mesonotum abruptly sloping into the pronounced mesoepinotal constriction, the transverse elevation weakly defined. Epinotal spines remarkably long, about one-third longer than the basal surface of the epinotum, the tips acute. Superior border of petiole thin, with a very distinct emargination. Postpetiole approximately one and one-half times as broad as long, the sides converging both anteriorly and posteriorly and forming on each side a prominent conule at their point of junction.

Mandible with coarse, scattered punctures in addition to the coarse, longitudinal rugulae which cover most of its surface. Median area of clypeus with longitudinal rugulae and sides with transverse rugulae, but with the extreme central part largely smooth and shining. Head with fine, dense, longitudinal rugulae which tend to converge on each posterior corner of the head, the interspaces finely alveolate; posterior part of head with coarse, prominent, hair-bearing punctures. Pronotum mostly smooth and shining, remainder of thorax finely rugulose-alveol te. Dorsal surface of postpetiole and gaster very finely alveolate.

Body subopaque in some lights, more shining in others, this being especially true of the head. Body covered with numerous well-scattered, suberect to erect, yellowish hairs. Dark reddish brown, approaching black; the funiculi and tarsi light.

Worker.—Length 3 mm.

Head approximately as broad as long, with feebly convex sides and a straight or very feebly emarginate posterior border. Frontal area not strongly delimited as with the soldier. Clypeus convex, with angularly projecting anterior border and rounded posterior border. Eye prominent, with 11 or 12 ommatidia in its greatest diameter, placed less than twice its greatest diameter from base of mandible. Antennal scape long, slender, extending almost one-third its length beyond the posterior border of the head, slightly enlarged apically. Mandible large, subtriangular, with 15 or 16 small but distinct teeth. Thorax, in profile, highest in the region of the promesonotal suture; mesonotum forming an almost even slope from this point to the well-defined mesoepinotal constriction. Epinotal spines unusually long, longer than the base of the epinotum, their tips acute. Petiolar node, from behind, with straight, transverse, superior border. Postpetiole of approximately equal length and breadth, with the sides convergent in the anterior and posterior halves and forming a distinct angle on each side. Legs rather long and slender. Gaster, from above, subelliptical.

Mandible distinctly rugulose, also punctate, especially near the masticatory border. Longitudinal rugulae extending on the head beyond the posterior border of each eye, the interspaces finely alveolate. Posterior part of head mostly smooth except for the scattered, hair-bearing punctures. Sides of thorax, especially the meso- and metapleura, alveolate; dorsal surface either smooth or with extremely fine alveoli. Sculpture of petiole and postpetiole similar to that of thorax. Gaster smooth and shining.

Hair long, grayish or light yellowish, suberect to erect, moderatly abundant and well scattered over body. Brown; gaster darker, funiculi and tarsi lighter.

Described from a soldier and worker collected at Nogales, Ariz., by Robert G. Wesson in rolling hills and grass at an altitude of 3,880 feet.

Since Nogales is the type locality of *rhea*, I have chosen to describe specimens from this region. Examination of numerous individuals from many localities shows that *rhea* is a polymorphic species and that the soldier described above does not represent the largest of its caste. An unusually large soldier from Escuinapa, Mexico, measures 8 mm. in length. In a letter, Wesson indicated that Wheeler had labeled the Blue River, Ariz., and the Escuinapa, Mexico, specimens as *rhea* and those from Stratton, Sabino Canyon, July 23, and Sabino Basin, July 8–12, as a new variety. There are no means now of determining on what characters Wheeler based his concept of a new variety. I have examined the specimens labeled by Wheeler as *rhea* and those he marked as his new variety, as well as individuals from all the other localities listed above. Among these there is a noticeable tendency for the sculpture on the head of the soldier to vary and for the epinotal spines to differ in shape. The rugulae on the anterior half of the head are consistently longitudinal whereas those on the posterior half of the head may converge at each posterior corner and there form somewhat of a concentric pattern, or they may all converge mesially toward the deep emargination on the back of the head or even may form a concentric pattern around the central part of the head. The epinotal spines likewise vary greatly as to the direction in which they are pointed. In some individuals the spines are almost horizontal; in others they are more angularly directed. In view of the high degree of variability in the sculpturing of the head and the position of the spines it does not seem advisable to recognize any subspecific forms of *rhea*.

SOME NOTES UPON THE TYPES OF NORTH AND SOUTH AMERICAN SYRPHID FLIES IN THE BRITISH MUSEUM OF NATURAL HISTORY.

By Frank M. Hull,
University of Mississippi.

Several years ago I made a study of rare genera and the types of species of the family Syrphidae as represented in the collections of the British Museum of Natural History. These collections are peculiarly interesting, containing as they do not only representatives from many parts of the world, but also types of such persons as Walker, Bigot and other dipterists. I am greatly indebted to Dr. John Smart and to the late Dr. F. W. Edwards, who placed the facilities of the museum at my disposal for study. This paper records some observations made at this time having to do principally with synonymy and are listed below.

Lepidomyia cincta Bigot belongs to the genus *Quihuana* Knab.
Eristalis fo Bigot belongs to *Lathyrophthalmus*.
Helophilus scita Walker (from the Amazon) is a *Habromyia*.
Neascia (*Ascia*) *striata* Walker belongs in *Calostigma* Shannon.

Baccha anthermus Walker should be *Mixogaster anthermus* Walker.

Syrphus laenas Walker, *vatia* Walker, *barbula* Walker, *portia* Walker all belong in the genus *Mesogramma.*

Eristalis soulouquensis Bigot described from Hayti is conspecific with *vinetorum* Fabricius.

Eristalis impositus Walker described from Hayti appears to be conspecific with *Helophilus similis* Macquart.

Quihuana (*Merodon*) *angustiventris* Macquart appears to be identical with *Quihauana* (*Helophilus*) *aurata* Walker. The former is the earlier name, having been described in 1855.

Cheilosia (*Melanogaster*) *rufipes* Bigot. The type, a male, is headless. It appears to belong to the genus *Melanostoma.* Its fore tibia are yellow, and slightly darker apically.

Meromacrus basigera Walker (described as *Eristalis basigera* Walker 1860) appears identical with *Meromacrus milesoides* Bigot (1880). The former name therefore has priority.

Endoiasimyia indica Bigot. I can see no important difference between this genus and *Hiatomyia* Shannon erected in 1922. The face of *Endoiasimyia* is strongly tuberculate but on the whole the fly is not greatly different from the American species.

Baccha luctuosa Bigot. This species from the pattern of its abdomen is strongly suggestive of *Allograpta* and should probably be placed there.

Paragus pachypus Bigot described from Australia belongs in the genus *Microdon.*

The following species related to *Helophilus* were examined for the presence or absence of the globiferous hairs at the base of the hind tarsi: *tarsatus* Bigot (*Prionotomyia tarsatus* Bigot), *indiana* Bigot (*Eumerosyrphus indiana* Bigot), *gigas* Curran, *albiceps* v. d. Wulp, *ruficauda* Bigot, *mesoleuca* Walker, *quadrivittata* Wied., *caudata* de Meijere. All of these species possess such globiferous hairs and hence belong in *Mesembrius* or are closely allied to this genus. *Helophilus inepta* Walker appears to completely lack such hairs. H. *africana* Verrall, although stated by Bezzi to possess them, appeared also to lack them.

ADDITIONS TO THE BIONOMICS OF SINEA DIADEMA (FABR.). (*Reduviidae, Hemiptera.*)

W. V. Balduf and J. S. Slater, *Urbana, Illinois.*[1]

A brown, spiny-legged bug somewhat more than a half inch long, *Sinea diadema* is by far the most common member of its family in Illinois. This article releases new data obtained by us mostly at Urbana to supplement the valuable foundation studies on this species contributed by Readio (1924, 1927).

Wintering Stage.

In the Urbana area, this predator passes the winter exclusively in the egg stage. We present several kinds of evidences in support of this conclusion. First, while a few females taken in September had not yet begun oogenesis, most individuals of this sex obtained in that month and in October either contained mature brown eggs and immature white oocytes or had expended their adipose stores and turned to a dark soupy consistency indicating senility. Concurrently the number of adult bugs decreased sharply as October progressed, only one living adult having been secured by sweeping in November of 1940 and 1941. Significant also is the fact that our departmental insect collection contains many adult specimens bearing dates of September and October but only one taken in November.

Second, neither does the collection have adults captured in April and May, nor did we obtain such by weekly sweepings during March, April and May, 1942, or by less systematic efforts in 1941. Instead, nymphs in the first instar appeared in the net on April 17 and 24, individuals in the second instar were taken on May 2 and 8, and others in successively more advanced stadia from May 16 to June 20. Beginning in mid-June, the nymphs matured and transformed to the adult form.

Third, we demonstrated experimentally that the egg can survive central Illinois winters. Eggs laid from September 28 to November 2, 1939, by females recently from the field, were placed out of doors between October 24 and November 2 and left exposed until March 2, 1940. Returned to the laboratory on the latter date, 33 percent of 131 eggs yielded nymphs in from six to 15 days, and dissections of 81 sample eggs removed from 17 masses showed that all clusters but one, which had perhaps not been fertilized, contained embryos. These had advanced to somewhat different states of development, those in the earlier states being brighter brown and more flexible, and contained larger amounts of heavy whitish homogeneous granular yolk than others. On the other hand, embryos that

[1] Contribution No. 234 from the entomological laboratories of the University of Illinois.

had proceeded almost to the hatching stage when set out of doors in the fall were dead on examination in March. These results indicate that perhaps only the embryos in the earlier developmental phase can survive winter temperatures. Records furnished by Henry P. Etler, observer in the local federal weather station, showed the egg masses had undergone 11 days of subzero temperature, including lows of − 11, − 12 and − 13° Fahr. in January, or a mean of 7.1+° Fahr. for the month.

These facts show then that the reproducing adults present from September to early November die before the advent of winter, leaving the egg alone to carry its species through the cold season. No search was made for eggs in the field.

Life Cycles.

Two generations are passed in a year at Urbana. The first begins with nymphs hatched from the overwintered eggs The occurrence of nymphs in the first instar on April 17 and 24, 1942 indicates hatching took place about the middle of that month. The further nymphal development at Urbana is indicated by records for 1942: second instar, May 2 and 8; third, May 16 to 30 (June 4, Park Ridge, Ill.); fourth, May 28 (June 18, Oak Harbor, O. and June 27, Sebring, O.); fifth, June 14 to 20 (June 18, Oak Harbor). Supplementing these weekly samples are data from other years and sources, as follows: many advanced nymphs occurred between June 15 and 30, 1938; individuals in the second instar were taken on May 30, 1940, and numerous others representing the third to fifth stadia came into the net from June 6 to 25, 1940; and many of successively more advanced instars developed from May 17 to June 24, 1941. The adult state, which climaxes this cycle, had been attained as indicated by the following dates: June 19 to August 8, 1940; June 7 to July 19, 1941, and June 15 (a pale, soft female) to July 4, 1942. Thus, the first generation develops from mid-April to about mid-June, and the adults persist into August at Urbana.

The adults of the first generation as a whole therefore seem to live as long as six weeks and initiate the second cycle of the year from late June to early August. Nymphs in various but mostly the more advanced instars were taken on September 7, 1938, August 8 to September 28, 1940, and July 26 to August 30, 1941. All nymphs had transformed to adults on September 23, 1938, September 21, 1940, and September 16, 1941. Females dissected on September 6 and 23, 1938, were still in the pregravid state, but the lots examined from October 11 to 21 contained mature eggs and oocytes, as did also samples taken on September 21, 1939, September 23 to October 28, 1940, and September 19 to October 25, 1941. Occurrence of the adult in September–October is reflected also by the relatively large numbers of specimens bearing those dates in student collections. However, the adult population declined numerically during October, with the result that only one individual was found on November 2, 1940, and none on November 3, 1941, in situations well populated in the previous month. The activities of the second generation therefore end with oviposition in September–October, leaving the eggs to start the first new generation in spring of the ensuing year.

To summarize, the three stages of the two cycles respectively appear approximately as follows: egg, September to April and July to August; nymph, April to June and July to September; adult, June to August and September to early November.

Diet and Development.

Two series, each consisting of 20 nymphs obtained in the wintering experiment described above, were carried through to determine in a preliminary way the relation of quantity of diet to growth. Although both the diets chosen proved to be inadequate to sustain the nymphs to adulthood, the results are worthy of a brief statement. Ninety-four percent of series I died in the first instar on a diet of one adult *Drosophila melanogaster* in five days, and the survivors starved in the second instar on an allowance of one *Drosophila* in three days.

The nymphs of series II, fed at the rate of one, two, four, eight and 16 *Drosophila* flies per day in the five instars, respectively, died as follows: 70 percent in the first instar; 0.0 in the second; 5.0 in the third; 20.0 in the fourth, and 5.0 percent in the fifth stadium. In the course of their varied lifetimes, the 20 nymphs sucked out a total of 364 flies, or an average of 18.2 flies per bug.

Process of Preying and Feeding.

The preying stance and manner of seizing prey have been noticed by Parker (1916), and structural adaptions for predatism were described by Barber (1923). These accounts are supplemented here by two observations made by the senior writer in the field. One of these concerns a male that captured and sucked out a female adult of the tarnished plant bug, *Lygus oblineatus* (Say) on June 25, 1940, on an umbel of tansy, and the other involved a female seen on October 5, 1940 holding a newly-seized and still vigorously-struggling adult female of *Chauliognathus pennsylvanicus* (De G.) on an *Aster*.

When *Lygus* came within range of vision,—a distance of four inches, the male *Sinea* oriented himself to face the mirid and quickly assumed his waiting stance. In this posture, the grasping front legs are raised aloft sharply, with the femora almost vertical and the tibiae forward and subhorizontal, and the body elevated in front, lowered behind. When *Lygus* remained but a quarter inch away, the predator lunged forward and downward, but failed to make the catch. Resuming the alert stance at once, he waited until *Lygus* approached almost within reach of the fore legs, hence only a short dash was needed to secure the prey. Both front legs embraced the small captive, the stout spiny femora bearing down from above while the slender tibiae clamped upon it from below. The grip of the legs and the prompt penetration of the body by the stylets inactivated the victim at once. *Sinea* crawled about for several brief periods during the 26 minutes that elapsed between capture and relinquishing the empty skeleton of the prey. In the course of feeding, he radically changed the position of his captive 15 times, introducing the stylets at as many, and more, different points of the body, including head, pronotum, lateral and ventral surfaces of the thorax, the apex of a femur and all aspects of the abdomen,—the flexible beak being introduced beneath the wings from the side when the dorsum was pierced.

When quietly engaged in feeding, *Sinea* relaxed his leg hold on the prey in part or entirely, permitting it to dangle from the end of the stylets or rest lightly on the flower, but in shifting the mirid from one position to another, he seized it anew between femora and tibiae of both grasping legs. When crawling from place to place, he either gripped the prey with his legs or dragged it along, holding it by the recurved end of the stylets.

By contrast, the comparatively strong, large *Chauliognathus* resisted decreasingly with kicking legs, vibrating antennae and chewing movements of the mandibles for five minutes after capture. During the 5.3 hours that followed inactivation, the female *Sinea* continually held her prey with her fore legs and beak, and turned it at intervals, inserting the stylets principally at the relatively soft conjunctivae of the body regions and the abdominal segments. It is not possible to state whether or not the bug fed continuously during the hours she held the beetle.

Postmortem examination of the prey insects showed all fluids and liquefiable solids had been drawn out of *Lygus*, but the abdomen remained normally extended,—the strong ovipositor probably preventing contraction. However, the abdomen of *Chauliognathus* had telescoped forward visibly. The relinquished beetle weighed 0.0218 gram, as compared with 0.0430 gr. which represents the average of four normal, newly-etherized adults of the same species. Assuming that the beetle victimized by *Sinea* was average in weight, this predator sucked out approximately 0.0212 gr. of substance, or about half of the original body weight of the prey.

When seen preying in the field, *diadema* almost always stood on the top of plants,—usually on flowers, with the inert prey dangling from the stylets beyond the end of the labium. Flowers of all sizes and colors are utilized for hunting, the choice of plant probably being determined by the attractiveness of the flower to potential prey rather than by its color or form. Plants found inhabited included *Aster multiflorus*, *Achillea millefolium*, *Rudbeckia*, *Bidens* and *Solidago*.

Insect Prey of Diadema.

The prey data listed in table I below were garnered from published articles cited in the Review of Applied Entomology and the Bibliography of Economic Entomology. The 40 separate records given in table II were secured through the direct observations of the present writers under field conditions at Urbana, Illinois. We are pleased to acknowledge the help of specialists at the United States National Museum in the identification of predatory and prey species concerned here.

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Table I. Records from Literature.

PREY SPECIES	ORDER	FAMILY	STAGE	SOURCES
Anthonomus grandis Boh.	Coleoptera	Curculionidae	Adult	Morgan (1907)
Diabrotica vittata (Fabr.)	Coleoptera	Chrysomelidae	Adult	Chittenden (1919)
Leptinotarsa decemlineata (Say)	Coleoptera	Chrysomelidae	Adult	Chittenden (1907)
Lema nigrovittata Guer.	Coleoptera	Chrysomelidae	Larva	Blaisdell (1893)
"Cankerworms"	Lepidoptera	Geometridae	Larva	Lugger (1900)
"Cotton caterpillars"	Lepidoptera	——	Larva	Lugger (1900)
"Small caterpillars"	Lepidoptera	——	Larva	Ashmead (1895)
Laphygma frugiperda S. and A.	Lephidoptera	Noctuidae	Larva	Luginbill (1928)
Prodenia praefica Gr.	Lepidoptera	Noctuidae	Larva	Blanchard and Conger (1932)
Fenusa pumila Klug	Hymenoptera	Tenthredinidae	Adult	Friend (1933)
Caliroa cerasi L.	Hymenoptera	Tenthredinidae	Larva	Webster (1912)
"*Vespa diabolica*"	Hymenoptera	Vespidae	Adult	Asron (1929)
"Gall fly"	Hymenoptera	Cynipidae	Adult	Walsh (1863)
"Cotton aphides"	Homoptera	Aphididae	——	Ashmead (1895)

Bethune (1899) described an instance in which an Ontario boy was said to have suffered a "fatal bite" from *Sinea diadema.*

Table II. Original Records.

PREY SPECIES	ORDER	FAMILY	STAGE OF PREY	DATE OF RECORD	STAGE AND SEX OF PREYING *Sinea*
Chauliognathus pennsylvanicus (Deg.)	Coleoptera	Cantharidae	Adult	Sept. 16, 1938	Adult male
			Adult	Oct. 5, 1940	Adult female
Diabrotica 12-punctata (Fab.)	Coleoptera	Chrysomelidae	Adult	Oct. 5, 1940	Adult female
			Adult	Sept. 29, 1939	Adult male
			Adult	Sept. 29, 1939	Adult female
			Adult	Oct. 16, 1939	Female of coupled pair

			Adult	Sept. 21, 1940	Adult male
			Adult	Oct. 5, 1940	Female of mating pair
Diabrotica longicornis (Say)	Coleoptera	Chrysomelidae	Adult	Sept. 28, 1940	Adult male
—— ——	Lepidoptera	Geometridae	Larva, one inch long	1938	Adult male
Feltia ducens Wlk.	Lepidoptera	Noctuidae	Adult	Sept. 28, 1940	Adult male
—— ——	Lepidoptera	——	Small larva	Sept. 16, 1939	Adult male
Halictus pilosus Sm.	Hymenoptera	Halictidae	Adult	Sept. 19, 1939	Adult male
Halictus near *pilosus* Sm.			Adult	Sept. 13, 1939	Adult male
			Adult	Sept. 29, 1939	Adult male
Halictus sp.			Adult	Oct. 17, 1938	Adult male
			Adult	Sept. 29, 1939	Adult male
Undetermined bee	Hymenoptera	——	Adult	Sept. 29, 1939	Adult female
Odynerus anormis Say	Hymenoptera	Vespidae	Adult	Oct. 14, 1939	Adult male
Oxybelum emarginatum (Say)	Hymenoptera	Sphecidae	Adult	June 25, 1940	Adult male
Sphaerophoria cylindrica (Say)	Diptera	Syrphidae	Adult	June 25, 1940	Adult female
Toxomerus geminata (Say)	Diptera	Syrphidae	Adult	June 25, 1940	Female of coupled pair
Eristalis sp.	Diptera	Syrphidae	Adult	Oct. 16, 1939	Adult male and adult female of *Phymata pennsylvanica*

TABLE II. ORIGINAL RECORDS (Continued)

PREY SPECIES	ORDER	FAMILY	STAGE OF PREY	DATE OF RECORD	STAGE AND SEX OF PREYING *Sinea*
Hylemya cilicrura (Rond.)	Diptera	Anthomyidae	Adult	June 13, 1941	Nymph
? *Hippelates* spp.	Diptera	Titaniidae	Adult	June 28, 1941	Adult male
Eugnoriste occidentalis Coq.	Diptera	Fungivoridae	Adult	June 25, 1940	Third instar nymph
Harmostes reflexulus (Say)	Hemiptera	Corizidae	Adult	June 12, 1941	Adult female
Lygus oblineatus (Say)	Hemiptera	Miridae	Adult	Sept. 5, 1938	Adult female
			Adult	Sept. 6, 1938	Adult female
			Adult	Sept. 8, 1938	Adult
			Adult	Sept. 30, 1938	Adult female
			Adult	Oct. 9, 1938	Adult female
			Adult	Oct. 10, 1938	Adult female
			Adult	Oct. 11, 1938	Adult
			Adult	Sept. 5, 1939	Adult male
			Adult	Sept. 7, 1940	Fifth instar nymph
			Adult	Sept. 26, 1940	Adult male
			Adult	Oct. 21, 1940	Adult female
Adelphocoris rapidus (Say)	Hemiptera	Miridae	Adult	Sept. 23, 1939	Adult
			Adult	Sept. 25, 1939	Female of mating pair

SOME APPLICATIONS OF INSECT SEPARATION METHODS TO ENTOMOLOGY.

Kenton L. Harris,
U. S. Food and Drug Administration.

In some entomological studies there is a need for methods that will separate insects parts from media such as soil, manure, etc. Peterson (1934) figures several devices such as the Lathrop and Nickels (1932) apparatus for concentrating pupae. Blueberry work in New Jersey (Beckwith 1941) met with certain difficulties in measuring the amount of infestation and it is possible that additional methods for the removal of worms from the berries might have facilitated the investigation. Similarly, flotation or sedimentation procedures might be applied to toxicity studies of minute insects or mites. Hamilton (1941) counted the live and dead red spiders on rose leaves.

Berlese (1921) described an apparatus for the separation of small animals from soil. This "Berlese Funnel" uses an alcohol flotation in an especially constructed elongate tube. Shirck (1930) described "an apparatus for separating eggs and young larvae of wireworms from field samples of soil by washing . . ." which utilizes a water flow and a series of screens. Davidson and Swan (1933) floated insects from pasture soil and skimmed them off.

The multiple complications arising as the result of accumulated foods held under conditions where there is an insufficiency of proper storage facilities, and the infestation problems that will develop if the use of certain insecticides is further curtailed because of reallocation for the war effort, will certainly lead to further insect control investigations. These problems will be undertaken with reduced personnel and appropriations. Entomologists may, therefore, be interested in an approach to insect studies that has been developed somewhat outside of their immediate field.

Work by the U. S. Food and Drug Administration in enforcing the Food, Drug, and Cosmetic Act has demonstrated that rather unusual methods may be employed to remove insects and insect parts from various food substances as a preliminary to their quantitative estimation. Tests have indicated that it is mechanically practical to remove small insects to a filter paper and if it is unnecessary to know whether the insects are living or dead, it may be possible to make population studies in that manner.

For several years the U. S. Food and Drug Administration has used mechanical screening, flotation, sedimentation, and solubility methods to remove insects from foods and drugs. Descriptions of the insect and rodent filth methods usually have

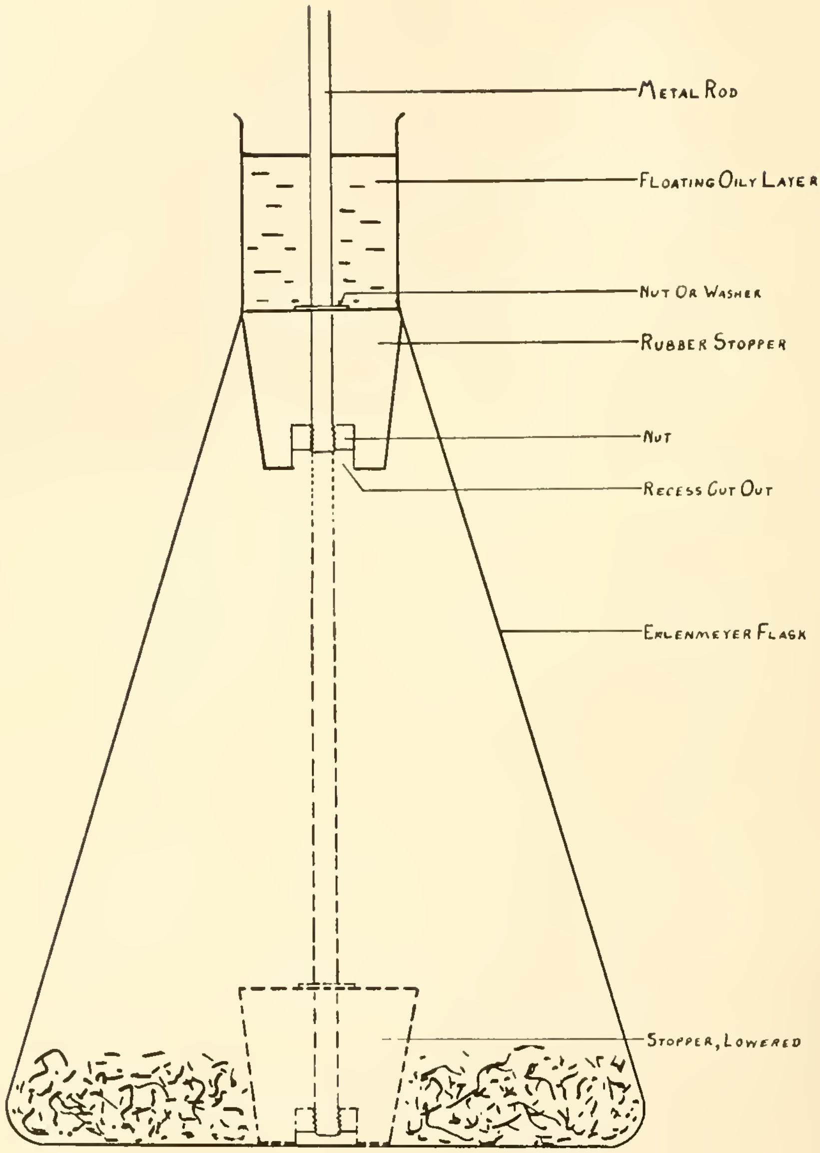

Figure 1. Wildman Trap Flask.

been mimeographed (U. S. Food and Drug Administration mimeographs) for distribution to parties interested in food examination. These methods utilize various procedures but usually are based upon one or more of three basic principles. (1) Solubility of the food or drug and insolubility of the insects. (2) Preferential wetting of insects or insect fragments by oily liquids whereby they acquire a lighter specific gravity which allows their separation by flotation methods. (3) Selective sedimentation in water or heavier-than-water liquids.

Some of these methods have been published (Wildman, 1932; Greene, 1935; Howard, 1935, 1937; Harris, 1941.) They have been used principally by food chemists and processors who are interested in the food purity situation. To a limited extent entomologists have utilized them as adjuncts to entomological surveys, as means of counting insects during control studies, or in life history work.

Many of the methods are based upon the use of a Wildman trap flask (Howard, 1937). This flask (see Figure 1) was devised by Mr. J. D. Wildman of the Microanalytical Division of the Food and Drug Administration for use in concentrating and recovering insect parts floating on liquids. It consists of a 1-liter or 2-liter Erlenmeyer flask into which is inserted a close-fitting rubber stopper supported on a stiff brass rod of 5/32″ to 6/32″ diameter and about 3″ longer than the depth of the flask. A rod of greater diameter is not desirable because of its greater displacement of liquid. The rod is threaded at the lower end and furnished with nuts and washers to hold the stopper in place. The lower nut and washer must be countersunk in the rubber to prevent the nut from striking the bottom of the flask. For some products (e. g., tomato products) a 2-liter flask is used, while for others (e. g., corn meal) the 1-liter size is preferred. In use, the food is put in the flask, water or other suitable liquid added, an oily liquid poured in and the mixture stirred with the rod. When the mixing is complete, water is added until the oily layer and some of the water rises into the neck of the flask. The insects are carried to the top and by raising the stopper the insect-bearing oil layer may be trapped off and decanted.

The best liquids to use in a Wildman flask for separation of insects and their remains from food or other substances depends on the character of the material being tested. Insects and insect fragments are often lighter than cereals and sometimes may be floated out in heavier-than-water liquids while the plant tissue settles out. Usually, however, they are extracted by a different procedure. With the exception of fly larvae, or maggots, insects and insect fragments can be wet with oils mixed into an aqueous mixture of a food and so floated up to the surface with the oil. In practice, because of several factors, this separation may be incomplete. It is difficult to wet all the insect material without creating a frothy emulsion of the plant material that will obscure a subsequent examination. Fragments may become trapped in or attached to a mass of plant material settling out. Droplets of oil often adhere to the sides of the trap flask and may hold insects there and so keep them from rising. To reduce some of these effects, the oil or gasoline is worked thoroughly into the water-cereal mixture, but with no "whipping" and as little inclusion of air as possible. Intermittent agitation is provided while the separation is taking place.

Some products cannot be extracted in water because too much of the food may rise with the "light filth." This rise of the food sometimes may be due to differences in specific gravity of parts of the food and the water, but often is caused by the formation of persistent emulsions, or by surface reactions that permit the food to be wet by an oil. To reduce floury emulsions, the extractions can be made in saturated salt solution. Sometimes caprylic alcohol or 95% ethyl alcohol can be used to break an emulsion. In general, when much bran or chaff is present it will float up with the oil when water or saturated salt solution is used and it is advisable to substitute a water-ethanol solution. (For some cereals a water-isopropyl alcohol solution may be used.) The alcohol not only soaks into bran but it is also less dense so that less plant tissue floats. Material trapped off in one Wildman trap may be transferred to another trap and re-washed to remove some of the plant material, or it may be transferred directly to a rapid-acting filter paper in a Buchner funnel where the liquid can be sucked off.

F lter papers can be so treated as to make the microscopic examination of the material deposited on them as simple as possible. Flour and bran can be cleared with mineral oil or chloral hydrate rendering insect fragments or excreta more readily visible. If mineral oil is used, the material on the filter must be air dried before the oil is added. Mineral oil is well suited to the microscopic examination of insects and insect fragments. If an excessive amount of starchy material is present, the paper may be completely cleared by gelatinizing it with chloral hydrate. The chloral leaves the pellet fragments soft but is extremely noxious to work with. It can be washed out of the filter after the clearing is complete and before the microscopic examination is made.

In order to facilitate quantitative determinations the filter paper can be ruled in fine parallel lines 6 mm. apart before it is used. The lines can be applied conveniently by means of a rubber stamp and pad. Waterproof India ink makes a permanent non-spreading line. If the filter paper is not ruled, it is necessary to place a wire grid over the paper to mark it off into smaller areas.

The ramifications and adaptations of these methods may prove to be limitless. Thus, by modifying the method for the recovery of insect fragments from tomato products (Howard, 1938 mimeograph), Smith (1942 mimeograph) found that he could float most of the tomato tissue and so recover any maggots and fly eggs by sedimentation. Smith (1942) by the use of castor oil in place of gasoline for the caterpillar separation obtained completely satisfactory results and secured residues freer from plant cellular material.

Welch (1940) described a radically different apparatus and reported that insect larvae could be separated from pecan pieces mechanically by means of a machine containing a moving inclined belt of ordinary window screen of about 16 mesh. The infested pecans are fed into the middle of the belt. The rough edged pecans move up with the belt but the worms roll down.

Blumberg (1939) has reported on and devised several procedures to determine insects in foods and drugs. He mentions work by Spicer and Price (1938) in which sodium citrate was used to dissolve cheese; Wilder and Joslyn (1937) on insects in tomato products; Butcher (1934) on flour contamination; and others. Blumberg's (1939) findings involve a sifting and digestion method of finding insect eggs, also a flotation method for insect eggs which uses a special separatory funnel, and the use of clove oil for insect excreta.

In one joint survey which included the Bureau of Entomology and Plant Quarantine, Bureau of Plant Industry, Food and Drug Administration, and others (Cotton, et al, 1941) the flotation tests and the flour-oil test were employed to determine the presence of insect contamination in flour.

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A NEW SPECIES OF CUTEREBRA FROM KANSAS. (*Diptera: Cuterebridae.*)

By David G. Hall,

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

The warble fly described below is a parasite of *Neotoma flavidianus osagensis* Blaiv. in the Vicinity of Fall River, Kans. It was first recovered by C. W. Hibbard, Department of Zoology, University of Kansas, Lawrence, Kans., who sent specimens to me for identification. It was later reared in some numbers by my friend R. H. Beamer, of the same institution. Because Dr. Beamer has a paper in preparation which describes the habits of this fly, it is necessary to publish the following description in advance of a larger work on the North American botflies which has been in the course of preparation for the past several years.

Cuterebra beameri, new species.

A medium-sized black species with infuscate wings.

Male.—Head black; vestiture black; frons three-fifths as wide as one eye; parafrontale and parafaciale with numerous minute punctures;

parafaciale wide; parafrontale and parafaciale with five small yellowish golden spots on eye margin, the former with an additional small spot on the inner anterior margin; faciale mostly pitchy black; bucca behind the metacephalon golden with golden hair.

Thorax brownish black; dorsum with short black hair, laterally with longer yellowish-golden hair; pleuron with golden hair.

Wings deeply infuscate.

Legs black, tarsal segments expanded.

Abdomen brownish black, laterally yellowish golden with circular dark markings.

Female.—Similar to male; frons one-fifth wider than one eye; yellowish spots on parafrontale and parafaciale smaller; thorax without yellowish hair laterally; abdomen with yellowish lateral spots smaller.

Holotype.—Male, in the University of Kansas collections.
Paratypes.—One male and one female, in the above collections.
Type locality.—Fall River, Kans.

NOTICE TO AUTHORS AND READERS.

If authors desire to receive the cuts used in illustration of their articles they should request them within a year after publication. Present needs for the metals used in these cuts make it necessary to discard them promptly if they are not used. Authors desiring cuts used before 1942 should request them within the next few weeks.

We hope to have Memoir No. 2 available within the next month or two. It will be by Dr. A. G. Böving and will treat of classification of larval Phyllophaga, or well known white grubs. As such, it will be of importance to economic as well as general entomology. The cost will be in the neighborhood of three dollars.

MINUTES OF THE 532ND REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON, DECEMBER 3, 1942.

The 532nd regular meeting of the Society was held at 8 P. M., Thursday, December 3, 1942 in Room 43 of the National Museum. President Cory presided and 25 members and 6 visitors attended. The minutes of the previous meeting were read and approved.

Frank E. Todd, Bureau of Entomology and Plant Quarantine, Beltsville, Md., was unanimously elected to membership in the Society.

President Cory brought to the attention of the Society the cancellation of the usual Christmas Meetings of the two national entomological societies. Cancellation, or at least postponement, was considered advisable in the best interests of the war effort.

The annual report of the treasurer was presented by Hahn W. Capps. It was voted to accept the report as read.

The annual report of the corresponding secretary was presented by F. M. Wadley. This report was accepted as read, and votes of thanks extended to Capps and Wadley.

H. H. Richardson, as a member of the nominating committee, presented the following nominations for officers for the calendar year 1943:

Honorary President.......................L. O. Howard
President..............................R. W. Harned
First Vice-President.....................P. N. Annand
Second Vice-President...................F. W. Poos
Recording Secretary.....................W. H. Anderson
Corresponding Secretary.................F. M. Wadley
Treasurer..............................G. J. Haeussler
Editor.................................Alan Stone
Executive Committee....C. F. W. Muesebeck, H. E. Ewing, E. N. Cory
To represent the Society as Vice-President of the Washington Academy of Sciences..................Austin H. Clark

No additional nominations were forthcoming from the floor. The secretary was instructed to cast a unanimous ballot for the officers as nominated.

Several notes were presented as follows:

L. B. Reed spoke of the finding of thrips in canned tomatoes. The thrips probably get into the tomatoes, on the vines, through cracks which are sometimes formed during ripening. The tomato may then heal over and the thrips are imprisoned. It was considered most unlikely that the thrips are able to enter sound fruit.

D. J. Caffrey exhibited seed pods of false indigo, *Amorpha fructicosa* from the southwest which had been heavily infested by the bruchid, *Acanthoscelides horni Pic.* The seed pods are being considered as a possible source of rotenone.

E. A. Back showed pieces of board which had been heavily tunneled by larvae of *Dermestes lardarius* L. The boards had been removed from a house near a button factory. The larvae had migrated to the house after feeding n the hoof storages and entered the boards to pupate.

W. H. Anderson presented a note, for E. R. Sasscer, on some remarkably adorned specimens of *Megazopherus chiliensis* Gray. These tenbrionid beetles, measuring nearly an inch and a half in length, are "dressed up" while alive, by gluing to the dorsal surface of thorax and abdomen pieces of brightly colored cloth. They are then tied to the front of ladies dresses by thread and worn as ornaments, apparently crawling about.

C. B. Philip commended on a northern record for distribution of *Anopheles quadrimaculatus* Say.

B. A. Porter reported that the Oriental fruit moth has been found in southern California.

The regular program consisted of two talks by members of the Bureau of Entomology and Plant Quarantine.

1. The action of bean leaves against the bedbug. By H. H. Richardson.

Bean foliage had been reported as attractive to bed bugs and at the same time toxic or stupefying. Experiments proved that about its only attraction was as a place to hide. Furthermore its toxic effect was in reality a mechanical one. The fine but strong, hooked hairs on the foliage caught the bugs and prevented them from escaping. (Secretary's abstract.) This talk was commented on by Smith, Fracker, Jones, Philip, Wadley, Caffrey and McConnell.

2. Statistical methods as an aid in taxonomy. By F. M. Wadley.

In taxonomic studies, two types of characters are utilized, qualitative and quantitative. In the first type statistics plays no part unless to indicate proper sampling methods. In the interpretation of quantitative characters, statistical methods are often of considerable value. At times a simple ratio will provide a significant difference between closely related forms. Often, however, it may be necessary to utilize more than one ratio, involving more complex calculations, to arrive at the desired result. (Secretary's abstract.) This talk was commented on by Fracker, Philip and McGovran.

Adjournment at 9:50 P. M.

William H. Anderson,
Recording Secretary.

Actual date of publication, January 30, 1943.

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

Double numbers: (per double no.) .50

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F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
Washington, D. C.

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VOL. 45 February, 1943 No. 2

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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First Vice-President . . . . P. N. ANNAND
Second Vice-President . . . . F. W. POOS
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Nominated to represent the Society as Vice-President of the Washington Academy of Sciences . . . . AUSTIN H. CLARK

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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 Corresponding Secretary and Treasurer should be addressed similarly.

PROCEEDINGS OF THE

Entomological Society of Washington

VOL. 45 FEBRUARY, 1943 No. 2

DESCRIPTION AND BIONOMICS OF CAECILIUS MANTERI N. SP. (Corrodentia).[1]

By Kathryn M. Sommerman,[2]
Illinois Natural History Survey, Urbana, Ill.

During a study of the bionomics of some corn (maize) stalk-infesting Corrodentia two species of *Caecilius* have been taken, both of which appear to be new. One of these, *Caecilius manteri*, is the tenth species in this genus to be recorded from the United States. It has been taken from Mt. Carmel, Conn., and Glen Ellyn, Ill.

DESCRIPTION

Caecilius manteri, n. sp.

According to the characters mentioned by Chapman (2) and Aaron (1), this species resembles *Caecilius subflavus* Aaron in size, paleness, general uniform wing color, and the usual absence of hairs on the postcubital vein. It differs from *subflavus* in color intensity, being darker, and in color pattern of the head and wing veins.

C. manteri is most easily recognized by its small size, buff color, golden brown eyes, fuscous lateral stripe, and tan forewings with veins brown in the distal two-fifths.

Female.—(Figs. 3, 4). The range of measurements of ten specimens is as follows: total length 2.07 mm. to 2.88 mm., head width 0.495 mm. to 0.549 mm., antennal length 1.647 mm. to 1.962 mm., and forewing length 1.665 mm. to 2.205 mm.

Head: Vertex clouded with light brown behind ocelli; front light brown; ocelli pale; ocellar interval light brown; clypeus faintly lineated with eight

[1] Contribution No. 228 from the Entomological Laboratories of the University of Illinois. This paper was included as a part of a thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science in Entomology in the Graduate School of the University of Illinois, 1941.

[2] I wish to express my appreciation of the suggestions made by Professors C. L. Metcalf and W. V. Balduf during this work. Thanks are also due Dr. A. B. Gurney of the U. S. Bureau of Entomology and Plant Quarantine, Dr. E. T. Cresson, Jr., of the Philadelphia Academy of Natural Sciences, and Mr. Nathan Banks of the Museum of Comparative Zoology, Harvard University, for their comparisons of *Caecilius manteri n. sp.* with closely related species.

or ten mesally directed brown bands fading anteriorly; labrum tan; fuscous band from anterior margin of eye above base of antenna to clypeus, and from rear margin of eye posteriorly. Length of thirteen antennal segments in the following proportions: 1 : 1 : 4 : 2.8 : 2.5 : 2.4 : 1.7 : 1.7 : 1.6 : 1.6 : 1.3 : 1.3 : 1.8; first three and a half pale, others brown, darkest at tip. Maxillary palpus light tan, dark at tip; fork of lacinia almost obscure. Paraglossae pale. Eyes orange brown in living specimens, black in alcoholic.

Thorax: Irregular fuscous band along pleura, across episternum and epimeron of prothorax, following dorsal margin of anepisternum of pterothoracic segments to abdomen; anterior surface of middle lobe of mesothoracic scutum brown, dorsal part of lateral lobes of mesothoracic scutum light brown; scutoscutellar suture very prominent on mesoscutum; lateral lobes of mesothoracic scutum light brown, pleura and sterna buff, tinged with tan; ventrally mesothoracic katepisterna orange brown. Legs pale, anterior tibiae darkest brown, second segment of tarsus darker than first, claws dark brown. Forewing tan, slightly darker toward base, first vanal cell darkest; veins brown in distal two-fifths, hyaline in basal three-fifths; stigma opaque, hairy. Hind wings almost hyaline.

Abdomen: Pale buff with infuscate dorso–lateral stripe. Genitalia (Fig. 5) colorless; subgenital plate (Sg. P.) not greatly modified, apex bluntly pointed and non-pilose. Gonapophyses (G.) consist of two pairs of slender, sharp-pointed parallel blades, similar to those of *Caecilius posticus* Banks as figured by Chapman (2). Distal half of lateral sclerites of tenth tergum covered with setae. Sensory tubercles (S. T.) light brown, covered with long delicate setae. Suranal plate (Sa. P.) pilose, with two longer setae distally.

Male.—Not known.

Type locality.—Mt. Carmel, Connecticut.

Holotype.—Female, Ill. State Nat. Hist. Surv., Urbana, Ill.

Paratypes.—Two females, Ill. State Nat. Hist. Surv., Urbana, Ill. Three females, U. S. Nat. Mus., Washington, D. C. Three females, Mus. of Comp. Zool., Harvard Univ., Cambridge, Mass. Three females, author's collection.

This species is named in honor of my former teacher, Professor J. A. Manter of the Department of Zoology, University of Connecticut.

Anomalies in wing venation were observed chiefly in the cubital and median veins. In Figure 13, M_2 and M_{3+4} are fused at the base. In Figure 14 there is a cross-vein between R—M and Cu, and in Figure 15 M_{3+4} is absent. Some of these peculiarities occurred on both forewings. A few specimens had one or two setae on the postcubital vein, as in *Caecilius croesus* Chapman, but in the majority this vein was bare.

BIONOMICS.

From the original group of six eggs collected on the inner surface of a corn sheath December 30, 1939, five nymphs hatched and four matured. These were females and all the adults raised under laboratory conditions, from the F_1 through the F_6 generation, likewise were females. It is evident that parthenogenesis exists in this species; so males probably do not occur. Of the thirty-five United States species belonging to this family, this is one of eleven in which only the female is known, and of the ten species included in this genus it is the only one known to be parthenogenetic.

Oviposition.—Egg laying started from one to three days after moulting to the adult and continued one to three weeks. Usually a small number of eggs was laid the first time, and likewise the number dwindled as the end of the oviposition period approached. The eggs were laid in groups from one to eleven, but most commonly in masses of four, five, seven or eight. Although the females seemed to prefer the surface of the corn, eggs sometimes were laid on the glass of the cages. The number of egg masses per individual ranged from one to twenty. Sometimes two masses were laid in one day. The maximum number of eggs deposited by any one individual was ninety-five. Death occurred from one to three days after oviposition ceased.

Eggs were deposited one at a time with an interval between, during which the female nibbled about on the sheath, returning often to the previously laid eggs. Finally the abdomen was pressed down beside the other eggs for a few seconds, and when it was raised the egg remained. After the last egg had been laid the process of covering the mass with silk began. The female touched her labium to the sheath here and there, then over the eggs, back and forth continuously, until the mass was covered with a delicate sheet of densely laid strands. The two individuals observed, worked in general, from the circumference of the mass in toward the center. It required fifteen minutes for one female to cover a mass of eight eggs, and ten minutes for the other to cover a group of four. Rarely were masses found lacking the sheet of silk.

Egg Stage.—The eggs (Fig. 1) are oblong with rounded ends and slightly curved sides. The surface is smooth and shiny. Measurements of fifteen eggs chosen at random averaged 0.418 mm. in length and 0.181 mm. in width. The eggs were white when first laid, but after thirty-six hours or so the vitelline membrane turned an iridescent bluish-brown dorsally. There remained at the anterior end an irregular U-shaped, light colored area. Some eggs about twenty-four hours old, still almost white, seemed to darken immediately while under the microscope light. The only external signs of embryonic development were the darkening of the vitelline membrane and the appearance of the dark eyes of the embryo through the chorion on the fifth day. Of fifteen egg masses, six hatched on the sixth day, two partly on the sixth and partly on the seventh, and seven on the seventh.

Hatching.—The U-shaped, light colored area at the dorso-anterior end of the egg widened. The chorion and vitelline membrane split and in a minute the head of the pronymph was seen coming out. The egg burster (Fig. 2) is borne on the front of the head inside the membrane surrounding the nymph. This differs from the reports of Wachter (7) and Peyerimhoff (4) who state that the egg burster ruptures the chorion, and that the vitelline membrane is broken by internal pressure, which implies that the egg burster is on the outside of the vitelline membrane. Observations during this work indicate that the chorion and vitelline membrane break first, probably due to internal pressure, and the embryo surrounded by the intact pronymphal membrane emerges. The egg burster is wishbone-shaped and each arm contains twelve or thirteen teeth. The front of the head appeared to be pulsating and when viewed from the side the pronymphal membrane could be seen stretched tightly across the burster. Then the eye facets showed distinctly, also the pubescence on the front of the head, indicating the sudden casting of the pronymphal membrane. Five minutes later bubbles of air were seen passing along inside the head. When the nymph was about three-quarters of the way out a continuous stream of bubbles appeared to be going down the oesophagous. The legs and antennae were finally freed from the pronymphal membrane in thirteen minutes from the time hatching started. This was brought about by the process of body inflation, aided by a forward and backward swaying of the body. The nymph remained quietly in a vertical position for a minute then bent over, freeing the tip of the abdomen. It remained practically motionless and no more bubbles could be seen passing within. The large bubble inside extended into the abdomen about three-quarters of its length. At this time the nymph was long and narrow, longer than the egg. Slight abdominal movements followed, after which the large bubble extended into the head as far as the posterior margin of the eyes. Within twenty minutes the abdomen had contracted until it was shorter than the rest of the body, but it lengthened again after feeding. The pronymphal exuviae bearing the egg burster always remained partly extruded from the chorion.

Postembryonic Development.—The first instar nymph (Fig. 7) is buff with an indication of a lateral fuscous stripe extending from the rear margin of the black eyes to the abdomen. The antennae are eight-segmented. Feeding commenced shortly after hatching. The first instar period required 3.4 days.

The second instar nymph (Fig. 8) is similar to the first in color, but the lateral fuscous stripe is more pronounced and appears, in addition, from the eyes to the antennae. The antennae are twelve or thirteen-segmented. The division of the third segment is not so distinct as the others. Apparently the third (?), fourth, fifth, sixth and seventh antennal segments of the first instar nymph give rise to two segments each. The second instar period required 3.3 days.

The third instar nymph (Fig. 9) is similar to the second, but the lateral fuscous stripe is more pronounced, the eyes are lighter in color, and there is a tendency in some specimens toward a cloudiness along the abdomen. The wing pads appear for the first time in this instar. The third instar period required 2.9 days.

The fourth instar nymph (Fig. 10), fifth (Fig. 11) and sixth (Fig. 12) are similar to the third in color pattern, and besides the general increase in size and the gradual change in eye color, there is little noticeable difference. The wing pads, which are thin in the early part of each instar period, become thicker as development progresses, and are very plump and project decidedly from the body the day before moulting. The wing pads about double their length with each moult. The fourth, fifth and sixth instar periods averaged 3.2, 3.0 and 3.9 days respectively. Averages of the measurements of eleven to fifteen specimens in each instar are given in the following table (Measurements in mm.):

Instar	*First* *mm.*	*Second* *mm.*	*Third* *mm.*	*Fourth* *mm.*	*Fifth* *mm.*	*Sixth* *mm.*
Head width	0.184	0.235	0.291	0.364	0.405	0.512
Antennal length	0.397	0.527	0.654	0.859	1.112	1.566
Forewing length			0.094	0.188	0.349	0.714

The complete nymphal period averaged 19.8 days, which undoubtedly varies with the amount of food available in the form of fungous growths; since the nymphal period of twenty-eight days was cut to nineteen when the pieces of corn sheath were changed every other day, instead of only two or three times during the nymphal period.

Immediately after the sixth moult the adult is light in color like the nymphs, but the eyes are a bright orange brown. Pigmentation proceeds rapidly, for within an hour, the lines on the clypeus show, and the distal part of the wing veins is dark. The adult period averaged 12 days, with the maximum being 26 days. The total of all the life stages averaged 38 days.

Moulting.—Judging from the grouping of the exuviae, in most cases there seemed to be a tendency for the nymph to return to the same spot when ready for the next moult. Almost all the exuviae were in a vertical position with the head down. The process of moulting was not observed for all instars, but required about five minutes for those observed. The epidermis split along the top of the head and thorax. The caeciliid arched up, with the antennae held down along the sides of the body. The head was finally freed and gradually the nymph rose up until it was actually resting on the end of the abdomen, although the tarsi of the exuviae were in contact with the substratum. When almost vertical the antennae were released, then the legs. During all this time air bubbles were being swallowed and the abdomen stretched out. After exercising the legs it bent over, freeing the tip of the abdomen, and stood beside the exuviae. After a short time the abdomen contracted to its normal length.

Habits.—Nymphs and adults were observed eating fungous hyphae that extended along the inside of the glass cage. They were at times observed attempting to feed on their own excrement, but the pellets were too large for them to chew. Occasionally exuviae could not be accounted for and may have been eaten, but the majority were not. This species must have depended almost entirely on fungus for food because it did not appear to feed on the eggs, exuviae, epidermis or mesophyll of the corn sheath. Silk webbing was deposited by all instars and adults, but it was hardly noticeable. In contrast to this, the eggs were covered with a very dense sheet of silk. This species reacted to moisture by giving a sudden start as if aware of the presence of water when the plugs were moistened, and presumably took moisture from the wet cotton plugs in the cages described by the writer, Sommerman (5). This is a delicate species, dying if the food was not changed often, or the cotton plugs in the cages kept moist. Because of this sensitivity colony cultures were not successful.

Overwintering.—There is a decided lack of field information concerning this species. The five egg masses taken during this study were found on the inner surface of the corn sheaths, about four or five feet up on the erect stalks. Four of these egg masses were collected March 14, 1941, in Glen Ellyn, Ill., by Miss A. Edmondson, and they all hatched and matured. Since the eggs collected in Mt. Carmel, Conn., on December 30, 1939, also hatched, and since adults were not found on the corn at either time, although those of *Ectopsocus pumilis* (Banks) were present, it seems possible that this species overwinters only in the egg stage. This is further suggested by collection and rearing data of *Caecilius aurantiacus* Hagen from the banks of the Middlefork River near Danville, Ill. Egg masses of *C. aurantiacus*, collected on fallen leaves of maple, cottonwood, willow and elm hatched in February and March when brought inside at that time, while others of *C. aurantiacus* that were left out of doors hatched April 8, 1940, and neither living nymphs nor adults were found throughout the winter.

Parasitism.—*Alaptus caecilii* Girault (Hym. Mymaridae) has been recorded from Florida from "psocid eggs," and from California from the eggs of *Caecilius aurantiacus* Hagen according to Girault (3), and from *Ectopsocus californicus* (Banks) according to Spruyt (6). The following record from Illinois suggests the possibility of continuous widespread distribution. Adults of *Alaptus caecilii*, determined by Mr. A. B. Gahan of the U. S. Bureau of Entomology and Plant Quarantine, emerged December 18 from eggs of *Caecilius aurantiacus* collected October 28, 1939. Two emerging adults of this parasite were timed and it required forty-eight and fifty-two minutes to chew a hole in the chorion through which to emerge. According to Spruyt (l. c.) a related species, *Alaptus psocidivorus* Gahan, emerges from the host egg by moistening the shell and pushing its way out. Eighty-five egg masses (799 eggs) of *C. aurantiacus* were collected in an hour on February 15, 1940, near Danville as mentioned above. These were left out of doors until March 7, then brought into the laboratory. They hatched March 13 and 14. Parasites emerged from the non-hatched eggs March 30. The nymphal stage of the caeciliid lasted about two weeks in the colony cultures; so it is obvious that these parasites emerge about the time the host is depositing eggs. It was interesting to note that on January 11 of the following year when a collection was made in the same place only one egg mass was found, from which caeciliids emerged in the spring. Either the parasites had been very successful in reducing the numbers of the host the previous year, or environmental conditions were not favorable.

Some freshly laid eggs of *C. manteri* were subjected to *Alaptus caecilii* adults that had emerged from the eggs of *C. aurantiacus* on April 5. Three days later the yolk of the caeciliid egg was moving. On April 9 motion still continued and on April 10 there was just an occasional pulsation. On April 11 two dark spots, probably the eyes (transmitted light) connected by a narrow band could be seen at one end of the egg, and at the other an apparently empty space. At this time no movement was observed. On April 17 there was still no movement, and on April 30 adult parasites emerged. Thus the period from oviposition to emergence required twenty-five days in this particular instance. In another case *C. manteri* eggs, lacking one day of hatching, were subjected to the parasites and it appeared as though oviposition had occurred, but the following day the nymphs hatched, apparently with no ill effects.

On March 16 another group of *Alaptus caecilii* adults emerged from the eggs of *C. aurantiacus;* and freshly laid eggs of *C. manteri* were exposed to them. Parasites emerged from these on April 2; so a new mass of *C. manteri* eggs was put in. Adult parasites emerged from this egg mass on April 17. The completion of two generations of parasites on the eggs of *C. manteri* in the laboratory suggests that the eggs might well be parasitized by this species under natural conditions. Thus in two cases the period from oviposition to emergence of *A. caecilii* was sixteen and fifteen days respectively.

Summary

Eggs of *Caecilius manteri* have been taken from corn stalks in Illinois and Connecticut. This species is parthenogenetic. The eggs are smooth-shelled and are laid in masses covered with a dense sheet of silk. Abundance of food in the form of fungus affects the maturing eggs, more being laid when food is plentiful. The egg burster, apparently on the inside of the pronymphal membrane, is used to puncture the latter, while the chorion and vitelline membrane are probably broken by internal pressure. The egg stage requires about six days. The nymphs swallow air bubbles at hatching and at moulting. The pronymphal membrane, with the egg burster attached, is always found protruding from the chorion after hatching. The antennae are eight-segmented in the first instar, twelve or thirteen-segmented in the second, and thirteen-segmented thereafter. Wing pads appear on the third instar and about double their length with each moult. During moulting the nymphs are in a vertical position with their heads down. The nymphal stage requires about nineteen days, and the adult stage lasts about twelve days. Thirty-eight days is the total time required for the three life stages, egg, nymph and adult. Silk is deposited by all nymphs and adults. The winter is probably spent in the egg stage. In the laboratory *C. manteri* has been successfully parasitized by *Alaptus caecilii* Girault, a parasite of *Caecilius aurantiacus* Hagen.

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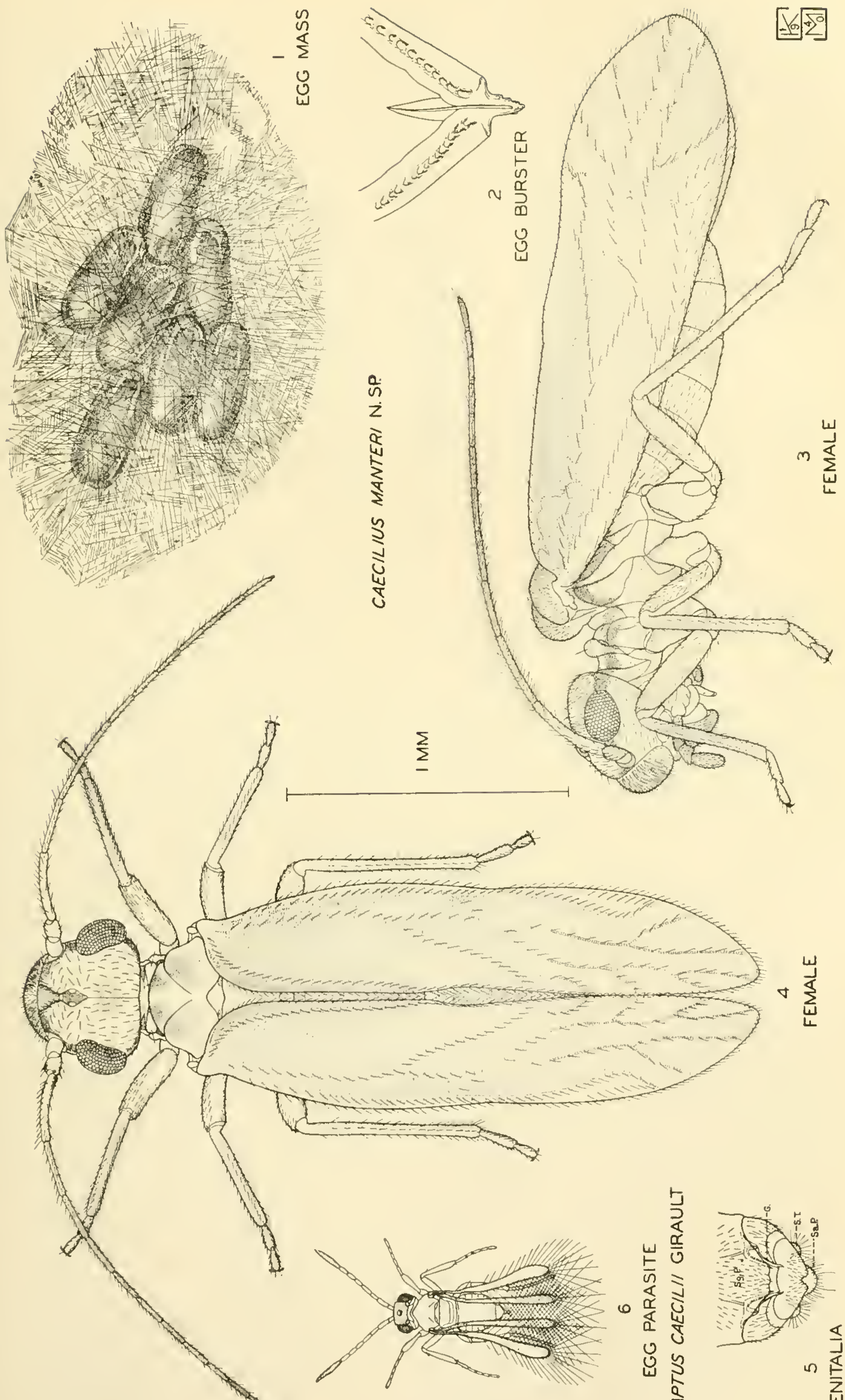
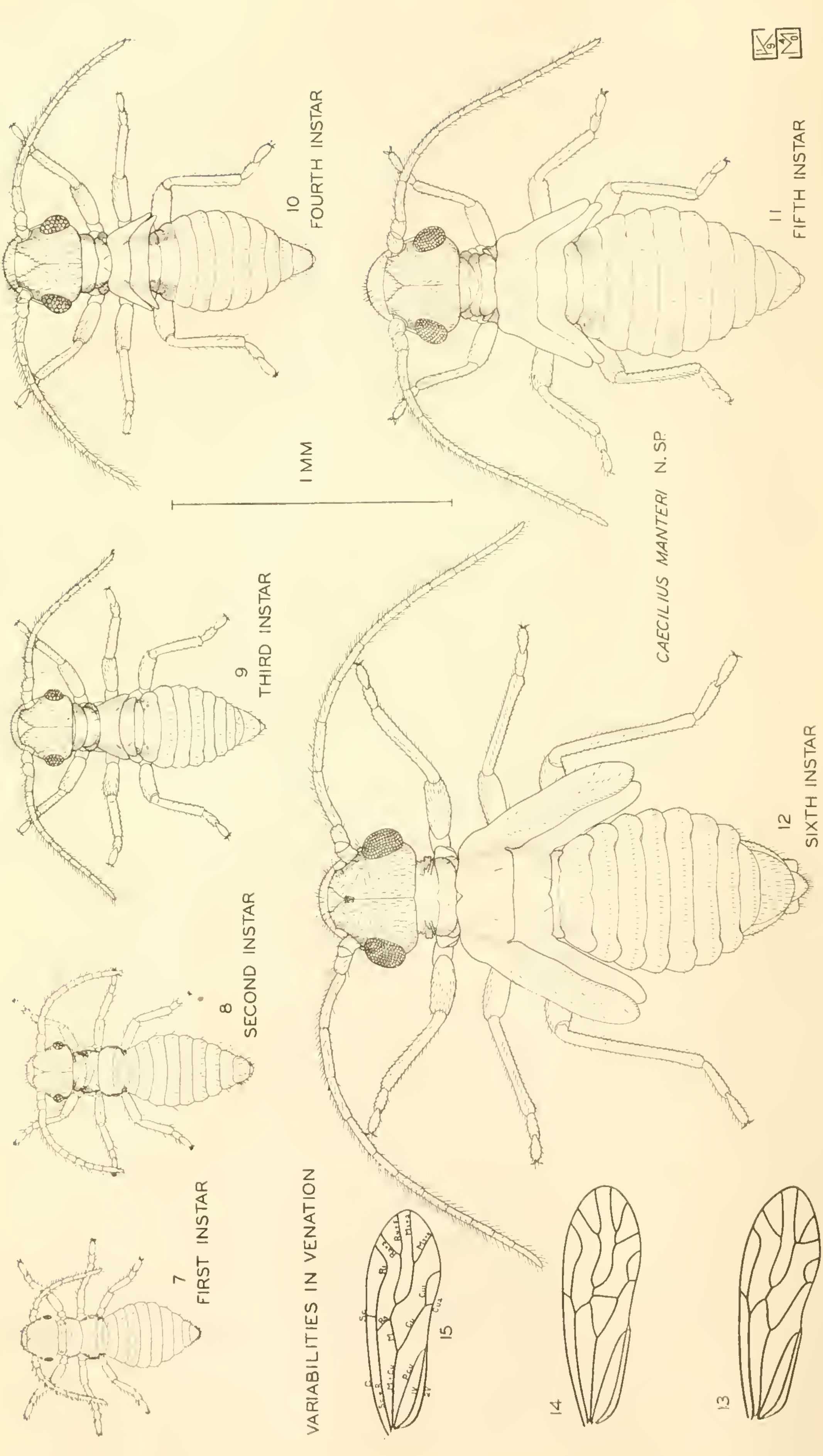

1 EGG MASS
2 EGG BURSTER
CAECILIUS MANTERI N. SP.
3 FEMALE
1 MM
4 FEMALE
6 EGG PARASITE
ALAPTUS CAECILII GIRAULT
5 GENITALIA


7
FIRST INSTAR
8
SECOND INSTAR
9
THIRD INSTAR
10
FOURTH INSTAR
1 MM
11
FIFTH INSTAR
CAECILIUS MANTERI N. SP.
12
SIXTH INSTAR
VARIABILITIES IN VENATION
15
14
13

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Explanation of Plates.

PLATE I.

Figure 1. Egg mass covered with silk sheet.
Figure 2. Tip of egg burster.
Figure 3. Female (lateral view).
Figure 4. Female (dorsal view).
Figure 5. Genitalia (ventral view), Sg. P. subgenital plate, G. gonapophyses, S. T. sensory tubercles, Sa. P. suranal plate.
Figure 6. Adult of *Alaptus caecilii* Girault (dorsal view of female).

PLATE II.

Figure 7. First instar.
Figure 8. Second instar.
Figure 9. Third instar.
Figure 10. Fourth instar.
Figure 11. Fifth instar.
Figure 12. Sixth instar.
Figures 13, 14, 15. Variability in wing venation.

A NEW SERICOTHRIPS ON ELM
(Thysanoptera: Thripidae).

By J. C. Crawford,

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

The leaves of elm have long been searched for Thysanoptera by Floyd Andre and by the author but without success. This year, however, Dr. Andre found adults and nymphs of *Sericothrips nubilipennis* Hood on the fully developed leaves, and at the same time the following new species was discovered in the unfolding young leaves.

Sericothrips andrei, new species.

Female (holotype).—Length (somewhat distended) 1.05 mm. Body dark brown with much suffused reddish internal pigmentation, femora almost as dark as body but much lighter colored basally and apically, tibiae yellowish white, each with a median light brown annulus (that on fore tibia rather faint in some specimens), tarsi yellowish white; antennae III–V light colored in basal portions, VI not pedicellate; forewing very dark gray brown, with 2 narrow, clear crossbands of about equal length, and with apex clear, the first clear band just beyond anal lobe and about as long as basal dark area, the second at middle of wing, about twice as long as the basal one (but in some specimens narrowed and somewhat darkened), the third dark band fading gradually into the hyaline wing tip; normally with 2 accessory bristles on forewing back of main vein (1 female paratype with a third accessory bristle on each forewing in the dark band beyond the basal one); hind wing gray brown and with a dark median longitudinal stripe; lines of microsetae on surface of wings dark brown; combs complete on terga VII–VIII but on VI, between the long lateral comb bristles, there are irregularly placed stubs of bristles, sometimes even in the middle of the tergum; on terga II–V no medial bristles on apical margins; body and wing bristles dark brown.

Head short, transverse, distinctly more than twice as broad as long; cheeks almost straight, very slightly converging caudad; a few faint transverse wrinkles just back of ocelli; fine, transverse, anastomosing lines at rear of head in front of, and back of, occipital carina; ocellar triangle elevated, with median ocellus directed somewhat forward; ocellar crescents dark red; anteocellar bristles long, strong, curved, and directed upwards; interocellars shorter and weaker than anteocellars, just back of and slightly farther apart than the width of median ocellus; eyes protruding; frontal costa with a wide U-shaped emargination; antennae I and II brown, with II lighter apically; III light brownish yellow, darkening to light brown beyond trichome; IV slightly darker, with most of apical half brown; V still darker, with apical half brown (in some specimens the light color of III–V is much more yellowish with V brown even basally and the differentiation in color between its basal and apical parts very slight); VI–VIII brown; III with a very narrow colorless white line just beyond pedicel.

Pronotum with anterior margin of blotch defined by an almost black line, within the blotch and cephalad of the anterior pair of smooth spots the transverse lines strong, close together, subparallel and very spasely anastomosing; back of this the transverse lines strong, much farther part, sparsely anastomosing; in front of the blotch the transverse lines still farther apart than those caudad within the blotch, broken or sparsely anastomosing; mesoscutum and scutellum with sculpture arranged as usual in the genus but very strong; costa with 25–26 bristles, fore vein with 3+15–16.

Abdomen with dorsal lines of dark-brown hair on terga I–VIII, on terga I–II these absent between the pair of discal bristles, on III–VI present basally between the discal bristles in successively increasing longitudinal areas; antecostal line on II–VII black, weaker medially on II–V.

Measurements (of holotype in microns): Head, length from occipital carina 62, total length 68, greatest width (across eyes) 152, least width 138; prothorax, median length 124, greatest width 172; pterothorax, median length 168, greatest width 232; hind tibia 192; ovipositor 228. Bristles, interocellar 26; inner postocular 24; inner bristle on dorsum of antenna II 38; posterior angular of pronotum 60; on tergum IX, subapical row of 4 pairs, inner to outer, 58, 38, 50, 36; lateral marginal 52; discals, inner 44, outer 49; on tergum X, both pairs, 68.

Antenna:	1	2	3	4	5	6	7	8
Length,	24	36	54	52	40	48	11	16

Male (allotype).—Length (somewhat distended) 0.85 mm. Very similar to female, except in secondary sexual characters but with the bases of femora almost white, and with the stubs of bristles forming the median section of the comb on tergum VI more apparent and regular, complete across margin; hair-bands medianly on basal segments less apparent; sternal sensory areas not apparent; costa with 24, fore vein with 3 (−4) +13 bristles.

Measurements (of allotype in microns): Head, median length 60, greatest width 140; prothorax, median length 100, greatest width 152; pterothorax, median length 148, greatest width 196; posterior angular bristles 46.

Antenna:	1	2	3	4	5	6	7	8
Length,	20	33	47	47	36	44	9	13

Type locality.—Falls Church, Va.

Host.—Unfolding young elm leaves.

Type.—Catalog No. 56482, United States National Museum.

Described from 12 females and 2 males taken as follows: 1 female, August 23; 1 female, August 25; 8 females and 1 male (including holotype and allotype), August 27; 1 female, September 1; 1 female and 1 male, September 2, 1942; Floyd Andre, collector.

The previously described dark-colored species of the Nearctic Region differ in part as follows: *Sericothrips baptisiae* Hood has the pronotum with only the blotch dark colored and normally it has two accessory wing bristles back of the main vein of the forewing, although in a series taken near Sunken Meadows (10 miles east of Huntington), Long Island, N. Y., September 11, 1935, on *Baptisia*, by W. S. Fields, almost every specimen has only one such bristle. *S. pulchellus* Hood, also with two accessory wing bristles, has the area within the pronotal blotch transversely striate but outside the blotch the surface is reticulate. *S. moultoni* Jones, with only one accessory wing bristle, has terga II–VI light brown contrasting strongly with the dark brown of terga VII–X. *S. langei* Moulton, with one accessory wing bristle, has the comb complete only on tergum VIII and antenna I–IV whitish yellow with I slightly brownish and V whitish yellow at base. *S. cingulatus* Hinds has terga IV–VI white and has no accessory wing bristles.

TWO NEW CHRYSOPS FROM CHINA
(Diptera: Tabanidae)

By L. L. Pechuman, *Medina, New York.*

The specimens on which these descriptions are based were found in some exotic *Chrysops* material sent to the writer by the United States National Museum. The courtesy of Dr. Alan Stone in making this material available for study is greatly appreciated.

Chrysops striatula, new species.

Female.—Length 9 mm. *Head:* Antennae slender; first and second segments yellow with black hairs; base of third segment brownish, flagellum black. Front dull yellow pollinose; frontal callosity black. Frontoclypeus shining yellow with a dark spot on each side. Cheeks yellow pollinose; frontal callosity black. Frontoclypeus shining yellow with a dark spot on each side. Cheeks yellow pollinose with a dark denuded area below. Palpi yellow. Proboscis fuscous.

Thorax: Dorsum black with two pale lines down the center and laterally above the wing base. Pleurae fuscous with a few yellow pollinose areas. Halteres brown. Legs mostly yellow; middle and hind coxae and apical tarsal segments black; posterior tibiae with long black hairs. Wing as figured; basal cells almost entirely hyaline; outer margin of the crossband nearly straight. The crossband does not reach the posterior margin of the wing; fourth posterior cell slightly more than half infuscated. Apical spot narrow, only slightly wider than the marginal cell, extending into the extreme apex of the second submarginal cell.

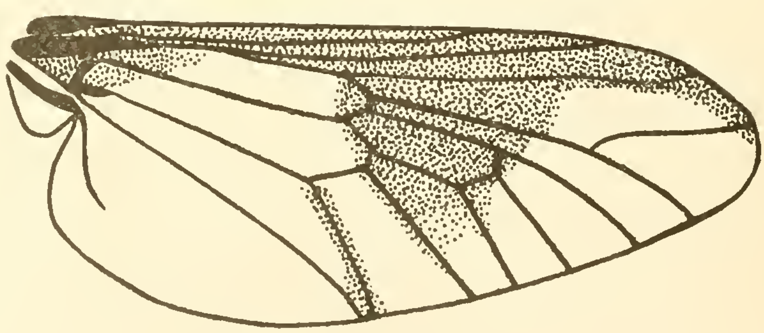

Fig. 1.—Wing of *Chrysops striatula*, n. sp. ♀

Abdomen: Predominantly yellow; first tergite without markings; a double black line begins about the center of the second tergite and extends the length of the abdomen; another black line, beginning on the third tergite and extending faintly on the second tergite, runs parallel with the double line near the lateral margins of each segment. Sternites yellow; a black line begins on the second sternite and runs to the end of the abdo-abdomen.

Male.—Length 9 mm. *Head:* First antennal segment yellow, second segment and base of third brownish-yellow, flagellum black. Frontoclypeus shining yellow-brown with a dark spot on each side. Cheeks yellow pollinose. Palpi slender, yellowish with dark hair. Proboscis fuscous.

Thorax: Markings as in female. Halteres fuscous. Legs predominantly yellow; middle and hind coxae, apical half of anterior tibia, anterior tarsi, and apical segments of middle and hind tarsi black; posterior tibiae with long black hairs. Wing pattern much like that of female, but first basal cell about half and second basal cell about one-quarter infuscated; fourth posterior cell wholly infuscated so apical spot reaches margin of wing.

Abdomen: Pattern much like that of female, but lateral stripes distinctly begin on the second tergite.

Type data.—Holotype female, Suifu, Szechuen, China, April 18, 1930 (D. C. Graham). Allotype male, Suifu, Szechuen, China, August (D. C. Graham). Four female and four male paratypes from Suifu and Chungking, collected in May and October are included in the series. The Chungking specimens are labeled "1–2000 ft.". Two damaged males and one damaged female are undoubtedly this species, but are not included in the paratype series. Holotype, allotype and four paratypes are in the collection of the United States National Museum. Two female and two male paratypes are in the collection of the writer.

There is no essential variation in any of the specimens studied. Some males show more intense black stripes than the allotype and in one specimen the stripes are fainter.

Chrysops striatula superficially resembles *C. mlokosiewiczi* Bigot and *C. vanderwulpi* Krober, but is easily separated by the infuscated discal cell.

Chrysops aenea, new species.

Female.—Length 9.5 mm. *Head:* Antennae black, rather stout; first two segments with long black hairs. Front dull orange-brown, thickly covered with pale hairs. Frontal callosity black. Frontoclypeus orange pollinose, covered with long pale hairs. There is a small dark denuded spot on each side of the frontoclypeus and two very small denuded spots directly above the margin of the mouth. Cheeks orange pollinose shading to fuscous below; a small denuded area is present on the lower part of each cheek. Palpi orange. Proboscis fuscous.

Thorax: Dorsum greenish black with golden hairs and faint indications of two yellow longitudinal stripes; a yellow stripe runs the length of the thorax directly above the base of the wing. Scutellum greenish black. Pleurae fuscous with golden hairs, partly yellow pollinose. Halteres black. Legs slender; all coxae and femora black; anterior femora with a reddish tinge; all tibiae and tarsi orange-brown with apex of anterior tibia and apical tarsal segments shading to fuscous. Wing as figured; wing membrane with a brownish tinge and wing picture not sharply defined; first basal cell about two-thirds and second basal cell about one-third infuscated; the crossband reaches the wing margin only along the vein separating the fifth posterior and anal cells; a narrow projection reaches from the crossband to the bend in the upper branch of the third longitudinal vein. The apical spot is practically separated from the crossband, crossing broadly over the upper branch of the third longitudinal vein but not extending very far into the second submarginal cell.

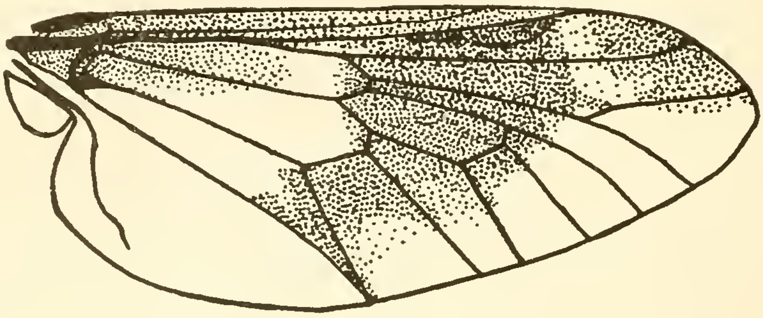

Fig. 2.—Wing of *Chrysops aenea*, n. sp. ♀

Abdomen: First four tergites predominantly orange; first tergite with two black separated spots partly concealed beneath the scutellum; second tergite with two similar spots arising from the anterior margin and extending three-quarters of the way to the posterior margin; third and fourth tergites similar to the second but the spots are smaller and in addition a small black spot lies on the lateral margin of each segment; fifth tergite with two more or less united black spots on each side, leaving an orange area between them and an orange posterior margin; sixth and seventh tergites black with an orange posterior margin. First four sternites orange with a fuscous spot in the center; remaining sternites fuscous with an orange posterior margin. Entire abdomen thickly clothed with golden hairs.

Type data.—Holotype female, Yellow Dragon Gorge near Songpan, Szechuen, China, 12,000—14,000 ft., 1924 (D. C. Graham). Three female paratypes bear the same data. Holotype and one paratype in the collection of the United States National Museum; two paratypes in the collection of the writer.

Chrysops aenea apparently is related to *C. pettigrewi* Ricardo and *C. semiignita* Krober, two other species found at high altitudes in the same general part of the world, but is easily distinguished. *C. pettigrewi* has completely black legs, completely infuscated fourth and fifth posterior cells, a quadrate spot on the first tergite and lacks black spots on the second tergite. *C. semiignita* has completely black legs, heavily infuscated basal and fourth posterior cells and has a solid or narrowly divided black band running the length of the abdomen.

A NEW RELATIONSHIP OF THE BURSA COPULATRIX TO THE FEMALE REPRODUCTIVE SYSTEM IN LEPIDOPTERA.

Joseph L. Williams, *Lincoln University, Pennsylvania.*

Introduction.

This work grew out of one of a series of investigations conducted with the hope of gaining some light on the relationship of monotreme to diplotreme Lepidoptera. The former group represents the primitive forms with one genital opening and the latter those with two genital openings. The author wishes to acknowlecge with thanks Dr. E. P. Darlington for supplying the material and to the officials of Hampton Institute in whose laboratory this investigation was done.

Materials and Methods.

The material consisted of pickled specimens of *Schoenobius forficellus* Thun. (=*longirostrellus* Clem.) that were killed and preserved in 70% alcohool. Pickled material of long standing is not at all satisfactory for making good dissections, but is considerably better than softened dried material. The most satisfactory material is that which is killed and dissected immediately in physiological salt solution. If specimens are allowed to remain exposed to the heat of a warm summer day for an hour or two they become more difficult to dissect. This difficulty can be prevented by keeping freshly killed specimens cool in a refrigerator or moist in a humidor. This particular material was dissected in 50% alcohol. The density of this solution allows the fragile material to settle to the bottom of the dissecting dish and is, therefore, easier to handle. Staining was in 70% alcoholic eosin and dehydration was continued up through 95% alcohol. Clearing was in xylene. This substance is not at all satisfactory as a clearing agent, since it causes the material to harden and shrink too much. Certain clearing oils as cedar-wood, etc., are better clearing agents than xylene for this bulky material.

It was found, although it may seem sloppy, that material partially cleared in xylene and which is covered over with balsam to prevent spoiling and allowed to remain in a dust proof container for several days is quite satisfactory. This method allows the water to escape through the chitin covering the eggs in the egg-tubes and from such bulky parts as the bursa copulatrix. It is difficult to extract the water from the ovaries of *Gastropacha quercifolia* L. and other large insects by any other method except forced drying with the aid of an electric heater. The drying time depends upon the bulkiness of the organs. Reproductive organs treated in this manner may remain indefinitely as long as they are covered sufficiently with balsam. At a convenient time more balsam is added and a suitable cover-glass is placed on, resting upon small pieces of broken glass to prevent crushing.

Observations.

The sac (D) may be bursal or spermathecal and is attached to the bursa proper by means of the short duct (E). This sac is definitely connected to the tube (C), which leads to the vagina. This condition was found to be true in several specimens dissected. Tube (C) is homologous to the spermathecal duct found in other Lepidoptera. The short extension (I), which may be the spermathecal gland extends free and above the attachment of tube (C) and sac (D). A narrow lumen was observed to extend from tube (C) into sac (D). The bursa copulatrix is also connected to the vagina by means of the seminal duct.

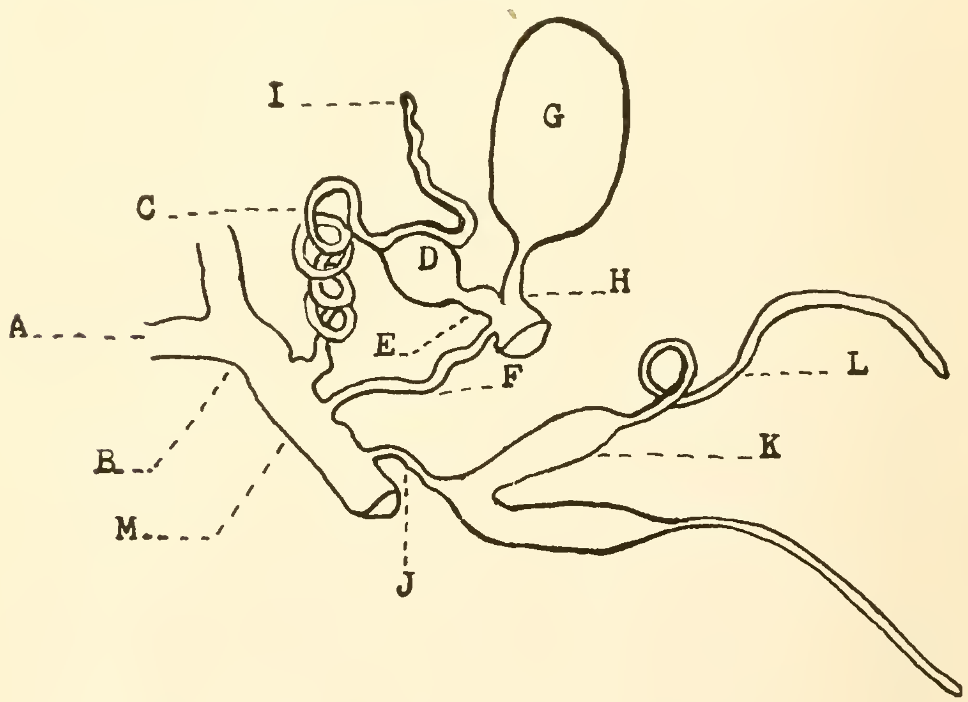

Fig. Female genitalia of *Schoenobius forficellus.*

Duct (E) is only about one-third as long as the seminal duct. The seminal duct of *S. forficellus* is homologous to that found in other diplotreme Lepidoptera. The reproductive organs were so cleared that the lumen in the lower bursal duct could be seen to bifurcate with branches leading to duct (E) and to the seminal duct.

Discussion.

This new relationship makes three types of bursal relationships in the reproductive systems of female Lepidoptera. The first of these is found in the primitive forms where the bursa copulatrix is joined directly to the vagina. Seminal fluid, therefore, must pass from the spermatophore, which is situated in the bursa copulatrix and through the bursal duct where it enters into the vagina. This fluid then passes from the vagina into the spermatheca. It seems peculiar that spermatozoa in the spermatheca should fertilize the eggs as they pass through the vagina when spermatozoa from the bursa copulatrix are able to get into the vagina. In other words it would seem that there should be no need for the spermatheca. However, fertilization takes place only with sperm from the spermatheca. Usually females are quiet for a period immediately after pairing and no doubt sperm are being transferred from the bursa copulatrix to the spermatheca during this quiet period. The author has observed the chitinous tubes of the seminal duct, vagina and spermathecal duct directly connected together in a partially disintegrated reproductive system of the European corn borer (*Pyrausta nubilalis*). There must be one or more valves through which the flow of sperm passing from the bursa copulatrix into the spermatheca and from the spermatheca into the vagina is regulated. The second type of bursal relationship in the female reproductive system is the connection of the bursa to the vagina by means of the seminal duct. In all females of this type the seminal duct joins the vagina, but its attachment to the bursa varies according to the species. The seminal duct may arise from the bursal duct as it does in *Catocala palaeogama* Gn. or it may arise from the junction of the bursal sac and bursal duct as it does in *C. amatrix* Hbn. or it may arise from the bursal sac as it does in *Scepsis fulvicollis* Hbn. Species belonging to this type have no connection between the bursa copulatrix and spermatheca. The third type, of course, is that reported in this paper.

There are three types of spermathecae found in Lepidoptera. The first type consists of a chamber with the spermathecal gland extending from it as that in *Utetheisa bella* L. The second type consists of a chamber with a sac extending from the lower part of the chamber by a short duct, which varies in length according to the species. An example of this type is found in *Arctia caja* L. The third type has no sac as that of the second type, but the spermathecal duct expands into a cavity near the vagina. This last type is found in *Drepanulatrix liberaria* Wlk. The spermatheca of *S. forficellus* does not agree with either of the above types, since there is an uncertainty concerning sac (D). If sac (D) is spermathecal then the spermatheca of this species would agree with that in type one.

The reproductive system of higher Lepidoptera differs from that in other insects, since there are two genital openings. The first opening, through which pairing takes place, is situated on the middle of the 8th abdominal sternum. This opening is also homologous to that found in other insects except primitive Lepidoptera. In other insects except Lepidoptera it serves as a pairing and egg-laying orifice. In primitive Lepidoptera, for example yucca moths, this opening serves as an egg-laying, pairing and digestive outlet orifice. In diplotreme Lepidoptera eggs are laid through a second opening situated on the middle of the 9th sternum. Just why this is the case and to what advantage it is to these forms is a question. Comparative reproductive studies thus far fail to give any light on this subject. It would be easy if one could think of the monotremes as being the ancestors of the diplotreme group, but this is hardly true. Petersen has worked out the evolution of diplotremes from the monotremes and also show further changes in diplotremes towards the highest type based on the attachment of the seminal duct to the bursa copulatrix. He claims that the highest diplotreme has its seminal duct extending from the bursal sac as that in *S. fulvicollis*. He further states that the lowext diplotreme has its seminal duct attached to the lower bursal duct and that the degree of specialization depends upon the degree of elevation of the seminal duct, until it extends from the top of the bursal sac. Petersen states further that the seminal duct in the highest diplotreme is long with a small diameter and that an intermediate form has a short duct with a rather large diameter. He lists *Psyche unicolor* as an intermediate form. Petersen's reasoning is hardly sound, since the size and length of the seminal duct vary in the same family or even in the same genus. The length of the seminal duct varies considerably in species of the family Psychidae. The seminal duct of *S. forficellus* is rather short and extends from the lower bursal duct. The probable spermatheco-bursal duct is shorter than the seminal duct, but is of a larger diameter. Its anatomy makes it appear to be more important than the seminal duct. It is a difficult matter to classify this species as a high or low diplotreme, since it differs from anything else studied.

It has been suggested that the so-called bursa copula rix of monotremes is not homologous to that of diplotremes. If this is true it supports the statement of non ancestral relationship of monotremes to diplotremes. The only means by which a monotreme diplotreme relationship can be set up must be based upon the recto-genital cloaca. In yucca moths this cloaca is quite long and can be thought of as being primitive. Among some Psychids it is somewhat shorter and can be thought of as being intermediate. In the highest forms it is almost eliminated.

Summary.

There are two ducts connecting the bursa copulatrix with the other organs of the reproductive system in *Schoenobius forficellus*

Thun. (=*longirostrellus* Clem.). The first is the seminal duct, which is homologous to that found in other diplotreme Lepidoptera and the second may be a spermatheco-bursal duct, which is new. This therefore makes three types of bursal relationship to the rest of the female reproductive organs in Lepidoptera. The first type is found in the monotremes where the so-called bursa copulatrix joins directly to the vagina. The second type is found in those diplotremes where the bursa copulatrix is joined to the vagina only by the seminal duct. Present studies do not support a monotreme diplotreme ancestral relationship.

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Explanation of Figure.

A............Oviduct.
B............Median oviduct.
C............Spermathecal duct.
D............A probable bursal or spermathecal sac.
E............Duct between (D) and bursal duct.
F............Seminal duct.
G............Bursal sac (primary).

H............Bursal duct.
I............Probable spermathecal gland.
J............Duct of accessory reservoirs.
K............Accessory reservoirs.
L............Accessory glands.
M............Vagina.

TWO NEW SPECIES OF BACCHA (Diptera: Syrphidae).

By F. M. Hull, *University of Mississippi.*

In recent studies of Syrphid flies two new species of *Baccha* from the neotropical region were discovered. These species are described in this paper. The types are in the collection of Dr. C. L. Fluke, of the University of Wisconsin, whom I wish to thank for the loan of this material for study. The paratypes are in the author's collection.

Baccha phobifer, new species.

Distinguished by its alternating bands of yellow, shining black and opaque black. Related to *pirata* Curran.

Male. Length 10 mm. *Head:* Face and front yellow, unusually wide, the latter with a black spot on lunula, both with black pile and golden pollen Antennae orange, narrowly black above. Arista blackish. *Thorax:* greenish black with opalescent blue tints and a pair of close, short, ill-defined yellowish vittae. Pile yellow, opaque, with abundant long black pile and fringe. Pleurae yellow. *Abdomen:* with nearly parallel sides, a little wider at the end of the fourth segment, first segment shining brassy black, yellow on the sides and corners, second segment narrowly yellow basally on the sides widely shining black apically, the remainder opaque black with across its middle a narrow transverse yellow fascia. Third segment similar without the basal yellow fascia, the central yellow fascia a little before the middle of the segment and wider. Fourth segment like the third. Fifth segment like the fourth but shorter, the segment about as long as wide. *Legs:* brownish-yellow, whole of hind tibia and femur except its narrow base brownish-black, the hind tarsi dark brown. Middle femora brownish posteriorly. *Wings:* deeply tinged with brown throughout; alulae well developed.

Holotype: male. Puyo, Oriente, Ecuador, 1,250 meters, March 20, 1939, F. M. and H. H. Brown, collectors (Fluke collection).

Baccha (Mimocalla), phobia new species.

Related to *capitata* Loew. Face yellow, wings hyaline, only the costal and stigmal cells dark. Hind femora yellow. Mesonotum obscurely vittate.

Male. Length 13 mm. *Head:* face and cheeks and the upper part of front and its narrow lateral margin pale yellow. Remainder of the protuberant front brownish black, frontal and upper facial pile black. Lower face pile yellow. Lunula yellow with large black spot. Antenna brown, third joint black, lighter below. Arista pale, black tipped. Vertex shining black. Occiput yellow—with only yellow hair. *Thorax:* mesonotum black, dull with a pair of widely separated dull pale yellow pollinose vitta reaching most of the length and from the scutellum a short medial grey vitta. Humeri, a sublateral nota-pleural vitta, anterior end of postcallus and an extension of its pale yellow. Scutellum yellow, the disc transversely brownish, the pile short, black, setaceous. Fringe long and yellow. Mesonotal pile black and yellow and sparse. Pleurae orange brown, the posterior half of the meso, upper part of sterno, and lower metapleurae and all of propleurae yellow. *Abdomen:* elongate pedicellate. First segment dark brown with yellow pile laterally. Second about five times as long as wide, very little wider apically, widely yellow on the basal portion, gradually becoming brown then darker brown towards apex. Third segment with a wide basal yellow fascia postero-medially indented. Remainder of segment black. Fourth segment with a similar less wide basal fascia not indented. Fifth segment with narrow basal lateral small yellow obtuse triangles. The posterior margin of the segment reddish. *Legs:* egg yellow, the hind femur slightly darker and with a brownish sub-apical spot ventrally, the ventral and basolateral pile black, its dorsal and apico-lateral pile golden. Middle femur with a ventral black fringe, elsewhere the pile is golden. Hind coxae and trochanters dark brown with long tufts of black pile. *Wing:* hyaline the costal cell pale brown, the stigmal cell darker, alula well developed, the third vein with a characteristic dip and the subapical cross vein with a strong flexure on its basal half.

Holotype: male. Banos, Chaupi, Ecuador, April 26, 1937, W. Clark McIntyre, Paratype: male, same data.

REPORT OF THE TREASURER FOR THE YEAR 1942

GENERAL FUND.

RECEIPTS.

Cash on hand Jan. 1, 1942	$6.00
Cash on hand Jan. 1, 1942 (stamps)	3.80
*Cash on hand Jan. 1, 1942, in general fund deposited in Hamilton National Bank	459.08
From members, dues for 1942	441.00
dues in advance	13.10
back dues	105.00
initiation fees	11.00
balance credited to account deposited in advance for future publications	35.21
From subscribers, for subscription to Proceedings	484.65
From authors, separates and author's copies	90.50
for partial payment cost of printing	76.65
for entire cost of printing	73.56
for illustrations	14.44
From institutions, for author's separates	26.39
for cost of printing article	64.00
From sale of back numbers of Proceedings	22.85
From final dividend District National Bank (Claim number 2794)	81.94
From general publication fund for use in payment of cost of publishing Memoir number 2	300.00
Total receipts	$2,309.17

*Adjusted balance, including funds for uncashed check number 193 in amount of $16.00 issued November 13, 1940.

EXPENDITURES.

To H. L. & J. B. McQueen, Inc., for printing Proceedings (Nos. 1–8 or vol. 44) and separates	$1,306.70
To H. L. & J. B. McQueen, Inc., for printing programs of six meetings (524 to 529, inclusive)	16.50
To H. L. & J. B. McQueen, Inc., for 500 plain manila envelopes	8.50
To H. L. & J. B. McQueen, Inc., for 2,000 plain cards	2.50
To Southern Engraving Company, for engravings for the Proceedings	168.73
To Southern Engraving Company, for engravings for Memoir number 2	90.95
To A. A. A. Letter Service, for mimeographing programs of three meetings (530th to 532nd inc.)	5.25
For stationery	1.86
For stamps	23.29
Shipping charges, including express, second-class postage, parcel post and packing expenses	8.39
For clerical help, Office of corresponding secretary	49.00
For clerical help, Office of treasurer	14.00

For rental and tax on safe deposit box at City Bank.........	4.20
For refund to F. W. Faxon Company, for cancelled subscription.	4.00
Miscellaneous expenses..........................	5.65
Total expenditures..........................	$1,709.52
Stamps on hand received in lieu of cash during 1942.........	1.25
Cash on hand in Hamilton National Bank..................	592.64
Cash on hand undeposited..........................	5.76
	$2,309.17
**Outstanding obligations..........................	$228.50

**Includes liability of $16.00 to cover uncashed check No. 193.

PUBLICATION FUND

Schwarz donation, (principal $1000.00), invested with American Building Association (reported 1941)......	$1,536.60
Dividends earned 1941, credited 1942..............	61.44
Total in Schwarz donation fund........................	$1,598.04
Knab bequest, invested with Columbia Federal Savings and Loan Association, reported 1941....................	$ 787.39
Additional interest not recorded 1941..............	9.56
Interest 1942..................................	11.94
Deposited 1942..................................	150.00
Covered by non-interest bearing note..............	500.00
Total in Knab bequest..............................	$1,458.89
General publication fund in savings account with Hamilton National Bank January 1, 1942..................	$ 782.50
from sale of No. 1 Memoirs........................	15.70
from life membership fee..........................	40.00
from interest on savings account..................	8.05
	$ 846.25
withdrawn and deposited in checking account for Memoir No. 2..................................	300.00
Total in general publication fund......................	$ 546.25
Total amount of publication fund......................	$3,603.18

Respectfully submitted,

Hahn W. Capps, *Treasurer*

The Committee on Audit has examined the financial accounts of the Treasurer and found them to be correct for the year 1942.

Respectfully submitted, January 14, 1943

F. M. Wadley

G. J. Haeussler

Auditing Committee

REPORT OF CORRESPONDING SECRETARY, DEC. 1, 1941 TO NOV. 30, 1942.

War conditions have brought about several changes. Demand for literature is low and it seems unwise to push its sale at present. Post-war demand should be much better. Complaints noted last year of Proceedings lost en route to England, etc., seem to have ceased. Membership and subscription hold up well, but a number of subscriptions in Europe, Asia and Africa are of course suspended.

Letters written have totaled 64—a large number of matters such as address changes, orders, etc., have been attended to without the formality of a letter.

Proceedings acquired (Nov. numbers estimated)	876 nos.
Proceedings sold (including 4 not yet published)	58 nos.
Net gain in stock in 12 months	818 nos.
Sales of Proceedings, 58 nos.	$23.65
Reprints—5	1.25
Memoir No. 1—4	10.20

Members, 13 elected (9 meetings), 5 resigned, 3 died—net gain 5
Subscribers, 4 new, 1 dropped—net gain 3*
Members at present, 256; subscriptions 138.

Respectfully submitted,
F. M. WADLEY,
Corresponding Secretary

* Nine suspended in addition on account of the war, making the total suspensions on account of war 38.

MINUTES OF THE 533RD REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON JANUARY 7, 1943.

The 533rd regular meeting of the Society was held at 8 P. M., Thursday January 7, 1943 in Room 43 of the National Museum. President Harned presided and 32 members and 9 visitors attended. The minutes of the previous meeting were read and approved.

The following note and resolution, prepared by a member of the Executive Committee, was read by the Recording Secretary.

At the last meeting of the Executive Committee of our Society, one of our very loyal members who has faithfully acted as editor of our publications for many years expressed his desire to withdraw from office. He stated that due to his approaching retirement from the government service, it would be very inconvenient for him to act as editor, and that another should be selected for that office. This action has been duly taken.

Be it therefore resolved that the Entomological Society of Washington express its deep appreciation for Mr. W. R. Walton's long service to our society. Not only has he acted for sixteen years as editor but he has held several other offices, including two terms as president and three terms as an elected member of the executive committee.

Be it further resolved that the corresponding secretary be instructed to notify Mr. Walton of the Society's action and that the same be printed in the Proceedings of our Society.

It was voted by the Society, to include, in the Minutes, the resolution as read.

Dr. E. N. Cory announced a decision of the Executive Committee of the American Association of Economic Entomologists to cancel the meetings of that Society which had been postponed. He stated that the Association had accepted one hundred applications for membership. He announced further that the annual election of officers would be handled by mail and that ballots would be issued by his office in the near future.

President Harned appointed the following committees:

Membership—M. P. Jones, F. M. Andre and W. H. White, Chairman.

Program—L. B. Reed, G. M. Langford and H. H. Stage, Chairman.

Henry K. Townes presented a short note calling attention to the fact that C. V. Riley had recorded an attraction of the leaves of *Lepidium* for bedbugs. At the same time Townes exhibited a portion of his manuscript of the Catalogue of Nearctic Ichneumonidae.

The regular program was as follows:

1. Entomology and War, Address of the Retiring President, E. N. Cory.

It is expected that this paper will appear in an early number of the Proceedings so no abstract has been prepared. The address was commented on by Rohwer, Bishop, Annand and Hyslop.

2. A Catalogue and Reclassification of the Nearctic Ichneumonidae, by Henry K. Townes, Bureau of Entomology and Plant Quarantine.

The taxonomy of the Nearctic Ichneumonidae is at present very confused and treated in widely scattered literature. In an effort to present a coherent guide to the published information, a complete bibliographic catalogue and a new taxonomic arrangement, based in part on the study of all available type material, have been prepared. It has been found necessary to synonymize about 800 species and to make about 1100 generic transfers.

The probable number of species in the family was discussed and the development of the taxonomy of the family outlined. The methods used in the preparation of the paper, including the way in which types were studied, were outlined. Among the taxonomic changes proposed is the erection of eight new subfamilies in addition to the five commonly recognized. (Author's abstract) Comments followed by Cushman.

3. The relative Resistance of Roaches to Pyrethrum Spray, by E. R. McGovran, Bureau of Entomology and Plant Quarantine.

The value of the Peet-Grady method for determining the effectiveness of fly sprays and the need for a similar method for evaluating roach sprays was discussed. The need for information on the relative resistance of roaches to insecticides as a basis for a standard test was pointed out.

The following observations on the relative resistance of roaches to sprays have been reported. A culture of *Blatella germanica* was found to be most resistant to household insecticides when 17 weeks old. Large nymphs and adult females of *B. germanica* and *Periplaneta americana* were more resistant to pyrethrum sprays than the males. Large nymphs were usually more resistant than the adult females. Eggs of *B. germanica* were shown to be more resistant than the adult females but the young nymphs were less resistant than even the adult males. *B. germanica* is more rapidly paralyzed by deposits of pyrethrum spray than *P. americana* but is more resistant to its lethal effects. (Author's abstract).

The following visitors were introduced to the Society: Louis G. Davis and F. L. Blickle.

Adjournment 9:40 P. M. W. H. ANDERSON, *Recording Secretary.*

Corrections: In the Minutes of the 532nd Regular Meeting of the Society the Recording Secretary misinterpreted the statements of L. B. Reed regarding thrips in canned tomatoes. Mr. Reed has furnished the following, corrected abstract of his note.

The thrips were found to enter the green fruit from the blossom end through small openings to cavities that normally occur in the central core of a small percentage of sound fruits. Sometimes the openings are closed as the tomatoes mature, and the thrips are imprisoned. It is considered unlikely that the thrips are able to pass through the actual tissue of the fruit.

A second error occurred in the recording of the note by D. J. Caffrey. The seeds of *Amorpha fructicosa* are being considered as a source of rotenone rather than the seed pods.

W. H. ANDERSON,
Recording Secretary.

Actual date of publication, March 6, 1942.

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

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

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F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
Washington, D. C.

CONTENTS

VOL. 45 March, 1943 No. 3

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.

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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The Corresponding Secretary and Treasurer should be addressed similarly.

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 45 MARCH, 1943 No. 3

THE AMERICAN CHIGGERS (LARVAE OF THE TROMBICULINAE) OF THE GENUS ACARISCUS, NEW GENUS.

By H. E. EWING,

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

When the writer [1] (1938) published his revised key to the genera of chiggers he established the genus *Eutrombicula* for those members of *Trombicula* Berlese with the "Palpal claw divided into two prongs . . ." and usually with less than 30 dorsal abdominal setae. In the present paper the genus *Eutrombicula* is itself divided as follows:

A. Dorsal abdominal setae (counting the posterior marginal pair) 22, and arranged, previous to engorgement, as follows: 2–6–6–4–2–2; ventral body setae (counting the 4 sternals, but not counting the 2 posterior marginals) 14, arranged as follows: 2–2–6–2–2 .... *Eutrombicula* Ewing, *sensu stricto*
Type species, *Microthrombidium alfreddugèsi* Oudemans

AA. Dorsal abdominal setae more than 22, arranged differently; ventral body setae (counting sternals but not counting posterior marginals) more than 14, 2 or more pairs being situated farther posteriorly than the anus .... *Acariscus*, new genus
Type species, *Trombicula flui* Van Thiel

Remarks.—The name *Acariscus* is derived from *Acarus*, a mite, *iscus*, a diminutive. Aside from the differences in chaetotaxy, this genus appears to be the same as *Eutrombicula*. Furthermore, its geographical and host distribution appear also to be very similar.

KEY TO THE AMERICAN SPECIES OF THE GENUS ACARISCUS, NEW GENUS

A. Dorsal abdominal setae less than 34.
B. Dorsal plate with a poorly sclerotized or incomplete posterior border; prongs of palpal claw of equal length, divergent. Parasitic on lizards .... *gurneyi* (Ewing)

[1] Ewing, H. E. A key to the genera of chiggers (mite larvae of subfamily Trombiculinae) with descriptions of new genera and species. Jour. Wash. Acad. Sci. vol. 28, pp. 288–295.

BB. Dorsal plate with a well sclerotized posterior border.
C. Inner prong of palpal claw much larger than outer and extending distally beyond apex of latter.
D. First 3 palpal setae simple; dorsal abdominal setae less than 30 .... *panamensis* (Ewing)
DD. First 2 palpal setae subplumose; dorsal abdominal setae .... *bruyanti* (Oudemans)
CC. Inner prong of palpal claw not larger than outer and not extending distally beyond the apex of latter.
D. Dorsal abdominal setae 26; ventral body setae (including sternals) 16 .... *masoni*, new species
DD. Dorsal abdominal setae 28 or more.
E. Dorsal abdominal setae not over 30.
F. Dorsal plate more than twice as broad as long; posterior eyes smaller than anterior but with cornea; ventral abdominal setae 18 .... *brasiliensis* (Ewing)
FF. Dorsal plate less than twice as broad as long; "posterior eyes inconspicuous"; ventral abdominal estae 12 .... *butantanensis* (Da Fonseca)
EE. Dorsal abdominal setae 32 (counting the posterior marginal pair) .... *hominis* (Ewing)
AA. Dorsal abdominal setae 34 or more.
B. Dorsal abdominal setae less than 40.
C. First palpal seta with lateral branches; dorsal plate less than twice as broad as long; posterior eyes smaller than anterior; dorsal abdominal setae less than 38 .... *flui* (Van Thiel)
CC. First 3 palpal setae simple; dorsal plate more than twice as broad as long; posterior eyes equal to anterior; dorsal abdominal setae 38 .... *myotis* (Ewing)
BB. Dorsal abdominal setae 50 .... *multisetosa*, new species

DESCRIPTION OF SPECIES.

In the following pages extensive formal descriptions have been avoided and in their stead there are given only those characters that will definitely identify the species. However, considerable supplementary data are added under the headings of type material, type host, type locality, range, and remarks.

Acariscus gurneyi (Ewing).

1937. *Trombicula gurneyi* Ewing, Proc. Biol. Soc. Wash., vol. 50, p. 169.
1938. *Eutrombicula gurneyi* (Ewing) Ewing, Jour. Wash. Acad. Sci. vol. 28, no. 6, p. 294.

Distinguishing characters.—Prongs of palpal claw of equal length, but divergent, the inner somewhat the stouter. First palpal seta short, with 0–2 lateral branches; second and third palpal setae simple. Pseudostigmatic organs with rather long lateral branches. Anterior and posterior eyes equal; ocular plate absent. Dorsal abdominal setae arranged as follows: 2–6–6–4–4–4 (including second laterals).

Type material.—Six cotypes in United States National museum.

Type host.—Blue-tailed skink, *Eumeces fasciatus.*

Type locality.—Along Patuxent River, Md.

Range.—Reported only from Maryland and Virginia.

Remarks.—This chigger is peculiar in the way the two prongs of the palpal claw diverge from each other. It was named after A. B. Gurney, of the United States Bureau of Entomology and Plant Quarantine, who collected the host bearing the type material.

Records of specimens as follow:

On *Eumeces fasciatus*, blue-tailed skink.

Maryland: Priest Bridge, Patuxent River, 6 specimens (cotypes), April 24, 1937, by A. B. Gurney.

Virginia: Hunter, 4 specimens, September 11, 1938, A. B. Gurney.

On lizard (species?)

Maryland: Laurel, 4 specimens, August 31, 1938, by E. B. Marshall.

Acariscus panamensis (Ewing).

1925. *Trombicula panamensis* Ewing, Amer. Jour. Trop. Med., vol. 5 no. 3, p. 259.

1938. *Eutrombicula panamensis* (Ewing) Ewing, Jour. Wash. Acad. Sci., vol. 28, no. 6, p. 294.

Distinguishing characters.—Inner prong of palpal claw much larger than outer and extending distally beyond the latter. All of palpal setae on segments II to IV inclusive simple. Pseudostigmata situated behind middle of dorsal shield; pseudostigmatic organs flagelliform and with a few lateral branches. Dorsal abdominal setae arranged as follows: 2–8–6 (not counting laterals)–6–4–2.

Type material.—Several cotypes mounted on four microscope slides in the United States National Museum.

Type host.—Cotton rat, *Sigmodon hispidus chiriquensis.*

Type locality.—Balboa, Panama.

Range.—Reported only from Panama.

Remarks.—Although *panamensis* was originally included in *Eutrombicula* it does not fit well into that genus (*sensu lato*); hence it is rather questionably included in *Acariscus*. This is because there is an indication of a slight vestige of a third prong to the palpal claw. This species is identified by a combination of two characters, it having the inner prong of the palpal claw much larger than the outer and the first five palpal setae simple.

Specimens examined as follows:

On *Sigmodon hispidus chiriquensis*, cotton rat

Panama: Balboa, several specimens (including holotype), by L. H. Dunn.

Acariscus bruyanti (Oudemans).

1910. *Microthrombidium bruyanti* Oudemans, Ent. Ber., vol. 3, no. 54, p. 85.

1930. *Trombicula bruyanti* (Oudemans) Van Thiel, Parasitology, vol. 22, no. 3, p. 352.

1938. *Eutrombicula bruyanti* (Oudemans) Ewing, Jour. Wash. Acad. Sci., vol. 28, no. 6, p. 294.

Distinguishing characters.—No specimen of this species being at hand, the following characters are taken from the literature: Outer prong of palpal claw slender, straight, sharply pointed; inner prong curved, stout, greatly surpassing the outer. First palpal seta subplumose, second palpal seta with a few lateral branches on one side only, third palpal seta strongly curved, plumose. Pseudostigmatic organs very fine, plumose on distal half. Dorsal abdominal setae 32, there being 6 setae in each of the second to fourth transverse rows inclusively.

Type material.—In the Trouessart Collection.

Type host.—Opossum, *Didelphis opossum.*

Type locality.—Southern Brazil.

Range.—Southern Brazil.

Remarks.—A combination of two characters easily distinguish this species from all others in the genus. They are: The shape of the two prongs of the palpal claw and the presence of 32 dorsal abdominal setae.

Acariscus masoni, new species.

(Fig. 1)

Distinguishing characters.—Outer prong of palpal claw extending beyond apex of inner. First palpal seta curved, with 0–2 lateral branches; second palpal seta slightly curved, simple; third palpal seta recurved, with 0–3 lateral branches. Dorsal plate as in *flui* (Van Thiel). Pseudostigmatic organs each with 3–5 subequal, parallel, lateral branches. Dorsal abdominal setae (counting the first lateral pair as dorsal) 26, arranged as follows: 2–6–6–4–4–2–2, or, in fully engorged specimens, 2–6–6–6–4–2; ventral body setae 16.

Type material.—Three cotypes on type slide, United States National Museum No. 1426.

Type host.—Man.

Type locality.—Orlando, Fla.

Range.—Extreme southeasterm part of United States and coastal region as far north as Massachusetts.

Remarks.—This species is named after A. C. Mason, of the Bureau of Entomology and Plant Quarantine, who first collected it in 1922. It is similar to *hominis* (Ewing), with which it was confused. Since it has only 26 dorsal abdominal setae, it is sufficiently distinguished from *hominis*, which has 32.

Specimens at hand as follows:

On black snake (species?)—

Florida: Orlando, 6 specimens, June 30, 1933, by F. C. Bishopp.

On *Didelphis virginiana pigra*, Florida opossum—

Florida: Immokalee, 1 specimen, June 19, 1933, by O. C. Van Hyning.

On Man—

Florida: Orlando, 3 specimens (cotypes), May 30, 1922, by A. C. Mason; 3 specimens, May 11, 1942, by A. W. Lindquist and A. H. Madden; 6 specimens, June 3, 1942, by A. H. Madden; 8 specimens, June 8, 1942, by A. H. Madden. Sarasota, 2 specimens, May 11, 1942, by A. W. Lindquist and A. H. Madden.

On *Microtus pennsylvanicus pennsylvanicus* meadow mouse—

Massachusetts: Edgartown, 8 specimens, September 3, 1937, by C. N. Smith. Oak Bluffs, 7 specimens, September 10, 1937, by C. N. Smith.

On *Neofiber alleni alleni*, muskrat—

Georgia: Okefinokee Swamp, 7 specimens, December 5, 1934, by E. V. Komarek.

On *Neofiber alleni nigrescens*, muskrat—

Georgia: Okefinokee Swamp, 17 specimens, November 9, 1935, by Francis Harper.

On *Odocoileus* sp., white-tailed deer—

Florida: Orange County, 6 specimens, April 19, 1938, by F. D. McKenney.

On *Procyon* sp., raccoon—

Florida: Immokalee, 4 specimens, February 11, 1937, by B. V. Travis.

On *Sigmodon hispidus hispidus*, cotton rat—

South Carolina: Coosowahatchie, 2 lots of specimens of 3 each, June 22, 1940, by E. V. Komarek. Luray, 1 specimen, June 23, 1940, by E. V. Komarek.

On *Sigmodon littoralis littoralis*, cotton rat—

Florida: Hendry County, 3 specimens, April 17 and 1 specimen April 18, 1941, by E. V. Komarek. Tallahassee, 1 specimen, November 9, 1936, by B. V. Travis.

Acariscus brasiliensis (Ewing).

1925. *Trombicula brasiliensis* Ewing, Proc. Ent. Soc. Wash., vol. 27, no. 4, p. 92.

1938. *Eutrombicula brasiliensis* (Ewing) Ewing, Jour. Wash. Acad. Sci,. vol. 28, no. 6, p. 294.

Distinguishing characters.—Outer prong of palpal claw much longer and stouter than inner. First palpal seta subplumose, second palpal seta with 1–2 lateral branches or barbs. Pseudostigmatic organ with lateral branches on distal half. Dorsal abdominal setae 28 to 30, the second, third, and fourth rows being 6–8–8. Ventral abdominal setae 18 (6–4–2–4–2).

Type material.—Three cotypes in United States National Museum.

Type host.—Man.

Type locality.—Manáos, Brazil.

Range.—Amazon Valley, Brazil.

Remarks.—At the time the original description of this species was written the type host was not known. A subsequent letter from the collector, Professor J. Bequaert, of the Harvard School of Tropical Medicine, stated that the specimens were taken from man. This species is rather closely related to the Brazilian species *butantanensis* (Da Fonseca). Its differences from *butantanensis* will be discussed under remarks relating to the latter species.

Material at hand as follows:

On man—

Brazil: Carvoeiro, 1 specimen, August 26, 1934, by J. Bequaert. Manáos, 3 specimens (cotypes), July 25, 1924, by J. Bequaert. Para, 4 specimens, July 13, 1924, by J. Bequaert.

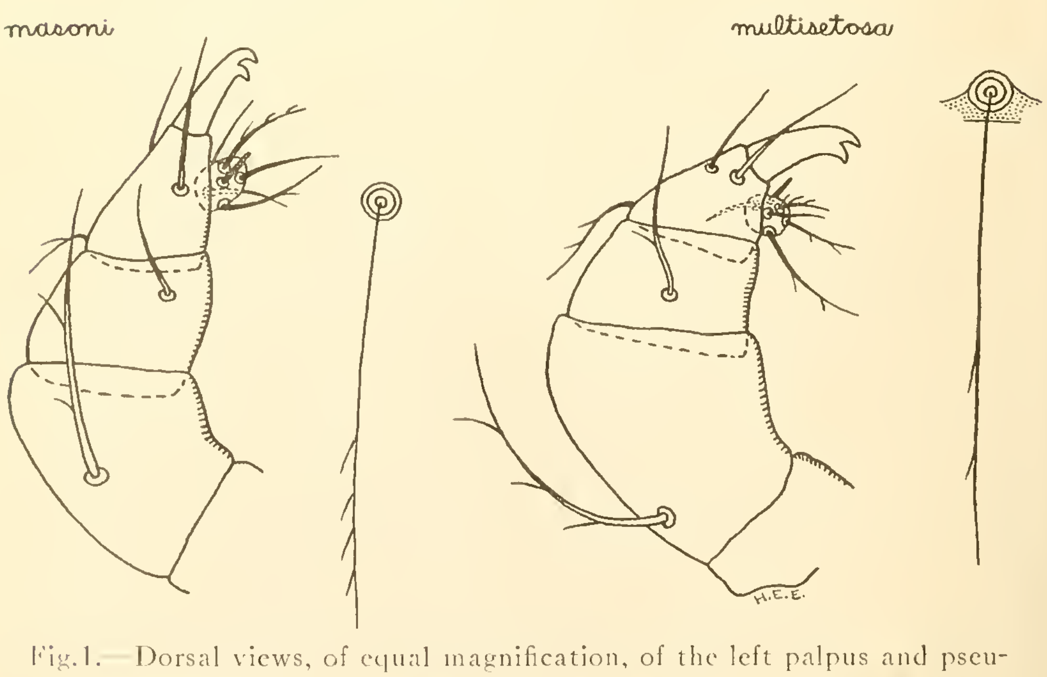


Fig. 1.—Dorsal views, of equal magnification, of the left palpus and pseudostigmatic organ of *Acariscus masoni*, n. sp. and of *A. multisetosa*, n. sp.

Acariscus butantanensis (Da Fonseca).

1932. *Trombicula butantanensis* Da Fonseca, Mem. Inst. Butantan, vol. 7, p. 147, 1 fig.

1938. *Eutrombicula butantanensis* (Da Fonseca), Ewing, Jour. Wash. Acad. Sci., vol. 28, no. 6, p. 294.

No specimens of this species being at hand, the following characters are taken from the original description.

Distinguishing characters.—First palpal seta with 3 or 4 lateral branches; second palpal seta simple; third palpal seta with 2 lateral branches, fourth and fifth palpal setae simple. Pseudostigmatic organs subplumose, with several subequal, parallel, lateral branches. Posterior eyes "inconspicuous." Dorsal abdominal setae 28 (2–8–8–2–4–2–2). Ventral abdominal setae, not including two pairs of sternals, 12, arranged in 6 pairs in engorged specimen.

Type material.—Holotype in collection of Butantan Institute.

Type host.—Man.

Type locality.—"Instituto Butantan, S. Paulo, Brazil."

Range.—Known only from the type locality.

Remarks.—All that is known about this trombiculine is that contained in the original description based on a single engorged specimen. However, the original description appears to be as complete as desired. But since the setal formulas are based on an engorged specimen, we are left in doubt regarding the setal arrangement before engorgement. *Acariscus butantanensis* is evidently closely related to the Brazilian species *brasiliensis* (Ewing), but according to its original description it differs from the latter in having a dorsal plate less than twice as broad as long instead of more than twice as broad as long, and in having only 12 ventral abdominal setae instead of 18.

Acariscus hominis (Ewing).

1933. *Trombicula hominis* Ewing, Proc. U. S. Natl. Mus., vol. 82, art. 29, p. 5, fig. 3.

1938. *Eutrombicula hominis* (Ewing) Ewing, Jour. Wash. Acad. Sci., vol. 28, no. 6, p. 294.

Distinguishing characters.—Outer and inner prongs of palpal claw subequal. First palpal seta subplumose, second palpal seta with a few lateral branches, third palpal seta simple. Pseudostigmatic organs longer than dorsal plate, each with 3 to 5 lateral branches. Dorsal abdominal setae 32, counting the posterior marginal pair, the first three transverse rows being as follows: 2–8–8. Simple, proximodorsal seta of tarsus I spinelike, slightly curved, situated more than its length from base of segment.

Type material.—Five cotypes in the United States National Museum.

Type host.—Man.

Type locality.—Aguabuenas, Republic of Panama.

Range.—Extreme southeastern part of the United States, Puerto Rico, Panama. Probably occurs throughout most of the West Indies and the lower altitudes of Central America.

Remarks.—In the past the writer has confused this species with *Acariscus masoni*, new species. It differs from *masoni* in having 32 dorsal abdominal setae, counting the posterior marginal pair, instead of 26. However, not only are the setae behind the third transverse row not arranged in definite rows but one or two pairs may be carried to a lateral, or even ventral, position owing to engorgement.

Specimens at hand:

On guinea hen—

Puerto Rico: Guaynabo, 3 specimens, April 1934, sent in by W. A. Hoffman.

On man—

Panama: Aguabuena, 2 specimens (cotypes), 1931, sent in by L. H. Dunn.

On rat (species?)—

Two specimens. No data.

On *Sturnella magna argutula*, southern meadowlark—

Florida: Immokalee, several specimens, June 16, 1933, by O. C. Van Hyning.

On *Taxostoma rufum*, brown thrasher—

Alabama: Fairhope, 2 specimens, August 10, 1931, by Mrs. N. H. Edwards.

Acariscus flui (Van Thiel).

1930. *Trombicula flui* Van Thiel, Parasitology, vol. 22, no. 3, p. 347, figs. 1 and 2.

1938. *Eutrombicula flui* (Van Thiel) Ewing, Jour. Wash. Acad. Sci., vol. 28, no. 6, p. 294.

Distinguishing characters.—Outer prong of palpal claw stouter and longer than inner. First palpal seta subplumose, second palpal seta with 2 or 3 unequal lateral branches, third palpal seta recurved, with 2 to 5 lateral branches. Pseudostigmatic organs about as long as dorsal plate, each with 3 to 6 lateral branches. Posterior eye with cornea, smaller than anterior eye and situated about its diameter from the latter; ocular plate well developed. Dorsal abdominal setae 34, not counting posterior marginal pair, arranged as follows: 2-8-8-8-4-4.

Type material.—Not mentioned.

Type host.—Man.

Type locality.—Surinam.

Range.—Northern coastal region of South America from Surinam to Colombia and in Puerto Rico in the West Indies. Probably occurs in Panama, and in Cuba and other islands of the West Indies.

Remarks.—*Acariscus flui* appears to be the most common chigger attacking man in Surinam. It probably is a synonym of *Acarus batatas* L., but proof of this may never be forthcoming. Hence to prevent confusion it appears best to avoid the use of *batatas* entirely.

Material at hand as follows:

On chicken—

Puerto Rico: Mayaguez, 4 specimens, April, 1932, by H. L. Van Volkenberg.

On horse—

Puerto Rico: Mayaguez, 4 specimens, April, 1932, by H. L. Van Volkenberg.

Acariscus myotis (Ewing).

1929. *Trombicula myotis* Ewing, Ent. News, vol. 40, p. 294.
1938. *Eutrombicula myotis* (Ewing) Ewing, Jour. Wash. Acad. Sci., vol. 28, no. 6, p. 294.

Distinguishing characters.—Palpi angulate laterally; inner prong of palpal claw much larger and longer than outer. First three palpal setae simple. Dorsal plate more than twice as broad as long, front margin incurved between each anterolateral seta and the median seta, posterior margin outwardly angulate behind each pseudostigma. Pseudostigmatic organs each with 3 to 5 unequal, lateral branches. Eyes equal; ocular plate wanting. Dorsal abdominal setae 38 (2–10–10–6–6–4).

Type material.—Three cotypes in the United States National Museum.

Type host.—A bat, *Myotis lucifugus lucifugus.*

Type locality.—Mount Katahdin, Maine.

Range.—Known only from type locality.

Remarks.—This species differs from all others of its genus in the shape of the dorsal plate. Known only from the cotypes, which were taken September 7, 1928, by Francis Harper and W. J. Hamilton.

Acariscus multisetosa, new species.

(Fig. 1.)

Distinguishing characters.—First palpal seta with 2–4 lateral branches; second palpal seta with 1–3 long, almost straight, lateral branches; third palpal seta recurved, with 1–3 lateral branches. Dorsal plate as in *Trombicula alfreddugesi.* Pseudostigmatic organs slender, setiform, almost straight, each with a few very fine, closely appressed barbs. Posterior eye well developed, almost equal to anterior and situated about its diameter from the latter; ocular plate well developed. Tarsus I with a conspicuous depression dorsally near its middle, over which the short, slightly curved, spinelike, simple, proximodorsal seta extends. Dorsal abdominal setae 50 and in unengorged specimen arranged as follows: 2–12–12–12–8–4; ventral body setae (counting the sternals) about 40, the first four rows being as follows: 2–2–8–8.

Type material.—Holotype, United States National Museum No. 1427.

Type host.—A raccoon, *Procyon* sp.

Type locality.—Near Christmas, Fla.

Range.—Known only from Florida.

Remarks.—Described chiefly from the holotype taken from the type host at the type locality, January 2, 1936, by B. V. Travis. Other records:

On *Sigmodon littoris littoris*, cotton rat—
Florida: Bonita Springs, 1 specimen, November 22, 1936, by B. V. Travis. Tallahassee, 6 specimens, November 9 and 2 specimens. November 10, 1936, by B. V. Travis.

On *Sturnella magna argutula*, southern meadowlark—
Florida: Shell Point, 2 specimens, October 30, 1936, by B. V. Travis.

AMERICAN SPECIES OF ACARISCUS, NEW GENUS, AND THEIR TYPE HOSTS.

brasiliensis (Ewing), from man.
bruyanti (Oudemans), from opossum, *Didelphys opossum.*
butantanensis (Da Fonseca), from man.
flui (Van Thiel), from man.
gurneyi (Ewing), from blue-tailed skink, *Eumeces fasciatus.*
hominis (Ewing), from man.
masoni, new species, from man.
multisetosa, new species, from a raccoon, *Procyon* sp.
myotis (Ewing), from a bat, *Myotis lucifugus lucifugus.*
panamensis (Ewing), from cotton rat, *Sigmodon hispidus chiriquensis.*

LYNN G. BAUMHOFER.

1895-1942.

Members of the Entomological Society of Washington were deeply grieved to learn of the death of Lynn G. Baumhofer, Associate Entomologist, Division of Forest Insects, Bureau of Entomology and Plant Quarantine, on June 13, 1942, following an illness of about two months. Mr. Baumhofer was very active in affairs of the Society and had served as Treasurer for several months prior to his death. He had given very freely of his time to this work and left the records of the Society in excellent condition.

Mr. Baumhofer was born at Montevideo, Minn., September 19, 1895, where he attended the public grade and high schools. After leaving high school in 1913 he followed various occupations until April 1918, when he enlisted as a private in the Army and served one year with the 71st Balloon Squadron at Richmond, Virginia. He enrolled at Hamline University, St. Paul, Minn., in the fall of 1919 but transferred in 1920 to the University of Minnesota where he registered in the Division of Forestry. His University training was interrupted by periods when he found it necessary to earn sufficient money to enable him to continue his education. "Shorty" as he was affectionately known by his fellow-students and professors, was an excellent student and was active in affairs on the campus.

Mr. Baumhofer's first field experience in entomology was during the summer of 1924 when he was employed as Field Assistant in the Bureau of Entomology under the direction of Dr. S. A. Graham who was then located at the University of Minnesota as an Agent with the Bureau. This first assignment was to study the spruce budworm in northern Minnesota. After graduating from the University in the spring of 1925 he was sent by the Bureau to Halsey, Nebraska to study the pine tip moth which was causing serious damage to pine plantations on the Nebraska National Forest. Except for short periods of graduate study, he continued on this work, first as Field Assistant and later as Junior Entomologist and Assistant Entomologist, until 1932. During these years he made detailed studies of the tip moth and its effects on the host trees. Dr. Graham and Mr. Baumhofer published a paper in 1927 entitled, "The Pine Tip Moth In the Nebraska National Forest" in the Journal of Agriculture Research, Vol. 35, No. 4 in which they gave the results of the earlier phases of this work. They published a second paper in 1930 entitled "Susceptibility of Young Pines to Tip-Moth Injury" in the Journal of Forestry, Vol. 28, No. 1.

As a part of this study and the effort to retard the damage caused by the tip moth, Mr. Baumhofer received and liberated parasites which were collected in other parts of the United States where the pest is native. The bulk of these natural enemies of the tip moth were collected in their native habitat in the eastern part of the United States by Mr. R. A. Cushman. Others were collected in the Southern States. All of these parasites were shipped to Halsey and reared out by Mr. Baumhofer, the primary parasites being liberated in various parts of the newly forested area. Certain of them became well established, and one, *Campoplex frustranae* Cushman, appeared for several years to be acting as an effective check on the tip moth. The annual report of the Chief of the Bureau of Entomology for the fiscal year ended June 30, 1930, gave a brief account of the results of the parasite studies up to that time. Subsequent observations indicated that other complicating factors were involved and in recent years the tip moth has been causing considerable injury even though the parasites are still fairly abundant. Unfortunately, the results of this interesting study have not been published.

Mr. Baumhofer was transferred to the Forest Insect Laboratory at Coeur d'Alene, Idaho, in August 1932, where he devoted most of his time to studies of the mountain pine beetle in addition to continuing certain phases of his work begun at Halsey.

With the expansion of the forest insect work program in connection with the Emergency Conservation Work (later the Civilian Conservation Corps) and the Shelterbelt Planting project, Mr. Baumhofer was promoted to Associate Entomologist and transferred to Denver and later to Fort Collins, Colorado. He divided his time between insects affecting Shelter Belt plantings and detailed biological studies of the Black Hills beetle.

In November, 1937, Mr. Baumhofer was transferred to the Washington office of the Division of Forest Insect Investigations. From then on he devoted the major part of his time to handling the voluminous correspondence on insects affecting shade trees and ornamental shrubs. During the months immediately preceding his death he had completed, as co-author with Dr. C. A. Weigel, a manuscript for a new Farmers' Bulletin on insects affecting ornamental plants.

On December 24, 1931, Mr. Baumhofer married Miss Hermine Munz, who with a daughter, Anne, now 8 years of age, survives him.

Mr. Baumhofer was a member of the American Association of Economic Entomologists, the Entomological Society of Washington and the Society of American Foresters. He had a host of friends among foresters as well as entomologists, all of whom admired and respected him for his quiet, unassuming manner and his painstaking thoroughness in all of his work. He was a great lover of the outdoors and took particular delight

LYNN G. BAUMHOFER
1895–1942

in spending Sundays or other leisure time in visiting nearby wooded areas with his family, especially in teaching his young daughter to know and appreciate the beauties of nature.

L. W. ORR, R. A. ST. GEORGE, AND F. M. WADLEY.

A NEW SPECIES OF LASPEYRESIA, A BEAN PEST FROM TROPICAL AMERICA (Lepidoptera: Olethreutidae).

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

The following description is offered in response to requests for a name for a species that appears to be of some importance as a pest of beans in Peru, and which lately has been intercepted at our border quarantine stations in beans from Mexico. It apparently attacks all varieties—lima beans, string beans, and soybeans.

Laspeyresia leguminis, new species.

(Plate 4, Figs. 1–5.)

Male: Antenna rather stout and somewhat compressed laterally; very shortly pubescent; scales pale gray to clay color, the scaling thicker and more abundant on the basal fourth of the shaft. Labial palpus with second segment long, extending almost to top of face; ashy gray, the scales fuscous or pale brown, tipped with white; paler on inner side, sometimes with a reddish or rust-colored suffusion on upper edge of third segment. Head and thorax cinereous, darker on middle of thorax. Fore wing rough scaled, with several small clumps of slightly-raised scales on area between base and outer third and a projecting fan of scales along inner margin for a slight distance from base; general color drab gray, the dark pattern markings, when distinguishable, blackish fuscous (more or less suffused in some specimens and in a few completely so); an irregularly shaped, blackish-fuscous subtornal spot; subapical bar blackish fuscous, divided at middle, with one arm extending to mid termen, the other downward to about vein 4, in some specimens the arms enclosing a contrasted, pale-yellowish or orange spot; apical area beyond subapical bar pale, gray, yellowish, or orange; a dark-fuscous spot on outer third of cell, sometimes extending to costa and inner margin to form a dark, transverse fascia; in strongly marked specimens an obscure, pale, smooth spot just beyond cell in area between veins 3 and 8, edged by slightly raised scales; cilia pale drab gray, in some specimens more or less suffused with reddish ocherous. Hind wing grayish brown to brown; cilia paler. Alar expanse 16–20 mm.

Genitalia (fig. 1) figured from type. Harpe with cucullus elongate triangular, densely spined toward inner (lower) margin; neck incurvation deep. Aedeagus long, slender, curved; cornuti a cluster of short, thin, flattened spines.

Female: Essentially like the male in color and markings; antenna more slender, hind wing darker.

Alar expanse 18–22 mm.

Genitalia (fig. 2) figured from paratype from Cañete, Peru. Ductus bursae sclerotized from about one-third of its length from junction with bursa copulatrix and with a small sclerotized collar at middle. Ductus seminalis from ductus bursae just beyond the sclerotized part of tube. Bursa weakly granulate, especially toward ductus bursae. Signa slender, sharp, thornlike, with broad bases. In the membrane behind and caudad of genital opening a pair of elongate, triangular, sclerotized plates.

Type and paratypes.—No. 56477 U. S. National Museum.

Type locality.—"Foa", Peru.

Food plant.—Beans.

Remarks.—Described from male type and one male paratype from the type locality (reared 19 Aug. 1930) and six male paratypes from Lima, Peru (reared Aug. 1930 and 15 Sept. 1940, all the foregoing submitted by Dr. Johannes Wille under his numbers 175-30 and 67-40), two female paratypes from Cañete, Peru (reared 22 May, 1942 by E. J. Hambleton, one male and one female paratype from Trinidad River, Panama (June and March, 1912, August Busck, collector), two female paratypes from Tabogilla Island, Panama (Feb. 1912, Busck), and one female paratype from San Salvador, El Salvador (reared 25 Jan. 1933 by S. Calderon). Both Dr. Wille and Mr. Hambleton report that the larvae were doing extensive damage to bean crops in Peru, boring into the stems and pods. Adults have also been reared and larvae and pupae taken at our Mexican border quarantine stations from string beans from Tepic, Nayarit, Mexico, indicating that the species has a wide distribution in Central and South America. It has not as yet been found in the United States.

Explanation of Plate.

Fig. 1. *Laspeyresia leguminis*, new species. Genitalia of male with one harpe omitted.

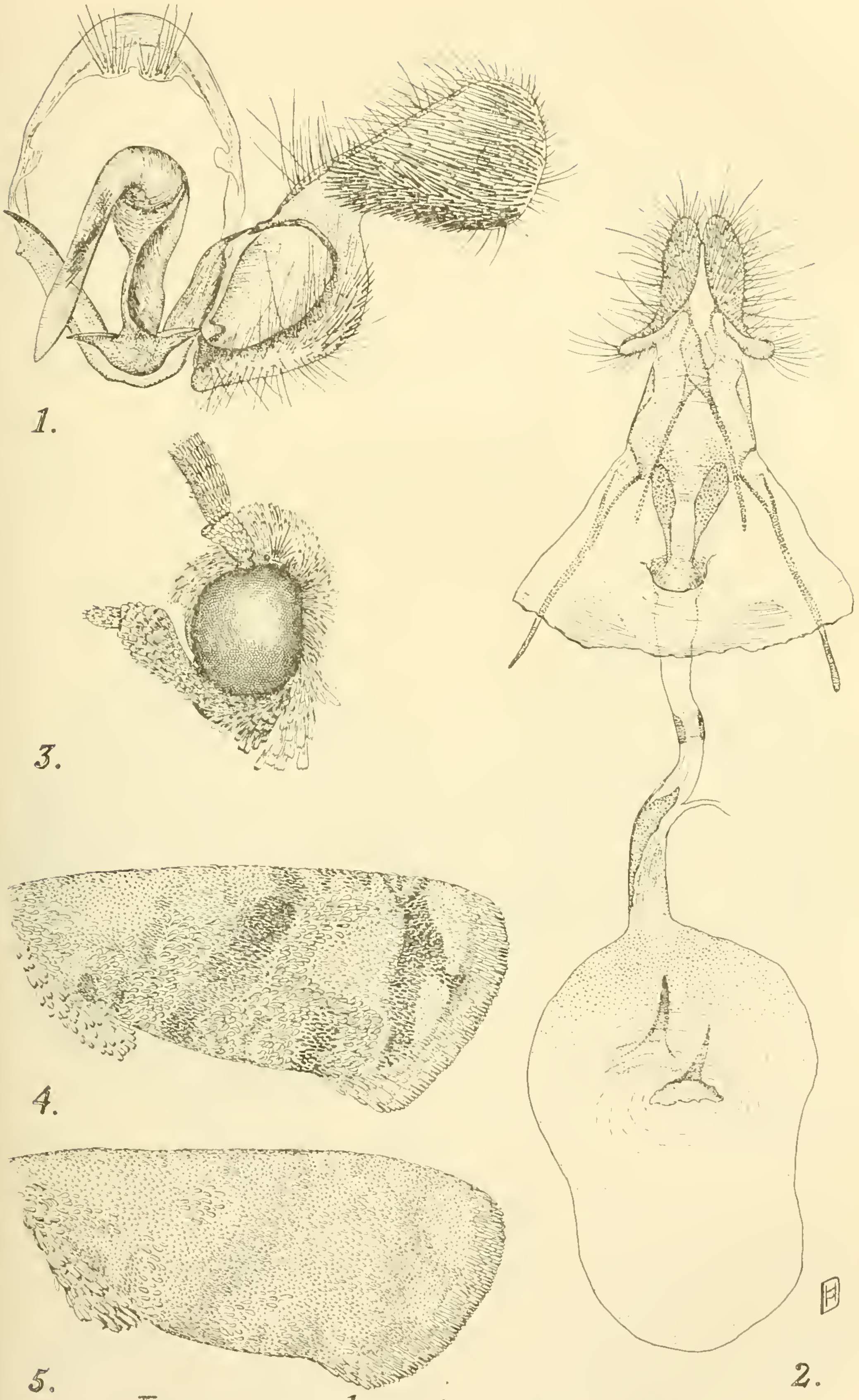
Fig. 2. Genitalia of female.

Fig. 3. Head of male.

Fig. 4. Fore wing of specimen with strongly contrasted markings.

Fig. 5. Fore wing of suffused specimen.

Drawings made under the author's supervision by Mrs. Sara H. DeBord of the U. S. Bureau of Entomology and Plant Quarantine.



Laspeyresia leguminis, new species

A NEW LEAFHOPPER OF THE GENUS HELOCHARA. (Homoptera, Cicadellidae.)

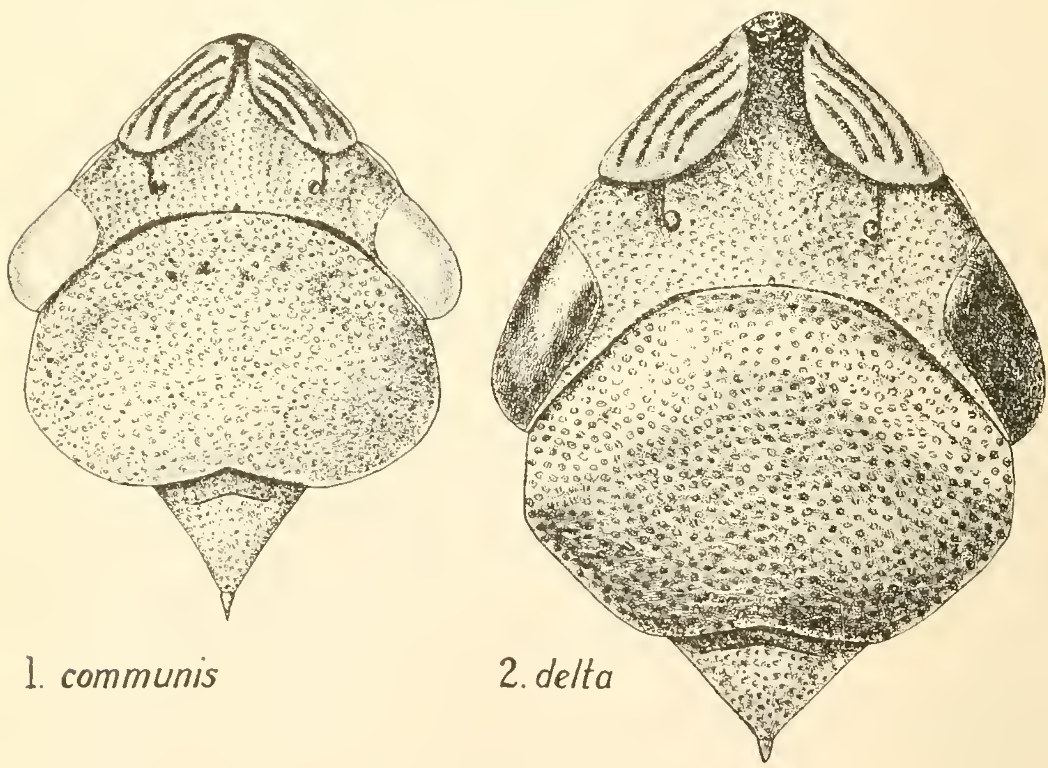
By P. W. Oman,
Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture.

It is suspected that the new species here described is a vector of the virus that is responsible for Pierce's disease of grapes in California.

Helochara delta, new species.

Larger than *communis* Fitch and with the head more produced. Length, male 5 mm., female 6 mm.

Dorsum and sides sordid green, frequently with irregular areas of sordid yellowish green; apex of crown, 4 short arcs on antero-lateral margin of crown, and occasionally a subbasal series of irregular spots on pronotum fuscous to black. Face and venter of thorax pale sordid brown to fuscous; abdomen, except terminal portion in female, fuscous to black.



Explanation of Figures.

Head, pronotum and scutellum of (1) *Helochara communis;* (2) *H. delta.* Illustrations by Mrs. Claudelle L. Gaddis.

Crown about five-sixths as long as pronotum, apex bluntly pointed, median portion between antero-lateral arcs at narrowest point one-fourth to one-fifth as wide as distance between ocelli, much broader than in *communis.* Pronotum varying somewhat in length, sometimes extended posteriorly nearly to transverse suture of scutellum. Venation and genitalia as in *communis.*

Holotype male, allotype female, and 14 male and 14 female paratypes from General Grant National Park, Calif., elevation 6,500 ft., October 16, 1941, Norman W. Frazier No. 12. Types in collection of United States National Museum, No. 56500; 4 male and 4 female paratypes returned to Mr. Frazier.

Other specimens at hand are from Kenwood and Smith River, Calif.

BOOK REVIEWS.

Chemistry of Insecticides and Fungicides: Donald E. H. Frear, Ph. D., Assistant Professor of Agricultural and Biological Chemistry, Pennsylvania State College, 8 vo., cloth, 300 pp., 31 illus., N. Y., D. Van Nostrand Co., 1942. ($4.00.)

This book is an outgrowth of lecture notes and reference compilations prepared by its author for use over a period of several years in connection with graduate courses on the subject. Its publication in the present form, however, has resulted from numerous requests by chemists, biochemists and others, who have felt that other productions otherwise somewhat similar in scope did not stress sufficiently certain phases of this rapidly growing field of chemical endeavor, and from similar requests by economic entomologists and plant pathologists who have felt that attempts by the public to control insects and plant diseases would be facilitated by a better understanding of the chemistry of those products used as insecticides and fungicides. Some idea of the general scope of the volume may be gained by a survey of the five general divisions of its contents: Under the division of (1) stomach poisons or protective insecticides (pp. 7-52) treatment is given of the arsenicals, as Paris green, London purple, calcium arsenate, lead arsenate, flourine compounds, fluorides, fluosilicates, fluoaluminates, hellebore, dinitro derivatives, phenothiazine and the like. Under the division of (2) contact poisons or eradicant insecticides (pp. 53-152) there may be found treatment of nicotine, pyrethrum, rotenone, deguelin, toxicarol, tephrosin, sumatrol, quassa, croton, the organic sulphur compounds, amines, sulphur and inorganic sulphur compounds, oils, soaps, tar oils, and the like. The fumigants also include such as hydrocyanic acid, chloropicrin, carbon disulphide, carbon tetrochloride, ethylene dichloride, trichloroethane, tetrachloroethane, propylene dichloride, ethylene oxide, methyl bromide, dichloroethyl ether, naphthalene, and paradichlorobenzine. The division (3) on fungicides (pp. 153-180) include the copper compounds such as Bordeaux mixture in various compounds, copper phosphate, copper ammonium silicate, copper zeolite, copper oxides, basic copper carbonate, copper sulphate and others. This same division on fungicides likewise considers the mercury and zinc compounds, other miscellaneous fungicides, and wood and cellulose preservatives. The division (4) on spray supplements and residue removal (pp. 181-208) contains chapters on wetting, spreading and emulsifying agents and on spray removal while the division (5) on analytical methods (pp. 209-277) contains detailed treatment of both macro and micro methods. The scope and length of treatment of these various subjects varies with importance and quantity of available material, and consideration is given to such matters as composition, properties and reactions, methods of application, and conditions of maximum usefulness of a given chemical or compound. For the benefit of readers wishing to pursue further a given topic, extensive bibliographical lists of carefully selected source material are given at end of each chapter, these being connected with corresponding text by appropriate cross reference. These bibliographies are by no means complete, but effort has been made to make them representative of the fields which they cover. In the preparation of this book special effort has been made by the author "to make it as widely useful as possible," and his objective has been "a reference work to which teachers and research workers in various fields, particularly of course in economic entomology, plant pathology and horticulture, may turn for information concerning the composition, properties, and reactions of the various chemicals used to control insects and plant diseases."

J. S. WADE.

The Genus Conotrachelus Dejean (Coleopetra, Curculionidae) in the North Central United States: Herbert Frederick Schoof, University of Illinois Biological Monographs, v. 19, n. 3, 170 pp., 9 plates (109 figures), 1942. ($1.50).

This is a systematic study of certain species of the large and polymorphic weevil genus *Conotrachelus*. Twenty-eight species, five of them new, are recorded from the region covered, which comprises the states of Illinois, Wisconsin, Iowa, Missouri, Kentucky, and Indiana; and a twenty-ninth (*carolinensis*) from outside this area, is described as new in an appendix. Excepting for several Floridian species, most of those treated have a rather wide distribution over the eastern half of the United States, and in effect the paper thus covers considerably more territory than is specified in the title. The 109 line drawings illustrate chiefly anatomical features which were found to be of taxonomic value.

In a general discussion of about 30 pages the author takes up: Review of literature; materials and methods; characters of taxonomic importance; nomenclature; and classification. Noteworthy are the descriptions of a special, balsam mount for the male genitalia; and of a method of everting the endophallus (internal sac). The distinction between the tibial uncus and mucro, modifications of which afford characters of importance in this and in many other genera of Curculionidae, is explained on page 21 and illustrated in figure 20. The systematic arrangement adopted is a 4-way division of the genus (p. 40); the species of each division are then tabulated in four separate keys. Useful taxonomic characters were found in the beak, mesoscutellum, sculpture of the body (particularly the contours of the elytral surface), structure of the legs and of the male genitalia, and in other parts. The relationship between *aratus* and *tibialis* is of an unusual kind in this genus, the male of *tibialis* possessing a striking differential structure on its front tibia, whereas the females of the two are separable with more or less difficulty or, in some specimens, are nearly indistinguishable. Species descriptions are headed by a diagnostic paragraph titled "Special Characters" and attention to this, in connection with the features mentioned in the key, will sometimes enable the experienced student to identify specimens without recourse to the longer, formal descriptions. In describing the dorsum of the prothorax the term "pronotum" is avoided, doubtless because the pronotum in Curculionidae typically includes much more than the dorsal surface alone. However, the word "disc," which apparently is adopted instead, is not exactly synonymous with the old "pronotum," leaving only the unwieldy "dorsal surface" (or "dorsum") "of prothorax" as a substitute term (in Curculionidae) for this part. Lectotypes of certain Leconte species, neotypes of several Say species, and plesiotypes of several Boheman and Germar species, are designated. A worth-while practice is the inclusion of the complete distribution, by states, of each species, not alone its partial distribution within the limited region covered (i. e., where the two distributions differ). The biological data given show that certain species, such as *nenuphar* and *anaglypticus* have what seems to be a remarkably wide range of breeding habits. A bibliography of 88 titles, and a glossary of technical terms, are placed at the end of the paper.

The author was confronted by a serious nomenclatorial situation which threatened to force the transfer of *Conotrachelus* from its present familiar position in the Cryptorhynchinae to the Barinae. This resulted from the circumstance that, of the species originally placed in *Conotrachelus* by Dejean, only two (both barines) seemed to be validly described; whereas the genotype of *Conotrachelus*, designated by Schoenherr in 1837 (*diaconitus* Germar), appeared to be a *nomen nudum*. However, a study of collateral evidence in the literature disclosed the possibility of connecting *diaconitus* Germar with an earlier (1829) description of *diaconitus* by Klug; and the genotype, by inference, becomes *diaconitus* Klug 1829. The reviewer feels that Dr. Schoof has presented a rational plan for retaining *Conotrachelus* in its commonly accepted sense, even though his solution is not in accord with a rigid application of the rules of zoological nomenclature.

The first dichotomy in the key on page 40 would be more easily appreciated if illustrated by much enlarged figures of the tarsal claws; and the same is true of the "coarse" and "fine" abdominal punctures mentioned in the first dichotomy on page 41. The statement on page 25 (line 20–21) regarding relative positions of the antennal socket in the sexes is true for the species treated, and also for nearly all others; but, to take care of such cases as that of *brevicollis* Champ., from Panama, in which the female has the antennal socket at about the basal fourth, the wording might be changed to bring out the distance of the socket from the base (or apex) rather than from the middle. In the discussion of sexual differences (pp. 24–25) no mention is made of the occasional small difference in contour of abdominal sterna 1 and 2, probably because this feature is either absent, or so poorly developed, in most species as to have little or no practical value; however, the character is of such wide-spread occurrence in curculionids as a whole that the feebleness of its development in *Conotrachelus* seems worth mentioning. On page 99 and again on page 118 the author states that the descriptions published by Walsh in "The Prairie Farmer" are invalid because the journal is not a technical one. As to this, the reviewer feels that a special ruling would be necessary to invalidate such descriptions.

A merit of the paper as a whole is the painstaking consideration given to the various problems, both taxonomic and nomenclatorial, which arose during the course of the work; and it is to be hoped that Dr. Schoof will be able to expand the study to other species of the genus. L. L. BUCHANAN.

Actual date of publication, March 31, 1943.

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F. M. WADLEY,
Corresponding Secretary,
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VOL. 45 April, 1943 No. 4

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON
1884

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.

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ENTOMOLOGICAL SOCIETY OF WASHINGTON.

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PROCEEDINGS OF THE

Entomological Society of Washington

VOL. 45 APRIL, 1943 No. 4

THE NEARCTIC SAWFLIES OF THE GENUS AGLAOSTIGMA. (Hymenoptera.)

By Herbert H. Ross,

Illinois Natural History Survey, Urbana, Illinois.

A study of the genitalia of *Aglaostigma* Kirby has disclosed characters which assist greatly in establishing the identity of various species in the genus. In many instances color differences are reliable for species separation, but a few cases have been found in which recourse to characters of the genitalia are necessary for accurate identification. Seven species are recognized in the nearctic region. Four of these are apparently restricted to the Rocky Mountain region and the remaining three are decidedly eastern, none of them having been recorded west of Iowa. Three of the species, *dilutum*, *dentatum*, and *ruficornum*, appear to be very local in distribution; this, combined with their very primitive phylogenetic position, indicates that they are probably archaic species with very narrow limits of ecological tolerance.

The genus extends throughout the nearctic and palearctic regions. I have examined representatives of many palearctic species; these resemble the nearctic forms in general shape of the male genital capsule, especially in shape of claspers and praeputial lobes, but differ from them in shape and detail of penis valves.

Key to Nearctic Species.

1. Apical sternite flat (males) 2
   Apex of abdomen with a scabbard-like sheath (females) 8
2. Mesopleuron black 3
   Mesopleuron with a yellow band or mostly yellow 5
3. Legs mostly rufous 4
   Legs mostly black with the anterior faces more or less streaked with yellow .... *veedee*
4. Head of penis valves with apico-dorsal area of lateral aspect thickly lined with spines, fig .2 .... *dilutum*
   Head of penis valves with only a few spines on lateral aspect, fig. 1 .... *rubense*
5. Penis valves with head markedly longer than wide, figs 3, 4, dorsal margin not produced into a spicate lobe 6

Penis valves with head scarcely longer than wide, figs. 5, 6, dorsal margin produced into a rounded lobe heavily set with spines 7

6. Penis valves with dorsal margin incised, the apical portion near and above the incision with a thick patch of spines, fig. 3 .... *ruficornum*

Penis valves with few spines and dorsal side evenly rounded, fig. 4 .... *dentatum*

7. All femora and tibiae each with a black band on posterior face *14-punctatum*

Only hind femora and tibiae with black, that sometimes absent .... *semiluteum*

8. Mesonotum either mostly yellow or uniformly yellowish brown 9

Mesonotum almost entirely black, except sometimes for some cream spots or bars 10

9. Mesonotum a distinct, bright yellow-brown. Known only from California .... *dilutum*

Mesonotum straw colored or dull and blotched. Known only from the northern Appalachian region *14-punctatum*

10. Scutal lobes with a cream-colored dot or bar 11

Scutal lobes entirely black (scutellum sometimes cream) 13

11. Hind femora each with a posterior black stripe extending its entire length *14-punctatum*

Hind femora slightly darkened only at apices 12

12. Antennae each with apical four segments cream, basal five segments dark brown; saw heavily sclerotized, with coarse teeth, fig. 8 .... *dentatum*

Antennae uniformly colored for their entire length; saw weakly sclerotized, teeth minute, fig. 7 .... *semiluteum*

13. Sheath subequal to mid tibia in length. Lancet extremely long and slender, fig. 11 .... *ruficornum*

Sheath less than two-thirds as long as mid tibia. Lancet shorter and wider, figs. 9, 10 14

14. Lancet weakly sclerotized, with small teeth and tapering only at apex, fig. 7 .... *semiluteum*

Lancet more heavily sclerotized, tapering from near base and with relatively large teeth, fig. 10 15

15. Legs almost entirely rufous .... *rubense*

Legs black, streaked in front with yellow .... *veedee*

Aglaostigma dilutum (Cresson).

Tenthredo dilutus Cresson, Amer. Ent. Soc. Trans. 8:24; 1880. ♀.

Male.—Length 9 mm. Color almost exactly as for *rubense* except that the apex of the abdomen apparently is always rufous instead of usually being black. Structure as in *rubense*, the only differences noted being in the penis valves. These, fig. 2, have the head longer than in *rubense*, its apical half swollen on the dorsal side, this swollen portion studded with spines.

Allotype, male.—Yorkville, Mendocino County, California, May 17, 1929, E. P. Van Duzee. In the collection of the California Academy of Sciences.

Distribution.—California.

Aglaostigma rubense (Cresson).

Tenthredo rubens Cresson, Amer. Ent. Soc. Trans. 8:24; 1880. ♂.
Tenthredo edwardsii Cresson, Amer. Ent. Soc. Trans. 8:24; 1880. ♀.
Tenthredo atravenus MacGillivray, Can. Ent. 27:283; 1895. ♂.
Astochus fletcheri MacGillivray, Can. Ent. 46:108; 1914. ♀.
Astochus aldrichi MacGillivray, Can. Ent. 46:137; 1914. ♀.
Tenthredo racilia MacGillivray, N. Y. Ent. Soc. Journ. 31:112; 1923. ♂.
Tenthredo refractaria MacGillivray, N. Y. Ent. Soc. Journ. 31:113; 1923. ♀.

The extreme difference in genitalia between *rubense*, as in fig. 1, and *ruficornum*, fig. 3, was unknown to Rohwer (1918) and myself (1931) when the synonymy of these species was discussed. The character of "rufous antennae" mentioned by MacGillivray for *ruficornum* is possessed also by some specimens of *rubense* and it is upon certain of these specimens that Rohwer's record of *ruficornum* is based.

Distribution.—B. C., Cal., Ida., Nev., Ore., Wash.

Aglaostigma veedee, new species.

Although very closely related to *rubense*, this species appears distinct on the basis of the legs being black with the anterior faces streaked with yellow instead of being predominantly rufous. Its range is apparently more southern and restricted than that of *rubense*. No suggestion of intergrades between the two forms has been found in a total of ninety specimens of both species which have been examined.

Male.—Length 9 mm. Head and thorax black with the following parts ivory: labrum, spot on base of mandible, appendages of mouth-parts, narrow lines on upper inner orbits, line on posterior margin of pronotum, tegulae; antennae mostly brown, each with a black area on dorsal surface. Legs black with the three apical tarsal segments of the hind tibiae and anterior faces of the two front pairs yellow, and the following parts rufous: posterior faces of front and middle tibae and tarsi and an indistinct area in middle of hind tibia. Wings with veins and stigma black. Abdomen rufous with basal plates and irregular area on apex black.

General structure as for genus. Penis valves, fig. 1, apparently identical with *rubense*, as follows: shape fairly regular, of a curved, spatulate type, the apical and dorsal margins toothed, the lateral face with a cluster of weak, scattered spines.

Female.—Length 10 mm. Color as in male with the following differences: most of clypeus, inner orbits, line on postgenae, central area of mesoepisternum, spots on metapleuron, most of coxae and sometimes under side of hind femur, ivory; abdomen usually rufous beyond basal plates, but a few specimens have large areas of the base and apex suffused with black.

General structure as in male. Saw, similar to fig. 10, with 15 annulets, with distinct rows of lateral teeth; ventral lobes wide and close together, each with a large double tooth at base with three to five teeth in front.

Holotype, male.—Fallen Leaf Lake, El Dorado County, California, July, 1931, O. H. Swezey. In the collection of the California Academy of Sciences.

Allotype, female.—Same data.

Paratypes.—All from California: 1 ♂, same data as holotype. Fallen Leaf Lake, L. Tahoe: June 20, 1915, E. C. Van Dyke, 1 ♂, 3 ♀. Huntington Lake: July 11, 1919, E. P. Van Duzee, 1 ♀. Yosemite Valley: May 9–28, 1921, 5 ♂, 1 ♀. Martinez, Contra Costa County; June, 1910, J. G. Grundell, 1 ♂, 3 ♀. Mineral King, Tulare County: July 31, 1923, 1 ♀. Deposited with the California Academy of Sciences and the Illinois Natural History Survey.

Aglaostigma ruficornum (MacGillivray).

Tenthredopsis ruficorna MacGillivray, Can. Ent. 25:242; 1893. ♀.

Male.—Length 9 mm. Color almost exactly as in female. General structure of body and genitalia as for genus. Penis valves distinctive, fig. 3, the dorsal margin of the head excavated near stalk, with a cluster of spines just above incision.

Allotype, male,—Mt. Hood, Oregon, June 24, 1925, elevation 3000–6000 ft., E. C. Van Dyke. In the collection of the California Academy of Sciences.

Distribution.—Known only from Mt. Hood, Oregon, and Olympia, Washington.

Aglaostigma 14-punctatum (Norton).

Tenthredo quattuordecimpunctatus Norton, Ent. Soc. Phil. Proc. 1:143; 1862. ♀.

This species is recognized in both sexes by the pale and blotched thoracic dorsum. It is closely related to *semiluteum*.

Distribution.—Mass., N. C., N. H., N. Y., Que.

Aglaostigma dentatum new species.

The male of this species differs from all others in the genus by the semicircular head of the penis valve, fig. 4, with only a few peripheral spines. The female most closely resembles *14–punctatum* but differs in saw characters.

Male.—Length, 8 mm. Head with posterior aspect and most of dorsal aspect above base of antennae, black; antennal tubercles, orbits and lower portion of head cream colored; antennae brownish yellow, the first five segments of each suffused dorsally with black. Thorax black with posterior and lateral margins of pronotum, faint lines on mesoscutum, anterior half of mesoscutellum, most of meso- and metaëpisternum, ivory. Legs with coxae and trochanters ivory, marked with irregular lines of black, remainder of legs light brown except hind femur and apical half of hind tarsus, which are blackish brown. Wings hyaline. Abdomen rufous. General structure as for other members of genus. Praeputial lobes divergent apically, slightly pointed. Harpes rounded at apices. Penis valve, fig. 4, with dorsal margin evenly arcuate, bearing only a scattered peripheral row of teeth; central portion with a group of a few inconspicuous teeth; apex rounded, ventral margin nearly straight; head narrowing gradually to stalk.

Female.—Length 8.5 mm. Color as in male, except as follows: antennae each with apical four segments ivory, basal five black with whitish marks on ventral surface; hind legs with only apices of femora suffused with dark brown. General structure as in male. Sheath more than twice as long as wide. Saw with 16 segments; lancet, fig. 8, tapering gradually from middle, the teeth of the lateral aspect fairly large; teeth of ventral margin larger and less numerous than those of *14–punctatum.*

Holotype, male.—Franconia, New Hampshire, Mrs. Slosson. In the collection of the Illinois Natural History Survey.

Allotype, female.—Hampton, New Hampshire, June 12, 1914, S. A. Shaw. Deposited with the holotype.

Aglaostigma semiluteum (Norton).

Tenthredo semiluteus Norton, Boston Soc. Nat. Hist. Proc. 9:121; 1862. ♀, ♂.

Pachyprotasis delta Provancher, Naturalist Canadian, 10:108; 1878. ♀.

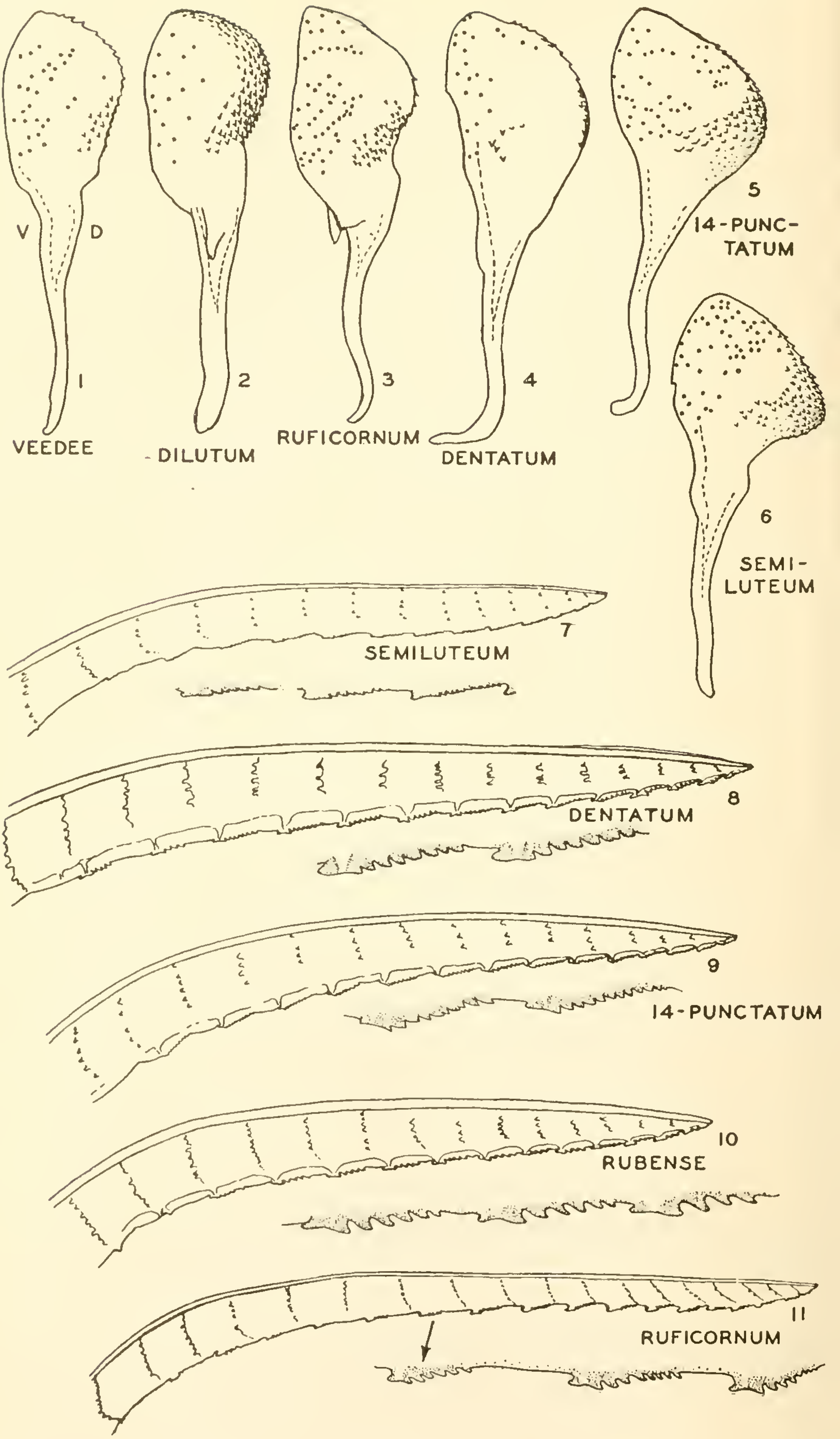
Bivena maria MacGillivray, Can. Ent. 26:328; 1894.

This species has hitherto been classified as two, a light form with the abdomen entirely rufous and several yellow marks on the dorsum of the thorax (*semiluteum*) and a darker form with the apex of the abdomen black and most of the yellow marks on the dorsum of the thorax replaced by black (*delta*). In the series of 60 specimens studied intergradations between these forms are abundant in both sexes. Furthermore there is no apparent structural difference between specimens differing in color, so they are considered as the same species. The male genitalia, fig. 6, resemble very closely those of *14–punctatum.* The female saw, however, is quite distinct, figs. 7, 9.

Distribution.—Conn., Ill., Ia., Mass., Md., N. C., N. Y., Ohio, Ont., Pa., Va.

PLATE 5.—PARTS OF AGLAOSTIGMA.

Figs. 1–6, penis valves. Figs. 7–11, lancets of saws.


V
D
1
VEEDEE
2
DILUTUM
3
RUFICORNUM
4
DENTATUM
5
14-PUNCTATUM
6
SEMILUTEUM
7
SEMILUTEUM
8
DENTATUM
9
14-PUNCTATUM
10
RUBENSE
11
RUFICORNUM

DESCRIPTIONS OF NEW NORTH AMERICAN PLECOPTERA. II.[1]

By John F. Hanson.

The following three new species of *Capnia* have come to my attention during the course of a revisionary study of the Capniidae. All three species are closely related to one another.

Capnia ligulata, n. sp.

(Fig. 1.)

Males.—Similar in all general morphological details to other species of the genus *Capnia*. Length of body, 5 to 6 mm.; length of fore wing 5 to 6 mm.

Abdominal tergites without projections or protuberances. The ninth and tenth tergites and part of the eighth with mid-dorsal, membranous areas underlying the supraanal process. Supraanal process long and nearly cylindrical throughout its length; arising from a slightly enlarged base and extending forward to the hind margin of segment eight; only slightly curved in lateral view, straight in dorsal view; tapering only very slightly until very near the sharply pointed apex; 0.50 mm. in length (Fig. 1). Ninth abdominal sternite without a ventral appendage.

Collection data: Holotype, male—Boulder, Colo., March 20 (Hite) (in Museum of Comparative Zoology). Paratype, male—Boulder, Colo., March 17 (in Cornell University Collection).

Capnia ligulata is most closely related to the two other species described here, but is easily distinguished from these by the shape and length of its supraanal process and by its possession of wings of normal size in the male sex. Of previously described species of *Capnia*, *C. ligulata* is most closely related to *C. glabra* from which it differs in several characters. In *C. glabra* the supraanal process, as seen in dorsal aspect, is asymmetrically curved, and in lateral view is more curved than is that of *C. ligulata*. Also, the ninth tergite of *C. glabra* bears a pair of raised knobs which are not present in *C. ligulata*.

Capnia lineata, n. sp.

(Figs. 2 and 3.)

Similar in all general morphological details to other species of the genus *Capnia*. Length of body, 5 mm. in male, 7 to 8 mm. in female; length of fore wing 0.5 mm. in male, 7 to 8 mm. in female. The fore wings of the male are so reduced as to be devoid of venation. They are about the size of the wing pads of normal immature Capnias. The hind wings are reduced to an even greater extent.

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[1]Contribution from the Department of Entomology, Massachusetts State College, Amherst, Massachusetts; supported in part through a Grant-in-Aid from the Society of the Sigma Xi.

Males.—Abdominal tergites without projections or protuberances. The ninth and tenth tergites and part of the eighth tergite crossed by a mid-dorsal, membranous stripe underlying the supraanal process. Supraanal process long and nearly cylindrical throughout its length; arising from a slightly enlarged base and extending forward to the middle of the eighth abdominal segment; straight in both dorsal and lateral views; in lateral aspect tapering gradually to the sharply pointed apex; 0.70 mm. in length (Fig. 3). Ninth abdominal sternite without a ventral appendage.

Female.—With a broad, membranous, mid-dorsal stripe extending across abdominal tergites one through eight. Eighth abdominal sternite only slightly modified: median portion of its posterior margin (lip of female reproductive opening) broadly rounded, straight, or broadly emarginate, and well sclerotized to its edge (Fig. 2).

Collection Data: Holotype male and allotype female—Troy, Idaho, April 22, 1911 (in my personal collection). Paratopotypes, 27 ♀ ♀ (in M.C.Z., Cornell University Collection, Ill. Nat. Hist. Survey Collection, and U.S.N.M.).

Capnia lineata is most closely related to the two other species described here. It is intermediate between these two species in the length of its supraanal process, and differs from them in having this process straight rather than curved. The extreme brachyptery of the male of *C. lineata* also distinguishes the species.

Capnia zukeli, n. sp.

(Figs. 4 and 5.)

Similar in all general morphological details to other species of the genus *Capnia*. Length of body, 7 mm. in male, 9 mm. in female; length of fore wing, 2 mm. in male, 8 mm. in female.

Male.—Abdominal tergites without projections or protuberances. Tergites seven, eight, nine, and ten with a mid-dorsal, membranous stripe underlying the supraanal process. Supraanal process long and cylindrical; typically, sharply recurved over the abdomen and extending forward at least to the hinder margin of the seventh abdominal segment; curved slightly upward beyond the middle and then slightly downward again at the apex; in dorsal view, straight; 1.35 mm. in length (Fig. 5). Ninth abdominal sternite without a ventral appendage.

Female.—With a broad, membranous, mid-dorsal stripe extending across abdominal tergites one through eight. Eighth abdominal sternite only slightly modified: median portion of its posterior margin (lip of female reproductive opening) straight, and with a narrow, membranous region along the edge (Fig. 4).

Collection data.—Holotype, male—Moscow, Idaho, alt. 2560 feet, April 2, 1938 (Zukel). Allotopotype, female. Both types are deposited in my personal collection.

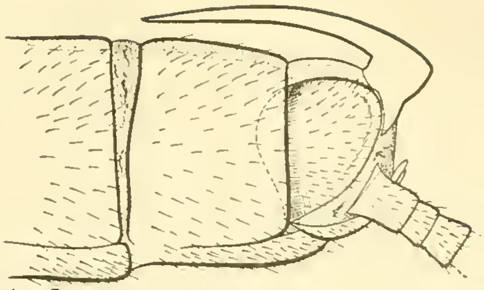
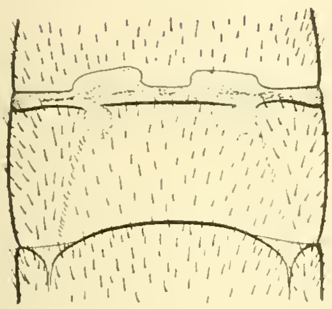


Fig. 1 Capnia ligulata ♂



C. lineata ♀

Fig. 2

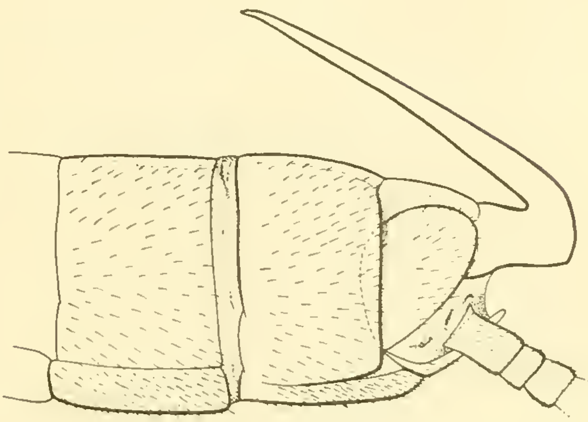
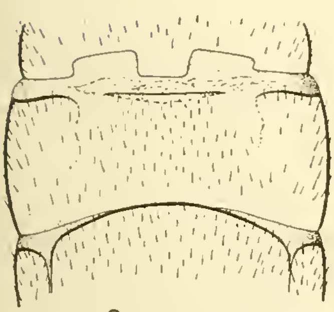


Fig. 3 C. lineata ♂

Fig. 6 C. gracilaria



C. zukeli ♀

Fig. 4

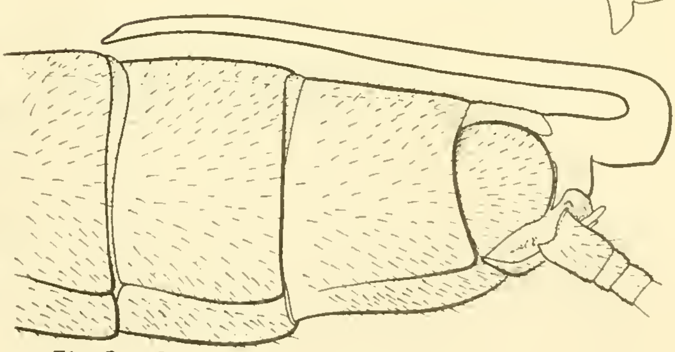


Fig. 5 C. zukeli ♂

EXPLANATION OF PLATE

Fig. 1. *Capnia ligulata* n. sp., ♂ genitalia, lateral view.
Fig. 2. *Capnia lineata* n. sp., ♀ genitalia, ventral view.
Fig. 3. *Capnia lineata* n. sp., ♂ genitalia, lateral view.
Fig. 4. *Capnia zukeli* n. sp., ♀ genitalia, ventral view.
Fig. 5. *Capnia zukeli* n. sp., ♂ genitalia, lateral view.
Fig. 6. *Capnia gracilaria* Clsn., supraanal process of male, lateral view.

This species is most closely related to *Capnia gracilaria* Claassen (Fig. 6) from which it is distinguished easily in the male sex. Its supraanal process is about twice as long and twice as thick as that of *C. gracilaria*. It extends to the seventh tergite and bends slightly downward at the apex rather than upward as in *C. gracilaria*. The wings of the male of *C. gracilaria* extend beyond the tip of the abdomen, while the holotype of *C. zukeli* is brachypterous and its wings extend only to the third abdominal segment.

The supraanal process of *Capnia elongata* is nearly as long (1 mm.) as that of *C. zukeli* but is of a considerably different shape. The former species also bears a protuberance on the seventh abdominal tergite, while *C. zukeli* has none.

The female of this species is very similar to that of *C. lineata*. The single known female specimen of *C. zukeli* differs from that of *C. lineata* in that the edge of the lip of its reproductive opening is membranous. It is highly probable that when more female specimens of this species are known it will be found to be inseparable from *C. lineata* in this sex. This situation is known to be the case in certain other instances in *Capnia* and other genera of Plecoptera.

THE QUEEN OF A BRITISH GUIANA ECITON AND A NEW ANT GARDEN SOLENOPSIS.

(Hymenoptera: Formicidae.)

By Neal A. Weber, *University of North Dakota*.

From the bivouac of an army ant in British Guiana I secured the queen for which a new subspecies of the tropical American *Eciton* (*E.*) *burchelli* (Westwood) was erected and briefly described as *jeanae* in the American Midland Naturalist (26:329, 1941). Although the soldiers and workers were similar to the common form, the queen differed distinctly from that caste figured and described by Wheeler (Proc. Amer. Acad. Arts Sc., 56:297–307, 1921) and that of a Trinidad colony of a form long known as the subspecies *urichi* Forel which I also briefly described in 1941. A figure of the head of the queen of the new subspecies and descriptions of the castes follow.

The *Solenopsis* is described at the present time in order to use the name in a paper on the ant gardens of South America.[1]

Eciton (E.) burchelli (Westw.), ssp. **jeanae** Weber (Fig. 1).

Eciton (*E.*) *burchelli* ssp. *jeanae* Weber, 1941, Amer. Midl. Nat., 26:329.

Female.—Length 21 mm. (of thorax 4.9 mm.). Head in front view, excluding mandibles, slightly broader than long, occipital margin distinctly impressed medially, sides in the form of two convexities, the posterior being slight, that in front of the eyes being more pronounced, anterior clypeal margin convex; eyes situated posterior to the middle, convex, 0.21 mm. in diameter; frontal groove distinct, terminating anteriorly in an expanded depression, continued to the occipital margin from a level with the eyes in a faint impression; occiput in side view with a faint protuberance on each side; mandibles linear, slightly expanded in the basal half, feebly curved apically; antennal scapes stout, slightly curved towards the head; 1st funicular joint, excluding attachment, slightly broader than long, 2nd joint 1¾ times longer than broad, following joints successively shortening to the terminal joint which is the longest of the funicle and is 3½ times longer than broad. Thorax in side view broadly convex to the epinotum, slightly raised at the anterior margin, distinctly impressed at the pro-mesonotal suture; from above the mesonotum is seen to be longitudinally and broadly impressed; meso-epinotal impression broad and deep, the metanotum being distinctly indicated and margined by sutures from the adjacent segments; from above the mesonotum appears compressed and is bordered in front by large, protuberant spiracles and behind by less protuberant spiracles, mesonotum expanded ventrally where joined by the coxae and bearing large, apparently open, stigmata; dorsal surface of epinotum erected in the form of two blunt, backwardly directed cones; sides with large slit-shaped stigmata. Petiole with a pair of much higher cones, also backwardly directed, which are horn-shaped and blunted. Gaster 11 mm. long in the preserved state, anterodorsal angle feebly impressed medially, sting stout, not exserted beyond the dorsal segments when preserved. Legs long, femora and tibiae somewhat compressed, claws large and stout, with two well developed teeth and a variably developed third, more minute, tooth at the base.

Surface of body dull to lucid, being finely and densely punctate dorsally and less so ventrally, dorsal surfaces also with numerous large, scattered, shallow pits, at least some of which were piligerous originally. Pilosity sparse, consisting of short, fine hairs which are most numerous at sutures, ventrally and on appendages, including the entire mandibles, these hairs are very short and fine on the ventral portions of body and coxae. Reddish brown, gastric segments brown anteriorly and ventrally. Color of head and thorax in life dull red brown, the gaster darker brown except for the posterior parts of the segments which were blotched with lighter brown, epinotal protuberances bright and shiny light red brown.

[1] This paper, "Parabiosis in neotropical ant gardens," is to be published in the journal, Ecology.

Soldier.—Extended length 16–17 mm. (thorax 4.4 mm.). Differing from the typical *burchelli* chiefly in the antennae. The scape in the typical form is, according to Borgmeier, much narrower at the distal end and does not completely hide the first funicular joint when this is extended at right angles. Resembling in this the ssp. *foreli* Mayr to which Borgmeier ascribes the Trinidad, Kartabo, B. G., and Barro Colorado I., C. Z. ants. The present subspecies differs from Trinidad specimens in having a markedly greater dilatation of the scape at the end and a petiolar node shorter and more rounded above. Kartabo specimens have a broader pedicel and have the epinotal carinae more widely separated in front and behind; Barro Colorado I. specimens have longer frontal carinae and shorter scapes.

Brood. Eggs elliptical, 0.23 x 0.51 mm., white. Larvae slender, curved, with numerous fine, flexuous hairs which are mostly simple and of variable size but are sometimes bifid, trifid or multifid; mandibles slender, falcate.

Described from a colony (No. 582) in rain forest close to the Oronoque River, Courantyne system, British Guiana, July 21, 1936. The ants had formed a bivouac at the base of a tree stump and hanging from branches of small saplings, dry leaves, etc., close to it. The brood was well above the ground and appressed to the stump. Two staphylinoid ecitophiles were taken in unburdened ant files going away from the bivouac.

Solenopsis parabiotica, sp. nov. (Fig. 2).

Worker. Length 2.0 mm. (of thorax 0.54 mm.). Head in front view with moderately convex sides which attain their greatest distance apart posterior to the eyes, occipital margin transverse to faintly concave, corners broadly rounded; eyes 0.046 mm. in greatest diameter; anterior clypeal margin with a minute tooth on each side of the median pair; mandibles 4-toothed, the basal tooth being much the smallest, the median pair sub-equal and the terminal tooth much the longest; antennae moderately impressed at the meso-epinotal suture, the anterior convexity slight and descending gradually to the anterior margin, the posterior convexity more marked and without angularity; from above broadly and gently impressed at the meso-epinotum. Petiole in side view 0.17 mm. high with high, conic node rounded above, ventral margin anteriorly bearing a small, triangular tooth; postpetiole ⅔ height of petiole, rounded above, slightly broader than petiole with sides evenly convex. Gaster of moderate proportions with anterior margin concave and terminating posteriorly in a long, fine sting. Legs long and slender.

Smooth and shining except for scattered piligerous punctations. Pilosity of scattered, fine hairs, mostly long on thorax, gaster and legs, mostly shorter on head and funiculi. Pale brownish yellow, margins of mandibles infuscated.

Female. Length with gastric segments extended 4.0 mm. (of thorax 0.95 mm.). Similar to the worker except for the usual sexual differences.

Petiolar node proportionately more compressed anteriorly-posteriorly. Smooth and shining except for more numerous piligerous punctations; pedicel striatepunctate except on dorsum of nodes. Pilosity more abundant than in worker and color much darker, being a bright, medium brown with the appendages paler.

Cotype workers from colony No. 347.2 and holotype female from colony No. 295, all from the forest back of the Forest Settlement, Mazaruni River, British Guiana, September 3 and August 19, respectively, 1935. The ants were dwelling in the thin partitions separating the chambers of ant gardens inhabited by *Crematogaster limata parabiotica* Forel and *Camponotus femoratus* (Fabr.). The workers of colony No. 295 vary in color in the dried state from brownish yellow to brown although in life they appeared yellow and were so recorded in field notes.

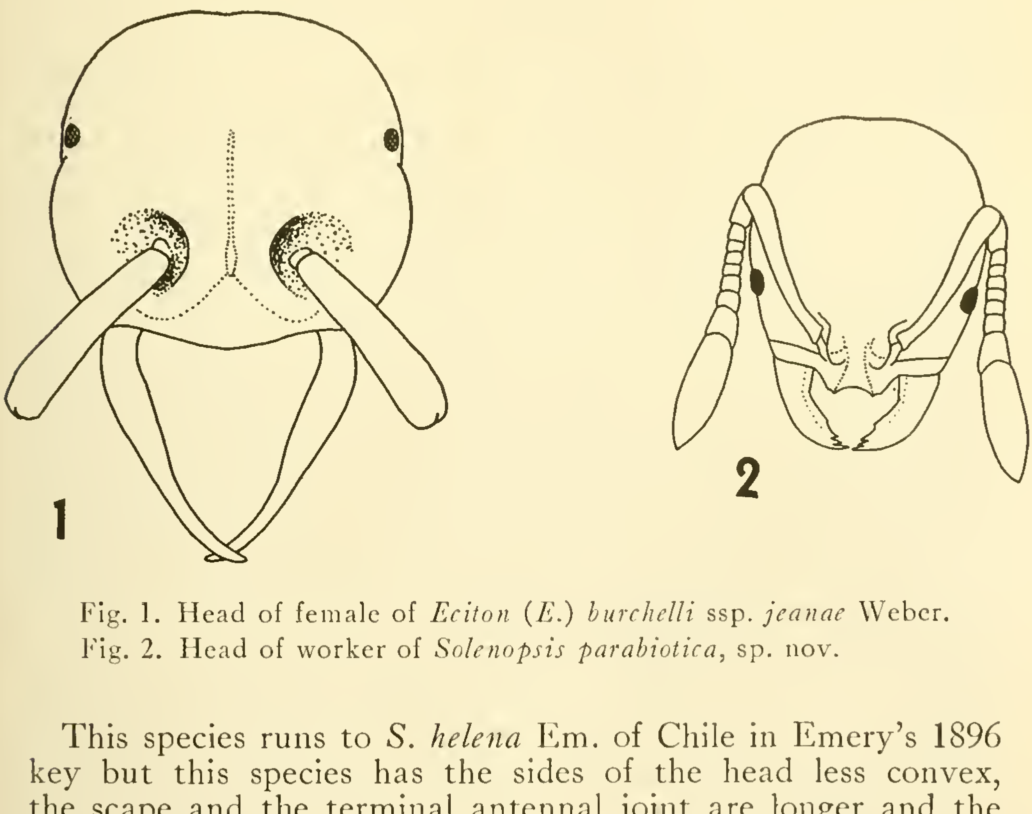


Fig. 1. Head of female of *Eciton* (*E.*) *burchelli* ssp. *jeanae* Weber.
Fig. 2. Head of worker of *Solenopsis parabiotica*, sp. nov.

This species runs to *S. helena* Em. of Chile in Emery's 1896 key but this species has the sides of the head less convex, the scape and the terminal antennal joint are longer and the size is smaller. It appears also close to *S. pollux* For. of St. Thomas but this species is still smaller, the terminal antennal joint longer, etc. Wheeler (Zoologica, 3:157–158, 1921) has described two subspecies of *helena* from British Guiana without figures. Judging from the brief descriptions the subspecies *hermione* is smaller and has smaller eyes, the subspecies *ultrix* is smaller, has longer antennal scapes and is darker colored.

WALTER SIDNEY ABBOTT.

Walter Sidney Abbott, of Takoma Park, Md., passed away on October 27, 1942, while returning home from a visit to the Beltsville Research Center, United States Department of Agriculture, Beltsville, Md., his last place of employment previous to retirement in 1938.

Mr. Abbott was born in Manchester, N. H., on May 21, 1879, and was graduated from the University of New Hampshire in 1910 with a B. S. degree. Upon graduation, he spent one year with the New Jersey Agricultural Experiment Station and one with the Illinois Natural History Survey, Champaign, Ill. His twenty six years of service with the United States Department of Agriculture began April 15, 1912, when he was appointed as agent with the Bureau of Entomology at Vienna, Va. Here he worked with insecticides in connection with the enforcement of the Insecticide Act of 1910. This work was subsequently supervised by the Food and Drug Administration. On March 3, 1920, Mr. Abbott was promoted to Entomologist and placed in charge of the Insecticide Testing Laboratory, and in June, 1928, he became Senior Entomologist, which title he held until his retirement.

Altho Mr. Abbott's duties were largely regulatory, he was able to carry out considerable research. He was author or co-author of about eleven publications, including several Government bulletins, on pyrethrum, derris, and on the effectiveness of miscellaneous materials against such economic pests as the San Jose scale, poultry lice, the dog flea, and household insects.

Mr. Abbott was a charter member of the Entomological Society of America, a member, then fellow, of the American Association for the Advancement of Sciences, and also belonged to the American Association of Economic Entomologists, and the Entomological Society of Washington. Mr. Abbott was also a charter member of the Insecticide Society of Washington, which organization he helped to establish with his characteristic foresight and enthusiasm.

Altho afflicted with a physical deformity which would have held most men largely inactive, Mr. Abbott overcame his difficulties in a truly remarkable manner. His natural zeal for a useful life, which goal he successfully attained both in professional and personal ways, carried him into active participation. Among his hobbies were marksmanship, fishing and other water sports. He possessed a fascinating mannerism in relating anecdotes of which he was fond; he had a good sense of humor.

Mr. Abbott is survived by his wife Lilla Robinson Abbott, his daughter Betty, and his son Robinson.

E. H. Siegler and L. J. Bottimer.

A NEW HETEROTHRIPS ON PROSOPIS.
(Thysanoptera: Heterothripidae.)

By J. C. Crawford,
Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture.

With each species of *Heterothrips* so nearly confined to the flowers of a single species of plant, it is not at all surprising that new species continue to turn up as the flowers of different plants are explored. The present form was taken as a by-product of an extensive investigation of insects on plants related to the cotton plant and on other plants growing nearby.

Heterothrips prosopidis, new species.

Female (holotype).—Length (fully distended) 1.6 mm. Head and thorax dark brown, abdomen lighter brown, legs about concolorous with head, with fore femur yellowish within near base and yellow apically, mid femur lightened apically, fore tibia yellow and with an irregular brown cloud medially above and at times a similar but fainter one beneath, mid tibia lightened at extreme base and yellow at extreme apex, hind tibia brownish yellow in basal fourth and with extreme apex yellow, all tarsi yellow; antenna dark brown with II lightened apically, III and basal half of IV almost white, IV almost abruptly brown in apical half.

Head about 1.2 times as wide as long, widest in front of middle of cheeks, eyes not protuding, cheeks gently convex and subserrate; occipital line almost black, strong, touching posterior margin of eyes, with a few very distinct, transverse, almost parallel lines back of it; fore part of head from middle of ocellar triangle with transverse lines, of which the one intersecting the middle ocellus is very strong and marks the point from which the front of the head is declivous and somewhat excavated on each side of the middle; lateral ocelli almost contiguous with eyes, 17 μ in diameter, mid ocellus only 10 μ; ocellar crescents dark red; frontal costa with a V-shaped emargination.

Thorax with the prothorax distinctly wider than long, widest back of middle, and with very distinct, transverse, anastomosing lines which are much less distinct in next to basal fourth; mesonotum with the usual transverse, and metanotum with the usual concentric sculpture; wings brownish gray, with the usual subbasal hyaline area which is about one-seventh the wing length; costa with 1 + 35, fore vein with 34, and hind vein with 29 bristles; hind wing with a median longitudinal brown stripe ending near apex of wing.

Abdomen with terga I–VIII with tranverse anastomosing lines bearing long hairs, this sculpture very faint on medial portions of terga II–VII, tergum IX medially with a triangular patch of short setae extending from about the level of insertion of the median pair of discal setae to apex of segment, these setae shortest basad and longest apicad and at apex of segment not extending laterad of median pair of setae; terga I–VII fringed laterally at apices with plates which apically are drawn out into spines about one-fourth the length of the plates on the intermediate segments, except on the innermost plates, where they are almost as long as the plates; VIII with a complete fringe of simple spines; VI and VII with complete combs, the interval between the plates filled with simple spines; on terga II–V about 6 spines medially between apical fringe plates; tergum X split open as far forward as pair of discal setae; sterna II–VI with complete apical fringes of plates apically drawn out into spines.

Measurements (in microns): Head, length 136, greatest width 164, width at base 152; prothorax, median length 152, greatest width 236; mesothorax, greatest width 284; length of forewing 846.

Antenna:	1	2	3	4	5	6	7	8	9
Length	20	32	87	51	33	34	21	16	17
Width	34	28	24	24	20	19	15	11	8

Male (allotype).—Length (fully distended) 1.28 mm. Similar to the female except in secondary sexual characters but much smaller, antenna IV only faintly brownish apically, front of head more declivous, spines fringing apical tergal plates as long as plates medianly (except innermost, where they are much longer) and almost as long as the plates laterad, comb on tergum VI not complete, mid and hind legs with less yellow and this yellow with a more pronounced brownish tinge; tergum X without processes; glandular areas on sterna III–VIII placed just back of antecostal line, long and narrow, those on V and VIII 28 by 8 microns.

Measurements (in microns): Head, median length 104, greatest width 140; prothorax, median length 142, greatest width 200; length of forewing 648.

Antenna:	1	2	3	4	5	6	7	8	9
Length	20	36	80	52	30	34	28	18	16

Type locality.—Brownsville, Tex.

Host.—Flowers of mesquite (*Prosopis* sp.).

Type Catalog No. 56496, United States National Museum.

Described from 10 female and 3 male specimens collected March 28, 1942, by F. F. Bibby.

Differs from all other known North American species, which have similar tergal plates, in having the antennal segments much longer and more slender, with segment III more than three and one-half times as long as wide. All other species have this segment at most three times as long as wide.

BOOK REVIEW

Outlines of Entomology: A. D. Imms, Reader in Entomology and Fellow of Downing College, University of Cambridge, England, 8 vo., buckram, I-VII and 1-184 pages, 96 illustrations. $3.75, New York, E. P. Dutton and Co., Inc.

"This book is intended for anyone who is willing to take sufficient pains to acquire an elementary knowledge of entomology as a branch of general zoology. It is consequently written more especially for the student who embarks upon a university training in zoology or agriculture in preparation for a career." "The author is not alone in the belief that there is considerable need for a book of this kind in the English language. It represents his ideas as to what constitutes the fundamentals of the subject and is based upon nearly forty years of experience at home and abroad."

After a five page introduction devoted to the size and diversity of the insect group and to the characteristics which made this diversity and dominance possible, seventy-two pages are devoted to anatomy and physiology; nineteen pages to embryology, growth, and metamorphosis; sixty-eight pages to classification; and ten pages to the relation of insects to other arthropods and of the major insect orders to one another. There is an excellent two-page discussion of the principles of classification and nomenclature and in the treatment of the insect orders are "appendices" on subjects of special entomological interest. These appendices average about a page and a half in length and are titled: *The Phases of Locusts*, *Predatism, Fecundity and Biological Equilibrium*, *The Nature of Insect Colors*, *Aquatic Insects*, *Social Insects*, and *Parasitism.* There is a bibliography of the more comprehensive and useful books on entomology.

The treatments of insect morphology and physiology are the more complete, with the sections on phylogeny and classification detailed enough to give a firm foundation for a knowledge of general morphology and physiology, but hardly going beyond this. The treatment of the twenty-four insect orders recognized is restricted to a few paragraphs or pages for each, with an attempt to give the main morphological and biological characteristics of each order and something of its size and diversity. Most of the suborders and major groups of families are mentioned, and many are characterized. American insects are given nearly as much attention as are those of Great Britain. The economic phases of entomology receive only incidental attention.

In this book, much of the best modern general information on insects is brought together in a well written and concise synopsis. Its outstanding qualities are the achievement of brevity without a false simplification of the matter treated, the large number of profound and interesting generalizations that are made, and an exceptional freedom from error and bias. The ratio between taxonomic and other material seems a happy one for a university text book. Although it covers the same field as *A General Textbook of Entomology* by the same author, it is not merely an abridgement of this more complete work, but an entirely new book.

In adverse criticism, one might raise the question whether even the intelligent university student for whom the book is intended would not find it formidable for a beginning text unless his foundation included a better than average grasp of zoology and entomology. To properly convey to the student all of the facts and principles that are packed into *Outlines of Entomology* would seem to require more words, figures, and supplementary information than a hundred and eighty-four pages would permit. The book seems better adapted to more advanced students.

H. K. Townes.

MINUTES OF THE 534TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON. FEBRUARY 4, 1943.

The 534th regular meeting of the Society was held at 8 P. M., Thursday, Feb. 4, 1943 in Room 43 of the National Museum. President Harned presided and 38 members and 15 visitors attended. The minutes of the previous meeting were read and approved.

The report of the committee on audits, G. J. Haeussler and F. M. Wadley, was read by the former. The committee found the treasurer's report for 1942 to be correct. The Society voted to approve this report.

The regular program consisted of a talk by W. E. Dove of the Bureau of Entomology and Plant Quarantine. The subject of this talk was "Some of the ways in which the Bureau of Entomology and Plant Quarantine has attempted to meet the needs of the Army."

Dr. Dove told of contracts with the Office of Scientific Research and Development which were arranged for by Dr. F. C. Bishopp and Major E. C. Cushing for the conduct of experimental work on insects affecting the armed forces. The human lice were obtained in the vicinity of Washington and were used for building up an uninfected colony for use in testing lousicides and for development of fumigation methods. This work was located at Orlando, Florida, where suitable arrangements were made with the Civic Planning Board for housing human research subjects and for conduct of the experiments. The three projects were operated from one office so as to conserve expenses and for full utilization of equipment and personnel. The methods used in rearing lice and testing lousicides were described and illustrated by lantern slides. The methods employed for testing repellents to mosquitoes and other biting insects were also described and illustrated by lantern slides. The human reaserch subjects served each day on louse experiments and for mosquito repellent experiments and when conditions were favorable they were taken to the marshes for outdoor tests with mosquitoes or to lake areas where chiggers were present in large numbers. The materials developed during the course of these investigations were not announced, but it is understood that material help has been given to the Army and Navy for protection of combat troops from such diseases as typhus and malaria. One of the good mosquito repellents is effective for about 340 minutes. The cooperation of the Insecticide Division, of the Division of Control Investigations and of the Pure Food and Drug Administration were gratefully acknowledged. (Author's abstract.)

Questions and comment followed by Snodgrass, Philip, Hertig, Jones, Annand, Fracker, Packard and Bishopp.

Adjournment at 9:15 P. M.

W. H. ANDERSON,
Recording Secretary.

MINUTES OF THE 535TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON MARCH 4, 1943

The 535th regular meeting of the Society was held at 8 P. M., Thursday, March 4, 1943 in Room 43 of the National Museum. Vice President Annand presided and 41 members and 35 visitors attended. The minutes of the previous meeting were read and approved.

Maurice T. James, Bureau of Entomology and Plant Quarantine, Washington, D. C., was elected to membership in the Society by a unamious vote.

The regular program consisted of three talks as follows:

1. *Phlebotomus* and Carrions Disease, by Major Marshall Hertig, Sanitary Corps, U. S. Army.

Major Hertig presented colored moving pictures of the type of terrain where *Phlebotomus* occurs and where Carrion's disease is prevalent. The disease is confined in distribution to small areas along certain rivers in Peru. Methods of searching for the flies and larvae were demonstarted, as well as techniques used in rearing the insects. Attempts to find the natural hosts did not meet with success. Rhesus monkeys were the only laboratory animals with which transmission experiments were successful. Major Hertig showed pictures of several stages of the eruptive form of the disease. (Secretary's abstract). Comment followed by Rohwer, Bishopp, Trembley and Greeley.

2. The Clear Lake Gnat and Suggestions for its Control, by C. C. Deonier, Bureau of Entomology and Plant Quarantine, Orlando, Fla.

The clear lake gnat occurs in huge swarms and for this reason it renders vacationing at Clear Lake, California, unpleasant. The adults emerge from the water and fly for some distance inland where they remain for one or more days. When conditions are favorable they fly back to the lake and deposit their eggs on the surface of the water. The eggs float, usually until the forenoon of the next day, and may be so numerous as to form rafts. The larvae hatch in a short time and either settle to the bottom or swim outwards into the lake. Suggested methods of control included light traps and burning of the rafts of eggs, either on the water or in the windrows formed when the pile up on the shore. Dr. Deonier showed colored movies of the lake and of the several suggested methods of control. (Secretary's abstract) Comments followed by Bishopp.

3. The Cattle Grub Problem and the War, by M. P. Jones, Extension Service, U. S. Department of Agriculture.

Mr. Jones discussed the importance of leather in the war effort and the necessity for increasing the supply of good quality leather by controlling the cattle grub. He exhibited hides showing numerous holes caused by the grubs. Not only do the insects harm the skins, they also cause to be discarded an appreciable quantity of meat which has been damaged by their feeding. The loins and other cuts of meat so trimmed are devalued about two cents per pound. There is also a loss in flesh and milk production caused by the running of the cattle during the fly season. Mr. Jones presented exhibits of the methods employed to publicize the importance of grub control and the proper procedures to be followed. This information was distributed to the farmers at demonstrations, on the radio, through their local papers and trade magazines, by posters, etc. About twenty states have started a cattle grub control program or intensified the work already under way. (Secretary's abstract.)

Adjournment at 10:18 P. M.

W. H. ANDERSON,
Recording Secretary.

Actual date of publication, May 3, 1943.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions...................... $3.00
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A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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

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

F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON
1884

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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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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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 45 MAY, 1943 No. 5

NOTES ON THE ANATOMY OF THE COCCID GENUS ACLERDA AND DESCRIPTIONS OF THREE NEW SPECIES [1]

By H. S. McConnell,[2]

University of Maryland, College Park, Maryland.

Recently the author collected a number of coccids of the genus *Aclerda* and began a study of them in an attempt to establish their identity. Examination of the material available and a review of the meager literature pertaining to this genus soon indicated that authors who have published on the subject did not have a correct understanding of many of the anatomical features of these peculiar coccids. The studies reported here should clarify some misconceptions of certain anatomical features and point out some others apparently unnoticed heretofore.

The position this genus should have in the classification scheme of the coccids has produced several opinions. Signoret (Ann. Soc. Ent. France (5), Vol. IV, p. 96, 1874) erected the genus for the inclusion of a single species, *subterranea*, and considered the genus closely related to *Lecanopsis* Targ. Tozz., a typical coccine. Mrs. Fernald placed it among the coccines in her catalogue of the Coccidae of the World. Green (Coccidae of Ceylon, pt. 4, p. 289, 1909) disagrees with Signoret in considering it closely related to *Lecanopsis*. While Green disagreed with the idea of a close relationship to lecaniines, he still thought it more unlike any other group of coccids. He further considered the larval stage of *A. distorta* to be suggestive of the larval stages of both Dactylopiinae (as he understood that group) and Lecaniinae. Ferris indicated in a paper published under the authorship of Teague (Ann. Ent. Soc. Am., Vol. 18, p. 432, 1925) that he considers the group to constitute a family of the Superfamily Coccoidea. He characterized the adult female of the family as follows: "Coccidoidea without abdominal spiracles; apex of the abdomen with a cleft at the base of which is the anal

[1] Scientific Article No. A52, Contribution No. 1882 of the Maryland Agricultural Experiment Station (Department of Entomology).

[2] The author gratefully acknowledges helpful suggestions from Dr. Harold Morrison of the Bureau of Entomology and Plant Quarantine. All parasites mentioned in this paper were identified by Mr. A. B. Gahan of the Bureau of Entomology and Plant Quarantine.

opening, this covered by a single plate which is sometimes deeply cleft, but is never completely divided; anal opening apparently without a distinct ring, the alimentary canal terminating in many slender processes; tubular ducts present, never with filamentous inner prolongations; margin of body beset with small tuberculiform setae; adult female always with the legs entirely lacking, and with the antennae reduced to mere tubercules." This diagnosis of the group by Ferris appears to have been made from descriptions of various anatomical features made by Teague in another part of the same paper. The only description of immature forms in literature appears to be that of the larval stage of *A. distorta* by Green (l. c.), and the several stages of *A. berlesii* by Buffa (Revista di Patologia Vegetale, Vol. 6, pp. 135–159, 1897–98).

Generous quantities of two species at hand made it possible to investigate the type or types of preparations that would yield the most information. These studies made it possible to select adult female material which would lend itself to satisfactory study. Usually favorable material will be found among specimens that may be designated as young adult females. Full grown females or even nearly full grown ones seldom produce favorable preparations, since they have become too heavily sclerotized, and in addition require prolonged caustic treatment to clear them. Both of these conditions tend to obscure delicate anatomical features. Favorable material cautiously handled through all of the processes of mounting from caustic clearing to staining produced preparations showing anatomical features which seem to have eluded previous authors.

In addition to slide mounts of specimens as ordinarily made by coccidologists for identification purposes, other types of preparations were made to secure information about the anatomy of these coccids. Histological preparations yielded some information on the nature of the anal area that probably could not have been secured in any other way. Histological preparations also confirmed the nature of some of the ducts and other dermal structures. Dissection of caustic treated and live material also contributed valuable information.

Below is a discussion of certain anatomical features that appear to be useful in identifying species of *Aclerda*. Errors in current concepts of some of these features are pointed out, and others apparently not previously observed are described.

Some Morphological Features of the Adult Female.

Setae.—There are several types of setae present on the body. The most striking of these make up the marginal band of tuberculate setae. In most slide preparations of the species examined, they appear as a band on the ventral surface as mounted, with the posterior ends of the band on the posterior lateral margins. In all probability these setae indicate the margin of the body. The bands of tuberculate setae are most striking in the young adults, in which the setae are closely grouped. As the scales grow older and larger, the band is stretched out and the tuberculate setae have the appearance of being much more scattered. The shape of these tuberculate setae vary a great deal among species; that is, from elongate, with or without a constriction at base, to short and wider than long, with or without a constriction at base.

The surfaces of the body have a few variously shaped setae that are widely scattered. These setae vary from stout, elongate lanceolate, to short or long, more conventional types. Both the posterior dorsal and ventral surfaces, and the posterior margins have elongate setae. There is some indication of segmental arrangement on the ventral surface of the abdomen. Some small groups usually occur in the dermal invagination that leads to the genital opening.

A greatly modified form of setae occurs on the posterior dorsal surface of the abdomen, principally in the densely sclerotized area. However, they are often found in the surrounding more membranous area. Teague (l. c., Pl. xxxi, fig. R) considered these structures to be tubular ducts, ". . . the outer opening of which is closed by a dome-shaped cap that is apparently pierced by many small sized pores, these giving the duct, when viewed from its end, a 'pepper-box' appearance." Several types of microscopic preparations indicate that these structures (Plate 7, fig. L) are more like setae than tubular ducts as usually defined in coccids. The "pepper box" appearance of the outer end is produced by sculpturing of the lumen where the trichogen cell beneath is attached. The nature of the sculpturing in the lumen of these setae or setae-like organs varies a great deal. In some species they are minute, and in others quite large or coarse. When viewed from an angle or from the side, these sculpturings are seen to extend to the inner end of the structure. The entire organ has the general appearance of a cylindrical seta that is attached at the bottom of straight sided depressions in the derm. The outer end, nearly flat or rounded, is at the upper level of this depression, thus the length is determined by the thickness of the derm. Those in the heavily sclerotized posterior abdominal area appear longer than those in more membranous areas.

Tubular ducts.—Teague (l. c. Pl. xxxi, Fig. N and Q) describes two types of tubular ducts, both without filamentous inner prolongations. However, both of these types can be demonstrated to have inner prolongations in good preparations. The larger type (Plate 7, figs. H and I) with one filamentous inner prolongation occurs in two sizes on the adult female. The larger size is scattered along the marginal band of tuberculate setae, and often on the dorsal area of the body. These larger ducts appear to be associated entirely with the dorsal surface. At the posterior end of the abdomen they are found generally distributed on the dorsal heavily sclerotized area. The smaller size of this type of duct, all apparently ventral, are located in a broad ventral submarginal band entirely around the body, intimately associated with the second type, minute tubular ducts (Plate 7, fig. K). This latter type appears to be the same that Teague (l. c., Plate xxxi, Fig. Q) illustrated (incompletely). They have several inner prolongations, and in this respect are different from any tubular ducts that have been reported in the coccids. While most of these ducts are confined to a ventral submarginal band, they may occasionally be seen on other parts of the venter, and a variable sized group is always found at the base of the rostrum of all stages of the female except the larva. The number of inner prolongations is apparently quite variable. The largest number counted is sixteen, while some have been observed with only two. These minute ducts with multiple filamentous inner prolongations have been observed in all stages of the females. In the larval stage they occur only along the ventral margin, and are very few in number, from four to six on each side.

Disc Pores.—Two types of disc pores have been observed on the body. Simple disc pores have been noted on the dorsal surface of all stages of the female. In the adult they are apparently confined to the membranous area. If they occur on the heavily sclerotized posterior area, they are obscured.

Quinquelocular disc pores occur at certain places on some species and possibly the pores of the so-called stigmatic plate of all species are of this type except those of the stigmatic plate of larvae. They have been reported in a ventral submarginal band on one species. In at least two species they are grouped about spiracles in such a manner that they appear as short broad bands extending toward the margins.

Spiracles.—The spiracles of adult females vary a great deal with the age of the individual in that the older the specimen, the more heavily sclerotized the spiracles are likely to become. Sclerotized areas form about the spiracular apodeme and this causes the spiracles to appear larger, and to assume shapes suggestive of hour-glasses.

The most striking feature of the spiracles is the so-called stigmatic plate. This plate is a cup-shaped invagination of the derm, just lateral to the atrium, thickly lined with disc pores that are apparently quinquelocular. The spiracular opening is from the mesal side of this invagination, thus determining to some extent the appearance of the plate. In some cases it is narrow and crescent shaped, and in others almost round. All stages of the females have this pore plate. The larvae usually have two large pores in each plate, and the number of pores in the plates increases with each succeeding molt.

Anal Structures.—The anal area is a complex of invaginations, evaginations, and folds that produces a telescoping tube and some pockets or pouches which almost defy intelligible description and illustration. Descriptions of certain features of this area by previous authors do not indicate a correct understanding of the "anal plate and anal tube" and the area about the anal opening. It hardly seems possible to obtain the correct relationship of all these parts from the usual slide preparations as made for identification purposes. Such preparations show a flattened, more or less ovoid shaped plate, that appears to be attached by its base at the anterior end of a short anal cleft. This plate is variously shaped, with the apex often notched or deeply cleft in some cases. Beneath the plate can be seen a bundle of hairs or setae. The anal plate has been described in various ways. Green (l. c.) says, "There is an ovoid median undivided dorsal plate, bearing on its margin from 8 to 10 stout hairs, and covering the extremity of the anal tube." Teague (l. c.) says, "The anal cleft is usually short, continuing on the ventral side as a furrow and covered at its base on the dorsal side by a plate or operculum which is free except at its base." The term "anal tube" is used frequently by authors. Green says, "There is a retractile anal tube, open at the under surface, apparently composed of numerous flattened hairs, which are confluent on the basal half but separate towards the extremity." Green quotes Newstead as considering this organ in *A. japonica* as composed of distinct but closely approximated hairs. Teague (l. c.) writes, "A retractile anal tube is present, which seems to terminate in many flattened hairs that form a fringe. They are apparently not setae." The correct understanding of these two structures can only be had by considering them together. The so-called dorsal plate (Plate 7, figs. A, B, C, Ap) is the more or less flattened, sclerotized dorsal surface of a sclerotized evagination (Plate 7, fig. C, E_1) from the anterior end of the short anal cleft (Plate 7, figs. A, C, Ac). This tube is invaginated (Plate 7, fig. C, I_1), and evaginated (Plate 7, figs. C, E_2) again with the anal opening at the center (Plate 7, figs. B, C, An) of the latter evagination which is quite heavily sclerotized, and without cellular pores. At the point where the latter evagination begins is a ring of long stout, thickly set setae (Plate 7, figs. A, B, C, Ars) that have been variously described. They project through the telescoped tube and beyond the apex of the abdomen.

The above clarification of the nature of the anal opening, the ring of setae and the immediate area about them indicates the adult female scales possess an anal ring that may be described as sclerotized, non-cellular and densely setigerous. The number of anal ring setae is twenty or more.

The anal cleft is continued along the ventral surface as a furrow or groove with the lateral margins (Plate 7, figs. A, B, D, E, F, G, Pm) heavily sclerotized and intimately applied to each other to form a pouch or pocket (they separate when specimen is treated with caustic as shown in (Plate 7, figs. A, Pm). The margins actually fuse posterior to the genital opening and continue as an internal ridge almost to the genital opening. The ventral pouch as formed in specimens before caustic treatment is indicated in (Plate 7, figs. B, D, F, Vp). The lateral and dorsal walls of this pouch are membranous, except two elongate more or less sclerotized bars (Plate 7, figs. A, B, C, D, E, F, G, Mvsb) in the median dorsal wall, which is morphologically the median ventral wall of the posterior part of the abdomen. The anterior ends of these bars are fused and form the posterior attachment for a large muscle with its anterior end attached at the genital opening. These bars have their posterior origin in the ventral wall of the evagination which forms the anal plate. A small secondary ventral pouch (Plate 7, figs. A, B, F, G, Svp) is formed beneath the point of fusion of the two rods. The membranous derm between them is flexed downward and backward, and then forward to produce the pouch. Optical cross sections (Plate 7, figs. F and G) through this area show the relationship of the two pouches. The secondary ventral pouch has only been demonstrated in histological preparations, but it is evident in both sagittal and cross sections.

The above notes indicate the need for the redefining of this group of coccids. They may be defined as follows: Adult females with 1-segmented beak; without abdominal spiracles; caudal area of the abdomen heavily sclerotized and wrinkled or furrowed; apex of abdomen with a short ovoid-shaped cleft, with a heavily sclerotized evagination from its base, flattened dorsally to form an anal plate which fills the cleft; often with apex of plate notched, sometimes deeply cleft; posterior end of anal plate evagination, invaginated, and evaginated again to form the anal ring without pores, but with a ring of closely set setae at point where later evagination begins; median ventral posterior abdominal wall with two parallel sclerotized bars (Plate 7, figs. A, B, C, D, E, F, G, Mvsb) that have their posterior origin in the ventral portion of anal plate evagination, fused at their anterior ends; two types of tubular ducts with filamentous inner prolongations, large ducts (Plate 7, figs. H and I) with the inner ends with a deep heavily sclerotized cup with the center reflexed, and with a single filamentous inner prolongation from one side; minute tubular ducts (Plate 7, fig. K) with heavily sclerotized walls and several filamentous inner

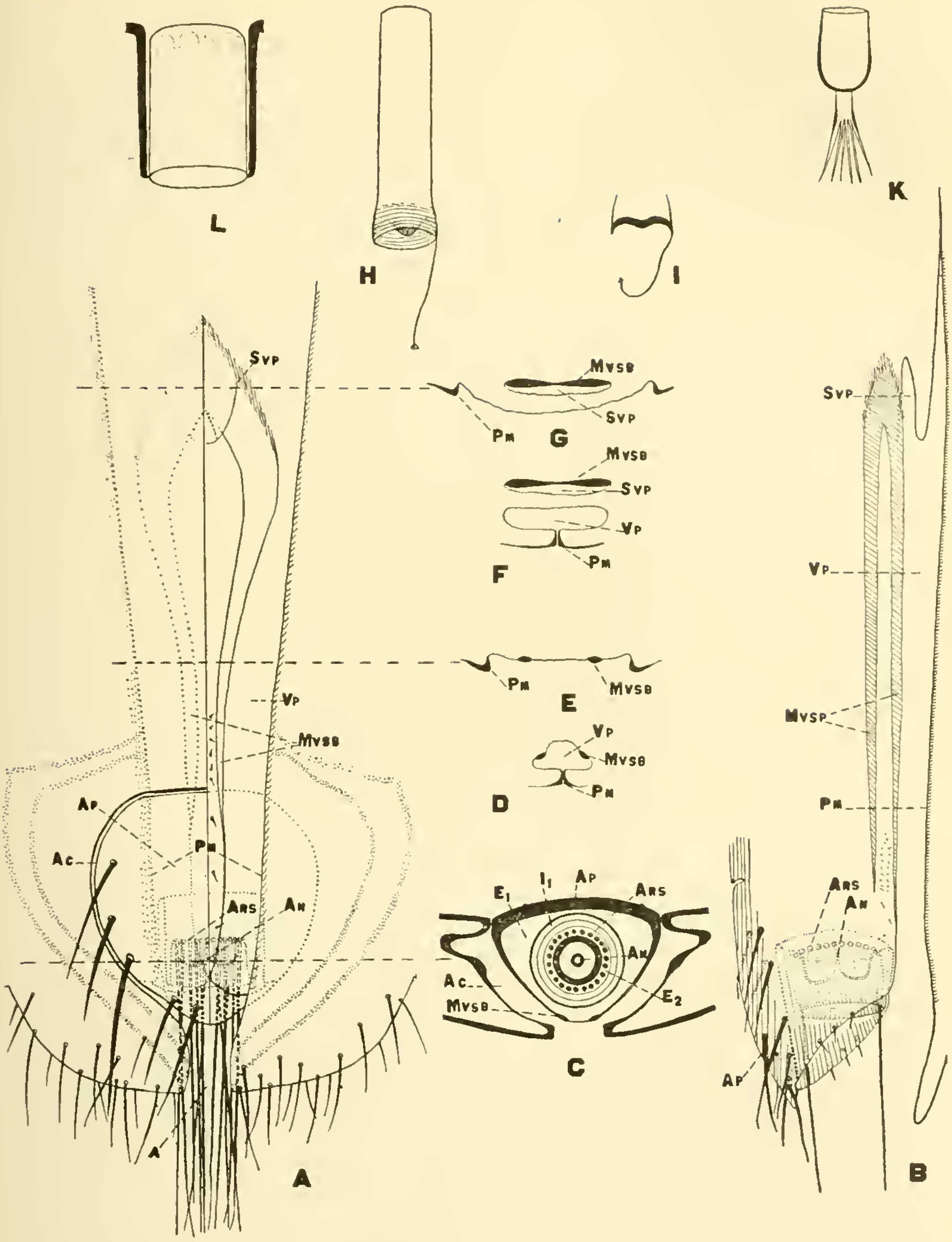


Plate 7.—*Aclerda* details (partly diagrammatic).

Figs. A. Dorsal and ventral surfaces views of the anal area; B. Lateral view of anal area; C. Optical cross section of Fig. A at indicated transverse dash line; D & E. Optical cross sections of Fig. A at indicated transverse dash line; F & G. Optical cross sections of Fig. A at indicated transverse dash line; H. Tubular ducts with one filamentous inner prolongation; I. Optical cross section of inner end of Fig. H; K. Tubular duct with several filamentous inner prolongations; L. Cylindrical internally sculptured seta. Ac—anal cleft; An—anus; Ap—anal plate; Ars—anal ring setae; E_1—evagination from base of anal cleft; E_2—evagination to form anal ring; I_1—invagination of anal plate; Mvsb—Median ventral sclerotized bars; Svp—secondary ventral pouch; Vp—ventral pouch; Vpm—ventral pouch margins prolongations from the center of the inner end of the ducts; margin of the body with a band of short tuberculate setae; posterior dorsal surface of caudal sclerotized area with short cylindrical setae (Plate 7, fig. L) like organs with variously sized sculpturing in the lumens, these setae-like organs often extending to the membranous portion of abdomen; spiracles with a variously shaped stigmatic pore plate; antennae reduced to short tubercles; legs entirely lacking.

Larvae with numerous stout, lanceolate, spine-like setae around margin, strongly developed anal lobes, with a single long stout anal lobe seta at apex; anal ring without setae and noncellular, legs normal, thoracic spiracles with a stigmatic pore plate with two, sometimes three, disc pores, antenna 6-segmented, segments III and VI often with one long slender seta; beak 1-segmented, legs normal; tubular ducts with several inner prolongations.

Intermediate stages legless; antennae reduced to short tubercles, with several stout setae; posterior abdominal region sclerotized and wrinkled or furrowed; a short narrow anal cleft, with a suggestion of an anal plate; anal ring without setae; noncellular; body margined with setae intermediate between the lanceolate form of the larvae and the tuberculate form of the adult; beak 1-segmented; tubular ducts of two types with inner filamentous prolongations.

The above descriptions contribute some facts that have a bearing on the place the genus *Aclerda* has in the classification of the coccids. The invaginated setigerous anal ring of the adult is suggestive of the invaginated setigerous anal ring of the Coccidae (Lecaniinae). The anal rings of the two groups differ, however, in that in the Coccidae it is cellular, but nonporiferous in *Aclerda*. The anal ring of the immature stages of the Coccidae is definitely poriferous and setigerous; while there is nothing in the immature stages of *Aclerda* even suggestive of a poriferous and setigerous anal ring. Thus the rather striking case of a setigerous anal ring present only in the adult stage and absent in all other stages is presented. The various forms of tubular ducts found in different groups of coccids are more or less characteristic of the groups. Ducts with several inner filamentous prolongations appear to be peculiar to the genus *Aclerda*.

In preparing the above definition of *Aclerda* no consideration was given to *A. digitata* (Ckll) nor *A. biwakoensis* Kuw., since no material suitable for detailed study was available. When these two forms have been studied sufficiently, some revisions may be necessary.

Aclerda andropogonis, new species.

(Plate 8.)

Adult female living between tight leaf sheaths at the base of the host, flattened, posterior end slightly convex, widest at mid-abdominal area, tapering gently toward anterior end, more sharply toward posterior end which is twisted slightly to one side, dorsal surface of body covered with a thin sheet of glassy wax, ventral surface with powdery wax.

Adult female.—(Plate 8, fig. A) Mounted, varying from 2.5 mm. to 7 mm. in length, and 0.75 mm. to 2.5 mm. in width, elongate-oval in shape. Anterior end rounded, posterior end more acutely rounded. Derm membranous in younger specimens except posterior end heavily sclerotized, however, this region not large; median portion of sclerotized area smooth, remainder wrinkled and deeply furrowed. Band of tuberculate, pointed acorn-shaped setae (Plate 8, fig. B) in more or less double row around the body, the ends extending almost to the anal plate, band appears to be ventral in most mounts, except at the posterior end where it is marginal, or on the dorsal margin. Other body setae rather few in number and well scattered; those on dorsum stout and lanceolate, those on ventral surface more slender, arranged segmentally on the abdomen. Cylindrical internally sculptured setae (Plate 8, fig. C) numerous, densely clustered in the sclerotized dorsal caudal area and extending forward almost the entire length of the abdomen, about twice as long as broad with fine sculpturing in the lumen. Spiracle (Plate 8, fig. D) rather large, with little sclerotized extension of the spiracular apodeme; stigmatic pore plate quadrate in shape with one corner somewhat expanded; usually from one to three quinquelocular disc pores anterior to the pore plate. Antenna (Plate 8, fig. E) small, possibly 2-segmented, apical portion small with several stiff setae at the apex, basal portion much larger with a few long setae around base of apical portion and a group of two or three minute setae on the derm near base. Anal plate (Plate 8, fig. F) ovoid with the apex usually notched, sometimes rather deeply, occasionally apex rounded without any evidence of a notch; with five long stout setae on each side, three near the apex and two near the mid point of each half. Median ventral sclerotized rods approximately parallel, about twice as long as the anal plate, little if any expanded at anterior end. Tubular ducts with filamentous inner prolongations of two types, large ducts with a one prolongation (Plate 8, fig. G) and minute ducts with several prolongations (Plate 8, fig. H); the large ducts with one prolongation of two sizes; the larger ducts associated with dorsal surface, in a narrow band around the body mingled with the tuberculate setae except at posterior end of body where they spread over the entire dorsal surface, the band narrows from posterior end toward anterior, until actually interrupted at the head; the smaller ducts with one inner prolongation associated with ventral surface, confined to a ventral submarginal band mingled with the minute tubular ducts with several prolongations. Beak 1-segmented with a small group of minute tubular ducts with several inner prolongations at the base. Disc pores of two types, quinquelocular (Plate 8, fig. I), usually from one to three anterior to each spiracle, and simple disc pores scattered over the dorsal surface, most numerous near the tuberculate setae.

Larva.—(Plate 8, fig. K.) From 0.6 mm. to 0.8 mm. long and 0.2 mm. to

0.3 mm. wide, body with definite indentations at the antennae, and slight constriction on the thoracic area. Each margin with about 30 stout setae (Plate 8, fig. L) assymetrically inflated at the base, and acutely pointed, eight of them equally spaced between the antennae; dorsum of posterior abdominal segment with three setae of about same size as marginal ones, but point obtusely rounded other setae scattered on both dorsal and ventral surfaces. Antenna 6-segmented, segment II shortest, segments I, III and VI longest, and approximately equal; setae few, segment VI with a group of several at apex, segment III with a seta more than twice as long as the segment. Legs slender, setae few; tarsal and claw digules knobbed, long and slender; claws slender, long, and acutely pointed. Anal lobe (Plate 8, fig. M) strongly developed, anal lobe setae nearly half as long as the body. Beak 1-segmented. Eyes prominent, flask-shaped. Minute tubular ducts with multiple inner prolongations (Plate 8, fig. N) few, four or five along each ventral margin. Simple disc pores along each dorsal margin.

Type host.—*Andropogon virginicus.*

Type locality.—Newport (Charles County), Maryland.

Type.—Adult female, collected August 1941, deposited in the National Collection; paratypes collected August 1940, December 1941, February 1942, and August 1942, deposited in National Collection, Maryland Agricultural Experiment Station Collection, and in the author's collection.

This species is close to *A. obscura* (Parrott) but has many more cylindrical internally sculptured setae, and the marginal tuberculate setae are shorter and stouter.

Collection data and observations indicate that there is a single generation of this species annually.

Aclerda arundinariae, new species.

(Plate 9.)

Adult female in life between the leaf sheaths and the stem, elongate, 2.5 mm. to 8.5 mm. long, depending upon age, flattened except posterior end of the body, often posterior end exposed through a hole cut in leaf sheath by ants, and this covered by a carton constructed of plant debris; most specimens distorted at posterior end, this frequently turned at a right angle; young adult females light in color, except posterior extremity, and lateral margins of abdomen, fully mature females darker, dead specimens reddish to black; usually covered with thin glossy wax on the dorsum, venter with small amounts of powdery wax.

Adult female.—(Plate 9, fig. A.) Mounted varying between 2.5 mm. and 9 mm. long, and 1 mm. to 3 mm. wide, depending upon stage of maturity, shape usually distorted, but variable, probably due to position on host, body may be twisted with the caudal region often at a right angle to the remainder of the body, anterior end of body well rounded. more or less membranous, posterior end acutely angled, heavily sclerotized, wrinkled, margins of entire abdomen wrinkled and sclerotized. Tuberculate setae (Plate 9, fig. B) elongate acorn-shaped, in double row, appearing on the ventral surface in slide mounts; posterior

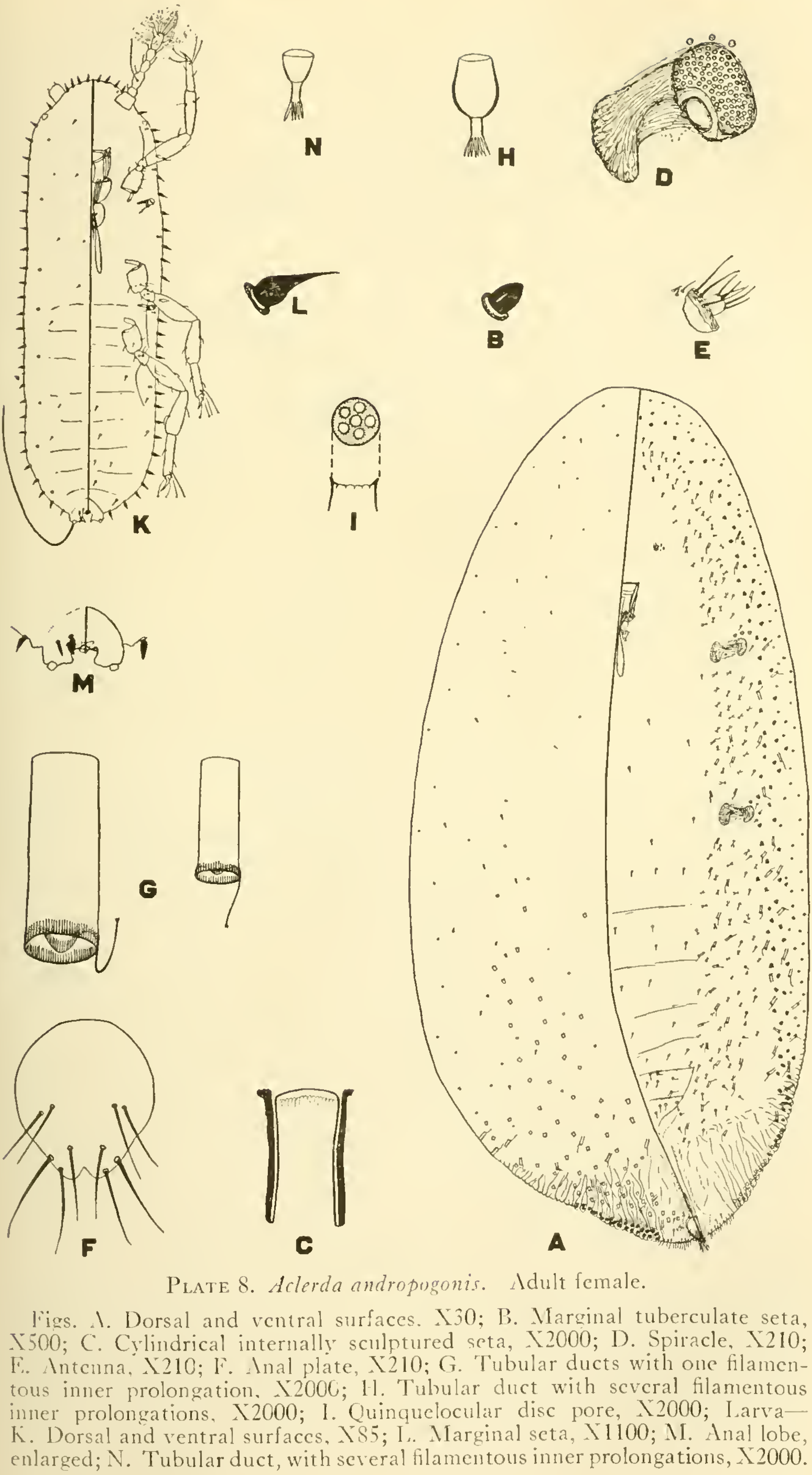


PLATE 8. *Aclerda andropogonis.* Adult female.

Figs. A. Dorsal and ventral surfaces. X30; B. Marginal tuberculate seta, X500; C. Cylindrical internally sculptured seta, X2000; D. Spiracle, X210; E. Antenna, X210; F. Anal plate, X210; G. Tubular ducts with one filamentous inner prolongation, X2000; H. Tubular duct with several filamentous inner prolongations, X2000; I. Quinquelocular disc pore, X2000; Larva—K. Dorsal and ventral surfaces, X85; L. Marginal seta, X1100; M. Anal lobe, enlarged; N. Tubular duct, with several filamentous inner prolongations, X2000.

ends of the band widened somewhat and reaching almost to the anal cleft, and covered by folds or invaginations of the greatly widened posterior margins (Plate 9, fig. A); other body setae of various shapes and sizes; posterior tip of abdomen with numerous elongate setae between the ends of the band of tuberculate setae; ventral surface of body with short delicate setae; somewhat segmentally arranged on the abdomen; dorsal surface with elongate lanceolate shaped setae (Plate 9, fig. C); internally sculptured cylindrical setae (Plate 9, fig. D) confined to posterior dorsal half of abdomen more than twice as long as wide, sculpturing in lumen coarse. Spiracles (Plate 9, fig. E) large, with a sclerotized area extending from the spiracular apodeme forming an hour-glass shaped area, stigmatic pore plate not large, rather narrow and almost semicircular; a group of 8 to 20 quinquelocular pores anterior to the spiracles, these pores not observed elsewhere on body. Anal plate (Plate 9, fig. F) ovoid in shape, usually slightly emarginate at base; apex variable, usually obtusely rounded, sometimes distinctly notched, with five long stout setae on each lateral margin. Median ventral sclerotized bars rather strong, wide, much expanded at anterior end. Tubular ducts with filamentous inner prolongations of two types, the larger type (Plate 9, fig. G) with one inner prolongation of two sizes; the larger size associated with dorsal surface in a dorsal submarginal band, entirely around the body; this band narrow at mid area and much broader at the anterior and posterior ends of the body; the smaller sized ducts with one filamentous inner prolongation, numerous, associated with ventral surface, and numerous ducts of the type with several inner prolongations (Plate 9, fig. H) intermingled to form a dense, wide ventral submarginal band entirely around the body. Disc pores of two types; quinquelocular disc pores (Plate 9, fig. I) in a group of 8 to 20 anterior to each spiracle; simple disc pores (Plate 9, fig. J) scattered over the dorsal surface, sometimes with internal sculpturing visible. Beak 1-segmented, with a group of several tubular ducts with several inner prolongations at base. Antenna (Plate 9, fig. K) apparently 1-segmented with numerous stout setae in two whirls, and with two or three small setae on the derm near base.

Larva.—(Plate 9, fig. L). Elongate, 0.8 to 1.0 mm. long, and 0.3 to 0.4 mm. wide; body with definite indentations at the point of attachment of the antennae, and slight constrictions on the thoracic area; margins set with about 30 stout spear-head shaped setae (Plate 9, fig. M) on each side; eight of these between the antennae in two distinct and well separated groups of four setae each; usually three or four more or less similar setae on the dorsal surface of the posterior abdominal segment; other setae few, well scattered. Antenna 6-segmented, segment II shortest; segments III, IV, V and VI similarly shaped and subequal in length; antennal setae few, except segment IV with a tuft of several at apex, one of which is longer than the entire antenna; one seta on segment III more than twice as long as the segment. Anal lobes (Plate 9, fig. N) strongly developed, with the anal lobe seta about one-third as long as the body. Legs rather long, with few setae; tarsal digitules about three times as long as the claws, forked at the tips, claw digitules knobbed, nearly twice as long as claws; claws not long, slightly curved, acutely pointed. Beak 1-segmented. Tubular ducts with multiple filamentous inner prolongations (Plate 9, fig. O) along ventral margins, few in number. Simple tubercle like pores (Plate 9, fig. P)

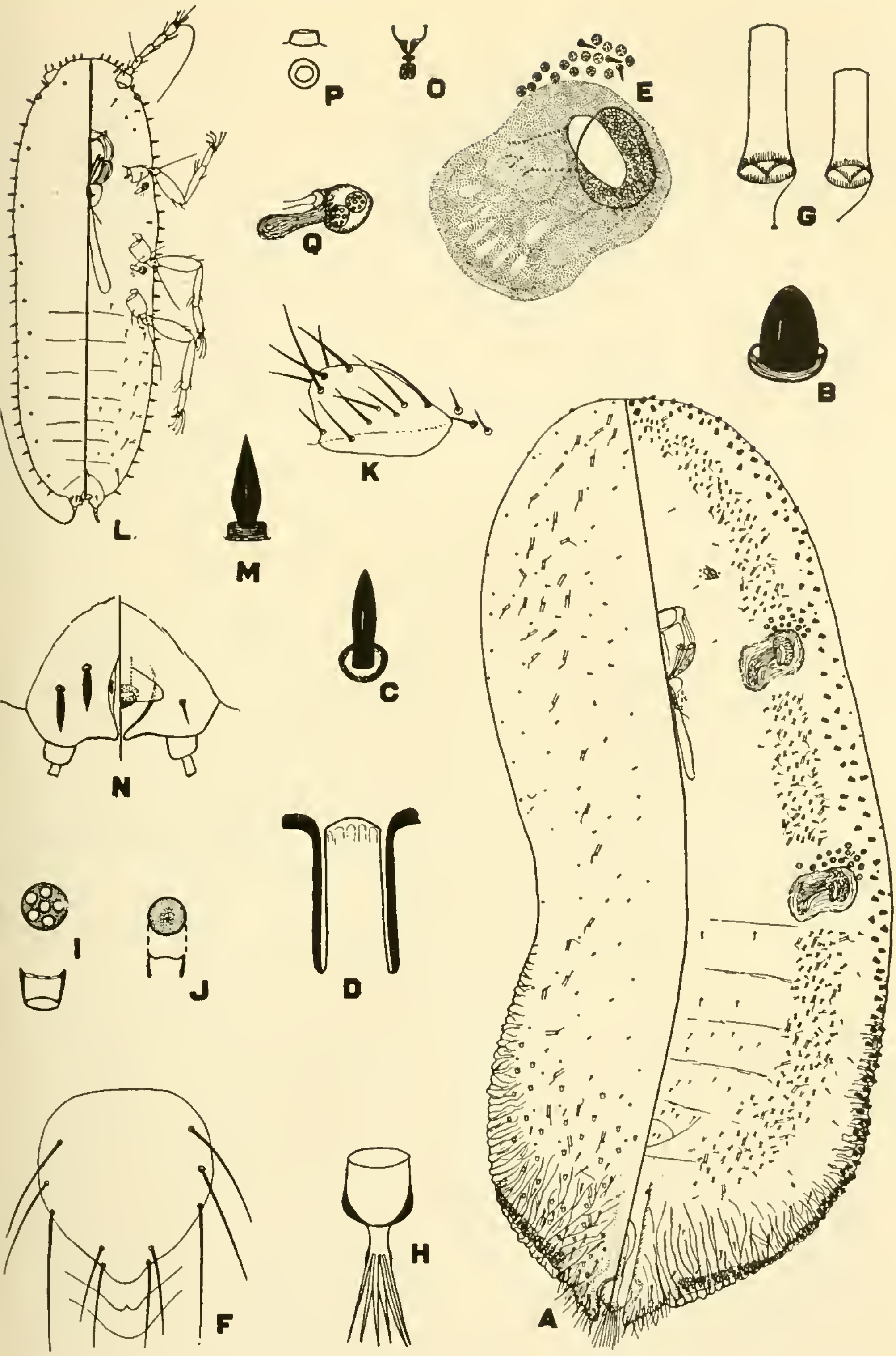


PLATE 9. *Aclerda arundinariae*. Adult female.

A. Dorsal and ventral surfaces, X25; B. Marginal tuberculate seta, X950; C. Dorsal lanceolate seta, X1000; D. Cylindrical internally sculptured seta, X10000; E. Spiracle, X150; F. Ventral plate, X200; G. Tubular ducts with one filamentous inner prolongation, X10000; H. Tubular duct with several filamentous inner prolongations; I. Quinquelocular disc pore, X10000; J. Simple disc pore, X1000; K. Antennae, X585; Larva—L. Dorsal and ventral surfaces, X55; M. Marginal seta, X2000; N. Anal lobes, dorsal and ventral; O. Tubular duct with several inner prolongations, X1000; P. Simple disc pore, X2000; Q. Spiracle, X2000.

along dorsal margin. Spiracles (Plate 9, fig. Q) with two disc pores, apparently with six or seven loculi, on each stigmatic plate.

Type host.—*Arundinaria tecta.*

Type locality.—Anderson, S. C.

Type.—Adult female, collected July 31, 1942, deposited in National Collection; paratypes collected July, 1940, July and August, 1941, and July, 1942, deposited in National collection, Maryland Agricultural Experiment Station Collection, and in the author's collection.

This species is quite unlike any species that has been recorded in North America. It is more like *A. distorta* Green than any species known to the author. The posterior end of the body is less acutely pointed than *A. distorta*, the anal plate more ovoid, and the marginal tuberculate setae are shorter and stouter.

A. arundinariae has been found most numerous on small shrubby plants growing in drier locations along the margins of "cane brakes." Infested plants can often be located by the ant cartons built around the terminal stems and the blackened appearance due to sooty fungus growing on the "honeydew" excreted by the scales. Judging from collection data there is only one generation annually.

An interesting group of parasites were reared from this species. From the several lots of scales collected, eight different species of parasites were reared, only one of which has been identified to species, *Encyrtus marilandicus* (Gir.).

Aclerda xalapenseae, new species.

(Plate 10.)

Adult female in life located behind the delicate leaf sheaths along the stem of the host near ground, small, varying from 1.4 mm. to 4.5 mm. in length, and 0.7 mm. to 2.6 mm. in width, the smaller specimens flattened and more elongate, larger specimens more oval, and convex; dorsum covered with translucent wax, varying in thickness on parts of the body, some portions thick enough to produce a warty appearance; ventral surface lightly dusted over with white powdery wax.

Adult female.—(Plate 10, fig. A). Mounted, varying from 1.5 mm. to 4.7 mm. in length, and 0.7 mm. to 2.77 mm. wide, sides of body approximately parallel, anterior end well rounded, posterior end more pointed and slightly twisted to one side. Derm not heavily sclerotized except in old and dried specimens and in posterior region; area of caudal region sclerotized variably, median dorsal portion more so than lateral, furrows in median portion of area tending to be transverse, others both dorsal and ventral more or less longitudinally arranged. Marginal tuberculate seta (Plate 10, fig. B) about one and one-half times as long as wide, definitely constricted at base, arranged in a more or less double row extending around body almost to the anal plate, posterior ends of band

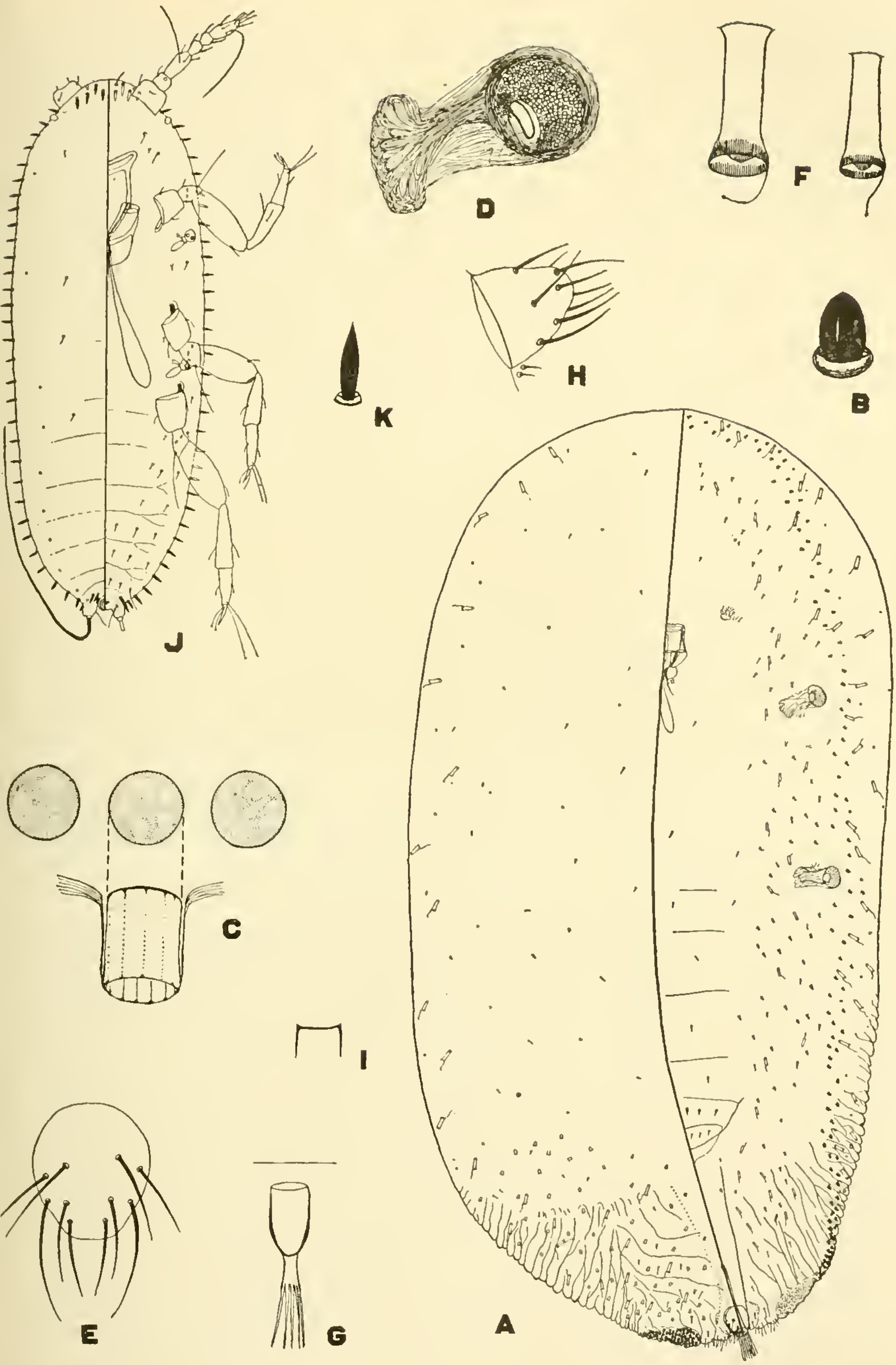


PLATE 10. *Aclerda xalapenseae.* Adult female.

A. Dorsal and ventral surfaces, X35; B. Marginal tuberculate seta, X1000; C. Cylindrical internally sculptured seta, X2000; D. Spiracle, X225; E. Anal plate, X220; F. Tubular ducts with one filamentous inner prolongation, X1000; G. Tubular duct with several filamentous inner prolongations, X1000; H. Antennae, X500; I. Simple disc pore, X2000; Larva—J. Dorsal and ventral surfaces, X120; K. Marginal seta, X600;

expanded to four or five rows, they appear on ventral surface in slide mounts, except expanded posterior ends of band where they appear to be on dorsal margin; numerous long setae on apex of abdomen; other setae of various shapes and lengths well scattered over both dorsal and v ntral surfaces of the body. Cylindrical internally sculptured setae (Plate 10, fig. C) numerous on dorsal sclerotized area extending forward somewhat on the more membranous area, rather short, less than twice as long as wide, internal sculpturing quite coarse. Spiracles (Plate 10, fig. D) large, heavily sclerotized, stigmatic pore plate nearly circular. Anal plate (Plate 10, fig. E) ovoid with apex somewhat truncated, five long stiff setae on each side. Median ventral sclerotized bars small, close together, slightly more than twice the length of anal plate. Tubular ducts with filamentous inner prolongations of two types, large ducts with a single prolongation (Plate 10, fig. F) and minute ducts with several prolongations (Plate 10, fig. G); ducts with one prolongation of two sizes, the larger associated with dorsal surface in a band around the body mingled with the marginal tuberculate setae and extending well to the dorsal surface of the more membranous portion of the body and over the entire sclerotized posterior dorsal area; the smaller ducts with one inner prolongation associated with ventral surface, confined to a sparse ventral submarginal band mingled with the minute ducts with several inner prolongations that extend around the body in the same plane as the spiracles, the band widening and spreading over the caudal ventral sclerotized area. Beak 1-segmented. Antenna (Plate 10, fig. H) 1-segmented with several stout setae. Simple disc pores (Plate 10, fig. I) scattered over the dorsal surface, few in number, tuberculate, longer than wide.

Larva.—(Plate 10, fig. J.) (Only unfed specimens available) 0.6 mm. to 0.8 mm. long, and 0.2 mm. to 0.3 mm. wide, body with only suggestions of indentations at the antennae and none whatever in the thoracic region. Each margin with about 36 stout, lanceolate shaped setae (Plate 10, fig. K), eight of them between the antennae, slightly dorsal as mounted rather than marginal, all eight not in line; two, nearer margin, the other six in a line somewhat farther removed from margin; dorsum of posterior abdominal segment with three setae similar to those of margins, and ventral surface with one larger submarginal seta; other body setae on both surfaces well scattered. Antenna six-segmented; segments II, IV and V shorter, subequal, segments II and VI longest, subequal; setae few, segment VI with one almost as long as antenna, and segment III with one seta almost twice as long as the segment. Legs rather stout with few setae, tarsal digitules long and slender, nearly three times as long as the claws, not knobbed, claw digitules knobbed exceeding the claw somewhat, claws long and slender, almost straight. Anal lobes strongly developed, anal lobe setae nearly half as long as the body. Beak 1-segmented. Eyes large and prominent. Minute tubular ducts with multiple inner prolongations few, four to six on each side of venter well removed from margins. Simple disc pores few, in a row near dorsal margin.

Type host.—*Panicum xalapense.*
Type locality.—Newport (Charles County), Md.
Type.—Adult female, collected August 20, 1942, deposited in

National Collection. Paratypes collected August, 1941 September 1941, December 1941, February 1942, and August 1942, deposited in National Collection, in Maryland Agricultural Experiment Station Collection, and in author's collection.

This species resembles *A. obscura* (Parrott), but can be distinguished from *obscura* in that the posterior ends of the band of tuberculate setae are much more expanded, and the band of tubular ducts with several filamentous inner prolongations contains fewer ducts.

Apparently there is only one generation each year.

AN APPARENTLY NEW SPECIES OF PAUROCEPHALA CRAWFORD (Homoptera, Psyllidae, Pauropsyllinae)

By LOUISE M. RUSSELL,

Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture.

This paper is published in order to provide a name for a psyllid which is reported to be of economic importance. The species was received from R. L. Steyaert, Division de Phytopathologie, Institut National pour l'Etude Agronomique au Congo Belge, with the information that it was responsible for a very destructive disease of *Gossypium* in the southern cotton belt of the Belgian Congo. He also stated that the injury caused by the insects was similar in many respects to psyllid damage to potatoes and tomatoes in the United States.

The species appears to be congeneric with *psylloptera* Crawford, the type of the genus *Paurocephala.* It differs from species previously described in the genus in several characters, the most conspicuous of which probably is the presence of prominent peglike teeth on the inner surface of the claspers.

Paurocephala gossypii, new species.

Adults.—Length to tip of folded wing, 1.80 mm.; length of body as mounted on slide, 2 mm.; length of fore wing, 1.45 mm., width, 0.55; length of hind wing, 1.25 mm., width, 0.45; width of head, 0.50 mm.

Color pale yellow with dark-brown markings located as follows: Eyes, last 2 antennal segments, tip of labium, anterior tarsi and claws, tegula of fore wings and a spot at end of veins (before end of anal vein) and on radius, a spot at ends of posterior 5 tergites of female and at ends of first dark abdominal tergite of male, inner surface of claspers; also in male (and occasionally but not characteristically in female), vertex dorsally, pronotum, 4 stripes or 2 elongate spots extending from mesoscutum to mesoscutellum and joined by a cross bar at base of mesoscutum, a transverse bar on metascutum, central portion of posterior 5 (faint in center of last 2) tergites.

Head as wide as thorax, strongly deflexed, reticulate. Vertex rounded forward and downward, posterior ocelli on elevations, a pair of foveae mesocephalad of elevations, genae not swollen, they and vertex with a few small setae. Frons well defined, anterior ocellus at its upper end. Antennae as long as width of head, 10-segmented, relative size of segments as illustrated; segments 5 and 7 without setae, segments 1–5, 6, and 8 with at least 1 small seta, segment 9 with 2 large, stout setae at outer end, segment 10 with a large, stout, apical and preapical seta and a minute seta at base of each of them; segment 2 with a small sensorium and segments 4, 6, 8, and 9 each with a large one; segments 1 and 2 reticulate, others encircled by sclerotized ridges or minute points. Clypeus triangular, elongate, reticulate, with 2 pairs of setae near base; labium with 2 pairs of setae just before brown spot and 2 pairs at tip.

Thorax strongly arched, reticulate, with a few small setae; pronotum nearly perpendicular; metascutellar tubercle small, rounded. Fore wings transparent, with a prominent pterostigma, shape and venation as illustrated; all cells except subcostal, and pterostigma, with minute dots (not close to veins); veins with minute setae; lower surface with a narrow marginal band of minute points starting at humeral angle and terminating on Cu_2, upper surface with a less conspicuous marginal band extending from R_1 to Cu_1; small square or rectangular designs on inner margin at base and before anal vein. Hind wings with minute points; costal margin with 3 or 4 setae near base, 3 or 4 beyond these, and 1 near center; 4 smaller ones on R+M+Cu, 2 opposite each group on margin. Legs slender, tibiae without a spur at base; posterior tibia with 7–9 sharp, slender, spinelike setae at apex, other tibiae with 6 or 7 slightly smaller ones; each tarsal segment with a sensorium on upper surface; tarsi each with 1 digitule, surpassing claws; posterior femur with 3 sensoria near center of inner margin; trochanters each with an irregular band of sensoria; legs encircled by bands of minute points except for some eye-shaped areas on femora. Metacoxal spurs of moderate size, longer than wide.

Abdomen with a row of small, slender setae on each sclerotized tergite and a row of longer setae on each sclerotized sternite, a cluster of spines at each end of anterior sclerotized tergite, most of surface with minute points. Seven pairs of spiracles, derm around or on one side of opening sclerotized, atria elongate, larger at opening than at inner end, walls sclerotized. Membrane behind posterior tergite in male with a small, median, sclerotized area.

Genitalia of female deflexed perpendicularly, a little more than one-half the length of rest of distended abdomen. Dorsal valve with a pair of median lobes at base; circumanal ring longer than wide, somewhat diamond-shaped, consisting of an inner row of elongate pores placed side by side and an outer row of minute circular pores, also a faint half ellipse of elongate pores located transversely just anterior to widest part of ring on dorso-lateral surface; valve moderately narrowed, apex subacute, curved outward, and extending slightly beyond ventral valve; short setae at intervals around ring, 8 elongate ones in a row slightly nearer ring than apex, a few shorter ones anterior to outer elongate ones and numerous minute to small ones between elongate ones and apex. Ventral valve strongly narrowed from center, 8 or 10 elongate setae opposite those on dorsal valve and a few shorter ones scattered to apex.

Genitalia of male with a row of 8 slender setae on ventral valve. Proctiger moderately stout, about one-fourth longer than wide, as long as claspers; a distinct membranous line on each side of ventral surface separating off a pair of swollen areas, these and outer part of organ with small to fairly large setae, Claspers strongly curved; 3 or 4 (usually 3) pairs of strong, peglike teeth set in sockets on inner surface, slightly nearer base than apex; a ridge with shallow sawlike teeth extending along upper edge of inner surface from outer peglike tooth to apex; minute setae on apex and longer setae elsewhere except on outer basal area. Aedeagus swollen near apex.

Fifth-stage nymph.—Length as mounted, 1.25 mm. Rather elongate, eyes bulging slightly beyond margin of head and thorax, wing pads projecting outward and backward, prominent processes bearing sectasetae extending beyond margin of abdomen posteriorly, median molting suture apparent from anterior margin of head to posterior sclerotic plate. Derm predominantly whitish or pale yellowish but brownish color of varying intensity located as follows: Distal antennal segment, sclerotic plates of head and thorax, basal part of both wing pads and inner apical portion of fore wing pads; first, second, third, fourth, and median portion of posterior abdominal sclerotic plates.

Sclerotic plates present dorsally, only posterior one extending across median line, pairs arranged as follows: Head, 1 roughly oblong; prothorax, 1 transverse, weakly separated from one on head, also 2 lightly sclerotized transverse spots (along suture) posterior to plate; mesothorax, 1 inner and 1 outer, both slightly longer than wide, also a lightly sclerotized linear one (along suture) posterior to larger plates and a linear one extending cephalad between outer plate and wing pad; metathorax, 1 transverse, and 2 linear ones similar to those on mesothorax; abdomen, 1 transverse, 2 short, lightly sclerotized, transverse spots (apparently along suture), 3 transverse. Also 1 plate covering posterior 4 abdominal segments; each segment of this plate and the pair of transverse plates immediately anterior to it terminating laterally in a conspicuous process, the processes becoming successively larger near end of abdomen. Dorsal surface of wing pads (except portion of hind pad covered by fore pad) sclerotized similarly to plates Larger sclerotic plates and wing pads bearing sectasetae arising from tuberclelike prominences, the sectasetae fairly acute at tip, 10–45 μ long, inner ones often stouter than outer ones, arranged approximately as follows on each half of body: Head, 7–11; prothorax, 11; mesothorax, inner plate 4 or 5, outer plate 7; metathorax, 8; anterior abdominal, 3 or 4; each of next 3 transverse plates, 5–7 (2 on process of last one); each of anterior 3 segments of posterior plate, 1 median (unpaired) and 6–8 others (anterior 2 processes each with 3, posterior process with 4); posterior segment of plate, 6 (1 between penultimate and posterior processes, 2 dorsally and 2 on outer margin of process, and 1 at apex); fore wing pad, usually 6–11 dorsally (sometimes nearly all replaced by other setae). 18–21 around margin with a large one usually alternating with a smaller one; hind wing pad, usually 4 or 5 (sometimes replaced by other setae) dorsally and 2 marginal at apex. Sclerotic plates and wing pads also with minute to small, thick, blunt, stublike or swollen setae scattered among (or occasionally replacing) sectasetae. Posterior segment dorsally with a pair of slender, curved, depressed lines.

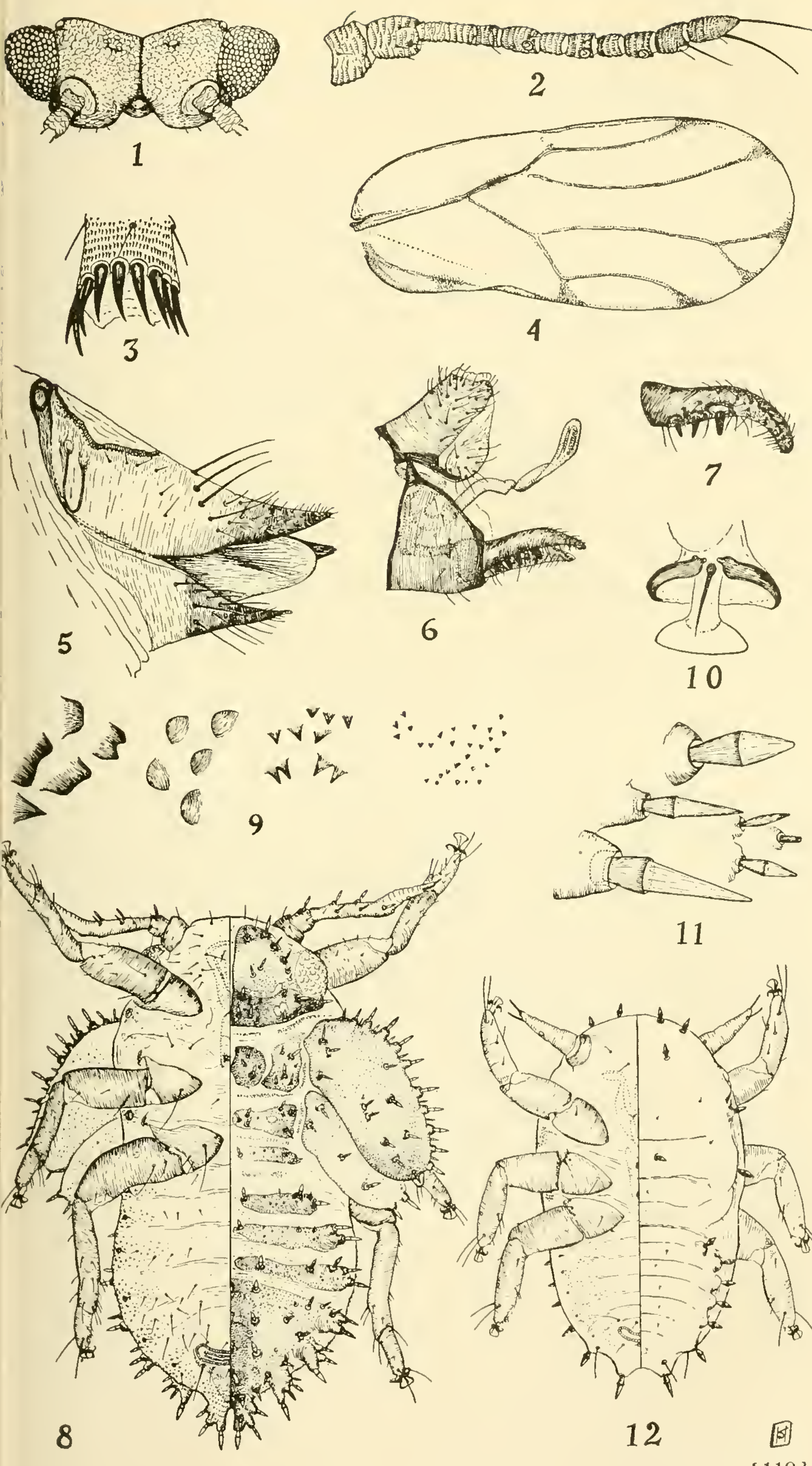
Antennae, mouthparts, legs, a small area around each spiracle, and a curved area posterior to circumanal ring lightly sclerotized. Antennae arising beneath margin of head; basal segment of each, short, broad, and with 2 setae; second segment longer and with 3 small setae, 1 sectaseta, and 1 sensorium; third segment elongate, bearing 2 small setae near base, 2 whorls of 4 sectasetae each, 2 sectasetae just beyond middle of segment, a large sensorium with a small stout seta, a preapical and apical large stout seta each with a minute sensorium and seta at base; apex (beside seta) stout spinelike. Clypeus triangular, elongate, a pair of setae at base; labrum without setae; labium with a pair of setae at base, a pair near center, and apparently 3 pairs at tip. Legs without trochanters, each with 1 tarsal segment; 2 tarsal digitules, surpassing claws; empodium somewhat triangular; 4 or 5 sensoria near base and 2 near center on inner margin of each femur, 1 on outer margin near center of each tarsus; posterior tibiae about one-third longer than others; slender setae on each segment. Seven pairs of abdominal spiracles, walls of atria sclerotized, somewhat tubular but swollen at opening. Slender setae present ventrally, arranged segmentally on abdomen, 1 pair also present dorsally near margin of head. Circumanal ring located ventrally before apex of abdomen, transverse, its ends curved cephalad, composed of an outer distinct, and an inner obscure, row of elongate pores placed side by side; a pair of close-set setae anterior, and a contiguous pair posterior, to center of ring.

Derm between sclerotic plates, on ventral surface of wing pads and body, membranous; also with characteristic ornamentation which is relatively large, rounded, and rugose dorsally and over the anterior margin of the head, but which is more acute and toothlike on the abdomen from ends of sclerotic plates to spiracles, and is spinelike mesad of abdominal spiracles, around thoracic spiracles and on ventral surface of wing pads; spinelike areas decreasing in size to minute points medially.

EXPLANATION OF PLATE 11.

Figure 1. *Paurocephala gossypii.* Head from front, x 70.
Figure 2. Antenna, x 115.
Figure 3. Apex of hind tibia, x 230.
Figure 4. Forewing, x 40.
Figure 5. Female genitalia, x 87.
Figure 6. Male genitalia, x 87.
Figure 7. Inner surface of clasper, x 115.
Figure 8. Fifth-stage nymph, x 50.
Figure 9. Ornamentation of membrane, x 650.
Figure 10. Apex of tarsus, x 345.
Figure 11. Setae of dorsum, x 460.
Figure 12. First-stage nymph, x 140.

(Drawings by Sara Hoke DeBord.)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Fourth-stage nymph.—Differing from fifth stage as follows: Length, 0.75 mm.; brownish color slightly more restricted; 1 pair of transverse sclerotic plates on mesothorax; setae on sclerotic plates and wing pads less numerous and smaller but same number of sectasetae on apex of hind wing pads and on all abdominal processes except posterior one, which has 5 (or 4, and a marginal one replaced by a seta); antennal segment 2 without small setae and segment 3 lacking 1 whorl of sectasetae; legs without tibio-tarsal articulation, with fewer setae, 3 sensoria at base and 1 near center of each femur; posterior tibio-tarsi about one-sixth longer than others; inner pores of circumanal ring very indistinct.

Third-stage nymph.—Differing from fourth stage as follows: Length, 0.55 mm.; sectasetae less numerous generally, only 3 on posterior and penultimate processes and 2 on each of next 3 processes; other setae of dorsum less numerous; second antennal segment poorly separated from third, with a minute seta, distal segment with only 2 sectasetae; middle and posterior femora each with only 2 sensoria near base, each femur with none near center; posterior tibio-tarsi only slightly longer than others; ornamentation of derm smaller and less distinct, mostly spinelike or in points.

Second-stage nymph.—Differing from third stage as follows: Length, 0.40 mm.; brownish only on prothorax and on median part of abdomen posteriorly; posterior 7 abdominal segments sclerotized dorsally, forming 1 sclerotic plate with a faint membranous median division through anterior 3; wing pads merely bulges in derm; sectasetae sparse, 1 at apex of hind wing pads; 2 on each of posterior 2 processes and 1 on each of next 3 processes; no ornamentation on dorsum; antennae 2-segmented, terminal segment with a sensorium at base, without small setae or sectasetae; elongate setae less numerous on legs and venter.

First-stage nymph.—Differing from second stage as follows: Length, 0.32 mm.; no brown color; no sclerotic plates, dorsum rather uniformly sclerotized; first antennal segment with 1 seta; all tibio-tarsi practically of same length; wing pads not differentiated; marginal sectasetae sparse, 2 on head and only 1 on any other segment, 1 submedian pair on head and 1 on mesothorax; other setae less numerous.

Egg (in female).—Partially collapsed but approximately 0.18 mm. long, apparently strongly narrowed at one end and broadly rounded at the other, the stalk somewhat thumblike, located near broader end of egg.

Described from dry, liquid, and slide-mounted specimens consisting of holotype male, allotype female, and more than 200 paratypes collected by Mrs. D. Soyer from *Gossypium* sp. at Gandajika, Belgian Congo, November 1941 and 1942, Number 381. Type specimens are in the collection of the United States National Museum.

NEW SPECIES OF SCOLYTOPLATYPUS SCHAUFUSS FROM MALAYSIA (Coleoptera; Scolytoidea)

By M. W. Blackman,
*Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture.*

In the present paper four new species of the genus *Scolytoplatypus* Schaufuss are described. Of these, three species were collected by R. C. McGregor in the Philippine Islands, and one species was taken in Java by C. Zimmermann. These have been in the collections of the National Museum for many years awaiting a time when other duties permitted a thorough study of these very remarkable forms.

The genus *Scolytoplatypus* was first described by Schaufuss in 1891 as a true platypid. In 1893 Blandford described several new species from Japan and the East Indies, pointed out that the group showed greater fundamental similarities to the scolytids than to the platypids, and placed it as a subfamily of the Scolytidae. Hopkins, in 1915, in his Preliminary Classification of the Superfamily Scolytoidea, raised the group to full family grade, coordinate with the Ipidae, Scolytidae, and Platypodidae. This disposal of the group seems to the present writer entirely satisfactory.

Scolytoplatypus macgregori, new species.

Male.—Reddish brown to piceous red; 3.06 mm. long, 1.83 times as long as wide.

Frons wide between eyes, frontal rectangle 1.48 times as long as wide; very broadly, rather shallowly concave; surface subopaque, distinctly reticulate, punctures minute, hairs minute, scarcely visible except for a few on epistomal margin; median line carinate on upper half. Eye ovate, wider above, facets moderate, inner line entire. Antenna large, scape somewhat twisted, club-shaped, longer than funicle but shorter than club; funicle 6-segmented, pedicel large, nearly as long as other segments combined, which become shorter and wider distally; club subsecuriform-ovate, without sutures, with moderately short, stiff hairs, except for several long hairs at apex, texture appearing areolate in balsam mounts.

Pronotum 1.06 times as wide as long, widest at base, posterior outline bisinuate, slightly produced at median line, posterior lateral angles sharply angulate; sides with a sharply elevated beaded margin, outlines excavated on posterior half, nearly straight and subparrllel anteriorly with anterior border very broadly rounded, subemarginate at median line; dorsal surface not strongly convex; surface subopaque, punctures close, very shallow, of moderate size; median line faint and fine on anterior half; vestiture lacking on disk and sides, fine short, and rather abundant near anterior margin. Sides of prothorax excavated behind, with a deep, rather large pit near anterior border; fore tibia rather narrow.

Elytra wider than pronotum and 1.29 times as long, 1.06 times as long as wide; bases bisinuate, with beaded margin; sides nearly straight for four-fifths of their length, very broadly rounded behind; surface subopaque for the most part; anterior third of disk uniformly reticulate, with little or no evidence of punctures, except near suture, and no indication of striae and interspaces except on extreme sides; behind this a distinctly elevated, shining ridge, extending at sides to the eighth striae, with fine distinct punctures near median line, but much fainter toward the sides; posterior disk without recognizable striae or strial punctures, each interspace with a narrow keel-like elevation along its middle, the wide intervening spaces nearly uniformly reticulate, impunctate and glabrous; extreme side with eighth and ninth striae impressed anteriorly, with very indistinct punctures; declivity moderately steep, raised keels of interspaces lacking on apical two-thirds, which is reticulate and finely granulate.

Female.—Slightly longer and not so stout as male (allotype, 3.31 mm. long, 2.07 times as long as wide); frons convex, wider between eyes than in male, frontal rectangle 1.1 times as wide as long; pronotum very slightly longer than wide, with a rather large, oval, bordered pit in median line in front of middle; elytra subopaque throughout, with first, eighth, and ninth striae faintly indicated, with interspaces keeled throughout, but not so strongly as in male. Fore tibia much wider than in male with many coarse tubercles on its outer face.

Type locality.—Port Galera, Mindoro, Philippine Islands.

Type material.—Holotype ♂, allotype and 44 paratypes, United States National Museum No. 56544.

The type series was collected by R. C. McGregor, in whose honor the species is named. The host is unknown.

Scolytoplatypus piceus, new species.

Male.—Piceous brown, subopaque with structures of ventral side reddish brown; 2.41 mm. long, 1.76 times as long as wide; allied to *macgregori*, new species, but much smaller and otherwise different.

Frons wide between eyes, frontal rectangle 1.2 times as long as wide; very broadly moderately deeply concave; median line scarcely raised but darker in color above; surface subopaque, reticulate, punctures minute, with very fine hairs seen only in profile, longer than in *macgregori*. Eye ovate, wider above, inner line entire, facets coarser than in *macgregori*. Antenna much as in *macgregori*.

Pronotum 1.19 times as wide as long, widest at base, posterior outline bisinuate, sharply produced at median line, posterior lateral angles sharp, sides with an elevated beaded margin; lateral outline excavated on posterior half (less strongly than in *macgregori*), straight and subparallel anteriorly, very broadly rounded in front; dorsal surface rather weakly convex; surface subopaque; punctures very shallow, close, small, interstices with small granules; median line not modified; vestiture, short, fine, appressed, longer and more abundant in front.

Elytra wider than pronotum and 1.36 times as long, 1.02 times as long as wide; bases nearly straight, scarcely bisinuate, with beaded margin; sides nearly straight and subparallel for nearly four-fifths of their length, then suddenly narrowed to the subangulately rounded apex; surface mostly subopaque; anterior portion (varying from one-fifth at median line to more than half of length at extreme sides) devoid of striae and interspaces, with surface varying from subopaque anteriorly to shining on the posterior edge, and texture varying from reticulate anteriorly to closely, finely punctate posteriorly; posterior disk and sides without evidence of striae, but each interspace marked by a keel-like elevation which extends backward and is lost on the declivity; posterior part of declivity without indications of striae or interspaces, granulate-reticulate; vestiture nearly lacking on disk, very fine, short hairs on sides and declivity.

The female is unknown.

Type locality.—Mt. Banahao, Luzon, Philippine Islands.

Type material.—Holotype ♂, United States National Museum No. 56545.

The holotype was collected at Mt. Banahao, Laguna Province, Luzon, Philippine Islands, by R. C. McGregor. Host unknown.

Scolytoplatypus benguetus, new species.

Female.—Piceous brown, subopaque above; 3.43 mm. long, almost exactly twice as long as wide; with elytral declivity ornamented with abundant, silky, yellow hairs.

Frons convex between eyes, slightly flattened above with median line narrowly elevated on vertex, strongly triangularly impressed below; surface subopaque, reticulate, very finely punctured above; impression shining, obscurely reticulate; epistomal margin extended as an epistomal lobe; frontal rectangle 1.1 times as wide as long. Eye and antenna similar to those of other Philippine species of the genus.

Pronotum 1.06 times as wide as long, widest at base, posterior outline bisinuate, not strongly produced at median line, posterior lateral angles sharp, sides with an elevated, beaded margin; lateral outline excavated on posterior half, arcuate on anterior half, anterior margin nearly straight; dorsal surface rather weakly convex, subopaque, reticulate, punctures very shallow, indistinct on anterior half, interstices not granulate; median line faintly elevated behind the bordered pit lying in front of middle; vestiture fine and short over most of disk, but with a few longer hairs at each side in front of middle.

Elytra wider than pronotum and 1.33 times as long, slightly longer than wide; bases nearly straight, only feebly arcuate, with beaded margin; sides slightly arcuate, moderately broadly rounded behind; surface subopaque, reticulate, without visible punctures and with minute hairs on disk, sides with a few larger hairs in addition to minute ones, striae not recognizable as such, interspaces feebly elevated along their centers (not keeled); declivity sloping, striae and interspaces not recognizable, all of declivity with numerous fine, sericeous, yellow-testaceous hairs throughout, longer than on disk; ninth interspace elevated, with small granules.

The male is unknown.

Type locality.—Benguet, Luzon, Philippine Islands.

Type material.—Holotype ♀, United States National Museum No. 56546.

The holotype was collected by R. C. McGregor with no record as to host. The specimen is somewhat mutilated.

Scolytoplatypus hirsutus, new species.

Female.—Reddish brown, 3.14 mm. long, exactly 2.0 times as long as wide; elytra faintly striate, with long, curved hairs on declivity.

Frons convex midway between eyes, slightly flattened above, triangularly impressed below; surface reddish, subopaque above, weakly shining below, finely reticulate, with fine punctures bearing minute hairs; epistomal margin black, shining, with longer hairs directed orad, epistomal lobe rather small; frontal rectangle 0.92 as long as wide; antenna and eye of the type usual in this genus.

Pronotum 1.11 times as wide as long, widest at base, posterior outline bisinuate, weakly produced at median area, posterior lateral angles sharp; sides with elevated, beaded margins; lateral outline excavated on posterior half, arcuate on anterior half, front margin nearly straight; dorsal surface weakly convex, subopaque, punctures very shallow, interstices elevated into an irregular network, each mesh enclosing one or several punctures, not granulate; median line scarcely at all modified; with an oval bordered pit in front of middle; vestiture almost entirely lacking, but with a few fine hairs on anterior half.

Elytra wider than pronotum and 1.33 times as long, 1.16 times as long as wide; bases sinuate, with beaded margin; sides subparallel on anterior two-thirds, moderately rounded behind; surface subopaque, finely reticulate; striae indefinitely indicated, punctures usually not visible except at extreme sides on eighth and ninth striae; interspaces nearly flat, appearing glabrous on disk, sides with a few small hairs. Declivity moderate, striae much as on disk; interspaces with distinct, small punctures and with fine, sharp granules; entire declivity with conspicuous, long, curved, yellow hairs.

EXPLANATION OF PLATE 11.

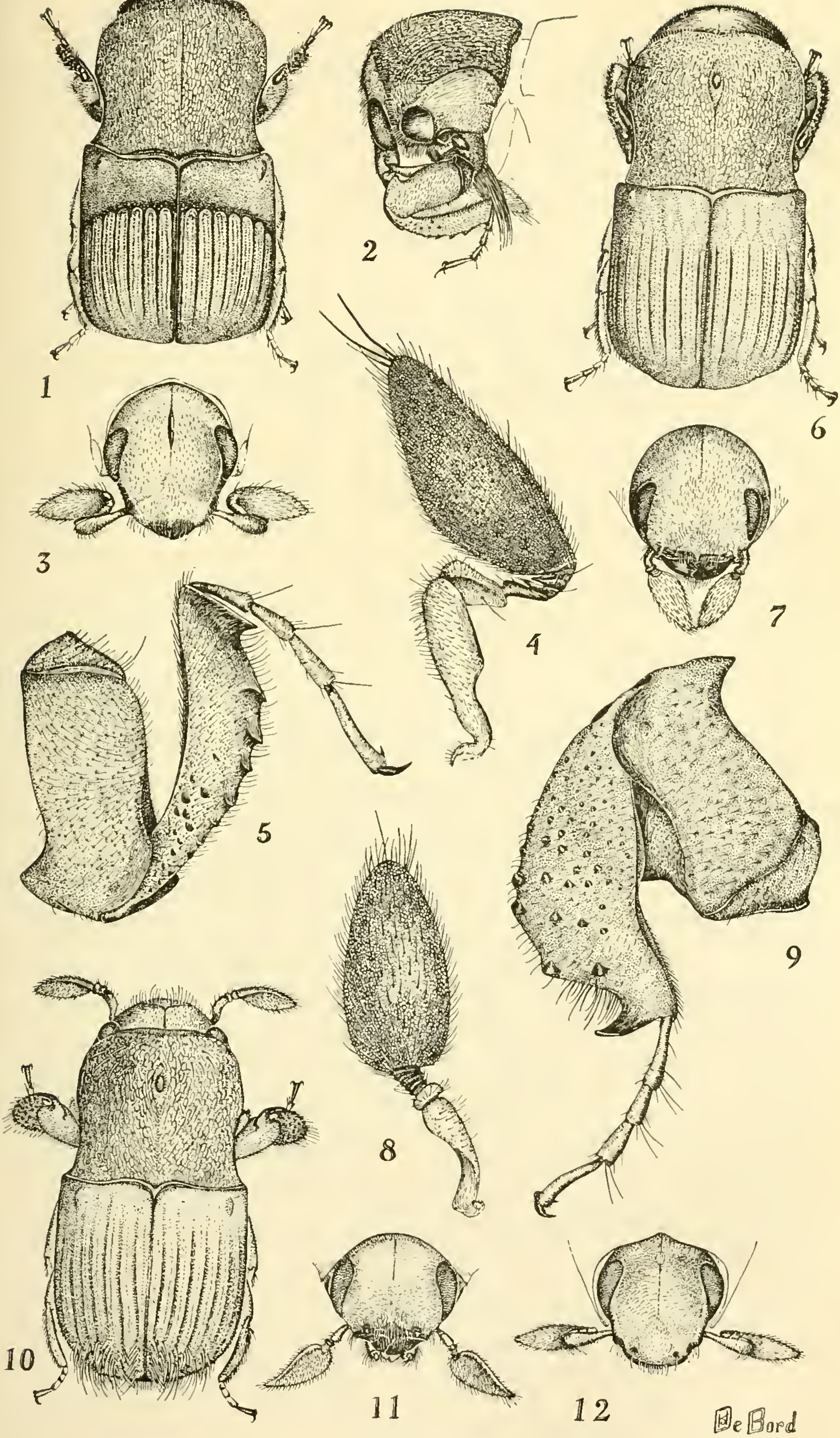
All drawings were made by Mrs. Sara H. DeBord.

Figures 1–9.—*Scolytoplatypus macgregori*, new species.

1.—Dorsal view of male. 2.—Lateral view of head and pronotum of male, showing the deep fovea. 3.—Face view of male. 4.—Antenna of male. 5.—Foreleg of male. 6.—Dorsal view of female. 7.—Face view of female. 8.—Antenna of female. 9.—Foreleg of female.

Figures 10–12.—*Scolytoplatypus hirsutus*, new species.

10.—Dorsal view of female. 11.—Face view of female. 12.—Face view of male.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Male.—Similar to the female but slightly stouter; frons concave from eye to eye, surface reticulate, subopaque, punctures fine, hairs inconspicuous; frontal rectangle 1.20 times as long as wide; prothoracic structures show the usual sexual differences, i. e., the narrower tibia, the pit at each side near anterior margin, and the absence of the median bordered pit on the pronotal disk; elytra with striae more impressed and interspaces more convex than in female, especially in an area one-fifth to two-fifths from base; declivital granules smaller than in female.

Type locality.—Buitenzorg, Java.

Host.—*Erythrina lithosperma.*

Type material.—Holotype ♀, allotype and nine paratypes, United States National Museum No. 56547.

The type series was collected in 1900 by C. Zimmermann, from *Erythrina lithosperma.*

A PREOCCUPIED NAME IN TORTRICIDAE (Lepidoptera)

By Carl Heinrich,
Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture.

The generic name *Peronea* Curtis (1824, Brit. Ent. I (4), No. 16) now used in the Tortricidae is a homonym of *Peronea* Rafinesque (1815, Ann. Nat., p. 147), an emendation of *Peronaea* Poli (1791, Test. Sicil. I, Introd., p. 29) in Mollusca. Rafinesque substituted "e" for the diphthong "ae" in various previously published generic names. It may be assumed, therefore, that in citing "Peronea Poli" he was deliberately emending *Peronaea* Poli. Accordingly, though this emendation may not be approved, it invalidates any later use of *Peronea* in a different sense. The next oldest available generic name for the species referable to *Peronea* Curtis is *Acleris* Hubner (1825, Verz. bek. Schmett., p. 384, type: *Tortrix aspersana* Hubner), a name that has been used by many lepidopterists and should be adopted for this concept.

A NEW SPIDER MITE ON CITRUS IN SOUTHERN CALIFORNIA (Acarina: Tetranychidae).

By E. A. McGregor [1], *Whittier, California.*

The description of this new species of *Tetranychus* is based upon material which was collected on navel orange fruits, and subsequently reared on lemon leaves.

Tetranychus lewisi, new species.

Female.—Averaging 0.36 mm. in length, and 0.17 mm. in width. Twenty-four strictly dorsal setae, not arising from tubercles; in addition, visible from above, are a pair of similar setae on the lateral margin of body opposite coxae III, and an inconspicuous pair of setae at posterior tip of abdomen. Body oval from above; at first a pale greenish-amber color, but deepening in age to amber; a varying number of blackish spots along lateral margin, but usually one over each 3rd coxa and a pair near hind tip of body. One perfect eye cornea on each side. The dorsal integument between the lumbal and sacral setae with transverse striations (as in *T. pacificus* McG.). Mandibular plate rounded anteriorly. "Thumb" of palpus fully one-fifth shorter than its greatest thickness; bearing terminally a "finger" with subparallel sides and rounded tip, when viewed laterally; terminal "finger" less than half as thick as "thumb" at tip; the dorsal sensilla spindle-shaped, about as long as terminal "finger"; "thumb" bearing five additional setae placed and proportioned about as usual. Relative lengths of the joints of the foreleg as follows: Coxa, 15; trochanter, 10; femur, 28; patella, 14; tibia, 17; tarsus, 24. Tip of tarsus (female) bearing a claw which is bent strongly downward, and is cleft into three pairs of needle-like spurs, the proximal pair the strongest basally. Tarsus of leg I with two sets of duplex setae dorsally. The usual four tenent hairs arising from the onychium, a pair on each side of the claw base. The collar trachea extends downward and backward as a slightly expanding tube, then abruptly bend upward at a right angle to form a somewhat swollen chamber which is about one-third as long as the main arm. Egg almost spherical, with a very slender axial stalk; at first almost colorless, but becoming straw-color before hatching; 0.12 mm. in diameter.

Male.—Body smaller, narrower, and more wedge-shaped than that of female; mustard-yellow color; legs proportionately longer. Penis with inner lobe rod-like; basilar lobe inconspicuous; shaft three times as long as its basal thickness, inner half concave above, bent downward about 45° from its main axis, then again bent slightly upward; portion of penis distad of the shaft gradually acuminate to a sharp tip. Tarsal claw of foreleg is fundamentally similar to that of female, but is less strongly bent, and the divisions are very closely appressed, and appear under the low magnification almost as a simple claw. "Thumb" of palpus more cone-shaped than in female; the terminal "finger" reduced to a nipple-like papilla.

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[1] Retired April 8, 1943, from the Bureau of Entomology & Plant Quarantine, U. S. Department of Agriculture.

Type slide.—U. S. National Museum No. 1431.

The type material is from Corona, Calif., from fruits of navel orange, collected by H. C. Lewis. It has also been collected from lemon fruits at Whittier, Calif., by F. Munger and H. R. Yust.

Of Amer can mites, this species perhaps is allied with *Tetranychus oregonensis* McG., *T. willamettei* McG., *T. yumensis* McG. and *T. sexmaculatus* Riley. Of the European mites, it is perhaps closest to (*Tetranychus*) *Eotetranychus carpini* (Oud.)

In the pattern of the dorsal cuticular striations, and in the general structure of the penis, the present species is referable to the genus *Eo etranychus* Oud. which includes several European species. American workers have not accepted this genus, but subsequent study may result in transferring to it several existing American species of *Tetranychus*.

Biological Notes.

Females of *Tetranychus lewisi*, n. sp., were transferred from navel oranges to tender lemon leaves in Mungar cages, and kept at room temperatures varying from 62° to 73° F. The mites seemed to thrive under these conditions.

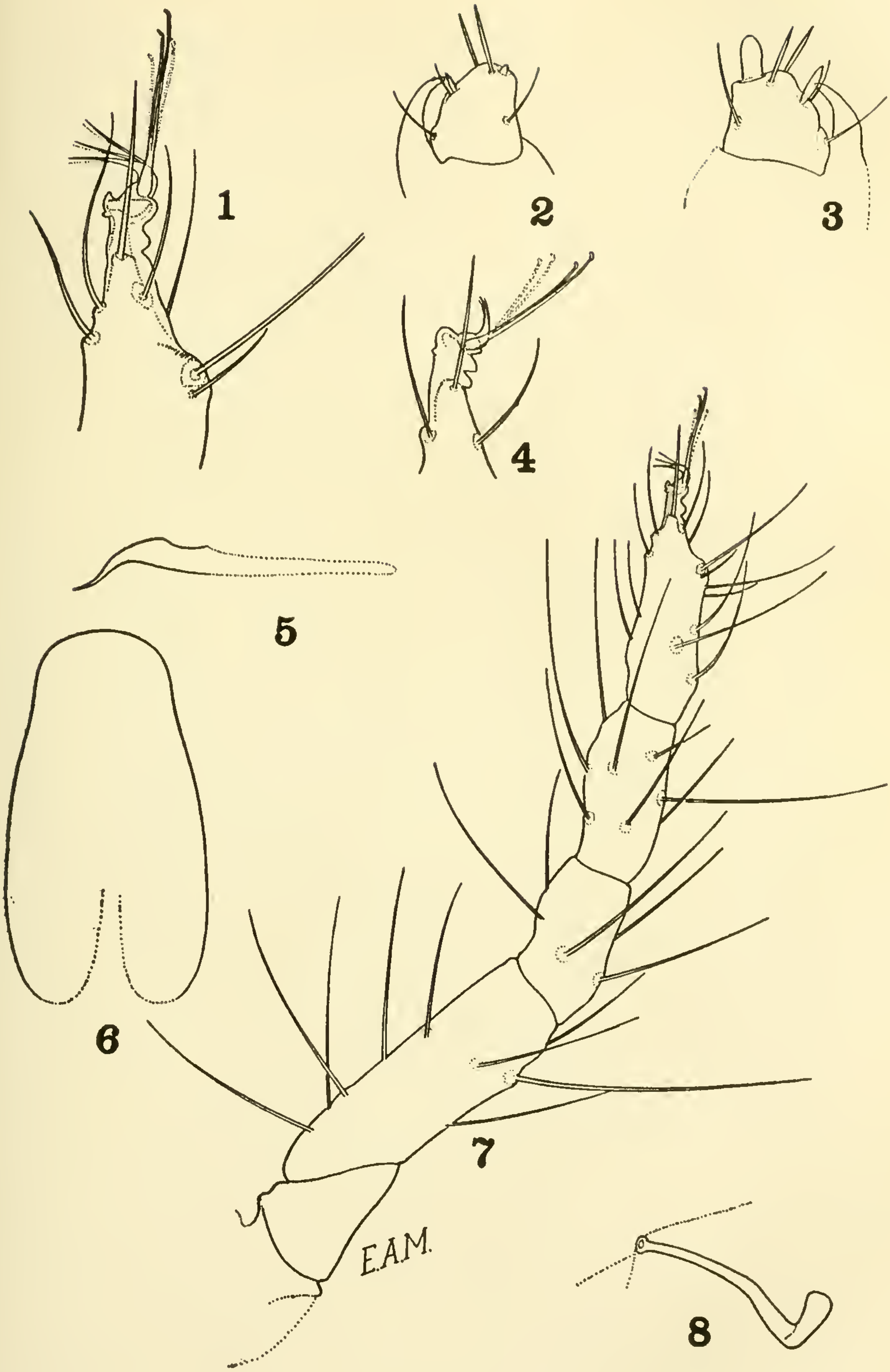
Females commenced ovipositing less than 24 hours after issuance. During the period of rearing, females deposited an average of five eggs per day. The average duration of the stages in developing females were as follows: Incubation, 6 days; larval stage, 2 days; 1st stage nymph, 2 days; 2d stage nymph, 2 days. The time required from egg deposition to the emergence of the female was 12 days. The development of male individuals required one or two days less, due to the omission of one nymphal instar.

The mites form a loose canopy of webbing under which they live. All stages are capable of spinning these fibrils. In feeding, either on the fruit or the leaf, pigment is extracted which results in a stippling of the rind and epidermis with paler spots.

Explanation of Plate 13.

Tetranychus lewisi.

Fig. 1. Tip of tarsus of leg I of female.
Fig. 2. Terminal portion of palpus of male, viewed laterally.
Fig. 3. Terminal portion of palpus of female, viewed laterally.
Fig. 4. Tip of tarsus of leg I of male.
Fig. 5. Lateral view of penis.
Fig. 6. Mandibular plate.
Fig. 7. Leg I of female, viewed from outside.
Fig. 8. Collar trachea, viewed laterally.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BOOK REVIEW

Insect Invaders, by Anthony Standen. 8vo., cloth, 228 pp., 56 illus., Boston, Houghton Mifflin Co., 1943, ($3.50.)

This book is another popular compilation of the more widely known and the more spectacular facts about insects, quite similar in scope to a considerable number of others already available. Indeed, so very many of these have been published from time to time dealing in a non-technical way with insects, with birds, and with other common forms of animal life, and the public need apparently has been so fully met, that it might well be a source of some wonder that the buying public does not experience a surfeit of such material. To survive at all or to be commercially profitable, in the midst of such heavy competition, it surely must be necessary that the new book be in some way outstanding or possess some definitely distinctive attribute. Perhaps in the case of this book such attraction may prove to be the quite unusual viewpoint of its author. Unlike most writers on insects, Mr. Standen is not a Nature Lover, and he very frankly states: "I hate insects. I admit, for it is undeniable, that they are completely and utterly fascinating, but for me it is the fascination of horror." In further development of this line of thought he quotes Maeterlinck's lines that "Something in the insect seems to be alien to the habits, morals, and psychology of this world, as if it had come from some other planet, more monstrous, more energetic, more insensate, more atrocious, more infernal than our own." In view of this mental attitude it is a matter of some interest as to why he has selected insects as subject matter for his book. This however is made somewhat clearer when we learn that he is by profession a research chemist, who, in various parts of the world, notably in Spain and Brazil, has specialized in fumigation against insects. Something of the general scope of this volume may be gained by an enumeration of its principal chapter headings, as: What is an insect? What an insect's body is like; How insects live and multiply; Insects that harm man and animals; Insects that eat our food and other things; Good insects; The balance sheet; Insects out of place; Insects kept in place; Chemicals; Other tricks; Set a bug to catch a bug; and Stamp on that bug. An index has been provided, and the illustrations, reproduced from various sources, have been well selected in relation to accompanying subject matter. The book has been dedicated to a friend "Bob Linscott, who remarked that insects seem to be much more prevalent now than thirty years ago, and suggested that this might be due to the greater prevalence of entomologists."

J. S. WADE.

Actual date of publication, June 3, 1943.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

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VOL. 45 June, 1943 No. 6

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

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PROCEEDINGS OF THE
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VOL. 45 JUNE, 1943 No. 6

A NEW GENUS AND FOUR NEW SPECIES OF WHITEFLIES FROM THE WEST INDIES (Homoptera, Aleyrodidae)

By Louise M. Russell,
Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

The Neotropical Region appears to be exceptionally rich in representatives of the Aleyrodidae, and although containing the type localities of approximately one-fourth of the known species of the world, it doubtless is still relatively unexplored as far as the members of this family are concerned. The incompleteness of our knowledge of the aleyrodid fauna of this region was vividly impressed upon the writer recently by her examination of a collection of pupae obtained from herbarial specimens of the plant genus *Coccoloba*. Not only are many of these species new to science, but a number of them apparently represent undescribed genera. Probably the major reason that so few aleyrodids are known from the Neotropical Region (and elsewhere) is that many of them are extremely difficult to see. The majority of those described are relatively conspicuous, owing to their comparatively large size, dark coloration, noticeable waxy secretion, or the copious growth of fungus sometimes associated with them. Specimens exhibiting the antitheses of these conditions often escape attention.

Only 14 species of Aleyrodidae have been described from the West Indies (exclusive of Trinidad), one of these was introduced from the Orient, and only a few additional species have been reported from the islands. Six of the 14 species were described from Jamaica and 2 from Cuba, but none have been described from Hispaniola. The discovery of a new and unusual genus, which is known to occur on these three islands and which doubtless is distributed elsewhere, therefore seems worthy of notice. Before proceeding to the description of the genus and its available species, however, it seems desirable to define a few terms as employed by the writer, since some are new and others have not been applied uniformly by previous workers.

The *dorsal disk* is all of the dorsum within the *submargin* (*submarginal area*). The term *submedian* is applied to an area of varying width lying each side of the median line, and the term *subdorsal* designates the zone between the submedian and submarginal ones. Usually the last two areas are not sharply demarked, but are inconspicuously indicated by setae and depressions fairly near the median line, and by a segregation of disk pores (more conspicuous on the abdomen than on the cephalothorax) with some near the depressions, some well laterad of these, and an intervening space without any. The outward limits of the submedian area are around the first abdominal setae (in most species in which these are present) or about opposite the ends of the first abdominal suture, and extend to the median line at each end of the body. *Pockets* are a pair of broad invaginations extending anteriorly from the submedian part of the posterior suture. *Disk pores* are minute, circular, nonloculate pores of the dorsal surface. *Porettes* are minute spots resembling, but smaller than, the disk pores and are associated with them. *Setae* on the dorsal disk are named from the segment on which they occur; the *ventral abdominal setae* are located meso-cephalad of the posterior spiracles. The *caudal furrow* is a groove extending posteriorly from the vasiform orifice.

The marginal *wax tubes* are short, inconspicuous structures located just beneath the body margin. The *thoracic tracheal folds* are a pair of furrowlike depressions extending from the anterior thoracic spiracles to the body margin; the *abdominal tracheal fold* is a single furrow extending from the posterior abdominal spiracles to the posterior margin of the body. *Tracheal pores* or *tracheal pore areas* are the points where the folds reach the body margin. The *adhesive organs* are a pair of saclike extensions of the body wall mesad of the middle legs. The *bifid sac* is a small, membranous, bifid invagination located medially between the posterior spiracles in males, but is absent in females. It was discovered by the writer while preparing a yet unpublished paper on the genus *Trialeurodes*, and appears to be a positive means of separating pupae of the two sexes.

Type specimens of the species treated herein are in the collection of the United States National Museum. They were removed from herbarial specimens of *Coccoloba* in the Arnold Arboretum, the Gray Herbarium, the New York Botanic Garden, and the United States National Herbarium. The writer's appreciation is extended to the persons in charge of the Herbaria for permission to examine the plants, and to Marjorie J. Camp of the Bureau of Entomology and Plant Quarantine, for collecting and mounting the insects.

BELLITUDO, new genus.

A very thin layer of transparent, colorless (white beneath tracheal folds), glassy wax on dorsal and ventral surfaces; a narrow, nearly flat border of white wax extending outward from just within body margin; columns of a white, fibrous, somewhat flocculent, waxy substance on dorsum (presumably arising from invaginations in center of body), too badly crushed in available specimens for complete description.

Specimens nearly circular to oval in outline; submargin deflexed somewhat diagonally in mature pupae; dorsal disk and ventral surface nearly flat. Dorsum whitish, yellowish, or brownish, weakly to rather strongly sclerotized; ventral surface thin, colorless, and membranous.

Body margin dentate. A pair of setae (at tips of teeth) on anterior and posterior margins of body. Submargin fairly uniform in width, demarked from dorsal disk by a faint or distinct membranous line. A row of toothed-shaped designs, much larger than marginal teeth, in derm on inner side of submargin, their edges (except across basal end and in center of distal end) serrate and heavily sclerotized, a disk pore and porette in center of basal end of each design. Submarginal ridges extending from marginal teeth to designs, as wide as teeth at margin but usually widened opposite ends of designs and narrowed between them. Tracheal pore areas well defined, the pores themselves within the margin, the thoracic pores beneath a narrow cleft extending from body margin to center of submargin, then widening into an oval area with a slightly depressed rim and a porous-appearing center, and this extending to inner edge of submargin, the entire structure somewhat spoon-shaped; abdominal tracheal pore at base of a short cleft in margin, extending about to center of submargin, lacking inner structure of thoracic ones. Apparently 15 (8 on abdomen and 7 on cephalothorax) pairs of minute, circular areas (resembling minute setal bases but without distinguishable setae, or disk pores but less distinct and without porettes) between submargin and dorsal disk.

Dorsal disk with disk pores and porettes, with a least 1 pair of conspicuous invaginations (presumably glandular in function) near center of body, associated with pores which usually are slightly larger than disk pores and with which there are apparently no porettes. A pair of submedian setae on cephalic, first abdominal, and eighth abdominal segments, and a median caudal pair in submargin at ends of ridges beside caudal furrow. Median molting suture extending to body margin; transverse one terminating at submargin approximately opposite ends of meso-metathoracic suture, curved posteriorly from center but recurved cephalad, located just anterior to thoracoabdominal suture. Most segmental sutures defined nearly to submargin, their edges heavily sclerotized, and some ending in designs resembling the links of a chain; cephalothoracic suture a weak depressed line merging with a submedian depressions, pro-mesothoracic suture a weak depressed line with median rearward bend, meso-metathoracic suture conspicuous and nearly straight, thoracoabdominal suture a depressed line ending in subdorsal area; first abdominal suture a straight, well-defined, depressed line ending in submedian area; other abdominal sutures conspicuous, second bent cephalad from submedian area and nearly reaching transverse molting suture, third nearly straight, fourth slightly curved caudad from inner subdorsal area, fifth more strongly reflexed, sixth curved posteriorly from its center; seventh nearly straight in submedian area, then bent straight backward, then curved outward and backward, its curved portion nearly parallel to ends of sixth suture. Median length of cephalic segment (including submargin) as great as, or slightly greater than, that of thorax; prothorax about three times length of mesothorax and two or three times length of metathorax; subequal length of abdominal segments 1, 2, and 7 usually a little less than length of segment 6, which is slightly less than subequal length of segments 3–5, each much shorter than segment 8. Pockets large, contiguous. Submedian depressions conspicuous, heavily sclerotized around edge, pairs arranged as follows: Two along cephalo-thoracic suture, 3 on prothorax, 2 along pro-mesothoracic suture, 1 on mesothorax, 1 adjoining meso-metathoracic suture posteriorly, 1 on metathorax, 1 posterior to thoracoabdominal and to each of anterior 6 abdominal sutures, 1 on outside (on seventh segment) of longitudinal part of posterior suture. Vasiform orifice cordate, deep, its sides nearly vertical, sclerotized, finely ridged; located more than its length from posterior suture and two and one-half to three and one-half times its length from body margin. Operculum cordate, filling orifice, posterior margin and ventral surface covered with minute slender spines, a pair of small ventral setae near center. Lingula elongate, lying in a curved position and contained in orifice but actually longer than orifice; somewhat spatulate, narrower in center than at ends, with a terminal lobe defined, covered with minute slender spines, a pair of small setae laterally before, and a longer pair ventrally at base of, terminal lobe. Caudal furrow deep, defined from orifice to tracheal pore. A rounded ridge each side of orifice, interrupted at caudal furrow, and a shallow to deep invagination with a transverse slitlike opening at posterior end of ridges; a flat, transversely lined ridge each side of caudal furrow.

Marginal wax tubes barely visible. Thoracic tracheal folds apparent but without characteristic marks, abdominal fold well defined and with a few minute needlelike sclerotic flecks. Opening of thoracic spiracles rather elongate, surrounded by an oval slightly sclerotized area; anterior abdominal spiracles smaller, and posterior ones larger than thoracic ones, posterior ones about opposite center of vasiform orifice. Segmentation of beak indistinct, apparently 3 pairs of minute setae at tip. Antennae apparently 1-segmented, reaching to or just beyond anterior spiracles; distal fourth narrowed and ending in a fingerlike tip with minute slender spines, with 1 or 2 sensoria near inner end and 1 near tip. Legs with segmentation indistinct, stout, disklike at tip, each with 3–6 minute setae on inner basal area, 2 near disk, and 1 slightly before these; a relatively elongate slender seta on inner basal area of each middle and posterior leg. Adhesive sacs inconspicuous. Bifid sac present in males.

Genotype, *Bellitudo jamaicae*, new species.

Bellitudo appears to be most closely allied to *Aleuroparadoxus* Quaintance and Baker and to *Pseudaleurolobus* Hempel, and somewhat less closely related to *Africaleurodes* Dozier, *Aleurolobus* Quaintance and Baker, and *Paraleurolobus* Sampson and Drews. The species of these genera usually have a dentate body margin, plainly indicated thoracic tracheal pore areas, the submarginal area separated from the dorsal disk, no thoracic setae on the dorsal disk, and the vasiform orifice or the area around it characterized in some way. *Bellitudo* can be immediately distinguished from the other genera mentioned by conspicuous characteristic invaginations near the center of the body, by chainlike designs along some sutures, by a rounded ridge each side of the vasiform orifice, by shallow to deep invaginations at the posterior end of these ridges, and by a flat, transversely lined ridge each side of the caudal furrow. It also differs from each of the other genera in at least one other character of taxonomic importance.

Bellitudo jamaicae, new species.

Specimens subcircular, 1.40–1.70 mm. long and 1.20–1.45 wide. Whitish or yellowish, rather weakly to moderately sclerotized, a narrow, finely sculptured band around edge of dorsal disk.

Submargin practically uniform in width, approximately one-fifteenth the width of dorsal disk. Marginal teeth rounded, moderately strong, slightly wider than long, slightly variable in width, 15–18 in 100 μ. Submarginal ridges moderately strong, usually 2 opposite each and 2 between adjacent tooth-shaped designs. Tooth-shaped designs 20–24 μ long and 24–28 wide, approximately one-third as long as width of submargin, their edges moderately serrate. Thoracic tracheal pores usually with 1 strong median tooth extending outward from porous area, abdominal one with 2 strong teeth, directed caudad. Marginal setae broken, each at least 12 μ long.

A pair of conspicuous, hemispherical, submedian areas about 60 μ in diameter on metathorax; strongly rugose and with 4–6 pores at the end of elongate openings to thick-walled, heavily sclerotized, saclike invaginations. Cephalic setae 16–32 μ long, first abdominal 24–44 μ; eighth abdominal 16–20 μ, located near posterior end of longitudinal part of posterior suture; caudal 80–84 μ, their bases in line with ends of tooth-shaped designs. Chainlike designs (a single chain usually) arranged as follows on each half of body: A longitudinal (usually double) submedian and a diagonal subdorsal chain on cephalic segment; a diagonal, 3-sided figure (outer side open) whose inner anterior angle meets the cephalo-thoracic suture and whose inner posterior angle meets the pro-mesothoracic suture; a transverse chain slightly nearer to angular figure than to meso-metathoracic suture; subdorsal part of all remaining segmental sutures. Pairs of disk pores arranged about as follows: Cephalic segment, 2–4 submedian and 6–8 subdorsal; prothorax, 2 or 3 submedian and 5 or 6 subdorsal; mesothorax, 2 or 3 submedian and 8–10 subdorsal; metathorax, none or 2 submedian and 4–7 subdorsal; first abdominal segment, 2 submedian; second, 1 submedian; third, 1 submedian and 8–12 subdorsal; fourth and fifth, each 1 submedian and 7–10 subdorsal; sixth, 1 submedian and 5–7 subdorsal; seventh, 1 submedian and 3–5 subdorsal; eighth, 1 submedian (opposite anterior part of orifice rather near posterior suture) and 2 or 3 subdorsal (usually 1 opposite posterior part of orifice and 1 or 2 farther caudad); 1–3 minute spines in derm around pores and porettes. Vasiform orifice around 62 μ long and wide, operculum around 60 μ long and wide, lingula with a pair of poorly defined lateral lobes. Ridges beside orifice strong, tending to merge into ridges beside caudal furrow, invagination at end of ridges beside orifice shallow. Caudal furrow finely sculptured.

Elongate setae mesad of legs 16–28 μ long, ventral abdominal setae 40 μ.

Hosts.—*Coccoloba longiflora* Fisch., *C. uvifera* L., *C. venosa* L.

Distribution.—Jamaica: Vicinity of Holly Mount, Mount Diablo; Union Hill near Moneague, Parish of Saint Ann; Parish of Saint Thomas; southeastern foothills of John Crow Mountains; Buff Bay.

Described from 12 specimens from plants collected as follows: *C. longiflora*, Holly Mount, W. R. Maxon, May 25–27, 1904, Union Hill, Britton and Hollick, April 6–7, 1908, and Parish of Saint Thomas, N. L. Britton, September 15–19, 1908 (including holotype); *C. longiflora* and *C. venosa*, John Crow Mountains, Harris and Britton, March 2, 1909; *C. uvifera*, Buff Bay, W. R. Maxon, July 21, 1926.

Bellitudo campae, new species.

Differing from *B. jamaicae* as follows: Specimens 1.40–1.75 mm. long and 1.20–1.50 wide. Submedian part of metathorax and first and second abdominal segments brownish. Thoracic tracheal pores usually without a median tooth, abdominal pore with or without 2 small teeth. Marginal setae 24 μ long, cephalic setae broken, first abdominal 16 μ, eighth abdominal 20 μ, located opposite posterior part of orifice in outer edge of ridge, caudal 20 μ. Number and distribution of dorsal disk pores approximately as in *jamaicae* but submedian pair of posterior segment located anterior to ends of orifice and nearer to it than to suture. Vasiform orifice 50–56 μ long and 54–60 wide, operculum 48–54 μ long and 52–58 wide. Ridges beside orifice rather weak, distinctly merging into ridges beside caudal furrow, invaginations in ridges beside orifice deep, saclike, and sclerotized.

Host.—*Coccoloba uvifera* L.

Distribution.—Jamaica: Coastal region east of Montego Bay.

Described from holotype and 10 paratypes from plants collected by W. R. Maxon and E. P. Killip, March 28, 1920.

Bellitudo hispaniolae, new species.

Differing from *B. jamaicae* as follows: Specimens 1.25–1.70 mm. long and 1–1.45 wide. Moderately sclerotized; sculptured band around dorsal disk wider, reaching well mesad of ends of some segmental sutures, rest of subdorsal area lightly sculptured. Submargin approximately one-twentieth width of dorsal disk. Tooth-shaped designs about one-half as long as width of submargin.

No hemispherical submedian areas on thorax but 2 pairs of nearly contiguous, submedian invaginations (the inner slightly smaller than the outer) on mesothorax, and 1 pair (as large as outer mesothoracic) on metathorax. Cephalic setae broken, first abdominal 20–28 μ long, eighth abdominal 12–20 μ, caudal 140 μ. Only 1 chain (single) on cephalic segment, this longitudinal and subdorsal. Pairs of disk pores arranged as follows: Cephalic segment, 1 or 2 submedian and 3–6 subdorsal; prothorax, 1–3 submedian and 2–4 subdorsal; mesothorax, 1 submedian and 4–7 subdorsal; metathorax, 1 or 2 submedian and 2–6 subdorsal; first abdominal segment, 2 submedian; second, 1 submedian; third, 1 submedian and 5–9 subdorsal; fourth, fifth, and sixth, each 1 submedian and 3–7 subdorsal; seventh, 1 submedian and 2–4 subdorsal; eighth, 1 submedian (about halfway between widest part of orifice and posterior suture) and 1–3 subdorsal. Vasiform orifice 58–68 μ long and wide, operculum 54–64 μ long and wide, no lateral lobes on lingula in available specimens. Ridges beside orifice very strong and prominent, rather abruptly separated from ridges beside caudal furrow.

Elongate setae mesad of legs 16 μ long, ventral abdominal setae 32 μ.

Hosts.—*Coccoloba diversifolia* Jacq., *C. laurifolia* Jacq.

Distribution.—Dominican Republic: Santo Domingo (Ciudad Trujillo ?). It is uncertain whether Santo Domingo refers to the city now known as Ciudad Trujillo or to the Dominican Republic. Haiti: Baille, La Lomas, vicinity of Saint Michel de l'Atalaye, Department du Nord; west of La Coup River, vicinity of Port de Paix.

Described from four specimens from plants collected as follows: *C. diversifolia*, Santo Domingo, Wright, Parry, and Brummel, January to March 1871; *C. laurifolia*, Baille, E. C. Leonard, November 26, 1925, and west of La Coup River, E. C. and G. M. Leonard, December 24, 1928 (including holotype).

Bellitudo cubae, new species.

Specimen oval, 1.40 mm. long and 1.10 wide. Brown, heavily sclerotized; dorsal disk sculptured rather strongly near edge and weakly elsewhere, line between it and submargin weakly sclerotized and light colored.

Submargin slightly wider laterally than at ends of body, at its widest point approximately equal to one-seventh width of dorsal disk. Marginal teeth strong, their margins smooth or minutely serrate, the majority acute at apex but some subacute or blunt, slightly longer than wide, 10–12 in 100 μ; space between them about equal to their width. Submarginal ridges strong, usually 1 opposite each and 1 between adjacent tooth-shaped designs. Tooth-shaped designs slightly to distinctly more than one-half as long as width of submargin, about 40 μ long at ends of body and 50–56 μ elsewhere, all about 20 μ wide; their edges very strongly sclerotized and strongly serrate near outer end; a row of heavily sclerotized, vertically directed, acute, minute points on each side of inner two-thirds of designs.

Thoracic tracheal pores with an elongate median tooth, abdominal one with 2 smaller teeth. Marginal setae not observed, presumably broken at base.

A pair of large, dark, thick-walled, heavily sclerotized, submedian invaginations on first and second abdominal segments (presence or absence of similar thoracic structures indeterminable in available specimen owing to parasite escape hole in center of thorax). All setae broken at base, presumably small in available specimen, eighth abdominal pair near end of longitudinal part of posterior suture, bases of caudal pair opposite center of tooth-shaped designs. Part of chainlike designs on thorax obliterated by parasite escape hole; a short, slightly diagonal chain on cephalic segment near a longer chain presumably meeting cephalothoracic suture, then a transverse chain presumably meeting pro-mesothoracic suture, then another transverse chain, and ends of meso-metathoracic suture; on abdomen around 3 links at ends of second to fifth sutures, 6 or 7 links at ends of sixth suture, and links on curved part of posterior suture; second to sixth sutures deep, furrowlike, with walls heavily sclerotized and vertically ridged; ends of transverse molting suture slightly anterior to a point opposite meso-metathoracic suture. Eye spots present, colorless, between anterior 2 chains. Derm around disk pores and porettes with several minute spines pointing upward; pairs of pores arranged as follows (total number on thorax indeterminable): Cephalic segment, 2 submedian and 5 subdorsal; prothorax, 2 subdorsal; mesothorax, 4 subdorsal; metathorax, 3 subdorsal; first abdominal segment, 2 submedian; second, 1 submedian; third, 1 submedian and 6 or 7 subdorsal; fourth and fifth, each 1 submedian and 4 or 5 subdorsal; sixth and seventh, each 1 submedian and 3 subdorsal; eighth, none or 1 submedian (about midway between widest part of orifice and nearest suture) and 1 subdorsal (opposite end of posterior suture). Vasiform orifice 49 μ long and wide, operculum 48 μ long and wide. Ridge beside orifice continued across its anterior end, very strong and heavily sclerotized, merging into ridges beside caudal furrow; invaginations shallow in ends of ridge around orifice, hardly deeper than some formed by lines across ridges beside caudal furrow. Caudal furrow deep, its walls sclerotized and vertically ridged.

Elongate setae mesad of legs 12 μ long, ventral abdominal setae 30 μ.

Host.—*Coccoloba retusa* Grieseb.

Distribution.—Cuba: Rio Seboruco to Falls of Rio Mayari, Oriente.

Described from one specimen from a plant collected by J. A. Shafer, January 26, 1910.

Key to species of Bellitudo.

1. Submedian invaginations located on first and second abdominal segments; second to sixth abdominal sutures deep and furrowlike, their walls heavily sclerotized and vertically ridged, only their ends chainlike; a ridge along anterior end

of vasiform orifice; marginal teeth very strong, the majority of them acute at apex, 10–12 in 100 μ, the interval between them about equal to the width of one; submargin approximately one-seventh width of dorsal disk; dorsum heavily sclerotized ....*cubae*, new species.

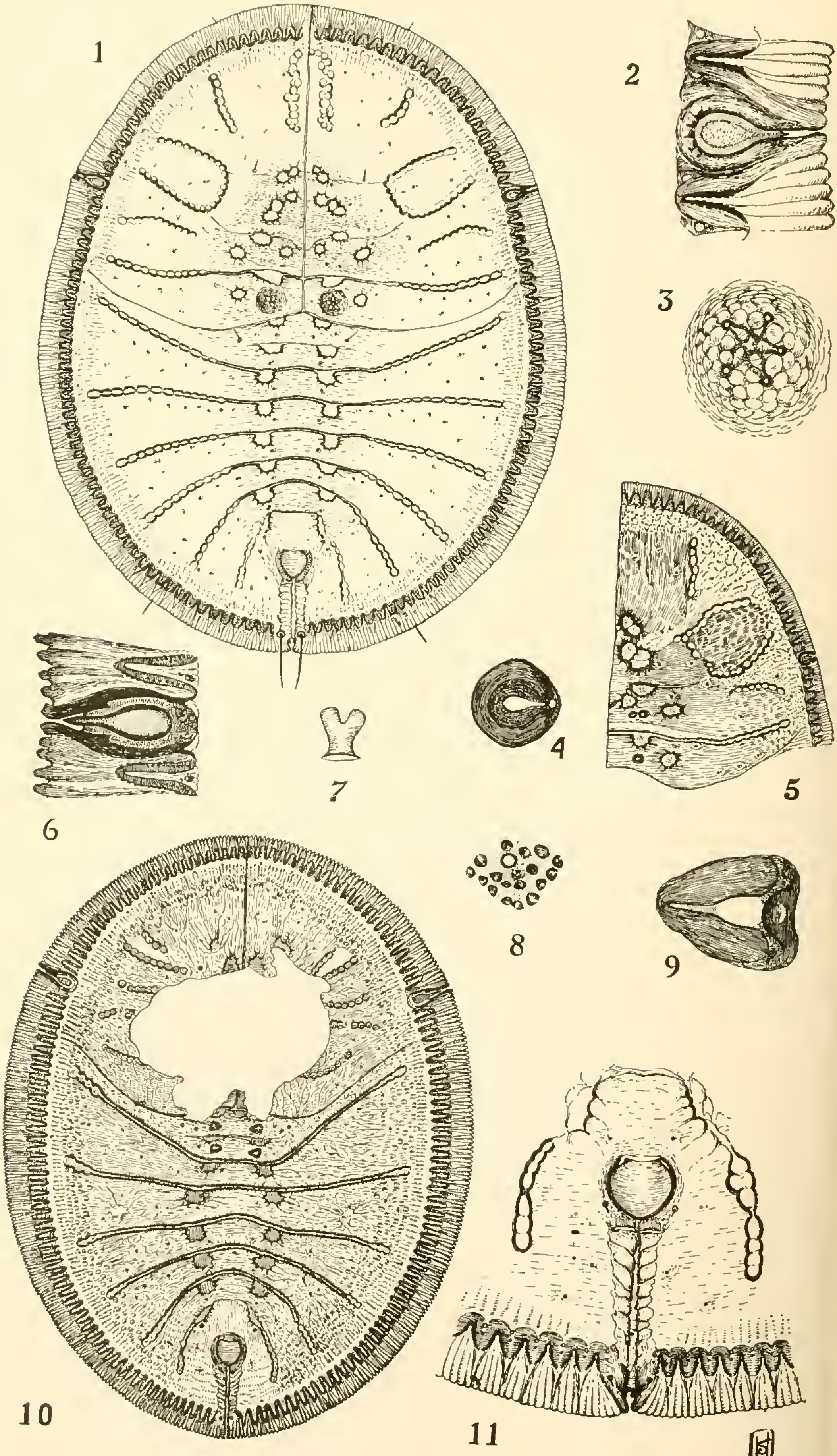
Submedian invaginations located on thorax; second to sixth abdominal sutures not as in *cubae*, all their subdorsal part chainlike; no ridge along anterior end of vasiform orifice; marginal teeth moderately strong, rounded at apex, contiguous, 15–18 in 100 μ; submargin no more than about one-fifteenth width of dorsal disk; dorsum rather weakly or moderately sclerotized.. 2

2. Submedian invaginations located on both meso- and metathorax, 2 pairs on mesothorax and 1 pair on metathorax, no hemispherical rugose area around their openings; 1 pair of chainlike designs on cephalic segment, somewhat diagonal, subdorsal; submargin approximately one-twentieth width of dorsal disk; sculptured band around dorsal disk extending well within ends of some segmental sutures..............
hispaniolae, new species.

Submedian invaginations located only on metathorax, 4–6 pairs, their openings surrounded by a conspicuous, hemispherical, rugose area; 2 pairs of chainlike designs on cephalic segment, 1 longitudinal submedian and 1 diagonal subdorsal; submargin approximately one-fifteenth width of dorsal disk; sculptured band around dorsal disk hardly reaching ends of segmental sutures................................ 3

3. Ridges beside vasiform orifice rather weak but their invaginations deep, saclike, and sclerotized; eighth abdominal setae located in outer edge of ridges near posterior end of orifice; submedian disk pores of posterior segment anterior to ends of orifice, nearer to it than to posterior suture; submedian part of metathorax and anterior 2 abdominal segments brownish
campae, new species.

Ridges beside vasiform orifice strong but their invaginations shallow and membranous; eighth abdominal setae located near anterior edge of segment; submedian disk pores of posterior segment opposite anterior part of orifice rather near posterior suture; submedian part of metathorax and anterior 2 abdominal segments whitish or yellowish.......
jamaicae, new species.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Explanation of Plate

Figure 1. *Bellitudo jamaicae*, dorsum, × 60.
Figure 2. *Bellitudo jamaicae*, submargin around thoracic tracheal pore, × 230.
Figure 3. *Bellitudo jamaicae*, submedian hemispherical area, × 230.
Figure 4. *Bellitudo hispaniolae*, dorsal view of submedian invagination, × 650.
Figure 5. *Bellitudo hispaniolae*, half of cephalothorax, × 60.
Figure 6. *Bellitudo cubae*, submargin around thoracic tracheal pore, × 230.
Figure 7. *Bellitudo cubae*, bifid sac, × 650.
Figure 8. *Bellitudo cubae*, area around disk pore and porette, × 650.
Figure 9. *Bellitudo cubae*, dorsal view of submedian invagination, × 460.
Figure 10. *Bellitudo cubae*, dorsum, × 60.
Figure 11. *Bellitudo campae*, posterior segment, × 115.

(Drawings by Sara Hoke DeBord.)

A LIST OF THE SPECIES OF MONANTHIA LEP. & SERV. OF THE WESTERN HEMISPHERE, INCLUDING DESCRIPTION OF A NEW SPECIES (Hemiptera: Tingitidae)

By Carl J. Drake, *Ames, Iowa*

The genus *Monanthia* Le Peletier and Serville, 1825, is widely distributed in both hemispheres. It is represented in the Eastern Hemisphere by 15 species, including the new form described below.

Monanthia berryi sp. new.

Small, obovate, sparsely pubescent, black, the paranota, collar and costal area somewhat brownish black. Antennae slender, finely pubescent; segments I, II and IV black; III testaceous, twice as long as IV. Legs slender, black, the tibiae testaceous, the tarsi mostly black, brownish basally. Rostrum brownish black, extending between middle coxae, the laminae black. Head black, with five short, appressed, brownish spines, the median sometimes greatly reduced.

Pronotum rather strongly convex, pitted, shiny, black, the triangular projection reticulate and brownish basally; median carina sharply raised, the lateral short, present on triangular process, faintly divaricating posteriorly. Collar distinct, areolate, truncate in front. Paranota rather narrow, completely reflexed, bitriseriate, completely reflexed, resting closely on the dorsal surface of pronotum, the outer margin nearly straight, the uncovered space between lateral margin and median carina a little wider than portion covered by paranota. Elytra completely overlapping and jointly rounded behind when in repose; costal area narrow, the areolae hyaline, smallest at middle; the C-shaped mark at apex of discoidal area large, its top and hind margins very strongly, sharply raised; sutural area more widely reticulated, black, a few of the areolae whitish. Female a little broader than male.

Length, 2.45 mm.; width, 1.00–1.12 mm.

Type (male), *allotype* (female) and 7 *paratypes*, Montevideo, Uruguay, August 21, 1942, collected by Mr. Paul A. Berry.

This species is most closely related to *M. loricata* Distant and *M. paritis* Drake, but may be easily separated from them by the very strongly and sharply elevated top and bottom margins of the C-shaped area of the discoidal area, which extends deeply into the subcostal area. *M. paritis* is smaller and the boundary of the C-shaped mark is not sharply elevated. The types are in the U. S. National Museum.

Genus **Monanthia** Le Peletier & Serville, 1825.

Dictyla Stal, 1874.

Logotype, *Tingis rotundata* Herrich-Schaeffer, 1835.

1. **ainsliei** Drake & Poor, 1935.	Guatemala.
2. **balli** Drake, 1922	Haiti.
3. **berryi** Drake, 1943	Uruguay.
4. **c-nigrum** Champion, 1898.	Brazil, Central America, West Indies, Mexico.
5. **coloradensis** Drake, 1917.	United States (Colorado).
6. **ehrethia** Gibson, 1917	United States (Texas), Mexico.
7. **figurata** Drake, 1922	Brazil.
8. **haitiensis** Drake & Poor, 1938.	West Indies.
9. **lobeculata** Uhler, 1893.	United States (California, Colorado, Arizona).
10. **loricata** Distant, 1888	Brazil, Argentina, Venezuela, Bolivia, Paraguay.
11. **monotropidia** Stal, 1860.	Brazil, Peru, Colombia, Bolivia, Paraguay, Venezuela, Argentina, West Indies, Central America, Mexico.
12. **paritis** Drake, 1936	Argentina, Paraguay, Brazil.
13. **parmata** Distant, 1888.	Brazil, Argentina, Paraguay, Peru, Venezuela.
14. **senta** Drake & Hambleton, 1942.	Peru.
15. **veterna** Scudder, 1890	United States (Colorado; Florissant, fossil).

THE IDENTITY OF AEDES BIMACULATUS (COQUILLETT) AND A NEW SUBSPECIES OF AEDES FULVUS (WIEDEMANN) FROM THE UNITED STATES (Diptera, Culicidae)

By Edward S. Ross,[1]

First Lieutenant, Sanitary Corps, Army of the United States

This paper presents evidence to show that two distinct species of *Aedes* occurring in the United States are both at present identified as Coquillett's *bimaculatus.* The true *bimaculatus,* described from Brownsville, Texas, and ranging from central Texas to El Salvador, is very distinct from the "*bimaculatus*" collected throughout the southeastern United States which is here described as a new subspecies of the Neotropical *fulvus* (Wiedemann). Vargas' *rozeboomi,* recently described from Campeche, Mexico, is shown to be a synonym of the true *bimaculatus.*

The *bimaculatus* series upon which this study is largely based was collected by Lt. H. R. Roberts and the writer at the type locality, Brownsville, Texas. It consists of a large number of each sex, the identity of which was confirmed by the writer's comparison of females with Coquillett's holotype in the U. S. National Museum. The U. S. National Museum collection of the *fulvus* group was also utilized.

The purpose of this paper is to clarify these names and to make known the adult and fourth-instar larval characters of topotypic *bimaculatus,* as well as those of *fulvus* and its new subspecies from the United States.

Aedes (Ochlerotatus) bimaculatus (Coquillett).

(Figures 2 and 3.)

Culex bimaculatus Coquillett, 1902, Proc. U. S. Nat. Mus., 25:84; Dyar, 1903, Proc. Ent. Soc. Wash., 5:147.

Aedes bimaculatus (Coquillett), Howard, Dyar, and Knab, 1917, Mosq. No. and Cent. Amer., and W. I., 4:622 (*ex parte*)

Ochlerotatus bimaculatus (Coquillett), 1906, U. S. Dept. Agric., Bur. Ent., Tech. Ser. 11, p. 18.

Aedes (*Heteronycha*) *bimaculatus* (Coquillett), Dyar, 1920, Ins. Insc. Mens. 8:105 (list); Dyar, 1920, Proc. U. S. Nat. Mus., 62:48 (*ex parte*).

Aedes (*Ochlerotatus*) *bimaculatus* (Coquillett), Vargas, 1940, Rev. Soc. Mex. Hist. Nat., 1:104, figs.

Aedes (*Ochlerotatus*) *fulvus* (Wiedemann), Dyar, 1922, Ins. Insc. Mens., 10:158 (in error); Dyar, 1928, Mosq. Amer., p. 154 (in error).

Aedes (*Ochlerotatus*) *rozeboomi* Vargas, 1941, Gaceta Medica de Mexico 69:393 (Type locality: Campeche, Mexico) (new synonym).

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[1] The writer is indebted to Alan Stone, H. R. Roberts, W. C. Reeves, and E. B. Johnson for valuable assistance and loans of specimens.

Male.—Head integument yellow; recumbent scales of occiput golden, erect scales and setae amber-yellow. Eyes black. Tori yellow, nude except for a few minute hairs on inner sides; antennae brown, terminal two segments black. Clypeus yellow, nude. Palpi elongate, slender; scales golden on basal three segments except toward tip of third; terminal two segments with muddy-yellow integument, scales smokey-black, erect setae prominent and blackish-yellow. Proboscis entirely yellow-scaled only in basal half, with an increasing mixture of blackish scales distad, entirely black at apex, labellum black.

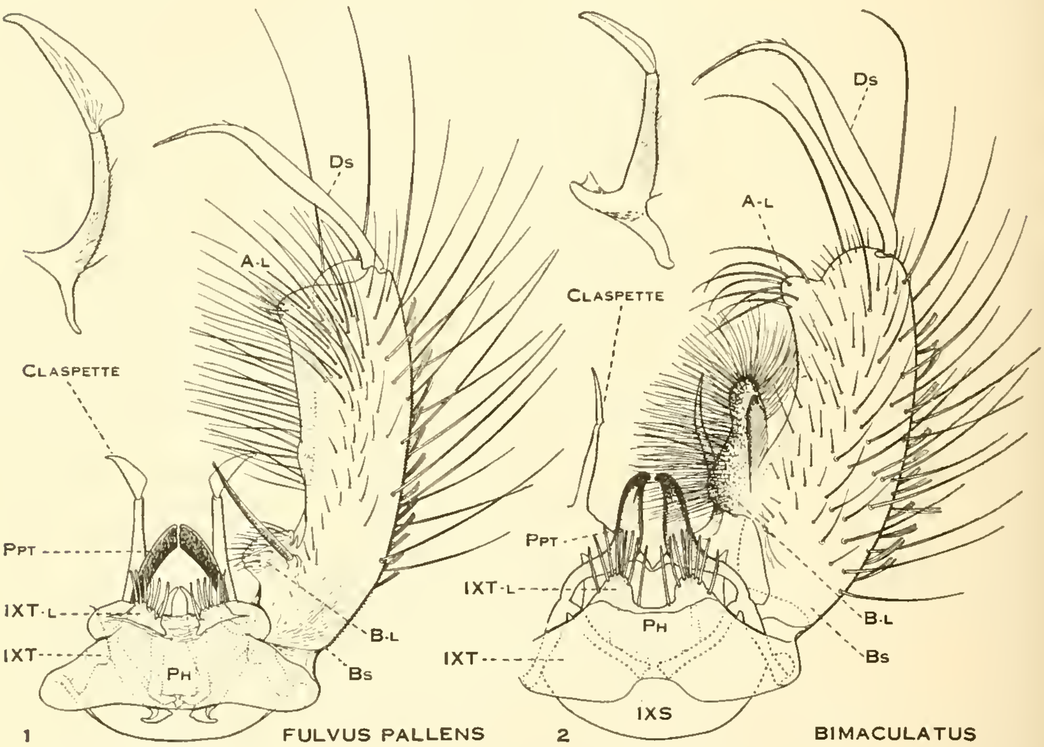

Figure 1, Male terminalia of *Aedes fulvus pallens* n. subsp., holotype with side view of claspette. Figure 2, Male terminalia of *Aedes bimaculatus* (Coq.), topotype, with side view of claspette. *Explanation of symbols:* (A–L) apical lobe, (B–L) basal lobe, (Bs) basistyle, (Ds) dististyle, (IXT) ninth tergite, (IXT–L) lobe of IXT, (IXS) ninth sternite, (PH) phallosome, (PPT) paraproct.

Thorax with integument (except mesonotal spots) lemon-yellow throughout, slightly darker in mid-dorsal line of mesonotum; scutellum blackish. Mesonotum with two conspicuous ebony-black spots sub-basally, the margins rounded, uninterrupted, abrupt; clothed with a mixture of golden and piceous recumbent hairs except over the black spots where these hairs are all black; erect setae amber-yellow. Pleural integument immaculate yellow; scales of prealar area and upper half of mesepimeron silver. *Wings* with scales smokey-black, except at extreme base of costal veins where they are yellow. *Legs:* coxae and trochanters with integument, scales, and setae yellow. Femora of fore- and mid-legs yellow-scaled on outer side with a mixture of blackish scales, somewhat concentrated medially; hind femora with only yellow scales on outer side; apices of all femora with an abrupt tip of black scales. Tibiae of fore- and mid-legs largely smokey-black scaled on outer sides; apices shaggy, gradually darkened; hind tibiae narrowly dark-scaled at base and broadly so at apex, some scales erect. Fore-tarsi entirely dark; mid-tarsi dark except toward base of basal segment; hind tarsi dark scaled except at basal two-thirds of basal segment.

Abdomen with uniform, broad, golden-scales throughout venter and on terminal half of dorsum; basal tergites increasingly mixed with black scales until almost entirely black-scaled on segments I and II.

Male terminalia (fig. 2) as illustrated. Salient features: Basistyle (Bs) stout; setae rather sparse, especially on venter; two very large, long,

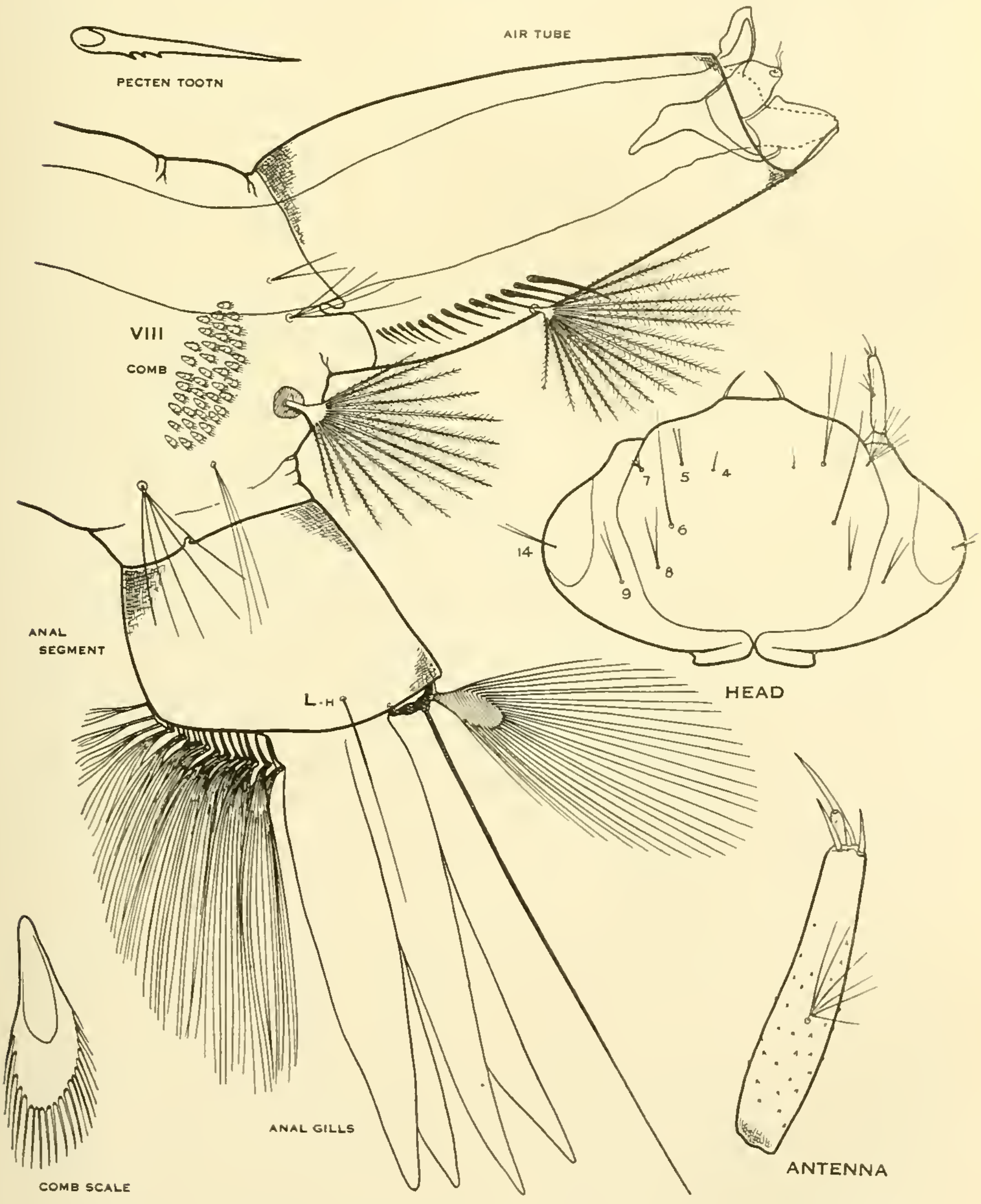

Figure 3, *Aedes bimaculatus* (Coq.), fourth instar larval characters. Specimen from San Benito, Texas.

apically curved setae arise subapically on venter; apical lobe (A-L) prominent, rounded, setae prominent, evenly curved basad; basal lobe (B-L) very conspicuous, half as long as basistyle, dark, very densely clothed with slender hairs, dorsal spine absent. Claspette filament (from side) rather slender, as figured.

Female: Very similar in coloration to male, except as follows: Proboscis with darker scales extending farther basad; tarsi more nearly completely dark; wings with more extensive gold scales on base of C and R_1. Abdomen with only a few dark scales on basal half of dorsum, almost completely golden-scaled. All claws toothed except those of hind tarsi.

Larva (fourth instar) (fig. 3): *Head* as figured, antennae very short. *Prothorax* with hairs 1 and 2 long, single; hair 3 fine, 2-branched; hair 4 finely 3-branched; hairs 5 and 6 long, single; hair 7 prominent, 3-branched from base; hair 8 small, single; hairs 9–11 fine, single, arise from common sclerite; hair 13 large, fan-shaped, many-branched. *Mesothorax* with hair 1 fine, single; hair 4 small, 4-branched at apical half; hair 3 finely 3-branched from base; hair 4 finely 7-branched from base; hair 5 a single prominent hair; hairs 6, 8, and 9 large multibranched, fan-shaped, hair 7 single; hair 13 small, multi-branched from base. *Metathorax* with hairs 8 and 9 fan-shaped but only half as large as those of mesothorax. *Abdomen:* dorsal lateral hairs (6) double on segments I and II, single on remaining segments; ventral hair of segment VI very conspicuous, rhizoid, many-branched. Terminal segments as figured; comb scales oval; pecten teeth extending just beyond ventral tuft of air tube, evenly spaced; lateral hair of anal segment single.

Holotype: female, Brownsville, Texas, June 16 (C. H. T. Townsend). Cat. No. 6259, U. S. National Museum.

Redescribed specimens: Male and female, from Brownsville, Texas, September 27, 1942 (E. S. Ross and H. R. Roberts).

Other specimens examined: TEXAS—Brownsville, VIII–30–16 (M. M. High), 2 ♀; Brownsville, VIII–25 (A. Price), 1 ♀; Ft. Brown (Brownsville) VII–9–42, 8 ♀; Brownsville, V–17–42, (Reeves, Brookman, Eads) 1 ♂, 5 larvae; Palmetto State Park, Luling, IX–15–42 (Roberts and Ross) 1 ♀ biting. MEXICO—San Blas, XI–03 (A. Duges) 1 ♀. EL SALVADOR—San Miguel, 1940, 1 ♀.

The male terminalia characters of *bimaculatus* are very distinctive and set the species well apart from *fulvus*. The larval differences between *bimaculatus* and *fulvus pallens*, on the other hand, are relatively slight. Adults of both sexes of these species may be separated as follows: *fulvus* has apical triangular areas of black scales on all abdominal tergites, thoracic pleura with at least one black integumental spot (*fulvus pallens*) or two longitudinal black stripes (*fulvus fulvus*); *bimaculatus*, with scarcely any black scales on tergites except toward base of abdomen, thoracic pleura yellow—no integumental maculation, It is apparent, thanks to his clear photographs of the male terminalia, that Vargas (1940) correctly identified specimens from Campeche, Mexico, as *bimaculatus.* Later (1941), however, perhaps noting the published terminalia figures of specimens incorrectly identified as *bimaculatus*, he concluded that his specimens represented a new species which he named *rozeboomi.* This name must now become a synonom of *bimaculatus.*

Little is known of the biology of *bimaculatus.* W. C. Reeves (in lit.) collected larvae of the species in a roadside ditch near San Benito, Texas, May 11, 1942. He noted a remarkable appearance in the larva; the head and only the sixth and seventh abdominal segments being dark, the remainder of the body being transparent and exhibiting the internal organs. He reared males from these larvae which proved to be *bimaculatus.* On September 27, 1942, near Brownsville, Lt. H. R. Roberts and the writer collected a large series of adults and pupae of the species. The adults, many recently emerged, were resting on grass growing in and around large, clear, semi-permanent roadside pools which had apparently been fed by flood water from the Rio Grande River. Although a careful search was made, no larvae of the species were taken. The fact that only pupae and adults were present in abundance during such a limited period indicated a simultaneous development perhaps resulting from the eggs of a previous generation being flooded all at the same time. If such a non-continuous breeding is the rule, it would explain the infrequency with which the species is collected. Many other mosquitoes were found breeding in these puddles, as follows: *Anopheles quadrimaculatus*, *pseudopunctipennis*, *albimanus; Psorophora ciliata*, *confinnis*, *discolor*, *signipennis; Culex erraticus.* The species is attracted to light and bites man at night.

Aedes (Ochlerotatus) fulvus fulvus (Wiedemann).[2]

Culex fulvus Wiedemann, 1828, Ausser. Zweifl. Ins., 1:546.
Culex ochripes Maquart, 1850, Dipt. Exot., Suppl. 4, part 1, p. 315.
Culex flavicosta Walker, 1856, Ins. Saund. p. 431.

The writer has before him the *fulvus* material in the U. S. National Museum from many localities in Central and South America. Representatives from Panama are described as follows:

Male.—Head integument and recumbent scales pale yellow, erect scales setae golden-yellow. Eyes black. Tori large, orange, naked except for a few fine brown hairs on inner sides; clypeus naked, yellow. Palpi longer than proboscis; first segment with integument brown; second segment with integument brown at extreme base only, clothed with golden scales except

[2] The extensive bibliography of this species is not included, but its synonyms are listed.

over dark base and extreme apex where the scales are smokey-black; third segment golden scaled except at extremities, greatly expanded in distal fourth, roughened ventrally and clothed with long golden hairs, two large bristles on dorsal apex; fourth segment dark scaled at basal and distal thirds, partially golden medially, densely clothed ventrally with long golden hairs, terminal segment slender, entirely clothed with shaggy black scales, sparse long black bristles dorsally, and dense long hairs ventrally. Proboscis entirely clothed with golden scales except at extreme apex where it is black.

Thorax with mesonotal integument lemon-yellow except for the subbasal spots; each spot is transversely divided medially by a yellow area, the spots are brownish-black with blending margins; clothed with bright golden recumbent hairs; except over and mesad of spots where these hairs are black. Pleural integument lemon-yellow with two longitudinal brownish-black bands, one extending caudad from side of anterior promontory of mesonotum to prealar sclerite, the lower band crossing middle of sternopleural sclerite and covering lower half of mesepimeron. The upper half of the latter sclerite and the prealar area are clothed with broad flattened silver scales. *Wings* with scales of C, Sc and R_1 golden, other scales yellowish-brown. *Legs:* coxae and trochanters lemon-yellow; femora with all scales yellow, except for those forming abrupt black tip; tibiae largely yellow-scaled except at extremities, scales rather uplifted; fore-tarsi largely yellow-scaled, except at tips of terminal segments; mid- and hind-tarsi with terminal four segments black-scaled, basal segment yellow-scaled except at extreme base and at terminal fourth.

Abdomen golden-scaled beneath and on dorsum except for triangular apical areas of black scales.

Male terminalia without significant differences from that described later for *fulvus pallens* (fig. 1).

Female.—Very similar in coloration and vestiture to male. The palpi are black-scaled at the apical third. Wings with scales of C, Sc and R_1 golden except at terminal fourth of wing. Abdomen with dark-scaled areas of tergites covering apical half, somewhat produced forward medially. All claws toothed except those of hind tarsus.

Holotype: Female, deposited in Frankfurter Museum. Type locality: "Brasilien."

Distribution.—Widespread in the Neotropical Region. The writer has examined specimens in the U. S. National Museum from Panama Canal Zone, Panama, Trinidad, Guatemala, Nicaragua, Brazil, Bolivia, and Peru.

Aedes (Ochlerotatus) fulvus pallens, new subspecies.

(Figures 1 and 4.)

This name is proposed for the "*bimaculatus*" of the southeastern United States which has been long misidentified as either *Aedes bimaculatus* (Coquillett) or *Aedes fulvus* (Wiedemann), *Holotype male:* Similar to *fulvus* from Panama but differing in the following details: Palpi with terminal dark scales paler, ventral vestiture of long golden hair of terminal segments almost absent on distal segment, this segment clothed on all sides with long brownish hairs. *Thorax* with mesonotal spots not divided, darker brown in color, rather abruptly limited in outline; pleurae almost entirely immaculate, only one small, inconspicuous brown spot below the mesothoracic spiracle. *Abdomen* with dorsal triangles of dark scales smaller in size.

Terminalia (fig. 1): Without significant differences from that of typical

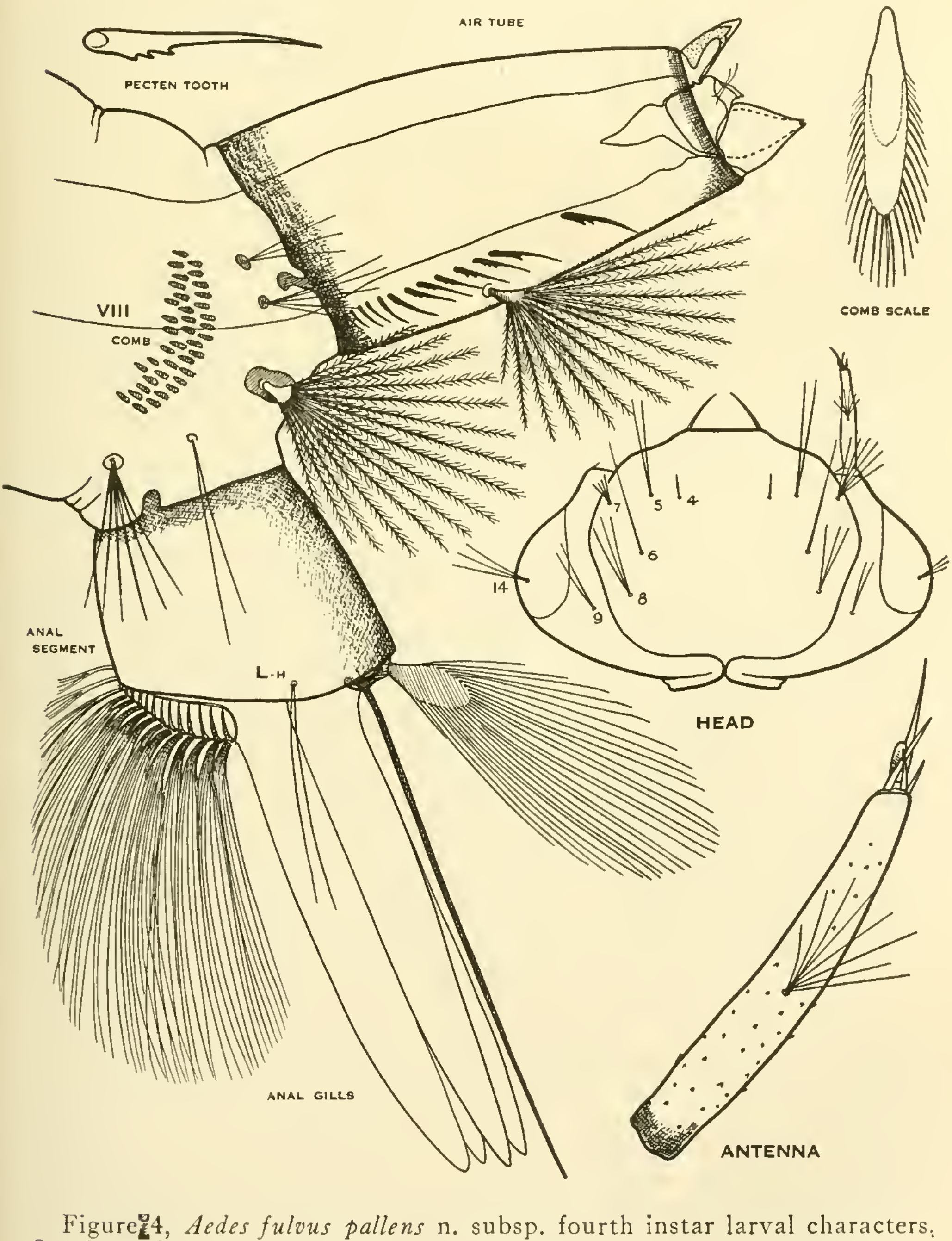

Figure 4, *Aedes fulvus pallens* n. subsp. fourth instar larval characters. Specimen from Bienville Parish, Louisiana.

fulvus. Salient characters: basistyle (Bs) rather slender; elongate, setae very dense distally on dorsal surface and along inner margin of venter, apical lobe (A–L) small, setae inconspicuous; basal lobe (B–L) small, somewhat flattened, spines short, directed mesad, arising from prominent sockets, with a conspicuous dorsal spine crossing its surface which is minutely barbed at tip; claspette filament (from side) broad, blade-shaped.

Allotype female: Similar to male in coloration but with black scales of abdominal tergites more restricted to apical margin (other specimens have the normal dark *fulvus*-like tergites.)

Larva (fourth instar) with important characters as illustrated (fig. 4).

Holotype: Male (terminalia on slide), and allotype female, New Orleans, Louisiana, September 10, 1914 (W. V. King) deposited in the U. S. National Museum.

Specimens examined.—LOUISIANA—Baton Rouge (Dupree) 2 larvae; Baton Rouge, IX–02 (H. A. Morgan), 1 female; Baton Rouge, X–16–02, 1 male; New Orleans, IX–24–02 (G. E. Beyer), 1 female; New Orleans, IX–10–14 (W. V. King) 1 female, 2 larvae; same data, X–2–14, 1 female; Bienville Parish, VI–12–39 (E. B. Johnson) 3 larvae, 2 terminalia; Leesville, VII–42 (R. W. Bunn), 2 males; MISSISSIPPI—Belzona, VIII–4–04 (H. S. Barber), 1 female; Natchez, VI–9–10 (A. Fleming), 1 female. SOUTH CAROLINA—Georgetown, IX–20–33 (C. C. C. Survey) 3 females. MARYLAND—Shadey Grove, VI–30–34 (C. C. C. Survey), 1 female. The subspecies has also been recorded from many localities of almost all of the southeastern states—usually as *bimaculatus*.

Because of the lack of apparent terminalia differences between the United States series and that from Panama, and because the more superficial characters such as color and vestiture are relatively slight, though constant, the United States series is placed as a subspecies of *fulvus*. *Pallens* can be separated at once from typical *fulvus* by the almost complete absence of pleural maculation of the thorax and by the greater development of the mesothoracic spots. *Bimaculatus* is readily distinguished from both by the darker, ebony-black mesothoracic spots, absence of any pleural maculation, darker wings, and legs, abdomen with tergites almost entirely golden-scaled, and the terminalia characters so distinct that they can be seen under a low power binocular microscope without preparation.

Barret (1919) has given a few details regarding the biology of this subspecies. He reported the larvae occurring in fairly large numbers in a semi-permanent sink-hole of muddy water following heavy rains, July, 1916, at Charlotte, North Carolina. The larvae rested nearly parallel to the surface and were dark brown in color. This latter point is of interest as a possible further point of differentiation of larvae of this species from *bimaculatus* which has partially colorless larvae. King (1942) reports the females to be severe biters.

Attempts have been made, using terminalia characters, to show that more than one species of the *fulvus* group occurs within the range of *pallens*. The writer feels that the characters used are either within the range of variation of the subspecies or due to distortions resulting from slide preparation.

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Vargas, L., 1940, *Aedes bimaculatus* Coquillett, 1904, del Estado de Campeche, Mexico. Description de Macho. Rev. Soc. Mex. Hist. Nat., 1:103–107, figs.

——— 1941, *Aedes* (*Ochlerotatus*) *rozeboomi* nueva especie (Dipt. Culicidae). Gaceta Medica de Mexico 69:393–395.

A NEW GENUS AND SPECIES OF THYSANOPTERA FROM NEW ZEALAND (Family Thripidae)

By J. C. Crawford,

Bureau of Entomology and Plant Quarantine,
United States Department of Agriculture

In this paper there is described another of the interesting forms sent by Donald Spiller for determination. The species is dedicated to him for his efforts in collecting Thysanoptera with full and exact data in a region from which previously almost nothing was known.

OTHINANAPHOTHRIPS, new genus.

Belongs to the Anaphothripini; antenna distinctly 9-segmented, with segments 7–9 forming a style; body not strongly reticulated; trichomes on segments 3 and 4 forked; ocelli in macropterous form fully developed; prothorax without any long setae; comb on tergum VIII complete, of simple spines; fore vein of anterior wing with an irregular row of setae on its entire length, hind vein with many setae; sterna of male with peculiar glandular areas (fig. 1, C); armature of apical segments of male also peculiar.

Type, *Othinanaphothrips spilleri*, new species.

To this genus must also be assigned *Hemianaphothrips tersus* Morison.

This genus differs from *Hemianaphothrips* Priesner in having the anterior vein of the forewing completely (though irregularly) spined and the comb on tergum VIII not medially made up of plates apically drawn out into 1–4 spines, in possessing fully developed ocelli in the macropterous form, and in the male being equipped with peculiarly shaped sternal glandular areas as well as the unusual armature of the apical segments.

Othinanaphothrips spilleri, new species.

Female (holotype).—Length (slightly distended) 1.35 mm. When viewed by reflected light, head and abdomen light straw color, thorax strongly orange; extreme base of head and tergum I faintly orange; the following marks brown: A narrow band along occipital carina, a triangular spot (rather faint in some specimens) on each side of extreme base of head, with the base of the mark caudad; an irregular longitudinal stripe on each side of median line of metanotum, these fading out posteriorly on metapostscutellum; tergum I faintly marked medially, terga II–VIII each with an irregularly semicircular mark medially on basal margin, that on II extending about two-thirds of the distance across tergum and about three-fourths of the distance from base to apex; marks on following terga successively decreasing in size with that on VIII minute; on each side of these median marks a small round spot on terga II–VII, that on II more or less connected with the median mark; antennae mostly brownish black; legs slightly deeper yellow than abdomen; by transmitted light, head yellow, darkened posteriorly, ocellar crescents bright red; antenna (fig. 1, B) I pale yellow, II dark brown, III lighter brown, with base and pedicel pale yellow, IV–IX very dark brown, with bases of IV and V distinctly lighter; thorax brownish red, with more brown laterally, the rest of the insect light yellow with a faint grayish-orange tinge, except for the markings enumerated above, these appearing lighter than when viewed by reflected light; forewing (fig. 1, A) brown, lighter at base (except anal lobe) and apex, and between the 2 longitudinal veins, with a darker stripe along basal half of fore vein (interrupted somewhat beyond anal lobe);

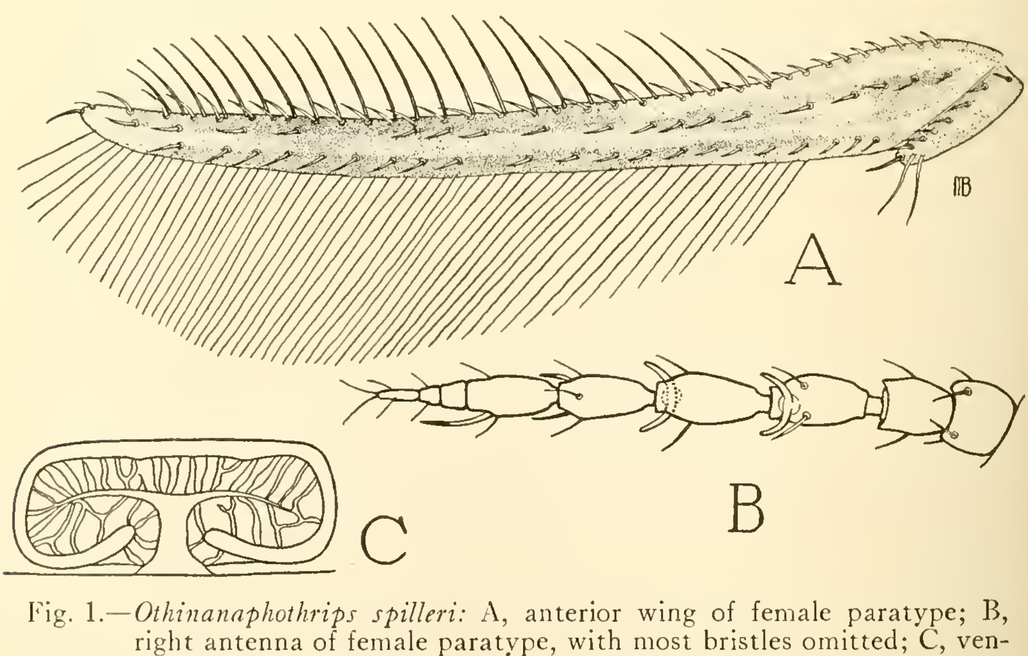

Fig. 1.—*Othinanaphothrips spilleri:* A, anterior wing of female paratype; B, right antenna of female paratype, with most bristles omitted; C, ventral gland of sternum 5 of male, dorsal view. (Drawings made by Mrs. Mary F. Benson.)

wing bristles and fringes brownish; lateral marginal abdominal bristles pale brownish, on apical segments distinctly brown.

Head wider than long, with width across eyes and across cheeks equal, cheeks gently curved, narrowed to eyes, head back of eyes with a few transverse anastomosing lines so strong that the cheeks in outline appear serrate; anteo_cellar, interocellar, and postocular bristles short, subequal, almost colorless; tennal segments III–VI pedicellate.

Pronotum about as long as wide, sides slightly divergent posteriorly, posterior margin with 4–5 pairs of brown bristles, these slightly stronger and longer than the discal bristles; laterad of these bristles on each side a pair of shorter, almost colorless bristles; median pair of bristles on metanotum remote from base; costa of forewing with about 31 bristles, fore vein with 15-17 bristles (usually 15) arranged in a basal group of 4 (exceptionally 5), then a group of 3 or 4, the bristles of both groups closely spaced, then a series of (usually) 6 more widely spaced bristles, then 2 bristles that are still more widely spaced and more widely set off from the previous series; the series of 6 evenly spaced, or, if 1 or more are missing, more widely and unevenly set; hind vein with about 20 evenly spaced bristles or about 17 when the line is somewhat interrupted; anal lobe with 7 (or 8) brown and 2 long, colorless bristles; bristles on veins short.

Abdomen with very faint transverse anastomosing lines which laterad become more distinct and subreticulate; comb on tergum VIII complete, of about 46 teeth.

Measurements (in microns): Head, total length 116, greatest width 140; prothorax, median length 136, greatest width 140; bristles on wing vein, medially 20; bristles on tergum IX, median pair 76, intermediate pair 72, lateral pair 80; bristles on tergum X, inner pair 88, outer pair 84; ovipositor 216.

Antenna:	1	2	3	4	5	6	7	8	9
Length,	24	36	49	44	40	40	14	10	16

Male (allotype).—Length (distended) 1.28 mm. Similar to the female but lighter in color, the antenna much paler, having segment I whitish, II and III light yellow, IV yellow with the apex gray, V yellow, brownish gray in apical half, VI–IX brownish gray, with VI much lighter in basal half, where it is yellow, only slightly tinged with gray; armature of abdominal segments IX and X essentially as figured by Morison in the original description of his *tersus*,[1] but the ventral glandular areas under high power appearing as shown in figure 1, C.

Type locality.—Auckland, New Zealand.

Host.—Tobacco.

Type.—United States National Museum No. 56601.

Described from 6 female and 3 male specimens taken July 14, 1941, in a greenhouse, by Donald Spiller.

Differs from the Australian *Othinanaphothrips tersus* Morison in the greater number of spines on the anal lobe, in having lateral gray marks on the head instead of a median mark, in the forewing not being uniformly colored and in the antenna being much darker in color, as well as many other small differences.

[1] Bul. Ent. Res. 21: 10, fig. 1, 1930.

THE FIRST RECORD OF LEPTOTHORAX, SUBGENUS GONIOTHORAX EMERY, IN THE UNITED STATES, WITH THE DESCRIPTION OF A NEW SPECIES (Hymenoptera: Formicidae)

By Marion R. Smith,

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

Previous to the finding of a new species of *Leptothorax* (*Goniothorax*) at Brownsville, Tex., by Mrs. Wilda S. Ross, no species of this subgenus was known to occur in the United States, although *Goniothorax* is well represented in South America, Central America, and to some extent in Mexico. The United States now contains 4 of the 5 subgenera of *Leptothorax* recognized by Emery, 1922.[1] *L.* (*Leptothorax*) is the largest, with 21 species, 6 subspecies, and 7 varieties, one or more of which are present in every State of the Union; *L.* (*Mychothorax*), the second largest, has 5 species, 5 subspecies, and 6 varieties, which are distributed over the northern half of the United States, especially in the extreme north and northwest; *L.* (*Dichothorax*), with 1 species, 2 subspecies, and 1 variety, is more typically southern, occurring from Florida to Virginia and westward at least to Iowa and Texas. It is unlikely that any form of *Temnothorax* will be found in the United States, as members of this subgenus are native to the region around the Mediterranean.

The worker of the *Goniothorax* here described is easily distinguished from the workers of the other subgenera by the very sharp humeral angles of the pronotum, the tubercles on the side of the thorax, which give a very irregular outline to this region, the prominent spines or tubercles of the petiole and postpetiole, and the peculiar obtuse or clubbed hairs. Since Emery's characterizations of the various castes of *Goniothorax* are not readily available to all formicologists, they are presented herewith, along with the synonymy of the subgenus, the citation of the subgenotype, and the general distribution of the group.

Leptothorax, subgenus **Goniothorax** Emery.

Leptothorax, subgenus *Goniothorax* Emery, 1896, Soc. Ent. Ital. Bol. 28:58; 1915, Portici R. Scuola. Super. di Agr. Lab. Zool. Gen. e Agr. Bol. 10: 24.

Nesomyrmex Wheeler, 1910, Amer. Mus. Nat. Hist. Bul. 28: 259.

Leptothorax, subgenus *Caulomyrma* Forel, 1914, Soc. Vaud. des Sci. Nat. Bul. 50: 233.

Atopula Forel (part), 1915, Tijdschr. v. Ent. 58: 25.

Type of subgenus, *Leptothorax vicinus* Mayr (by designation of Wheeler, 1911).

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[1] Genera Insectorum, Fascicule 174c: 248.

Worker.—Antenna of 11 or 12 segments, including a club of 3 segments or, exceptionally, without a well-defined club, the last 4 or 5 segments gradually becoming wider and longer. Pronotum more or less distinctly shouldered, the anterior angles well defined, often sharp, sometimes toothed. Petiole and postpetiole variable, in some species adorned with numerous points. Body hair obtuse or clubbed, barbed.

Female.—Pronotum shouldered as in worker, amply extended beyond mesonotum, which is flattened. Anterior wing with a short, closed radial cell, the discoidal cell absent.

Male.—Antenna with 12 or 13 segments, without a distinct club; scape at least one-fourth as long as the funiculus. Pronotum shouldered, distinctly extended beyond mesonotum. Wing as in female.

Geographic Distribution.—Central America, South America, Africa, Madagascar, and Sumatra.

Leptothorax (Goniothorax) wilda, new species.

Worker.—Length 2.5 mm.

Head, excluding mandibles, approximately one and one-sixth times as long as broad, with straight posterior border and feebly convex sides; narrowest anteriorly; area between inner margin of eye and frontal region impressed, causing the frontal region to appear elevated above the adjacent surfaces. Eye prominent, moderately convex, placed approximately its greatest diameter from base of mandible. Anterior border of clypeus extended as a broad, straight, or feebly rounded, median lobe. Antenna 11-segmented; scape moderately robust, extending approximately one-half distance between hind margin of eye and posterior border of head; last 3 segments of funiculus forming a rather distinct club, the last segment of which is longer than the combined length of the 3 preceding segments. Thorax, from above, with acute humeral angles; a very distinct boundary extending from side to side between humeral angles and delimiting pronotal collar from rest of pronotum; distance between humeral angles approximately twice that between apices of epinotal spines. Not including the humeral angle and the epinotal spine there are on each side of the thorax 3 distinct protuberances or tubercles; the most anterior of these marks the approximate junction of the prothorax and mesothorax, the second and larger lies in the mesothorax only a slight distance posterior to the first, and the third tubercle is situated anterior to the epinotal spine at a distance approximately equivalent to the length of the spine. Dorsum of thorax without promesonotal and mesoepinotal sutures. Epinotal spines short, not so long as space between their apices, apex of each spine directed posterolaterad and also very slightly dorsad. Borders of petiolar node, viewed from above, forming a subtrapezoid; posterior border of node bearing 4 distinct spines, anteromesad of which there is a pair of similar shape and still another pair anteromesad of the first-mentioned pair, thus making a total of 8 spines on the petiole excluding the angle formed on each side by the junction of the petiolar node with its peduncle. Postpetiolar node broader than petiolar node, approximately one and one-half times as broad as long, convex anteroposteriorly, each side bearing a pair of small spines. Gaster with distinct basal angles.

Hairs yellowish, suberect or erect, sparsely distributed over dorsum of body but lacking on appendages and also on impressed areas of head; hairs on head and thorax short, subclavate, those on gaster longer and less clavate.

Head, thorax, petiole, and postpetiole subopaque, with an alveolaceous-rugulose sculpture in which the rugulae often tend to become reticulate, especially on the nodes of the petiole and postpetiole.

Color a sordid yellow or pale yellow, eyes black, mandibular teeth brownish.

Female.—Length 4 mm.

Differing from the worker principally in the following particulars: Larger size, subrectangular head, and shape of thorax, which not only is larger and more robust but lacks the anterior and median tubercles on each side. The female also possesses only a pair of very short, blunt tubercles instead of spines. The sculpturing on the head and mesonotum is coarser, with more distinct longitudinal rugulae.

Type locality.—Palm (*Sabal texana* Becc.) grove 5 miles south of Brownsville, Tex.

Other locality.—Harlingen, Tex., October 24, 1942, Wm. F. Buren. From a dead twig on a tree.

Holotype.—United States National Museum No. 56577.

Twenty-nine paratype workers and one female; two workers each in the American Museum of Natural History, the Museum of Comparative Zoology, and the California Academy of Sciences.

These ants were collected by Mrs. Wilda S. Ross at the type locality on September 28, 1942, while they were crawling on vines in an area subject to overflow by the Rio Grande. Typical vegetation of this area is the large palmetto, *Sabal texana* Becc.; hackberry, *Celtis mississippiensis* Bosc.; snow-on-the-mountain, *Dichrophyllum marginatum* Pursh; sugar berry, *Ehretia elliptica* DC.; dogwood, *Cornus asperifolia* Michx.; and the vine *Clematis drummondii* Torr. and Gray.

Paratypes range in length from approximately 2 to 2.5 mm. The head of some workers is longer (subrectangular) than that of the holotype. The spines, which occupy the same relative positions on the petiole and postpetiole of different individuals, are often variable in size; furthermore, the anterior pair on the postpetiole is sometimes missing.

The worker of the new species superficially resembles the worker of *Leptothorax* (*Goniothorax*) *echinatinodis spininodis* Mayr of Brazil. It can be distinguished from the worker of that subspecies by its shorter antennal scape, the presence of the impressed areas on the head lying between the eyes and the frontal region, the less rugulose sculpture of the thorax, longer postpetiolar node in proportion to the postpetiolar breadth, lack of distinct sculpture on the base of the first gastric segment, shorter and more clavate hairs, and lighter color.

MINUTES OF THE 536TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON, APRIL 1, 1943

The 536th regular meeting of the Society was held at 8 P. M., Thursday, April 1, 1943, in Room 43 of the National Museum. President Harned was in the chair and 38 members and 32 visitors were present. The minutes of the previous meeting were approved as read.

The following were elected to membership in the Society by a unanimous ballot:

Mr. H. Elishewitz, U. S. Naval Medical Research Station, Bethesda, Maryland.

Mrs. Juliet H. Carrington, Division of Insect Identification, Bureau of Entomology and Plant Quarantine.

Miss Ina L. Hawes, Library, U. S. Department of Agriculture.

The first paper on the regular program was entitled: Entomology in Great Britain during War Time, by Prof. P. A. Buxton, London School of Hygiene and Tropical Medicine (University of London).

Professor Buxton spoke briefly on the effect of the war on scientists in general and on entomologists in particular. He pointed out that it is often difficult for a pure scientist to turn suddenly to applied science without a period of readjustment. However problems of applied science often may be broken up and those parts which can be handled by pure scientists turned over to them. Some of the projects, to which attention is being given, were mentioned. The populations of wireworms must be considered in recommendations to convert sod land to the growing of crops. Methods have been worked out which give an accurate estimate of the number present in a given area. A constant watch is made for the presence of the Colorado potato beetle. Prof. Buxton described the methods used in instructing officers and men in the army in the control of malaria. He remarked, in closing, that the Entomological Society of London has not missed any regular meetings, in spite of the war. The meetings have been held in the afternoons in order to avoid the inconveniences which may develop, in the evenings, during a blackout. (Secretary's abstract). Questions and comments followed by Bishopp and Packard.

The second paper, entitled: The Allocation of Insecticides under War-Time Conditions, was presented by S. A. Rohwer, Bureau of Entomology and Plant Quarantine.

Many materials used in the manufacture of insecticides are scarce or are needed for direct war use. To conserve and provide for essential uses, within the limit of supplies, procedures have been established to allocate and control their distribution. It is not practicable to ration insecticides. Insect pests are not uniformly distributed or regular in occurrence. Many occur in outbreak numbers only sporadically. To ration supplies of insecticides would not provide an effective way of controlling these pests.

Scarce materials used in the manufacture of insecticides may be grouped into three general categories: (a) Those such as hydrocarbon solvents where the amount used is only a minor part of the total supply; (b) those such as arsenic where insecticidal uses are established and require an important part of the total supply; and (c) those such as rotenone and pyrethrum where the primary or sole use of the entire supply is as insecticides. Materials needed for the war effort, the supplies of which are limited, are controlled by orders issued by the War Production Board. The Food Administrator and the Department of Agriculture are primary claimant agencies for supplies of materials needed in the manufacture of insecticides needed to control pests affecting agriculture and injuring food, fiber, and similar essential supplies. Where appreciable amounts of the total supply are needed for insecticides they advise the War Production Board how they should be allocated to assure the best use in aiding farmers and users to produce and protect supplies needed in the war effort. At their request the Bureau of Entomology and Plant Quarantine has prepared statements listing the major uses of important insecticides. These uses are arranged on a priority basis considering (a) the importance of the product (crop, livestock, etc.) for food, fiber, and other essential purposes; (b) the importance of the pest in the production or protection of the product; and (c) the availability of substitute materials that could be used to control the pest. These lists have been used as a basis of determinations made by those responsible for prescribing permitted uses set forth in various orders.

The administration of these orders involves consideration of technical questions, both entomological and chemical. The Bureau of Entomology and Plant Quarantine has, when requested, supplied information on such matters to those responsible for administering the orders. To aid them, maps have been prepared showing major growing areas where pests occur as well as statements giving information when the insecticides should be made available, the estimated quantity required, and the form that is most suitable for control.

To aid it to comply with these requests for information the Bureau has sought and received the assistance of cooperating State agencies, industry, and others having information in reference to insecticides.

Entomologists are greatly concerned in seeing that supplies of insecticides are on hand in the required amounts as needs arise in various areas where pests occur. To help industry to distribute the insecticides to areas where they are needed and to advise those responsible for controlling supplies, the Bureau endeavors to provide up-to-date information on the seasonal occurrence of pests in various areas. (Author's abstract). Comments followed by Hamilton and Buxton.

The third paper was entitled: Insect Control in Victory Gardens, by W. H. White, Bureau of Entomology and Plant Quarantine.

Mr. White referred to the National Victory Garden Program, which had its inception at the National Defense Gardening Conference, held in Washington, D. C., December 19–20, 1941, and which was sponsored by the Department of Agriculture.

Attention was directed to the losses in food caused by cabbage caterpillars, wherein experimental work had shown that, on a per capita basis, the loss in the productivity of one acre of cabbage was sufficient to supply 148 persons for one year. Likewise, losses caused by the tomato fruitworm in California, computed on the same basis, would supply 125 persons with canned tomatoes for one year.

It was pointed out that minor injuries, such as scarification of plant tissue and minor plant feeding on the leaves and stems, and insect-borne diseases which are frequently overlooked by the inexperienced gardener, often reduce crop yields, and, in our efforts to produce abundant food supplies during the war period, such injury should be guarded against.

The difference in the entomological problems of today's Victory Gardener and those of the Liberty Gardener of the first World War, were discussed. These differences are due primarily to the emphasis which has been placed on the production of leafy vegetables because of their high value as a source of vitamins—not generally recognized in 1918. Incidentally, the World War I gardener was not troubled, in the Eastern States, by the Mexican bean beetle, since it was not until 1920 that this insect was found damaging beans in the Birmingham, Ala., area. Since that time it has spread over the States east of the Mississippi River and to the North to the Great Lakes and northeastward to Maine. Over most of the area it is an annual pest, and constitutes a problem which the modern Victory Gardener must confront.

The handicap imposed on the Victory gardener by the shortage of rotenone and pyrethrum was emphasized, and Mr. White pointed out the restrictions on the use of these materials imposed by the War Production Board Order M–133 amended Jan. 23, 1943. The value of pyrethrum as a garden insecticide was discussed, and reference was made to the utilization of this material in comparison with rotenone, and also with regard to its specificity for the control of pests of the leafhopper group. Pyrethrum supplies are likely to be inadequate to the needs of the Victory Gardener, at least during the season of 1943. The restrictions on the use of rotenone and the inadequate supply of pyrethrum will increase the difficulties of the Victory Gardener in the control of insects on leafy vegetables and beans, since these materials may be used without incurring a harmful residue hazard, whereas this hazard is an important factor in the use of inorganic poisons on leafy vegetables in order to avoid the residue hazard was stressed by Mr. White.

Mention was also made of the use of cryolite as a substitute for arsenicals and the use of sodium fluosilicate in poison baits for cutworms. Mr. White emphasized that it is not necessary to use molasses (a scarce material) in the poison bait for cutworms.

Hand-picking of some insects was advocated, and the protection of transplants from cutworms by the use of paper collars was recommended.

Several slides were shown, as a supplement to Mr. White's discussion. (Author's abstract.) Mr. White's talk was commented on by Elishewitz and St. George.

The following visitors were introduced to the Society: R. Cortes, Melvin Goldberg, John Rodda, A. G. Biggam, Lt. Col. T. T. Mackie, C. C. Hamilton, Capt. L. S. West, Capt. A. L. Shafton, and Lt. N. Tischler.

Adjournment at 10:05 P. M.

W. H. Anderson,
Recording Secretary.

MINUTES OF THE 537TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON MAY 6, 1943

The 537th regular meeting of the Society was held at 8 P. M., Thursday, May 6, 1943, in Room 43 of the National Museum. Vice-President Annand presided and 25 members and 14 visitors attended. The minutes of the previous meeting were approved as read.

Mr. John F. Curry, Bureau of Entomology and Plant Quarantine, California State Department of Agriculture, was unanimously elected to membership in the Society.

The publication of Memoir Number 2 of the Society was announced by the Recording Secretary. The Memoir is entitled: A Classification of Larvae and Adults of the Genus *Phyllophaga*, written by Adam G, Böving.

E. N. Cory exhibited a list of the entomologists who are in military service. The list is being maintained by the American Association of Economic Entomologists and an attempt is being made to have the list complete, and to have the latest mailing address of each of the men in service. Dr. Cory asked for corrections and additions to the lists.

The first paper on the regular program was presented by Dr. E. N. Cory, University of Maryland, College Park, Maryland. Dr. Cory spoke on the subject: Organization for Insect Control in Maryland.

Under normal conditions the dissemination of timely information to farmers on the control of insect pests is much simpler than at present. With the man-power, gasoline and rubber shortages modifications of the usual practices must be employed. In certain counties in Maryland observation stations have been set up. The personnel of the station is is largely reliable young people of school age who collect the data on the development of certain insect pests. So far the observers have received sufficient, proper instruction to make them competent to collect data on the strawberry weevil. Stations have been designated, in several counties, for the pea aphid and the corn ear-worm in addition to the strawberry weevil. The observations are submitted to a coordinator, in most cases the science teacher in the school, who sends them in, each Tuesday, to Dr. Langford at College Park. Dr. Langford extracts the essential information which is turned over to the control service editor. The latter prepares a news release that goes out by Saturday morning to the County Agent who is responsible for seeing that the information appears in the local newspapers in the county. The news releases are prepared in such a way as to indicate that the recommendations come from the County Agent. The names of observers and farmers responsible for obtaining the information are indicated in the news items. This practice helps to insure reading of the article and cultivates an interest in the organization.

All members on the staff of the Department of Entomology at the University of Maryland are cooperating in the program. They prepare questionnaire sheets with accompanying directions, assist in the field training of individuals who make records, and supply factual data on pests.

The scope of the program and the territory to be covered are to be limited this year in order that proper procedures can be established. Only the major crops and their principal pests will be taken into consideration at present. Observations on, and recommendations for the control of, the following pests are planned: corn earworm, Mexican bean beetle, cutworms, flea beetles, pea aphid, melon aphid, European corn borer, Japanese beetle, Colorado potato beetle, codling moth, plum curculio, cabbage worms, fall army worm and possibly poultry pests.

Dr. Cory's talk was supplemented by lantern slides which showed the organization of the program and the logical manner in which the information is to be gathered and recommendations disseminated. (Secretary's abstract.)

The talk was followed by questions and comments by Annand and Rohwer.

The second paper on the regular program was entitled: The Feeding Apparatus of Biting and Disease-Carrying Flies, presented by R. E. Snodgrass, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

A review was given of the structure, homologies, and what is known of the mechanism of the feeding apparatus of biting flies, including species that are known, or are suspected on circumstantial evidence, of being vectors of disease agents. Representatives of the following groups were discussed and illustrated with slides: mosquitoes, sand flies (*Flebotomus*), biting midges (*Culicoides*), black flies (*Simulium*), horse flies, snipe flies, robber flies, biting muscoid flies (tsetse flies, horn flies, stable flies), louse flies (Hippoboscidae), and bat "ticks" (Streblidae and Nycteribiidae). It was shown that an exact homology can be traced between the flies and a cockroach in the basic structures of the head, the mouth parts and sucking organs, but that among the flies different parts have been utilized by the various biting species in the evolution of piercing and sucking mechanisms. (Author's abstract.)

A question followed by Anderson.

Several visitors introduced themselves to the Society.

Adjournment at 9:45 P. M.

W. H. ANDERSON,
Recording Secretary.

Actual date of publication, June 30, 1943.

ANNOUNCEMENT

Memoir Number 2, "**A Classification of Larvae and Adults of the Genus Phyllophaga,**" by Adam G. Böving, is now available for distribution.

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VOL. 45 October, 1943 No. 7

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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PROCEEDINGS OF THE

Entomological Society of Washington

VOL. 45 OCTOBER, 1943 No. 7

A REVISION OF THE NEARCTIC SPECIES OF ADOXOMYIA (Diptera, Stratiomyidae)

By Maurice T. James

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

Since the publication of my review of this genus several years ago, enough additional information has been accumulated to warrant a revised treatment of it. In the present paper I am also correcting a misplacement in the previously published key.

The genus *Adoxomyia* Kertész belongs primarily to the temperate regions of the Northern Hemisphere. The known fauna includes, in addition to the 9 species treated in this paper, 15 from the Palaearctic region, 2 from India, 1 from Formosa, and 1 from tropical East Africa.

Some confusion has arisen regarding the proper use of this name. It was first proposed by Kertész in 1907 for *Clitellaria* of authors, not of Meigen; the same writer later (1923) separated those species which have the antennae arising below the middle of the head and the style long and slender, and distributed this latter group between two new genera, *Haplephippium* and *Euclitellaria*, to the latter of which he referred all the Nearctic species. Pleske (1925) synonymized the two genera *Adoxomyia* and *Euclitellaria*, and Lindner (1938) has accepted this synonymy. In my previous paper I had first used *Euclitellaria* in the manuscript, and later, after it was in the hands of the editor, changed it to *Adoxomyia*. This change was not made on the cover of volume 11, no. 2, of the Pan-Pacific Entomologist, and this accounts for the use of the name *Euclitellaria* in that place.

In Curran's "North American Diptera" *Adoxomyia* runs clearly to *Euclitellaria* (p. 141, couplets 26 and 31); his illustrations (figs. 30, 44, and 65, the last one designated as "*Euclitellaria subulata*") show clearly that he had this genus in mind. In this he was following Kertész. What Curran keys out to *Adoxomyia*, however, can not be *Adoxomyia* Kertész, which, like *Euclitellaria*, has densely pilose eyes. *Adoxomyia* of Curran's manual is probably *Dieuryneura* James, a monotypic Southwestern genus which readily traces to that point in the key.

ADOXOMYIA Kertész

Adoxomyia Kertész, 1907, Ann. Mus. Nat. Hung., 5: 499; 1923, Ann. Mus. Nat. Hung., 20: 96-101; Pleske, 1925, Encycl. Ent., Dipt., 1: 109 (synonymy of *Euclitellaria*); James, 1935, Pan-Pac. Ent., 11: 62-64 (Nearctic species); Lindner, 1938, Die Fliegen der Palaearktischen Region, 18, pp. 154-162 (Palaearctic species).

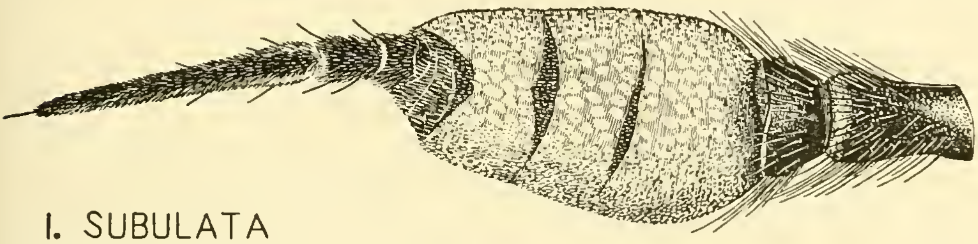
Clitellaria Auct., not Meigen, 1803.

Euclitellaria Kertész, 1923, Ann. Mus. Nat. Hung., 20: 96-97, 101-107; Pleske, l. c. (synonymy); Curran, 1934, North American Diptera, pp. 137, 138, 141, 142; Lindner, l. c. (synonymy, following Pleske).

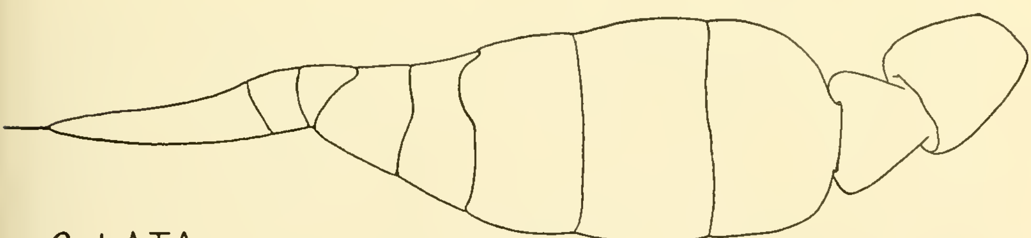
Genotype, *Clitellaria dahlii* Meigen, by designation of Bezzi, 1908, Wien. Ent. Zeitung, 27:75.

Generic characters.—Antenna with ten segments, the last eight fused into a flagellum and in some species apparently reduced, so that there may appear to be less than eight; the terminal segment more or less elongated and forming a style which may vary from robust and segmentlike to slender and almost arista-like in form; scape in length equal to or but slightly longer than the pedicel, the latter never produced on the inner side so as to encroach upon the flagellum; antennae, especially the basal three segments of the flagellum, usually much stouter in the female than in the male. Eyes densely pilose in both sexes, broadly contiguous in the male. Prealar callus of the thorax not spinelike. Scutellum broad, two-spined. Legs of usual form, not especially elongated. Vein R_4 and cross-vein r-m present; vein Cu_1 arising from the discal cell. Black, robust, moderately pilose flies, of medium size.

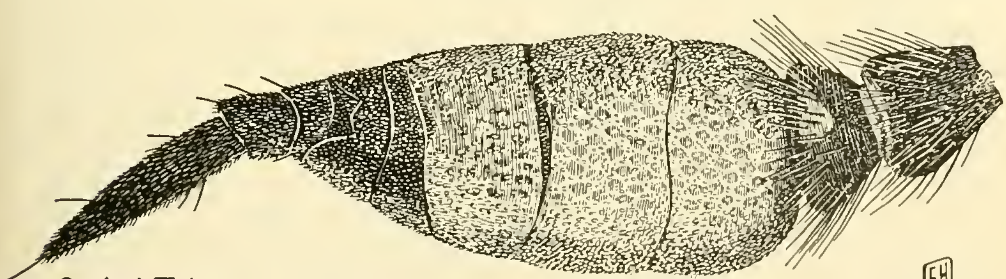
Our species may be divided into two groups, based on the structure of the antennae and front, and correlated with geographical distribution. The one, known to occur only east of the Rocky Mountains and including *subulata* (Loew) and *texana* James, has the first three flagellar segments greatly thickened; the apical segment is subequal in length to the three basal ones combined, but is slender and sharply pointed; the subapical one is also slender, but short, being but little longer than wide and about one-fifth the length of the apical one; the three intermediate segments, representing the tapering of the flagellum from the thickened basal portion to the style, are rather strongly fused, so that their individuality can scarcely be distinguished; their combined length is but little greater than that of the subapical segment (fig. 1). This type of antennal structure approaches the *Euclitellaria* type. The front is rather sparsely punctured and is narrow, its width at the vertex being about one-fifth that of the head. In the other and characteristically Rocky Mountain and Pacific coast group, including the remaining species, the three basal segments are similarly thickened, but not so much so; the intermediate segments are proportionately much longer and the transition from the thickened part to the style is not so abrupt; the identity of these segments is usually fairly clear, though the last one can be seen only when viewed from the outer side; the subapical segment is as in the first group; the apical segment is much shorter and thicker, being at most two-thirds the combined length of the first three (fig . 2, 3). This type of antennal structure represents a condition intermediate between that of *Euclitellaria* and that illustrated by Kertész for the genotype of *Adoxomyia* (actually *A. schineri* Lindner, = *A. dahlii* Kertész in part, not Meigen). The front is rather densely punctured and wide, its width at the vertex being nearly or fully one-third that of the head.



1. SUBULATA



2. LATA



3. LATA

Fig. 1. *Adoxomyia subulata* (Loew), left antenna, lateral view.
Fig. 2. *Adoxomyia lata* (Loew), right antenna, dorsal view.
Fig. 3. *Adoxomyia subulata* (Loew), left antenna, lateral view,
Drawings by Mrs. Sara H. DeBord.

The following key includes all the known Nearctic species. In preparing it I have examined types of all species, both valid and synonyms, except that of *Euparyphus niger* Bigot, and that species has been fully redescribed by Kertész. No Neotropical species are known, except possibly *Ephippium fenestratum* Macquart. Though Kertész has stated that this species belongs without doubt to *Euclitellaria*, I have reason to question his statement. It may be distinguished from the Nearctic species by the hyaline discal cell which stands out in contrast to the rest of the wing, a character possessed by *Dicyphoma schaefferi* (Coq.), a species superficially resembling *Adoxomyia.*

Key to the Nearctic Species

1. Legs, including tarsi, wholly black, or black except for the knees......... 2
   Tarsi pale in large part, and contrasting with the black tibiae............ 6
2. Antennal flagellum red, at least on the basal segments................. 3
   Antennal flagellum entirely black.................................... 5
3. Wings pale brownish; pile of mesonotum, in male, either appressed or in large part black, in female wholly appressed...................... 4
   Wings uniformly hyaline; pile of mesonotum, in male, erect, entirely pale; pleura with little or no black pile (female unknown).......... *claripennis* James
4. Pleura predominantly black-pilose; mesonotum of male with abundant, erect, black pile; venter black-pilose (reddish-brown, in certain lights) on the basal segments..........................*lata* (Loew)
   Thorax entirely pale-pilose; pile of mesonotum, in both sexes, appressed; venter entirely pale-pilose...................*appressa* James
5. Pleura and face of female black-pilose (male unknown)............. *nigribarba* James, n. sp.
   Pleura of both sexes and face of female pale-pilose.........*rustica* (O. S.)
6. Style about one-third the length of the rest of the flagellum.............. 8
   Style at least three-fourths the length of the rest of the flagellum......... 7
7. Wings with first three posterior, discal, and apices of basal cells distinctly clouded..*subulata* (Loew)
   Wings slightly and uniformly infuscated.................*texana* James
8. Flagellum of antenna with basal segments reddish; pile of face entirely silvery...*argentata* (Will.)
   Flagellum of antenna entirely black; pile of face mixed black and white...*albopilosa* (Cresson)

THE LATA GROUP

Adoxomyia claripennis James

Adoxomyia claripennis James, 1935, Pan-Pac. Ent., 11:62.

Type, male, Mustang Mts., Ariz.; in the Snow Entomological Collection of the University of Kansas.

Distribution.—Arizona: Mustang Mts. (type). Chiricahua Mts., Ariz., 8,000-9,000 ft., July 3, 1927 (J. A. Kusche), 1 ♂.

Adoxomyia lata (Loew)

Clitellaria lata Loew, 1872, Berliner Ent. Zeit., 16: 55 (Century x, 9); Williston, 1885, Canad. Ent., 17: 127.

Euparyphus niger Bigot, 1879, Ann. Soc. Ent. France, (5) 9: 204 (new synonymy).

Euclitellaria lata (Loew) Kertész, 1923, Ann. Mus. Nat. Hungary, 20: 97.

Euclitellaria nigra (Bigot) Kertész, 1923, Ann. Mus. Nat. Hungary, 20: 97, 106.

Aochletus nigropilosus Cresson, 1919, Proc. Acad. Nat. Sci. Philadelphia, 71: 174 (new synonymy).

A relatively large species, usually 9 to 11 mm. in length, although some specimens may be as small as 6 mm. The antennal flagellum is usually bright red on its basal portion, though in some specimens, especially in males, it may be darkened. Pile of eyes brownish black. Pleura largely black-pilose; face and mesonotum of male also with erect black pile; female with dense erect and appressed pale pile on the head, which may be silvery around the antennae, and with dense, appressed, yellowish tomentum on the thorax, interrupted by three longitudinal bands of blackish tomentum. Scutellar spines strong, divergent, usually reddish or yellow, sometimes more or less blackish. Abdominal tomentum black dorsally, with lateral spots of yellowish tomentum, those on segment 4 connected posteriorly; segment 5 yellow-tomentose; venter blackish-tomentose basally, yellowish apically. Male genitalia small, yellow; the hypopygial lamellae mostly soft haired, but with several stiff black hairs externally.

Types of *lata*, 2 ♂ ♂, 1 ♀, California, in the Museum of Comparative Zoology; of *niger*, 1 ♂, Bigot Collection; of *nigropilosus*, 1 ♂, Academy of Natural Sciences of Philadelphia. The synonomy of *lata* and *nigropilosus* was determined through a study of the types. Bigot's description of *niger* is brief, but the redescription by Kertesz leaves little doubt as to the identity of the species.

Distribution.—At lower elevations of western California, Oregon, and Washington, from the region of Monterey Bay northward. WASHINGTON: recorded by Williston (1885). OREGON: Corvallis, recorded by Cole and Lovett. Corvallis, June 4, 1898 (Aldrich), 2 ♀ ♀, June 30, 1941 (C. R. Ferguson), 1 ♀, and June 11, 1925 (Van Dyke), 5 ♀ ♀, 4 ♂ ♂. CALIFORNIA: Pacific Grove, May 8, 1906 (Aldrich), 2 ♂ ♂; Bryson, Monterey County, May 20, 1920 (Van Dyke), 1 ♀; Bradley, Monterey County, May 17, 1920 (E. C. Van Duzee), 1 ♂; Santa Cruz Island, May 16, 1919 (Van Duzee), 1 ♂; Carrville, Trinity County, 2,400-2,500 ft., June 2, 1934 (Van Dyke), 1 ♀; Oakland, May 1, 1937 (E. S. Ross), 1 ♂; Paraiso Springs, June 10, 1932 (L. S. Slevin), 1 ♀; Sobre Vista, Sonoma County, April 30, 1911, 1 ♀; Pacific Grove, May 20-24, 1920, 1 ♀; Santa Cruz, April 20, 1934 (J. W. Tilden), 1 ♂; Putah Canyon, between Yolo and Solano Counties, May 2, 1936 (M. A. Cazier), 1 ♂; Livermore, Alameda County, May 12, 1940 (Cazier), 1 ♀; Santa Cruz, June, 1936 (Cazier), 1 ♀.

Adoxomyia appressa James

Adoxomyia appressa James, 1935, Pan-Pac. Ent., 11:63.

Contrary to the statement made in the original description, the antennal flagellum consists of six segments in addition to the two in the style, the sixth segment being visible only from the outer side. The membrane near the heavy veins is more or less clouded, and the basal cells and stigmatal region may be distinctly infuscated.

Holotype, male, from Cloudcroft, N. Mex., in the Snow Entomological Collection of the University of Kansas.

Distribution.—NEW MEXICO: Cloudcroft, type series. ARIZONA: Oak Creek Canyon, June 17, 1936 (G. P. Englehardt), 1 ♂.

Adoxomyia nigribarba James, new species

A robust species, related to *Adoxomyia lata*, but with entirely black antennae and black-pilose face and cheeks.

Female: Body, including appendages, black; front knees, extreme tips ventrally of tibiae and of middle and hind femora, scutellar spines, and apices of tarsal pads reddish yellow; labellae of proboscis and halteres yellow, bases of stalks of latter brown, Front at vertex fully one-third as wide as head, clothed with semiappressed yellow pile; yellow tomentum on vertex and postocular orbits rather dense; pile of face, cheeks, palpi, and eyes rather dense, black, reddish brown in certain lights; that of proboscis yellow. Mesonotum and scutellum yellow-tomentose, except for three longitudinal stripes of black tomentum, the middle one reaching from the anterior margin of the mesonotum to the apex of the scutellum, the lateral ones attaining neither the anterior margin nor the base of the scutellum, and broadly interrupted at the suture; pleura with crinkly hair and sternum with straight tomentum the same color as pile of face. Tarsi golden-pilose below; apical half of front tibiae with short yellow pile; legs otherwise with short black pile. Wings dusky hyaline, veins brown. Abdomen dorsally with erect yellow pile, with a little black pile intermixed, on sides of first segment, and with some black erect pile laterally at base of second segment; sides of second to fourth segments except extreme base, extreme apex of fourth segment, and fifth segment except extreme base yellow-tomentose, rest of abdomen dorsally black-tomentose; venter, except extreme apices of fourth and fifth segments, black-tomentose. Length 11 mm.

Holotype, female, Eagle Ridge, Klamath Lake, Oreg., June 5, 1924 (C. L. Fox). In the California Academy of Sciences.

From the single record this seems to be, like *rustica* and unlike the more closely related *lata*, a species of the higher elevations.

Adoxomyia rustica (Osten Sacken)

Clitellaria rustica Osten Sacken, 1877, Geol. & Geog. Survey, Bul. 3, no. 2, p. 213; Beutenmuller, 1904, Bul. Amer. Mus. Nat. Hist., 20: 87.

Euclitellaria rustica (Osten Sacken) Kertész, 1923, Ann. Mus. Nat. Hung., 23: 97.

Adoxomyia rustica (Osten Sacken) James, Pan-Pac. Ent., 11: 62.

Smaller than *Adoxomyia lata*, and much more extensively pale-pilose and tomentose. The major areas of black tomentum are on the middle half of the third abdominal segment and adjoining areas of the apex of the second and base of the fourth, and the three interrupted longitudinal bands on the mesonotum are similar to those described for *nigribarba*. The face of the male has black and pale pile intermixed; the eyes are black-pilose in both sexes. The mesonotum of the male has erect yellow pile in addition to the black and yellow or golden tomentum. The vestiture is otherwise yellow.

Of the type series (three males and six females, from The Geysers (Sonoma County), San Geronimo (Marin County), and Webber Lake (Sierra County), Calif.) two males and three females are in the Museum of Comparative Zoology, and one female is in the American Museum of Natural History.

Distribution.—WASHINGTON: Cle Elum and Ellenburg, recorded by James. Tampico, July 4, 1923 (A. Spuler), 1 ♀; Pullman, April 28, 1910 (H. E. Burke), 1 ♂, 1 ♀. OREGON: No locality, 1 ♀. CALIFORNIA: Angel Island, Marin County, May 1913 (J. C. Thompson), 1 ♀; Tejon Canyon, Kern County, May 12, 1937 (Van Dyke), 1 ♀; Fallen Leaf Lake, Lake Tahoe, July 14, 1915 (Van Dyke), 1 ♀; Gold Lake, Sierra County, July 12, 1921 (C. L. Fox), 1 ♀. IDAHO: Moscow (Aldrich), 1 ♂, 6 ♀ ♀; Kendrick, May 25, 1902 (Aldrich), 1 ♀; Juliaetta, May 3, 1901 (Aldrich), 1 ♂; Juliaetta (Aldrich), 1 ♀; Lake Waha, June 14, 1930, and July 22, 1927 (Aldrich), 2 ♀ ♀; Craig's Mountain (Aldrich), 1 ♀; Lawyer's Canyon, June 16, 1909 (Aldrich), 1 ♂; Sweetwater, June 5 and 17, 1930 (Aldrich) 1 ♀, 1 ♂; Lenore, May 7, 1938 (E. Ritzheimer), 1 ♂. MONTANA: Sweetwater Lakes, Glacier National Park, July 5, 1930 (Van Dyke), 1 ♀. WYOMING: Jenny Lake, Great Tetons, June 25, 1938 (Van Dyke), 1 ♀. UTAH: Mountain Home, Sept. 19, 1935 (F. C. Harmston), 1 ♀; Logan, May 28, 1938 (Harmston) and May, 1913, 2 ♂ ♂.

This species is apparently characteristic of the moderate elevations of the Sierras and northern Rockies; the only region where, according to my records, its range overlaps that of *lata* is in the San Francisco Bay area.

Adoxomyia argentata (Williston)

Clitellaria argentata Williston, 1885, Canad. Ent., 17: 127–8.

Euclitellaria argentata (Williston) Kertész, 1923, Ann. Mus. Nat. Hung., 20: 96.

Adoxomyia argentata (Williston) James, 1935, Pan-Pac. Ent., 11: 63.

Type, male, California, in the Snow Entomological Collection of the University of Kansas. Williston gave the type locality as "Arizona (Prof. Comstock)," but this does not agree with the information on the label.

Distribution.—CALIFORNIA: Type (no locality on label). ARIZONA: Tucson, June 21, 1924 (A. A. Nichol), 1 ♂.

Adoxomyia albopilosa (Cresson)

Aochletus albopilosus Cresson, 1919, Proc. Acad. Nat. Sci. Philadelphia, 71: 173.

Type, male, Alamogordo, N. Mex., in the Academy of Natural Sciences of Philadelphia.

THE SUBULATA GROUP

Adoxomyia subulata (Loew)

Clitellaria subulata Loew, 1865, Berliner Ent. Zeit., 9: 147 (Century vi, 29).

Adoxomyia subulata (Loew) Smith, 1910, Report N. J. State Mus. 1909, p. 737; James, 1935, Pan-Pac. Ent., 11:64.

Euclitellaria subulata (Loew) Kertész, 1923, Ann. Mus. Nat. Hung., 20: 97; Curran, 1934, North American Diptera, p. 142.

The only species known to occur on the Atlantic seaboard, readily distinguished from the other Nearctic species by the antennal structure coupled with the characteristic clouding of the wing. The male is well characterized in Loew's description, but the female has never been described.

Female.—Mainly black; thickened part of antennal flagellum, proboscis, first segment of palpi, apex of scutellum, scutellar spines, halteres, knees, extreme apices of tibiae, and tarsi yellow. All pile, pollen, and tomentum of head, including eyes, white; a pollinose area underlying the white tomentum above the eyes; above this the front with only sparse pile, except for a prominent tomentose area along each eye about half way to ocellar triangle. Thorax with three black, longitudinal, tomentose stripes, hardly interrupted at suture, the lateral ones not attaining either the anterior or posterior margins, the median one extending onto the scutellum; otherwise, including legs, wholly with white pile and tomentum. Third and fourth abdominal tergites black-tomentose, except prominent antero-lateral triangles on each segment and a prominent median triangle whose base occupies about the median half of the apex of segment 4 and whose apex extends a short distance onto segment 3; apical half of first sternite black-tomentose; abdomen otherwise with white pile and tomentum. Wing as in the male, that is, subhyaline, the area roughly between veins R_5 and M_3, and including the discal and extreme apices of the basal cells, infumated. All tomentum described as black appears reddish brown in certain lights. Length 6-8 mm. (The description of the female is based on all specimens at hand.)

Type, male, Virginia, in the Museum of Comparative Zoology.

Distribution.—NEW JERSEY: Recorded by Smith and Johnson. PENNSYLVANIA: Philadelphia, recorded by James; Philadelphia, July 8, 1892, 1 ♂. MARYLAND: Beltsville, June 26, 1917 (Greene), 1 ♀, and June 1918 (W. R. Walton), 1 ♀; Plummer's Island, July 4, 1907 (A.K. Fisher), 1 ♂, July 1, 1905 (Fisher), 1 ♀, and June 14, 1908 (McAtee), 1 ♂; Mt. Calvert, July 2, 1916 (J. Silver), 1 ♀. DISTRICT OF COLUMBIA: Rock Creek, June 12, 1917 (Townsend), 1 ♂, and July 18, 1934 (Bridwell), 1 ♀; Washington (M. L. Linell), 1 ♂ (Coquillett), 1 ♂, 1 ♀, and July 19, 1926 (Aldrich), 1 ♂. VIRGINIA: Falls Church, May 29 to June 25 (Greene), 4 ♂ ♂, 4 ♀ ♀, June 7, 1914 (Shannon), 1 ♂, and July 7, 1914 (W. Middleton), 1 ♂; Potomac Run, May 30, 1916 (McAtee), 4 ♀ ♀, 5 ♂ ♂; Chain Bridge, July 23, 1915 (Greene), 1 ♂, 1 ♀; Woodstock, June 1897 (F. C. Pratt), 1 ♂; Bluemont, June 20, 1912 (Greene), 1 ♀. NORTH CAROLINA: Raleigh, recorded by Brimley. INDIANA: Lafayette, recorded by James; Lafayette, June 1923 (Aldrich), 1 ♂. OHIO: No locality, June 17, 1901, 2 ♂ ♂. TENNESSEE: Gatlinburg, June 15, 1940 (E. C. O born), 1 ♀: Knoxville, spring of 1934, 1 ♀. TEXAS: Columbus, 1 ♀.

Adoxomyia texana James

Adoxomyia texana James, 1935, Pan-Pac. Ent., 11:63.

Very close to *subulata*, but the wings are uniformly light-clouded.

Holotype, from Brazos County, Tex., in the collection of the Texas Agricultural Experiment Station.

Distribution.—TEXAS: Brazos County, College Station, and Brownwood, in the type series. No locality or date (Belfrage), 1 ♀. ARKANSAS: Fayetteville, in the type series. OKLAHOMA: Flint and Wilburton, in the type series.

THE LARVA OF HOLOSTILPNA NITENS (LEC.) AND ITS RELATIONSHIPS (Coleoptera, Anthribidae)

BY W. H. ANDERSON

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

During the past winter numerous larvae of a small anthribid were found infesting *Hypoxylon atropunctatum* (Schw.) Cke., a fungus which was growing in the bark of dead black oaks. Subsequent rearing from pieces of the fungus produced adults which were determined by L. L. Buchanan as *Holostilpna nitens* (Lec.) The larva is remarkable in several structural details and has considerable systematic significance. For these reasons a short description has been prepared, together with remarks on the probable relationships of the species.

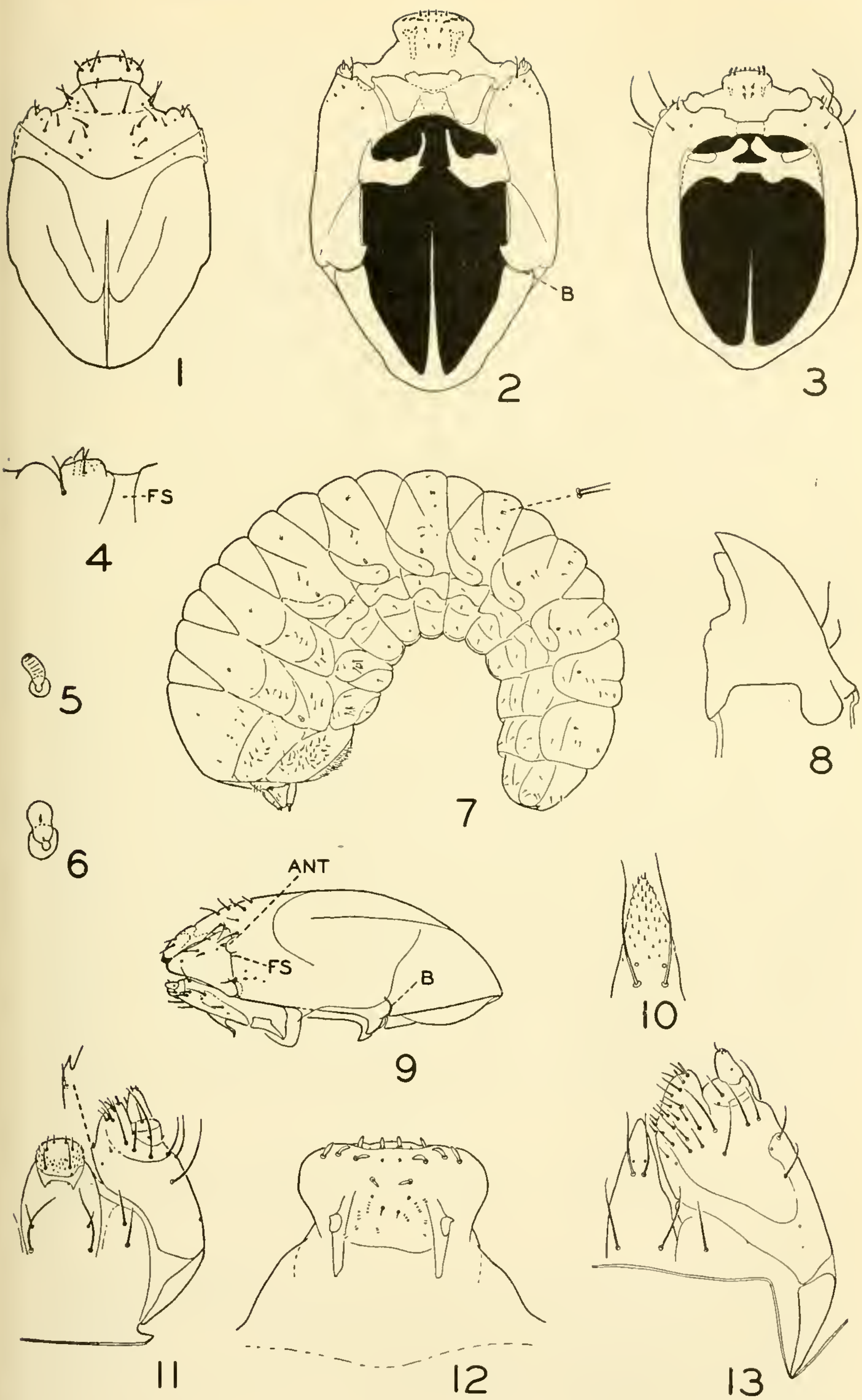
The material on which the following description is based is in the collection of the United States National Museum. Several larvae are mounted on micro cope slides, the remaining larvae are in alcohol. The larvae, as well as the reared adults, bear the data: ex *Hypoxylon atropunctatum*, University Park, Md., dates ranging between October 1942 and May 1943, Division of Insect Identification No. 38–42.

Mature larva (fig. 7), ranging between 1.8 and 2.9 mm. in length, moderately to strongly curved, subcircular in cross section, thicker through anterior segments, gradually tapering posteriorly. Legs absent. Setae few, inconspicuous. Spiracles (fig. 5) with subcircular peritreme, small, subcircular orifice, and single, weakly annulated air tube. Head (figs. 1, 2, and 9) deeply retracted into pronotum, distinctly longer (from posterior margin to base of clypeus) than broad, widest slightly behind the middle, abruptly tapering posteriorly. Lateral margins of foramen magnum interrupted three-fifths the distance from mandibular fossa to posterior margin of head, the interruption resembling an imperfect ball-and-socket joint (figs. 2 and 9, *B*). Hypopharyngeal bracon and hypopharyngeal sclerome well developed. Posterior tentorial arms not united in the middle line. Frontal suture (figs. 4 and 9, *FS*) complete in front, i. e., extending to basal membrane of mandible, absent posteriorly. Antenna (fig. 4) membranous, with conical accessory sensory appendage. Ocellus absent. Clypeus only indistinctly separated from epistoma. Labrum free, with two basal sensilla. Labral tormae present (fig. 12). Mandible (fig. 8) apically bifid, with poorly developed mola. Labium (figs. 10 and 13) undivided, acutely triangular in ventral view, without palpi. Maxillary mala (fig. 13) simple, without inner lobe. Distinct palpiger bearing mala and palpus absent. Palpus with two articles. Thoracic spiracle in mesothorax. Pedal area of prothorax

Explanation of Plate

(Figures drawn by author with the aid of a camera lucida)

Figure 1.—*Holostilpna nitens* (Lec.): Head, dorsal view, X 55.
Figure 2.—*Holostilpna nitens* (Lec.): Head (larger specimen), ventral view, X 55.
Figure 3.—*Bruchela lilii* (Fåhr.): Head, ventral view, X 35.
Figure 4.—*Holostilpna nitens* (Lec.): Right antenna, lateral view, X 240; *FS*, frontal suture.
Figure 5.—*Holostilpna nitens* (Lec.): Spiracle, second abdominal segment,X 240.
Figure 6.—*Bruchela lilii* (Fåhr.): Spiracle, second abdominal segment, X 240.
Figure 7.—*Holostilpna nitens* (Lec.): Larva, X 30.
Figure 8.—*Holostilpna nitens* (Lec.): Left mandible, ventral view, X 125.
Figure 9.—*Holostilpna nitens* (Lec.): Head, lateral view, X 55; *ANT*, antenna; *FS*, frontal suture.
Figure 10.—*Holostilpna nitens* (Lec.): Labium, distal half, ventral view, X 240.
Figure 11.—*Bruchela lilii* (Fåhr.): Labium and maxilla, X 70.
Figure 12.—*Holostilpna nitens* (Lec.): Epipharynx, X 240.
Figure 13.—*Holostilpna nitens* (Lec.): Labium and maxilla, X 125.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with numerous setae; of meso- and metathorax with few setae. Sternum of prothorax triangular, with numerous setae; of meso- and metathorax with a single seta on each side. Spiracles present on abdominal segments I to VIII, inclusive. Typical abdominal segments with two dorsal folds.

From the characters stated above it appears obvious that the larva of *Holostilpna* belongs in the series Anthriboidea (= Platystomoidea) of Böving and Craighead.[1] Probably some of the characters usually accepted as diagnostic of that group will be discarded or altered. The larva of *Holostilpna* differs from nearly all the formerly described larvae of the Anthribidae by the absence of a thornlike lacinia (see also *Phloeobius*[2]) and by the fusion of prementum and postmentum. In the past, too much emphasis has been placed on the presence of a strong hypopharyngeal sclerome whereas the presence of a hypopharyngeal bracon appears to be the essential feature (see also *Autotropis*, Gardner, l. c., 1936). Other characters by which the larva of *Holostilpna* differs from the hitherto known larvae of the Anthribidae, exclusive of *Bruchela* (= *Urodon*), are the absence of the labial palpi, the deeply retracted head, and the remarkable interruption of the margins of the foramen magnum.

The larva of *Holostilpna* has no close relatives among those of the North American Anthribidae which are known. However, two of the characters which separate it from other anthribid larvae, namely, the absence of the labial palpi and the deeply retracted head, are present also in the larva of *Bruchela*.[3] The hypopharyngeal sclerome is less strongly developed in the two species of *Bruchela* which are available although the hypopharyngeal bracon is complete (fig. 3). There is no apparent separation between prementum and postmentum in *B. rufipes* (Oliv.) and the lacinia is absent. The larva of *B. lilii* (Fåhr.), however (fig. 11) does have a small sclerite at the base of the indistinctly developed prementum and the lacinia is represented by a small spine on the mala. The larvae of *Bruchela*

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[1] Böving, Adam G., and Craighead, F. C. An Illustrated Synopsis of the Principal Larval Forms of the Order Coleoptera. Ent. Amer. (n. s.), v. 11, 1931.

[2] Gardner, J. C. M. Immature Stages of Indian Coleoptera (10) (Anthribidae). Indian Forest Records, v. 16, pt. 11, 1932. Immature Stages of Indian Coleoptera (19) (Anthribidae). Indian Forest Records (n. s.), v. 2, No. 2, August 5, 1936.

[3] The statement by Emden (Emden, Fritz van. On the Taxonomy of Rhynchophora Larvae (Coleoptera). Roy. Ent. Soc., London, Trans. 87 (1): 5, 1938) that the larva of *Bruchela* lacks a hypopharyngeal bracon may have been based on observations of specimens which were killed immediately before a molt in which the bracon might be weakened or broken. A well-developed bracon is present on the larva of each of the species of *Bruchela* I have examined, namely, *B. rufipes* (Oliv.), which was received from Dr. van Emden, and *B. lilii* (Fåhr.), from South Africa.

and *Holostilpna* possess the essential characters of the Anthriboidea but they disagree with the described larvae and agree between themselves in the absence of legs and in having all spiracles unicameral. They differ between themselves in the pigmentation of the head capsule, the degree of development of the hypopharyngeal sclerome, the presence of a distinct ocellus in *Bruchela*, the shape and structure of the head capsule, and in habitus. Moreover, *Holostilpna* lives in fungus whereas *Bruchela* develops in seeds.

Both Jordan [4] and Emden (l. c., pp. 5–6) have considered *Bruchela* as belonging in the Bruchidae, but the correctness of this assignment is questionable. The epipharynx of the adults of the Bruchidae is complicated, bearing a subrectangular sensory area near the apex, a short, asperate, projecting lobe near the middle, and elongate, subparallel, paired rows of minute ridges or striae toward the base. The epipharynx of the adults of the Anthribidae, and of *Bruchela*, however, is a relatively simple structure, usually bearing a number of setae and, posteriorly, a small sclerite. Asperities are present on the epipharynx of *Cimberis* [5] and of *Bruchela*, and some sensilla are present in the latter genus. The adults of the Bruchidae have a distinct, usually elongate, pigmented clypeus whereas in *Bruchela* and the Anthribidae the clypeus is very short and the epistomal suture is obsolete. The adults of the anthribids and of *Bruchela* have a strong hypopharyngeal bracon, as do their larvae, but the bruchids, in both adult and larval stages, lack the bracon. Furthermore, as Bridwell [6] has pointed out, the membranous flap, which is present on the mandibles of bruchid adults, is absent in *Bruchela* and the Anthribidae. The maxilla of bruchid larvae has a distinct palpiger which bears the mala and the palpus, and the antenna has two sclerotized articles. On the other hand, the maxilla of larval Anthriboidea, including *Bruchela*, lacks a distinct palpiger and the antenna consists of a membranous base with a conical or subconical accessory appendage. It seems rather clear, therefore, that *Bruchela* must be considered quite distinct from the Bruchidae and closely related to the Anthribidae and that in some respects, at least, it is connected to the latter through *Holostilpna*.

[4] Jordan, K. On the position of *Urodon*, a genus of Coleoptera. Ent. Soc., London, Proc., pp. xcviii–xcix, October 15, 1924.

[5] *Cimberis* Gozis = *Rhinomacer* F. See Bradley, J. Chester. Brooklyn Ent. Soc. Bul. 25 (5): 259–262, 1930.

[6] Bridwell, John Colburn. The Subfamilies of the Bruchidae (Coleoptera). Ent. Soc. Wash. Proc. 34 (6): 102, 1932.

A NEW SPIDER MITE FROM ARGENTINA

By E. A. McGregor, *Whittier, California*

A species of spinning mite has been intercepted by the port inspectors on shipments of pears from Argentina. This mite appears to be a species previously unknown, and its description follows:

Septanychus argentinus, new species

Female.—Body outline rather widely oval. Dorsal armature consisting of 26 conspicuous bristles, distributed about as usual; not arising from tubercles. A single perfect eye cornea on each side. Mandibular plate rounded anteriorly at maturity. "Thumb" of palpus shortened axially, greatest thickness about one-third more than length, bearing terminally a dome-shaped "finger" which is slightly thicker than long; the rather ample dorsal sensilla is nearly twice as long as the terminal "finger"; the other five hairs and digituli of the "thumb" about as usual. Legs rather long, especially first and last pairs. Relative lengths of joints of foreleg as follows: Coxa, 12; trochanter, 7; femur, 18; patella, 10; tibia, 13; tarsus, 20. Tip of tarsus (female) bearing a claw which is sharply bent at a point one-fifth distance from base to tip, at which point arises dorsally a straight spur and ventrally a stronger division which soon splits into six equal, slender, spine-like parts which much exceed in length the dorsal spur. The usual four tenent hairs arise from the onychium, a pair on each side of the claw base. The colla· trachea is U-shaped with the arms subequal.

Male.—Body smaller and narrower than that of female. Legs not so conspicuously long as usual. Penis with inner lobe rodlike; basilar lobe inconspicuous; shaft from two to three times as long as its basal thickness, bent upward and backward more than 90° from axis of main shaft, expanding terminally to form the prominent barb whose axial length slightly exceeds the length of the "hook" of the shaft; anterior portion of barb slightly acute-angled; posterior portion of barb bent strongly downward and acuminate, resembling the claw of a hammer. Tarsal claw of legs I and II differing from those of other two pairs of legs and from those of female; distal portion (corresponding to the main claw) rather straight and relatively weak, the proximal portion (analagous to the deflexed spurs in certain genera) much thicker at base and appearing to be split indistinctly into three segments.

Explanation of Plate

Septanychus argentinus

Fig. 1. Collar trachea, viewed laterally.

Figs. 2 and 3. Terminal portion of palpus (♀) with appendages; Fig. 3 viewed laterally, Fig. 2 viewed from slightly different angle.

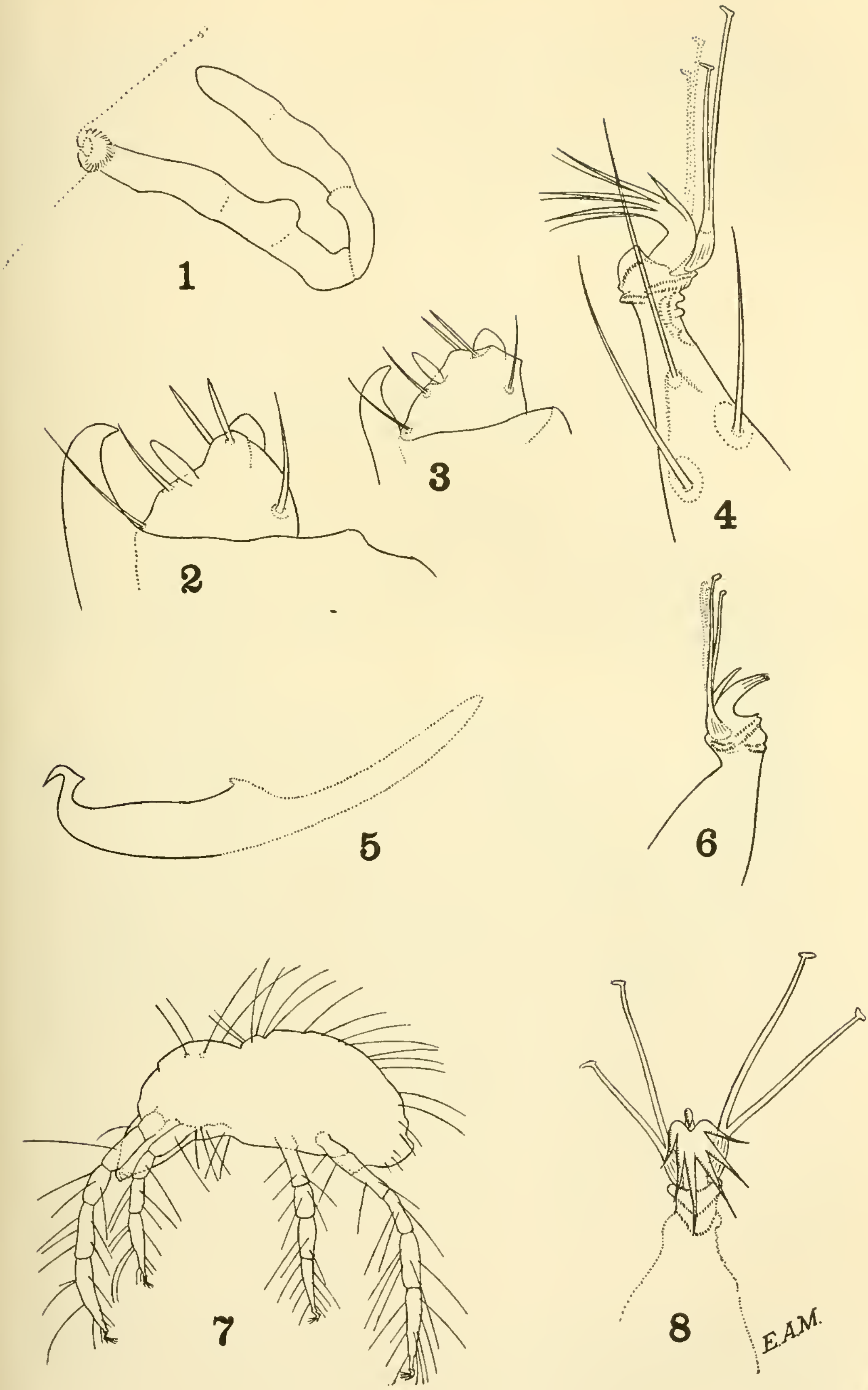
Fig. 4. Tip of tarsus of female, viewed laterally.

Fig. 5. Lateral view of penis.

Fig. 6. Tip of tarsus of leg I of male, viewed laterally.

Fig. 7. Lateral view of female mite (legs of right side not shown).

Fig. 8. Tip of tarsus of female, viewed terminally.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Type slide.—U. S. National Museum No. 1437.

The type material is from Argentina, intercepted at port of New York by E. C. Hodson, of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, March 3, 1938, from pear fruits. The species was also intercepted on the S. S. Southern Cross from Argentina on pear fruits, March 11, 1938, by L. J. McConnell, of the same agency.

A NEW ATANUS FROM ARGENTINA, SOUTH AMERICA (Homoptera-Cicadellidae)

By R. H. Beamer

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

The following species of leafhopper is suspected of being a vector of a sugar-beet virus disease in South America. Therefore the species is here described to make a name available in this connection.

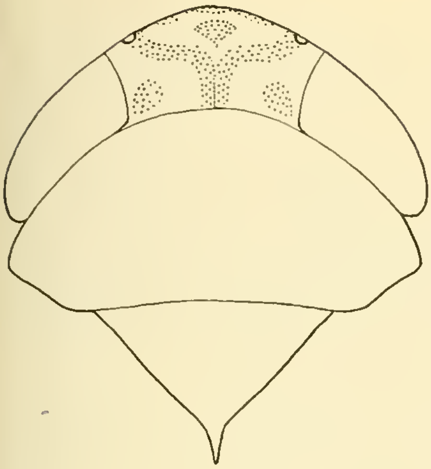
Atanus exitiosus, new species

Resembling in external appearance *Atanus dentatus* (Obs.) but usually somewhat smaller, not so definitely marked, and with the processes on the male aedeagus arising at the base of the shaft instead of near the apex. Length ♂, 3 mm.; ♀, 3.75 mm.

General color stramineous, often with the head, pronotum, and scutellum deep yellow. Some specimens typically marked as illustrated. Elytra semihyaline, veins darker with some indication of darker areas in some specimens.

Genitalia: Last ventral segment of the female about twice as long as the preceding, with the lateral angles broadly rounded to the strongly produced median third, often with a very slight indication of a median notch. Male valve triangular; plates slightly broader at base than valve, roundingly narrowed about basal third and tapering to long, sharp apices; styles broad on middle two-thirds, abruptly narrowed on outer fourth to about one-third middle width, apices truncate; aedeagus in dorsoventral view narrow with the sides almost parallel, in lateral view curved dorsally, widest at base, gradually narrowing to sharp apex, with a pair of processes arising near base of shaft on ventral margin, extending parallel with shaft to diverge slightly near their tips and end short of its apex.

Holotype ♂, allotype ♀, 10 ♂ ♂ and 28 ♀ ♀ paratypes from Rio Negro Valley, Argentina, January 21–22, 1941, C. W. Bennett. Swept from sugar beets. Types in the Collection of the United States National Museum, Cat. No. 56671.



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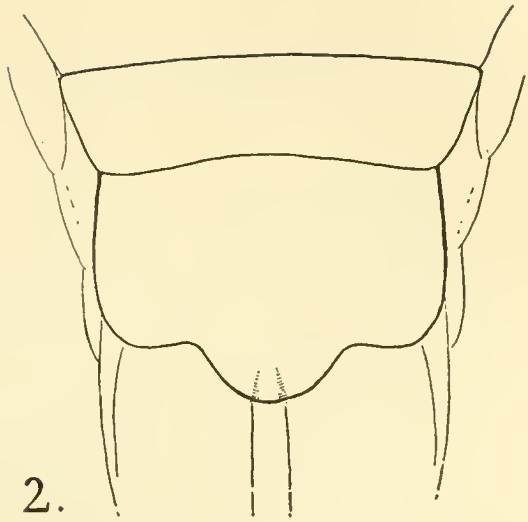

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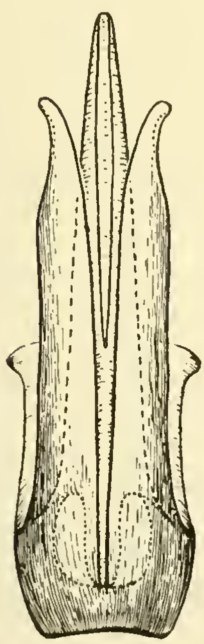

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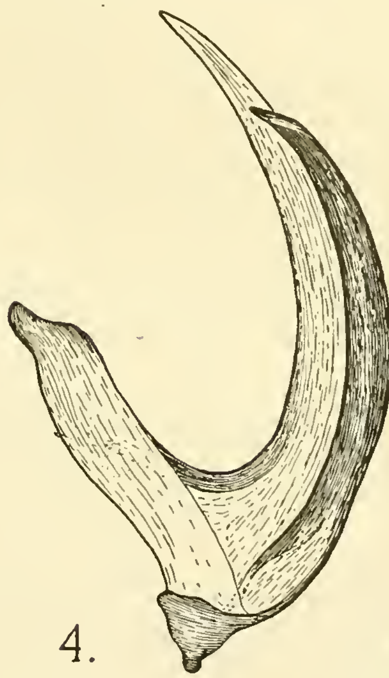

4.

Atanus exitiosus

Explanation of Figures of *Atanus exitiosus*, new species

1. Dorsal view of head, pronotum, and scutellum showing typical markings of some individuals.
2. Last ventral segment of female.
3. Dorsoventral view of aedeagus.
4. Lateral view of aedeagus.

VARIATIONS NOTED IN ANATOMICAL LARVAL STRUCTURES OF CULEX TARSALIS COQ. (Diptera: Culicidae)

By W. W. Yates,

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

In identifying large numbers of mosquitoes the writer has noted considerable variation in the anatomical structure of different specimens of the same species. When these variations occur in certain taxonomic characters used in separating closely allied species, considerable confusion and uncertainty in the determination usually result.

During the season of 1942, extensive collections of mosquito larvae were made in the Pacific Northwest, and a large number of these larvae proved to be *Culex tarsalis* Coq. Most of the collections came from Yakima and Walla Walla Counties, Washington, and the rest were made in the Willamette Valley in Oregon. As the larvae of this species were being examined it was observed that certain variations occurred rather frequently. Notes on such variations as were found in fourth instars are recorded herein. In this species the anal segment is ringed by a plate, and this ring is incomplete until the 4th stadium; this feature, therefore, was used as an indication of maturity.

The numbers of upper and lower head hairs on 160 larvae were counted, the results being as given in table 1.

Table 1.—*Numbers of upper and lower head hairs on 160 fourth instars of Culex tarsalis*

Character	*Number*	*Percent of total*	*Probable Occurrence*
Those with 5 upper and 4 lower hairs	102	63.77	1 in 1.57
Those with 6 upper and 5 lower hairs	18	11.24	1 in 8.9
Those with 5 upper and 5 lower hairs	13	8.13	1 in 12.3
Those with 6 upper and 4 lower hairs	10	6.24	1 in 16.0
Those with 5 upper and 3 lower hairs	6	3.75	1 in 26.7
Those with 4 upper and 4 lower hairs	5	3.12	1 in 32.0
Those with 4 upper and 3 lower hairs	2	1.25	1 in 80.0
Those with 6 upper and 3 lower hairs	1	0.625	1 in 160
Those with 7 upper and 3 lower hairs	1	0.625	1 in 160
Those with two sets of tufts differing	2	1.25	1 in 80

Dyar's description of the larva of *Culex tarsalis* reads, in part, as follows: "Air tube slender, uniform, about 4 times as long as wide, pecten on basal third, followed by five paired tufts, the basal one within the pecten, approximately posteriorly and irregularly inserted, none displaced, or subapical one moved laterally." The position of these tufts on the air tube is a taxonomic feature used to separate several species of *Culex*. Herewith are recorded observations on the basal position of these paired tufts on 180 specimens. For convenience, data on these larvae (table 2) are divided into five classes according to the position of the tufts on the air tube.

A number of larvae having paired tufts on the air tube in these five positions were reared to maturity and in all cases the adults proved to be *Culex tarsalis*.

Counts were also made of the number of pecten teeth on the air tubes of 70 *Culex tarsalis* larvae, but their accurate determination proved difficult because the flexing of the tube or folds in the cuticle where the air tube is attached to the abdomen very often hide the teeth. However, the number of pecten teeth ranged from 10 to 16, 35.8 percent appearing to have 12 teeth.

These observations indicate the wide variations that may occur in different specimens belonging to the same species. No. doubt such variations are bound to result in uncertainties in identification, particularly if the specimens are few in number and these happen to be off type. Too often taxonomic keys and insect descriptions are based on the examination of a limited number of specimens before the extent of the differences in anatomical structure has been fully determined.

TABLE 2.—*Position of tufts on air tubes of 180 larvae of Culex tarsalis*

Class	*Number of Cases*	*Percent Occurring*	*Probable Occurrence*
One pair of tufts within the pecten.	12	6.66	1 in 15
Proximal pair attached even with last pecten tooth.	50	27.78	1 in 3.6
Proximal pair spaced close to pecten but not even with it.	73	40.56	1 in 2.47
Proximal pair starting near center of air tube.	36	20.00	1 in 5
Proximal pair spaced considerable distance from pecten and beyond center of air tube.	9	5.00	1 in 20

CONSERVATION OF SCHOLARLY JOURNALS

The American Library Association created in 1941 the Committee on Aid to Libraries in War Areas, headed by John R. Russell, the Librarian of the University of Rochester. The Committee is faced with numerous serious problems and hopes that American scholars and scientists will be of considerable aid in the solution of one of these problems.

One of the most difficult tasks in library reconstruction after the first World War was that of completing foreign institutional sets of American scholarly, scientific, and technical periodicals. The attempt to avoid a duplication of that situation is now the concern of the Committee.

Many sets of journals will be broken by the financial inability of the institutions to renew subscriptions. As far as possible they will be completed from a stock of periodicals being purchased by the Committee. Many more will have been broken through mail difficulties and loss of shipments, while still other sets will have disappeared in the destruction of libraries. The size of the eventual demand is impossible to estimate, but requests received by the Committee already give evidence that it will be enormous.

With an imminent paper shortage attempts are being made to collect old periodicals for pulp. Fearing this possible reduction in the already limited supply of scholarly and scientific journals, the Committee hopes to enlist the cooperation of subscribers to this journal in preventing the sacrifice of this type of material to the pulp demand. It is scarcely necessary to mention the appreciation of foreign institutions and scholars for this activity.

Questions concerning the project or concerning the Committee's interest in particular periodicals should be directed to Dorothy J. Comins, Executive Assistant to the Committee on Aid to Libraries in War Areas, Library o Congress Annex, Study 251, Washington, 25, D. C.

Actual date of publication, October 27, 1943.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

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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.

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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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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 45 NOVEMBER, 1943 No. 8

PAUROPODA FROM THE DUKE FOREST

By J. H. STARLING,

Duke University, Durham, North Carolina

The writer collected organisms, periodically during the year 1941–42, from soil of the Duke Forest, with the aid of modified Berlese funnels. Such collections included 5 and possibly 6 species of pauropods which form the basis for this paper.

Pauropoda constitute a class of progoneate (Pocock 1893) and labiate (Snodgrass 1938) arthropods. They are distinguished from other "myriapods" by the presence of branched antennae, 11 post-cephalic somites, and 9 pairs of ambulatory legs in the adult, except those in the genus *Decapauropus* which have 12 trunk somites and 10 pairs of ambulatory legs.

Sir John Lubbock (1866) was the first to call attention to these remarkable animals and described 2 species from England. Packard (1870) extended the geographical range to North America when he "insufficiently" (Hansen 1902) described a species from Salem, Massachusetts. (Ryder (1879) proposed a new family and a new genus and described *Eurypauropus spinosus* from Fairmont Park, Philadelphia. Latzel (1880, 1884) divided the group into 2 families and added 4 species from Austria, one being the type for his new genus *Brachypauropus*. Tömösváry (1884) in Russia, Daday (1889) in Hungary, Silvestri (1895) in Italy, and Attems (1895) in Austria, all described species. Haase (1885) from Schleswig and Berlese from Italy redescribed Lubbock's species. Both Schmidt (1895) and Kenyon (1895) published anatomical and morphological papers. Cook (1895) "insufficiently" (Hansen, 1902) described several species from Indiana and Long Island. Two of his three proposed genera were accepted: *Stylopauropus* by Hansen (1902) and *Allopauropus* by Verhoeff (1934). The most outstanding work on the systematics of Pauropoda was that of Hansen (1902). In it he included characteristics of families and genera, along with the description and geographical distribution of 22 new European and South American species. In the same year Silvestri erected *Allopauropus*, *Hemipauropus*, and *Scleropauropus* for his new Italian species. Bagnall (1909, 1911, 1914, 1918) gave an account of the British Pauropoda. Harrison (1914) described a new species of *Eurypauropus* and

4 of *Pauropus* from New South Wales. Hilton (1928, 1930, 1930a, 1930b, 1931, 1931a, 1931b, 1933, 1934) published papers on American species found in Alaska, California, Oregon, Iowa, and New Mexico. Williams and Hefner (1928) reported *Eurypauropus spinosus* and *Pauropus huxleyi* from Ohio. Remy has done more with the group than any other since Hansen. His more important contributions included descriptions of: A new family (Polypauropodidae, 1932), 3 new genera (*Decapauropus*, 1931; *Polypauropus*, 1932; and *Gravieripus*, 1937b); at least 36 new European species (1930, 1931, 1933, 1933a, 1935, 1935a, 1935b, 1935c, 1935d, 1935e, 1936, 1936a, 1936b, 1936c, 1937, 1937a, 1937b, 1937c, 1938, 1940); 5 new variations (1932, 1935e); and an extension of Eurypauropodidae. Kishida (1928) proposed *Neopauropus* and Esaki (1934) *Thaumotopauropus* for their Japanese species. Other important publications are those of Attems (1930) and Verhoeff (1934). Verhoeff (1934) and Bagnall (1935) have extended the classification to show more clearly the relationship of the families and to take into account the newly described species.

The present paper embodies: (1) the description of 4 new species of pauropods from the Duke Forest; and (2) a check-list of species as reported from various parts of the world. The Duke Forest collection includes: *Brachypauropus pearsei* n. sp.; *Eurypauropus spinosus* Ryder, 1879; *Pauropus carolinensis* n. sp.; *Pauropus dukensis* n. sp.; *Pauropus causeyae* n. sp.; and a species of *Stylopauropus* for which I shall not propose a name since the single specimen is damaged to such an extent as to preclude a complete description.

As well as the writer is able to determine, there is no previous reference as to the occurrence of pauropods in the South-eastern United States, nor is there a report of the occurrence heretofore of a representative of *Brachypauropus* in North America.

Grateful acknowledgment is made to Dr. A. S. Pearse, who was very helpful to the writer during this study.

DESCRIPTION OF NEW SPECIES

Brachypauropus pearsei, new species

Material. Four immature (? sex) specimens. Color: White. Dimensions: Length of body, 0.52 mm.; greatest width of body, 0.19 mm.; greatest width of head, 0.07 mm.; median length of head, 0.05 mm.

Head. The head has 3 transverse rows of dorsal, curved, and pointed setae. The first row has 4, the two outer appearing somewhat shorter than the two median setae. The second and third row each have 6 setae, 4 median and 2 lateral. The eye areas are visible from the ventral view and are relatively small.

Antenna (fig. 1A). The peduncle consists of 3 segments. The upper branch is a little over twice as long as broad, and slightly longer than the two distal joints of the peduncle. The lower branch is as long as the upper branch. The width of the anterior margin of the former is at least twice as wide as that of the latter. The anterior flagellum is slightly shorter than the flagellum of the upper branch. The posterior flagellum is even shorter than the anterior one. The unringed basal portion of the longest flagellum is slightly longer than the

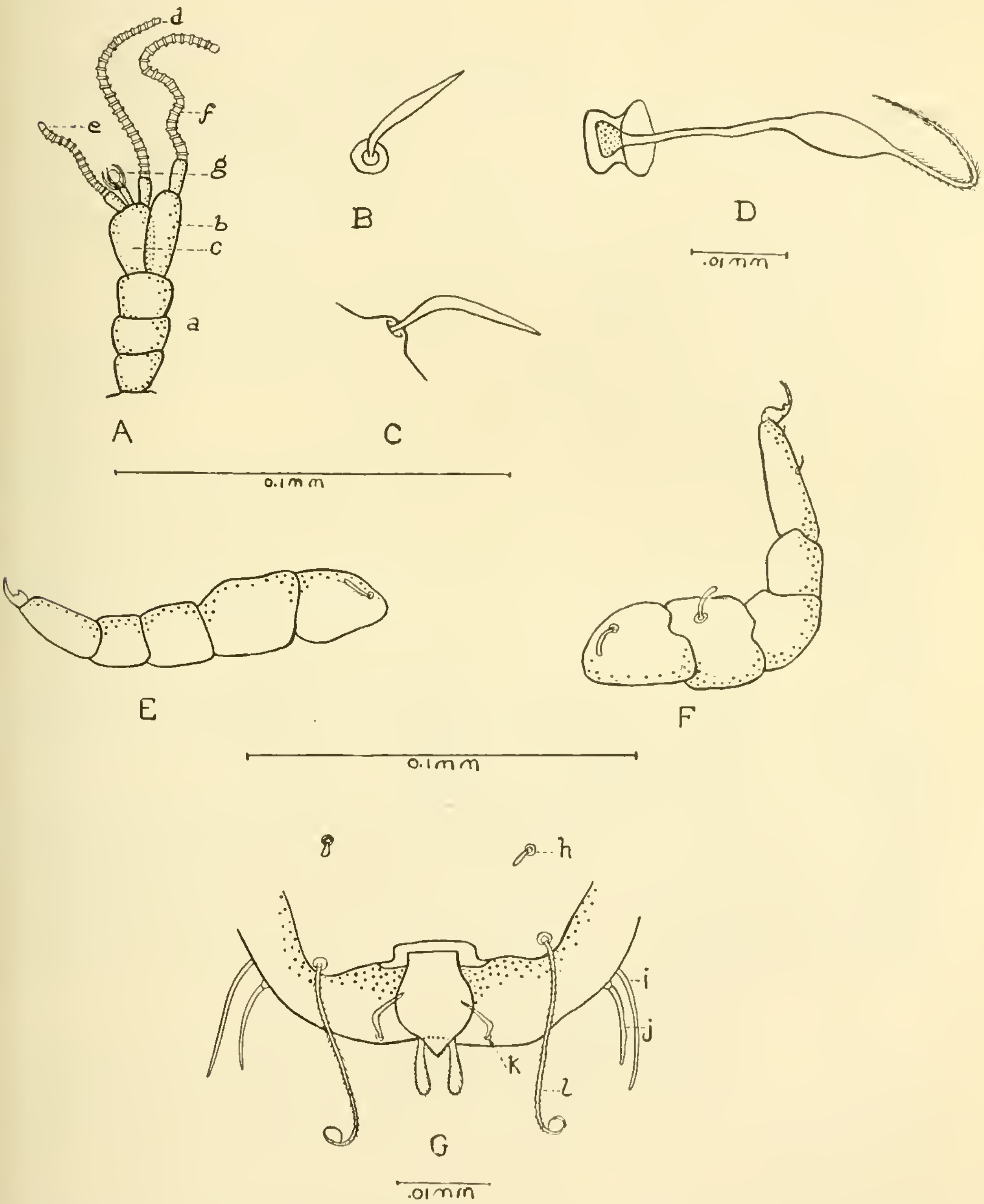

Fig. 1.—*Brachypauropus pearsei* n. sp. A. left antenna seen from above; B. dorsal seta; C. lateral seta; D. right third sensory seta; E. ventral view of the left leg of first pair, from specimen with six pairs of legs; F. ventral view of right leg of sixth pair; G. ventral view on anal region. a. peduncle; b. upper branch; c. lower branch; d. anterior flagellum; e. posterior flagellum; f. flagellum of upper branch; g. globulus; h. anterior seta on sternum of the anal segment; i. intermediate seta on the tergum; j. lateral seta on the tergum; k. stilus; l. posterior seta on the sternum of the anal segment.

breadth of the posterior margin of the lower branch and longer than the same part of the other two flagella. The globulus is nearly spherical and its stalk is slightly longer than its transverse diameter.

Trunk. The third instar seems to possess 5 terga; each except the last is subdivided into 2 pairs of highly chitinized and subequal plates. The setae of each tergite are arranged in 2 transverse rows on these plates; each row has 4 setae, exclusive of the lateral setae, except the first row of the first tergite which has 2 setae. The setae are curved and pointed (figs. 1B, 1C). The last tergite possesses only one highly chitinized plate with 2 pairs of setae; those of the more anterior pair are closer together. There are 4 pairs of tactile setae; the first pair is slightly longer than the second and the third, but approximately equal to the length of the fourth. The third pair is peculiar in that each has a hollow swelling, largest toward the middle of the seta; each is tapering and pubescent from this point distally (fig. 1D). The fourth pair of sensory setae are slender, tapering and more distinctly pubescent toward the distal third.

Legs. All the legs have 5 segments, and increase in length slightly from the anterior pair posteriorly. The segments of the last pair of legs are most robust, the trochanter is broader than long (figs. 1E, 1F).

Anal Segment (fig. 1G). On the tergum the submedian setae are very short and cylindrical and are situated near each other. The intermediate and lateral setae are approximately the same length, curved, tapering, and lie close together. On the sternum, the styli are curved, tapering, and are about half the length of the lateral setae. The posterior setae present a lyre effect with their distal ends rolled. The anterior setae are about one-sixth the length of the posterior setae.

Type.—Immature specimen with 6 pair of legs, collected from the Duke Forest under oak leaves, July 17, 1941, now in United States National Museum, No. 1433.

Remarks.—The distinctive features of this species are in the shape and size of styli, the single seta arrangement in each of the two first tergal plates, and the antennae. The anal region of *Brachypauropus pearsei* is similar to that of *B. superbus* Hansen, but differs in the character of the styli and the setae arrangement of the head.

Pauropus carolinensis, new species

Material. Four adult female specimens. Color: White. Dimensions: Length of body, 1.5 mm.; greatest width of body, 0.43 mm.; greatest width of head, 0.14 mm.

Head. The head has 4 transverse rows of dorsal, clavate, and pubescent setae. The first row contains 1 seta which projects forward; the second, 10, the two lateral setae on it are longer and smaller; the third, 5; and the last, 6. The eye areas are conspicuously large, as each occupies approximately three-fourths of the lateral edge of the head.

Antenna (fig. 2A). The length of the upper branch is greater than that of the lower branch and about equal to the combined length of the third and fourth segments of the peduncle. The width of the anterior margin of the lower branch is greater than its posterior margin and wider than the greatest width of the upper branch. The inferior flagellum is about half as long as the superior one, which is approximately the same length as the flagellum of the upper branch. The globulus is small, nearly spherical and almost sessile. The longest setae on the dorsal surface of the fourth joint of the peduncle is nearly

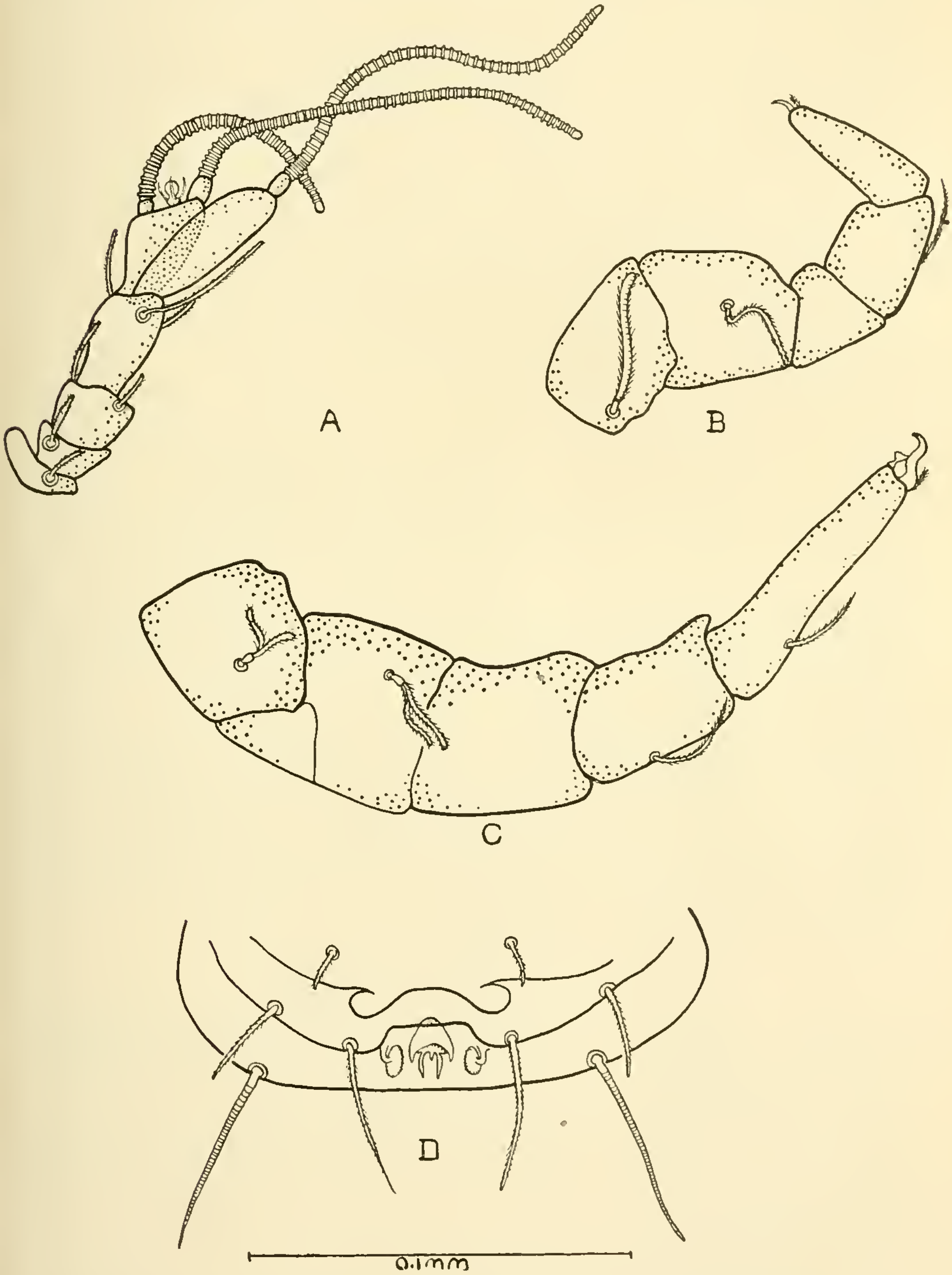

Fig. 2. *Pauropus carolinensis* n. sp. A. left antenna seen from above; B. ventral view of right leg of first pair of adult female; C. ventral view of right leg of ninth pair of adult female; D. ventral view of anal region.

as long as the upper branch. Each of the other segments of the peduncle bears 2 short setae.

Trunk. The trunk is robust. The first tergite has 2 rows of setae, similar in appearance to those of the head, with 4 in each row. The second tergite has 3 rows, 2 setae in the first, 6 in the second, and 4 in the third row. The third tergite has 2 rows with 4 and 6 setae, respectively in each row. The fourth tergite is similar to the third. The fifth bears 2 rows of setae, 6 in each row' The last tergite has 2 rows of 4 and 2 setae respectively. The tactile setae are all approximately the same length except the last pair which is longer. The pubescence of these sensory bristles is greatest towards their tapering apex.

Legs. The legs increase in length from the anterior pair posteriorly. Each leg of the first and the last pair has 5 segments. The coxa and trochanter of each of the first eight pairs of legs bear a simple, clavate, and pubescent seta (fig. 2B); while those of the last pair of legs are biramous (fig. 2C).

Anal Segment (fig. 2D). The submedian and intermediate setae of the tergum are approximately the same length, and each is about one half as long as the lateral setae. The setae are cylindrical, without pubescence, and tapering towards their distal ends. The styli are ovate and flat, as broad as long, and located on the ventral surface of the tergum, dorso-lateral to the anal plate. On the sternum, the anterior pair of setae are smaller in diameter and shorter in length than the posterior pair; both, however, are pubescent. The anal plate bears 2 sharp lateral spines between which are located 2 clavate, very slightly pubescent setae, and a small lobe between the setae.

Type.—An adult female, collected November 10, 1941, in the Duke Forest in oak and pine humus, now in the United States National Museum, No. 1434.

Remarks.—Instars with 3, 5, 6, 8 and 9 pairs of legs were collected from May–November, 1940 and 1941. Adults were collected throughout the year. The distinguishing characters are: Its size, the setae arrangement on the peduncle, and the anal region. The anal plate is similar to that of *Pauropus spinifer* Hansen, but the peculiar arrangement of the styli in *P. carolinensis* easily distinguishes it.

Pauropus causeyae, new species

Material. Three adult female specimens. Color: White. Dimensions. Length of body, 0.92 mm.; greatest width of body, 0.14 mm.; greatest length of head, 0.05 mm.; greatest width of head, 0.08 mm.

Head. The head bears 4 rows of clavate, pubescent setae. Progressing posteriorly each row consists of 4, 6, 4, and 9 setae, respectively. The ocular areas are large relative to the length of the head, and occupy about three-fifths of the lateral margins.

Antenna (fig. 3A). The two branches of the antenna are approximately the same length, the anterior margin of the lower branch being slightly wider than the same of the upper branch. The posterior flagellum of the globulus-bearing branch is about half the length of the anterior one. The latter is as long as the single flagellum. The unringed basal portion of the posterior and single flagella are rather long, about one-third the length of their respective branches. The same region of the anterior flagellum is only slightly shorter. The fourth segment of the peduncle is larger than the third and bears 2 setae; the more anterior is longer than the upper branch. A single setae is located on the mid-dorsal surface of the lower branch.

Trunk. The body is slender. The first tergite bears 2 rows of clavate and pubescent setae, 4 to each row; the second, 3 rows with 2, 4, and 4 to each row respectively; the third, 4 rows with 2, 3, 2, and 4 setae; the fourth, 3 rows with 4, 2, and 4 setae; the fifth, 3 rows with 4 in each row; and the sixth, 2 rows of 2 and 4 setae.

Legs. The legs increase in length posteriorly. The first and ninth pairs are with 5 segments. The remainder of the legs have 6 segments. The coxa and trochanter of each leg bears a simple setae (figs. 3B, 3C). The tibia and tarsus of the last pair of legs each bear a seta, a short distance from their proximal ends. That of the tibia is as long as the joint; that of the tarsus is half its length.

Anal Segment (fig. 3D). The lateral setae of the sternum are about half the length of those in the posterior pair. No anterior setae were observed. The intermediate setae of the tergum appear to be about the same length as the

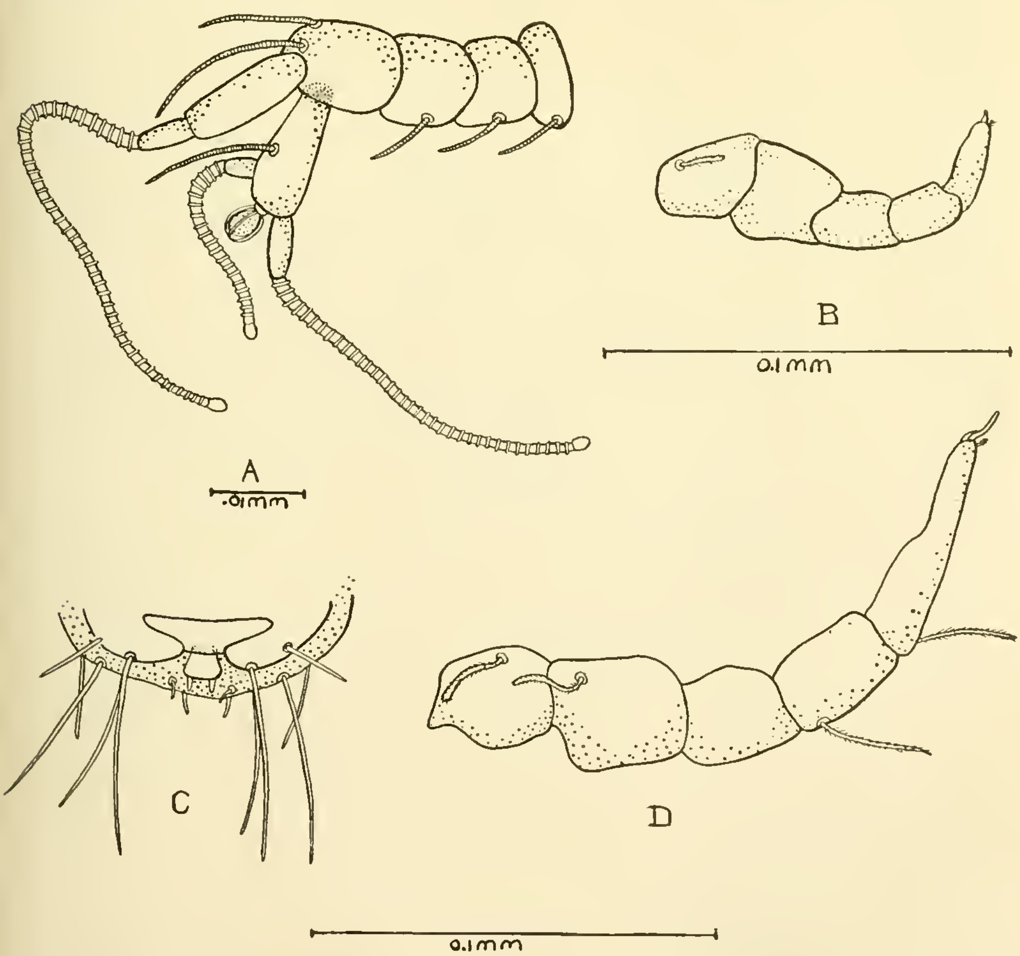

Fig. 3. *Pauropus causeyae* n. sp. A. left antenna seen from above; B. ventral view of right leg of first pair of adult fèmale; C. ventral view of anal region; D. ventral view of right leg of ninth pair of adult female.

posterior setae of the sternum. The anal plate is truncate at its base and oval at its distal edge, with two lobes projecting from the same.

Type.—Adult female, collected August 3, 1941, from the Duke Forest in oak and pine humus, now in the United States National Museum, No. 1435.

Remarks.—The species is distinguished from others described by the long unringed portions of the flagella, the setae arrangement on the lower branch and the fourth segment of the peduncle, and the anal region. The anal plate of this species and that of *Pauropus argentinensis* are similar, but the proportion and shape of the antennal branches of *Pauropus causeyae* easily distinguishes it.

Pauropus dukensis, new species

Material. Three adult specimens, one female and two male. Color: White; Dimensions: Length of body, 0.88 mm.; greatest width of body, 0.18 mm. greatest length of head, 0.10 mm.; greatest width of head, 0.11 mm.

Head. The head bears 4 rows of dorsal, slightly clavate more nearly cylindrical, long, and finely pubescent setae, with 1, 5, 4, and 6 setae respectively in each row.

Antenna (fig. 4A). On the antenna the fourth segment of the peduncle bears two dorsal and tapering setae which are as long as the lower branch. The upper branch is longer than the last three segments of the peduncle and about one-fourth longer and half as wide as the lower branch. The unringed basal portions of the flagella supported by the lower branch are only slightly shorter than the similar structure supported by the upper branch. The globulus is spherical and nearly sessile, with a diameter of about the same length as the basal portion of the anterior and posterior flagella.

Trunk. The setae of each tergite are arranged near the edges. Tergite one bears 2 rows of 4 setae; tergite 2, 3 rows with 2, 5, and 4 setae respectively; tergite 3, 3 rows with 4, 2, and 4 setae; tergite 5, 4 rows with 2, 4, 2, and 4 setae; and the last tergite, 3 rows of 2 setae. The last two pair of sensory bristles are rather heavily pubescent. Paired penes in the male are as shown in figure 4E.

Legs. The legs are all rather long, but increase in length posteriorly; the last pair are about one and one-half times as long as the first pair. The coxa and trochanter of each leg bear a seta; those on the last pair are biramous. Leg pairs one and nine are without a metatarsus. A rather long seta extends from the tarsus of the ninth leg, a shorter one from the tibia (Fig. 4C).

Anal Segment (fig. 4D). The submedian setae of the tergum are slightly longer than the intermediate setae, and the latter longer than the lateral. On the sternum the anterior setae are absent. The styli are short and setiform. The anal plate is truncate at its base, with a somewhat hexagonal plate structure having an indention on its distal side. Two rather short setae leave the prongs of the notch.

Type.—An adult male collected from the Duke Forest in oak humus, July 12, 1941, now in United States National Museum, No. 1436.

Remarks.—Like *Pauropus inornatus*, *P. dukensis* has unusually long antennal branches, but it is easily distinguished by the shape of its anal plate and arrangement of setae on its anal segment.

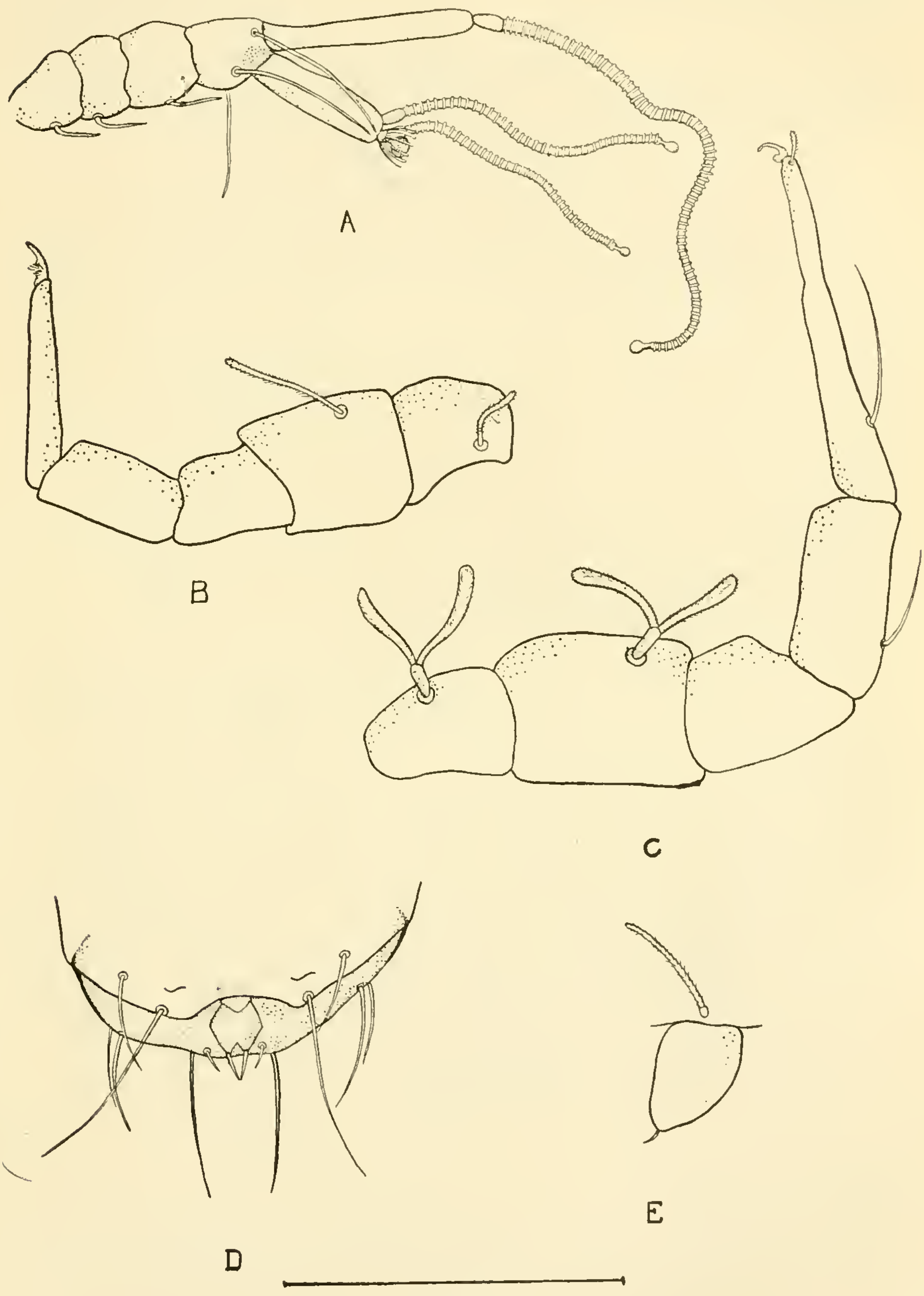

Fig. 4. *Pauropus dukensis* n. sp. A. right antenna seen from above; B. ventral view of left leg of first pair of adult male; C. ventral view of right leg of ninth pair of adult male; D. ventral view of anal region; E. left penis seen from the side.

Stylopauropus species

It is clear that a new species found in the Duke Forest belongs to the genus *Stylopauropus*, but insufficient material precludes a further description.

The stalk upon which the peduncle rests is greater than the diameter of the globulus itself (Fig. 5A). The setae on the coxa of the first and ninth pair of legs are peculiar and are shown in figures 5B 5C,.

LIST OF KNOWN PAUROPODA

The reported distribution of Pauropoda by countries is given in the following list. It is to be understood that the list is merely a compilation of the genera and species as they appear in the literature, and does not express opinions of the writer. Species which have been questioned as being valid are indicated in the following manner: a question mark before the name means that the whole reference is questionable; after the generic name, that the generic name is questionable; and after the species that the validity of the species has been questioned.

It appears that all the species of *Allopauropus* which were described before the genus was subdivided have not been reclassified relative to their respective subgenera.

Acopauropus ? Cook, 1896.

A. ornatus (Latzel, 1884). Cook, 1896—Austria, Germany.
Eurypauropus ornatus Latzel, 1884 (type).

Allopauropus ? Silvestri, 1902.

A. brevisetus Silvestri, 1902 (?type)—Italy.
A. barcinonensis Remy, 1933—France, Spain.
A. brolemanni Remy, 1935d—France.
A. corsicus Remy, 1940—France.
A. decaryi Remy, 1937—Madagascar.
A. gravieri Remy, 1935d—France.
A. hessei Remy, 1935c—France.
A. jeanneli Remy, 1935b—East Africa.
A. minutus Silvestri, 1902—Italy.
A. productus Silvestri, 1902—France, Greece, Italy.
A. ribauti Remy, 1937—Dalmatia.

Allopauropus (Allopauropus) Remy, 1936.

A. (*A.*) *aristatus* Remy, 1936c—France.
A. (*A.*) *danicus* (Hansen, 1902). Remy, 1936—Denmark, England, France, Greece, Great Britain, Italy.
Pauropus danicus Hansen, 1902.
A. danicus var. *rectistylus* Remy, 1938—Rumania.
A. (*A.*) *denisi* Remy, 1936b—France.

A. (*A.*) *distinctus* Remy, 1936 (Bagnall in litt.)—Germany, Great Britain.
A. (*A.*) *doryphorous* Remy, 1936b—Greece.
A. (*A.*) *furcula* Silvestri, 1902. Remy, 1936—Greece, Italy.
  A. furcula Silvestri, 1902.
A. (*A.*) *fuscinifer* Remy, 1936b—Rumania.
A. (*A.*) *gracilis* (Hansen, 1902). Remy, 1936—Denmark, England, France, Germany, Greece, Italy.
  Pauropus gracilis Hansen, 1902.
A. (*A.*) *helveticus* (Hansen, 1902). Remy, 1936—France.
  Pauropus helveticus Hansen, 1902.
A. (*A.*) *helveticus* var. *obtusicornis* Remy, 1935e—France.

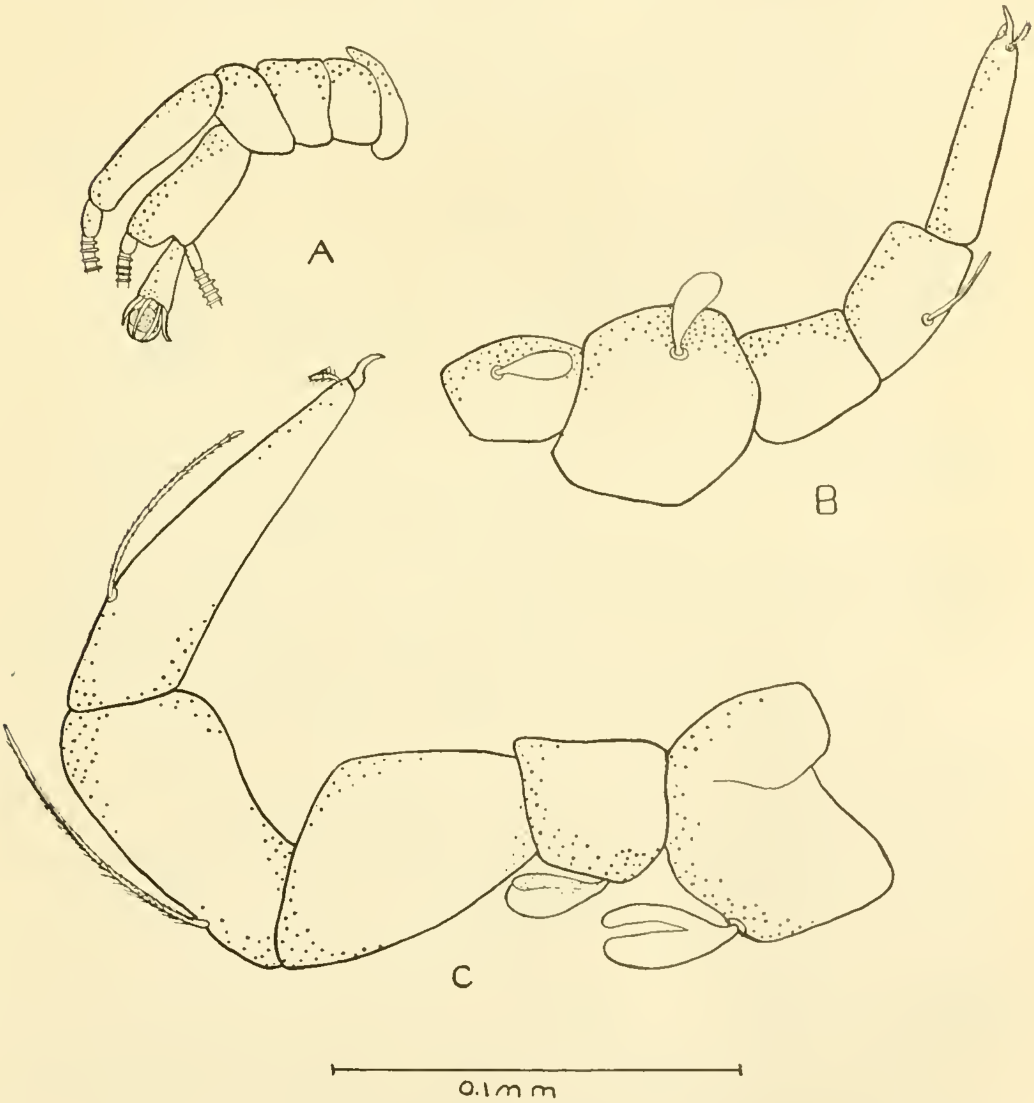

Fig. 5. *Stylopauropus* sp. A. left antenna seen from above; B. ventral view of right leg of first pair from adult female; C. side view of left leg of ninth pair from adult female.

A. (*A.*) *multiplex* Remy, 1936—Germany.
A. (*A.*) *sceptrifer* Remy, 1936b—France.
A. (*A.*) *subminutus* Remy, 1936b—France.
A. (*A.*) *thallossophilus* Remy, 1935a—France.
A. (*A.*) *vulgaris* (Hansen, 1902). Remy, 1936—Denmark, England, France, Germany, Greece, Italy, Jugoslavia.
Pauropus vulgaris Hansen, 1902.
A. (*A.*) *zerlingae* Remy, 1936a—France.

Allopauropus (Decapauropus) Remy, 1936.

A. (*D.*) *cuenoti* (Remy, 1931). Remy, 1937c—France.
Decapauropus cuenoti Remy, 1931 (type).
A. (*D.*) *amaudruti* Remy, 1936—Germany.
A. amaudruti var. *cordieri* Remy, 1938—Yugoslavia.
A. (*D.*) *helophorus* Remy, 1936b—Rumania.
A. (*D.*) *sabaudianus* Remy, 1936—France, Jugoslavia, Great Britain.
Decapauropus sabaudianus Remy, 1935.

Allopauropus (Thalassopauropus) Remy, 1936b.

A. (*T.*) *remyi* (Bagnall, 1935a). Remy, 1936b—England.
Thalassopauropus remyi Bagnall, 1935a.

Asphaeridiopus Bagnall, 1935.

A. ashrowthi Bagnall, 1935 (type)—Scotland.

Australopauropus Bagnall, 1935.

A. speciosus (Harrison, 1914) Bagnall, 1935—New South Wales.
Eurypauropus speciosus Harrison, 1914 (type).

Brachypauropus Latzel, 1884.

B. hamiger Latzel, 1884 (type)—Austria-Hungary.
B. lubbocki Bagnall, 1914—England.
B. superbus Hansen, 1902—Italy.
B. tuberosus Remy, 1936—Germany.

Eurypauropus Ryder, 1879.

E. spinosus Ryder, 1879a, b (type)—Indiana, Massachusetts, New York, Ohio, Pennsylvania.
E. consobrinus Remy, 1937b—France.
E. hastatus Attems, 1895—Austria.
E. okinoshimensis Esaki, 1934—Japan.

Gravieripus Remy, 1937b.

G. latzeli (Cook, 1896). Remy, 1937a—Austria, Germany, Italy.
Eurypauropus spinosus Latzel, 1884 (non *E. spinosus* Ryder) (type).
E. latzeli Cook, 1896.
E. hansenii Silvestri, 1902.
E. latzeli Hansen, 1902.
E. (*E.*) *latzelli* Verhoeff, 1934.

Hemipauropus Silvestri, 1902.

H. leptoproctus Berlese, 1902 (type)—Italy.

Neopauropus Kishida, 1928.

N. niwai Kishida, 1928 (type)—Japan.

Pauropus Lubbock, 1866.

P. huxleyi Lubbock, 1866 (type)—Austria, California, Denmark, England, France, Germany, Italy. Massachusetts, Pennsylvania, Russia.
? *P. lubbockii* Packard, 1870. Latzel, 1883.
P. huxleyi var. *filiformis* ? Latzel, 1884—Austria.
P. huxleyi var. *lanceolatus* Remy, 1937—Finland.
P. amicus Harrison, 1914—New South Wales.
P. arctus Hilton, 1931a—Alaska.
P. argentinensis Hansen, 1902—Argentina.
P. armatus Hansen, 1902—Siam.
P. australis Harrison, 1914—New South Wales.
P. bagnalli Remy, 1935e—France.
P. bollmani ? Cook, 1896—Indiana.
P. burrowesi Harrison, 1914—New South Wales.
P. californianus Hilton, 1930a—California.
P. caudaspinosus Hilton, 1930a—New York.
P. claviger Hansen, 1902—Siam.
P. dawydoffi Remy, 1933a—Indo-China.
P. elegantulus Hansen, 1902—Siam.
P. filiformis ? Cook, 1896—Austria.
P. furcifer Silvestri, 1902—France, Great Britain, Italy, Jugoslavia, Rumania.
P. globus Hilton, 1930a—California.
P. impar ? Cook, 1896—Long Island.
P. indigenous Hilton, 1930a—California.
P. inornatus Hansen, 1902—Paraguay.
P. intermedius Hansen, 1902—Chile.
P. laminus Hilton, 1930—California.
P. manus Hilton, 1933—New Mexico.
P. medianus Hilton, 1934a—Iowa.

P. medius Hilton, 1930a—California.
P. mexicanus Hilton, 1930a—Mexico.
P. modestus Hansen, 1902—Siam.
P. mortensenii Hansen, 1902—Siam.
P. nexus Hilton, 1933—New Mexico.
P. novaehollandiae Harrison, 1914—New South Wales.
P. oculatus Hansen, 1902—Siam.
P. pectinatus Hansen, 1902—Italy.
P. pinus Hilton, 1930a—California.
P. pygmaeus Hansen, 1902—Argentina.
P. quercus Hilton, 1930a—California.
P. robustus Hansen, 1902—Chile.
P. santus Hilton, 1930a—California.
P. siamensis Hansen, 1902—Siam.
P. simulans Hansen, 1902—Siam.
P. spectabilis Hansen, 1902—Chile.
P. spinifer Hansen, 1902—Siam.

Polypauropus Remy, 1932.

P. duboscqi Remy, 1932 (type)—France, Greece.
P. duboscqi var. *inflatisetus* Remy, 1938—France.
P. legeri Remy, 1940—France.

Remypus Verhoeff, 1934.

R. sequanus (Remy, 1930). Verhoeff, 1934—France, Greece.
Allopauropus sequanus Remy, 1930 (type).

Samarangopus Verhoeff, 1934.

? *Austrolopauropus* (Bagnall, 1935). Remy, 1937.
S. jacobsoni (Silvestri, 1930). Verhoeff, 1934—Java.
Eurypauropus jacobsoni Silvestri, 1930 (type).

Scleropauropus Silvestri, 1902.

S. hastifer Silvestri, 1902 (type)—Italy.
S. grassei Remy, 1936a—France.
S. hanseni Bagnall, 1935—England.
S. lyrifer Remy, 1936—Germany.
S. portitor Remy, 1935—France.

Sphaeropauropus Silvestri, 1930.

S. malayus Silvestri, 1930—Java.

Stylopauropus Cook, 1896.

S. pedunculatus (Lubbock, 1866). Cook, 1896 (type)—Austria, Denmark, England, France, Germany, Italy, Jugoslavia, Russia.

S. pedunculatus var. *brevicornis* Remy, 1936—France.
S. pedunculatus var. *brito* Remy, 1938—France.
S. alaskensis Hilton, 1931a—Alaska.
S. atomus ? Cook, 1896—Long Island (U. S. A.).
S. dawsoni Hilton, 1931a—Yukon Territory.
S. digitis Hilton, 1930a—California.
S. globus Hilton, 1931a—Alaska.
S. locatus Hilton, 1930a—Oregon.
S. pubescens Hansen, 1902—France, Germany, Great Britain, Italy, Rumania.
S. simplus Hilton, 1930a—Lower California.

Thaumatopauropus Esaki, 1934.

T. glomerans Esaki, 1934 (type)—Japan.

Trachypauropus ? Tömösváry, 1882.

T. glomeriodes Tömösváry, 1882 (type)—Austria-Hungary, Italy.
Eurypauropus cycliger Latzel, 1884.
E. (*Latzelipus*) *cycliger* Verhoeff, 1934.
E. poecillifer Silvestri, 1902.

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TWO NEW BUPRESTIDAE (Coleoptera)

By W. S. Fisher

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

In working over material received for identification during the past two years, the following new species of buprestid beetles were found.

Agrilus frisoni, new species

Male.—Rather robust, subcylindrical, feebly shining, uniformly brownish cupreous.

Head with front rather wide, subequal in width at top and bottom, with a broad, deep, longitudinal depression extending from occiput to clypeus; sides nearly parallel, vaguely, arcuately expanded at vertex; surface densely, finely granulose, irregularly rugose, densely clothed with long, recumbent, white hairs; clypeus wide between antennae, broadly, deeply, angularly emarginate in front; antenna extending slightly beyond anterior margin of pronotum, serrate from fifth segment, outer segments as wide as long.

Pronotum slightly wider than long, slightly wider at apex than at base, widest along apical half; sides nearly parallel from apical angles to middle, then feebly, obliquely narrowed to posterior angles, which are rectangular; marginal and submarginal carinae widely separated anteriorly, united near middle; anterior margin strongly sinuate, median lobe strongly produced and broadly rounded; base arcuately emarginate on each side, median lobe moderately produced, broadly subtruncate in front of scutellum; disk moderately convex, with a very broad, deep, median depression extending from base to near anterior margin, the depression much deeper at middle, a large, deep depression on each side extending from lateral margin to median third; prehumeral carinae strongly elevated, extending from near base to middle of pronotum; surface coarsely, closely, transversely rugose, finely, densely punctate between rugae, sparsely clothed in depressions with moderately long, recumbent, white hairs. Scutellum vaguely, transversely carinate, densely, finely granulose.

Elytra broadly, shallowly constricted in front of middle; tips separately narrowly rounded, obsoletely dentate; disk slightly flattened along sutural margins, which are slightly elevated posteriorly; basal depressions broad and deep; surface finely, densely imbricate-punctate, sparsely, uniformly clothed with short, recumbent, white hairs.

Abdomen broadly exposed above, strongly convex beneath; surface densely, finely granulose, sparsely, finely punctate, the punctures connected transversely by sinuate lines, which are coarser on basal sternite, sparsely, irregularly clothed with moderately long, recumbent, white hairs; first sternite broadly, vaguely, longitudinally concave at middle; last visible sternite broadly rounded at apex; vertical portions of first and second sternites more densely pubescent than ventral surface; pygidium not longitudinally carinate. Prosternum coarsely, densely rugose, coarsely punctate, rather densely clothed with long, erect, white hairs; prosternal lobe broad, strongly declivous, broadly, vaguely emarginate in front; prosternal process broad, slightly expanded behind coxal cavities, then converging to apex, which is acute. Tibiae slender, straight, anterior and middle pairs with a very small tooth on inner margin at apex. Posterior tarsi about three-fourths as long as tibiae, first segment as long as the following two segments united. Tarsal claws similar on all feet, cleft near middle, the inner tooth much shorter and broader than the outer one, and not turned inward.

Length 5.75 mm., width 1.5 mm.

Type locality.—Texas (no definite locality given).

Type.—In the United States National Museum, No. 56659.

Described from a single male, labeled simply "Texas," received from Theodore H. Frison.

This species runs to *Agrilus illectus* Fall in Fisher's key (U. S. Nat. Mus. Bul. 145, 1928, p. 15) but it differs from that species in having the pronotum deeply, longitudinally depressed at the middle. *A. frisoni* differs from all other known species of *Agrilus* found in North America in having the antenna serrate from the fifth segment and the pronotum very deeply, longitudinally depressed at the middle.

The male genitalia resemble those of *Agrilus impexus*, but they are more strongly expanded posteriorly, and the median lobe is broader, more subtruncate at the apex, with the median tooth more prominent.

Chrysobothris verdevallis, new species

Female.—Rather broadly elongate, moderately convex above, slightly shining, dark bluish green, with a distinct violaceous tinge on front of head and underside of body; antenna brownish cupreous except basal segment, which is bluish green.

Head flat in front with an irregular, transverse, arcuate, smooth space on vertex and a vague, narrow, longitudinal groove on occiput; surface coarsely, densely, uniformly punctate, sparsely clothed with short, semierect, white hairs; clypeus broadly, deeply, angularly emarginate in front, arcuately rounded on each side. Antenna distinctly narrowed to apex; intermediate segments compact, robust, nearly square, broadly subtruncate at outer margins; third segment distinctly longer than following two segments united.

Pronotum twice as wide as long, slightly narrower at apex than at base, widest near apex; sides vaguely converging from near apical angles to posterior angles, which are broadly rounded; anterior margin slightly sinuate, with a feeble, broadly rounded, median lobe; base broadly, arcuately emarginate on each side, median lobe slightly produced and broadly rounded; disk uniformly convex, without depressions or callosities; surface finely, densely granulose, feebly, transversely rugose, coarsely, densely, uniformly punctate. Scutellum black, triangular, finely, obsoletely granulose.

Elytra at base distinctly wider than pronotum, twice as long as wide; sides nearly parallel anteriorly, broadly, arcuately expanded behind middle, then arcuately converging to tips, which are separately broadly rounded; lateral margins coarsely serrate posteriorly; basal depressions broad and deep; humeral depressions not indicated; disk moderately convex, each elytron with a vague, median depression in front of middle and a similar depression near sutural margin at apical fourth; surface glabrous, coarsely, densely, uniformly punctate, feebly, transversely rugose basally, intervals obsoletely granulose.

Abdomen beneath coarsely, sparsely, irregularly punctate, smooth along anterior margins of sternites, sparsely clothed with short, inconspicuous, recumbent hairs, intervals densely granulose, without lateral callosities; last visible sternite shallowly, rectangularly emarginate at apex, with a strongly elevated, coarsely serrate, submarginal ridge, which is transversely truncate and coarsely serrate in front of apex; lateral margins not serrate; eighth tergite not visible. Prosternum coarsely, densely punctate, transversely rugose, with a few short, recumbent, white hairs; anterior margin rounded, with a short, broad, median lobe; prosternal process strongly, angularly expanded behind coxal cavities. Anterior femur with a short, broad, triangular tooth, which is coarsely dentate on outer margin. Anterior tibia strongly arcuate, unarmed; middle and posterior tibiae straight.

Length 6.5 mm., width 2.5 mm.

Type locality.—Verde Valley, Ariz.

Type.—In the United States National Museum, No. 56658.

Described from a single female collected at the type locality, June 25, 1924, by H. Brisley.

This species runs to *Chrysobothris smaragdula* Fall in Fisher's key (U. S. Dept. Agr. Misc. Pub. 470, 1942, p. 29) but it differs from that species in having the head flat on the vertex and occiput, the pronotum widest near the apical angles, and the last visible abdominal sternite shallowly, rectangularly emarginate at the apex, with the submarginal ridge coarsely serrate in front of the apical emargination.

BOOK REVIEW

Entomologia Agricola del Peru by J. E. Wille. Paper bound, 445 pp., 213 figs., Ministerio de Agr., Lima, Peru. 1943. ($5.00, U. S., prepaid. May be ordered from Estac. Exper. de La Molina, Apartado 2791, Lima, Peru.)

This work is a resume of the knowledge of agricultural entomology in Peru, which should prove of value to all those interested in the agriculture and entomology of the region. It is clearly written in Spanish, without many difficult idiomatic expressions so that the North American student with some knowledge of Spanish can read it easily. The work is well printed on a good grade of paper. A few minor typographical erros occur, some listed in a page of errata, but these do not detract seriously from the information presented. Numerous text figures are used; many are original, while some familiar illustrations are borrowed from North American entomology.

A brief preface and introduction sketch the history of entomological study in Peru and the agricultural situation as to insect importance. No general discussion is presented of structure and classification of insects. The bulk of the book is a series of chapters each listing insects of a class of crops in Peru. Cotton, sugarcane, cereals (corn, wheat and rice), tropical special crops (including tobacco), fruits, vegetables and flowers, and various other crops (including potatoes) are thus treated. A chapter on stored grain insects and one on methods of insect control follow these; then an extensive bibliography, glossary, and index.

In cases where many insects are listed for a crop, they are classified according to place and method of attack. For each pest is given something of its importance, distribution, appearance, habits, enemies, and methods of control. Both local and scientific names are given, as well as references to the bibliography. The status of the pest in Peru is well defined in each case.

F. M. WADLEY.

MINUTES OF THE 538TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON JUNE 3, 1943

The 538th regular meeting of the Society was held Thursday, June 3, 1943, at 8 P. M., in Room 43 of the National Museum. Vice President Annand presided and 24 members and 13 visitors were present. The minutes of the previous meeting were read and approved.

By a unanimous ballot the following were elected to membership in the Society:

Mr. R. G. Oakley, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Hoboken, N. J.

Dr. Max Day, Australian Scientific Mission, Washington, D. C.

Dr. Annand announced that word had been received, that morning, of the death of W. P. Flint, Entomologist, State of Illinois. The funeral was held June 5, 1943.

The first paper on the regular program was entitled Preliminary Life History Studies of *Ancylonycha mindanaona* (Brenske) in Guam, by R. G. Oakley, Bureau of Entomology and Plant Quarantine.

Mr. Oakley stated that in this preliminary study the adults of *Ancylonycha mindanaona* were found feeding on twenty-five species of trees and the larvae on the roots of approximately twelve plants. Newly hatched larvae feed upon humus for four or five months before moving to the roots of green plants. When soil conditions become unfavorable because of drought the larvae move downward to greater depths and rest. Pupation takes place in the soil. Upon emergence the adults begin to feed immediately. The life of the adults is apparently quite short. The maximum number of eggs dissected from specimens was thirty-five. Field studies showed that there are no grubs in savannah land, only a few in heavy soils whereas the lighter soils in the uplands have the highest concentration of grubs. (Secretary's abstract.)

Comments followed by Packard.

The second paper on the program was entitled Insect Taxonomy in China, by T. Y. Hsiao.

Dr. Hsiao presented a general picture of present day conditions in the study of taxonomic entomology in China. One of the hinderances to more rapid progress in insect taxonomy lies in the attitude of the younger students. They prefer to study economic entomology since more emphasis is placed on that phase of the subject. China is a large country and contains representatives of three faunas in its boundaries; palaearctic, oriental and indo-malayan. This makes a revision of any group of insects difficult. Furthermore all recognized descriptions of new species from China have been in languages other than Chinese, which is responsible for the scattering of references. The location of the types of the new species is as diverse as the literature, in fact the locations of some seem not to be recorded. Therefore the problem of studying the types is a very difficult one. The type localities present problems of their own, they may be so general, such as "China" as to give no information at all or they may be simply free spellings of the name of a small town, which name may apply to a town in any of several provinces. Dr. Hsiao made a number of suggestions which will aid the progress of insect taxonomy in China. He has suggested that each entomologist take up a group of insect, with the idea of revising it. He suggested further that the revisionary studies be confined in geographical area. In this way the problems will be simplified and progress easier. The difficulties encountered in the study of types, however, are not easily overcome. It is nearly impossible to travel over the whole world to see the types, and comparison by other, perhaps disinterested parties, is not satisfactory. While he is able to do so, Dr. Hsiao is making microfilm copies of many references. In this way it will be possible to gather a large library on a group of insects. (Secretary's abscract.)

Comment followed by Cushman.

The third paper, entitled Concerning a Mosquito Atlas and two serious Cases of Anophelophobia, by Lts. H. R. Roberts and E. S. Ross, was presented by Lt. Roberts.

The Mosquito Atlas, a new publication, is a series of loose-leaf sheets, each of which fully illustrates and treats a single species. It is being published by the American Entomological Society at Philadelphia, and Part I will contain "The Nearctic Anopheles, Important Malaria Vectors of the Americas, and Aedes aegypti, Culex quinquefasciatus," and Part II, "18 Old World Anopheles Important to Malaria." The authors planned this work while at the 8th Service Command Laboratory, Texas, and were transferred to Washington to carry it out at the U. S. National Museum. The Mosquito Atlas is a new departure from the usual systematic treatment of species, and may prove to be a useful method of treating other groups of insects. Primary emphasis is placed on illustrations to avoid long, technical descriptions. The same structure, whether important or not, for every species is illustrated to facilitate comparisons. The drawings of the adult are presented on one side of the page and those of the larva on the reverse side. The identification (salient features); habits; habitat (of larva); distribution; type locality; source of illustrated specimens; and importance to malaria are presented below the drawings in a condensed and concise form. It is so planned that each species is treated on a single sheet. The main edition is printed on ledger paper and suitable holes punches on the inner edge of the page for a notebook. By this means it is possible to break up each published part into a series of sheets, which will enable the user to arrange them for his own convenience, and to interpolate species from parts printed at a later date. This also allows the more important species to be treated first and additions and changes can be made later. It is hoped that in time that all species of *Anopheles* can be treated in this manner.

The systematics of the genus *Anopheles* was briefly discussed. The recognition by scientific name of fine divisions ("varieties") of a species presented a difficult problem to those concerned with identification. The need for an arbitrary and practical limit for the naming of such subdivisions was suggested. (Abstract by speaker, Lt. Roberts).

Professor J C. Bradley was present at the meeting as a visitor.

Adjournment at 9:55 P. M.

W. H. Anderson,
Recording Secretary.

Actual date of publication, November 25, 1943.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions	$3.00
To members of the Society	$2.40

A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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

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

F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
Washington, D. C.

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VOL. 45 December, 1943 No. 9

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 25, 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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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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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 45 DECEMBER, 1943 No. 9

THE GENERIC POSITION OF HYPOLAMPSIS PILOSA (ILLIGER) AND SOME RELATED NEW SPECIES (Coleoptera: Halticidae)

By Doris H. Blake

Clark states in the introduction to his Catalogue of Halticidae that the only genus included in the Catalogue that "presented serious difficulties is the genus *Hypolampsis*," and that "it contains within it at least three slightly but distinctly different forms." In a footnote he adds, "*H. pilosa* Ill. also represents another (N.A.) modification of form." At the end of his detailed description of the genus he writes that it is a "very difficult group . . . after many weeks of careful microscopic investigation I have ventured to bring all the species together under a single genus. It will have been obvious from the preceding generic diagnosis that there is very much dissimilarity in general form among the species included. . . I am unable to satisfy my own mind as to the exact limits of any subdivision." However he thought it "better to unite for the present at least all together under one single genus, leaving the task of suggesting subdivisions to future students who shall have the advantage of a larger amount of materials."

Haltica pilosa was described from a specimen collected by Melsheimer in Pennsylvania with Illiger's[1] usual full careful detail so that one can be reasonably certain which of several closely related species he had before him. Olivier[2] a year later described *Altica rugosa* from Carolina from Bosc's collection. With the help of the illustration this species, too, is fairly recognizable, and is probably the same as Illiger's. In 1844 Ziegler[3] described *Oedionychis hispida* from Pennsylvania. His type specimen preserved in the Museum of Comparative Zoology in the LeConte collection matches the description of *Haltica pilosa* Illiger. In 1860, Clark[4] described and assigned to his genus *Hypolampsis* a specimen from Chevrolat's collection from Pennsylvania which was identified, "auct. Chevrolat", as Illiger's species, *H. pilosa*. In 1873 Crotch,[5] comparing Illiger's

[1] Illiger, Mag. f. Insect., 6:105, 1807.
[2] Olivier, Ent., 6:707, 1808.
[3] Ziegler, Proc. Acad. Nat. Sci. Phila. 2: 46, 47, 266, 272, 1844.
[4] Clark, Catalogue of Halticidae, p. 258, 1860.
[5] Crotch, Proc. Acad. Nat. Sci. Phila. 25: 57, 1873.

and Clark's descriptions, decided that Clark's beetle was "evidently very distinct" and named it *Hypolampsis clarkii.*

On the basis of the two descriptions, the differences between Illiger's and Clark's species may be summed up thus: (1) in length, Illiger gives 1¾ lines, Clark, 1 line; (2) in shape, Illiger describes the elytra as elongate, Clark, as broad, globose; (3) in Illiger, between the eyes are two flattish protuberances; in Clark, the space between the eyes is without fovea or depressions; (4) in Illiger, the antennae are yellow brown with black apical joints; in Clark, entirely flavous; (5) in Illiger, the surface of the thorax is uneven; in Clark, "equate."

Therefore it may be deduced that Clark did not have Illiger's species before him when he referred it to the genus *Hypolampsis*. Clark described his beetle as being without any antemedial depression on the elytra and having the elytral punctures entirely concealed by thick flavous pubescence. These last points do not apply to any of the species considered in the present paper. All of them are marked by a distinct depression below the basal callosity near the suture, and in all of them, the elytral striae show distinctly through the pubescence. Going a step farther, one may say that Illiger's species may very well not belong at all to the genus *Hypolampsis* as conceived by Clark, and that none of the species in the closely related group treated in this paper belongs to *Hypolampsis* either. In fact Jacoby has described as *Omotyphus suturalis* a species very near to *pilosa* from western Mexico. What the beetle is that Clark described is not apparent. The description does not fit any North American one known to me. Possibly it is from some other locality.

Even if the species which Clark presumed was correctly identified as *pilosa* were Illiger's species or one closely related to it, I do not believe it is well to keep it in the genus *Hypolampsis*. Of the 36 other species that Clark described and included under this name, 1 comes from Chile, 30 from Brazil, 1 from Surinam, 2 from the Island of St. Paul, and 2 from Bogota. Since Clark, Jacoby has described 1 from Mexico, 1 from the West Indies (assigned to the genus *Hadropoda* by Blake[6]); Crotch has described 1 from Kansas; Weise 1 from Brazil; Kirsch 1 from Ecuador. Since all but three of the species hitherto referred to *Hypolampsis*, one of which is the probably wrongly identified *pilosa*, are South American species, it seems to be best to regard one of the latter as being representative of the genus. Therefore in order to limit the genus which Clark himself has confessed is made up of several "forms," I hereby designate *H. balii* Clark as type of the genus *Hypolampsis*. This is the second one described by Clark under that genus. The first, a large

[6] Blake, Bull. Mus. Comp. Zool., 92 (8):413, 1943.

species from Chile, is not chosen because Clark described it as being somewhat different in characters from the rest. For the North American species which have hitherto gone under the name of *Hypolampsis pilosa* a new generic name is proposed, **Distigmoptera,** from δις two, στίμα a mark, πτερόν wing.

Hypolampsis mellyi Cr. is a very rare species of which I have seen only one specimen, the type. It is not closely related to *Distigmoptera.* Probably it is the northern representative of a Central American genus. Until these groups can be studied as a whole, I think it best to leave it in its present genus. The situation is the same in regard to the monotypic genus *Pseudolampsis* Horn, containing only the single species, *guttata*, described by LeConte from Louisiana. It too is extremely rare in collections, and is possibly a subtropical beetle belonging to a group found more commonly in the tropics. Drawings of the two types have been included in this paper in order to enable the student to recognize these two rare beetles. Both these species differ from *Distigmoptera* in lacking the elytral pits and are not very closely related.

The species described in this paper form a closely related natural group, which may be roughly divided into two subgroups according to size, the larger and the smaller species. The small species, of which there are undoubtedly many, are poorly represented in collections, more so than the large ones. I have described one very distinct species from one specimen collected by E. A. Schwarz in Washington, D. C. Of each of the new species described from Costa Rica there is only the type specimen, and the same is true of a well marked species from Arizona. Much more material is needed for study. I believe there are more species represented among the few specimens that I have been able to study, but I am unwilling to describe them on the basis of so few specimens. Nothing whatever is known of their life histories or their host plants.

Description of the Genus Distigmoptera

From 2–5 mm. in length, oblong oval, varying from yellow brown to deep brownish or black, conspicuously pubescent, the hairs often in part erectish; antennae not more than half the length of the body, with the 5 outer joints thickened; head and thorax coarsely punctate, the latter uneven; elytra wider than thorax, coarsely striate-punctate, a depression running obliquely from within the humerus to a more or less pronounced depressed spot on each elytron near the suture before the middle; hind femora thickened, hind claws swollen, anterior coxal cavities closed.

Head moderately elongate, not much produced in front, but usually with distinct frontal tubercles separated by a deep groove, coarsely and densely punctate and pubescent. Antennae usually not extending much below the humeri; joints 3-6 slenderer than the rest, 7-11 thickened, in some species nearly or quite as wide as long. Prothorax quadrate, in most species somewhat wider than long and a little wider than head, with straight sides and distinct margin, at each corner a seta-bearing nodule, the basal margin rather straight, not sinuate. Disc uneven, in the larger species usually with more or less of an antemedian elevation, in some species like a crown, with a central depression, also depressed on the sides and below the frontal elevations; surface coarsely and densely punctate and usually but not always with erectish hairs. Scutellum triangular and covered with dense appressed pubescence. Elytra much wider than prothorax with well rounded, rather prominent humeri and an intrahumeral depression extending down below the basal callosities, which are well marked in most species, to a distinct depressed spot near the suture, this sutural depression on each elytron present in all the species, particularly marked in the southern, more tropical ones. Punctation in striae varying in coarseness, sometimes the interval between the striae wider than the punctures, in other species the punctures almost square and contingent. The pubescence also variable, usually consisting of shorter and more appressed hairs mingled with less dense and erectish hairs, these latter darker than the grayish or brownish appressed pubescence, in no case entirely concealing the punctation below. Body beneath shining, usually paler or reddish brown with finer, closely appressed hairs, the back of the thickened hind femora with pubescence as dense and coarse as on the elytra; the surface of the prosternum as densely punctate as the disc of the prothorax; the coxae rather widely separate, the anterior ones closed. Legs moderately short and stout; hind tibia with a suggestion of grooving and at the end dilated to form a socket for the tarsus, this socket fringed with tiny comb-like teeth and at the end a short spur; claws in male each with a well developed tooth at base, in female only shortly appendiculate.

Type of genus: *Distigmoptera apicalis*, new species.

Key to the Species

1. Large, 3–5 mm. in length.................................... 2
   Smaller, 2–2.8 mm. in length.................................. 5
2. Antenna with apical joint or distal joints pâle.................... 3
   Antenna with distal joints dark.................................... 4
3. Elytra with pronounced intrahumeral depression extending from humeri down below the basal callosities. (Brownsville, Texas).. *texana* n. sp.
   Elytra with only slight trace of intrahumeral depression. (Ontario to Texas).......................................*apicalis* n. sp.
4. From 3.5–4.7 mm. long (eastern and coastal region from Quebec to Texas).......................................*pilosa* (Illiger)
   From 3.2–3.6 mm. long (Indiana, Iowa, Kansas, Michigan)........ *mesochorea* n. sp.
5. Five distal joints of antenna wider than long...........*schwarzi* n. sp.
   Distal joints not wider than long.................................. 6
6. Last 2 distal joints paler than preceding ones (Costa Rica)............. 7
   Last 2 distal joints not paler than preceding.......................... 8
7. Elytral hairs long, erectish, with no shorter appressed pubescence; elytral punctation large, contingent near base..........*capillosa* n. sp.

Elytral hairs short and appressed; elytral punctation not contingent but the punctures well separated.....................*brevihirta* n. sp.

8. Fifth and sixth antennal joints pale, remainder dark. (Mexico).... *suturalis* (Jacoby)

All the proximal joints pale.. 9

9. Elytra with a slight transverse ridging behind the basal callosities. (Arizona).......................................*falli* n. sp.

Elytra with no trace of transverse ridging. (Eastern and northern, from New Brunswick to Montana)...............................10

10. Males either wingless or with wings reduced. (Isle au Haut, Maine, Mass.).......................................*impennata* n. sp.

Wings fully developed in both sexes. (New Brunswick to the Rocky Mountains)....................................*borealis* n. sp.

Distigmoptera pilosa (Illiger)

(Plate 1, Fig. 1.)

Haltica pilosa Illiger, Mag. f. Insect., 6:105, 1807.

From 3.5–4.7 mm. long, deep brownish or blackish with paler legs, densely covered with grayish, brownish, and often along the suture with golden or coppery pubescence; antennae paler brown with the last 4 or 5 joints dark; prothorax uneven with antemedian prominences; each elytron with a depression near the suture before the middle.

Head with interocular space usually a little less than half its width, densely and coarsely punctate, without occipital protuberances, frontal tubercles well marked with a depression between but not much swollen. Antennae extending a little below the humeri, the last 4 or 5 joints darker than the basal ones, apical joint never pale, the last 5 joints much thickened. Prothorax scarcely any wider than long, with straight sides; a seta-bearing nodule at each corner; very densely and often confluently and coarsely punctate; surface uneven, with two moderately developed tubercles before the middle and between and below them a less prominent elevation, producing in the centre a small depression; on the sides smaller ridges; lightly pubescent. Elytra densely pubescent, the pubescence consisting of closely appressed hairs, some coppery or golden, especially along the suture at base, others grayish, forming a wavy pattern more apparent in apical half, and less dense, long, erectish hairs; a slightly marked intrahumeral depression running obliquely to a more marked depressed spot near the suture; at the base near the scutellum a slight tendency to ridging, the striate punctation deep and coarse, especially in basal half, and quite visible through the pubescence. The thickened hind femora on back covered with a pubescence similar to that on the elytra. Anterior legs and undersurface of the hind femora, tibiae and tarsi usually paler.

Type from Pennsylvania, collected by Melsheimer.

Distribution: Quebec (Joliette); Ontario (Blackburn); Massachusetts (Brookline, Dover, Framingham, Wayland); New York (Rockaway Beach); Pennsylvania; Washington, D. C.; Virginia (Barcroft, Falls Church, Ft. Monroe, Virginia Beach);

Kentucky (Louisville); Florida (Crescent City, Dunedin, St. Petersburg); Texas.

Remarks: This is probably the species described by Illiger as *pilosa*. It is also Ziegler's *hispida*, the type of which is in the LeConte collection at Cambridge, a male, badly rubbed but with the distinguishing characters quite plain. There are several species, all very similar although differing in size and other rather inconspicuous details, which have always gone under Illiger's name *pilosa*. The size, 1¾ lines long (2 lines in Ziegler's *hispida*), makes Illiger's species definitely one of the larger species of the group. The color of the antennae, given by Illiger as being with entirely dark apical joints, is the clearest point of his description in differentiating the species. One other large species, having the apical joint of the antenna pale, also occurs in the eastern Atlantic states. This species is noted by Horn as being a brown color form of *pilosa*. In reality it is quite distinct.

Distigmoptera mesochorea, new species

(Plate 1, Fig. 2.)

Between 3.2 and 3.6 mm. long, dark brown or black, the legs and first six antennal joints paler; covered with gray and brownish pubescence, some hairs erectish; coarsely and densely punctate; prothorax uneven with antemedian elevations; on each elytron a depressed spot near the suture before the middle.

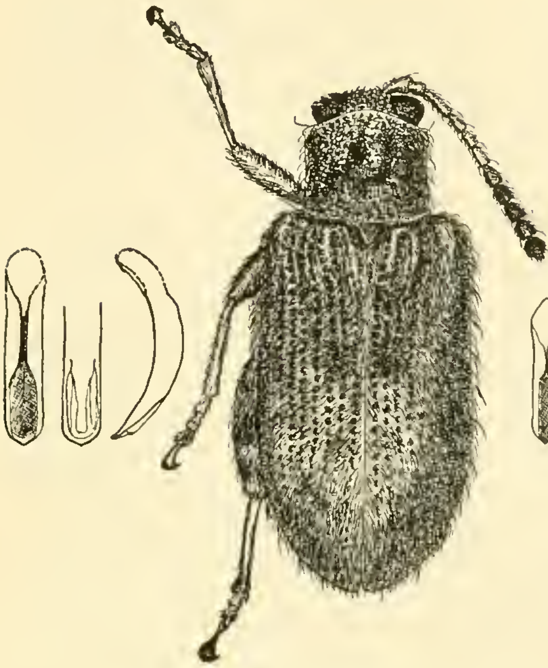
Head with the interocular space half its width; densely and coarsely punctate and pubescent; frontal tubercles separated by a narrow groove. Antennae not extending much below the humeri, the six proximal joints paler than the thickened distal joints. Prothorax a little wider than long, with straight sides, a seta-bearing nodule at each corner; surface densely and coarsely punctate and pubescent; three median elevations in the form of a half crown before the middle. Elytra covered with fine, closely appressed gray and brown pubescence, forming a wavy pattern, and with longer, erectish, dark, not so dense hairs; the coarse striate punctation distinctly visible through the pubescence; a well marked intrahumeral depression curving inwards towards the suture and terminating in a concavity before the middle of the elytra near the suture. Body beneath deep reddish brown or piceous, legs usually paler, shining, covered with light pubescence.

Type male U.S.N.M.Cat. No. 56743.

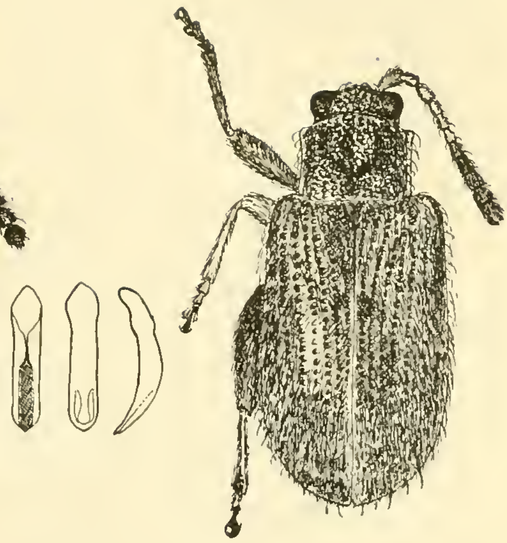
Type locality.—Iowa City, Iowa, collected June 10, 1917, by L.L.Buchanan.

Distribution.—Michigan (Port Huron, Marquette, collected by Hubbard and Schwarz); Kansas (Douglas Co., collected by F. H. Snow, and in Riley Co. by E. A. Popenoe); Missouri (Washington Co.); Indiana (Lake Co., collected by W. S. Blatchley).

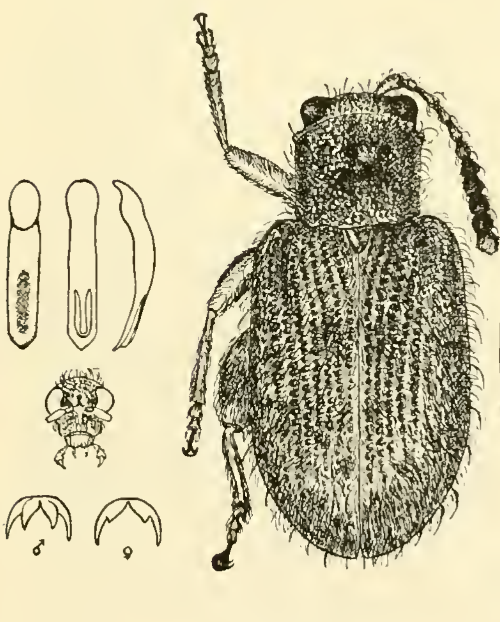
Remarks.—In size this species is intermediate between the large and the small ones of the group. It is very close to *pilosa* but differs in being smaller and also slightly in the shape



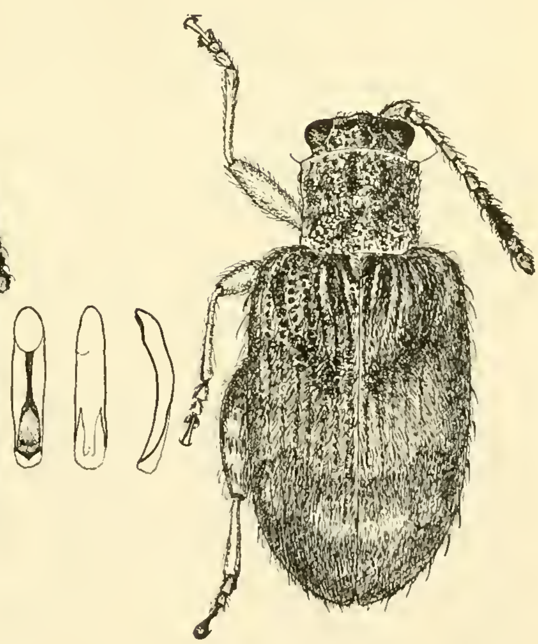
1. Distigmoptera pilosa (Ill.)



2. D. mesochorea



3. D. apicalis



4. D. texana

of the aedeagus. On the lower surface, the opening in the aedeagus is longer in proportion to the entire length. Possibly it is only a variety but among the few specimens examined I have not seen any intergradation between the eastern and western specimens. However it is certainly not so distinctive as the following two species.

Distigmoptera apicalis, new species

(Plate 1, Fig. 3.)

Between 3.5 and 4.5 mm. long, yellowish or deep reddish brown or not infrequently dark brown with paler areas on humeri and along the sides of the elytra; densely covered with brownish, gray, or about the suture, golden pubescence, this pubescence of both closely appressed and longer, erect dark hairs. Antennae with joints 7–10 dark, apical joint pale.

Head with interocular space a little more than half its width, densely and coarsely punctate, a small pit-like depression between the frontal tubercles, lightly pubescent. Antennae not extending much below the humeri, joints 7–10 dark, the apical one usually pale. Prothorax a little wider than long, with straight sides and a seta-bearing nodule at each corner; surface very uneven with a pronounced median depression below the middle and a smaller one before the middle, these two concavities kept from forming a median channel by a semicircular antemedian elevation; surface densely and coarsely punctate and pubescent. Elytra with long incurving intrahumeral depression ending near the suture in a shallow concavity; striation coarse and visible through the dense, closely appressed, yellowish brown or gray pubescence, and the longer and more erect dark hairs. Legs and undersurface shining reddish brown with pale pubescence, the back of the hind femora with a pubescence similar to that on the elytra.

Type male and 4 paratypes, 2 males, 2 females, U.S.N.M. Cat. No. 56744.

Type locality.—Wildwood, N.J., collected June 23, 1935 by L.Bottimer.

Distribution.—Ontario (Pt. Pelee); Massachusetts (Wayland); New Jersey (Seaside Hts., Sea Isle, Wildwood); New York (Rockaway); Maryland (Forest Glen); Washington, D. C.; Virginia (Falls Church, Woodstock); Indiana (Marion Co., Harrison Co. on willow, W.S. Blatchley); Kentucky (Frankfort); Tennessee (Nashville); North Carolina (Southern Pines); Georgia (Peach Co., in a peach orchard); Texas (Denison, Plano).

Remarks.—This is one of the forms mentioned by Horn under *H. pilosa.* It is clearly a distinct species. The width between the eyes is slightly greater than in *pilosa*, the antennae nearly always have pale tips, the thorax has a deep basal median depression, and the elytra are not so convex, with less marked depressions. They also appear more pubescent because of the fuzziness of the dense erectish hairs. The whole beetle is usually lighter in coloration, being a reddish brown, although some individuals are deeper. The aedeagus is quite different in the shape of the tip and the sculpture of the lower surface.

Distigmoptera texana, new species

(Plate 1, Fig. 4.)

About 4 mm. in length, reddish brown with gray and brown pubescence; antennae with joints 7–9 (sometimes 10) darker; prothorax with antemedian elevations, and the elytra with a marked oblique depression running from within the humerus nearly to the suture before the middle.

Head with interocular space more than half its width, densely and coarsely punctate and with a slight ridge across the vertex and a swelling in the middle of the occiput and a groove between the frontal tubercles; lightly covered with erectish pubescence. Antennae with joints 7–9 and sometimes 10 dark, joints 5, 6, sometimes 10, and 11 pale, basal joints brownish. Prothorax about a fourth wider than long, nearly quadrate with a small seta-bearing nodule at each angle, surface very uneven, with two pronounced antemedian tubercles and a median and lateral depression; lesser knobby prominences on the sides; densely and coarsely punctate and lightly pubescent. Elytra densely pubescent, with both closely appressed and longer erectish hairs, the pubescence varying in color from golden brown especially coppery about the suture, to grayish, and forming a kind of wavy pattern more noticeable on the apical half; yet the deep coarse striate punctation visible through the hairiness. Elytra with a marked oblique sulcus extending from within the humerus nearly half way down the elytra and ending in a deeper depressed spot near the suture. Length 3.8–4 mm., width 1.8–2 mm.

Type male and 3 paratypes (female) U.S.N.M.Cat.No. 56745, 2 paratypes in the Schaeffer collection, in the possession of H. S. Barber (both females).

Type locality.—Esperanza Ranch, Brownsville, Texas, collected by Charles Schaeffer on May 6, also collected there by Wickham.

Remarks.—The bright reddish brown color, varicolored antennae, and unusually deep oblique elytral sulcus distinguish this from the more northern species. The prothorax and elytra are both knobbier than in the other species. The aedeagus resembles somewhat that of the dark species (*pilosa*), but is distinctly different.

Distigmoptera schwarzi, new species

(Plate 2, Fig. 7.)

About 2 mm. in length, oblong oval, shining, deep reddish brown, deeply and coarsely punctate and with yellowish and more or less erect pubescence; antennae pale with 5 distal joints darkened and thickened; prothorax with two antemedian polished elevations.

Head with interocular space half its width; densely punctate and pubescent, frontal tubercles separated by a median groove extending up the vertex. Antennae not extending much below humeri, joints 3–6 slender, 7–11 twice as thick and darker. Prothorax considerably wider than long, with straight sides, a nodule at each corner; surface uneven, with dense, coarse punctures and two small rounded protuberances quite impunctate and polished a little before the middle; pubescence erectish. Elytra somewhat convex with well marked intrahumeral sulcus and a depression near the suture before the middle; the striate punctation unusually coarse leaving the intervals between very narrow; pubescence pale and erectish. Body beneath shining reddish brown, lightly pubescent; legs somewhat yellowish brown. Length 2.1 mm., width 1 mm.

Type male U.S.N.M.Cat. No. 56746.

Type locality.—Washington, D. C., collected on the 10th of June by E. A. Schwarz.

Remarks.—This is readily distinguished from the other small species of its group by its more rotund, convex shape, its reddish brown coloring and coarser elytral punctation, as well as by the small polished protuberances on the prothorax. The thickened distal joints of the antennae are shorter and broader than in the other species, being broader than long, and the aedeagus is unlike the others. Only one specimen is known.

Distigmoptera impennata, new species

(Plate 2, Fig. 5.)

From 2.1–2.5 mm. long, varying from yellow to dark brown, densely punctate, pubescent; the striate punctures of elytra well separated by distinct intervals; males wingless.

Head with interocular space half its width, shining, lightly pubescent, deeply and coarsely punctate except down the middle, a groove between the frontal tubercles. Antennae extending a little below the humeri, outer joints gradually thickened and a little darker, but neither conspicuously darker nor wider than long as in *schwarzi.* Prothorax about a fourth wider than long with straight sides and a seta-bearing nodule at each corner; surface uneven but without marked elevations; densely and coarsely punctate and pubescent. Elytra in wingless males with poorly developed humeri, the humeri more prominent in winged females in which also the intrahumeral depression is not lacking; in both sexes a distinct depressed spot before the middle near the suture; the rows of striate punctures well separated and in males the punctures in the rows not so dense but more widely spaced, particularly in the 5th and 6th rows.

Type male and 2 paratypes (females), Museum of Comparative Zoology Type No. 26579. 1 paratype, male, in National Museum, U.S.N.M.Cat. No. 56747.

Type locality.—Isle au Haut, Maine, collected in August 1896, (Bowditch collection).

Remarks.—I have chosen this tiny island form with the wingless male to typify the eastern species. The western and more northern species, which seems to occur throughout Canada from New Brunswick to the Rockies, is far better represented in the collections examined than the eastern and more southern species. In fact I have not seen a good series from any eastern locality, but only a few scattered single specimens for the most part. The series from Isle au Haut of 4 specimens, and 7 specimens from Tyngsboro, Mass., of Blanchard's collecting are the largest series examined. Of the Tyngsboro specimens, at least two, a male and a female, have wings that are reduced, that is extending only three-fourths of the length of the elytra. Two other specimens in other collections, labelled simply Mass., have similarly shortened wings. A small pale male from Boscawen, N. H., a male from Webster, N. H., a male from Paris, Me., a female from Sherborn, Mass., 2 males from Washington, D. C., and a pair from West Virginia have normally developed wings. Whether these are all one species is difficult to determine without more material or biological work. But they do differ from the northern and western specimens without a doubt. In general they are smaller, with less elongate elytra, they are more lightly pubescent, and the elytral punctation is frequently coarser. Unfortunately the aedeagus is not very distinctive.

A female from Columbus, Texas, another from Opelousa, La., and a male from Logansport, La. may represent still another species. These are somewhat more coarsely punctate and less convex, and very hairy.

Distigmoptera borealis, new species
(Plate 2, Fig. 6.)

From 2–3 mm. long, varying from yellow to piceous, prothorax usually darker and humeri paler; elytra shining beneath the sparse, partly erect pubescence. Antennae with the thickened distal joints darker.

Head densely and coarsely punctate and lightly pubescent except in the middle of the lower front, there polished, a groove separating the frontal tubercles. Interocular space about half the width of the head. Antennae extending a little below the humeri, the five distal joints gradually thickening and frequently, but not always, darker. Prothorax about a fourth wider than long, densely and coarsely punctate with erectish pubescence; surface a little uneven with a median channel and often slight elevations on either side of it anteriorly. Elytra elongate, covered with light pubescence, both appressed and semierect, but not so thick as to obscure the striate punctures, punctures varying in size but generally not so coarse as in *impennata*, and with the intervals between as wide or wider than the punctures; humeri well rounded, an intrahumeral depression extending obliquely across the elytra to the depression near the suture before the middle; color varying from yellowish to deep brown, the humeri usually paler.

Type male and 8 paratypes (1 male, 7 females), U.S.N.M.Cat. No. 56748.

Type locality.—Swift Current, Saskatchewan, collected Sept. 1882, C. V. Riley collection.

Distribution.—New Brunswick (Treadie); Hudson's Bay; Quebec (Duparquet); Ontario (Arnprior, Pt. Pelee); Manitoba (Brandon, Stony Mt.); Saskatchewan (Saskatoon); Alberta (Edmonton, Leduc); Montana (Assiniboine); Colorado (Pago Spgs.); Kansas (Reno Co.); Oklahoma (South McAlester); Iowa (Iowa City); Illinois (Champaign); Michigan (Higgins Lake, Houghton Co., Lawton, Marquette).

Remarks.—This species is fairly abundantly represented in collections. No hint is given of what its food plant may be. Apparently it occurs in sandy soil, often near water. Mr. Gentner has taken a large series of it that he collected alive on the surface of Higgins Lake. In general, it is more elongate than the eastern and more southern species, *D. impennata.*

Distigmoptera falli, new species

(Plate 2, Fig. 10.)

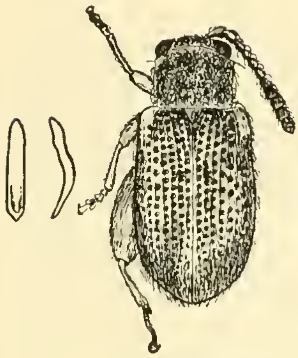
Nearly 3 mm. in length, oblong, deep yellow brown with darker head and paler humeri, the last 5 antennal joints dark and thickened; coarsely punctate and covered with pale, partly erectish pubescence.

Head with interocular space about half its width, coarsely punctate except for the tubercles and a median space in the lower front; a deep groove between the tubercles; lightly pubescent. Antennae extending well below humeri; 6 proximal joints yellow brown, distal 5 much darker and enlarged. Prothorax about a third wider than long with straight sides, a seta-bearing nodule at each corner; densely and coarsely punctate; a well marked depression below the middle; deep brownish with somewhat paler margins; lightly pubescent. Scutellum narrowly shield shaped, dark, pubescent. Elytra with striate punctures nearly as wide as intervals at base, becoming finer towards apex; basal callosities near scutellum not very much developed; a transverse ridging above the two elytral depressions and a slight depression towards the apex of each elytron at the curve; surface shining deep yellowish brown, with paler humeri, covered with light pubescence, partly appressed, with longer erectish hairs; undersurface shining yellowish brown, pubescent. Length 2.8 mm., width 1.5 mm.

Type male in the Museum of Comparative Zoology, in Fall's collection. M.C.Z. Type No. 26580.

Type locality.—Globe, Arizona.

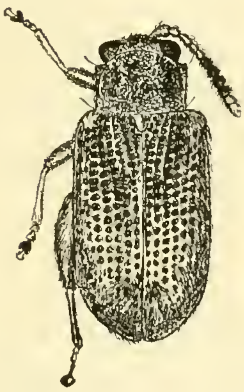
Remarks.—In size this resembles the Costa Rican species, being a little larger than the small species of the group from the United States. Unfortunately the drawing was made with a borrowed microscope and is on a slightly smaller scale than the rest of the drawings. Two distinctive characters are the more marked thoracic depression and the peculiar transverse ridging above the elytral depressions. The antennae, which are fairly long, have much enlarged distal joints.



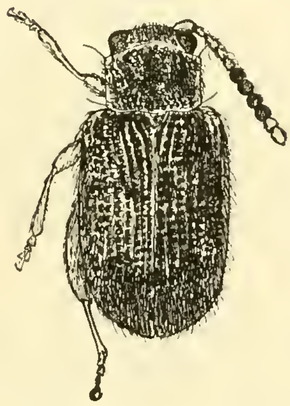
5. D. impennata

6 D. borealis

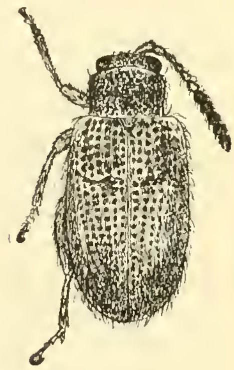
7 D. schwarzi



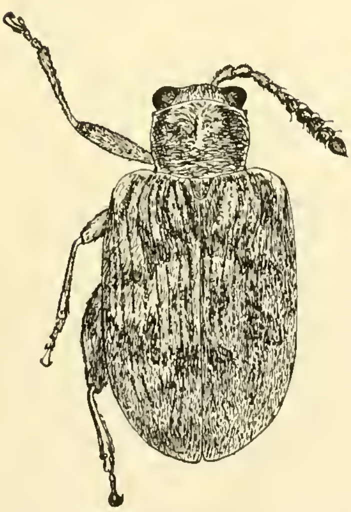
8. D. brevihirta



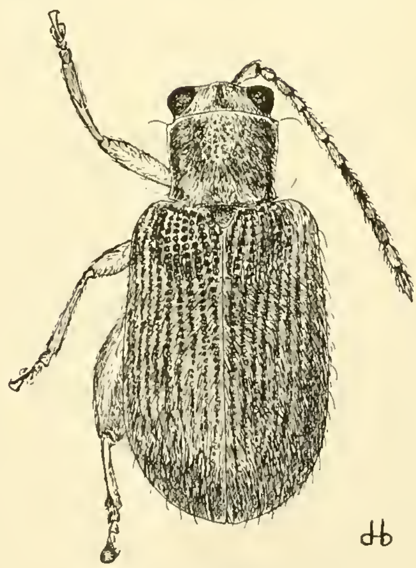
9. D. capillosa



10. D. falli



11. Pseudolampsis guttata (Lec)



12. Hypolampsis mellyi Cr.

Distigmoptera capillosa, new species

(Plate 2, Fig. 9.)

About 2.5 mm. long, deep reddish brown, shading into piceous, with paler legs and abdomen, and with the proximal five and distal two antennal joints pale; densely and coarsely punctate; elytra with striate punctures without intervals; covered with ashy brown, erectish pubescence; prothorax with an elevated crown in the middle anteriorly; elytra with pronounced basal callosities.

Head coarsely and rugosely punctate, a small carina between antennal bases and a vertical depression above; tubercles not distinguishable; pubescent; interocular space more than half width of the head. Antennae extending below the humeri; joints 6–11 enlarged, and except the 2 distal joints dark. Prothorax a little wider than long, with straight sides; surface very densely and coarsely punctate and with a raised crown in the middle anteriorly; pubescence long and erectish. Scutellum narrowly triangular. Elytra broad with rounded humeri, a deep incurving intrahumeral depression ending in a deep concavity below the well developed basal callosity; striate punctures coarse and deep without interstitial intervals; shining reddish brown shading into piceous areas; covered with a fine, semierect cinereous pubescence. Body beneath shining chestnut brown; with paler abdomen and legs; lightly pubescent. Length 2.4 mm.; width 1.2 mm.

Type female U.S.N.M. Cat. No. 56749.

Type locality.—San Pedro de Montes de Oca, Costa Rica, collected Jan. 31, 1936 by C. H. Ballou.

Remarks.—This species differs from the other Costa Rican one by its longer antennae, more coarsely punctate surface and by the erectish pubescence. It differs from all the other small species by having more pronounced thoracic and elytral prominences, and by being entirely without the shorter appressed pubescence.

Distigmoptera brevihirta, new species

(Plate 2, Fig. 8.)

2.3 mm. in length, piceous with paler tibiae and tarsi and antennae, joints 6–9 dark; head and prothorax densely punctate, elytra coarsely striate-punctate; lightly covered with golden appressed pubescence; prothorax with a slightly raised half crown in middle anteriorly, elytra with an intrahumeral depression.

Head lightly pubescent, piceous, somewhat shining, densely and coarsely punctate throughout; the frontal tubercles slightly distinct with a short groove between; interocular space about half the width of the head. Antennae not extending much below the humeri; first five and last two joints pale, the six distal joints thickened. Prothorax about a third wider than long with straight sides, a seta-bearing nodule at each corner, surface densely and coarsely punctate, depressed at the sides, a crownlike elevation in anterior half; lightly pubescent. Elytra with prominent basal callosities and a deep sulcus running from within the humeri to the depressed spot near the suture; punctation of the elytral striae coarse and in basal portion very close; pubescence light, golden, and closely appressed. Body beneath shining piceous, tip of abdomen, coxae, tibiae and tarsi paler; finely pubescent. Length 2.3 mm.; width 1 mm.

Type female, U.S.N.M. Cat. No. 56750.

Type locality.—San Francisco, Costa Rica, collected Feb. 8, 1940.

Remarks.—This distinctive species is outstanding because unlike any of the other small species it has closely appressed pubescence, with no long semi-erect hairs. It has less developed thoracic and elytral prominences than the other Costa Rican species.

Distigmoptera suturalis (Jacoby)

Omotyphus suturalis Jacoby, Biol. Cent. Amer., Coleopt., 6 (1) Supplement; 322, 1892.

"Black, sparingly pubescent, the 5th and 6th joints of antennae and the base of the tibiae flavous; head and thorax strongly rugose-punctate, the thorax with two small elevations; elytra with a deep depression near the middle; strongly punctate-striate, the suture narrowly fulvous-pubescent. Length 1¼ line .... Mexico, Chilpancingo in Guerrero, collected by H. H. Smith. A single specimen."

Jacoby's description together with the illustration definitely places this species in the genus *Distigmoptera*. It is about the same size as the Costa Rican species but differs in having sparse pubescence and also in the coloration of the antennae.

A NEW GENUS AND SPECIES OF HOPLOTHRIPINI (Thysanoptera; Phlaeothripidae)

By J. C. Crawford

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

The new species described herein appears so unrelated to any known North American form and exhibits such unique peculiarities that a new generic name is proposed for it.

Zaxenothrips, new genus

(Plate 20)

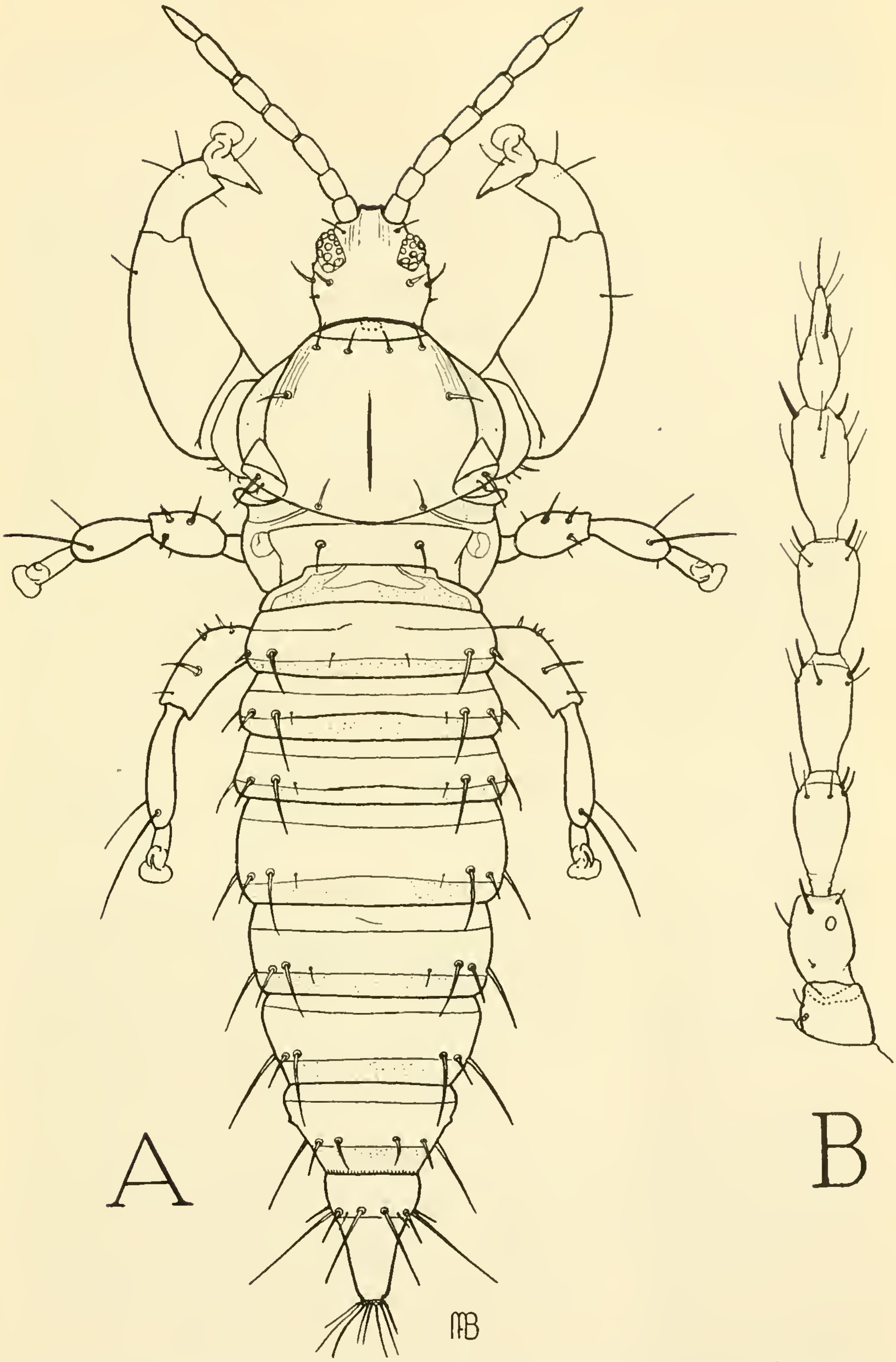
Belongs to the Hoplothripini; head much broader (1.43) than long in female, less so (1.2) in smaller (positively) heterogonic male, only slightly broader than long in larger (positively) heterogonic male, widest at middle (or back of it in larger (positively) heterogonic male, shorter than prothorax, produced in front of eyes, elevated dorsally, declivous in front and with the widely separated antennae inserted well below vertex; ocelli absent in apterous, present in macropterous, form; a pair of long, strong anteocellar bristles, located far forward, almost at edge of declivity; postoculars almost on lateral margins of head, eyes small, dorsally almost subrectangular and not extending onto ventral aspect of head, facets well separated, the row at rear and on outer margin much enlarged; head notched back of eye and with a (usually) very pronounced tubercle just back of notch; with two heterogonic horns in male, a median decurved horn just beneath insertion of antennae, and a median transversely elliptical one just anterior to mouth cone, these practically indiscernible in mounted specimens (though in such specimens the latter is decipherable as an elliptical ring); in the female these horns absent but the subantennal horn represented by a small low tubercle; mouth cone short, broadly truncate; antennal segments short, VI longest, III and V subequal, IV shorter than these; VII and VIII closely united, the suture separating them lacking dorsally; pronotum robust, its hind margin strongly convex, overhanging; anterior angles of mesothorax produced, strongly concave anteriorly; legs short, stout, fore femur much enlarged, mid and hind femora with a few short, heavy spines, fore tibia strongly bent; fore tarsus in female with a long tooth, in male the tooth larger, in large heterogonic male with a great tooth as broad as length of segment and longer than width of tarsus; anterior abdominal terga greatly reduced in length, tergum III almost six times as broad as its median length in female, seven times as long in large heterogonic male; tube short and stout, constricted near tip; body bristles short and stout; in the macropterous form the eyes somewhat larger than in the brachypterous form but still subrectangular with well-separated facets and with large facets caudad and laterad, only one pair of wing-retaining setae on a segment, these sigmoid on intermediate segments, no accessory hairs on hind margin of forewing.

Type of the genus, *Zaxenothrips peculiaris*, new species.

This genus would seem, from the description of *Oedemothrips* Bagnall, to be closely allied to that genus, but a comparison of specimens shows that it differs markedly in characters and appearance. In *Oedemothrips*, as represented by *O. propinquus laticeps* Bagn., the anteocellar setae are between and about on a line tangent to the anterior margins of the posterior ocelli, which are present in the brachypterous form but reduced in size, the head widest anteriorly and not constricted back of the eyes, the antennae eight-segmented, with the segments elongate, the abdominal terga normal in length, the eyes large in the brachypterous form, with crowded facets, and extending onto the ventral aspect of the head where they are prolonged caudad.

Eurynothrips Bagnall, of which one species in the male has a median subantennal horn, does not have well-developed anteocellar setae, has the prothorax elongated and very strongly narrowed to the head, has eight-segmented antennae and the mouth cone long, slender, and pointed.

This new genus is described mostly from the apterous form,



Zaxenothrips peculiaris: A, large heterogonic apterous male, most minor setae omitted; dotted ellipse on head shows location of median horn anterior to mouth cone; antecostal line of terga omitted. (Drawing by Mrs. Mary F. Benson.) *B*, right antenna of above, minor setae omitted. (Drawing by Mrs. Sarah H. DeBord.)

as the only macropterous specimen available is a slide mount made from a dried etiolated shell which is not in the best of condition.

Zaxenothrips peculiaris, new species

Female (holotype, apterous).—Length 1.18 mm. Very dark blackish brown, with tips of femora nearly white, bases of tibiae lightened, tarsi light yellowish brown; antennae dark blackish brown, abruptly translucent whitish in more than basal half of III, IV, V, and VI, on the last the light color tinged with yellow, VII abruptly very light yellow in almost basal half, fading to nearly white basad; pedicels of segments IV to VII brown; all body setae brown.

Head widest somewhat back of notch behind eyes, cheeks in outline convex, converging both to eye and narrowest part of head and again widening to extreme base, head thus apparently with a neck; anteriorly with irregular longitudinal wrinkles, back of eyes with faint transverse anastomosing lines; postocular setae near lateral margins of head 148 microns apart, slightly back of them a pair of short setae much closer (100μ) together, a single seta on each lateral margin not far back ($12\ \mu$) of postocular seta; antennal segments II-VII pedicellate, VII strongly narrowed to base from near middle; sense cone formula, III, 0–1 (an inner sense cone found on one antenna of a paratype), IV, 1–I, V, $I–1+^1$, VI, $I–I+^1$, VII, one dorsally; on segment III the sense cone short; on VI the outer one short, the inner long, reaching to middle of segment VII; other sense cones moderate in length.

Pronotum anteriorly at extreme sides with a few longitudinal lines, posteriorly with several faint transverse anastomosing lines; mesoscutum with distinct sparsely anastomosing transverse lines, these fading medially; pterothorax parallell sided; fore tarsal tooth curved, its lower margin with a seta just basad of a slight notch apicad of middle.

Abdomen, especially on anterior terga, with transverse anastomosing lines, these tending to form transverse rows of tetragons; basal margin of terga each with a narrow, thickened darker line and with the antecostal line (omitted in figure) very close to this thickened margin; cephalad of middle of terga III–VIII a single strong transverse line, indistinct laterad, on tergum II this line faint, irregular, interrupted and largely obscured by the coarseness of the other sculpture; anterior segments with posterior margin medially, broadly, slightly emarginate.

Measurements (in microns): Head, length 120, width across eyes 152, width behind eyes 148, greatest width 172, narrowest width near base 164, width between antennae 25; from eye to base of antenna (externally) 8, from eye to apex of frontal costa 20; prothorax, median length 164, greatest width 284, width including coxae 356; mesothorax, width across anterior angles 328; pterothorax, median length 124, greatest width 320; abdomen, tergum III medial length 50, width 348; tube, length 104, basal width 64, width at apex 30. Setae: anteocellar 22, postocular 30, anterior marginal 8, anterior angular 4, midlateral 10, epimeral 30, posterior marginal 20; on tergum IX, I, 76, 2, 44, 3, 40; on X, both pairs 52.

Antenna	1[1]	2	3	4	5	6	7	8
Length	24	44	46	40	46	56	40	28
Width	33	32	27	30	30	28	20	14

Male (allotype; large, heterogonic, apterous).—Length (distended) 1.5 mm. Very similar to the female in color, sculpture, and structure but with head and prothorax, including fore legs, heterogonically developed, the head practically as long as wide, the fore femur enormously enlarged; fore tarsal tooth straight along upper margin, its upper margin with a long seta near base in addition to the one on lower margin, which is much nearer apex than in female (in smaller males the tarsal tooth curved); prothorax more overhanging than in female and with a discal median longitudinal internal thickening.

Measurements (in microns): Head, length 148, least width just back of eyes 134, greatest width 152, least width near base 140, from front of eye to base of antenna externally 10, from front of eye to apex of frontal costa 32, prothorax, median length 240, width 292, width including coxae 420; mesothorax, width across anterior angles 352; pterothorax, length 104, width 332; median length of fore femur 380, its greatest width 148; fore tarsal tooth, length on upper margin 52, width of fore tarsus including tooth 82; width of fore tibia at apex 52; tube, length 102, basal width 64, width near apex 30; setae, anteocellar 30, postocular 33, anterior angular 26, midlateral 44, epimeral 72, posterior marginal 40; on tergum IX, 1, 96, 2, 40, 3, 108; on X, both pairs 68; longest seta near apex of mid tibia 80, longest seta near apex of hind tibia 100; longest seta on hind femur 36.

Antenna	1[1]	2	3	4	5	6	7	8
Length	24	48	53	48	53	62	40	24
Width	36	30	28	28	26	26	20	12

The single macropterous female, though badly etiolated and distorted, shows the antennae to be colored as in the apterous form, the antennal segments in length about as in the apterous female, the forewing fringes simple, the eyes not much larger than in apterous specimens, head very transverse and the tubercle back of eye smaller. The general condition is too poor to merit a detailed description, though I have marked the specimen "morphotype ♀."

Type locality.—Bethesda, Md.

Type.—Catalog No. 56672, United States National Museum.

Described from three male and six female apterous specimens and one etiolated macropterous female shell taken by the author, August 18, 1940, under bark of a newly fallen hickory branch which was sufficiently punky to enable the insects to crawl out of sight into the outer tissue of the wood.

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[1] Visible portion only.

A GLANCE AT CHILEAN ENTOMOLOGY

By Raúl Cortés [1]

Departamento de Sanidad Vegetal, Ministerio de Agricultura, Santiago, Chile

Chile is a country which occupies the western slopes of the southern Andes in the pointed tip of America del Sur. While Argentina extends through the wide plateau of the eastern side, Chile is reduced to a narrow 3,000 mile long strip of land running from 18 to 56 degrees of latitude south. From the biogeographical point of view Chile belongs to the sub-andean temperate part of the Neotropical region, and has long been compared as to her soil, climatic and agricultural conditions with southern California, but certainly neither Chileans nor Californians can fully agree in such comparison.

Although it has almost the same area as Texas, Chile is slightly less populated than Michigan, and if spread over the States it would run from Boston to Los Angeles, her average width being however the distance between Washington, D. C., and Philadelphia.

The northern fourth of Chile is a mining district and one of the most extremely desert regions of the world. By a paradoxical contrast this country of dryness and desolation is the only world source of natural nitrate fertilizers. The central half of Chile is the properly called agricultural region, while the southern part is covered with dense forests and with snow almost all the year.

The fauna and flora of the country are also quite peculiar and have an outstanding relation with those of South Africa and Australia. Insect families like Termitidae, Nemestrinidae and Thynnidae show a remarkable inter-relation in the three countries.

Entomology in Chile is supposed to have started with the work of the Abbot Juan Ignacio Molina, the first Chilean and South American naturalist, who was born near Linares in Central Chile in 1740 and died in Bologna (Italy) in 1829. Molina was a Jesuit priest who lived in his country only the first 27 years of his life, since in 1767 the Jesuit community was expelled from the Spanish colonies by order of the King of Spain. He and his companions settled down in Bologna where Molina remained for the rest of his life, teaching in the famous University and always remembering his distant country.

He wrote in Italian three major works, namely, the "Compendio sulla Storia geografica, naturale e civile del Regno de Chile" published anonymously in 1776, the "Saggio sulla Storia

[1] The author wishes to express his appreciation to Drs. E. A. Chapin and M. T. James for sponsoring his name to the Entomological Society of Washington, and particularly to Dr. James who kindly reviewed the manuscript of this paper.

naturale del Chile" in 1782, and a second supplementary volume in 1787 which was called "Saggio sulla Storia civile del Chile." In 1810 he published a revised edition of the last two papers bound in one much enlarged volume. All these works have been reprinted several times and translated into Spanish, German, French and English. By far, the most important of Molina's papers is the "Saggio sulla Storia naturale," published in 1782, in which he names and briefly describes, among others, 110 Chilean animals arranged in 61 genera according to the Linnean system of nomenclature. Of these, seven are insects in the modern sense, comprising five genera to which the species questionably belonged. One of the most beautiful Chilean Buprestidae was described by Molina as *Chrysomela* and our injurious potato blister beetle was placed under *Lucanus!* The insects described by the Abbot are 2 Hymenoptera, 3 Lepidoptera and 2 Coleoptera, and still bear the specific names of Molina, which, by the way, were almost always the vernacular names applied to them by the Indians of his native region.

The work of Claudio Gay is, however, the most outstanding contribution to the further knowledge of our Natural History and still remains a matter of inmense pride to the people and Government who encouraged and sponsored him. Claudio Gay was a traveller-naturalist of French birth brought down to Chile in 1828 to teach in one of our Colegios in Santiago when he was only 28. In September 1830 he was commissioned by the Government to make a thorough survey of the national territory from the natural, geological, geographical, agricultural and civil points of view, the results of which would be later published elsewhere.

He spent almost 10 years travelling all through the country under the most precarious conditions it is possible to imagine, collecting all sort of samples which he carefully labelled, assembled and then mailed to France. In 1845 there appeared in Paris the first volume of his big "Historia de Chile" which full publication required almost 20 years and comprised 28 volumes and 2 large atlases. Although the manuscripts were originally handed back to Gay either in French, Italian or Latin, he translated them into Spanish, in which the whole work was also published.

The "Historia de Chile" of Gay is divided in four main sections, namely: Zoology, Botany, Agriculture, and Civil and Geographical History. Both Zoology and Botany cover eight volumes each, with an average of 500 pages to the volume. The whole work was mainly based upon the material collected by Gay himself, and upon some other which had been earlier deposited by different men in the Paris Museum where later the full collection of Gay was also placed. This material was studied by the best men at that time working in France, and the manuscripts submitted to Gay for translation and publication. Insects in Gay' Historia are treated in volumes 5, 6 and 7 of the Zoology, as well as in part of the fourth volume, and the species included number 1,817. The collaborators of Gay were: for the Thysanura, Nicolet; for Coleoptera, Solier and Blanchard; for Lepidoptera, Orthoptera, Diptera, Neuroptera, Siphonaptera and Thysanoptera, Blanchard also; for Hymenoptera, Spinola and De Saussure; for Hemiptera, Spinola and partially the same Blanchard.

The Historia of Gay was largely made possible by subscriptions paid in advance by Chileans interested in the project, but finally was almost completely supported by the National Government. While the paper was still in process of publication, Gay made several trips back and forth between Chile and France, until death came to him in 1873. The work of this illustrious Chilean citizen well deserves the motto that Horace wrote for his celebrated Odes: *Exegi monumentum aere perennis.*

Afterwards Chilean Entomology expanded with a number of men, most of them Europeans. M. Philibert Germain was the first to arrive and in 1853 was appointed as the first Director of our National Museum. An enthusiastic collector, this French coleopterologist greatly improved the knowledge of our beetles and weevils, some of his specimens still being kept in Santiago. After Germain had scarcely had a few months as Director of the Museum, the position was turned over to Rodolfo Armando Philippi, the German naturalist who had arrived in Chile almost at the same time as Germain. The latter was made then Sub-Director and first Chief of the Entomological Section just created for him.

R. A. Philippi was rather a naturalist in the wide sense, although he published a lot on our insects, worthy of mention being his well known paper on Chilean Diptera dealing mostly with Tabanidae, Syrphidae and Nematocera. His son, Federico Philippi, was the third Director of the Museum after his father's death. His Catalogue of Chilean Coleoptera, and some other short papers on Chilean weevils, make his name stand among the pioneers of our Entomology. In 1869, when the eldest Philippi was Director of the Museum, Edwyn Charles Reed, an Englishman, was appointed to the Entomological Section, but he finally quit and was made Director of the recently founded Museum of Valparaiso. When Reed died in 1910, he was Director of the Museum of Concepcion. He published widely on our insects, his little known Catalogues on Chilean Diptera and Hemiptera deserving special mention.

As in every other country, present-day Entomology in Chile is practiced throughout three main sort of Institutions: the Ministry of Agriculture, the National and private museums, and a linking organization, the Chilean Society of Entomology.

Since we have a different educational system from that of the States, our universities do not constitute large centers of research, although extensive collections are usually maintained and investigations are frequently made through graduate students.

After Germain and Reed, the Entomological Section of the Museum was headed by Senor Carlos Silva Figueroa, known mostly for his works on Chilean Phoridae. Carlos E. Porter succeeded him, his name being always attached to the Revista Chilena de Historia Natural of which he was the editor and founder in 1897. Porter was certainly a very peculiar character and a charming man, always joking and in a bright spirit. Although he didn't accomplish very much in taxonomic entomology, his interest in encouraging and helping the beginners shall be fully appreciated by many generations. Dr. Emilio Ureta, a well known lepidopterologist, is the present Chief of the Section of Entomology in the Museum. He has travelled extensively through Chile and Bolivia and has a wide personal collection of Chilean butterflies. The collection of insects in the National Museum is at present quite large, and besides many of the types of Germain, Philippi, Reed, Silva Figueroa, Porter and others, it holds part of the collections of Paulsen, Herbst, Rivera, Izquierdo, Varas Arangua and Droste.

There exists also a number of private museums attached to Colegios, where large collections are kept and research work is usually done. The collection of the Museo San Pedro Nolasco has now approximately 100,000 Chilean insects, its curator having been until his recent death H. Flaminio Ruiz[2], known for his works on Chilean Hymenoptera, particularly on Apidae. The collection in the Museo de los Padres Franceses was headed until not long ago by Father Anastasio Pirion, and is especially valuable because of the very many specimens of Chilean Diptera identified by Drs. Aldrich and Townsend. The collections in the Museo de los Padres Alemanes, as well as those of Dr. E. P. Reed in Valparaiso, Bullock in Angol, Wagenknecht in Coquimbo, etc., are worthy of mention.

The knowledge of the biology of our insects has been greatly improved through the contributions of F. Philippi, E. C. Reed, F. Lataste, M. J. Rivera, V. Izquierdo, C. E. Porter, Silva Figueroa, M. Amaral, H. Janvier (better known as H. Claude Joseph), F. Ruiz, etc.

There are two universities in Chile, both in Santiago, where entomology is taught: the Chilean State University and the Catholic University of Chile. Until his recent retirement Senor Carlos Stuardo was the Professor at the State University. He is a very fine dipterologist, having done some good work on

[2] Died November 8, 1942.

Nemestrinidae and Cyrtidae. At present the Professor is Dr. Leonidas Duran, who has published a thorough revision of the Chilean Thynnidae. Until his death, the Professor at the Catholic University was Carlos E. Porter[3], a figure rather known everywhere.

The Sociedad Chilena de Entomologia is a rather small Institution with about 80 members, its President being Senor Pedro Godoy. We very proudly count among our Honorary Fellows Dr. L. O. Howard. Besides this Society there exists also a number of local institutions, as well as the Chilean Academy of Natural Sciences.

But by far the most intensive work on pure and economic Entomology is done in the Ministry of Agriculture, through the Seccion Zoologia Agricola of the Departamento de Sanidad Vegetal. Our Seccion is at present headed by Dr. Leonidas Duran and has a number of men in Santiago studying economic problems and many others scattered along our 25 provinces. The Departamento de Sanidad Vegetal, an organization of the Ministry of Agriculture corresponding to the Bureau of Entomology and Plant Quarantine plus a part of the Bureau of Plant Industry, is almost 50 years old, so we have in our Seccion Zoologia Agricola quite a long experience on Chilean entomological problems.

Entomology in Chile has long corresponded and depended on Europe. As a matter of fact for many years the dream of our entomologists has been to take a trip to Germany or France in order to make advanced studies. In addition to all the European-born entomologists I have mentioned before, our best men like Silva Figueroa, Porter, Stuardo, Duran, etc. are of European training. As far as I know the only men that came to the States to get their training in this country were Manuel J. Rivera and Eduardo Varas Arangua. Rivera, a very promising young man mainly interested in economic problems, made his trip to this country as early as 1898, and met in Washington Dr. Howard, Mr. Coquillett and many other American entomologists of that time. In the U. S. National Museum I have found a number of Chilean Diptera sent by Rivera to Mr. Coquillett. Varas Arangua came to the States very young in 1926 and worked mostly in the Museum of Comparative Zoology at Harvard, where it is still possible to find material of Chilean Cicindelidae sent by him to Dr. Nathan Banks. Both Rivera and Varas, our only two U. S. trained entomologists, died very shortly after their returning to Chile, exactly at the age of 33. If I must be placed as the third Chilean with entomological studies in this country, well, let me then express my deep concern about my Life Insurance Company!

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[3] Died December 13, 1942.

As for expeditions which have surveyed our coastal line and territory, there are so many that I don't think it would be advisable to mention them all. In 1872 we had the visit of Louis Agassiz, while the most recent expedition recorded in Chile is that conducted by Edwards and Shannon to collect Diptera in the Chilean-Argentine Patagonia. The valuable and extensive material gathered together by these two distinguished entomologists was shared by the British Museum and the U. S. National Museum.

It is to be expected that after the war the relations between South and North America will be greatly improved in every possible way. The present conflict has brought to all American minds the realization of the unity and solidarity of our continents, and the aspiration to base them on a deeper cultural basis rather than on a commercial or economic foundation. Entomology is an open field for this collaboration, although much has already been accomplished on the subject of biological control and transportation of parasites under the skilled direction and care of Dr. C. P. Clausen.

Systematic entomology in South America is particularly an enterprise which very few dare to undertake, since we do not have extensive identified collections and complete libraries, without which taxonomy is rather a precarious hazard. Moreover, our insect types are generally deposited in Europe or in the United States, thus making it necessary for the South American entomologist to take sometimes long and expensive trips to distant countries in order to examine or redescribe those types. Nevertheless in Buenos Aires, Santiago and in several places in Brasil, important centers of entomological research are being increasingly developed, in spite of the difficulties and lack of resources they must face.

This movement toward a more intensive and close cooperation in American Entomology has been recently expressed by Dr. Kennedy in the last March issue of the Annals of the Entomological Society of America, where he asks for papers and revisions including Neotropical species besides the Nearctic material treated. I think however that the paper of Dr. A. Stone dealing with the New World species of the genus *Anastrepha* is the best example of what can be achieved in American entomology from a continental point of view. It can certainly be taken as a fine example deserving imitation.

We feel very proud in South America of the many men scattered all through our southern continent who have accomplished a thorough work, although the material conditions they confronted were hard and frequently insuperable. We profess also a great deal of admiration for your outstanding entomologists beginning with Thomas Say and the brilliant generation that picked up his pioneer work. Indeed these goodneighborhood feelings truly pave the way for the full understanding and cooperation among our countries, thus making certain the scientific role that America must have in the coming world.

BOOK REVIEW

Unbidden House Guests, by Hugo Hartnack, vol. 1, 560 pp. Illus. Hartnack Publishing Company, Tacoma, Washington, 1943. (Intr. Pr. $12.00.)

According to the author the urgent need for an American book on house pests prompted him to produce this volume. It is essentially a compilation and presentation of information pertaining to the many members of the plant and animal world that are associated with the habitations of man. In discussing the harmless or harmful nature of these unbidden guests of the household and methods of combatting them, the writer has drawn freely from the voluminous foreign and domestic literature on the subject and his own personal experiences. The first in an intended series of two volumes it consists of parts 1, 2, 3, and 5. Part 4 which is reserved for volume 2 is to deal solely with insects. Part 1 contains a rather broad discussion of household pest control problems and will be of particular interest to entomologists. It includes such diverse topics as: Professional lingo; History of house pests; Interrelations between man and animals; House climate and pests; Food and pests; Insect spoorology; Pest fighting; Pests and waste; Insect names, etc. Part 2 takes up the subject of plants as house pests; Bacteria, molds, fungi, timber rot, and plant relations to animal house plants. Part 3 discusses the lower animals as house pests, protozoa, worms, snails, millipedes, spiders, mites, etc., and Part 5 the Backboned animals, Rodents, rats, mice, etc. The figures and illustrations that occur on almost every one of the 560 pages will both interest and intrigue the reader. The author has attempted to supply illustrations of household insects that differ from the ones that, "have been used over and over again with monotonous regularity for 30 or 40 years." The repetition of a number of the illustrations in different sections of the book seems unnecessary. Indication of the source of more of the facts cited and of the many excellent illustrations would add to the value of the book.

R. T. Cotton.

MINUTES OF THE 539TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON, OCTOBER 7, 1943

The 539th regular meeting of the Society was held at 8 P. M., Thursday, October 7, 1943 in Room 43 of the National Museum. President Harned presided and 30 members and 17 visitors were present. The minutes of the previous meeting were read and approved.

J. C. Bridwell presented an interesting note concerning the host plants of a hispid beetle. He reported that the larvae mine in the leaves of approximately fifteen species of plants, including such widely separated ones as apple, oak, linden, chestnut and alder. Since it was first recorded the species has had twenty binomial names applied to it. Mr. Bridwell stated that not one of these twenty is correct. The correct name with its synonymy will be published separately.

F. L. Campbell exhibited two books on insects which have been published recently. The first was entitled Unbidden House Guests, by Hugo Hartnack, the second, Biology of *Acarus scabiei*, by Reuben Friedman.

The first paper on the regular program was: Fumigation of Cereals and Cereal Products, by H. H. Shepard, Office of Materials and Facilities, Chemical Division, War Food Administration.

The problems of cereal insect control vary to a marked degree according to location of the infested product. Conditions in a farmer's grain bin contrast with those of the country and terminal elevator, those in a country feed mill differ greatly from those in a modern flour mill. Few grain men realize fully that the three simple factors which in general make for good storage are also the best safeguards against insect infestation. These factors are cleanliness, dryness, and a moderately cool temperature. Valuable experience as to the importance of the storage of clean grain was gained during the corn storage program of the Commodity Credit Corporation. The farmer is usually poorly equipped to clean and dry his grain yet economic conditions have led him to go into the grain storage business. As a result of this general situation grain insect problems have become intensified in the last few years and the sale of liquid grain fumigants has increased. This type of fumigant is usually either a 3 to 1 mixture of ethylene dichloride and carbon tetrachloride or a 1 to 4 mixture of carbon disulfide and carbon tetrachloride. In flour and packaged product treatment, methyl bromide has become popular largely because of its penetrative powers. (Author's abstract.) Dr. Shepard's talk was illustrated with lantern slides.

Comments and questions by Campbell followed.

The second paper entitled, The Significance of Apiculture in the War Effort, was presented by J. I. Hambleton, Division of Bee Culture, Bureau of Entomology and Plant Quarantine.

When the War Production Board was created to utilize the productive services of manufacturers in this country, beekeeping was considered non-essential. As such the fabrication of beekeepers' supplies was greatly curtailed and it appeared that beekeeping might well pass out of existence at least as a commercial enterprize. Because of this turn in events it became necessary to acquaint officials in the War Production Board and other war agencies with the essential part that bees play in the production of many agricultural crops. There are no less than 50 of our common crops, mostly fruits, vegetables, and forage crops, that are either entirely dependent on insects for fruit or seed formation or produce larger crops when pollinating insects are abundant. The legumes, especially alfalfa, red, white and sweet clovers must have bees in abundance for any seed formation.

Honeybees are much more important during this war than they were during the first world war because of a growing scarcity in wild pollinating insects. Various reasons can be ascribed to the present dangerously reduced numbers of these highly beneficial insects: Planting of large acreages which not only destroys wild pollinating insects but so limits the food plants that those whose nests are accidently spared are apt to starve, clean cultivation, brush and forest fire, an unsatiable desire to destroy bumblebee nests or the nests of any stinging insect. Whether or not these are the cause, the coincidence at least is rather startling that during the last 25 years there has been a marked decline in the per-acre production of all the legumes which require insect pollination. This decline in yields has proceeded in spite of the best known agronomic practices to stem the decline.

Honeybees are the only possible substitute to replace or to supplement wild insects; and, since honeybees will not maintain themselves in a wild state in sufficient numbers in those areas where they are especially needed, the beekeeping industry has to be given every safeguard possible if seed goals, and this means food goals, are to be met. The various war agencies fortunately have seen the light. The Office of Price Administration, for example, has granted beekeepers a liberal amount of sugar to feed colonies to prevent starvation and to help to build strong pollinating colonies, the War Food Administration regulates the sale and use of honey that the beekeeping industry may carry on effectively not only now but continue doing so after the war, the War Production Board is now granting manufacturers large enough quotas of critical materials to maintain the industry, and the War Manpower Commission recommends the deferment of beekeepers having 400 or more colonies of honeybees. (Author's abstract.)

Dr. Hambleton's talk was followed by considerable discussion by Bridwell, Snodgrass, Wood, Capt. West, Elishowitz and Hawes.

The following visitors were introduced to the Society: Private C. S. Barnhart, Capt. L. S. West, Sgt. D. D. Millspaugh, D. E. Howell, Y.-T. Mao, W. A. Baker and S. H. Newcomer.

Dr. E. N. Cory announced that the Annual Meetings of the two national entomological societies will be held jointly, Dec. 7, 8 and 9 at Columbus, Ohio. The program will consist almost entirely of invited speakers.

Adjournment at 9:53 P. M.

W. H. ANDERSON,
Recording Secretary.

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Actual date of publication, December 30, 1943.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions	$3.00
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A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON

VOLUME 46

Published by the Society
WASHINGTON, D. C.
1944

ACTUAL DATE OF PUBLICATION VOLUME 46

Number 1—pages 1-24 inclusive........................*January 28, 1944*
Number 2—pages 26–54 inclusive........................*March 13, 1944*
Number 3—pages 55–84 inclusive..........................*April 4, 1944*
Number 4—pages 85–104 inclusive.........................*May 3, 1944*
Number 5—pages 105–136 inclusive.......................*May 31, 1944*
Number 6—pages 137–164 inclusive.......................*July 10, 1944*
Number 7—pages 165–204 inclusive...................*October 31, 1944*
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PRESS OF
H. L. & J. B. McQueen, Inc.
Washington, D. C.

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VOL. 46 January, 1944 No. 1

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON
1884

Published Monthly Except July, August and September

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON 25, 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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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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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 46 JANUARY, 1944 No. 1

A TAXONOMIC STUDY OF THE GENUS ALEUROGLANDULUS BONDAR (Homoptera: Aleyrodidae)

By LOUISE M. RUSSELL,

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

This paper redefines the genus *Aleuroglandulus* and the species previously assigned to it, and describes as new three species, two of which have been intercepted by plant quarantine officials of the United States Department of Agriculture. The study is based on the pupae, the stage which has been principally used in the development of the present system of classification of the Aleyrodidae. Although the genus consists of only five known species, it is distributed from Florida to Brazil, and is recorded herein from six rather widely separated plant families. In material examined by the writer the species are relatively stable and show little variation in most of their structural characteristics.

The writer is indebted to Gregorio Bondar, Instituto Central de Fomento, Bahia, Brazil, and to G. F. Ferris, Stanford University, Calif., for sending specimens for study. Types of the new species are in the collection of the United States National Museum.

Aleuroglandulus Bondar

Aleuroglandulus Bondar, 1923, Aleyrodideos do Brasil, p. 121; Sampson and Drews, 1941, An. de la Escuela Nac. Cien. Biol. [Mexico] 2: 157; Sampson, 1943, Ent. Amer. (n. s.) 23: 197, 205. (Genotype, *Aleuroglandulus subtilis* Bondar, by original designation.)

The genus *Aleuroglandulus* is rather closely related to *Aleyrodes* Latreille but differs from the latter as well as from other known genera in the following combination of characters: At least one pair of dorsal glands; tracheal pore areas dentate and strongly contrasted with rest of smooth body margin; disk pores on minute elevations and porettes in minute depressions; minute dorsal invaginations present.

In describing this genus Bondar said, "a margem nao denteada ou denteada em parte." The margin is dentate, however, at the tracheal pore areas. In 1941 Sampson and Drews stated, and Sampson later reiterated, "thoracic tracheal folds evident, arising from large circular glands; * * * operculum semi-circular, filling less than one-half of orifice." The thoracic tracheal folds extend outward from the anterior spiracles rather than from the dorsal glands, and in specimens examined by the present writer the operculum fills distinctly more than one-half of the vasiform orifice.

Ventral surface covered with whitish granular wax in a thin layer whose edges are thickened, vertically striated, and extend diagonally outward from just within the body margin. Dorsum with similar wax emanating from each gland and with a thin layer of transparent inconspicuous wax.

Specimens ovoid or elliptical, flat to slightly convex dorsally, flat ventrally. Derm colorless or yellowish, thin and membranous.

Body margin dentate at tracheal pore areas,[1] smooth elsewhere; anterior and posterior marginal setae present. Weak ridges extending inward from margin; submargin not separated from dorsal disk, not deflexed, apparently bearing 7 cephalothoracic and 8 abdominal pairs of minute setal bases.

Dorsum with at least 1 pair of glands, with disk pores on minute elevations and porettes in minute depressions, and with minute, slender, sclerotized invaginations. A pair of submedian setae on cephalic, and on first and eighth abdominal segments, and a median or submedian caudal pair at the body margin. Median molting suture extending to body margin; transverse one directed slightly caudad from its midpoint, its ends slightly recurved and terminating in subdorsal area about opposite its midpoint, located just anterior to thoracoabdominal suture. Segmental sutures terminating in subdorsal area; cephalothoracic suture diagonal near ends and with a rearward bend if apparent in center; pro-mesothoracic suture curved or straight near ends and with a median rearward bend; meso-metathoracic suture nearly straight; thoracoabdominal suture directed similarly to transverse molting one, but continued diagonally caudad from opposite ends of the latter and terminating in outer subdorsal area; first and second abdominal sutures bent cephalad near ends and nearly or actually reaching the thoracoabdominal one; third and fourth abdominal sutures nearly straight; fifth and sixth curved caudad from submedian area, seventh bent strongly backward from submedian area. Median length of cephalic segment greater than that of thorax, prothorax slightly longer than subequal meso- and metathorax; subequal length of abdominal segments 1, 2, and 7 usually slightly less than that of segments 3–6, each much shorter than segment 8. Pockets small, inconspicuous. Submedian depressions often weak on cephalothorax, well defined on abdomen, pairs arranged as follows: One or 2 in cephalo-thoracic suture, 1 in and 1 adjoining posteriorly the pro-mesothoracic suture, 1 on mesothorax, 1 posterior to meso-metathoracic suture, 1 on metathorax, 1 adjoining posteriorly the thoracoabdominal and each abdominal suture. Vasiform orifice somewhat cordate, rather deep, its sides vertically ridged, its bottom rugose, a vertical rim on its sides, located approximately its

[1] For discussion of terminology see Russell, 1943, Ent. Soc. Wash. Proc. 45: [131]-132.

length from posterior suture and one or two times its length from body margin. Operculum occupying about two-thirds of orifice, nearly as long as wide, its posterior margin curved; its dorsal surface somewhat sculptured near base and a tongue-shaped area defined at distal end; numerous minute spines present ventrally; a pair of small ventral setae near posterior margin. Lingula contained in orifice, elongate, with 2 or 3 pairs of lateral lobes and an unpaired terminal one, covered with minute spines; a pair of small setae at base of posterior lateral lobes and an elongate ventral pair at base of terminal lobe. A groove extending from anterior angles of vasiform orifice to the well defined caudal furrow; the latter extending to tracheal pore area teeth; a rather broad rounded ridge outside grooves and furrow, its outer margin approaching or reaching the posterior suture opposite anterior margin of orifice.

Marginal wax tubes visible at tracheal pore areas, usually not evident elsewhere. Tracheal folds fairly broad, without characteristic markings. Opening of thoracic spiracles slightly longer than wide, derm around them lightly sclerotized, about same size as posterior abdominal pair, which is located opposite widest part of vasiform orifice; anterior abdominal pair minute or indistinguishable. Segmentation of beak indistinct, apparently 3 pairs of setae at tip. Antenna 1-segmented, reaching about to anterior spiracle, its distal end covered with minute spines, the tip narrowed and fingerlike, 3 sensoria at base of narrowed area. Leg indistinctly segmented, stout, disklike at tip, 2 minute setae just before tip and 1 just before these; 2–4 minute setae around basal area of each leg, and a relatively elongate, slender seta on inner basal area of each middle and posterior leg. Adhesive sacs large, inconspicuous. Bifid sac present in males.

Aleuroglandulus subtilis Bondar

Aleuroglandulus subtilis Bondar, 1923, Aleyrodideos do Brasil, pp. 121–122, illus.

A posteriorly curved, horn-shaped, waxy process rising from dorsal glands.

Specimens ovoid, measuring around 1.10 mm. long and 0.90 wide.

Tracheal pore area teeth somewhat tusk-shaped, the majority large and moderately to strongly acute, but the outer ones sometimes short and rounded, often bent downward from the base; 7–12 in 40–60μ at each thoracic, and 21–29 in 110–140μ at abdominal tracheal pore area. Anterior marginal setae 12μ long, posterior marginal 28μ.

Rather weak ridges extending from body margin nearly to center of subdorsal area; the ridges usually slightly narrower than alternating furrows at body margin but gradually widening and the furrows narrowing to depressed lines; a few depressed lines across inner end of others. A prothoracic pair of subcircular, somewhat sclerotized glands 120–140μ long and 100–135 wide extending practically from cephalo-thoracic to pro-mesothoracic suture, their axes parallel to axis of body; distal part of pro-mesothoracic suture curved around gland. Pairs of disk pores and porettes arranged as follows: One submedian each on cephalic, mesothoracic, and third and fourth abdominal segments; 1 subdorsal on each thoracic segment and on each of abdominal segments 5–7. Pairs of minute submedian invaginations arranged as follows: One prothoracic close to inner edge of gland, 1 mesothoracic posterior to gland, and 1 on each of abdominal segments 3, 5, and 7. Cephalic and first abdominal setae each about 12μ long; eighth abdominal around 16μ, almost contiguous to ends of rim along anterior edge of vasiform orifice; caudal 40–64μ, submedian in position, located well outside ridges beside caudal furrow at base of tracheal pore area teeth, about 16 teeth between them; bases of dorsal setae slightly tuberculate. Vasiform orifice cordate, rather narrow posteriorly, 65–70μ long and 56–60 wide, its posterior end about length of orifice from body margin; a well-defined, flat rim 12μ long across anterior end of orifice, a notch in posterior end of vertical rim, and a tooth in orifice opposite the notch. Operculum 36–44μ long and 40–46 wide. Lingula 48–52μ long and 24–28 wide, with 3 pairs of lateral lobes, its long setae 36–40μ.

A conspicuous spine 12–16μ long on inner basal area of each leg and one about 6μ sometimes present on middle legs. Two setae about 12–15μ long mesad of each posterior leg and one about 12μ mesad of each middle leg. Ventral abdominal setae about 25μ long.

Redescribed from six specimens, the type from *Chomelia oligantha* Muell. Arg., Bahia, Brazil, Gregorio Bondar; four removed from plants in the United States National Herbarium by Marjorie J. Camp, from *Chomelia spinosa* Jacq., Rio Pedro Miguel, near East Paraiso, Panama Canal Zone, P. C. Standley, January 7, 1924, from *Chamaedorea wendlandiana* (Oerst.) Hemsl., Cerro de la Plata, near San Felix, Chiriqui, Panama, H. Pittier, December 17, 1911, and from *Synecanthus warscewiczianus* Wendl., between Gorgona and Gatun, Panama Canal Zone, H. Pittier, January 7, 1911; one from an aroid plant, Panama Canal Zone, James Zetek, March 12, 1923.

Aleuroglandulus magnus, new species

Differing from *A. subtilis* as follows: Specimens 1.25–1.55 mm. long and 1–1.25 wide. Each thoracic tracheal pore area with 14–20 teeth in 60–90μ, abdominal one with 28–42 teeth in 140–240μ. A narrow marginal band divided by shallow grooves spaced at nearly uniform intervals, the wide ridges and furrows extending inward from the band; the furrows usually narrowed to depressed lines suddenly or broken up by cross lines, in outer subdorsal area. Prothoracic glands 145–190μ long and 120–155 wide, their axes diagonal to, and their anterior ends toward, median line of body. Caudal setae 25–30μ long, 14–18 teeth between them. Vasiform orifice 72–80μ long and 60–76 wide. Operculum 45–56μ long and wide, its posterior end narrow. Lingula 52–60μ long and 28–32 wide, its long setae 32μ. Spines absent from inner basal area of legs.

Described from six specimens removed from plants in the United States National Herbarium by Marjorie J. Camp, as follows: *Chamaedorea wendlandiana* (Oerst.) Hemsl., Boca de Pauarando, Sambu River, Darien, Panama, H. Pittier, February 1912; *Synecanthus warscewiczianus* Wendl., north of Frijoles, Panama Canal Zone, P. C. Standley, December 19, 1923 (including holotype).

Aleuroglandulus emmae, new species

Aleuroglandulus striatus Sampson and Drews, 1941, An. de la Escuela Nac. Cien. Biol. [Mexico] 2: 157–159, illus., in part.

Differing from *A. subtilis* as follows: A waxy process smaller than the prothoracic one arising from glands on abdominal segment 3. Specimens 1.10–1.25 mm. long and 0.90–1 wide. Rather numerous depressed lines crossing inner part of furrows extending inward from body margin. Each thoracic tracheal pore area with 9–15 teeth in 58–88μ, abdominal one with 20–24 teeth (usually rather blunt at tip) in 120–140μ. Prothoracic glands 120–160μ long and 120–140 wide; a pair of subcircular glands 50–70μ long and 50–80 wide on abdominal segment 3, their axes diagonal to, and their posterior ends toward, median line of body. Caudal setae 45–80μ long, 12–16 teeth between them. Vasiform orifice slightly broader near apex, 72–80μ long and 64–66 wide. Operculum 44–48μ long and 48–52 wide. Lingula 44–60μ long and 28–32 wide.

Described from seven mounted specimens (all examined before mounting) as follows: From a plant belonging to the Flacourtiaceae, between La Union and Sihuantanejo, Guerrero, Mexico, G. F. Ferris, February 3, 1926 (including holotype); *Gardenia* sp., Mexico, intercepted at El Paso, C. H. Wallis, November 3, 1939; *Galactia acapulcensis* Rose (plant in the United States National Herbarium), Los Labrados to Marisma, Sinaloa, Mexico, Rose and Painter, August 11, 1905; *Galactia?* sp., Sanibel Island, Fla., E. A. Back, summer 1909. One paratype is in the collection of Stanford University.

Sampson and Drews' description and illustrations of *striatus* refer in part to this species. A discussion of the confusion concerning the two is given under *striatus*.

Aleuroglandulus malangae, new species

Differing from *A. emmae* as follows: Each thoracic tracheal pore area with 4–8 short, blunt teeth in 28–50μ, usually pointing downward; abdominal pore area with 17–24 teeth in 116–156μ. Prothoracic glands about 140μ long and 120 wide; abdominal ones 60–80μ long and 70–88 wide, their axes transverse to axis of body. Caudal setae 68–72μ long. Vasiform orifice broader at posterior end, measuring 68–76μ long and 64–72 wide, the rim across its anterior end 16μ long. Operculum 44–52μ long and 52–56 wide. Lingula 56–68μ long and 28–32 wide.

Described from unmounted paratypes, eight mounted paratypes, and mounted holotype from Malanga [*Xanthosoma* sp.], Cuba, intercepted at New York, S. D. Whitlock, December 3, 1939.

The insects were abundant on the leaves submitted.

Aleuroglandulus striatus Sampson and Drews

Aleuroglandulus striatus Sampson and Drews, 1941, An. de la Escuela Nac. Cien. Biol. [Mexico] 2: 157–159, illus., in part.

Waxy secretions not observed, presumably similar to those in other species of the genus, but waxy process from dorsal gland probably much smaller than in other described species.

Specimens elliptical, measuring around 1.30 mm. long and 1 wide.

Tracheal pore area teeth large, shaped somewhat like a finger bent downward from its proximal joint; 7 or 8 in 45–50μ at each thoracic, and 10 or 11 in 60–65μ at abdominal tracheal pore area. Anterior marginal setae 16μ long, posterior marginal setae broken.

Rather weak ridges extending from body margin nearly or actually to submedian area; ridges usually wider than furrows at margin, the furrows quickly narrowing to depressed lines; a few depressed cross lines in inner and outer subdorsal area. A prothoracic pair of somewhat tuberculate glands around 28μ in diameter, not approaching cephalothoracic or pro-mesothoracic suture; distal part of the latter suture nearly straight. Pairs of disk pores and porettes arranged as follows: One submedian on cephalic, on mesothoracic, and on each of abdominal segments 3–5; 1 subdorsal on each cephalothoracic segment and on each of abdominal segments 6–8 (the posterior pair opposite eighth abdominal setae close to suture). Usually 1–6 minute invaginations in inner subdorsal area of each segment except first, second, and eighth abdominal, and usually a median pair on each of abdominal segments 3–5. Cephalic and first abdominal setae each about 8μ long, their bases tuberculate; eighth abdominal about 24μ, located opposite anterior margin of orifice in outer edge of groove; caudal about 32μ, located at end of ridges beside caudal furrow at base of tracheal pore area teeth, about 5 teeth between them. Vasiform orifice somewhat cordate, broad at apex, 60–64μ long and wide, located about twice its length from body margin; usually a notch in rim at posterior end, a tooth in the notch and one opposite it in orifice. Operculum 36–40μ long and 44–48 wide. Lingula 40–44μ long and 24 wide, with 2 pairs of weak lateral lobes, its long setae 36–40μ.

A seta about 24μ long on inner basal area of posterior legs and one about 12μ on middle legs. Ventral abdominal setae 36μ long.

Redescribed from the holotype, and another specimen from the same source but not seen by Sampson and Drews, collected from a plant belonging to the Flacourtiaceae,[2] between La Union and Sihuatanejo, Guerrero, Mexico, G. F. Ferris, February 3, 1926; and from four specimens collected by Marjorie J. Camp from *Coccoloba* in the Herbarium of the New York Botanic Garden or the United States National Herbarium, as follows: *C. schiedeana* Lind., Las Pinas near Canela, Chiapas, Mexico, Collins and Doyle, December 13, 1906; *C. hondurensis* Lund., vicinity of Quirigua, Izabal, Guatemala, P. C. Standley, May 15–31, 1922; *Coccoloba* sp., Cuyamel, Honduras, M. A. Carleton, April 10, 1924.

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[2] Kindly identified by C. V. Morton, United States National Herbarium.

Two species were partially described in the original treatment of *striatus*. The present concept of the species is of course based on the holotype, the only specimen in the complex seen both by Sampson and Drews and by the present writer. The latter has examined a part of the original collection from which the former writers obtained their material, however, and in it found representatives of the true *striatus* and apparently of the species confused with it. The latter is herein described as *emmae*. In the original treatment the thoracic and abdominal glands mentioned and illustrated belong to *emmae* rather than to *striatus* though the abdominal pair is located on the third rather than on the second segment. The figures of the legs also appear to refer to *emmae* since there are no long setae on the anterior legs of *striatus*. Other corrections of the original description or figures are as follows: There is one instead of two pairs of dorsal setae on the cephalothorax, the pair of setae anterior to the vasiform orifice is ventral rather than dorsal, the "one pair of small glands with central process" are the posterior abdominal spiracles, the median molting suture extends to the transverse one rather than terminating on the cephalic segment, and some of the disk pores occupy different positions than shown.

A. striatus, although congeneric, is distinct from the other species treated in this paper and represents a different group.

Key to Species of Aleuroglandulus

1. Prothoracic glands relatively small and inconspicuous, tuberculate, not strongly differentiated from adjacent derm, not approaching cephalo-thoracic or pro-mesothoracic suture; tracheal pore area teeth shaped somewhat like a finger bent downward from its proximal joint; ridges extending from body margin practically to submedian area; no subdorsal disk pores on abdominal segment 5 but a subdorsal pair on cephalic segment and on abdominal segment 8; without a rim across anterior end of vasiform orifice, the orifice located about twice its length from body margin; minute invaginations in inner subdorsal area; spines absent from inner basal area of legs; body elliptical.................. *striatus* Sampson and Drews

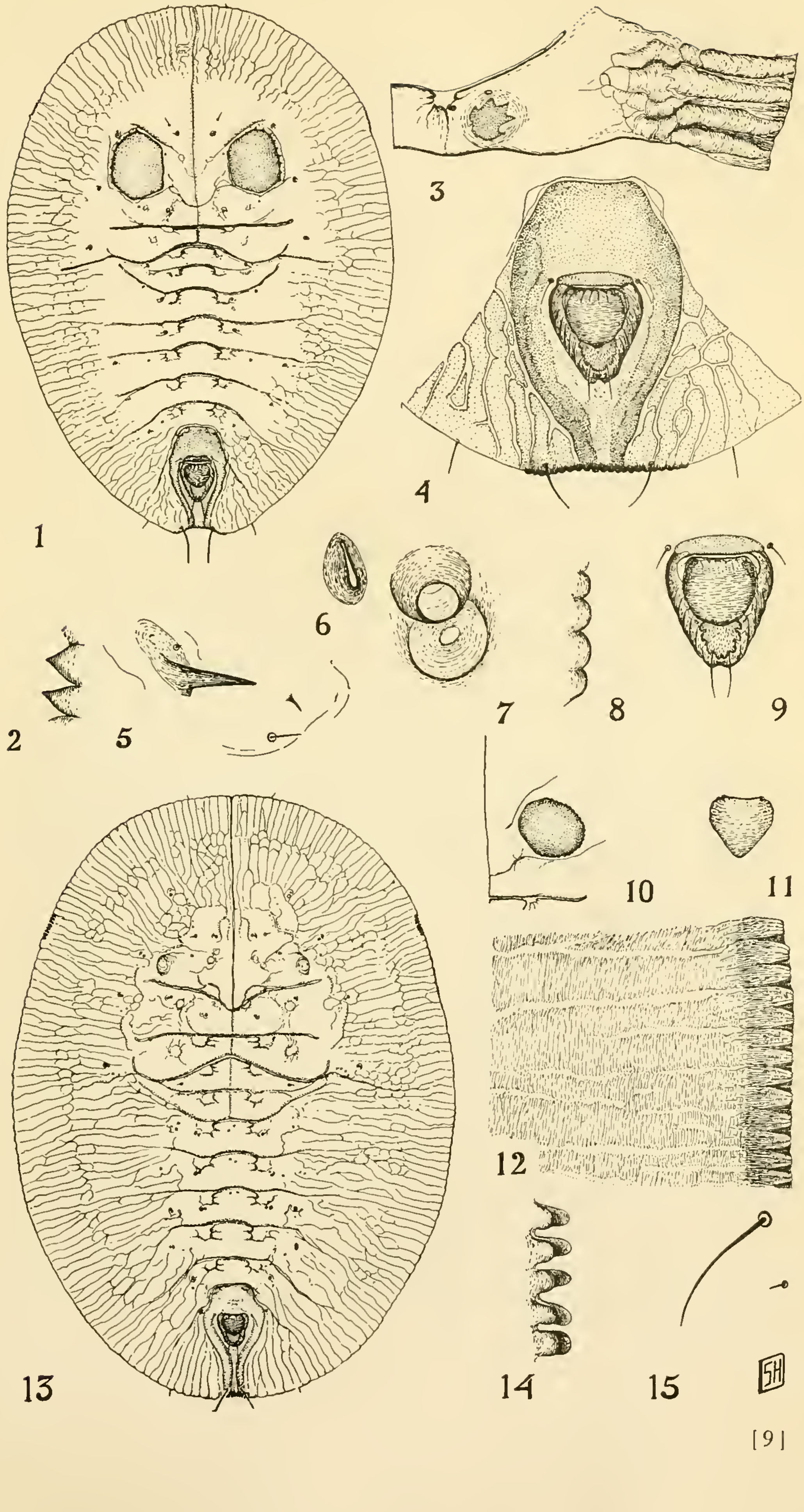
   Prothoracic glands large and conspicuous, nearly flat, strongly differentiated from adjacent derm, extending practically from cephalothoracic to pro-mesothoracic suture; tracheal pore area teeth somewhat tusk-shaped; ridges extending from body margin nearly to center of subdorsal area; a pair of subdorsal disk pores on abdominal segment 5 but no subdorsal ones on cephalic segment or on abdominal segment 8; with a rim across anterior end of vasiform orifice, the orifice located about its length from body margin; minute invaginations in submedian area; spines absent or present on inner basal area of legs; body ovoid... 2

2. One pair of glands present, located on prothorax 3
   Two pairs of glands present, 1 located on prothorax and 1 on abdominal segment 3 4
3. Inner basal area of each leg with a conspicuous spine; prothoracic glands 120–140μ long and 100–135 wide, their axes parallel to axis of body; each thoracic tracheal pore area with 7–12 teeth in 40–60μ and abdominal one with 21–29 teeth in 110–140μ; specimens around 1.10 mm. long and 0.90 wide .... *subtilis* Bondar
   Inner basal area of legs without spines; prothoracic glands 145–190μ long and 120–155 wide, their axes diagonal to axis of body; each thoracic tracheal pore area with 14–20 teeth in 60–90μ and abdominal one with 28–42 teeth in 140–240μ; specimens 1.25–1.55 mm. long and 1–1.25 wide .... *magnus*, new species
4. Each thoracic tracheal pore area with 9–15 strong, sharp teeth in 58–88μ; axes of abdominal glands diagonal to axis of body; vasiform orifice fairly broadly cordate, in the proportion of 72–80μ long and 64–66 wide .... *emmae*, new species
   Each thoracic tracheal pore area with 4–8 short, blunt teeth in 28–50μ; axes of abdominal glands transverse to axis of body; vasiform orifice broadly cordate, in the proportion of 68–76μ long and 64–72 wide.... .... *malangae*, new species

Explanation of Plate 1

Figure 1. *Aleuroglandulus subtilis*, dorsum, X 60.
Figure 2. *Aleuroglandulus subtilis*, thoracic tracheal pore area teeth, dorsal view, X 650.
Figure 3. *Aleuroglandulus emmae*, half of third abdominal segment, dorsal view, X 115.
Figure 4. *Aleuroglandulus emmae*, posterior segment, dorsal view, X 165.
Figure 5. *Aleuroglandulus emmae*, spines and setae on inner basal area of middle leg, X 650.
Figure 6. *Aleuroglandulus emmae*, minute invagination, X 1500.
Figure 7. *Aleuroglandulus emmae*, disk pore and porette, X 1500.
Figure 8. *Aleuroglandulus malangae*, thoracic tracheal pore area teeth, dorsal view, X 650.
Figure 9. *Aleuroglandulus malangae*, vasiform orifice, X 165.
Figure 10. *Aleuroglandulus magnus*, area around prothoracic gland, X 60.
Figure 11. *Aleuroglandulus magnus*, operculum, X 165.
Figure 12. *Aleuroglandulus magnus*, section of margin and submargin, X 345.
Figure 13. *Aleuroglandulus striatus*, dorsum, X 60
Figure 14. *Aleuroglandulus striatus*, thoracic tracheal pore area teeth, dorsal view, X 650.
Figure 15. *Aleuroglandulus striatus*, setae on inner basal area of middle leg, X 650.

(Drawings by Sara Hoke DeBord.)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THREE NEW SPECIES OF SYRPHID FLIES IN THE BRITISH MUSEUM OF NATURAL HISTORY

By F. M. Hull, *University of Mississippi*

Several years ago a collection of unstudied syrphid flies was submitted to the author by the British Museum of Natural History. Of the numerous new forms, two studies have appeared in the Annals and Magazine of Natural History (series II). This paper describes two species of *Baccha* and a species of *Ceriogaster*.

Baccha vera, new species

Abdomen long and quite slender; third and fourth segments each with a pair of subquadrate, yellow spots, only the second and third segments with opaque black markings. Sixth segment short but flattened dorso-ventrally. Related, perhaps, to *lativentris* Curran.

Female.—Length 11 mm. *Head:* Vertex shining black with a single row of black hairs. The front is flattened and transversely striate on all except the lower callus area, and shining steel-blue. The sides of the front are narrowly yellowish-white with whitish pile. The pile over the central portion of the front is blackish. Face yellowish-white, narrower below from in front. The tubercle is well developed, the cheeks light brown, the pile of face white and the sides silvery pubescent, except on the lowest sixth; antennae light brown. *Thorax:* Shining blackish, with two, broad, widely separated, bluish-black, grey pollinose vittae; sides of mesonotum also dark. The humeri are light brown, the scutellum brownish-black, or very dark brown with short, abundant, pale pile; the ventral fringe, if present, can not be detected. The upper part of the mesopleuron, its posterior margin and a spot on the upper sternopleuron are yellowish-white; remainder of pleura very dark brown; all thoracic pile white. *Abdomen:* Extremely slender, shining brownish-black; there is a short, opaque black annulus near the posterior fourth of the second segment and there are a pair of widely separated, small, lateral, somewhat oval, yellowish spots in the middle of the anterior half of the third segment and a pair of larger, subquadrate, narrowly subbasal spots upon the fourth segment with their postero-medial corners rounded. The sixth segment is widened and dorso-ventrally flattened, but is rounded apically, and is without ridges to enclose the laterally flattened, short ovipositor. *Legs:* First and second pairs of legs pale whitish-yellow; there is a wide, subapical brown band on each femur and the last two tarsal joints are pale brown; the pile is whitish. The hind femora, except for their narrow bases and narrow apices are dark brown; these other parts, the basal two fifths of the hind tibia and the last sixth of the hind basitarsus and remaining tarsal joints are whitish. First part of basitarsus and greater part of its tibia blackish and black pilose. *Wings:* Elongate, slender and hyaline; the stigmal cell is brown, the costal cell pale brownish-yellow. Alulae practically but not quite absent. The linear vestige is only a third or less as wide as the basal portion of the costal cell.

Holotype: A female. Amazon (66.53). British Museum of Natural History.

Baccha triloba, new species

Abdomen steel blue, with opaque black pattern, the fourth segment trilobate. Related, perhaps to *lativentris* Curran.

Female.—Length 6.5 mm. *Head:* Vertex steel-blue with a single row of black hairs. The front is wholly shining steel-blue with whitish pile. The antennal callus is also steel blue. The face is entirely steel-blue except for a tiny brown spot on the moderate tubercle; the sides of the face are widely silvery pubescent and white pilose. The cheeks are very narrow and pale brown; the antennae dark brown. *Thorax:* Mesonotum shining bluish-black with, viewed obliquely, a pair of slender, narrow, submedial, blackish and more or less linear vittae; near the middle upon either side there is a similar one. The halteres are dark brown. The sides of the mesonotum, the whole pleura and scutellum are concolorous with the mesonotum. All the thoracic pile erect and whitish and quite sparse upon the scutellum. The extreme rim of the scutellum is somewhat reddish-brown. *Abdomen:* Flattened, spatulate, very little narrower basally, and shining bluish-black marked with opaque black. Beginning just at or past the middle of the second segment there is a wide, opaque black, continuous fascia narrowed laterally. In the middle of the third segment there is a transverse, black, opaque fascia which is postero-medially indented; the lateral portions of the anterior margin of this fascia are rounded and convex upon either side and the anteromedial portion extends forward as an anterior, rounded, narrow wedge that does not reach the base of the segment. Pattern of fourth segment similar to third. Fifth segment with three, somewhat elongate, vittate black spots. *Legs:* Dark brown, the apical fifth of each of the first four femora and the narrow apices of the hind pair and the basal halves of all of the tibiae pale yellowish. The hind basitarsi and remaining joints are dark brownish-black. *Wings:* Basal half faintly and dilutely brown including whole of the stigmal cell; apical portion hyaline; alulae quite well developed.

Holotype.—A female. Amazon (66–53) British Museum of Natural History.

Ceriogaster funebris, new species

Mesonotum with two divided, narrow, golden pollinose fascia, and a similar triangle before the scutellum; abdomen but little constricted, with a pair of elongate, reddish vittae. Related to *rudis* Hull with wider abdomen and no reddish vittae, etc.

Male.—Length 7 mm. *Head:* Vertex shining greenish-black, but opaque black across the ocelli and yellowish pubescent in front and also behind the ocelli. The upper part of the occiput has a single row of stout, black spines. The front and the sides of the face are covered with pale, brassy or golden pubescence; the ground color of the sides of the face and the posterior part of the cheeks are reddish-brown. The face is keeled, greenish black, transversely striate, and the cheeks separated by an angle and ridged. There is a slight depression in the face beneath the antennae. The antennae are moderately elongate, the first two joints of each light reddish-brown, the third joint greyish-brown. Arista long and slender, light brown basally, darker apically. The eyes touch for only a short distance, perhaps less than twice the length of the anterior ocellus. The upper anterior facets of the eyes are greatly enlarged. *Thorax:* Dull black, with densely black, microscopic pile, with two, widely interrupted, prominent, transverse stripes of golden pubescence. The posterior stripe borders the transverse suture. The anterior stripe is interhumeral, its anterior margin has a row of stout, black spinules. There is a narrow band of whitish pubescence posteriorly on the mesopleuron and the whole sternopleuron is silvery pubescent and there is fainter pubescence over much of the remainder of the pleura, the metasternum and their coxae. There is short white pile posteriorly on the mesopleuron and some on the pteropleuron. There is short golden pile on the anterior golden fascia and some on the extreme anterior lateral portion of the mesonotum. The humeri are greenish-black with pale pile and some darker hairs. There are black spinules on the anterior portion of the post-calli and some above the wing. There is a more or less triangular, wide patch of bright golden pubescence in front of the scutellum with an anteromedial extension. Viewed dorsally the scutellum is brassy with some golden pubescence and sparse, short, black appressed setae. Three are four or five pale short hairs on the ventral fringe. *Abdomen:* Subpetiolate, the second segment about equally wide basally as apically and with, on either side, a large, lateral, shining, brownish-red vittate stripe. This leaves the middle of the segment opaque brownish-black. The abdomen begins to expand at the base of the short third segment; this segment is faintly greenish-black upon the base and extensively in the anterior corners, becoming more metallic upon the sides; the posterior margins are linearly shining. The greater portion of the third segment, from corner to corner, is covered by an opaque black triangle which reaches the mid point of the base of the segment. Fourth segment entirely dull, feebly shining black with, broadly over the center, a very faint milky-bluish cast; it becomes more greenish or brassy and metallic upon the lateral margins and dark reddish-brown upon the posterior margins. The short hypopygium is also reddish brown. Pile of the abdomen pale brassy upon the sides, becoming black, short, microscopic and appressed throughout the middle of the first three segments and upon the central portion of the base of the fourth segment. The pile of the fourth segment over the middle of the base and the whole of the posterior part is shining, pale yellow. *Legs:* Dark shining brown, the whole of the anterior tibiae except their narrow bases and all of their tarsi jet black. The anterior tarsi are flattened, but only moderately widened. The tarsal pile is black and the tibial pile black except upon the posterior surface where it is white. Hind femora moderately thickened, less thickened than in *rudis* Hull. The first four hind tarsal joints and mid tarsal joints are light brownish to yellow. *Wings:* Pale brownish hyaline, the stigmal cell dark brown.

Holotype.—A male. British Guiana, Essequibo River, Moraballi Creek, August 20, 1929. Oxford University Expedition. British Museum of Natural History.

MAULSBY WILLETT BLACKMAN
1876 - 1943

MAULSBY WILLETT BLACKMAN

1876–1943

Maulsby Willett Blackman was born at Lawrence, Kansas, March 26, 1876; and died at his home in Silver Spring, Maryland, near Washington, D. C., on October 12, 1943.

He was graduated from the University of Kansas in 1901, and took his A. M. degree from this school the following year. From 1901 to 1904 he served as instructor in zoology and histology at the University of Kansas. He held the Austin fellowship at Harvard in 1904 and 1905, and obtained his Ph. D. degree from Harvard in 1905. For the next five years (1905–1909) he was instructor in histology at Western Kansas University. In 1909 he joined the staff of Syracuse University where he was assistant professor of zoology from 1909 to 1911, and associate professor, 1911 to 1913. He took a leading part in organizing a department of entomology, with special emphasis on forest insects, at the State College of Forestry at Syracuse, and was professor of forest entomology at this institution from 1913 to 1929. During the summers of 1925, 1926 and 1927 Dr. Blackman had appointments as field assistant in the Forest Insects Division in the Bureau of Entomology, and devoted his entire time to a detailed study of the Black Hills beetle and its aggressive outbreak in the Kaibab National Forest and surrounding regions. This was the first comprehensive study of this destructive barkbeetle and the results were published in a bulletin of the New York State College of Forestry. In 1929 he was appointed specialist in Scolytidae in the Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine; later he became senior entomologist, and in 1937 he joined the Division of Insect Identification in the same Bureau, where he remained until his death. While with the Division of Forest Insects he acted, at times, as assistant chief, in which capacity the soundness of his judgments and recommendations reflected, no doubt, his broad biological background and remarkable grasp of the fundamentals of insect control.

Naturally of discerning mind and critical attitude, his views, though usually based on sound reasoning, were often expressed with disconcerting frankness. As a teacher, his humor and integrity, combined with a genuine interest in the work and in his students, raised him to a place of high esteem; and he will be remembered by many as a favorite instructor, a helpful colleague, and a staunch friend. His interest in his former students never lagged, and he always welcomed the opportunity of chatting with any who might visit him after he left Syracuse. Dr. Blackman was a member of the American Association of Economic Entomologists, the Entomological Society of Washington, the Entomological Society of America, and a fellow of the American Association for the Advancement of Science.

During his early academic career Dr. Blackman did a considerable amount of cytological work, the results of which were published in several papers on spermatogenesis in Myriapods, and in one paper on the histology of the scent glands in *Mephitis*. Later, his chief scientific interests centered in the study of the life histories, taxonomy, and control of forest insects, particularly of barkbeetles (Scolytidae). Wide field experience with Scolytidae, many species of which exhibit complex and marvelously perfected instincts, and highly specialized food plant associations, gave Dr. Blackman a clear conception of the important part that biological data may be made to play in taxonomic investigations; and more than once he expressed the opinion to colleagues that at least a mention of food plants, and preferably a more or less extended account of the biology, should be considered an integral part of technical descriptions. Most of his taxonomic papers deal with genera and species of Scolytidae from North America; a few are on species of other regions. In most cases his revisions are accompanied by illustrations, and by well planned synoptic keys. Though handicapped by ill health in recent years, he maintained an active interest in his special province to the end, and had completed a manuscript on Scolytids a short time before his last, brief illness.

A list [1] of Dr. Blackman's published works follows:

1901. The spermatogenesis of the myriapods. I. Notes on the spermatocytes and spermatids of *Scolopendra:* Kansas Univ. Quart., 10: 61–76, pls. 5–7.

1903. The spermatogenesis of the myriapods. II. On the chromatin in the spermatocytes of *Scolopendra heros:* Biol. Bull., 5: 187–217, 22 figs.

1905. The spermatogenesis of the myriapods. III. The spermatogenesis of *Scolopendra heros:* Bull. Mus. Comp. Zool. (Harvard), 48: 1–138, pls. 1–9, 9 text figs.

1905. The spermatogenesis of the myriapods. IV. On the karyosphere and nucleolus in the spermatocytes of *Scolopendra subspinipes:* Proc. Amer. Acad. Arts & Sci., 41: 331–344, 1 pl.

1907. The spermatogenesis of the myriapods. V. On the spermatocytes of *Lithobius:* Proc. Amer. Acad. Arts & Sci. (contrib. from Bermuda Biol. Sta. for Research no. 10), 42: 487–518, 2 pls. and bibliography.

1908. Theories of sex determination resting on a cytological basis: The Cleveland Med. Journ., 7: 197–209, 1 text fig.

1910. The spermatogenesis of the myriapods. VI. An analysis of the chromosome group of *Scolopendra heros:* Biol. Bull., 19: 138–160, 2 pls., 4 figs.

1911. The anal glands of *Mephitis mephitica:* Anat. Rec., 5: 491–515, 5 pls.

1912. On a supernumerary median ocellus in *Melanoplus femur-rubrum:* Psyche, 19: 92–96, 3 figs.

[1] Compiled by Miss Mathilde M. Carpenter, Librarian, Division of Insects, U. S. National Museum.

1915. Observations on the life history and habits of *Pityogenes hopkinsi* Swaine: N. Y. State Coll. Forestry (Tech. Pub. no. 2), 16 (1): 11–66, 6 pls. and bibliography.

1916. (With W. O. Ellis). Some insect enemies of shade trees and ornamental shrubs: N. Y. State Coll. Forestry Bull., 16 (26): 1–123, 1 col. pl. 56 figs.

1918. (With Harry H. Stage). Notes on insects bred from the bark and wood of the American larch: N. Y. State Coll. Forestry (Tech. Pub. no. 10), 18 (4): 2–115, 9 pls. and bibliography.

1918. On the insect visitors to the blossoms of wild blackberry and wild *Spiraea*—a study in seasonal distribution: N. Y. State Coll. Forestry (Tech. Pub. no. 10), 18 (4): 119–144 and bibliography.

1918. Apple tent caterpillar: Journ. Econ. Ent., 11: 432–433.

1919. Nature's control of the apple tent caterpillar: Empire Forester, (N. Y. State Coll. Forestry), 4: 25–26, 2 figs.

1919. Notes on forest insects. I. On two bark-beetles attacking the trunks of white pine trees: Psyche, 26 (4): 85–96, pl. 4.

1919. Notes on forest insects. II. Notes on several species of *Pityophthorus* breeding in the limbs and twigs of white pine: Psyche, 26 (5): 134–142, pls. 7–9.

1919. Report on the spruce budworm, 10 pp. Pub. by Maine Forestry Dept. in cooperation with Foresty Dept., Univ. of Maine and Maine Agr. Exp. Sta.

1919. Report on the white pine weevil, 12 pp. *op. cit.*

1920. Notes on forest insects. III. Two new species of *Pityophthorus* from Colorado: Psyche, 27 (1): 1–5, pl. 1.

1920. North American Ipidae of the subfamily Micracinae, with descriptions of new species and genera: Miss. Agr. Exp. Sta. Tech. Bull. no. 9: 1–62, pls. 1–5 and bibliography.

1921. Descriptions of eight new bark beetles (Ipidae) from Mississippi: Miss. Agr. Exp. Sta. Tech. Bull. no. 10: 1–16, pls. 1, 2.

1922. Mississippi bark beetles: Miss. Agr. Exp. Sta. Tech. Bull. no. 11: 1–130, pls. 1–18, bibliography and index to genera and species.

1922. New species of Ipidae from Màine: N. Y. State Coll. Forestry (Tech. Pub. no. 16), 22 (5): 117–136, pls. 6–9.

1922. Two new bark beetles from Colorado: N. Y. State Coll. Forestry (Tech. Pub. no. 16), 22 (5): 137–141, pl. 10.

1922. Description of *Hylocurus parkinsoniae* n. sp., with revisional notes on *Hylocurus* Eichhoff and *Micracis* Leconte: N Y. State Coll. Forestry (Tech. Pub. no. 16), 22 (5): 142–148, pl. 11.

1924. The effect of deficiency and excess in rainfall upon the hickory bark beetle: Jour. Econ. Ent., 17: 460–470, 1 fig.

1924. (With Harry H. Stage.) On the succession of insects living in the bark and wood of dying, dead and decaying hickory: N. Y. State Col. Forestry (Tech. Pub. no. 17), 24 (22): 3–240, pls. 1–14 and bibliography.

1928. The genus *Pityophthorus* Eichh. in North America. A revisional study of the Pityophthori, with descriptions of two new genera and seventy-one new species: N. Y. State Coll. Forestry Bull. (Tech. Pub. no. 25), 1 (3-b): 5–183, pls. 1–11, bibliography pp. 157–159 and index to genera and species pp. 209–212.

1928. Notes on Micracinae, with descriptions of twelve new species: N. Y. State Coll. Forestry Bull. (Tech. Pub. no. 25), 1 (3-b): 185–208, index to genera and species pp. 209–212.

1931. A revisional study of the genus *Pseudopityophthorus* Sw. in North America: Journ. Wash. Acad. Sci., 21 (10). 223–236, 15 figs. and bibliography.

1931. A revisional study of the genus *Gnathotrichus* Eichhoff in North America: Journ. Wash. Acad. Sci., 21 (12): 264–276, 18 figs. and bibliography.

1931. The Black Hills beetle (*Dendroctonus ponderosae* Hopk.): N. Y. State Coll. Forestry Bull. (Tech. Pub. no. 36), 4 (4): 1–97, pls. 1–10, 6 figs. and bibliography.

1934. A revisional study of the genus *Scolytus* Geoffroy (*Eccoptogaster* Herbst) in North America: U. S. Dept. Agr. Tech. Bull. 431: 1–30 and bibliography.

1938. New species of *Cactopinus* Schwarz (Coleoptera: Scolytidae)· Proc. Ent. Soc. Wash., 40 (6): 151–157.

1938. *Ancyloderes*, a new genus of Scolytidae: Proc. Ent. Soc. Wash., 40 (7): 204–206.

1938. The genus *Chramesus* Leconte in North America (Coleoptera: Scolytidae): Journ. Wash. Acad. Sci., 28 (12): 534–545, 9 figs. and bibliography.

1939. A new genus and three new species of Scolytidae from Argentina and Bolivia (Coleoptera): Rev. Ent. (Rio de J.), 10 (1): 86–96, 13 figs.

1940. The scolytid beetles of the genus *Renocis* Casey, with descriptions of nine new species: Proc. U. S. Nat. Mus., 88 (3084): 373–401, 2 figs.

1940. A new species of *Xylechinus* Chapuis from Montana (Coleoptera, Scolytidae): Proc. Ent. Soc. Wash., 42 (6): 123–125, 4 figs.

1940. Reviews article by W. J. Chamberlin—The bark timber beetles of North America north of Mexico—in Proc. Ent. Soc. Wash., Vol. 42, No. 2, pp. 46–47.

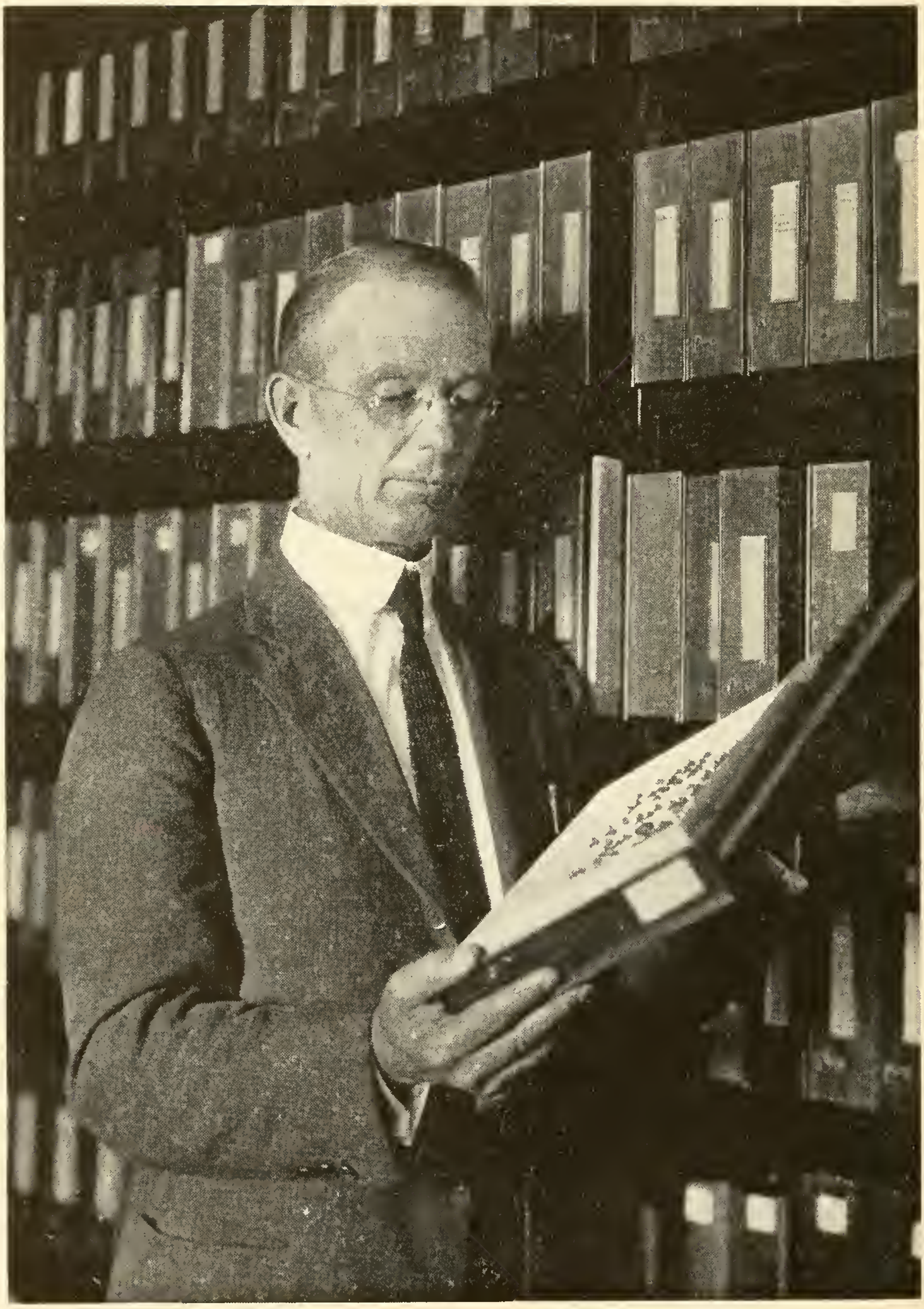
1941. Bark beetles of the genus *Hylastes* Erichson in North America: U. S. Dept. Agr. Misc. Pub. 417: 1–26 with index to genera and species.

1942. Revision of the bark beetles belonging to the genus *Pseudohylesinus* Swaine: U. S. Dept. Agr. Misc. Pub. 461: 1–31, 3 figs.

1942. New species of bark beetles (Pityophthorini) from Mexico and Tropical America (Coleoptera, Scolytidae): Proc. U. S. Nat. Mus., 92 (3147): 177–228, pls. 20–23.

1942. Revision of the genus *Phloeosinus* Chapuis in North America (Coleoptera, Scolytidae): Proc. U. S. Nat. Mus., 92 (3154): 397–474, pls, 38–41.

1943. New genera and species of bark beetles of the subfamily Micracinae (Scolytidae, Coleoptera): Proc. U. S. Nat. Mus., 93 (3165): 341–365, pls. 29, 30.



ELMER DARWIN BALL
1870 - 1943

1943. New genera and species of neotropical bark beetles (Coleoptera: Scolytidae): Journ. Wash. Acad. Sci., 33 (2): 34–38, 6 figs.
1943. New species of *Scolytoplatypus* Schaufuss from Malaysia (Coleoptera: Scolytoidea): Proc. Ent. Soc. Wash., 45 (5): 121–126, pl. 12.
1943. New species of American Scolytoid beetles, mostly neotropical: Proc. U. S. Nat. Mus., 94 (3174): 371–399, pls. 15, 16, 17. (Issued Nov. 22, 1943, a little more than a month after Dr. Blackman's death.)

F. C. Craighead, H. H. Stage, and L. L. Buchanan.

ELMER DARWIN BALL
1870–1943

Dr. Elmer Darwin Ball who was a member of our Society for more than twenty-five years, died October 5th, 1943. He was born in Athens, Vt., September 21, 1870, and in early life moved with his family to northwestern Iowa where he grew up in a pioneer farm community.

In early life he must have been interested in natural history and when entering Iowa State College, was already turning his attention to entomology in which he specialized during his college course. He graduated with a B. S. in 1895 and remained for two years as Assistant Entomologist in the Iowa Experiment Station, receiving his Master's Degree and then went to Colorado as assistant to Professor Gillette in the Colorado Agricultural Experiment Station. In 1902 he was Entomologist in the Agricultural College of Utah; from 1907 to 1916 he was Dean of Agriculture and Director of the Experiment Station. He served as State Entomologist of Wisconsin from 1916–18; Professor of Zoology and Entomology, Iowa State College and State Entomologist of Iowa, 1918–21; with leave of absence to serve as Assistant Secretary of Agriculture, June 12, 1920 to October 1, 1921. He also served as Director of Scientific Work 1921–5. He was in charge of celery insect investigations for the Florida State Plant Board, 1925–8; and Dean of Agriculture and Director of the Experiment Station, University of Arizona, 1928–31; after which he acted as Research Professor of Zoology and Entomology. During all of these years he was an ardent collector and discoverer of many new species of insects especially in the Homoptera. While in the Department of Agriculture one of his prominent contributions was a stubborn fight for a higher standard of training for scientific men. This included not only training but remuneration as well, and he is credited with organizing the Graduate School in the Department and serving as its director until 1925. He was also instrumental in the fight for establishing a Bureau of Home Economics and organized the Bureau of Agricultural Economics.

Dr. Ball was a tireless worker. He put in a great deal of overtime both before and after hours and on holidays and excused days. A considerable portion of this overtime work was given over to taxonomic work on leafhoppers. He maintained his collection in the corner behind his desk and whenever he had any time, even for short periods, he would work on it. Following his early interest in the sugar beet leafhopper and the curlytop diseases, he became very much interested in all manifestations of plant injuries caused by leafhoppers.

While in Washington he kept certain trees and shrubs under observation and made regular trips to examine them in working out not only the progress of leafhopper injuries, but the biologies of the insects themselves. He was essentially an "outdoor" entomologist and with ecological leanings. He tried to find explanations for the things he observed in nature. In 1906 he was the first to associate the beet leafhopper with the curly top disease of sugar beets in the West. He also, in 1918, was the first to discover that the potato leafhopper is responsible for causing tipburn or hopperburn of potato.

The Society was honored by his membership and the important contributions he has made to entomological science and in a wider sense to agricultural science in general.

Herbert Osborn, J. E. Graf, and F. W. Poos.

MINUTES OF THE 540TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON NOVEMBER 4, 1943

The 540th regular meeting of the Society was held at 8 P. M., Thursday, November 4, 1943, in Room 43 of the National Museum. President Harned presided and 42 members and 19 visitors attended. The minutes of the previous meeting were approved as read.

By a unanimous ballot the following men were elected to membership in the Society:

Sr. Gabriel Olalquiaga, Departamento de Sanidad Vegetal, Ministerio de Agricultura, Santiago, Chile.

Dr. Lyman S. Henderson, Bureau of Entomology and Plant Quarantine, Beltsville, Md.

Sr. Raúl Cortés, Entomologist, Departamento de Sanidad Vegetal, Ministerio de Agricultura, Santiago, Chile.

President Harned appointed the following as members of the Nominating Committee: J. A. Hyslop, S. B. Fracker, C. F. W. Muesebeck.

The President announced that he had asked three members to prepare an obituary notice of M. W. Blackman. The members are F. C. Craighead, L. L. Buchanan and H. H. Stage. He further announced that an obituary notice of E. D. Ball will be prepared by Herbert Osborn, J. E. Graf and F. W. Poos.

G. J. Haeussler exhibited a simple but effective trap which is being used by the Pear Psylla Control Project of the Bureau in scouting for infestations of pear psylla in the pear-growing areas of the Pacific Northwest. The trap consists of a 5 by 9 inch board painted yellow on both sides and covered with a sticky material. The board is hung in a tree and examined at intervals up to a month or more. It is not known if the psyllas are attracted to the board or merely get caught in the adhesive. In some respects these traps are more effective than visual scouting and are a good supplement thereto.

J. C. Bridwell exhibited specimens of the first species of bruchid described from Chile.

The species was described in 1833 by Gyllenhal as *Bruchus leguminaris*. The specimens which Mr. Bridwell exhibited were among material sent for identification, and were reared from a species of *Cassia*.

L. J. Bottimer exhibited specimens of one of the cowpea bruchids, *Callosobruchus chinensis* (L.), together with the seeds of the broad bean, *Vicia faba*, from which they were reared. The specimens had been received from Lt. S. C. Billings from somewhere in China. This is apparently a new host record for this insect.

The first paper on the regular program, entitled Present Day Entomology in Chile, was presented by Sr. Raúl Cortés, Entomologist, Departamento de Sanidad Vegetal, Ministerio de Agricultura, Santiago, Chile.

Sr. Cortés' paper will appear in full in an early number of the Proceedings [1] and therefore no abstract was prepared.

The second paper on the program, The Program of the American Association of Economic Entomologists and The Entomological Society of America, to be given jointly at Columbus, Ohio, December 7–9, 1943, was presented by W. H. White and C. F. W. Muesebeck, Bureau of Entomology and Plant Quarantine.

An outline was given of the main subjects to be discussed at the Columbus Meetings.

M. P. Jones made a few remarks on the program of the meeting of the Eastern Branch of the American Association of Economic Entomologists which was held November 18–19, 1943, at Philadelphia, Pennsylvania.

The third paper, entitled Some Examples of Control Projects in which the Bureau of Entomology and Plant Quarantine is cooperating, was presented by W. L. Popham, Bureau of Entomology and Plant Quarantine.

Mr. Popham exhibited a map upon which were indicated the areas in which cooperative control projects are being carried on. Some of these projects are concerned with the control of insects which themselves cause the principal

[1] Vol. 45; 226, 1943.

damage, such as the gypsy moth, Japanese beetle, white-fringed beetle, etc. Others are directed against plant diseases and the insect vectors thereof, such as Dutch elm disease and peach mosaic.

The most economical way to protect a particular crop from a specific insect of plant disease is to prevent the introduction of the pest into the area or areas where the crop is grown. When a destructive pest penetrates our quarantine lines the immediate object of measures taken against it may be eradication, or it may be control to provide time for gathering information on the pest; or it may be to delay the spread of the pest while developing an economically sound method of producing crops in its presence. In most cases there is little hope of eradicating pests indigenous to this country, or those of foreign origin that have been permitted to become firmly established over extensive areas. The best that can be done is to limit the amount of damage they cause.

Experiences of the past twenty years have taught many lessons regarding large-scale control programs. One of the most obvious is the need for closely coordinated effort on the part of all agencies directly or indirectly concerned with the problem. To conduct a control program with an acceptable degree of effectiveness may require the coordinated efforts of law makers and law enforcers, research entomologists, plant pathologists, geneticists, cultural specialists, chemists and extension workers. To operate effectively, leaders in control work must acquaint themselves with cultural practices that are generally followed in the infested area in order that they may intelligently determine the practical limitations within which these practices may be varied as an aid to control. Systematic surveys to determine the limitations of infested areas are essential. The most vulnerable point in the life cycle of the insect or disease must be determined. A sympathetic understanding on the part of property owners must be developed, and the measures recommended for combating pests must be developed, and the measures recommended for combating pests must be economically sound and otherwise practical. Frequently this taxes the ingenuity of everyone concerned with the problem.

Mr. Popham exhibited a series of lantern slides of machinery used in control of insects. The series began with the early, hand-operated sprayers and showed the development of more and more modern equipment, to the use of airplanes in the application of insecticides.

The following visitors were introduced to the Society: E. J. Hambleton, Major P. J. Kopp, Miss H. I. Gibbon, Mr. W. B. Hull, C. F. Rainwater, Dr. Y. P. Sun, W. H. Mitchell and Sgt. Millspaugh.

Adjournment at 9:55 P. M.

W. H. ANDERSON,
Recording Secretary.

Actual date of publication, January 28, 1944.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions	$3.00
To members of the Society	$2.40

A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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

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

F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
Washington 25, D. C.

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VOL. 46 February, 1944 No. 2

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

THE ENTOMOLOGICAL SOCIETY OF WASHINGTON
1884

Published Monthly Except July, August and September

BY THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON
U. S. NATIONAL MUSEUM
WASHINGTON 25, 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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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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The Corresponding Secretary and Treasurer should be addressed similarly.

EPHRAIM PORTER FELT
1868 - 1943

PROCEEDINGS OF THE

Entomological Society of Washington

VOL. 46 FEBRUARY, 1944 No. 2

EPHRAIM PORTER FELT

1868-1943

In the death of Dr. Ephraim Porter Felt on December 14, 1943, our society lost a distinguished member. Death, due to a heart ailment, came suddenly while Dr. Felt was in his office at Stamford, Connecticut. He had returned to Stamford only a few days before from Columbus, Ohio, where he had attended the annual meetings of the American Association of Economic Entomologists. He had been very active in the affairs of that organization and he remarked at Columbus that since 1898 he had missed only two of the annual meetings. Unfortunately for the Entomological Society of Washington he was rarely in the city on meeting dates and therefore did not participate actively in the business of our society; but he was a member for more than forty years, having been elected in 1899.

Born in Salem, Massachusetts January 7, 1868, Dr. Felt graduated from the Massachusetts Agricultural College in 1891 with the bachelor of science degree. He was employed in 1891 as assistant to the late Professor C. H. Fernald to make observations and conduct experiments on the gypsy moth for the Massachusetts Board of Agriculture. In 1892–93 he held a fellowship at Cornell University, and in 1894 he was awarded the doctorate of science by that institution. During the two school years of 1893–95 he taught in the science department of Clinton Liberal Institute, Fort Plain, New York; and in September 1895 he was named assistant to Dr. J. A. Lintner, then State Entomologist of New York. He was appointed State Entomologist in 1898, upon Dr. Lintner's death, and continued in that position until 1928 when he retired. Directly after his retirement, however, he became chief entomologist and director of the Bartlett Tree Research Laboratories, with headquarters in Stamford Connecticut. This post he retained up to the time of his death.

Dr. Felt's long and active career was one of varied entomological interests. His publications dealt with many different fields but conspicuously emphasized two, the control of insects affecting ornamental, shade and forest trees, and the classification of the gall midges comprising the family Itonididae, often called the Cecidomyiidae. In both fields he published voluminously. In addition to numerous short papers on the insects of ornamental and forest trees and shrubs he produced certain larger reference works, notably a manual in two volumes entitled "Insects Affecting Park and Woodland Trees," which was issued as Memoir 8 of the New York State Museum in 1905 and 1906, and a "Manual of Tree and Shrub Insects" in 1924. The latter work was later revised and enlarged and in 1932 the revision was published jointly with Dr. W. H. Rankin under the title "Insects and Diseases of Ornamental Trees and Shrubs." His taxonomic work on the Itonididae began in 1902 and the results of his studies are given in a long series of published papers, more than 160 in number. He worked so energetically on the classification of this family, dealing with both the insects themselves and the galls they produce, that the group has for a generation remained almost exclusively his, so far as the North American fauna is concerned. For the past forty years he has been the American authority on the gall midges. He described a very great number of new genera and species, and these descriptions, in considerable part, are scattered through numerous short papers; but included among his works on this family of Diptera are certain large and important contributions to our knowledge of the basic classification of the group. Of greatest significance is the series of eight papers entitled "A Study of Gall Midges" published between 1913 and 1925 in the reports of the Entomologist of the State of New York. They total 1094 pages and are illustrated with 464 text figures and 76 plates of halftones. They contain keys to the subfamilies, genera and species, give descriptions or redescriptions of the numerous forms treated and record observations on habits. In short, they represent one of the most comprehensive systematic treatments ever to be published on the Nearctic fauna of any single major family of insects. As already indicated Dr. Felt's studies on the classification of the adults of the Itonididae were supplemented by a vast amount of work on the galls these insects produce. Fortunately, his exceptional knowledge of the galls also has been largely preserved for others through his publication in 1918 of a "Key to American Insect Galls" (N. Y. State Museum Bull. 200) and the revision of this work which appeared in 1940 under the title "Plant Galls and Gall Makers" (Comstock Publishing Co.). These publications, like those on the adults of the Itonididae, are exceedingly well illustrated, and their usefulness is further increased by the inclusion of galls formed by other insects than the Itonididae. It is then these two widely different entomological activities that stand out in any consideration of Dr. Felt's scientific achievements; and both the applied entomologists and the systematists are warranted in claiming him as one of their number.

While producing so great a volume of scientific contributions and performing certain administrative tasks few would have found time for anything more. Dr. Felt, however, also carried a heavy load of editorial work over a long period, practically all of this being done at home in the evening. From 1898 to 1911 he was entomological editor of the Country Gentleman. This was a comparatively simple assignment; but in 1908 he assumed a much more difficult and time-consuming responsibility. It was in that year that the American Association of Economic Entomologists began publication of the Journal of Economic Entomology and he was elected editor. In that capacity he served the Association twenty-eight years, until 1936, when the arduous duties of the office were taken over by a younger member and Dr. Felt was named honorary editor. As editor of the Journal of Economic Entomology he cooperated with the Federal Bureau of Entomology and later with the Bureau of Entomology and Plant Quarantine in editing the Index to the Literature of Economic Entomology which was published by the American Association of Economic Entomologists, the volumes appearing at four- or five-year intervals between 1917 and 1942. Few entomologists have lived more active lives or have participated in so wide a range of entomological fields.

Besides being a member of the Entomological Society of Washington and of the American Association of Economic Entomologists, he was a fellow and emeritus life member of the American Association for the Advancement of Science, a fellow of the Entomological Society of America, and a member of the New York Entomological Society. He was president of the American Association of Economic Entomologists i 1902 and vice-president of the Entomological Society of America in 1916. A further honor was conferred on him in 1901 when, at the Pan-American Exposition in Buffalo, he was awarded a gold medal and three silver medals for his scientific contributions.

Dr. Felt's private life was likewise very full. In some way he found time for active participation in civic affairs, being for a number of years a member of the Board of Education and of the Public Library Committee of Nassau, New York where he lived many years. For a time he was a deacon of the Dutch Reformed Church of Nassau and superintendent of the Sunday School. His evenings, however, were mostly spent at home, for he did not care particularly for outside social activities, and as already indicated, they were to a large extent devoted to editorial work; but he always found time to read to and to play with his children when they were young, and in later life he and Mrs. Felt became much interested in chess. She died in 1939 but Dr. Felt is survived by two brothers and a sister, three daughters, one son, and thirteen grandchildren.

C. F. W. Muesebeck and C. W. Collins

ANTS OF THE GENUS CARDIOCONDYLA EMERY IN THE UNITED STATES

By Marion R. Smith

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

This article attempts to present all facts known to the author concerning the taxonomy, biology, and distribution of the four species of *Cardiocondyla* that have been recorded from the United States. Although these species have been found only in Florida, it is reasonable to expect that representatives of the genus will be collected eventually in some of the other subtropical areas in the country, since its members are known to occur over most of the warmer regions of the earth. Often it is extremely difficult to ascertain whether the species in a given region are native or introduced. Certainly the small size of the ants and their colonies, as well as their habit of nesting within plants or other exportable material, would afford them an excellent means of becoming widely disseminated by commerce. Emery (1909, Deut. Ent. Ztschr. p. 27) states that although *emeryi* Forel was described from specimens taken in St. Thomas, Virgin Islands, he believes it was probably introduced there from an original home in Asia. Wheeler (1932, N. Y. Ent. Soc. Jour. 40: 7) also remarks that two of the species occurring in Florida (*nuda* var. *minutior* Forel and *wroughtoni* var. *bimaculata* Wheeler) were probably introduced. He did not venture an opinion on the remaining species.

Although the biology of our species is little known, *emeryi*, at least, has been observed to nest in the soil and within cavities of plants and, like the variety *bimaculata*, has been found visiting honeydew-excreting insects and feeding on the flesh of small arthropods.

One of the most interesting facts about these ants is the occurrence of ergatoid, or wingless, workerlike males in some of our species and the strong probability that they are produced by all of them. Only the ergatoid male is known for the species *wroughtoni*, and this is so peculiar in appearance that when Forel (1890, Ann. Soc. Ent. de Belg. 34: 110) described it he proposed the new generic name *Emeryia* for it. Recently the author has seen an ergatoid male among some specimens of *wroughtoni* var. *hawaiiensis* Forel from Hawaii; hence, it may be expected that this type of male likewise occurs in the variety *bimaculata*. For many years *emeryi* was known to possess only a normal male, but recently Borgmeier (1937, Rev. de Ent. 7: 132) has shown that this species also has an ergatoid male. So perplexing have been the females, males, and ergatoid males of *Cardiocondyla* that so illustrious a formicologist as Emery

(1909, ibidem) erroneously described an apterous, ergatoid individual as the female of *emeryi*, the specimen having been received with some *emeryi* workers from St. Thomas, Virgin Islands. Later (1917, Soc. Ent. de France Bull. p. 96), realizing his error, he erected the genus *Xenometra* for this female, which he assumed to be parasitic. Such instances clearly indicate the need for more diligent study in the genus.

This article has been based largely on specimens in the United States National Museum, the Museum of Comparative Zoology, and the personal collection of Dr. Wm. M. Mann. In addition, various friends have contributed specimens and notes. Unless otherwise stated the generic and specific descriptions as well as the keys are those of the author and apply only to the species in the United States. Only selected references are given. Figures of the worker cast of each species are included as an aid to recognition.

Cardiocondyla Emery

Cardiocondyla Emery, 1869, Accad. degli Aspiranti, Naples Ann. 2: 21.
Emeryia Forel, 1890, Soc. Ent. de Belg. Ann. 34: 110.
Leptothorax Mayr (part), 1866, Sitz. ber. Akad. Wiss. Wien 53: 508.
Monomorium Santschi (part), 1912, Soc. Ent. de Belg. Ann. 56: 163.

Genotype, *Cardiocondyla elegans* Emery (monobasic).

Worker.—Monomorphic. Length 1.6–2.5 mm. Head subrectangular, longer than broad, with straight or faintly emarginate posterior border, rounded posterior corners, and feebly convex, almost subparallel sides. Antenna 12-segmented; funiculus with a 3-segmented club, the last segment of which is often several times as long as the preceding segment; funicular segments 3 through 5 as broad as or broader than long. Eye prominent, placed less than its greatest diameter from base of mandible. Frontal carinae short, scarcely divergent posteriorly. Frontal area small, indistinct, or lacking. Clypeus projecting above mandibles, middle of anterior border subtruncate. Prothorax usually with pronounced humeri. Promesonotal suture obsolescent or absent. Mesoepinotal constriction sometimes absent but more often weakly to rather strongly developed. Epinotum usually with a pair of short or moderately long, rather blunt spines (spines sometimes even tuberculate). Petiole distinctly pedunculate. Post-petiole very noticeably broader than petiole, much broader than long, with rounded sides and rather subparallel anterior and posterior borders. First segment comprising most of gaster. Body reticulate-punctate, the head often subopaque. Body with closely appressed, grayish pubescence. Erect hairs almost absent except for a few on mandibles, clypeus, and posterior part of gaster. Habitus of a *Leptothorax*.

Female.—Length 2.25–3 mm. Larger than worker. Ocelli present but small. Thorax of the usual female structure. Mesonotum projecting prominently into the pronotum. Anterior wing with small stigma and an incomplete or poorly defined cubital cell. Radial and discoidal cells lacking. Body usually more coarsely sculptured than that of worker; otherwise, except for the normal female structures, very similar to worker.

Ergatoid male (*a*).—Length 1.7 mm. Antenna 11-segmented (12-segmented in the worker) one of the segments being lost through a more or less imperfect fusion of 2 segments. Mandible very long and narrow, without masticatory border, rather strongly curved in the apical half and tapering into an acute point. No ocelli. Anterior border of clypeus with a very strong emargination, on each side of which there is a pronounced angle or tooth. Eye somewhat similar to that of worker. Thorax wingless, with a slight resemblance to that of worker. Pronotum with very strong humeral angles. Mesonotum with a prominent, transverse gibbosity which is extended on each side as a distinct protuberance. Epinotum with a pair of short spines or tubercles. Postpetiole of a shape somewhat similar to that of the worker but more subrectangular.

Occurs occasionally in *emeryi* and will very probably be found in *wroughtoni* var. *bimaculata*.

Ergatoid male (*b*).—Apterous and workerlike. Mandible with 4 or 5 teeth. No ocelli. Antenna 12-segmented, shorter and thicker than in worker. Eye not so large as in normal male. Pronotum with more pronounced humeri than in worker. (Adapted from Forel, 1904, Rev. Suisse Zool. 21: 7.)

An ergatoid male answering to this general description will very probably be found in *nuda* var. *minutior*, and there is also reasonable likelihood that it may be found in *venustula* since both these forms are closely related to *nuda*, a species which has an ergatoid male of this type.

Male.—2 mm. Antenna 13-segmented. Ocelli small. Eye prominent, placed close to base of mandible. Mandible of same general shape as in worker. Thorax of the usual male conformation but lacking Mayrian furrows. Anterior wing with a small stigma, and an incomplete or poorly defined cubital cell. Radial and discoidal cells lacking. Petiole and postpetiole with a striking similarity to that of worker. Genital appendages small.

Key to Species

(For identification of workers)

1. Petiolar node, from above, very distinctly longer than broad, compressed. (Prothorax with well defined humeral angles. Promesonotum compressed. Epinotal spines short, stout, approximately half as long as their interapical space. Last segment of antennal club more than 3 times the length of the preceding segment. Color usually yellowish red to dark reddish with brown or black gaster, light appendages, and the antennal club distinctly infuscated.) (Plate 5, fig. 1)....................................*emeryi* Forel

   Petiolar node, from above, not as described, more subglobular and lacking the distinctly compressed appearance........................ 2

2. Epinotum with a pair of extremely small, scarcely perceptible tubercles instead of spines. Body length 2–2.25 mm. (Last segment of antennal club approximately twice the length of the preceding seg-

ment. Mesoepinotal constriction distinct. Prothorax with rounded humeral angles.) (Plate 5, fig. 4) .... *venustula* Wheeler

Epinotum with a pair of very short to moderately long spines. Smaller species 3

3. Gaster pale brown to brown with a spotlike infuscation on each side, which is sometimes rather indistinct. Mesoepinotal constriction pronounced (best seen in profile). Epinotal spines moderately long and prominent, longer than one-half their interapical space. (Plate 5, fig. 2) .... *wroughtoni* var. *bimaculata* Wheeler

Gaster of a deep uniform brown or black. Mesoepinotal constriction either absent or weakly developed. Epinotal spines very short, scarcely one-half the length of their interapical space. (Plate 5, fig. 3) .... *nuda* var. *minutior* Forel

Cardiocondyla emeryi Forel

(Plate 5, fig. 1, worker)

Cardiocondyla emeryi Forel, 1881, Mitt. Muench. Ent. Ver. 5: 5, *worker*; Andre, 1881, Soc. Ent. de France Ann. 1: 69, pl. 3, *worker*, *male;* 1882, Spec. Hymen. Europe 2: 328, pl. 21, figs. 9–12, 14, *worker*, *male;* Wheeler, 1905, Am. Mus. Nat. Hist. Bull. 21: 89; ibidem, 24: 128, pl. 11, fig. 6; Emery, 1909, Deut. Ent. Ztschr. p. 20, 26, fig. 7, *a*, *b*, *e;* Arnold, 1916, So. Afr. Mus. Ann. 14: 200, pl. 5, f. 57, *worker*, *female*, *male;* Emery, 1922, Gen. Insect. Fasc. 124, pp. 124–125, pl. 2, fig. 20; Smith, 1930, Fla. Ent. 14: 4; Wheeler, 1932, N. Y. Ent. Soc. Jour. 40: 7; Smith, 1936, Puerto Rico Univ. Jour. Agr. 20: 835, fig. 1; Borgmeier, 1937, Rev. de Ent. 7: 129–134, *ergatoid male*, p. 133, figs. 1–5.

Worker.—Length 1.6–2.1 mm. Head subrectangular, approximately one and one-third times as long as broad, with almost straight posterior border, rounded posterior corners, and feebly convex, subparallel sides. Scape lacking twice its greatest width of reaching posterior border of head. Last segment of antennal club more than 3 times the length of the preceding segment. Eye prominent, but not strongly convex, placed less than its greatest diameter from base of mandible. Frontal carinae short, scarcely divergent posteriorly. Frontal area small, not well defined. Clypeus produced, prominently projecting above mandibles (best seen in profile); from above, the median area of the anterior border appearing subtruncate, with the lateral section beneath each antennal socket laminate and not concealing the antennal insertion. Mandible with approximately 4 to 6 teeth. Thorax, from above, without promesonotal suture but with very distinct humeral angles and mesoepinotal constriction; promesonotum compressed. Epinotal spines short, rather stout, approximately half as long as their interapical space. Petiolar node, from above, convex, distinctly longer than wide, somewhat compressed. Postpetiole convex above, about one-third broader than long, with almost straight anterior and posterior margins, and convex sides. Legs moderately long and slender; middle and hind tibiae without spurs.

Head and thorax above rather finely reticulate-punctate, gaster smooth.

Body and appendages with fine, grayish, very closely appressed pubescence.

Hairs almost absent from body except on clypeus, mandibles, and posterior end of gaster.

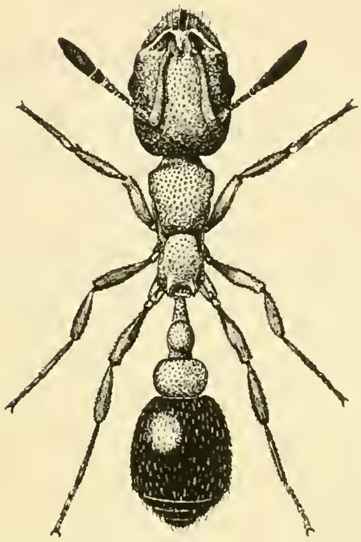
Head, thorax, petiole, and postpetiole varying from light to dark yellowish red, gaster uniform dark brown or black, appendages light, with the antennal club very distinctly infuscated.

Description based largely on specimens from Mayaguëz, Puerto Rico, collected by the author.

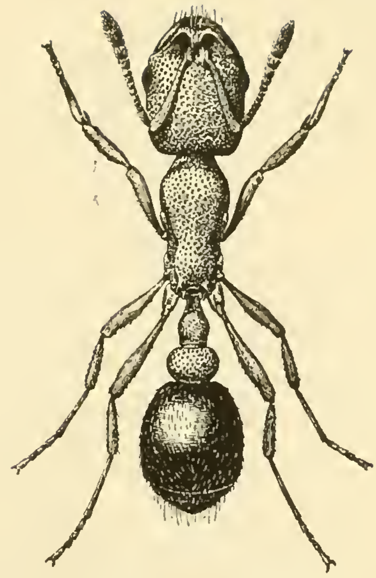
"*Female.*—Length 2.5 mm. Head, thorax and petiole brown, abdomen black, legs, antennae and mandibles yellow, the club of the flagellum infuscated. Head very similar to that of worker, but a trifle wider. Eyes rather small, very little larger than in the worker. Ocelli small, inconspicuous and sunk a little below the surface. Pronotum widely exposed at the anterior lateral angles, which are rounded; the median portion of the pronotum is occluded by the mesonotum, which extends far forward in the middle. The mesonotum is convex in front, very feebly convex or nearly flat transversely in its posterior half. The scutellum is rather flat, very slightly raised above the level of the metanotum. Dorsum of the epinotum wider than long, widest at the base, sloping downwards posteriorly; the epinotal teeth are longer than in the worker. Abdomen similar to that of the worker but larger. Wings hyaline, the nervures hardly distinguishable. Puncturation as in the worker. The pubescence of the abdomen longer and more abundant than in the worker." (Arnold, 1916, So. Afr. Mus. Ann. 14: 201–202.)

The following description by Borgmeier (1937, Rev. de Ent. 7: 132) is based upon one specimen found with 6 workers in a small acacia gall at Rio de Janeiro, Brazil, on July 15, 1935:

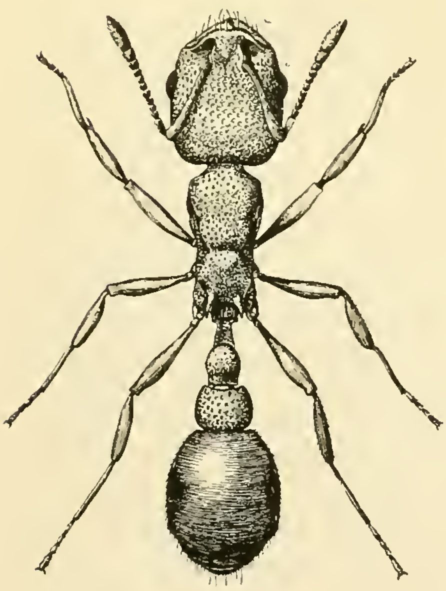
"*Ergatoid male.*—Length 1.7 mm. Head without mandibles slightly longer than wide (55 : 50), narrower anteriorly, posterior angles broadly rounded, posterior border straight. Eyes relatively small, slightly convex, situated in the anterior third of the sides of the head. Mandible very long, linear, without apical border, tapering toward the apex and pointed, straight in the basal half, curved in the apical half. Clypeus emarginate in front, with 2 carinae which enclose a deep and wide furrow; this furrow prolonged into the frontal area up to the middle of the front. Frontal carinae short, divergent posteriorly. Antenna 11-segmented, the 5th funicular segment with a small incision on both antennae. The first funicular segment elongate, claviform, as long as the combined length of the 3 succeeding segments; terminal segment clavate, slightly longer than the combined length of the 6 preceding segments. Scape more or less exceeding three-fourths the length of the head. Pronotum with sharp humeral angles. Promesonotal suture faintly indicated, strongly convex anteriorly. Mesonotum slightly longer than wide (4 : 3), with a transverse gibbosity which forms on each side a triangular protuberance. Meso-epinotal suture represented by a deep furrow. Base of epinotum longer than wide, and also longer than the declivity; slightly convex anteriorly, posteriorly with 2 obtuse teeth. Pedicel as in worker. Petiole pedunculate, node small, elongate



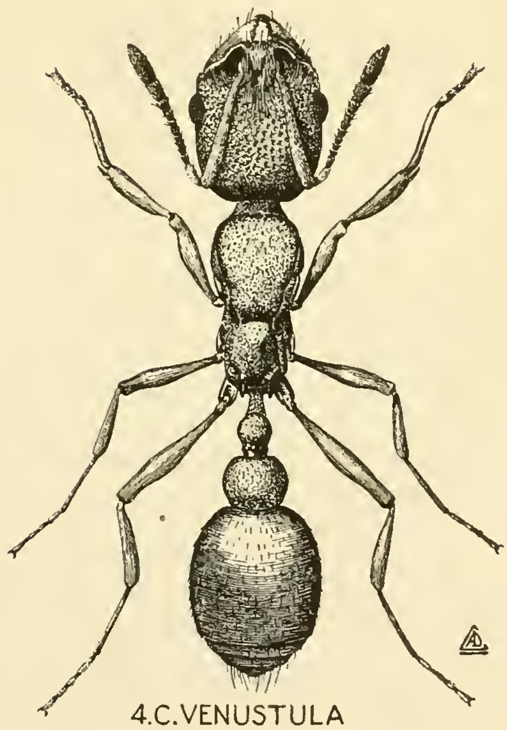
1. C. EMERYI



3 C. NUDA var. MINUTIOR



2. C. WROUGHTONI
var. BIMACULATA



4. C. VENUSTULA

Workers of the United States Species of *Cardiocondyla* Emery.
Fig. 1, *emeryi* Forel; Fig. 2, *wroughtoni* var. *bimaculata* Wheeler;
Fig. 3, *nuda* var. *minutior* Forel; Fig. 4, *venustula* Wheeler.
(Illustrations by Arthur D. Cushman)

oval, in profile slightly convex. Postpetiole much wider than petiole, with straight anterior border (in *wroughtoni* the anterior border is concave), the lateral borders slightly convex. Gaster oval, truncate in front.

"Mandibles and head glossy, with sparse, finely pointed hairs. Thorax moderately dull, punctate-reticulate. Pedicel and gaster shiny, with fine, sparse punctures. Head, mandibles, pedicel, gaster and legs with a yellowish pubescence, prostrate and relatively long. Thorax naked. No erect pilosity. Color pale, testaceous-yellow. Gaster fuscous-yellow."

Male.—Length 2 mm. Head approximately one and two-tenths times as long as broad, with rounded posterior border, and sides strongly convergent above eyes. Ocelli small, situated on a very slight protuberance. Eye prominent, rather strongly convex, placed close to base of mandible. Antenna 13-segmented, all segments longer than wide; scape approximately as long as the combined lengths of the first 5 or 6 funicular segments. Clypeus not projecting above base of mandibles so prominently as with worker, and also with less well developed lateral laminae. Mandible with 4 or 5 teeth, the 2 apical teeth rather prominent. Prothoracic humeri distinct. Parapsidal sutures but no Mayrian furrows. Middle of anterior border of mesoscutum somewhat angularly projecting into the prothorax. Pronotum, from above, not concealed by mesoscutum. Epinotal spines about as in worker. Legs moderately long and slender. Anterior wing pale, with small but distinct stigma, and a single cubital cell. No discoidal or radial cells. Petiole, postpetiole, and gaster similar to those of worker. Genital appendages small, usually not exposed. Sculpture, pilosity, and pubescence like those of worker. Color differing from that of worker mainly in that the head is somewhat darker, and that the funiculus, with the exception of the first segment is infuscated.

The above description is drawn from a specimen from Havana, Cuba, collected by "Baker" and deposited in the collection of the Museum of Comparative Zoology. Arnold (1916, ibidem, p. 202) states, "scape about as long as the first 8 joints of the flagellum." This is not true for the Cuban specimen or for a specimen from Makapun, Hawaii, collected by O. H. Swezey. In these ants the scape is approximately as long as the combined length of the first 5 or 6 funicular segments.

The worker of *emeryi* can be readily recognized by its very characteristic petiole, the short, stout epinotal spines, compressed promesonotum, prominent humeral angles, distinct but not strongly pronounced mesoepinotal constriction, and color. Both color and sculpture are variable, however.

This seems to be one of the best known and most widely distributed species of the genus. The ant no doubt owes a great deal of its distribution to commerce. Wheeler (1908, Amer. Mus. Nat. Hist. Bull. 24: 128), writing of the presence of *emeryi* in Puerto Rico, remarked, "the colonies of this ant are small and occur in sandy places, especially in river or creek bottoms and on sea beaches." The author has found that although such situations are commonly inhabited by *emeryi* in Puerto

Rico, nests are also constructed in clay soil. The nest entrances are very small and therefore are easily overlooked. Borgmeier (1937, ibidem, p. 131) has also found colonies nesting in cane culms, and in *Solanum*. He thinks that the species is indigenous to Brazil. As previously mentioned, *emeryi* has both a normal and an ergatoid male of the (*a*) type, the former being much more common.

Type locality.—St. Thomas, Virgin Islands.

Other localities.—Florida: Coral Gables (R. E. Gregg) in weedy field, Miami (collection of American Museum of Natural History), and dry marsh on Tamiami Trail, 10 miles south of Miami (R. E. Gregg); Bahamas; western Mexico; West Indies; Island of Madeira; Belgian Congo; South Africa; Madagascar; Palestine; Syria; East Indies; Formosa; Guam; Polynesia; Tahiti; Territory of Hawaii.

Cardiocondyla venustula Wheeler

(Plate 5, fig. 5, worker)

Cardiocondyla venustula Wheeler, 1908, Amer. Mus. Nat. Hist. Bull. 24: 128-130, pl. 11, fig. 5, *worker*, *female;* Wheeler and Mann, 1914, Amer. Mus. Nat. Hist. Bull. 23: 19, *female;* Smith, 1936, Puerto Rico Univ. Jour. Agr. 20: 836, fig. 2, *worker;* Wolcott, 1936, ibidem 20: 543, fig. 5; Wheeler, 1936, Harvard Univ. Mus. Compar. Zool. Bull. 80: 199, *worker.*

Cardiocondyla nuda var. *minutior* Smith, not Forel, 1933, Fla. Ent. 17: 25.

Worker.—Length 2–2.25 mm. Head subrectangular, approximately one and one-fourth times as long as broad, with rounded posterior corners, very weakly emarginate posterior border, and weakly convex, subparallel sides. Antennal scape lacking a space almost equivalent to its greatest width of reaching the posterior border of the head; last segment of club approximately twice the length of the preceding segment, funicular segments 3, 4, and 5 broader than long. Eye prominent, moderately convex, placed slightly less than its greatest diameter from base of mandible. Frontal carinae short, scarcely divergent behind. Frontal area small, triangular. Clypeus about as described for *emeryi.* Mandible with 5 or 6 teeth, the 2 apical teeth rather prominent. Thorax, from above, larger, stouter, and more convex than that of *emeryi.* Prothorax with rounded humeri. Mesoepinotal constriction rather prominent, best seen in profile. Epinotum with a pair of very small, scarcely perceptible tubercles, base of epinotum at least one and one-half times as long as the declivity. Petiolar node, from above, subglobular, about twice as wide as long, tapering off rather rapidly into the peduncle. Postpetiole transversely elliptical, about one and one-fourth times as broad as long. Legs moderately long and slender.

Mandibles rather smooth and shining although bearing a few scattered punctures. Clypeus longitudinally rugulose. Head reticulate-punctate. Meso- and metapleura densely punctured, thorax above more finely sculptured. Head subopaque; thorax, petiole, and postpetiole somewhat more glabrous.

Pubescence fine, closely appressed, grayish in some lights. Hair as in *emeryi.*

Head and gaster usually a deep brown, approaching black; thorax, petiole, and postpetiole somewhat lighter. Legs and scape usually even lighter, antennal funiculi infuscated.

Redescribed by author from cotype specimens.

"*Female.*—Length 2.75–3 mm. Resembling the worker. Thorax narrower than the head, more than twice as long as broad, somewhat flattened above. Epinotal teeth stronger than those of the worker but of the same shape. Petiole and postpetiole of the same shape and proportions.

"Head, thorax and postpetiole opaque above; petiole slightly more shining; all of these parts uniformly reticulate-rugose; the mesonotum behind with more longitudinal rugae; epinotal declivity smooth and shining.

"Pubescence as in the worker. Wings minutely hairy, with long marginal fringe on the posterior pair.

"Head, thorax, and nodes of petiole uniformly dark brown; gaster black, except the bases of segments 2–4, which are yellowish. Mandibles, legs and antennae of the same color as in the worker. Wings white with colorless veins and stigma." (Wheeler, 1908, Amer. Mus. Nat. Hist. Bull. 24: 129).

Male.—Unknown. Will very probably be an ergatoid male of the (*b*) type.

The worker of *venustula* can be distinguished by its large size, subglobular petiolar node, small tubercles on the epinotum, rounded humeri, prominent longitudinal rugulae of the clypeus, and color.

Wheeler (1908, ibidem, p. 130) states, "*C. venustula* is not uncommon in sandy and gravelly places, especially on the sea beaches where it lives in small colonies, comprising a single dealated queen and a few dozen workers, in shallow nests like those of some species of *Leptothorax*." Wheeler collected winged females at Coama Springs, Puerto Rico, on March 23 while they were issuing from a nest in a gravelly creek bottom. H. L. Dozier collected workers on several occasions from dry cow dung in very arid pastures at Ponce, Puerto Rico.

Type localities.—Culebra Island; Coama Springs, Puerto Rico.

Other localities.—Florida: Hollywood (D. E. Read); Haiti: Jacmel (W. M. Mann); Mona Island (Lutz); Puerto Rico: Ponce and Guyama (H. L. Dozier), Mayaguëz (M. R. Smith).

Cardiocondyla nuda var. **minutior** Forel

(Plate 5, fig. 3, worker)

Cardiocondyla nuda var. *minutior* Forel, 1899, Fauna Hawaiiensis 1: 120, *worker;* Wheeler, 1932, N. Y. Ent. Soc. Jour. 40: 7; Phillips, 1934, Hawaii Univ. Expt. Sta. Pineapple Prod. Coop. Assn. Ltd. Bull. 15: 21–22.

Worker.—Length 1.5–1.7 mm. Head subrectangular, approximately one and one-fourth times as long as broad, with apparently straight posterior border, rounded posterior corners, and feebly convex, subparallel sides. Antennal scape lacking approximately twice its greatest width of reaching posterior border of head; funicular segments 3 through 7 broader than long, last funicular segment approximately 3 times length of preceding segment. Eye prominent, moderately convex, placed approximately one-half its greatest diameter from base of mandible. Frontal carinae short, subparallel, scarcely divergent posteriorly. Frontal area triangular, very small, but distinct. Clypeus somewhat similar to that of *venustula*. Mandible with 2 prominent apical and 3 or 4 smaller basal teeth. Prothorax with distinct subangular humeri. Promesonotal suture missing. Mesoepinotal impression absent or very weakly developed. Epinotal spines short, scarcely longer than one-half their interapical space. Petiole, from above, subglobular. Postpetiole approximately one and one-third times as broad as long, with almost straight anterior and posterior borders and very convex sides. Base of gaster meeting sides in very slightly perceptible angles; first segment occupying most of gaster.

Mandible more or less shining in spite of the scattered, piligerous punctures. Clypeus longitudinally rugulose. Head, thorax, petiole, and postpetiole reticulate-punctate. Punctures on side of thorax dense. Gaster smooth and shining.

Pubescence fine, grayish, closely appressed, in some lights appearing rather dense on head and gaster. A few erect hairs on mandibles, clypeus, and posterior section of gaster.

Head usually dark brown but apparently never so dark as the gaster, which varies from a very dark brown to black. Thorax, petiole, postpetiole, legs, and antennae lighter. Antennal funiculus usually infuscated, especially in the region of the club.

Description based largely on workers from Pensacola, Fla., collected by R. M. Lhamon and F. F. Bibby.

Female.—Length 2.25–2.5 mm. Similar to worker except for its larger size, more angular humeri, slightly broader postpetiole (one and one-half times its length), much darker and more nearly uniform color of body, more apparent pubescence, and more coarsely sculptured body, especially the thorax. There are also unusually small ocelli on the head.

Description drawn from two females collected at Kunia, Island of Oahu, Territory of Hawaii, by Kiyoshi Ito.

Male.—Unknown. Will very probably be of the ergatoid (*b*) type.

The worker of this small species can be distinguished by its more or less subglobular petiolar node, absent or very weakly developed mesoepinotal impression, short epinotal spines, subangular humeri, and color, in which the head is usually dark brown, the gaster even darker, and the appendages and remainder of the body lighter than either.

Phillips (1934, ibidem) says that the colonies of this species are very small; one found in grassland contained only 20 or 30 individuals. He states that Williams has observed nests in compost heaps. At Pensacola, Fla., workers were collected from holly but no statement was made as to their nesting site.

Type localities.—Honolulu and Molokai, Territory of Hawaii.

Other localities.—Florida: Weedy field, Coral Gables (R. E. Gregg), road in mangrove swamp, Coconut Grove (R. E. Gregg), dry marsh on Tamiami Trail, 10 miles from Miami (R. E. Gregg), roadside, Palma Vista Hammock, Homestead (R. E. Gregg), Miami (A. E. Wight), Perrine and Sebring (D. E. Read), Pensacola (R. M. Lhamon and F. F. Bibby); Midway Island; Necker Island; French Frigate Shoal; Easter Island; New Britain Island; Flint Island.

Cardiocondyla wroughtoni var. **bimaculata** Wheeler

(Plate 5, fig. 2, worker)

Cardiocondyla wroughtoni var. *bimaculata* Wheeler, 1929, Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici 24: 43–44, *worker, female;* Wheeler, 1932, N. Y. Ent. Soc. Jour. 40: 7; Smith, 1933, Fla. Ent. 17: 24.

Worker.—Length 1.75–2 mm. Head subrectangular, approximately one and one-fourth times as long as broad, with rounded posterior corners, straight posterior border, and feebly convex sides. Scape lacking slightly more than its greatest width of reaching posterior border of head. Last segment of antennal club approximately 3 times the length of the preceding segment; funicular segments 3 through 7 as broad as or broader than long. Eye prominent, moderately convex, situated slightly less than its greatest diameter from base of mandible. Frontal carinae short, slightly divergent posteriorly. Clypeus produced above mandibles (best seen in profile); median area of anterior border with a weak emargination or impression, lateral sections laminate, not concealing antennal insertions. Frontal area small, not clearly defined. Mandible with about 5 teeth, the 2 apical teeth rather prominent. Prothoracic humeri well defined, subangular. Promesonotal suture absent. A slight constriction often visible on each side of thorax in promesothoracic region. Mesoepinotal constriction pronounced (best seen in profile). Epinotal spines stout, moderately long, longer than one-half their interapical space. Petiole, from above, subglobular, about one-sixth to one-eighth broader than long, not so long in proportion to breadth or laterally compressed as with *emeryi.* Postpetiole about one-fourth broader than long, with distinctly concave anterior border, more nearly straight posterior border, and convex sides. Legs moderately long and slender. First gastric segment occupying most of gaster.

Head, thorax, petiole, and postpetiole reticulate-punctate, at least the first two subopaque. Gaster smooth and shining.

Pubescence grayish, fine, short, closely appressed on body and appendages.

Body almost devoid of hair except on anterior border of clypeus, mandibles, venter, and posterior section of gaster.

Color of body varying from a pale brown or yellowish brown to a moderate light brown; appendages usually lighter, with antennal funiculi infuscated and darker than scapes. First segment of gaster with a distinct infuscated spot on each side and sometimes a variable amount of lighter infuscation between them.

Description based on specimens from Bradenton (G. D. Reynolds) and Paradise Key (W. M. Wheeler), Fla.

Female.—Length 2.5 mm. Larger and stouter than worker but similar except for the following: Very small ocelli. Thorax of the usual female type but rather subrectangular. Mesonotum prominently projecting into pronotum. Anterior wing pale, with small stigma and an incomplete or poorly defined cubital cell. Most of first gastric segment so deeply infuscated that the lateral spots are either poorly defined or are absent.

Described from specimens taken at Bradenton, Fla. (G. D. Reynolds).

Male.—Undescribed. Will very probably prove to be an ergatoid of the (*a*) type, such as is known for *wroughtoni* Forel, and also for its variety *hawaiiensis* Forel.

The worker of *bimaculata* can be readily distinguished by its color, spots on the gaster, pronounced mesoepinotal constriction, somewhat subglobular petiolar node, moderately long and rather stout epinotal spines, and the last segment of the antennal club, which is approximately 3 times the length of the preceding segment.

The author has not been able to examine cotypes of the variety *hawaiiensis* or of *bimaculata*, but if the specimens from the Wheeler collection of the Museum of Comparative Zoology are typical of both varieties, it would seem that the variety *bimaculata* is scarcely distinct from *hawaiiensis* and that eventually the name *bimaculata* may have to be relegated to synonymy.

Wheeler (1932, ibidem) remarked that two colonies of *bimaculata* were collected from the hollow culms of sedges at Royal Palm Park, Fla. He also stated that this ant, which was probably introduced from the Orient in living plants, "closely resembles the var. *hawaiiensis* Forel, except that the two spots on the sides of the first gastric segment of the worker are large and dark brown. Sometimes there is a third smaller and paler brown spot in the middorsal line." G. D. Reynolds who collected specimens at Bradenton, Fla., had the following to say concerning it, in a letter: "I found *C. wroughtoni* var. *bimaculata* nesting in flowerpots at the base of plants, and at the base of concrete footings; I also have seen them present under decaying fruits of peppers and tomatoes. Whether these ants were nesting or feeding there I cannot be sure. This species attends aphids, root and aerial forms. * * * The ants were found feeding on dead or dying insects. They were attracted to sugar-honey syrup (1–1–3)."

Type locality.—Karashisho, Formosa (F. Silvestri).

Other localities.—Florida: Royal Palm Park and Paradise Key (W. M. Wheeler), Winter Garden and Port Ogden (D. E. Read), Bradenton (G. D. Reynolds), and Archbold Biological Station 10 miles south of Lake Placid (T. C. Schneirla).

A NEW SPECIES OF AEDES FROM FLORIDA [1]
(Diptera: Culicidae)

Woodrow W. Middlekauff, Captain, Sanitary Corps
Fourth Service Command Medical Laboratory
Fort McPherson, Atlanta, Georgia

In a routine collection of mosquitoes from Kissimmee, Florida, sent to this laboratory for identification there appeared a specimen of *Aedes* which was recognized as a unique. At first it was thought to be an exotic and the fact that it was taken at an Army airport seemed to substantiate this belief. The specimen was sent to Dr. Alan Stone of the United States National Museum who kindly examined the specimen and suggested we make an intensive search for additional specimens. A second female, collected by John A. Mulrennan, arrived at the museum several days later and was forwarded to the author by Dr. Stone. This female was taken at MacDill Field, approximately 80 miles southwest of Kissimmee. Subsequently, there came into the possession of the author a third female from Pinecastle which is only a few miles northwest of Kissimmee, and on November 1, 1943, a male specimen was taken in a light trap at Camp Murphy which is about 125 miles southeast of Kissimmee on the Atlantic coast.

This species is at least locally distributed over a wide area of central and southern Florida and appears to be a late summer and fall species.

It gives the author pleasure to name this species in honor of a friend and former professor, Dr. Robert Matheson of Cornell University.

Aedes (Ochlerotatus) mathesoni, n. sp.

Female.—Vertex of head with a rather broad triangular patch of white, recumbent, lanceolate scales which extend posteriorly over the occiput, and bordered anteriorly by a small patch of black, lanceolate scales. Postgenae clothed with broad, appressed, yellowish-white scales, and a few scattered dark ones. Many slender, erect, slightly forked, black scales on occiput. Tori fuscus, shading to black on anterior surface a few small black scales on inner surface. Palpi short, black, with purplish iridescence. Proboscis rather long, slender, black, with faint purplish iridescence. Clypeus brownish-black, nude· Mesonotum with a narrow, median line of curved, very small, golden brown scales, bordered by small black scales which laterally become somewhat coarser. An elongate patch of yellowish-white scales on the anterior angles of the mesono-

[1] The author wishes to thank Major Stanley J. Carpenter, Sn. C., for his helpful suggestions, and for their assistance, the following members of the entomology department of the Fourth Service Command Medical Laboratory: Miss Leonore Peeples, SP–3; Miss Jeanne Pryor, SP–3; and Corporal John Wanamaker.

tum and a somewhat similar patch, laterally on middle of mesonotum. A few yellowish-white, lanceolate scales laterally on mesonotum just above the origin of the wing. Ante-scutellar space with a few yellowish-white, lanceolate scales. Bulb of halteres covered with dark purplish scales. Prosternum with mostly purplish-iridescent scales. Sternopleuron, upper mesepimeron and a line on lower post-spiracular plate bordering sternopleuron with scattered patches of broad, white scales. Wing scales purplish black. Legs purplish black. Scales on coxae, trochanters, base of anterior femur, a line on inner surface of anterior femur, which widens over entire inner surface of basal two-thirds of mid- and hind femora, and a small knee spot at each femoro-tibial joint, white. A narrow white ring more conspicuous on outer surface, on base and apex of metatarsi and base of second tarsal segments; in addition the hind tarsus with apex of second and base of third segments similarly ringed. Abdomen uniform purplish black, without markings dorsally, laterally with small triangular basal segmental white spots, which extend over basal third of ventral segments.

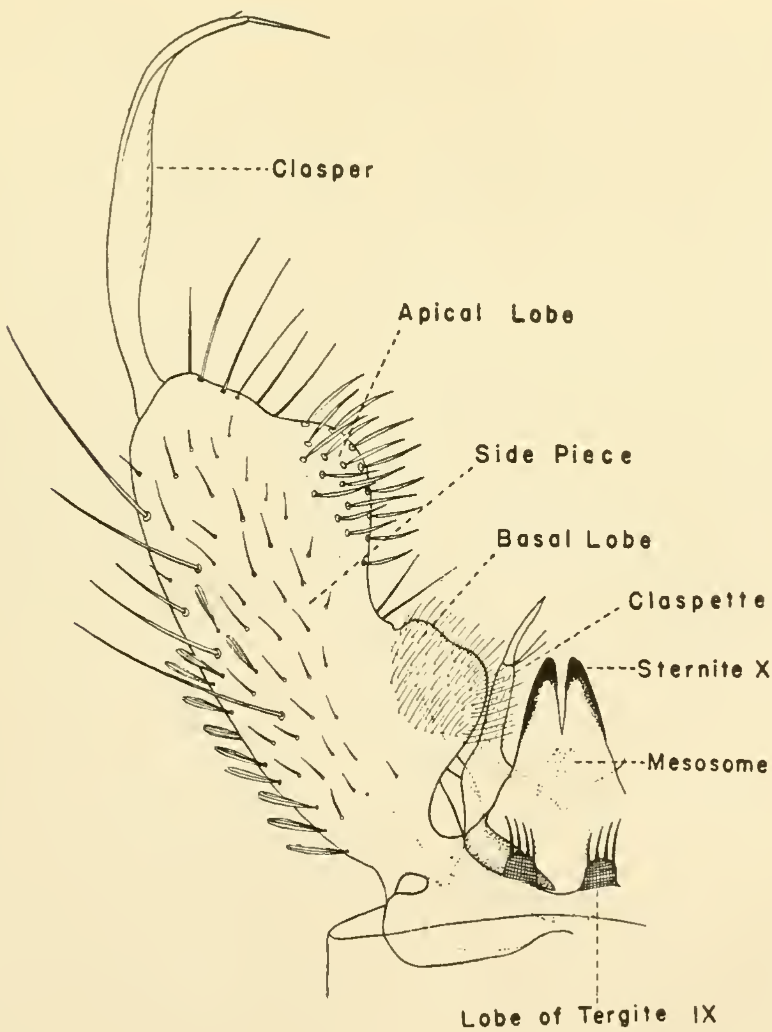


Fig. 1—Male genitalia of *Aedes* (*Ochlerotatus*) *mathesoni*, m. sp.

Male.—Similar to female except in the following detail: Postgenae with wider band of broad yellowish-white scales. Mesonotal vestiture rather badly rubbed but appears essentially the same as in the female. Fore- and mid-legs dark at base of metatarsi; hind legs dark beyond base of second tarsal segment; whitish scales confined to small patch on outside of leg. Abdomen uniform purplish black without markings dorsally, laterally with conspicuous basal segmental white triangles. Venter with purplish-black scales.

Male genitalia.—(Fig. 1) Clasper long, swollen in middle, with short terminal spine. Side-piece stout, rounded at tip; apical setae one-fourth length of clasper; apical lobe large, rounded, bearing dense, rather long, blade-shaped setae from distinct tubercles; basal lobe large, truncate with many fine setae arising from small tubercles; no spine present. Claspette with straight, narrow stem, two small hairs near apex; the filament narrow linear about one-half length of claspette. Tenth sternite narrow, thickened at apex, with rounded, adjacent tips. Ninth tergites small, rounded, each with four evenly arranged apical spines.

Holotype.—Female, Kissimmee, Florida, September 17, 1943. Caught in light trap.

Allotype.—Male, Camp Murphy, Florida, November 1, 1943. (Light trap.)

Paratypes.—Female, MacDill Field, Tampa, Florida, September 18, 1943. (Light trap.) Collected by John A. Mulrennan. Female, Pinecastle, Florida, October 23, 1943. (Resting station.)

Holotype, allotype and one paratype in the collection of the United States National Museum. One paratype (Pinecastle) in the collection of the author.

This species is most closely related to *Aedes canadensis* (Theob.), but that species lacks the nearly black scales of the mesonotum and the white areas on the legs are more extensive. The male genitalia of *canadensis* differ only slightly, the spines of the ninth tergites being less regularly placed and more abundant, and the tenth sternites being somewhat curved and acutely apically.

TWO SPECIES OF XYLOTA FROM SOUTHERN ASIA (Diptera: Syrphidae)

By F. M. Hull, *University of Mississippi*

This paper describes two new species of *Xylota* from among miscellaneous material from the British Museum of Natural History.

Xylota fo, new species

Characterized by the metallic black abdomen, the apex of the last segment reddish, and the absence of golden pilose vittae upon the mesonotum. Related to *spinipes* Curran, the first four femora are not yellowish-brown.

Male.—Length 12 mm.; width of thorax 3 mm.; length of wing 9 mm. *Head:* The vertex and upper part of the occiput are bare and shining steel-blue; the blue color is very prominent and slightly purplish behind the ocelli; there is similar color on the anterior part of the vertical triangle. The eyes touch for a distance longer than the front or at least as long as the front. The front is flattened; together with the face and cheeks it is densely covered with pale yellowish-white or yellowish-grey pubescence. The front and the upper part of the face have a few quite short whitish hairs. Antennae with first and second joints dark blackish-brown, the third joints missing. The face in profile is very short and distinctly concave below the middle. The cheeks are almost absent or at least very short. The eyes are bare, the lower three-fourths of the occiput white pubescent and white pilose. *Thorax:* The mesonotum and scutellum are shining brassy-black, not very pronounced. There is a whitish pollinose spot at the inner anterior corners of each humerus, and there are no thoracic stripes. The margin of the scutellum is somewhat thin with a double, shallow groove along the margin; its shape is roughly sub-trapezoidal. The pile of the thorax is short, erect and pale brownish-yellow; there is similar pile on the disc of the scutellum and longer, pale yellowish to whitish pile on the pteropleuron and mesopleuron. There are a few, long, pale hairs on the margin of the scutellum. The squamae are white with pale yellow border and fringe. *Abdomen:* Slender and narrowest at the end of the long second segment; it is strongly metallic brassy on the whole of the first segment; and on the sides of the second segment but more extensively in the middle of the sides of the second segment; it is also brassy on the sides, but less extensively, of the third segment and on the whole of the fourth segment except for an extensive area on the base of this segment. The posterior margin of the fourth segment is light, reddish-yellow and much constricted, that is, with a preapical bulge to the dorsal part of this segment. The remainder of the abdomen, in the center of the second and third segments, is dully shining black. The pile everwhere, except on the blackish areas, is pale yellowish and largely erect; on the black areas it is short, appressed and black. *Legs:* All of the femora are shining black with a slight metallic cast; their pile is wholly pale whitish to yellow. The hind femora each have a strong, double row of long, stiff spines that reach quite as far as the tibial width. The hind trochanter has a strong and sharply pointed, long, posteriorly directed spine. The anterior four tibiae are wholly pale yellow except for a small, ventral, brown, diffuse spot in the middle of each. The hind tibiae are similarly colored, the brown beginning just before the middle and continuing over the whole of the lateral sides of the apical portion of each tibia, but not upon the dorsal edge. The first three joints of the fore and mid-tarsi are wholly pale yellow; the first three joints of the hind tarsi light brown, the last two joints of all of the tarsi black and blackish pilose. Elsewhere the tibiae and the tarsi are wholly pale yellowish or whitish pilose. The hind femora are considerably thickened along the middle three-fifths; hind tibiae somewhat flattened and arcuate, and ending without spur. *Wings:* Pale brownish, nearly hyaline; the stigmal cell is pale brownish-yellow, the spurious vein is well developed.

Holotype: A male, Southeast China, Yunnan, San-Nen-Kai.; purch. E. Le Moult. B. M. 1933–189.

Xylota stylata, new species

Related to *pendleburyi* Curran, the scutellar and pleural pile is golden, not white, the antennae are blackish, and the posterior femoral mid tuft of pile is reddish.

Male.—Length 13 mm.; wing 9.5 mm. *Head:* The vertical triangle is shining steel-blue. The eyes touch for a shorter distance than the length of the front; the upper anterior facets are enlarged. The front, except just before the antennae, and the entire face, is covered with dense, white pubescence; along the edges of the front there are a few very short hairs. The face is concave about the middle and projects further outward than in *fo.* The antennae are blackish; the third segment is one and a half times as long as wide and is broadly rounded apically and flattened. The arista is brown, quite long and slender. The eyes are bare. The vertex is extremely flat and level with the eyes; it is slightly convex in *fo.* *Thorax:* deep, brownish, to brassy-golden in color, becoming more greenish on the rugose, subtrapezoidal scutellum and steel-bluish over the whole of the humeri. The pile of the thorax is composed of a pair of very prominent, brilliant, golden, thick, forward-appressed, golden pilose stripes. These stripes are widest anteriorly at the extreme anterior edge of the thorax where the stripes are rather widely separated, and decrease quite uniformly to a narrow point at the base of the scutellum. At the same time these two stripes very slightly diverge so that they end at each basal corner of the scutellum. Lying parallel to the inner side of these stripes and beginning at the scutellum there are a pair of similar, golden, posteriorly appressed, pilose stripes that are widest posteriorly, diminish anteriorly, slightly converge anteriorly, and rapidly converging just before the sutures so that they join one another approximately at the sutures and continue as a much narrower single stripe the remaining distance to the anterior margin of the thorax. There is an additional pair of golden pilose bands along the margin of the posterior calli to just beyond the root of the wings, that do not reach the suture. They are directed downward and are ventrally appressed. The pleura have a vertical band of pile, golden above, whitish below. The scutellum has short, yellowish pile and a very few, barely longer hairs on the margin and a conspicuous, ventral fringe of numerous, brassy hairs along the ventral margin. The squamae are white with pale brownish margin and fringe. *Abdomen:* Barely narrower at the end of the long second segment, which is longer than the third segment. The first segment is shining metallic, the second and third more or less shining, the fourth wholly metallic or brassy except for a narrow, basal area. There are a pair of very diffuse, reddish-brown, elongate spots on the second segment and a similarly colored pair of roundish spots on the basal half of the third segment; each pair is separated by dark reddish-brown color. The extreme base of the second segment, its apex and the apical half of the third segment, more narrowly on the sides, is almost blackish. The pile of the abdomen is quite long on the sides of the first three segments; everywhere the pile is pale brassy, except in the middle upon the apex of the second segment, upon the apical half and middle of the third segment and upon the basal middle portion of the fourth segment. *Legs:* Femora wholly shining, metallic black, slightly greenish or brassy. The pile of the femora is everywhere pale whitish, becoming a long, thick tuft laterally upon each hind femur just past the middle; just in the middle of the hind femur laterally, near the dorsal edge, there is a tuft of matted, stiff, long, reddish-brown hair. The hind femora are thickened, especially just before the middle, and each has a double row of stout, black, tubercle-set spines on the apical ventral two-fifths. There are eight spines in all upon the outside. The anterior tibiae and tarsi are wholly pale yellow, the last joint brown; the mid-tibiae are pale dorsally and basally on the basal third, but are brown throughout the entire length and on the remainder of the lateral and ventral surface. There is a tuft of yellowish hair dorsally on the apex of each tibia. The hind tarsi are brown. The hind femora have a strong, basal, lateral, nearly ventral groove. The hind trochanters each have a long stout spine. The anterior tibiae on the posterior lateral surface or outer lateral surface, together with the mid-tibiae and fore and mid basi-tarsi have a similar, lateral, long fringe of whitish pile, but this fringe is yellowish on the mid-tibiae. *Wings:* Pale brownish; the stigmal cell rather deep brown.

Female: With a broad transverse band of silvery-white pile situated some distance below the ocelli. The front is widely bare and shining above the antennae. The tibiae lack the conspicuous clothing of pile as do also the hind femora. The hind femur laterally has a double row of spines, only five in all, on the outside. The trochanters lack the stout spine; the arrangement of the bands on the thorax are about the same. The scutellum is less flattened. The same, obscure, light reddish spots are present on the abdomen.

Holotype: A male. Java (Soekaboemi, IV. 1926, purch. E. Le Moult, B. M. 1933–189.)

Allotype: A female, and one paratype female, with the same data.

BOOK REVIEW

A Revision of Nearctic Dorilaidae (Pipunculidae): D. Elmo Hardy, University of Kansas Science Bulletin, v. 29, pt. 1, n. 1, 231 pp., 18 plates (109 figures), 1943.

At last we have what seems to be an adequate treatment of the taxonomy of this economically important family of Diptera. Based on field as well as laboratory studies, it represents a serious attempt to bring the taxonomy of the Nearctic species up to date.

The first page and a half are devoted to an abstract of the paper. The author then follows a brief introduction with a section on taxonomy, in which he discusses briefly the phylogeny of the group and his reasons for accepting the Meigen 1800 name *Dorilas* in place of the familiar *Pipunculus* of Latreille, 1802. The section that follows, on morphology and terminology, is well written and should make clear the meanings of terms used in the text. The author is to be commended for refraining from introducing new and needless morphological terms in places where familiar ones will suffice. In the section on economic importance he gives a brief general description of immature stages. The section on collecting and methods of study includes a discussion of habitat studies, methods of mounting, preparing genitalia, and repairing the easily-lost heads of specimens, and methods of dissecting leafhoppers in searching for the parasitic dorilaid larvae. A brief account of the known fossil species is given.

The key to genera includes all those known in the world, fourteen in all, one of which is divided into two subgenera. The generic concept is a fairly conservative one; yet the genus *Dorilas* is used in a much more restricted sense than that of *Pipunculus* of previous American authors. Descriptions are given for all genera, even those not occurring in the Nearctic region, although for the latter they are brief; and keys to all Nearctic species are given. One hundred seventeen species, subspecies, and varieties are discussed, twenty-seven of which are new to science. The descriptions seem adequate, and include male genitalia; most species are illustrated, each figure as a rule showing several structures. Distribution is given by states in the case of the more common species, and by detailed locality records in the others.

The work should be easy to use. The keys seem well constructed, and the meanings are frequently further clarified by references to the illustrations. Each exit in the key is accompanied by a page reference to the genus or species which keys to that point, and an index serves as a further aid in locating names, both valid and synonymous. Descriptions are complete in themselves and do not require reference to others, except in the case of subspecies and varieties. The species are arranged in alphabetic order under the genus; this, however, may be somewhat confusing in the case of *Dorilas*, where the two subgenera are treated together. The genera stand approximately in a phylogenetic order, although, according to the subfamily indications in the key, some are misplaced. The order and general arrangement fo the paper might have been somewhat improved.

A critical student will find fault with some details of the work. For instance, the non-existent word "harpagone" is used repeatedly for "harpago" as the singular of "harpagones". His statement concerning the determination of the type of *Dorilas* by Becker to the effect that "there is no possibility for a misidentification on his part" (page 7) seems rather naive; we have never heard of an infallible taxonomist! Moreover, we are at a loss to understand how "the color of the humeri, although not a specific character in itself," can be "useful in setting off groups of species." (Page 11.) However, in view of the excellence of the work in general, such criticism seems rather petty.

MAURICE T. JAMES.

REPORT OF CORRESPONDING SECRETARY, DEC. 4, 1942 TO NOV. 1, 1943

Little change has occurred in general conditions from last year. Service to our one remaining subscriber on the continent of Europe has been suspended. The American Library Association has purchased a number of volumes for restoration of foreign libraries, and other literature sales have been better than last year. Memoir No. 2 is off to a good start.

Letters written, 50; many matters were attended to by informal notations or statements.

Proceedings acquired, 806; sold, 625; net addition to stock, 181. Old reprints sold, 6.

Memoirs sold: No. 1, 5; No. 2, 59 (six copies also given to reviewers).

Receipts from sale of literature: Proceedings and reprints, $304.03; Memoirs, $158.30.

Membership changes of record: Elected 7 (8 meetings), resigned 3, died 2; net gain 2.

Subscription changes: Gain 6, loss 1; net gain 5.

Respectfully submitted,
F. M. WADLEY,
Corresponding Secretary.

REPORT OF THE TREASURER FOR THE YEAR 1943

GENERAL FUND

Receipts

Cash on hand January 1, 1943	$5.76
Cash on hand January 1, 1943 (stamps)	1.25
Cash on hand January 1, 1943, in general fund deposited in Hamilton National Bank	576.64
From members, dues for 1943	542.90
dues in advance	30.00
back dues	234.25
initiation fees	13.00
credited to account as advance deposit	7.10
From subscribers, for subscription to Proceedings:	
1943 and back payments	390.00
1944 subscriptions in advance	170.50
From American Library Association, for 10 sets 1941, 1942, and 1943 Proceedings	127.50
From authors, separates and author's copies	119.25
for illustrations	19.06
for cuts	1.00
From institutions, for author's separates	70.50
for cost of printing articles	57.51
From sale of back numbers of Proceedings	156.98
From sale of old plates	2.00
From general publication fund for use in payment of cost of publishing Memoir No. 2	282.70
Total receipts	$2,807.90

Expenditures

To H. L. & J. B. McQueen, Inc., for printing Proceedings (No. 9 of Vol. 44 and Nos. 1–8 of Vol. 45) and separates	$1,320.00
To H. L. & J. B. McQueen, Inc., for printing programs of six meetings (536–541st., inclusive)	18.00
To H. L. & J. B. McQueen, Inc., for:	
1,000 printed clasp envelopes	17.25
100 printed open end envelopes	2.50
3,000 printed manila envelopes	25.50
500 printed return envelopes	5.50
500 printed letterheads	5.50
500 printed invoice forms	9.00
2,000 unprinted cards	3.00
To Southern & Standard Engravers, for engravings for the Proceedings (No. 9 of Vol. 44 and Nos. 1–9 of Vol. 45)	211.18
For stationery	2.80
For stamps	42.70
Shipping charges, parcel post	3.04
For clerical help (December 1942 to December 1943, inclusive)	91.00

For rental and tax on safe deposit box at City Bank	4.20
To The Monumental Printing Co., for 300 copies of Memoir No. 2	485.00
1 Binder's stamp	6.75
Miscellaneous expenses	6.65
Total expenditures	$2,259.57
Stamps on hand received in lieu of cash during 1943	2.50
Cash on hand in Hamilton National Bank	545.83
	$2,807.90
Outstanding obligations	$197.87

PUBLICATION FUND

Schwarz donation (principal $1,000.00), invested with American Building Association (reported 1942)	$1,598.04
Dividends earned 1942, credited 1943	63.92
	1,661.96
Withdrawn and deposited in checking account for use in paying costs of publishing Memoir No. 2	282.70
Total in Schwarz donation fund	$1,379.26
Knab bequest, invested with Columbia Federal Savings and Loan Association, reported 1942	$958.89
Dividends received 1942, credited 1943	12.12
Dividends received 1943	14.56
Covered by non-interest bearing note	500.00
Total in Knab bequest	$1,485.57
General publication fund, in savings account with:	
Hamilton National Bank January 1, 1943	$546.25
From sales of Memoir No. 1 (5 copies)	14.40
From sales of Memoir No. 2 (63 copies)	155.30
From interest on savings account	5.90
From John D. Sherman, Jr., for insured postage	.37
Total in General publication fund	$722.22
Total amount of publication fund	$3,587.05

Respectfully submitted,

G. J. Haeussler, *Treasurer.*

The Committee on Audit has examined the financial accounts of the Treasurer and found them to be correct for the year 1943.

Respectfully submitted, January 5, 1944.

W. B. Wood,

F. W. Poos,

Auditing Committee.

MINUTES OF THE 541ST REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON, DECEMBER 2, 1943

The 541st regular meeting of the Society was held at 8 P. M., December 2, 1943, in Room 43 of the National Museum. There were 27 members and 14 guests present. President Harned called the meeting to order and the minutes of the previous meeting were read and approved.

New members were elected as follows:

John H. Fales, Bureau of Entomology and Plant Quarantine, Beltsville, Md.

William A. Baker, Bureau of Entomology and Plant Quarantine, Washington, D. C.

Willard W. Yates, Bureau of Entomology and Plant Quarantine, Portland, Oregon.

Lt. Harry D. Pratt, U. S. Public Health Service, Puerto Rico.

The report of G. J. Haeussler as Treasurer was read. President Harned appointed as auditors W. B. Wood and F. W. Poos.

Dr. F. W. Wadley's report as Corresponding Secretary was read and approved.

President Harned mentioned a letter which he had received from Dr. L. O. Howard. It was agreed that the letter should be included in the minutes.

45 Pondfield Road West
Bronxville, N. Y.
Nov. 26th, 1943

DEAR MR. HARNED:

I congratulate both you & the society on your position as President. My daughter Lucy & I are very comfortable here in a nice apartment & expect to spend the winter, going to our house in Onteora Club near Tannersville, N. Y. for the summer. I am fairly well & spend most of my time thinking over past days. I am in good health for a man of 86 & I have all my Washington books & pictures & furniture here. Our New York friends call on us & I expect sooner or later to see an entomologist or so. I shall be only too glad to hear from any of the old Washingtonians & I send you all my best wishes.

Sincerely yours
L. O. HOWARD

The following names presented by the Nominating Committee were unanimously approved as officers for the coming year:

President.................................... P. N. Annand
First Vice-President.......................... F. W. Poos
Second Vice-President........................ C. A. Weigel
Recording Secretary.......................... Ina L. Hawes
Corresponding Secretary. .... F. M. Wadley
Treasurer.................................... G. J. Haeussler
Editor....................................... Alan Stone
Executive Committee.......................... R. W. Harned, H. E. Ewing, E. N. Cory.
Representative to the Washington Academy of Sciences................................. Austin H. Clark

Mr. Rohwer spoke in appreciation of the effective service given to the Society by the retiring Recording Secretary and a vote of thanks was unanimously accorded to Dr. W. H. Anderson.

Dr. F. C. Bishopp reported on the 37th annual meeting of the Southern Medical Society held in Cincinnati, Nov. 16th–18th. The papers presented at the joint sessions with the American Society of Tropical Medicine and the National Malaria Society were of especial interest. Dr. Bishopp mentioned the paper by Dr. W. A. Sawyer on "Introduction of Tropical Diseases into the United States after the War," which he felt took too optimistic a view of the problem, and the paper by Dr. Lewis A. Hackett, now located in Buenos Aires, Argentina, on "The South American Scene." This latter paper was an excellent summary of the work on malaria, oroya fever, plague, and yellow fever in that region. Another outstanding feature of the program was the Joint Symposium on Malaria, during which 9 papers were given with reference to malarial problems in this country. In the last paper Dr. J. W. Mountin of the U. S. Public Health Service presented a plan for the eradication of malaria from the United States.

Capt. G. E. Davis of the U. S. Army presented the first paper on the regular program: Ticks in Relation to Relapsing Fever.

The argasid genus, *Ornithodoros*, contains the species involved in the transmission of relapsing fever. In the United States the first cases of proved endemic origin were reported from Bear Creek Canyon, Colorado: by Meador in 1915 and by Warring in 1918. Dr. Briggs reported the disease from Polaris, California in 1922, and Cornick from West Texas in 1927. A tick vector was first recognized during the severe Texas outbreak of 1930. Small mammals, especially rodents, are the usual reservoirs of infection. *Ornithodoros hermsi* is reported as a vector in California, Colorado, Oregon, Washington, Idaho, and Nevada. Specimens collected from the vicinity of Lake Tahoe in 1914 and identified as *O. talaje* were later reexamined by Cooley and proved to be *O. hermsi*, thus placing that species in this locality twenty years before it was recognized as a new species. *O. hermsi* prefers wooded areas at relatively high altitudes. The few cases reported at lower altitudes in California were probably due to *O. parkeri*. *Ornithodoros turicata* is reported as a vector in Texas, Kansas, New Mexico, Oklahoma, and Arizona. The Arizona record is not proved, and the species involved is probably *O. hermsi*. *Ornithodoros parkeri* is a proven vector in the San Joaquin Valley, California. Spirochetes have been recovered from this species in Wyoming, S. W. Montana, Nevada, and southern Idaho, but no cases of relapsing fever reported in this connection. *Ornithodoros talaje* has been found in the burrows of kangaroo rats in Arizona and spirochetes recovered from the material, although this species has not yet been shown to transmit relapsing fever to human beings in the United States. It is a proven vector in Panama. Our ticks transmit relapsing fever by bite only, and not by means of the coxal fluid as is the case with *O. moubata* in Africa. *Ornithodoros turicata* has been crossed with *O. parkeri* under laboratory conditions, and evidence indicates that interbreeding occurs in nature where species population overlap, as in the San Joaquin Valley, California. The chief vectors in South and Central America are *Ornithodoros talaje*, *O. rudis*, and *O. turicata*. Capt.

Davis closed his paper with a brief mention of the situation in North Africa and in Russia.

In response to a question from Dr. Bishopp on the specificity of relapsing fever and ticks, Capt. Davis discussed briefly the fact that in this country certain species of ticks transmit only certain strains of the disease.

(Secretary's abstract)

Lt. W. K. Lawlor of the U. S. Navy presented the second paper on the regular program: Some Experiences in Malaria Control in the United States Navy.

Malaria is the Number One War Disease. The differences between civilian and military malaria control practices are marked, and it is emphasized that successful military malaria control is effected only by using intelligently, and in combination, all the means known to prevent the transmission of the disease to troops. Specific instances are cited of some special problems, and the results of their application among navy and marine corps forces ashore are given. Malaria control is not mosquito control alone. Many other factors enter into the control of this disease, although mosquito control ordinarily plays an important part. The need for entomologists to become trained malariologists is emphasized. All those now on duty have as their own aim the mission of the Medical Department of the United States Navy, "to keep as many men at as many guns as many days as possible."

(Abstract by W. K. Lawlor, Lieut. H–V (S) U. S. N. R.)

Comments followed by Capt. West, Dr. Bishopp, and Lt. Reed.

President Harned called for the introduction of visitors, after which the meeting adjourned at 10:25 P. M.

INA L. HAWES,
Recording Secretary.

Actual date of publication, March 13, 1944.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions.......................... $3.00
To members of the Society................................ $2.40

A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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

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

F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
Washington 25, D. C.

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VOL. 46 March, 1944 No. 3

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 25, 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.

OFFICERS FOR THE YEAR 1944.

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President . . . . P. N. Annand
First Vice-President . . . . F. W. Poos
Second Vice-President . . . . C. A. Weigel
Recording Secretary . . . . Ina L. Hawes
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Executive Committee . . . . . . H. E. Ewing, E. N. Cory, R. W. Harned
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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The Corresponding Secretary and Treasurer should be addressed similarly.

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 46 MARCH, 1944 No. 3

DESCRIPTIONS OF NEW CYNIPIDAE INCLUDING TWO NEW GENERA (Hymenoptera)

By LEWIS H. WELD

Collaborator, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

This paper brings together some notes and descriptions which have accumulated in the last few years. Included are: An addition to our fauna of a representative of a subfamily previously known only from the Oriental region; a second species of an exotic genus known only from the genotype; two new genera of dipterous parasites; some generic transfers; descriptions of associated sex and an account of the biology of a *Drosophila* parasite reared in large numbers under controlled laboratory conditions.

Subfamily MESOCYNIPINAE

Mesocynips albata, new species

(Fig. 1.)

Female.—Black; basal half of antenna and hind margin of tergites II, III and IV reddish; ventral region of abdomen yellowish; pubescence pale yellow with dense white patches on truncation of pronotum, on upper third of mesopleuron and on sides of scutellum, also paired transverse bands on hind margins of tergites IV, V and VI which are silvery white when seen from above. Face punctate above with a median ridge and fan-striae about the mouth, malar space three-fourths eye (57:76). Head from above showing two smooth antennal grooves and a prominent carina below median ocellus. Antenna 13-segmented, lengths of segments as (scape) 40 (width 15): 9: 23 (12): 19: 18: 17: 16: 15: 15: 15: 15: 15: 34(13). Sides of pronotum punctate, truncation broad, margined, without median dorsal tooth. Mesoscutum with about 17 low, sharp, continuous, transverse ridges; parapsidal grooves percurrent, no median groove. Scutellum with 6 longitudinal ridges and 5 pits at base; disk with large shallow punctures, rounded behind. Mesopleuron with a large smooth and bare area both above and below the longitudinal groove. Metapleuron sculptured, pubescent. Propodeum with irregular ridges on sides, the dorsal distance to neck much shorter than the ventral, the usual dorsal carinae short and between them two closely parallel carinae in place of a median. Wing pubescent with short cilia on margin, membrane yellowish, with a brown cloud on first cubital cell reaching to anterior margin and another beyond apex of radial cell, the most of radial cell and the base of third cubital cell clear; radial cell 4 times as long as broad; cubitus meeting the strongly curved basal on its upper third. Median vein parallel with subcosta for half its length then bending sharply toward lower end of basal. Hind wing scarcely clouded. Hind tibia with a longitudinal carina on inner face and at apex two long ventral spines and a dorsal rounded tooth and short, broad spine. Hind tarsal segments as 27: 3.5: 3: 2.5: 14 (including simple claws); other claws bifid. Abdomen longer than head plus thorax; lengths of tergites along dorsal curvature as (petiole) 7 (width 14): 18: 11:12 24: 34: 16, sheaths 10, projecting ovipositor 5. All tergites bear setigerous punctures which are larger and more numerous on posterior tergites. Petiole sulcate. Length 9.0 mm. Antenna 3.6 mm. Wing 6.4 mm.

Described from one specimen labelled "Surigao, Mindanao, Baker, Coll."

Type.—Cat. No. 56810 U. S. N. M. and parts mounted on slide in balsam. The only other described species is from Borneo.

Paramblynotus zonatus, new species

(Fig. 2.)

Female.—Amber; with mesonotum, mesopleura and abdomen black, occiput and hind coxae slightly infuscated. Face rugose. Malar space about half eye (23: 47). A prominent carina from between antennae to median ocellus. Antenna filiform, 13-segmented, lengths of segments as (scape) 23 (9.5): 6: 21 (6): 23: 21.19: 16: 16: 14: 3: 11: 11: 15 (6). Antennal furrows distinct, cheeks margined, not broadened behind eyes, occiput punctate. Truncation of pronotum broad, margined, without median dorsal tooth, sides with large, shallow punctures. Mesoscutum coarsely sculptured with about nine discontinuous, transverse, sharp-edged ridges, parapsidal grooves broad, median indistinct. Base of scutellum with 5 smooth pits, the middle one narrow; disk coarsely reticulate, margined, emarginate behind where and at sides are dense patches of white hairs. Propodeum coarsely reticulate, carinae arcuate in profile and from rear, the area between them sculptured, the neck short, the ventral distance to neck almost horizontal. Mesopleuron smooth with a broad longitudinal groove and a large patch of white hairs under tegula. Metapleuron bare above with 5 longitudinal ridges. Wing pubescent and ciliate; a broad, transverse cloud on proximal side of basal vein, another quadrate cloud covering the entire radial cell. Radial cell 2.6 times as long as broad, cubitus reaching basal on its upper third. Hind wing almost clear. Hind tibia without carinae, a rounded tooth on outer side at apex, metatarsus not as long as 2–5 united. All claws simple. Abdomen not as long as head plus thorax; lengths of tergites along dorsal curvature as (petiole) 13 (width 27): 40: 20: 27: 92: 8: 36; the petiole sulcate; coarse punctures dorsally on tergites V and VI with finer punctures below; tergite V largest in side view. Length 5.1 mm. Antenna 2.85 mm. Wing 3.65 mm.

Described from one specimen taken by beating on *Ulmus* *crassifolia* at Brownsville, Texas on May 26, 1914, by Mr. H. S. Barber.

Type.—Cat. No. 56811 U. S. N. M. Abdomen on point, wing and antenna in balsam.

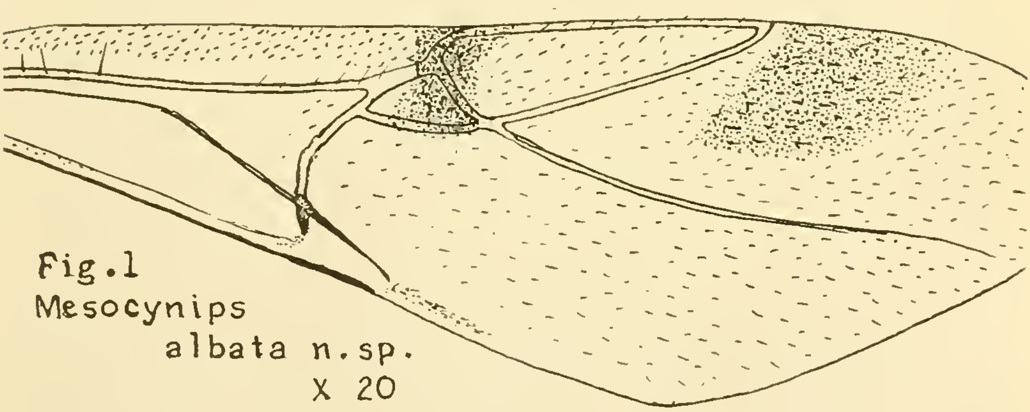
The 9 previously described species in this genus were from the Oriental region.

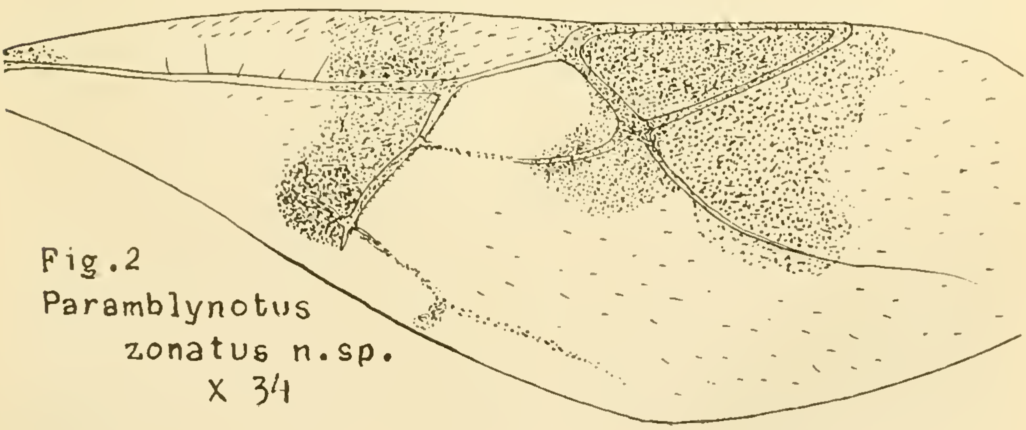
Subfamily Aspicerinae

Paraspicera bakeri Kieffer

This genus and species was founded on a male from Wisconsin (Ent. Ztschr. Stuttgart 21:152, 1907). What seems to be the associated female is described below.

Female.—Black, legs and antennae red. Distinct parallel ridges below the antennae, those above fainter. Vertex not excavated. Occiput with vertical ridges above the transverse ones. Cheeks margined, without a prominent angle in side view. Antennae 13-segmented, lengths of segments as (scape) 18 (11): 7: 17 (8): 13: 13: 13: 12: 11: 10: 10: 10: 10:26 (7.5). Truncation of pronotum with a patch of felt-like pubescence on each side below. Scutellum, including the stout, blunt spine, slightly longer than mesoscutum, its upper surface striate with the carina between the shallow pits continued back as a median ridge. Propodeum with dense white pubescence between and on each





side of the parallel carinae and with prominent lobes below the spiracles. Wing hyaline, surface dotted, very short cilia on anal angle, veins reddish, radial cell twice as long as broad, cubitus reaching nearly to lower end of basal vein. Hind metatarsus stout, its length to rest of tarsi as 38: 43, claws simple. Abdomen not compressed; lengths of tergites along dorsal curvature as (petiole) 6:50:63:0:6:9. Lengths of three specimens: 5.55, 3.65 and 4.0 mm. Lengths of three males: 3.35, 3.4, and 3.7 mm.

Locality.—The females are from: Ravinia, Ill., Sept. 4 (Weld); Glen Echo, Md., June 16 (Fouts); Georgetown, D. C. (H. H. Smith). The males are from: Medina, N. Y., July 4 (Weld); D. C., Sept. 9 (Pergande); Rosslyn, Va., (H. H. Smith). These are in the U. S. N. M. collection.

Subfamily FIGITINAE

PARASCHIZA, new genus

Abdomen almost sessile; petiole broader than long, mostly smooth; tergite II not liguliform, not half as long as II–IV inclusive, with a hairy ring at base; tergite III largest in side view. Mesoscutum smooth and shining, parapsidal grooves percurrent. Scutellum rounded behind, with two distinct pits at base; disk seen from behind flattened, its sides perpendicular, its large smooth surface sloping posteriorly and ending in a rugose rear aspect somewhat as in *Trischiza*. Wing pubescent and ciliate, folding longitudinally; radial cell open; areolet not completely formed. Antenna of female 13-segmented, segment 3 longer than 4. Distinct from *Trischiza* which has a sulcate petiole, the second tergite bare and a short abdomen. Separated from *Melanips* and *Sarothrus* by its open radial cell.

Genotype.—Paraschiza cupressana n. sp. Monobasic.

Paraschiza cupressana, new species
(Fig. 3.)

Female.—Black; flagellum, tegula, all tibiae and tarsi brownish. Head, (except clypeus and directly back of eyes) with setigerous punctures which are closer together on the face; from in front higher than broad (40:35), malar space one-fourth eye, without groove; from above as broad as thorax, its length to width as 26:35; cheeks not broadened behind eyes and not margined; ocelli white; antennae 13-segmented, lengths as (scape) 16(5):8:10(4):7:8:9:10:10:10:10:10:9:15(5); scape punctate; last 9 segments fluted. Truncation of pronotum closely punctate, sides smooth with scattered punctures, a narrow patch of dense pubescence anteriorly. Mesoscutum polished, with scattered setigerous punctures, parapsidal grooves only slightly widened behind; median groove extending forward one-third way; deep grooves over tegulae. Pits at base of scutellum circular, deep, smooth; septum narrow; lateral bars sculptured. Disk flat from the rear but convex in profile, its large, smooth, nearly circular area rugose peripherally; in side view a large densely pubescent depression below lateral bar. Propodeum with two straight carinae converging slightly above and enclosing a space much longer than broad, the neck rugose. Mesopleuron bare, polished, with a band of parallel striae across lower third. Wing clear, veins yellowish-brown; radial cell open on margin and slightly so at base and apex as in *Trischiza*, 2.25 times as long as broad; first abscissa of radius strongly bent and prolonged into a spur, the rest of areolet not formed, the wing folding longitudinally at lower end of spur and basal vein. Outer face of coxa almost bare; hind tibia longer than tarsus; claws weak, simple. Petiole smooth with short striations at base. Abdomen length to height to width as 93:50:36; lengths of tergites along median dorsal line as (petiole) 3(7):31:27:11:7:6:15; ring of hairs at base of tergite II not interrupted dorsally, rest of tergites bare; faint punctures on V and VI; hypopygium over half the length of abdomen with scattered hairs on under side. Using the width of the head as a base the length of mesonotum ratio is 1.5; antenna 3.0; wing 5.0; ovipositor 4.3. Range in length of 19 specimens 2.2–3.1 mm. Average 2.6 mm. Male unknown.

Type.—Cat. No. 56812 U. S. N. M. Type and 7 paratypes. Paratypes in California Academy of Science.

Habitat.—Cypress, Orange Co., California, February 22. 1930. "Taken from holes of *Citellus* in mushrooms." Mr, A. C. Davis, collector. U. S. D. A., Bureau of Ent. & P. Q., Truck Crops #2080.

THRASORUS, new genus

Abdomen sessile, shorter than thorax in female, not compressed; petiole smooth inconspicuous, crescent-shaped as in the gall-makers; tergite II hairy at the base. Scutellum with 2 distinct pits; disk mostly rugose, rounded behind. Mesoscutum smooth and shining with many fine setigerous punctures, parapsidal grooves percurrent. Wing pubescent and ciliate, radial cell closed. Head smooth, pubescent; cheeks not margined, not broadened behind eyes. Antennae 13-segmented, filiform, segment 3 longer than 4. Male unknown.

The name is an anagram of *Sarothrus* from which it differs by having non-margined cheeks not broadened behind the eyes, a longitudinal groove on lower third of mesopleuron, an inconspicuous smooth petiole, a shorter abdomen and the relatively large tergite behind the second apparently made up of II and III fused.

Genotype.—*Thrasorus pilosus* n.sp. Monobasic.

Thrasorus pilosus, new species

(Fig. 4.)

Female.—Head, antennae, tegulae, legs and abdomen red; thorax black. Head and thorax covered with silky pubescence with denser patches on sides of prothorax, under tegulae, on ventral region of meso- and metapleura and propodeum. Head from in front broader than high; malar space one-half eye, without groove; from above, occiput concave, cheeks not broadened behind eyes, not margined. Antennae 13-segmented, filiform, segments as (scape) 16(5):

9:16(4):11:10:10:9:8:8:8:8:7:15(5). Sides of pronotum smooth, truncation punctate, broadly emarginate above. Mesoscutum shining, smooth, with many fine setigerous punctures; parapsidal grooves percurrent; faint anterior parallel lines present; distinct grooves over tegulae and a faint median groove posteriorly. Pits at base of scutellum large, smooth, distinctly separated by a smooth septum; disk coarsely rugose except behind septum, not margined, rounded behind. A large, smooth, bare, polished area on mesopleuron and a longitudinal groove. Carinae on propodeum almost parallel, enclosed area as broad as long. Wing pubescent and ciliate; radial cell closed, 2.6 times as long as broad; areolet faintly outlined; cubitus directed toward lower end of basal vein. Hind tibia longer than tarsus; claws weak, simple. Abdomen sessile, shorter than thorax, length to height to width as 73:53:40; lengths of tergites along dorsal curvature as 21:32:17:1:21; the last tergite punctate and pubescent. Using the width of the head as a base the length of mesonotum ratio is 1.18; antenna 2.4; wing 3.0. Range in length of 8 specimens 2.45–2.8 mm. Average 2.53 mm.

Type.—Cat. No. 56813 U. S. N. M. Type and 4 paratypes.

Habitat.—Sydney, New South Wales, Australia, November 19, 1915, Mr. J. C. Bridwell, Collector.

Xyalophora quinquelineata (Say), new combination

Diplolepis 5-lineata Say, 1836, Boston Jour. Nat. Hist. 1:267.

This species has been placed at various times in *Figites*, *Onychia*, *Aspicera*, *Figitodes* and *Figitides*, the last an evident typographical error. The type is lost. The description and early determinations of the species indicate that it should go in *Xyalophora* Kieffer (1901).

In July and August 1922 the writer took large numbers of females while they were ovipositing in cow manure in Modoc, Plumas and Eldorado counties, at Red Bluff, Truckee and Tahoe City, Calif.; Oregon Caves, Oreg.; Williams, Ariz.; Santa Fe, N. M., and Trinidad, Colo. All these locations were in the transition zone where cattle were pasturing among conifers. The bare, non-ciliate wings were folded back upon the abdomen before they dove into the soft mass just as it began to glaze over so as to reach the dipterous host larvae during the first larval instar. From this submergence they came out immaculate. Males were taken by sweeping the surrounding vegetation. Range in length of females 3.05–5.25 mm. Average of 100, 4.0 mm. Males measured 2.5–4.25 mm. Average of 40, 3.36 mm. The species has also been recorded from Idaho, Mont., Utah, Ill., Wis., Mich., N. Y., Alberta, Ontario and Nova Scota. Carl Mohr reared it from puparia of *Sarcophaga l'herminieri* R. Desv. in cow dung in Ill. and found that it winters over in the puparia (in letter, Jan. 1933).

The genus *Figitodes* was proposed by Ashmead in 1887 without mention of a species. The first species to be described under that name was *Figitodes atricornis* Ashmead (1896) which is therefore the genotype and the fixation of *Figites quinquelineatus* Say by Ashmead in Psyche 10:11 (1903) is erroneus. *Figitodes atricornis* Ashmead was placed by Dalla Torre and Kieffer in *Trischiza* so that *Figitodes* becomes a synonym of that genus.

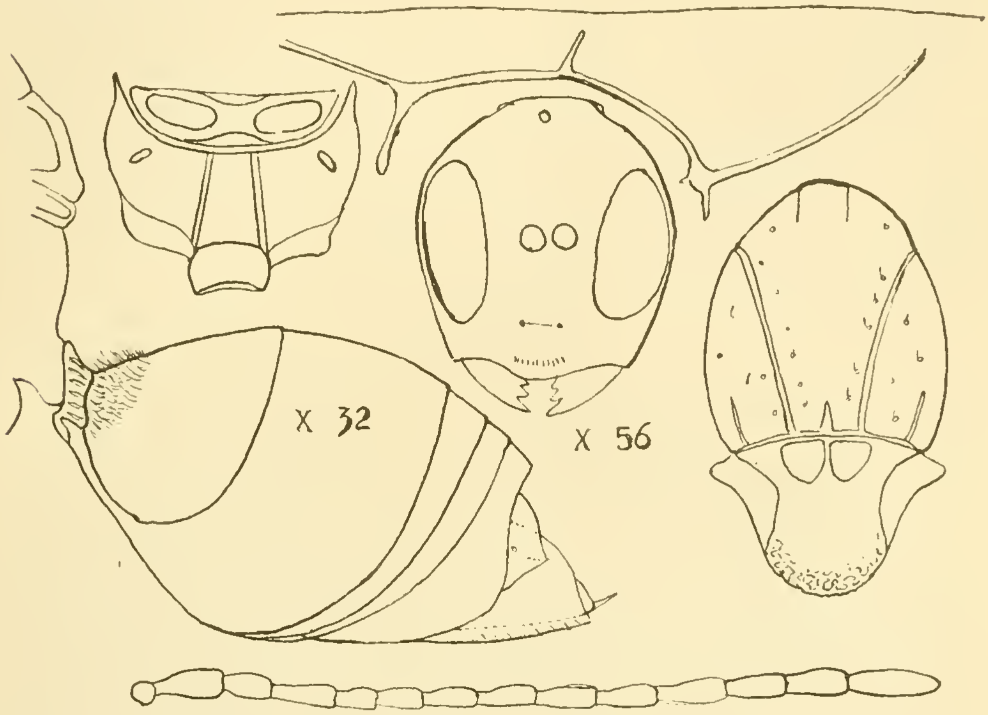


Fig. 3 Paraschiza cupressana n.g., n.sp.

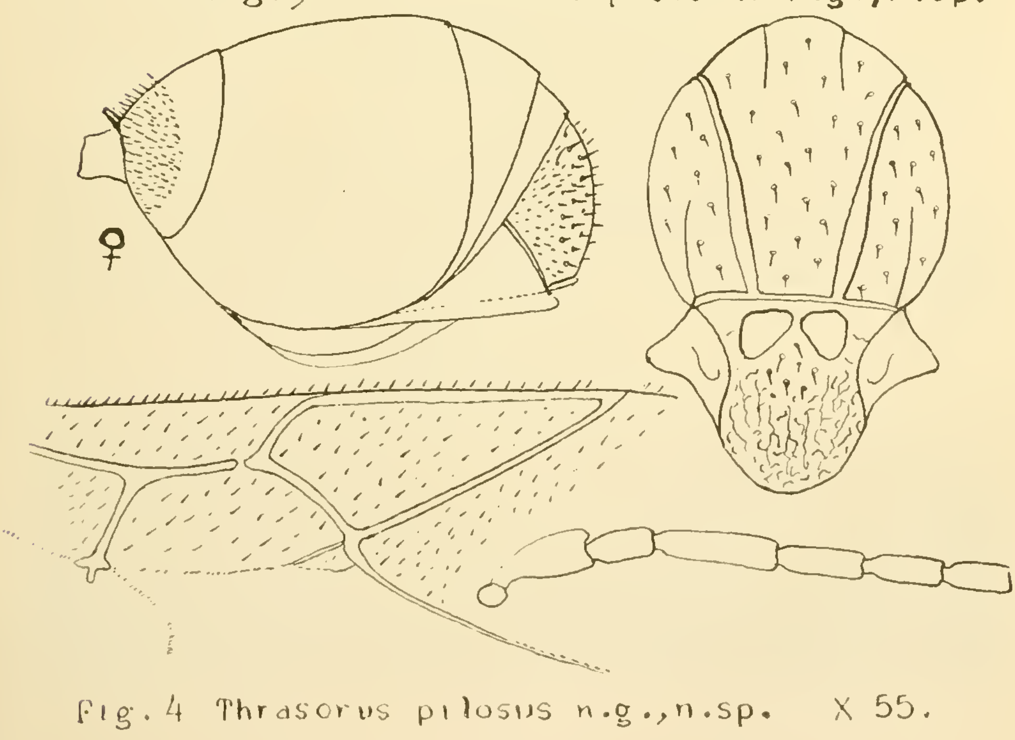


Fig. 4 Thrasorus pilosus n.g., n.sp. X 55.

Figites floridensis, new name

Omalaspis floridanus Ashmead, 1887 Trans. Amer. Ent. Soc. 14: 155 ♂.
Homalaspis floridana Ashmead, 1893 Dalla Torre, Cat. Hym. II Cynipidae p. 7.
Tavaresia floridana Ashmead, 1901 Kieffer Bull. Ent. Soc. France, p. 160.

The second tergite of the type male in the U. S. N. M. is not liguliform and the species therefore belongs in the Figitinae in the genus *Figites*. As the name *floridanus* is preoccupied there by *Figites floridanus* Ashmead 1887, the new name *floridensis* is here proposed.

Besides the type the museum has four other male specimens as follows: Jacksonville, Fla., Tifton, Ga., and Thomasville, Alab., Apr. 20, 1910, W. D. Pierce, Coll.; East Falls Church, Va., June 20, On flowers of parsnip. Lengths: 2.4, 2.5, 2.8 and 2.5 mm.

What seems to be the associated female is here described.

Female.—Black, flagellum red, femora infuscated, tibiae and tarsi red. Head broader than thorax, vertex smooth, malar space coriaceous, eyes hairy, antennae 13-segmented, flagellum gradually stouter and moniliform distally, last segment longest and stoutest. Pronotum striate on sides anteriorly; truncation broad, margined, truncate above. Mesoscutum smooth, almost without punctures, parapsidal grooves percurrent, deep grooves above tegulae. Disk of scutellum almost smooth back of the two deep, smooth pits; reticulate and margined behind. Mesopleuron striate in part. Wing hyaline, bare, non-ciliate, folding lengthwise, veins pale yellowish; radial cell closed, twice as long as broad, cubitus obsolete, areolet represented by second intercubitus. Abdomen not as long as head plus thorax, length to height to width as 105:65:40; lengths of tergites along dorsal curvature as (petiole) 5(22):34:45:7:0:5:17, petiole striate, faint striae in front of a narrow red band on tergite II. Using width of the head as a base the length of mesonotum ratio is 1.4, antenna 2.25, wing 3.5. Lengths 2.1–3.1 mm. Average of seven 2.43 mm.

Habitat.—Selma, Alab., Oct., Patton; Victoria, Tex., Nov. 6, 1906, J. D. Mitchell; Uvalde, Tex., Apr. 14, 1934, A. W. Lindquist (Bishopp #20, 070); Medina, N. Y., July 2; Evanston, Ill., June and Aug.; East Falls Church, Va., June 20, On flowers of parsnip.

Subfamily Eucoilinae

CONEUCOELA Kieffer

Kieffer proposed this genus for his *Coneucoela gracilicornis*, a species from Magagascar with a closed radial cell and a large cup, described in Voeltzkow, Reise in Ostafrica, Wiss. Erg. 2: 534. This elaborate work was not published until 1910. In the mean time he had found a specimen in the Baker material from Brasil which, in spite of its open radial cell, he called *Coneucoela brasiliensis*. A description of this was published promptly in 1909 in

Bull. Nat. Hist. Soc. Metz 26 : 63 and this species technically thus becomes the genotype, being the first species to be described under the name of *Coneucoela*. Unforunately the specimen was a male and the type does not seem to be in the Baker collection at Pomona. As it was obviously the author's intention to found the genus on *gracilicornis* it would be only courtesy to respect his wishes, but the International Rules decree otherwise and make another species, described from a unique male specimen now lost, the genotype. The type of *gracilicornis*, preserved in alcohol in Berlin, seemed to me to be congeneric with the genotype of Ashmead's genus *Odonteucoila* and may be known as *Odonteucoila gracilicornis* (Kieffer), comb. n.

Apparently congeneric with *brasiliensis* Kieffer, so far as ascertainable from the published description, is a new species from Africa described below. Combining the characters taken from the description of the male of *brasiliensis* with females of the new species below, the genus as now understood would be characterized as follows:

Abdomen sessile; tergite II with a distinct ring of tangled hairs at base. Mesoscutum smooth and polished, without longitudinal carinae or parapsidal grooves. Scutellum with two deep, smooth pits at base; the disk punctate, tapering gradually in both dorsal and side views to a blunt point well behind the cup and overhanging the propodeum; cup large. Wing of normal size, richly pubescent and ciliate, the radial cell open. Head from in front higher than broad. Antennae of female 13-segmented, with a 7-segmented club; filiform and 15-segmented in the male, the fourth segment longest and stoutest and slightly bent.

Coneucoela tanganyikensis, new species

Female.—Black; mandibles, tegulae, metapleura, legs and antennae red Head from in front higher than broad, polished, smooth except for a few punctures bearing hairs; malar space one-half eye, with a fine groove; median area of face prominently bounded laterally by grooves running to clypeus; cheeks margined; occiput concave; antennae 13-segmented, lengths of segments as (scape) 8:4(4):6:4:4:4(3.5):7(5):7:7:7:7:7:8. Truncation of pronotum punctate, half as wide as head, truncate above; sides striate anteriorly. Mesoscutum slightly wider than long, with rows of setigerous punctures in position of the parapsidal grooves. Scutellum almost as long as mesoscutum; pits deep, smooth, elliptical; lateral bars smooth; cup large reaching three-fourths way back to end of scutellum, two-thirds the width of disk, bearing a round pit behind and 2–3 punctures on each side; disk punctate, with scattered hairs, tapering gradually behind cup to a blunt smooth point. Mesopleuron bare, polished, with a fine longitudinal groove across lower third. Metapleuron bare. Carinae on propodeum enclosing an elongated harp-like area which, like the lateral areas, bears white pubescence. Wing richly pubescent and ciliate, radial cell entirely open on margin ("open except on proximal third" in *brasiliensis*), 2.37 times as long as broad; cubitus and anal veins represented by faint clouds. Hind tibia shorter than tarsi which taper distally; claws weak, simple. Abdomen shorter than head plus thorax, length to height to width as 64:47:26. Measured along dorsal curvature the lengths of tergites are as 42:9:1:7; posterior third of the big tergite and exposed parts of the next two bearing fine punctures. Using the width of the head as a base the length of mesonotum ratio is 1.5; antenna 2.29; wing 3.89. Range in length of 6 specimens 1.55–1.9 mm. Average 1.73 mm.

Male.—Antennae filiform, 15-segmented, lengths of segments as (scape) 7:4:9:12:10:10 . . . . . . 11; the fourth segment slightly bent and stoutest; ratio 4.5 (using width of head as a base). Abdomen shorter than thorax, length to height to width as 42:37:19. Lengths of tergites as 33:19:0:8. Three specimens measured 1.55, 1.45, 1.65 mm.

Type.—Cat. No. 56814 U. S. N. M. Type female, allotype and 3 female paratypes.

Habitat.—Muhesa, Tanganyika Territory, Africa, November 21, 1935, Mr. Fred Bianchi, Collector. "Ex dipterous pupa ex Solanum sp."

Eutrias tritoma (C. G. Thomson)

In April 1933 and Oct. and Nov. 1934, Mr. A. W. Lindquist reared from dipterous puparia of the family Sepsidae taken from cow dung at Uvalde, Texas, a series of cynipids (Bishopp #20,027 and #20,066) which were determined as belonging to the genus *Eutrias* and which seemed to agree with the published description of the genotype species *tritoma* and also with notes the writer made on the types of that species in 1931. Accordingly a male and a female specimen were sent to Lund, Sweden, in 1934 for direct comparison with the types and Dr. N. A. Kemner reported substantial agreement with Thomson's types. In June 1940 Mr. Leith F. Hitchcock, while searching for a dung insect to control the buffalo fly in Australia, reared specimens of this species at Floydada and Johnson City, Texas. This adds another record of an Old World parasitic cynipid to our American fauna. No other species has ever been proposed in the genus.

Females measured 1.3–2.15 mm. Average of 14, 1.71 mm. Males measured 1.0–1.95 mm. Average of 18, 1.42 mm.

DIMICROSTROPHIS Ashmead

This genus was founded on *Dimicrostrophis ruficornis* Ashmead which was described as having a closed radial cell and the pubescent girdle at the base of the abdomen nearly obsolete and hence was made a synonym of *Eucoila* in the DallaTorre and Kieffer monograph in Das Tierreich 24:164 (1910). An examination of the type in the United States National Museum shows that the radial cell is distinctly open for about half its marginal length and there is a distinct girdle of erect hairs at the base of tergite II. The genus should therefore become a synonym of *Trybliographa* Förster. (Synonymy new).

Pseudeucoila bochei, new species

(*Eucoila* of authors)

Female.—Black, legs and antennae fuscous. Head from above transverse, not as broad as thorax, cheeks narrowed behind eyes; from in front higher than broad; antennae 13-segmented without a distinct club, arising above middle of eyes, lengths of segments as (scape) 17:8:18(5):15:14:13:14:16:17:17:16:16:18 (8); malar space .5 eye, with a fine groove. Truncation of prothorax .4 width of head, not emarginate above. Mesoscutum broader than long. Scutellum with disk rugose, rounded behind and overhanging metanotum; with two deep, smooth, elliptical pits at base; cup well-elevated, long-elliptical, not reaching end of disk, not quite half as broad as disk, broadest in front of middle, the posterior tapering half bearing a large round pit and depressed in profile. This high-arched profile of the cup forms the best recognition mark of the species. Mesopleuron bare, with a fine groove below middle. Wing pubescent and ciliate; radial cell closed, 2.4 times as long as broad; first abscissa of radius prolonged into a spur; cubitus obsolete. Legs slender, proximal end of hind femur and distal end of tibia stouter, hind metatarsus almost as long as 2–5 united. Propodeum with two strong, almost straight carinae, enclosed space higher than broad. Abdomen as long as head plus thorax, longer than high; lengths of tergites as 49:13:7. Using width of head as a base the length of mesonotum ratio is 1.4, antenna 2.8 ,wing 4.2, ovipositor 4.0. Length 1.5–2.05 mm. Average of 58 specimens 1.64 mm.

Male.—Differs in having 15-segmented antennae whose proximal segments are as 24:8:41:51:46:48:49, the third almost straight, the fourth slightly bent; all flagellar segments with rhinaria. Lengths of tergites as 33:17:5:2:3. Antenna ratio 5.2, wing 4.2 (using width of head as a base). Length of 32 specimens 1.05–1.65 mm. Average 1.34 mm.

Types.—U. S. N. M. 56815. Type female, allotype, 10 male and 10 female paratypes. Paratypes in American and Field Museums, Harvard, Philadelphia Academy and California Academy.

Host.—*Drosophila melanogaster* Meigen.

Biology.—In October 1941, Dr. Robert D. Boche of the Univ. of Pennsylvania collected four female parasitic cynipids at Perryman, Md. On Nov. 21 he sent in for determination *Drosophila* larvae in a culture medium and in the vial a few living cynipids which he said were the F^1 progeny of one or the other of the above mentioned four. Adult cynipids emerged from the parasitized larvae at intervals—males from Dec. 20 to Jan. 6, females from Dec. 20 to Jan. 15, largest numbers of both sexes coming out Dec. 26. These are labelled Perryman, Md.

which might be considered the type locality. Agreeing with these is one from North East, Pa. (R. A. Cushman) July 24, 1914 "found in a jar of decaying fruit infested by *Drosophila*" and one from Maywood, Va. (McAtee) Nov. 20, 1921.

Eucoila drosophilae Kieffer from French Guinea differs in having the "radial cell twice as long as broad, segments 3–6 of antenna of female without rhinaria and cup flat." *P. bochei* has radial cell 2.3–2.4 times as long as broad, segments 3–8 without rhinaria and the posterior third of cup is depressed.

In a letter Dr. Boche adds some details of the life history of this Perryman material. "The life cycle ranges from 3–5 weeks depending on the temperature. Adults ordinarily survive only 2–3 weeks after emergence, thus the generations do not overlap. The egg is laid in the first or second instar larva (third instar parasitism is attempted but usually fails). One and only one parasite develops from each host larva, although several eggs are occasionally deposited in the same host. Unfertilized females (virgins isolated as pupae) produce nothing but males which are apparently haploid. The sex ratio may vary from all males (no fertilization) to about five females to one male. From 36 single pair cultures in which both sexes occurred among the progeny were 3399 females and 1683 males. The ratio 2.02 to 1 is a spurious one since it depends chiefly on how many eggs the female fertilizes. Thus in one culture there were 213 females and 52 males; while in another there were 146 females and 190 males."

In 1936 he studied the life history of a form collected by Mr. Warren P. Spencer at Long Lake, Ohio, and after breeding it for a couple of years lost it. He sent me two whole mounts of this Long Lake material and they seemed to me to be the same as the Perryman form. Moreover in Dec. 1934, Mr. Spencer sent to Washington for determination a series of specimens, alive and in alcohol, reared from *Drosophila melanogaster*. He found it would parasitize the closely related *D. simulans* and was trying it on about a dozen other species of *Drosophila*. A few of these had been retained for the Museum collection and they seem to be the same as the form he sent to Dr. Boche and the same as the Perryman material. Although not included in the type series this adds another host and locality record.

As far as I know no parasitic cynipid has previously been bred in such numbers. Dr. Boche states, "I place a few cynipids and a few *Drosophila* together in a culture bottle and wait. I have grown both single pair and mass cultures in this way and few or no parasitic insects are as easy to rear." The culture medium used was the usual corn meal, agar, molasses yeast formula developed by Bridges for *Drosophila* (Am. Nat. 67:437 and see also Sci. n. s. 96: 282).

A NEW GENUS AND TEN NEW SPECIES OF SERENTHIINES (Hemiptera: Tingitidae)

By CARL J. DRAKE, *Ames, Iowa*

The subfamily Serenthiinae may be separated from the other subfamilies of Tingitidae by not having the discoidal and sutural areas defined; or the subcostal, discoidal and sutural areas not differentiated. The costal area may be obsolete, or present and well defined. The legs are suddenly incrassate above the base and then become slenderer near or towards the apex. The hood is absent.

This paper contains the description of a new genus from Africa and the descriptions of 10 new species from African and Australian regions. The characters of the serenthiines are mentioned because certain species that have been placed in the genera *Nethersia* Horvath (1925) and *Epimixia* Kirkaldy (1907) fall into the subfamily Tingitinae. *Teleonemia vulturna* Kirkaldy belongs to the genus *Epimixia*. In the new species of *Nethersia*, the areas of the elytra are well defined, even in some of the specimens determined tentatively as *N. maculosa* Horvath. In most species of *Epimixia*, the areas of the elytra are not or poorly defined. It should also be pointed out that the genus *Alveotingis* Osborn & Drake possesses elytra in the brachypterous form typical of the Serenthiinae rather than Tingitinae. The members of the genera *Serenthia* Spinola (1837), *Lullius* Distant (1904), *Ceratnoderma* Stal (1873), *Coleopteroides* Philippi (1863) and *Sabestena* Drake (n. gen.) are typical of the Serenthiinae. *Coleopteroides brunnea* Drake & Poor from Argentina should be treated as a distinct species rather than a variety of *C. liliputiana* (Signoret). The length of the antennae and color separate the two species. The types of the new species described below are in my collection.

SABESTENA, new genus

Head short, only slightly produced in front of antennae, without spines; eyes moderately large, placed close to pronotum. Pronotum narrowed anteriorly, pitted, unicarinate, without hood; triangular process long, narrowed to a pointed apex; collar distinct, low, finely areolate. Antenniferous tubercles short, not prominent. Antennae moderately long, rather slender; segment I rather short, scarcely longer or thicker than II; III longest, slenderest; IV scarcely thicker than III, moderately long. Rostrum moderately long, the channel distinct. Bucculae areolate, closed in front. Legs short, the femora incrassate, particularly the front pair. Elytra smooth, with costal area dilated, areolate, the others not differentiated. Hypocostal ridge present, without distinct areolae. Orifice present, very distinct.

Type of genus *Sabestena africana*, n. sp. Macropterous form unknown. Brachypterous form small, obovate, the elytra strongly convex above. Separated from genera *Ceratnoderma* Stal and *Coleopteroides* Philippi (= *Solenostoma* Signoret) by having a distinct costal area; *Serenthia* Spinola and *Lullius* Distant are represented by larger and much more elongate species.

Sabestena africana, new species

(Pl. 6).

Very small, obovate, dark fuscous, the costal area, front margin of collar and most of triangular projection of pronotum whitish. Head black, slightly rugose, without spines; bucculae whitish, areolate, converging in front. Rostral laminae whitish, very widely separated; rostrum brownish, dark at apex, extending to near middle of mesosternum. Antennae long, indistinctly pilose; segments I and II black, rather short, the latter slightly slenderer, slightly brownish apically and subequal to I in length; III slightly bent, mostly testaceous, nearly twice as long as IV; IV a little thickened distally, testaceous, embrowned towards apex. Legs short, moderately stout, brownish black, the tips of femora, tibiae and tarsi brown; anterior femora strongly, abruptly thickened a little beyond base, moderately narrowed apically, the small basal portion slenderest; middle and hind pairs only moderately thickened, slightly bowed.

Pronotum moderately narrowed anteriorly, pitted, only very slightly transversely raised through humeri, the median carina only faintly raised, appearing fairly distinct on triangular process because of its brown color; calli slightly impressed, black; collar slightly raised, areolate; paranota absent; triangular process long, finely areolate, uniformly narrowed to apex. Elytra strongly convex above, fitting rather closely to sides and hind end of abdomen, even projecting a little below abdomen, fuscous-brown, finely areolate, a small rather indistinct patch near the middle of each side, another larger and distinct area on each side behind, a narrow inner margin and all of costal area whitish; costal area rather narrow, uniseriate throughout, the areolae small and subhyaline. Body beneath brownish black.

Length, 1.78 mm.; width, 1.00 mm.

Type, female, Naburu, Kenya, Africa, June, 1919.

The elytra in the short-winged form meet within in nearly a straight line, are only slightly overlapping apically and scarcely longer than abdomen. The carinae and nervures separating areas of elytra are beset with fine, pale hairs.

Lullius insolens, new species

Similar to *L. major* Distant, but a little smaller, darker in color, wider costal area, and larger first and second antennal segments. Pronotum slightly more convex than in *major*, the median carina low, becoming indistinct posteriorly, the hind process embrowned. Head black, without spines. Rostrum brownish, extending a little beyond pro-mesosternal suture; channel deep on mesosternum, very shallow and wide on metasternum. Body beneath black. Antennae brown; segment I stouter and subequal to II in length; III becoming slenderer distally, the apical portion broken. Elytra rounded at apex, brown,

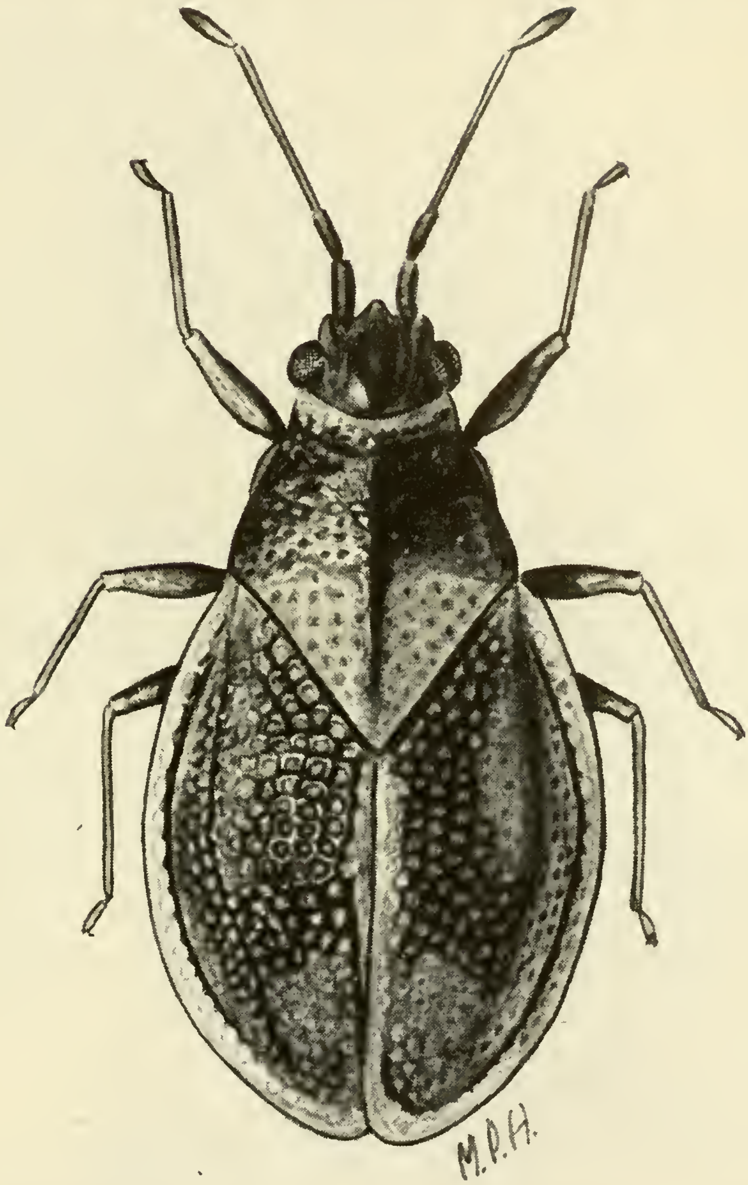


Plate 6. *Sabestena africana*, new species.

the areolae small, clear; costal area uniseriate, the areolae moderately large, brown, the apical portion slenderer and turned inwards at almost right angles. Other characters very similar to *major*.

Length, 3.40 mm.; width, 1.10 mm.

Type, male, Camps Bay, Cape Peninusula, Africa.

This species is larger than *L. minor* Distant, the pronotum more narrowed in front and the elytra much broader behind.

Epimixia veteris, new species

Head black, with front and hind pairs of spines very short, adpressed, usually testaceous, the median absent. Bucculae reddish brown, reticulate, closed in front. Rostral channel narrow and deep on mesosternum, much wider and with laminae low, parallel and open behind on metasternum; rostrum extending nearly to the base of mesosternum. Legs very short, black, without long setae. Antennae moderately long, black; segment I short, stouter and a little longer than II; III long, slender, black, somewhat shiny, two and one-half times as long as IV, the latter only slightly thickened.

Pronotum strongly convex, pitted, shiny, tricarinate, yellowish brown to reddish brown, the collar and triangular process becoming testaceous; median carina much lower but distinct on disc; lateral carinae obsolete or nearly obsolete on disc, the lateral and median carinae testaceous in front and on triangular process, the lateral very short in front; collar distinct, somewhat testaceous, truncate in front. Elytra distinctly narrowed posteriorly, slightly constricted beyond middle, grayish brown to reddish brown, somewhat shiny; costal area pale, represented by a very narrow ridge, indistinctly areolate behind; subcostal area broad, closely reticulated, four areolae deep; discoidal area extending to middle of elytra, narrowed at base and apex, widest slightly beyond middle, there five areolae deep, the outer boundary distinct but only slightly elevated; sutural area a little more widely reticulated, sometimes broadly fuscate along median line. Body beneath black.

Length, 3.65 mm.; width, 1.10 mm.

Type, male, Samsonvale, Queensland, Australia, Oct. 7, 1938; allotype, North Pine River, March 29, 1930. Paratypes: 1 specimen, National Park, Dec., 1933, 3 specimens, N. Pine; and 2 specimens Adelaide.

The strongly tumid disc and lateral carinae separate this species from other members of the genus. The median space immediately behind collar and separating the two black calli is raised and testaceous. The testaceous paranota are almost obsolete opposite humeral angles, slightly wider and with indistinct areolae in front.

Epimixia tenuatis, new species

Head, legs and antennae black, the elytra and pronotum variable in color pattern, fuscous with testaceous along carinae and outer margins of discoidal and sutural areas. Head with front and hind pairs of spines very short, tuberclelike, testaceous. Antennae moderately long, smooth; segment I stouter and a little longer than II; III twice as long as IV, the latter rather long, slightly thickened.

Pronotum moderately convex, pitted, tricarinate, largely dark fuscous; lateral carinae slightly convex within in front, on the disc less raised but distinct; paranota narrow, testaceous, carina-like, slightly wider in front, there with tiny areolae; collar distinct, pale testaceous in front. Elytra distinctly narrow posteriorly, faintly constricted beyond middle, the costal area very narrow, testaceous, with a row of very tiny areolae.

Length, 2.95 mm.; width, 0.90 mm.

Type, male, Cedar Creek, Jan. 25, 1931; allotype, taken with type; paratypes, 3 specimens, Meringa and Cedar Creek, Australia.

The very narrow costal area and the stripe-like appearance of the color pattern separate this species from other members of the genus. In *E. vittata* Horvath, the pronotum is more tumid, the costal area wider and the lateral carinae indistinct on disc of pronotum.

Epimixia evansi, new species

Head black, with two short, black, tubercle-like hind spines, the others wanting. Antennae moderately long, slender, brownish black; segments I and II short, the latter slenderer and scarcely more than one-half as long; III long, smooth, twice as long as IV, the latter moderately long, slightly thickened distally. Legs rather short, black, the anterior femora beneath with short, inconspicuous setae. Rostrum brownish, black at tip, practically extending to base of mesosternum; metasternal laminae low, blackish, widely separated. Body beneath black, somewhat shiny.

Pronotum moderately convex, pitted, tricarinate, the calli black; collar distinct, areolate, truncate in front; paranota pale testaceous, narrow, linear, slightly wider in front, uniseriate, the areolae small; carinae yellowish brown, the lateral carinae less elevated on disc; triangular process areolate. Elytra moderately narrowed posteriorly, slightly constricted before apex, brownish, the outer margins and nervures separating areas yellowish brown; subcostal area moderately wide, triseriate, dark fuscous within; discoidal area large, extending a little beyond the middle of elytra, narrowed at base and apex, widest near middle, there five areolae deep; sutural area becoming more widely reticulated apically; costal area not distinct.

Length 3.10 mm.; width 1.00 mm.

Type, female, and 1 paratype, Tasmania, J. W. Evans. Another male, taken with type, seems to be this species but differs in having much longer antennae.

Nethersia poorae, new species

(Fig. 1.)

Moderately large, testaceous, beset with numerous bristly hairs. Head with five, pale, testaceous spines; hind pair longest, adpressed; median porrect, pointed at apex; frontal pair with tips touching, nearly porrect. Eyes reddish brown. Rostrum brownish, darker apically, extending to base of mesosternum; rostral channel deep, rather narrow on mesosternum, distinctly wider and chordate on metasternum. Antennae moderately long, beset with bristly hairs, testaceous, the apical segment with distal half black; segments I and II very short, the latter shorter and slenderer; III slenderest, two and one-half times as long as IV, the latter moderately swollen. Body beneath pale testaceous.

Pronotum strongly convex, coarsely pitted, sharply tricarinate, truncate in front, the hind triangular portion pointed, reticulate, embrowned; paranota narrow, strongly reflexed, resting on the pronotum, uniseriate behind, becoming wider and biseriate in front; collar rather long, distinct, areolate, four areolae deep; median carina more elevated, uniseriate, the areolae small; lateral carinae more widely separated in front, sharply raised but without dis-

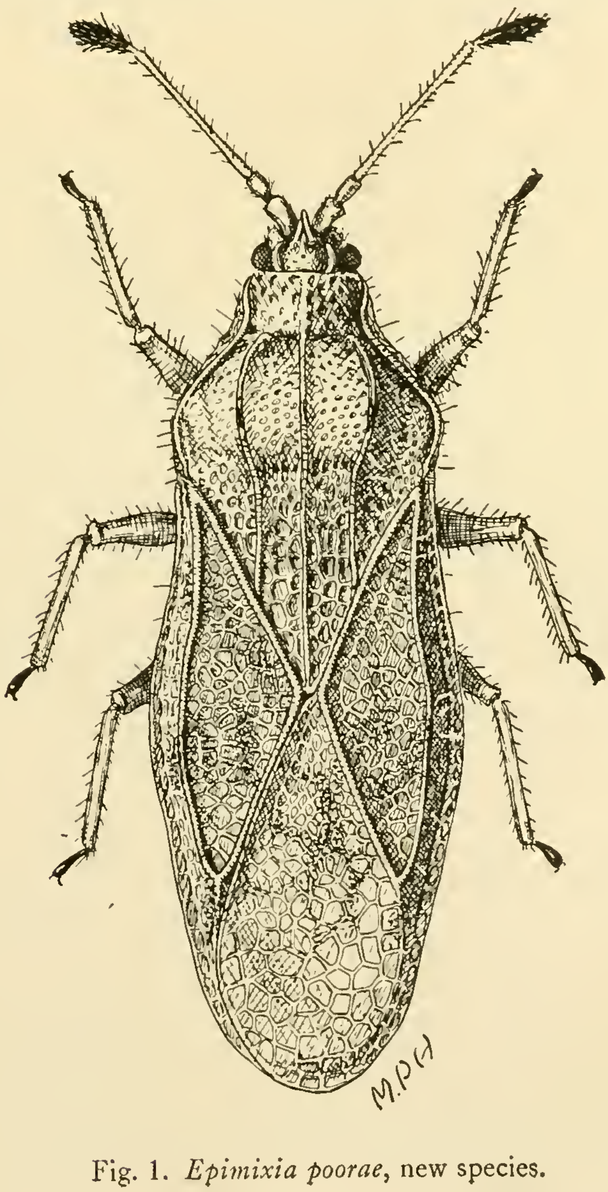


Fig. 1. *Epimixia poorae*, new species.

tinct areolae. Elytra with areas distinctly separated; costal area very narrow linear, with one row of small areolae; subcostal area wider, biseriate; discoidal area large, about three-fourths as long as elytra, narrowed at base and apex, widest near middle, there six areolae deep; sutural area closely reticulated, the areolae becoming a little larger distally. Legs rather short, beset with bristly hairs, testaceous, the tarsi darker.

Type, female (figured) and allotype, male, Mt. Tambourine, Queensland, Austr., Dec. 26, 1928, H. Hacker. One paratype taken with type and another from Bundaberg, Queensland, Sept. 2, 1928, R. W. Montgomery.

This insect is named in honor of the artist, Mrs. Margaret Poor Hurd, who has written a number of illustrated papers on Tingitidae. *N. poorae*, n. sp. is shorter, broader, more setose and the carinae are higher than in *setosa* Hacker. The costal area is distinct and uniseriate.

Nethersia absimilis, new species

Pronotum moderately convex, pitted, tricarinate, pale brown, the triangular process testaceous; lateral carinae distinct, not sharply elevated, slightly convex within in front; median carina slightly more elevated; collar distinct, areolate, truncate in front; paranota very narrow behind, carina-like, wider and areolate in front, there completely reflexed; triangular process areolate, finely hairy. Head dark reddish brown, the median spine absent, the hind and front pairs of spines short, testaceous. Eyes black. Antennae short, indistinctly hairy, brownish; segments I and II moderately stout, the former stouter and longer; III twice as long as IV, the latter moderately thickened. Legs short, rather stout, brownish, with a few bristly hairs. Rostral channel very wide on meso- and metasternum, the laminae testaceous, concave within on each sternum; rostrum brown, black distally, extending to base of mesosternum. Elytra narrowed posteriorly, pale testaceous, the veinlets sparsely clothed with pale, short hairs, a transverse brown band near the middle of subcostal area and veinlets of sutural area slightly embrowned, the nervure separating discoidal and subcostal areas distinct; costal area wanting; subcostal area biseriate; discoidal area large, widest beyond middle, there four areolae deep. Body beneath brown, clothed with short, pale hairs.

Length, 2.60 mm.; width, 1.00 mm.

Type, female, Roma, Queensland, Austr., Nov. 30, 1940.

This species is shorter and stouter and the antennae shorter than in other members of the genus.

Nethersia nostratis, new species

Similar to *N. poorae*, n. sp. but easily distinguished by the much more elevated carinae (especially median on disc), the legs, antennae and nervures without setose hairs, and the broad, transverse band of elytra. Head brown, with five yellowish brown spines, the median very short, tubercle-like. Rostrum extending between intermediate coxae. Legs short, brown, the tibiae yellowish brown, with short inconspicuous setae. Antennae indistinctly hairy; segments I and II short, stout, brown, the latter a little thinner and shorter; III testaceous, about two and one-half times as long as IV, the latter swollen distally.

Pronotum strongly convex, coarsely pitted, all carinae finely areolate, the median carina arched and more elevated on disc, there biseriate and blackish; paranota completely reflexed, uniseriate opposite humeri, biseriate in front. Elytra brownish, testaceous in front and behind the broad transverse dark fuscous band, the band becoming broader and including most of distal half of discoidal area, the portion of the nervures in the band separating subcostal, discoidal and sutural areas distinctly raised and black; sutural area considerably infuscated.

Length, 3.10 mm.; width, 1.30 mm.

Type, female and allotype, male, Cedar Creek, Queensland, Austr., Aug. 28, 1930, H. Hacker. This is a very striking species and not easily confused with other members of the genus.

Nethersia koebeli, new species

Moderately large, obovate, pale testaceous, without markings. Head pale brown, the spines very short, pale testaceous. Eyes black. Antennae testaceous, indistinctly pilose, the terminal segment becoming fuscous apically; segment I short, slightly stouter and a little longer than II; III slender, straight, two and a half times as long as IV, the latter fusiform. Bucculae broad, reticulate, testaceous, closed in front. Rostral channel deep, open behind, moderately narrowed posteriorly, the laminae whitish testaceous, areolate; rostrum long, dark fuscous, extending between intermediate coxae.

Pronotum moderately convex, coarsely pitted, tricarinate, truncate in front; lateral carinae distinct, very low on disc, distinctly concave within in front; median carina about equally elevated throughout, all carinae slightly more raised on posterior triangular process. Collar distinct, biseriate. Paranota narrow, carina-like opposite humeri, wider and uniseriately areolate in front. Elytra widest near middle, thence narrowed posteriorly, the costal area wanting; subcostal area mostly triseriate; discoidal area large, narrowed at base and apex, widest opposite apex of triangular process, there five areolae deep; sutural area slightly more widely reticulated. Legs rather short, without long, setose hairs, yellowish brown, the tips of tarsi brown.

Length, 3.00 mm.; width, 1.05 mm.

Type, female and 3 paratypes, collected in Australia by Koebele, in whose honor the insect is named. It differs from *N. maculosa* Horvath by having broader subcostal area, distinct lateral carinae and uniform color. *N. setosa* (Hacker) is more elongate and darker in color, the legs are distinctly setose and the antennae are much longer.

Nethersia pugna, new species

Moderately large, stout, with prominent markings. Head brown, with four short, slender, testaceous spines, the median wanting, the posterior pair sometimes adpressed. Eyes rather large, black. Antennae moderately long, the tip of last segment black; segments I and II short, the latter shorter and slenderer; III slenderest, a little more than twice as long as IV. Bucculae reticulate, closed in front. Rostral channel very wide on meso-metasternum, open behind; the rostrum extending to middle of mesosternum. Legs rather stout, short, brown, beset with long setae.

Pronotum strongly convex, closely punctate, tricarinate; lateral carinae faintly convex within in front, without areolae, fuscous, testaceous, each dark fuscous on tumid area; median carina testaceous, with dark fuscous spot on disc and another near apex, there slightly thickened, slightly more raised and indistinctly areolate in front and behind; collar distinct, finely areolate, truncate in front; pronota very narrow, carina-like, a little wider and areolate in front. Elytra testaceous, with a broad, transverse band at middle (expanded in discoidal area) and apical portion reddish brown to fuscous; subcostal area biseriate; discoidal area large, narrowed at base and apex, widest a little beyond middle, there six areolae deep; costal area wanting.

Length, 2.75 mm.; width, 1.05 mm.

Type, female, Roma, Queensland, Austr., Nov. 30, 1930, L. Franzer. Two examples from National Park and 1 from Stanthorpe, Queensland appear to belong to this species.

A NEW GENUS AND SPECIES OF COLEOPTERA FROM PANAMA

By M. W. Blackman [1]

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

During the last 73 years several genera of beetles have been described which have been the subjects of considerable discussion and differences of opinion regarding their relationships to one another and to such established groups as the Scolytidae, Platypodidae, and Cossoninae. The genera in question are *Coptonotus* Chapuis (1869) from Colombia, *Chapuisia* Dugès (1885) from Mexico, *Craniodicticus* Blandford (1895) from Ceylon, *Notoplatypus* Lea (1910) from Australia, *Platytarsulus* Schedl (1935) from the Malay States, and *Scolytotarsus* Schedl

[1] Dr. Blackman died on October 12, 1943. His manuscript, describing this genus and species, and the drawings, were completed before his death and are published without alteration.

(1937) from Africa. In this paper still another genus of somewhat similar and also doubtful affinities is described. This I am naming *Mecopelmus*, new genus, with *M. zeteki*, new species, from Panama, its genotype.

It is not my purpose to enter into a thorough discussion of this complex of genera. To me such action in the present state of our knowledge would seem rather futile. We dare to say only that all these genera lie rather near the Platypodidae and the Scolytidae, some of them showing certain similarities to the Cossoninae. Each genus is represented by a single species, and each of five of the six described genera is known from only a single continent, the sixth occurring on Ceylon adjacent to southern Asia. As would be expected, the similarities of structure among genera arising in such diverse and widely separated areas as isolated localities in Africa, southern Asia, Australia, and Central America are more in the nature of general resemblances than more detailed similarities. Or, if certain structures, such as those of the legs, do show similarities which are usually considered significant, other structures, as the antenna for instance, may be so radically different as to negate any idea of a close relationship.

Even the three genera that occur in the Western Hemisphere, in Mexico, Panama, and Colombia, appear to be no more closely related to one another than they are individually to forms from the Eastern Hemisphere. Indeed, the genus described herein seems to be more closely allied to *Notoplatypus* Lea from Australia and *Platytarsulus* Schedl from Malaysia in antennal and tarsal structures than it is to *Chapuisia* Dugès or *Coptonotus* Chapuis. In other respects, however, such as in the shape of the head, the shape and positions of the eyes, the broadly separated fore coxae, etc., there is little similarity to any of the other genera mentioned. The similarities between *Mecopelmus* and certain of the Platypodidae such as *Periomatus* Chapuis seem rather close if we consider only the shape of the head and the structure of the fore tarsus, but in other respects the differences are striking. It seems, then, rather hopeless to assign *Mecopelmus* to a definite place in the scheme of classification.

As an example of the differences of opinion regarding the disposal of one of these genera of doubtful position, I might cite the case of one of the best known. *Chapuisia* was placed by its describer, Dugès (1885), in the family Scolytidae. Blandford (1896) divided the Platypodinae of Central America into two groups, the Platopodides and the Chapuisiides, the latter containing only the single species *Chapuisia mexicana* Dugès. Strohmeyer (1914) elevated the group containing only the single species to full family rank, under the name Chapuisiidae, coordinate with the Platypodidae. Hopkins (1915) placed *Chapuisia* as the single representative of the subfamily Chapuisiinae of the family Platypodidae. Schedl (1939) grouped the three genera *Coptonotus*, *Scolytotarsus*, and *Chapuisia* into the family Coptonotidae, placing the last genus as the subfamily Chapuisinae (sic).

With authorities on the group differing so markedly in their conclusions as to the position of the same species in the scheme of classification, it would seem wise to postpone the placing of these genera until we know considerably more of their structure and mode of life, and until further collecting has brought to light other forms, as yet unknown, which may make clearer the real relationships. At present, aside from avoiding the issue as I have done, we have two alternatives, either to broaden our conceptions of the family Scolytidae and the family Platypodidae so that each will include certain of the genera of doubtful position, as has been done by Blandford, Hopkins, and Hagedorn, or to create several new families and subfamilies, as proposed by Schedl.

MECOPELMUS, new genus

General appearance as seen from above (fig. 5) similar to that of *Coptonotus* Chapuis, but much smaller. Head (figs. 3, 4) exserted, globose; eyes large, antenna with unsegmented club and 3-segmented funicle; pronotum much wider behind, constricted and excavated at sides; fore coxae very widely separated, tarsi similar to those of *Platypus* etc.; elytra punctate striate.

Genotype, *Mecopelmus zeteki*, new species, described herein.

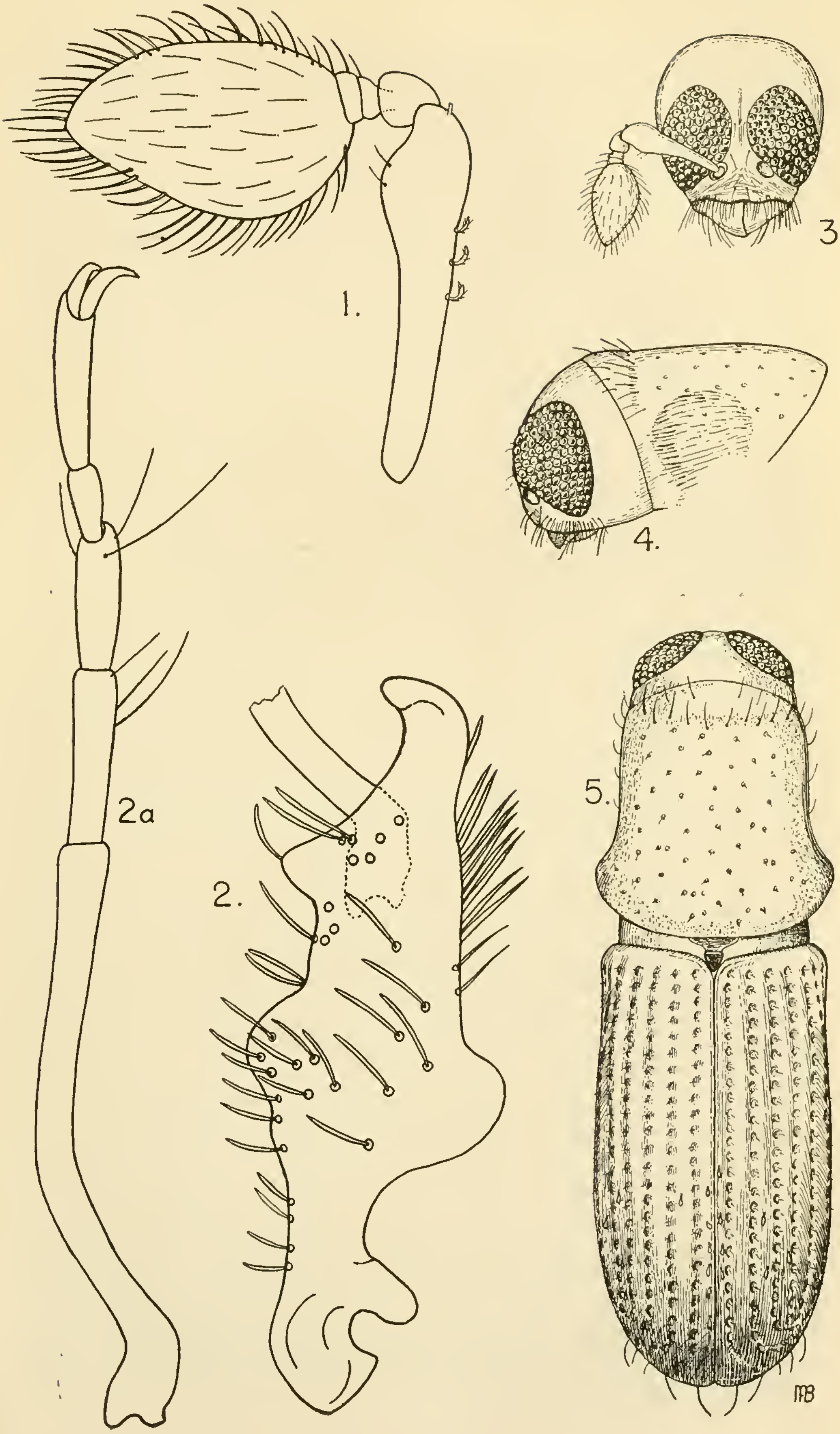
Mecopelmus zeteki, new species

Reddish brown, 1.53 mm. long, 3.14 times as long as wide; with pronotum excavated at sides as in *Coptonotus cyclopus* Chapuis and having a general resemblance to that species, but much smaller and very different in structural details.

Head with contour evenly arcuate from occiput to epistomal margin; eyes (figs. 3, 4) narrowly separated above, large, very broad oval (subcircular), not emarginate, facets coarse; frons narrow above between eyes, feebly reticulate, median line feebly sulcate, with a faint, triangular impression below between bases of antennae and mandibles; antennal scape (fig. 1) moderately slender, club-shaped, as long as club and funicle together, funicle short, pedicel as long as other two segments combined, club flattened, ovate, about 1.66 times as long as wide, with distal end subacuminate, and with no trace of sutures.

Pronotum 1.06 times as long as wide, widest in posterior fourth, much narrower anteriorly (24:34), posterior outline arcuate, not margined; sides strongly excavated (constricted) in anterior three-fourths, anterior outline weakly arcuate; surface moderately shining, distinctly, regularly, finely reticulate, with fine, shallow, rather sparse punctures bearing extremely minute hairs on most of

Mecopelmus zeteki. 1, antenna; 2, tibia; 2a, tarsus; 3, front view of head; 4, lateral view of head and pronotum; 5, dorsal view of body. All drawings by Mrs. Mary F. Benson.


1.
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disk, punctures near anterior margin somewhat larger and deeper and bearing larger hairs. Tibia (fig. 2) with large, curved, terminal mucro, outer edge with two large, blunt serrations; tarsus (fig. 2a) very long, 1.5 times as long as tibia, very slender, segments nearly uniformly cylindrical, first segment nearly as long as other four combined.

Elytra very slightly narrower than pronotum and 1.67 times as long, 1.90 times as long as wide; bases nearly straight, sides subparallel on anterior three-fifths, then gradually narrowed, with end extreme and rather broadly rounded; surface shining, striae weakly but distinctly impressed, with punctures rather fine and close, with minute, inconspicuous hairs; interspaces convex, wider than striae, finely, distinctly reticulate, with very few, fine punctures, subglabrous on disk and sides. Declivity sloping; striae as on disk; interspaces with small, sparse, shallow punctures; hairs scanty, rather short, spatulate.

Type locality.—Barro Colorado Island, Panama Canal Zone.
Host.—Unknown.
Type material.—Holotype, United States National Museum No. 56775.

The new genus and the new species are described from a single specimen taken at light June 20, 1941, by James Zetek.

MINUTES OF THE 542D REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON JANUARY 6, 1944

The 542d regular meeting of the Society was held at 8 P. M., Thursday, January 6, 1944, in Room 43 of the National Museum. President Annand presided and 38 members and 14 visitors were present. The minutes of the previous meeting were read and approved.

President Annand announced that the Treasurer's Report had been audited by the Committee appointed and approved. The following Committees have been appointed:

Membership—M. P. Jones, L. J. Bottimer, C. M. Packard.
Program—L. D. Reed, E. H. Siegler, H. K. Townes.

The regular program continued with a group of papers on the Columbus meetings:

1) Dr. F. C. Bishopp—*Report on program on Medical Entomology in Wartime.*—The program was divided into two parts, one group dealing with the role of medical entomology and the other with chemical control of the insects involved. Among several outstanding speakers from the Army Medical Corps who appeared on the program in the first group were Major O. R. McCoy who discussed the general and historical importance of insects in medical corps work,

Col. W. A. Hardenbergh who spoke on entomologists and the Sanitary Corps, and Major Stanley Carpenter whose paper dealt with work in the 4th Service Command. Canada was represented by Major R. H. Ozburn who gave an account of the entomological work of the Royal Canadian Army Medical Corps. Dr. Stanley Freeborn and George H. Bradley of the U. S. Public Health Service discussed the work of that Service in connection with the control of malaria in extra-cantonment areas. W. H. W. Komp was not able to attend the sessions, due to illness. In the second group Randall Latta dealt with work on fumigants in louse control, E. F. Knipling with repellent and insecticides of value in control of lice and other insects of military importance, T. C. Alvin with sabadilla seed as a partial substitute for pyrethrum, and Dr. L. D. Goodhue discussed and demonstrated the new aersol bomb. The Corps of Engineers of the U. S. Army was represented by L. W. D. Reed. (Secretary's Abstract.)

2) S. A. Rohwer—*Report on program on Agricultural Entomology in Wartime.*—The program of Agricultural Entomology in Wartime began with the afternoon session on December 8th. Agricultural Entomology was, however, also discussed at the opening session as it was ably considered in portions of the scholarly address of President Annand entitled "The War and the Future of Entomology." The portion of the program headed Agricultural Entomology included addresses by 18 speakers. The papers covered a wide variety of subjects, from those dealing with the supplies of insecticides, their distribution and allocation, to current wartime problems concerned with the enforcement of plant quarantines. High lights of recent research to discover, develop, and apply new insecticides and how to use substitute or alternate materials to the best advantage were the themes of the talks presented by a number of speakers. Research to devise and utilize ways of protecting packaged and stored food from damage by insects was explained by three invited speakers and amplified through discussion. New problems in the production of seed because of insects and the part that the honeybee plays in crop and seed production were also important features considered.

The address and at least the important additional comments brought out in the discussion will be published. To attempt to abstract what was said would be a poor substitute for the original, which will be available shortly in the Journal of Economic Entomology.

During the discussion of the afternoon of the eighth, the late E. P. Felt ably and briefly emphasized the importance of trees to the war effort and their value during peacetime. His discussion is remembered as one of the high lights of the meetings, and particularly because of the sincerity and vigor with which he spoke of the importance of protecting trees from insect pests. He was in good spirit and appeared to be in good health. Little did we expect that this meeting would be his last, as he passed away on December 14.

An interesting and perhaps significant difference was noted in the over-all make-up of the program for the two general subject matter fields. That section of the program which dealt with medical entomology had a number of papers by leaders of operations where entomology and the results of entomological research were being applied. The scheduled talks and the discussion in the section of the program concerned with agricultural entomology were, with two exceptions, all by entomologists. Entomologists talking to entomologists—

and in this respect the usual kind of program for entomological meetings. From an over-all, public relation, stimulating, and general orientation point of view, it appeared that the program for the section on medical entomology had the greater interest and was more effective. The contrasting way the two programs were organized contributed to the difference in general interest between the two sections.

The program of the section on agricultural entomology was so much more effective and interesting than the average annual meeting that, contrary to what has been the usual custom of late, those in attendance were in the meeting room rather than corridors. It was a most successful national meeting and reflects high credit on the program committee. It demonstrated the advantages of a planned program of invitation papers. It will be a good model on how to plan future meetings for the benefit of entomologists and the improvement of entomology.

The meeting arrangements were a unique feature for annual meetings. Tables and chairs were well arranged and made it comfortable and convenient for taking notes. The local committee is to be congratulated for digressing from the conventional lecture room set-up usual at the annual national meetings. The regular program filled the daytime so that committee meetings and business sessions had to be held at night. (Author's abstract.)

Dr. Annand reminded the Society that Dr. E. P. Felt had been a member, and appointed Mr. Muesebeck and C. W. Collins to prepare an obituary notice for publication in the Proceedings.[1]

3) M. P. Jones—*Report on program on Extension Entomology*—The Extension Section met on Dec. 8th with representatives from 18 States. Most of the North Central specialists decided to attend the North Central States conference rather than the Columbus meetings. Eight papers were discussed. Mr. Jones stressed that, while the general sessions dealt with recommendations, the extension session was more interested in methods of getting out the findings of research to the people. There is a wide variety of conditions in the different States: as, for example, Pennsylvania has 4 full-time Extension Entomologists and 2 full-time Beekeeping Specialists while Texas has only 2 Entomology Specialists for its 280 counties. Where extension personnel is scarce it is necessary to rely on the cooperation of subject matter specialists, district agents, and a more extensive use of illustrated material. Last year's cattle grub program which was discussed, illustrated the difficulties encountered in planning control programs. The States based their recommendations on the use of rotenone and when the time came for action there was no material procurable. An interesting paper was given on the use of 4-H Clubs in extension work. The information gathered last year by several hundred club members on cotton insect control was so effective that three States issued them certificates of award. The points brought out in favor of using the Clubs were: 1) the club members learn the value of determining insect populations; 2) they render a real service to their fathers and neighbors; 3) the boys who go on to study Entomology approach the subject from a more practical viewpoint. The Session discussed the most satisfactory types of publications and felt that it would be best to break down

[1] See this volume, pages 26–29.

general bulletins into more concise leaflets. The latter are easier to use and less expensive. (Secretary's Abstract revised by Author)

There were further comments on the Columbus meetings by Mr. Rohwer and President Annand.

The last paper on the regular program was the address of Ex-President Harned entitled: Problems and Progress in Cotton Insect Control.

Mr. Harned discussed Problems and Progress in Cotton Insect Control, especially the problems that have arisen because of war conditions. Lantern slides were shown that gave some of the results of recent investigations of cotton insects and the cotton insect survey. One of the most pressing problems is the prevention of the increase in cotton aphid infestations that usually follow the use of arsenical insecticides for the control of other insects.

Before the war good results had been obtained in controlling the cotton aphid by the addition of derris or cube to calcium arsenate used for boll weevil control, so that .5 percent rotenone was in the mixture.This was recommended for one year when war restrictions prohibited its use on cotton. At several field laboratories of the Division of Cotton Insects experiments have now shown that satisfactory control of the cotton aphid may be obtained from nicotine sulphate, free nicotine, and fixed nicotine applied at any time when the air is quiet. Equally good control may be obtained by mixing any one of these nicotines with calcium arsenate so that there is 1 percent nicotine in the mixture for each application or 2 percent when the nicotine is used only in alternate applications.

The urgent need for copper for war purposes made it necessary to find substitutes for paris green and basic copper arsenate, the only insecticides containing copper that are extensively used for the control of cotton insects. To substitute for paris green in the paris green-sulfur mixtures used in the irrigated regions of the Southwest several arsenical-sulfur mixtures were found to be effective. One of these mixtures consists of equal parts of sulfur and a mixture of 5% calcium arsenite and 95 percent calcium arsenate. Various other mixtures of sulfur with calcium arsenate or calcium arsenite, or with mixtures of these arsenicals have given practically as good results as the paris green-sulfur mixture. To substitute for basic copper arsenate, cryolite is satisfactory against the bollworm, the cotton insect for which basic copper arsenate has shown the most promise.

Because of a possible shortage of arsenic for insecticidal purposes, search has been made for substitutes for calcium arsenate and other arsenical insecticides used on cotton. For bollworm control cryolite has been found to be equally or more effective than calcium arsenate or any other arsenical insecticide, but against the boll weevil and cotton leafworm cryolite is only about half as effective as calcium arsenate. However, even though 50,000,000 pounds of calcium arsenate are used annually for boll weevil control, it has been found that the cotton growers can get along with a much smaller amount if that should become necessary. Many growers begin dusting too soon, apply too much calcium arsenate, or continue applications too late in the season for best results. Many growers use no insecticides for boll weevil control but depend entirely upon cultural practices to produce a crop in spite of the weevil. More can do so if necessary. Experiments in Louisiana and Mississippi have shown that more profitable results are obtained by waiting until 25 or 30 percent of the squares are infested than by beginning the applications of calcium arsenate when 10 percent are infested as was formerly recommended. Waiting for 25 percent infestations means that often it is not necessary to use any calcium arsenate, or at least less calcium arsenate is used and there is less damage from aphids.

War conditions have emphasized the importance of insect surveys. The survey of cotton insect conditions was expanded during 1942 and further expanded in 1943 through the cooperative efforts of State and Federal agencies. It was conducted to aid in the orderly distribution of insecticides and to help the extension workers and farmers by furnishing reliable information on conditions that would be helpful in their efforts to reduce losses from insects. The summaries of insect conditions, issued at weekly intervals or oftener were based on 25,741 reports received during the season. Federal entomologists, chiefly in the Division of Cotton Insects made 5,918 reports; 3,430 came from extension, experiment station and state entomologists; 9,756 from farm crop reporters through the State Statisticians of the Bureau of Agricultural Economics in the nine states where the boll weevil causes the heaviest losses; 3,531 from 4-H club members in 5 states, and 3,106 from farmers and others. Excellent cooperation was given in each of the 16 states that were included in the survey. This included all of the important cotton-growing states except California. (Author's abstract.)

President Annand called for comments, and Dr. McIndoo asked for clarification of the term "mopping." Mr. Harned stated that a mixture of molasses, calcium arsenate, and water was prepared fresh each day and applied to the tops of seedling plants by means of cloths attached to the end of sticks.

As there were no further comments the meeting adjourned at 10:02.

Ina L. Hawes, *Recording Secretary.*

Actual date of publication, April 4, 1944.

ANNOUNCEMENT

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VOL. 46 April, 1944 No. 4

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 25, 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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PROCEEDINGS OF THE

Entomological Society of Washington

VOL. 46 APRIL, 1944 No. 4

THE MEXICAN SPECIES OF PHLEPSIUS (Homoptera: Cicadellidae)

By Dwight M. DeLong, *Department of Zoology and Entomology, Ohio State University*

An attempt was made in 1939 to bring together all the records for Mexican species of the genus *Phlepsius*, at which time a list was compiled and published and the new species then at hand were described. Six species belonging to this genus were recorded for Mexico. In 1941, the writer spent several weeks in field collecting in Mexico together with C. C. Plummer, J. S. Caldwell, and E. E. Good. As a result this list has been increased to thirteen by including the seven new species described in the following pages. This is a rather small number as compared to a list of some seventy species occurring in the United States.

The *costomaculatus* group contains a number of closely related species which resemble each other very closely superficially but the male and female genitalia are different and furnish characters for easy separation of the species.

Phlepsius utahnus Ball

Phlepsius utahnus Ball. Can. Ent. 41:79, 1909.

No specimens of this species from Mexico have been examined but Dr. Ball has reported it from Comondu, Lower California, Mexico.

Phlepsius lascivius Ball

Phlepsius lascivius Ball. Can. Ent. 32:200, 1900.
Phlepsius micronotatus Osborn & Lathrop Ann. Ent. Soc. Amer. 16:321, 1923.

This species has been previously reported from the states of Michoacan and Jalisco by the author. Additional Mexican material has been collected at Guadalajara, Jalisco (5,051 ft.) Zamora, Michoacan (5,800 ft.) Lake Chapala, Michoacan (5,500 ft.) and Valles, San Luis Putosi, Mexico (300 ft.). It is apparent from these records that it is common at altitudes of 5,000 to 6,000 feet and also occurs in the low tropical portion of the Gulf region. It is common in the southwestern portion of the United States.

Phlepsius continuus DeLong

Phlepsius continuus Delong. Lloydia 1:239, 1938.

The species is apparently limited in its distribution to the lower, more tropical areas of Mexico. It has been collected at several localities in the State of Vera Cruz, in Nuevo Leon at low elevations and in the State of San Luis Potosi at Valles (300 ft.) and at Tamazunchale (350 ft.) from grass along the Moctozuma River. It closely resembles *fuscipennis* the common plains grass species of the northern Mississippi Valley States.

Phlepsius ventosus, new species

Resembling *continuus* in form and general appearance but darker in color and with distinct male genitalia. Length 6–7 mm.

Vertex short and bluntly angled or rounded, more than three times as wide between eyes as median length in male and four times as wide as length in female.

Color tawny yellow, heavily marked with dark brown pigment lines and irrorations. The vertex and scutellum are usually less heavily marked. The scutellum bears two black marginal spots on each side.

Genitalia: Female last ventral segment with three distinct notches on posterior margin. A deep narrow notch is formed on each side between the lateral margin and a produced black tooth either side of the broader median V-shaped notch which extends farther basally. The median notch is black margined. Male plates long, only slightly narrowed to apex which is blunt, rounded on outer margins and obliquely sloping to inner margin. Styles narrow, elongate, apical portion narrow, fingerlike. The pygofer slopes rapidly from dorsal to ventral portion. Aedeagus with a narrow basal portion which extends dorsally and caudally. The ventral portion extends caudally and curves dorsally bearing a pair of barb-like teeth just before apex.

Holotype male, allotype female and male and female paratypes collected at Tepotzlan, Morelos, Mexico, September 11, 1941, by Plummer, Caldwell, Good and DeLong. A paratype male was collected at Cuernavaca, Morelos, Mexico, October 21, 1941 by Good and DeLong.

Phlepsius cirrus, new species

Closely related to *slossoni* which it resembles in form and appearance but the genitalia are distinct. Length male 5.5 mm.

Vertex short, scarcely produced, apex blunt, rounded, almost three times as wide at base as median length. Median portion depressed behind margin which is sharp but not foliaceous.

Color: Pale, heavily marked with brownish pigment. Ocelli encircled by a pale spot and with four prominent white spots on margin of vertex, a median pale spot just back of apex and a pale spot either side of middle at base. Elytra rather uniformly marked except for two small round brown spots on clavus along commissure at about one-third and two-thirds the distance from apex of scutellum to apex of clavus. There are several small dark spots along posterior portion of costa and apical margin. Face mottled with brown.

Genitalia: Male plates rather long, convexly rounded to pointed apices. Style broad at base abruptly narrowed at half its length, the much narrower portion bearing a pointed apex which curves outwardly. Aedeagus rather large at base with a blunt portion protruding dorsally, then narrowed to form a long rather slender apical portion which extends dorsally and bears a pair of slender apical processes, one is directed dorsally and the longer process curves cephalad and ventrally.

Holotype male collected by the author near Mexico City, D. F., Mexico (9000 ft.), from pine, September 1, 1939.

Phlepsius dampfi DeLong

Phelpsius dampfi DeL. Anal. Esc. Nac. de Cien. Biol. 1:381, 1939.

Records to date show this species to occur in two states on desert vegetation. In the State of Nuevo Leon it was collected at the Granja Experimental Bodriguez and in the State of Coahuila at Saltillo (5,000 ft.). Since the difference in elevation of these two localities is some 4,000 feet, the similar desert condition is probably the most important of the environmental factor.

Phlepsius extremus Ball

Phlepsius extremus Ball. Can. Ent. 33:10, 1901.

The only available records for this species are those obtained by Ball from Tijuana, Baja California, Mexico.

Subgenus **TROPICANUS,** new subgenus

The members of this subgenus might be designated as the *costomaculatus* group. The subgenus is related to *Dixianus* Ball but the species are more Phlepsoid in general appearance.

The vertex is short and bluntly angled and gradually rounded to the front without a definite margin. The head is wider than the pronotum. The middle ante-apical cell is long, decidedly exceeding the outer anteapical cell both anteriorly and posteriorly. The elytra are usually conspicuously marked with brown ramose pigment lines which appear as cross nervures.

Genotype: Phlepsius costomaculatus (Van Duzee).

For several years we have placed a number of species, similar in color but apparently distinct, under the species name *costomaculatus*. This is the common species described from material from the southern United States and redescribed by Baker as *pulchripennis* from material collected in the same region. All of the species of the group resemble each other in general appearance and in color pattern which is pale, with brown elongated mottling on the elytra. Among these species there is a difference in size, slight differences in color pattern and distinct differences in male and female genitalia.

Phlepsius costomaculatus (Van Duzee)

Allygus costomaculatus Van Duzee, Bull. Buf. Soc. Nat. Hist. 5:207, 1894.
Phlepsius pulchripennis Baker. Ent. News 9:65, 1898.

This is the common *Phlepsus* with the mottled brown pattern of a *Eutettix* on the elytra which occurs throughout the southern and a portion of the southwestern United States. It is the only known species of this group of closely related species which has been taken in the United States. It can be separated from the Central and South American species by distinct male and female genital characters.

The female last ventral segment is shallowly trisinuate. The male plates are long and slender, concavely narrowed to slender pointed apices. Pygofer exceeding plates in length, produced and pointed on dorsal caudal portion. Aedeagus with a narrow anterior and a narrow posterior process extending from basal portion. The anterior process is short, the posterior process is more than twice as long and is narrowed to a pointed tip which is directed anteriorly at the end of the long dorsal portion. Style with a rather long finger-like portion on inner apical margin.

Both Dr. Ball and the writer have reported this species for Mexico common in many areas. Since more extensive collecting has been done and a more detailed study has been made of this material it is quite clear that this species was reported in error. It does occur in Texas and undoubtedly occurs along the border, at least, in Mexico but no definite records are at hand. It would seem at the present time that the common species in the United States does not occur in Mexico and the common species in Mexico do not occur in the United States. This pattern of distribution will undoubtedly be changed when sufficient collecting is completed.

Specimens of this species have been examined from Florida, Alabama, Louisiana, Mississippi and Texas. It may occur in northern Mexico but no specimens have been examined which are this species.

Phlepsius flectus, new species

Resembling *costomaculatus* in form and appearance but with distinct male and female genitalia. Length 5 mm.

Vertex bluntly angled, twice as wide between eyes as median length in female, less than twice as wide as long in male.

Color similar to *costomaculatus*, dull yellow with dark markings, Vertex with a round black spot just back of each ocellus and a small spot each side on basal margin. Four short transverse dash lines on margin between ocelli. Pronotum mottled with brown and with a round black spot just back of inner margin of each eye. Pronotum pale with two small black spots along each side. Elytra with a pale band along scutellum and inner clavus pale. Four black spots along costal margin. Median portion marked with brown pigment lines and dark spots from base to apex. Face brownish, mottled.

Genitalia: Female last ventral segment with rounded, produced lateral angles, between which the posterior margin is broadly, angularly excavated. The excavation is brown margined. Male plates elongate triangular, tapered to long slender apices. Styles long, apices blunt. Aedeagus with a long thick basal process which extends dorsally and a long curved apical process which extends caudally. The latter has a small apical hook which curves dorsally and anteriorly.

Holotype male and allotype female collected at Mexcala, Guerrero, Mexico (1,700 ft. elevation), October 22, 1941, by E. E. Good and the author. Male and female paratypes were collected at Valles, San Luis Potosi, Mexico (300 ft. elevation), September 29, 1941, by Caldwell, Good and the author; at Iguala, Guerrero, Mexico (2,500 ft. elevation), September 11, 1939 by Plummer and the author; at Acapulca, Guerrero, Mexico (sea level), September 10, 1939 by Plummer and the author; at Yazalaxi, Oaxaca, Mexico, November 29, 1932 (M. F. 2358) by A. Dampf; and at La Forestal, Vera Cruz, Mexico, November 12, 1920 by A. Dampf.

Phlepsius digitus new species

Resembling *costomaculatus* in form and appearance but with distinct genital structures. Length 5–5.5 mm.

Vertex short, blunt, more than twice as wide between eyes at base as median length.

Color dirty white with dark markings. Vertex darker at apex, a pale spot on inner side of each ocellus and a black spot posterior to each ocellus. Pronotum with three black spots behind each eye. Scutellum with two marginal spots each side along clavus of elytra. The elytra are pale, mottled with brown. There are four dark spots on costal margin, a dark area on base of clavus next claval vein, a pale brown area on corium and the middle ante-apical cell brown. Face mottled with brown.

Genitalia: Female last ventral segment with produced lateral angles, between which the posterior margin is rather deeply excavated, the central half of excavation with margin truncate or slightly convexly rounded with a slight notch at middle. Male plates long, tapered to pointed apices, concavely rounded on inner margins. Style elongate, curved, gradually narrowing to bluntly pointed apices. Aedeagus rather thick at base with three dorsal processes. The anterior process is broad and extends dorsally, the middle process is narrow, longer than either of the others and extends dorso-caudally; the posterior process is short, narrowed to apex and extends caudally.

Holotype male, allotype female and male and female paratypes collected at Jiutepec, Morelos, Mexico (4,500 ft. elev.), September 6, 1939, by Dr. C. C. Plummer and the author. Paratype females collected at Uruapan, Michoacan (5,500 ft. elev.), October 1, 1941, by Plummer, Good, Caldwell and the author and at Tuxpan, Michoacan (4,000 ft. elev.), October 5, 1941, by Caldwell, Plummer, Good and the author.

Phlepsius calidus new species

Resembling *costomaculatus* in form, size and general appearance but with distinct male and female genitalia. Length 5.5–6 mm.

Vertex broad and blunt, rounded at apex, more than twice as wide between eyes at base as median length.

Color pale with dark markings. Vertex with faint marks along margin between ocelli, a black spot behind each ocellus and two small merged spots on posterior margin at either side. Pronotum with three dark spots on anterior margin, either side; two behind each eye and one behind the basal markings of the vertex on either side. Scutellum with the two black marginal spots on either side. Elytra with a black spot about the middle of clavus on either side and a brownish longitudinal band composed of ramose brown pigment lines extending from corium to middle of apex of each elytron. Face pale brown.

Genitalia: Female last ventral segment with posterior margin slightly produced from lateral angles to middle which is slightly notched and with a brown wedge-shaped mark on middle. Male plates narrow, elongate, tapered to narrow, attenuated, pointed apices which are surpassed in length by the pygofers. Style rather broad at base, rapidly narrowed at half its length to form a long narrow finger-like portion on inner margin which is sharp pointed at apex. Aedeagus in lateral view rather broad at base with a short basal process extending dorso-caudally. From its apex a pair of conspicuous curved processes with an apical hook bent caudally extend ventrally and laterally. Apical portion long and narrow, extending caudally, apex bluntly pointed.

Holotype male from Santa Engracia, Tamaulipas, Mexico (1,000 ft. elev.), collected November 8, 1938, by J. S. Caldwell, Allotype female collected at Valles, San Luis Potosi, Mexico (300 ft. elev.), September 24, 1941, by Caldwell, Good and DeLong. Male and female paratypes from Cordoba, Vera Cruz, Mexico (3,000 ft. elev.), October 8, 1941, Orizaba, Vera Cruz (3,500 ft. elev.), October 8, 1941. Tehuantepec, Oaxaca, Mexico (75 ft. elev.), October 13, 1941, all collected by Plummer, Caldwell, Good and DeLong. A large number of paratypes are also at hand collected by Dr. Dampf at La Forestal, Vera Cruz, October 15, 1926 (M. F. 1106B), December 23, 1926 (M. F. 1134), and November 12, 1926 (M. F. 1108); Loma Oaxaca, June 8, 1937 (M. F. 6070); Nainari, Sonora, August 11, 1927 (M. F. 245), Peten, Guatemala, October 28, 1925 (M. F. 753), Yaxha, Guatemala, October 25, 1925 (M. F. 764),

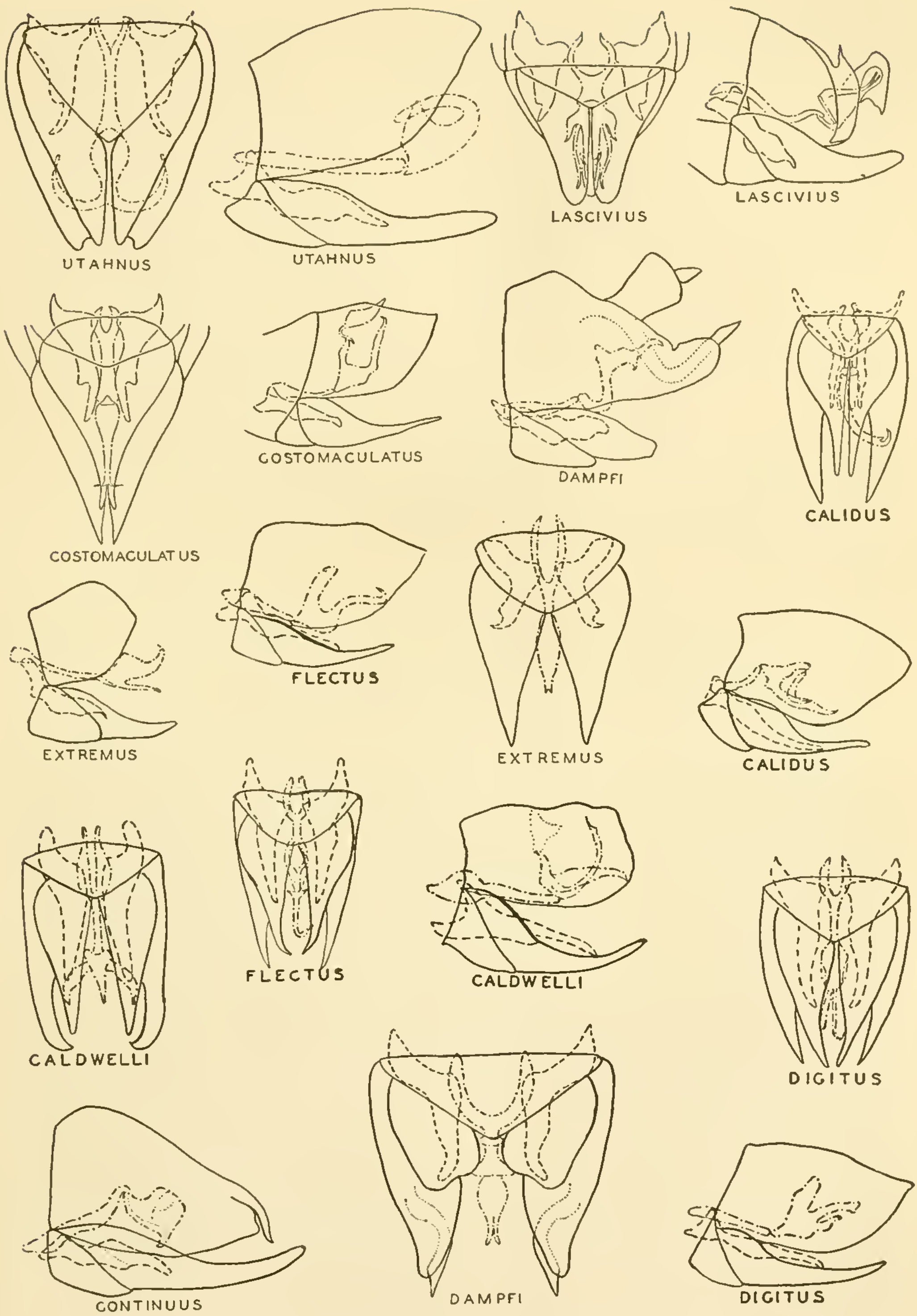

Plate 8—Ventral and lateral views of male genital structures as labeled.

San Jose, Guatemala, November 13, 1925 (M. F. 797), shores of Lake Peten, Guatemala, November 14, 1925 (M. F. 801), Flores, Lake Peten, Guatemala, December 6, 1925 (M. F. 866), Vera Cruz, Vera Cruz, October 14, 1926 (M. F. 1066), October 26, 1926 (M. F. 1112), December 13, 1926 (M. F. 1119), December 13, 1926 (M. F. 1125), May 1, 1927 (M. F. 1160), Centinela, Colima, January 28, 1930 (M. F. 1598), El Mante, Tamaulipas, October 26, 1930 (M. F. 1775), Tolosa, Oaxaca, December 31, 1932 (M. F. 2511) Tierra Blanca, Vera Cruz, July 29, 1932 (M. F 2655), Tonala, Chiapas, November 3, 1932 (M. F. 2722).

This species is apparently one occurring primarily at low altitudes and it is essentially tropical; A few specimens have been taken at altitudes of from 3,000 to 5,000 feet.

Phlepsius caldwelli, new species

Resembling *costomaculatus* in form and general appearance but with different color markings and distinct male and female genitalia. Length 5–5.5 mm.

Vertex broad, bluntly angled, about twice as wide between eyes at base as median length.

Color, vertex pale with faint brownish mottling. A small round black spot just back of each ocellus and a small spot along basal margin either side of middle. Pronotum rather heavily mottled with dark brown. Scutellum with the two marginal spots on either side. Elytra more heavily marked than most of the species of this group. Four dark brown spots on costa, a large oblique spot on clavus just before middle, a small spot at apex of clavus, and a small triangular spot on corium. Ramose pigment lines are rather uniform on elytra except the anterior portion of costa. Face mottled with brown.

Genitalia: Female last ventral segment with lateral margins produced, between which the posterior margin is broadly concavely rounded to a slight median notch. The entire posterior margin except for the lateral angles is broadly bordered with brown. Male plates elongate, triangular, as long as pygofer, apices bluntly pointed. Style elongate, gradually narrowed to a blunt apex. Aedeagus in lateral view "U"-shaped with a narrow basal portion extending dorsally and a longer more slender apical portion extending dorsally and tapered to a sharply pointed, attenuated apex.

Holotype male, allotype female and male and female paratypes collected at Tamazunchale, San Luis Potosi, Mexico (600 ft. elev.), November 15, 1938 by Dr. J. S. Caldwell. I take pleasure in naming this species for Dr. Caldwell who has collected and described many interesting species of North American Homoptera.

Phlepsius singularis, new species

Resembling *costomaculatus* in form and coloration but larger and with distinct male genitalia. Length male 6.5 mm.

Vertex produced and bluntly angled, rounded at apex, more than twice as wide between eyes at base as median length.

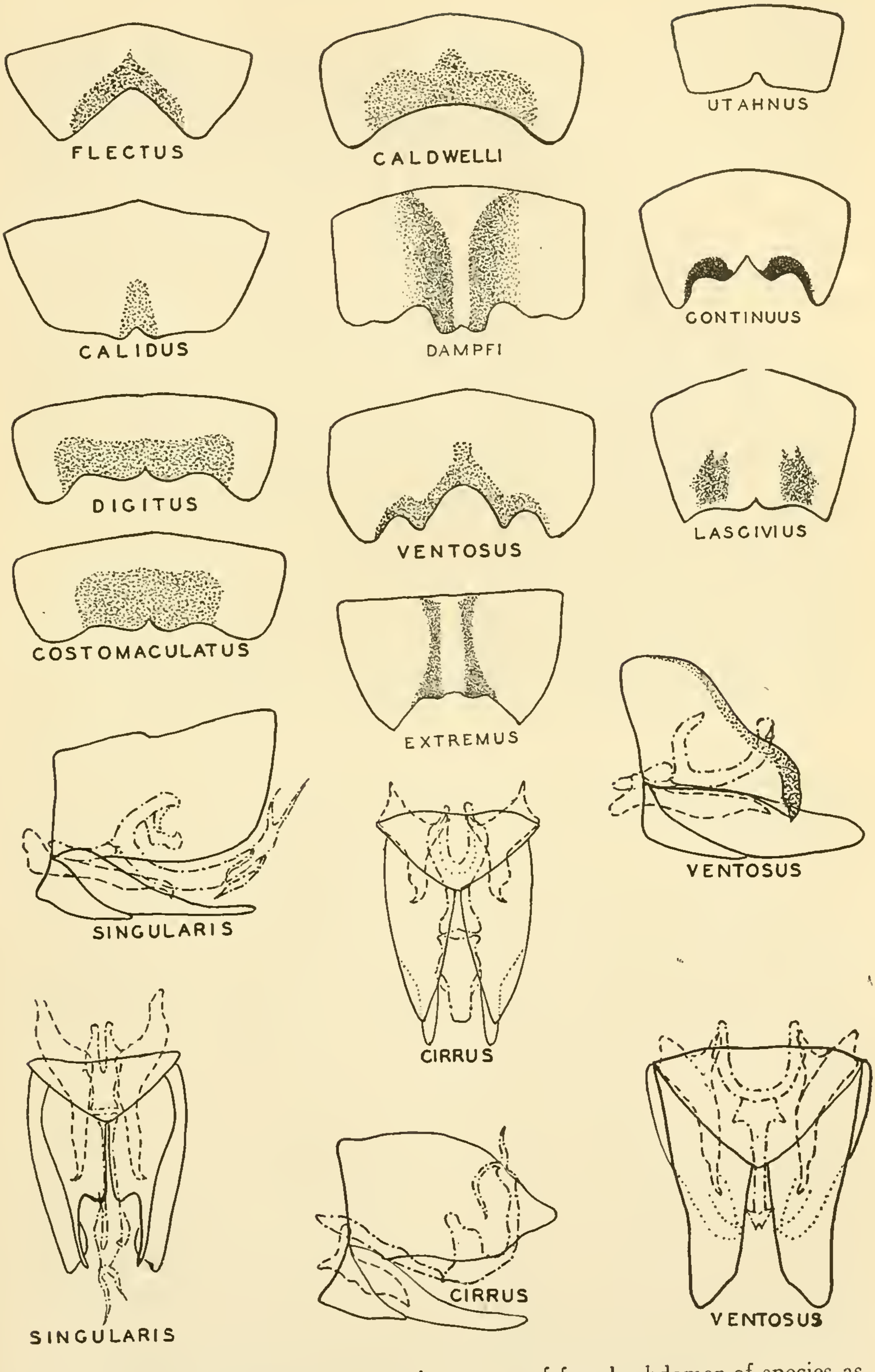

Plate 9—Upper portion—last ventral segment of female abdomen of species as labeled. Lower portion ventral and lateral views of male genital structures as labeled.

Color: Vertex pale with faint spots along margin. A small dark brown spot behind each ocellus and close to the eye near its middle. A semicircular brown line passes through this spot and is open at basal margin. Pronotum mottled with darker brown. Scutellum with basal angles dark brown. Elytra pale brown marked with dark brown spots and whitish blotches. Veins dark brown and four large brown spots on costal margin, an elongated spot on corium and a few smaller spots on outer clavus. Face pale brown with darker brown markings.

Genitalia: Male plates unique in type. They are concavely excavated from inner margin at about two-thirds their lengrh then produced to form pointed apices on the outer margins. Style elongate, narrow, tapered to a narrow blunt apex. Aedeagus with a long basal process extending dorsally and caudally. The main portion of aedeagus is long and rather narrow, extending dorso caudally with a pair of separated styles at apex. The ventro caudal style is the longer and both project caudally as a continuation at the apex. Just before the apex a curious flap-like structure arises which extends basally along the aedeagus and is pointed at the apex. On the opposite side and a little anterior a slender style-like process arises which is twisted and then extends basally.

Holotype male collected at Vergel, Chiapas, May 19, 1935, by Dr. A. Dampf (M. F. 4207).

The large size and the bizarre genital structures mark this as a unique form among this group of closely related species.

FOUR NEW AMERICAN TINGITIDAE (Hemiptera)

By C. J. Drake and E. J. Hambleton

The present paper contains the descriptions of four new tingitids. The types have been deposited as indicated under each species.

Amblystira dozieri, new species

Separated from *A. fuscitarsis* Champion by its smaller size, wider elytra at base, mostly biseriate costal area, and less tumid pronotum. Antennae rather slender, finely pilose, pale testaceous, the tip of last segment fuscous; segment I very short, scarcely thicker or longer than II; III less than twice as long as IV, the latter long. Head short, black, unarmed; eyes blackish, large. Rostrum testaceous, extending beyond middle of mesosternum; laminae dark, widely separated on meso- and metasternum.

Pronotum black, coarsely pitted, tricarinate, the median carina slightly more elevated. Elytra widest near base, distinctly narrowed posteriorly, completely overlapping behind in repose; costal area moderately wide, biseriate at base, uniseriate at middle and uni- or biseriate in widest part, the areolae in uniseriate portion distinctly larger, the color, except for transverse fuscous band in front of middle, testaceous, the areolae hyaline; subcostal area biseriate, the veins dark fuscous; discoidal area not reaching middle of elytra, narrowed posteriorly, widest beyond middle, there triseriate, the veins dark fuscous; sutural area becoming more widely areolate apically, the veins dark fuscous, the areolae clear. Legs slender, pale testaceous.

Type (male) and 2 paratypes, Hinch, Haiti, W.I., collected by H. L. Dozier. Type in U. S. Natl. Museum.

Pleseobyrsa parana, new species

Very similar to *P. atratarsis* D. & H. but much smaller and with the lateral margins of elytra much less rounded. Color and markings very similar to *atratarsis*, the areolae smaller. Antennae moderately long, testaceous, beset with long bristly hairs; segment IV long, scarcely thickened, not darkened. Elytra broad, the margins beset with moderately long slender spines; costal area very wide, five to six areolae deep, the outer margin nearly straight; subcostal area broad, more closely areolated; discoidal area large, moderately elevated, six areolae deep in widest part, somewhat narrowed at apex, the outer boundary highest beyond middle. Pronotum slightly convex, finely pitted, areolate behind, tricarinate; lateral carinae short, present on anterior lobe, terminating before calli, parallel; median carina long, slightly more elevated; paranota shaped as in *atratarsis*. Legs testaceous, the tarsi not or only slightly darkened.

Type (male), allotype (female), and 45 paratypes, Belem, Para, Braz., Oct. 3, 1938, collected by Hambleton and Sauer. Type in Drake Collection.

Gargaphia shelfordi, new species

This species may be easily separated from other Mexican species of *Gargaphia* Stål by its small size, wide costal area, elevated carinae and clothing of fine hairs.

Small, testaceous, with three or four transverse nervures of costal area infuscate; head and pronotum brownish, the hind triangular projection of latter testaceous. Head smooth, with five, very long, slender, testaceous spines. Antennae yellowish brown, beset with rather short, bristly hairs, the terminal segment infuscate; segment III less than three times the length of IV. Rostrum almost extending to transverse laminae. Body beneath brown, clothed with rather short, golden hair. Legs testaceous, slender, beset with rather short, bristly hairs.

Pronotum moderately convex, clothed with fine, rather short, golden hair, the triangular portion areolate. Margins of elytra, paranota and carinae beset with rather short, golden hair, the nervures with similar erect hairs. Hood small, sharply raised to a point near the middle, somewhat compressed laterally. Carinae foliaceous, areolate; lateral carinae raised anteriorly. The three areolae in front largest; median carina low in front, thence raised to center of disc and then gradually lowered to apex of triangular process. Paranota broad, moderately reflexed, widest opposite humeral angles, there triseriate. Elytra rather broad, not divaricating posteriorly, the outer margins broadly rounded, the tips not widely separated; costal area broad, mostly triseriate, quadriseriate in widest part; subcostal area narrow, mostly biseriate, uniseriate behind, discoidal area about reaching middle of elytra, narrowed at base and apex, widest beyond middle, there four areolae deep; sutural area widely reticulated. All areolae hyaline. Length, 2.90 mm.; width, 1.25 mm.

Type (male) and 1 paratype, Victoria, Tamp., Mexico, on shrub, December 30, 1943, V. E. Shelford, named in honor of Dr. Shelford, who has greatly increased our knowledge of animal ecology. Type in Drake Collection.

Corythucha compta, new species

Very similar to *C. hispida* Uhler, but much larger, with stouter spines and wider costal area. Moderately large, whitish testaceous, the pronotum somewhat stramineous, the tips of spines black. Pronotum moderately convex, the hind portion triangular, long, whitish; median carina longer than hood, rathe; low, uniseriate, attached in front at base of hood, the areolae moderately larger lateral carinae distinctly raised anteriorly, areolate, not extending as far forward as base of hood.

Hood strongly constricted behind middle, the anterior portion very narrow, extending a little beyond apex of head, the hind portion not as high as wide, inflated. Margins of elytra and paranota, some of the veins of hood, carinae, paranota and elytra armed with erect spines. Elytra broadly constricted, not strongly narrowed posteriorly, the tumid elevation rather small, inflated, spinose; costal area wide, triseriate, the margins beset with numerous spines. Antennae testaceous, clothed with long hairs, testaceous, the terminal segment dark. Rostrum dark brown, extending to intermediate coxae.

Length, 4.10 mm.; width, 2.15 mm.

Type (male), allotype (female) and 15 paratypes, La Jolla, Calif., May 10, 1931, C. H. Hicks; 2 paratypes, San Diego, Calif., Aug. 5, 1915, E. P. Van Duzee. Type in Drake Collection.

This species has been confused with *C. hispida* Uhler. The latter is smaller, with elytra distinctly narrowed posteriorly, narrower costal area and longer and slenderer marginal spines. Also, the erect spines on veins are a little more numerous.

THE ANTS OF THE GENUS THAUMATOMYRMEX MAYR WITH THE DESCRIPTION OF A NEW PANAMANIAN SPECIES (HYMENOPTERA: FORMICIDAE)

By Marion R. Smith

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

Included in the ponerine genus *Thaumatomyrmex* Mayr are some of the rarest and most primitive of all ants, whose distribution is apparently entirely neotropical. Previous to the discovery of the new species described in this article only six species were known, one each having been found in Cuba, Honduras, Venezuela, British Guiana and Trinidad, Brazil, and Bolivia. The total number of known specimens of described species probably does not exceed a dozen individuals and very peculiarly all of these are workers. Since no one has been fortunate enough to discover a colony of these ants, information is lacking as to nesting sites, size of colonies, and the nature of their food.

Few ants are more easily recognized generically than the extraordinary workers of *Thaumatomyrmex*. They can be readily identified by a combination of the following characters: The narrow, arcuate mandible with three spiniform teeth; the convex, coarsely faceted eye, situated near the base of the mandible; the prominent frontal lobe; the usually anteriorly divergent lateral borders of the head; the black body with light brown appendages; and a range in length of 3.25 to 4.75 mm. As Weber (Bol. Ent. Venezolana 1:67, 1942) has so aptly stated, "The differences between the species lie chiefly in the proportions of the teeth, width of head compared with its length, convexity of the pronotum and mesonotum, angularity or lack of angularity between the epinotal base and declivous surfaces, shape of the petiolar node and development of striation or punctation. The differences are perfectly distinct yet no species varies so much that it might be placed in another genus, for there is none near it."

Since most of the species have been described very recently and there are no records of them in the common reference works including Dalla Torre's Catalogue Hymenopterorum and Wytsman's Genera Insectorum, most of the important bibliographic citations are given below.

T. mutilatus Mayr, 1887, Verh. Zool.-Bot. Gesell. Wien 37:531; Emery, 1894, Berlin. Ent. Ztschr. 39:380, fig.; Emery, 1911, Genera Insectorum, fasc. 118, p. 49, pl. 2, figs. 5, 5b; Weber, 1939, Ann. Ent. Soc. Amer. 32:98; Weber, 1942, Bol. Ent. Venezolana 1: 67, 68.

T. ferox Mann, 1922, Proc. U. S. Natl. Mus. 61:3; fig. 1; Weber, 1939, Ann. Ent. Soc. Amer. 32: 98; Weber, 1942, Bol. Ent. Venezolana 1: 67, 68.

T. cochlearis Creighton, 1928, Psyche 35: 163, fig. 1, A, B; Wheeler, 1937, Bul. Mus. Comp. Zool. 81:445; Weber, 1939, Ann. Ent. Soc. Amer. 32:98; Weber, 1942, Bol. Ent. Venezolana 1: 67, 68.

T. atrox Weber, 1939, Ann. Ent. Soc. Amer. 32:98, fig. 3; Weber, 1942, Bol. Ent. Venezolana 1:67, 68.

T. manni Weber, 1939, Ann. Ent. Soc. Amer. 32:99; Weber, 1942, Bol. Ent. Venezolana 1: 67, 68.

T. paludis Weber, 1942, Bol. Ent. Venezolana 1:68, 69, figs. 1, 2.

The following key, which is largely adapted from that of Weber (Bol. Ent. Venezolana 1:67, 68, 1942), will serve to distinguish the workers of the seven species:

1. Apical teeth of closed mandibles not exceeding lateral margins of head... 2
   Apical teeth of closed mandibles exceeding lateral margins of head...... 5
2. Epinotum, in profile, evenly convex with no indication of an angle where base and declivity usually meet.................................... 3
   Epinotum, in profile, not evenly convex but more or less angled where base and declivity usually meet.................................... 4
3. Epinotum in profile low, evenly descending to ventral margin; anterior and dorsal margin of first gastric segment forming in profile an approximate right angle. Venezuela............................*paludis* Weber
   Epinotum in profile high, passing ventrally into a second and smaller convexity; anterior and dorsal margins of first gastric segment forming in profile a marked and acute angle. Brazil.........*mutilatus* Mayr
4. Basal and declivous surfaces of epinotum meeting in a distinct angle; head subopaque, covered with coarse punctures interspersed with fine striae. Cuba....................................*cochlearis* Creighton
   Basal and declivous surfaces of epinotum meeting in a broadly rounded angle; head smooth and shining, not covered with punctures and striae as described above. Canal Zone................*zeteki*, new species
5. Lateral margins of head strongly diverging anteriorly. Bolivia *manni* Weber
   Lateral margins of head moderately diverging anteriorly............... 6
6. Third tooth of closed mandibles barely reaching center of clypeus. Honduras.......................................*ferox* Mann
   Third tooth of closed mandibles exceeding center of clypeus. British Guiana and Trinidad................................*atrox* Weber

Thaumatomyrmex zeteki, new species

Worker.—Length 3.25 mm.

Head, excluding mandibles, subquadrate, widest in the region where the strongly divergent genae touch the mandibles, posterior corners well rounded and merging into the very feebly impressed posterior border. Eye longer than broad, convex, with coarse facets; placed approximately its greatest length from the base of the mandible. Antennal lobe large, concealing base of antenna, ending anteriorly in a distinct angle. Clypeus concave, anterior border broadly and feebly emarginate. Frontal area subtriangular, but not strongly defined, Frontal furrow rather distinct, of approximately the same length as the frontal area. Antennal scape stout, apparently not surpassing the posterior border of the head. Mandible composed of a basal portion from which projects 3 long spines each of which is more or less curved, these spines increasing in length apically; terminal spine unusually long, curved, acute, its apex scarcely attaining the greatest width of the gena. Dorsal surface of prothorax, not including collar, at least three times as long as the small but distinct mesonotum. Dorsal surface of mesothorax lower than that of prothorax and epinotum, thus giving this region a constricted appearance. Dorsal surface (base) of epinotum about one and one-third times the length of the dorsal surface of the prothorax, not including the collar, gently convex, meeting the declivous surface in a bluntly rounded, obtuse angle. Legs moderately long and slender. Petiole unusually large, wider than thorax but not as wide as gaster; from above, subtrapezoidal, with convex anterior face and flattened, sloping posterior face; petiole, in profile, at least one and one-half times as high as long. Gaster, in profile, with a flattened perpendicular base; from above, moderately large, oval. Very smooth and shining excepting for the rugulose anterior border of clypeus, antennal lobes, and prothoracic collar; the punctate region surrounding the antennal socket; the moderately shining legs, and subopaque antennae. Hairs yellowish; sparse, long, mostly suberect or curved; rather abundant on gaster. Pubescence on antennal scapes short, coarse and appressed, that on funiculi fine but also closely appressed. Black; mandibles, antennae, and tip of gaster reddish brown; legs yellowish, suffused with reddish brown.

Holotype and paratype from Barro Colorado Island, Canal Zone; James Zetek; July-August 1942; Zetek 4975, Lot No. 42-11986. Both specimens have been placed in the National Museum collection and assigned United States National Museum No. 56483.

This ant can be easily distinguished from all the other known species of *Thaumatomyrmex* except *cochlearis*, from which it is, however, quite distinct. W. S. Creighton, who kindly compared the worker of *zeteki* with that of the type of *cochlearis*, found that *zeteki* was smaller. He wrote, "In addition your specimen is a much smoother ant. The head and dorsum of the thorax in *cochlearis* are covered with close set punctures and delicate striae. Their surface is only feebly shining at best and in places is definitely dull. The anterior face of the petiole is also notably punctate in *cochlearis*. Other differences which are quite noticeable are: The angular posterior corners on the node of the petiole when seen from above in your specimen. The posterior corners of the node of *cochlearis* are broadly rounded. The head of your specimen is proportionately narrower than that of *cochlearis*. Its pro-mesonotum is more convex when seen from the side and stands higher above the dorsum of the epinotum. The epinotum of your specimen is less angular with basal and declivous faces joined by a rounded curve rather than a distinct angle."

MINUTES OF THE 543d REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON FEB. 3, 1944

The 543d regular meeting of the Entomological Society of Washington was held Thursday, Feb. 3, 1944, at 8 P. M. in Room 43 of the National Museum with President Annand presiding. There were 39 members and 22 visitors present. The minutes of the previous meeting were approved as read, and the President then called for miscellaneous items.

Mr. Haeussler circulated a copy of the Constitution of the Society with the explanation that the Executive Committee had voted to have copies reprinted for sale. They may be obtained from Dr. Wadley at a cost of ten cents each. A copy will be presented to each newly elected member.

Mr. Rohwer read a statement from Dr. C. L. Marlatt entitled:

Japanese Beetles, Japan, 1901[1]

In midsummer of 1901, in the course of my search in Eastern Asia for the native home of the San Jose Scale, I was overtaken in Japan early in July by the rainy season with its 100% humidity and high temperature making serious work indoors or out impossible. I therefore joined the trek of the Europeans in Japan and China to the mountain region of central Hondo, to tide over this season and incidentally to enjoy a brief respite from the 18-hour-a-day surveillance of my Japanese mentor, Hori, with whom, after two months, I was pretty well fed up—but that is another story!

Some weeks were spent in this region divided between Nikko, Chuzenji, and Youmoto, places having respectively elevations of 2,000, 4,500, and 5,000 feet. In general it was a forested area and included large Imperial forest reserves, in one of which is the summer palace of the Emperor.

From the points named, long excursions were made on foot and by ricksha and such search as was possible was continued for scale and other insects. Scale insects were practically absent, probably due to elevation and a more or less continuous rainy season, resulting in the trunks and limbs of trees being covered with lichens, moss and fungus. The temperatures also were low—overcoat weather in summer and very cold in winter.

One of these excursions (July 23) was to the village of Youmoto, a hot sulphur springs resort much frequented by the Japanese, both sexes bathing in the nude! The return to Chuzenji was made on foot and across two lakes by boat. On the forest trails we encountered a few open meadows with scattering shrubs of *Crataegus* or possibly the wild apple. No scale was found on them, but, as recorded in my notebook: "The leaves of this shrub were skeletonized by a beetle (Lamellicorne) with a truncated abdomen." This beetle, which I was to meet again, is the subject of this note.

Early in August, our vacation over, we began the exploration of the northern provinces of Japan and mid-August found us at Sapporo, the capital of the great north island of Yezzo or Hokkaido, the center of a new and very extensive apple district and the seat of one of Japan's agricultural colleges and experiment stations. After paying my respects to the President of the College, Dr. Sato, I

[1] Printed in full at the request Mr. Rohwer, *Ed.*

went out with three Professors, those of Agriculture, Horticulture, and Mycology, to examine the college and station orchards—the Entomologist, Prof. Matsumura, with whom I had corresponded, being then away on his sabbatical year. These orchards, chiefly of American apples, proved to be practically free from scale pests—and those found were dead. My note (August 19) recording the situation as to scale insects concludes with the statement: "Clean bill of health as to other insects save the work of leaf-feeding beetles—two Lamellicornes, which were badly cutting the foliage of plum and especially grape, like the work of our rose chafer."

The following day with Mr. Hori and the Professor of Forestry, Mr. Niijima, an examination was made of the entomological collections of Professor Matsumura and there we found our beetles duly named as follows:

"*Popillia japonica*"—my smaller truncated winged-leaf chafer—the same as collected near Chuzenji, and

"*Anomela rufocuprea*"—the larger leaf-chafer.

Professor Matsumura's writing was bad and I took his generic name of the Japanese beetle down as Poplia or Hublia. In the absence of any records or information on the part of any of my hosts as to the injurious possibilities of the beetles, the scientific names meant nothing more than other Lamellicornes with the leaf-feeding habits of their very numerous family. Professor Matsumura might have added something to our information, but probably all he had seen was their feeding on foliage. That these early records were not recalled when this beetle was discovered in 1916 by the New Jersey Department of Agriculture to be well-established over a large area at Riverton, New Jersey, has the following explanation:

On my return to Washington about May 1, 1902, after some fourteen months' absence, I was immediately immersed in the administration of the Bureau and of the several lines of research which I still retained along with scale insects as my special field. Dr. Howard was away much of that year, 1902, leaving me in charge of the Bureau and to make the Annual Report as Acting Entomologist. A little later began the years of effort to secure the passage through the Congress of a Plant Quarantine Act and then followed its enforcement during a long period of hectic opposition calling for its defense in many directions, in fact, world wide! My Oriental explorations were necessarily put aside for a more convenient season, save for reports on a few special subjects and a Bulletin on the San Jose Scale. This season did not come until forty years after the notes were made, when, in 1941, I took up my notebooks, the pages yellowed with age, to see what of value might be salvaged from them. They brought in review a high period of my life of travel and interest, and also disclosed many records of interest, among which are these notes on the "Japanese Beetle!"

On this rediscovery, I went immediately to the United States Natural Museum where Mr. Muesebeck showed me my beetles duly labeled "Marlatt Sapporo, Japan!" Therefore, even if lost to memory (mine) the specimens and the record, during this whole period, had been available! The Youmoto specimens—also mailed—seemed to have been lost. I hasten to add that all these bettles had been quarantined in cyanide!

A third Lamellicorn is recorded in my notes collected (May 11) on the island of Sakarajima off the southern tip of Kiushu in subtropical Japan. I had called it *Euphoria* sp., a honey or sap feeder, finding it on orange blossoms, some dozen beetles massed on a single bloom.

As to these records, it must be remembered that this exploration was specifically directed to one scale insect, the San Jose Scale, but enlarged as to collections to include all scale insects—other insects coming in only as side issues except mosquitoes which I collected "religiously around the world. There were many, many little pill boxes full of mosquitoes very carefully packed and sent to Washington for Dr. Howard and Mr. Coquillett. A few of these were described by Mr. Coquillett. The rest and by far the large numbers were not studied although they no doubt include what Dr. Ashmead would title "new and remarkable species!"

Dr. M. T. James presented the first paper on the regular program: A Projected Manual of Myiasis Producing Flies.

The author has in progress a manual of the flies that produce myiasis in man. Though written from the human standpoint, it should prove useful to veterinarian as well. The taxonomic part is being prepared with the collections of the United States National Museum as a working background; for information concerning the other phases of the work it is necessary to rely on the literature.

The plan is to present the work in ten chapters, the scope of which, in brief, is as follows. (1), *Introduction*, including a discussion of the significance of myiasis in medical entomology. (2), *Types of myiasis*. In this chapter, two classifications are to be presented: the one, following Bishopp's plan, of dealing with myiasis according to the parts affected (cutaneous, traumatic, ophthalmic, etc.); the other, following Patton in discussing the parasitism as obligate semi-specific, and accidental. (3) *The causative organism*, the fly; this chapter will include a discussion of anatomy (including a glossary of terms), life history, and ecology. (4) *Technique*—of rearing, preserving, and mounting. (5) *Classification*. Chapters six to ten inclusively will deal with the parasitic flies themselves, arranged in a systematic order according to families.

Mr. Arthur Cushman is preparing the larger part of the illustrations to be used. (Author's Abstract.)

Dr. Annand called for discussion. Capt. West asked if it would be possible to include the larvae of all insects affecting man. Dr. James replied that such a course would not be warranted in the present work. Miss Trembley inquired how important a part *Cordylobia* would have in the manual, and Dr. James said that *Cordylobia*, which is a blood sucker, not an invader of the body, would not be particularly stressed. It is an African species which has no parallel in this country.

The second paper, Entomological Work in Alaska, was given by J. C. Chamberlin.

The discussion primarily covered the preliminary results of studies conducted during the period August to October 1943 inclusive in Alaska. The purpose of the work was to investigate a serious outbreak of cutworms in the Matanuska Valley during the spring and summer of 1943; to note and evaluate other insect pests of agricultural importance, and to prepare recommendations for future entomological research on agricultural insects in the territory.

The work was done under the auspices of the University of Alaska Agricultural Experiment Station in cooperation with the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration of the U. S. Department of Agriculture.

First hand observations supplemented by extensive search of past records, indicated that the only insect pests of present or past agricultural importance in Alaska are the root maggots and the cutworms. Of these the root maggots are probably, all things considered, of greatest importance.

The root maggots (the cabbage maggot and/or its relatives (*Hylemya* spp.)) seriously affect all cole crops throughout the territory with the exception of the truly arctic subregion bordering the Arctic Ocean.

Indications are that the insect or insects involved are native forms primitively infesting wild brassicaceous plants, such as the mustards. There is a serious need of accurate taxonomic determinations before the status of root maggot injury in Alaska can be fully evaluated.

Cutworm injury in Alaska is much less extensive although locally, as in Matanuska in 1943, much more serious than root maggot injury. Cutworms caused some injury to crops in the Tanana Valley in 1939 and have done extensive damage in the Matanuska Valley as far back as 1928. Years of most serious damage in Matanuska have been 1928, 1935, 1942, and 1943. At least $100,000 damage was done in the 1943 outbreak. It is probable that several cutworm species were actually involved in the 1943 outbreak including the red-backed cutworm (*Euxoa ochrogaster* Gn.) and the spotted cutworm (*Amathes c-nigrum* (L.)). At least three other cutworm species with past histories of economic damage also were found (the glassy cutworm, the w-marked cutworm and the black army cutworm).

The lack of economic populations of such insect pests as the various aphids, leafhoppers, fleabeetles, and other leaf-feeding beetles and foliage feeding Lepidoptera was especially noteworthy. Associated with the scarcity of insect vectors was the lack, or extremely low incidence, of any of the numerous virus and other insect spread diseases of such plants as peas, potatoes, cold crops, and beans.

The discussion was concluded with the showing of a series of 30 "kodachrome" lantern slides illustrating the general topography and agriculture of the Matanuska Valley. These slides were loaned through the courtesy of Mr. W. A. Rockie of the Soil Conservation Service in Portland, Oregon. Among the crops doing especially well under Alaskan conditions are such forage crops as oats, barley, vetch, peas, and various grasses, as well as such truck crops as cabbage, cauliflower, broccoli, turnips, rutabagas, lettuce, peas, and celery. (Author's Abstract.)

In the animated discussion which followed, questions from Miss Sollars, Dr. James, Mr. Rohwer, Dr. Anderson, A. G. Webb, Mr. Latta, Mrs. James, and Dr. Sasscer brought out the following points; 1) Not enough corn is grown in Alaska to make corn insects an important problem, although the corn seed maggot may be among the as yet unidentified material collected since it has been recorded from Alaska; 2) Mosquitoes are present in May and June but are not as severe a pest in the cultivated areas. There are also pests known locally as "white socks" and to scientists as *Simulium vittatum*; 3— Mr. Chamberlin had no opportunity to survey southern Alaska but expects to do so on a return trip; 4) Stable flies, cockroaches, and silverfish were observed but no house-flies; 5) There is very little beekeeping as the honey flow is not sufficient to maintain the colonies and new ones must be imported each year; 6) No stone fruits are grown and apples are poor; 7) There is at present no inspection service to safeguard the importation of fruit stocks. Dr. Annand explained that the survey had been a cooperative project between the Alaska Experiment Station and the Bureau of Entomology and Plant Quarantine.

The following visitors were introduced to the Society: Dr. W. E. Hoffman, Dr. A. A. Ogloblin, Dr. Irma de Crouzel, H. Peters, S. Parks, and W. A. Thomas. Mr. Hoffman, who had just returned from China on the Gripsholm, spoke briefly of his experiences at Lingnan University under Japanese invasion, and of the 16,000 mile trip home. He mentioned the almost complete scientific isolation from which workers in China now suffer.

The meeting was adjourned at 9:58.

INA L. HAWES,
Recording Secretary.

Actual date of publication, May 3, 1944.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

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VOL. 46 May, 1944 No. 5

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 25, 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.

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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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PROCEEDINGS OF THE

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VOL. 46 MAY, 1944 No. 5

THE GENUS SOLUBEA (Heteroptera: Pentatomidae)

By Reece I. Sailer

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

The generic name *Solubea* was established by Bergroth in 1891 to replace *Oebalus* Stål, 1862, which he found to be preoccupied by *Oebalus* Rafinesque, 1815, in the Mollusca. Kirkaldy, 1909, subsequently designated (*Cimex typhoeus* F.) = *Solubea pugnax* (F.) as genotype. The last revisionary treatment of the genus is that by Stål of 1872 in the "Enumeratio Hemipterorum."

Solubea is a genus representative of the subfamily Pentatominae and has been treated by Stål and subsequent authors as belonging to the tribe Pentatomini. It is closely related to the older genus *Mormidea* Amyot and Serville, 1843, and to *Poriptus* Stål, 1861. The following key seems to provide adequately for the separation of these genera:

1. Jugae greatly produced, contiguous before the tylus.......... *Poriptus* Stål
   Jugae not produced before tylus.. 2
2. (1) First rostral segment not exceeding posterior apices of bucculae..
   Solubea Bergroth
   First rostral segment exceeding posterior apices of bucculae......
   Mormidea Amyot and Serville

The external genitalia of both sexes present characters of generic significance. The shape of the proctiger of the male is of fundamental importance. In *Solubea* it is typically wedge-shaped, the sides sloping laterally from the median line. This median line is sutured along part of its length (in *S. linki* the proctiger is tricarinate dorsally and this median suture is not evident). In *Mormidea* the proctiger appears as a flaplike structure, with the apex tending to be trilobate. The margins of these lobes are strongly serrate, frequently comblike. The proctiger also occupies much more of the genital cup than is the case in *Solubea*, and there is a corresponding reduction in the size of the claspers. The subgenital plates of the female provide a character which serves to separate these two genera in all species. In *Solubea* these plates are bluntly acuminate apically, while in *Mormidea* they are rounded and the margin somewhat thickened or inflated in appearance. The female genital plates of *Poriptus* are very similar to those of *Solubea*, probably indicating the existence of a close relationship between these two genera. No males of *Poriptus* were available for study.

The genus *Solubea* and the two related genera discussed above are confined to the Western Hemisphere, where their distribution is, in the main, neotropical. Two species of *Solubea* and five species of *Mormidea* have been reported from the United States and of these only *S. pugnax* (F.) and *M. lugens* (F.) are predominately nearctic.

In recent years several species of *Solubea* have been recognized as important pests of rice. The first record of this association with rice was made by C. F. Riley in 1882 when he mentioned *Oebalus pugnax* (F.) as common on this crop. The earliest record of damage of economic importance was made in 1867 by T. Glover, who reported the same species as seriously damaging wheat in Chesterfield County, Va. *Solubea pugnax* has since been reported as damaging many of the grasses and cereals and remains the most important species in the genus. The rice injured by the feeding of this insect is known commercially as "pecky" and results in serious losses to growers in Arkansas and Texas. Other species known to cause damage of economic importance are *Solubea insularis* (Stål) and *S. poecila* (Dallas). The former was reported by Essig (1928) as causing considerable damage in rice-growing areas of Mexico, while the latter is an important pest of rice in the Guianas and Brazil. Recently a considerable series of specimens was received from Puerto Rico with the report that the species was injuring rice. The specimens were found to be *S. ornata*, a new species described in this paper.

Undoubtedly all members of this genus are capable of inflicting damage on cereal crops whenever local conditions favor the building up of sizeable populations on neighboring host plants of the grass family. Outbreaks, while sporadic and seldom general in character, are often spectacular and, together with lighter infestations which often pass unnoticed, take an important toll from the rice industry of this hemisphere.

This study is based, principally, upon specimens in the United States National Museum Collection. Additional material from the Francis Huntington Snow Collection of the University of Kansas, the American Museum of Natural History, and the California Academy of Sciences was made available through the kind offices of Dr. R. H. Beamer, Dr. M. A. Cazier, and Dr. R. L. Usinger. Material from the personal collections of Dr. C. J. Drake, Dr. H. M. Harris, both of Ames, Iowa; Dr. R. L. Usinger of Davis, Calif., and Mr. J. C. Lutz of Philadelphia, was also generously loaned the author.

SOLUBEA Bergroth

Oebalus Stål, 1862, Stettin Ent. Ztg. 23: 102; 1867, Öfvers. af Finska Vetensk. Soc. Förhandl. 24: 527; 1872, Enum. Hemip., vol. 2, p. 22; Berg, 1879, Hemip. Argentina, p. 41; Distant, 1880, Biol. Cent. Amer., Heterop. vol. 1, p. 56.

Solubea Bergroth, 1891, Rev. de Ent. 10: 235 (new name for *Oebalus* Stål); Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 125; Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 61 (names *pugnax* Fabricius as type); Zimmer, 1912, Nebr. Univ., Studies 11: 222; Van Duzee, 1917, Cat. Hemip. Amer. N. of Mex., p. 39; Parshley, 1917, Hemip. Conn.—Pentatomidae, p. 761; Stoner, 1920, Iowa Univ. Studies in Nat. Hist. 13: 222; Blatchley, 1926, Heterop. East. N. Amer., p. 125; Barber, 1939, Sci. Survey Porto Rico and Virgin Islands, vol. 14, pt. 3, p. 288.

Color.—Ranging from straw yellow through rufescent to fuscous. Punctures on all surfaces except dorsum of abdomen usually rufescent to fuscous. Frequently areas of pronotum, scutellum, and corium are devoid of punctures and appear as yellow calloused areas. These are most pronounced on the scutellum and may or may not be of value as a specific character. Venter of abdomen with median line more or less infuscated, lateral line also usually darkened by presence of rufescent to fuscous punctures. Legs yellow with scattered fuscous points or small spots, these always present on femur but sometimes absent on tibia. Antennal tubercles each with a fuscous spot laterally.

Structure.—Form elongate oval, broadest across humeri, tapering gradually posteriorly and abruptly anteriorly. Noticeably convex dorsally, strongly so ventrally. Anterior portion of pronotum and the head moderately declivous.

Head as long as broad across eyes, jugae not exceeding tylus, margins somewhat reflexed and sinuate before eyes; antennal tubercles visible from above, second antennal segment never longer, usually shorter than the third; rostrum with first segment never exceeding posterior apices of bucculae, second segment longest, apex of rostrum not exceeding posterior margin of hind coxae. Lateral margins of pronotum obtusely, irregularly carinate and concave before the humeri, anterior lateral angle behind eye with a distinct tooth; humeri with or without spines. Scutellum as long as, or longer than, width at base. Connexivum narrowly or not at all exposed. Outer apex of corium acute. Ostiolar orifice with a short elevated auricle; evaporating area well defined, truncate apically.

External genitalia of male.—(Pl. 10, fig. 1) Ninth abdominal or genital segment with cup broad and deeply concave, opening dorsoposteriorly. Margin of cup more or less thickened on posterior lateral portion and carinate on the anterior. Inferior ridge, when evident, narrow, with a spinose process medially each side of proctiger; when reduced, with a stout tuberculate spine each side near lateral margin. Lip produced posteriorly and, if not strongly concave from ventral view, then with a well-developed median lobe. Superior ridge reduced. Genital plates not distinct from inner face of cup, areas outlined by two carinae, the superior carinae forming part of the anterolateral margin of cup and the inferior carinae, usually shorter, often denticulate, located on inner face in a position more or less parallel to superior carinae. These tend to form a groove or trough opposite apices of claspers. Proctiger wedge-shaped, not more than half as wide as long, usually sloping sharply from the median line; this line frequently sutured in part and often produced into an elevated lobe at posterior dorsal apex. Clasper stout, never bearing more than two arms; ectal arm usually much reduced.

External genitalia of female.—Genital plates in part or entirely contiguous along inner margins. Subgenital plates bluntly acuminate apically and with the face of each sulcate basally. Lateral plates spinose posteriorly.

Key to Species

1. Second antennal segment shorter than first and fused with third........ 2
   Second antennal segment longer than first, suture between second and third distinct.. 3
2. (1) Humeri not spinose, at most angulate. Male with lateral angle of genital cup thickened and bearing a tooth directed inward from inner surface......................*grisescens*, new species.
   Humeri spinose. Male with lateral tip of genital cup thin and bearing an upright tooth on dorsal margin.............. *ypsilon-griseus* (DeGeer).
3. (1) Scutellum with basal width equal to length.....*linki* (Heidemann).
   Scutellum longer than basal width............................. 4
4. (3) Humeri with spines directed anteriorly, outer margin forming a continuation of line formed by costal margin of hemelytra in normal resting position.. 5
   Humeri without spines or these, if present, forming a posterior continuation of the lateral pronotal margin, projecting at right angles to line formed by the costal margin of hemelytra...... 7
5. (4) Lateral margin of pronotum anterior to humeral spine with pronounced carina, edge roughened, almost serrate............. *mexicana*, new species.
   Lateral margin of pronotum anterior to humeral spine obtusely angulate, not more than calloused............................ 6
6. (5) Genital cup of male without an infuscated ridge joining each of the 2 tuberculate spines on inferior ridge with tooth on lateral angle................................*pugnax* (Fabricius)
   Genital cup of male with an infuscated ridge joining each of the 2 large tuberculate spines on inferior ridge with tooth on lateral angle..........................*pugnax torrida*, new subspecies
7. (4) Males.. 8
   Females...10
8. (7) Clasper with apical margin linear from dorsal view and regularly concave from lateral view.....................*insularis* (Stål)
   Clasper with apical margin not entirely linear from dorsal view, never regularly concave from lateral view...................... 9
9. (8) Clasper with ectal arm flattened at right angles to apical margin *ornata*, new species
   Clasper with ectal arm bent upward only slightly.................. *poecila* (Dallas)

10. (7) Length of inner margins of genital plates more than two-thirds length of sixth visible abdominal segment along median ventral line . . . . *insularis* (Stål)
Length of inner margins of the genital plates less than two-thirds, seldom more than half, length of sixth visible abdominal segment along median ventral line 11
11. (10) Hind tibia immaculate, without infuscated spots surrounding bases of setose hairs, or at least with the spots not so conpicuous as those on fore tibia . . . . *ornata*, new species
Hind tibia with infuscated spots surrounding bases of setose hairs distinct, more conspicuous than those on fore tibia . . *poecila* (Dallas)

Solubea pugnax (Fabricius)

(Pl. 10, figs. 4 and 7)

Cimex pugnax Fabricius, 1775, System. Ent., p. 704; 1781, Spec. Ins., vol. 2, p. 348; 1787, Mantissa Ins., vol. 2, p. 285; 1794, Ent. Syst., vol. 4, p. 100; 1803, Syst. Rhyng., p. 161; Goeze, 1778, Ent. Beytr., vol. 2, p. 238; Gmelin in Linnaeus, 1788, Syst. Nat., Ed. 13, vol. 1, pt. 4, p. 2140.

Cimex typhoeus Fabricius, 1803, Syst. Rhyng., p. 162; Wolff, 1811, Icon. Cimic., vol. 5, p. 180, fig. 174.

Pentatoma orthocantha Palisot de Beauvois, 1805, Ins. Rec. Afr. Am., p. 130, pl. Hemip., 9, fig. 9.

Pentatoma augur Say, 1831, Heterop. New Harmony, p. 3; Fitch reprint, p. 758; Le Conte, 1859, Complete Writings of Thos. Say, vol. 1, p. 313.

Cimex vitripennis Burmeister, 1835, Handb. d. Ent., vol. 2, p. 367.

Mormidea typhoeus (Fabricius), Dallas, 1851, List of Hemip., vol. 1, p. 216; Walker, 1867, Cat. Heterop., vol. 2, p. 253.

Pentatoma typhoeus (Fabricius), Guérin-Méneville, Sagra, 1857, Hist. de Cuba, Ins., p. 370.

Oebalus typhoeus (Fabricius), Stål, 1862, Stettin Ent. Ztg. 23: 102; 1868, Hemip. Fabriciana, p. 27.

Oebalus pugnax (Fabricius), Stål, 1868, Hemip. Fabriciana, p. 120; 1872, Enum. Hemip., vol. 2, p. 22; Uhler, 1876, U. S. Geol. Survey Bul. 1: 285; 1878, Boston Soc. Nat. Hist. Proc., 19: 377; Distant, 1880, Biol. Cent. Amer., Heterop., vol. 1, p. 56; Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 125; Gundlach, 1894, Fauna Puerto-Riquena, p. 591; Van Duzee, 1904, Amer. Ent. Soc. Trans., 30: 43.

Oebalus typhaeus (Fabricius), Glover, 1876, Illus. Insects, Order Hemip., pp. 55, 130, pl. 11.

Pentatoma (*Mormidea*) *typhaeus* (Fabricius), Stahl, 1883, Cat. Cub. Zool., p. 210.

Solubea pugnax (Fabricius), Bergroth, 1891, Rev. de Ent. 10: 235; Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 61; Van Duzee, 1909, Buffalo Soc. Nat. Sci. Bul. 9: 155; 1917, Cat. Hemip. N. Amer., p. 39; Smith, 1910, Cat. Insects N. J., Ed., 3, p. 135; Bueno, 1910, N. Y. Ent. Soc. Jour. 18: 24; Olsen, 1912, N. Y. Ent. Soc. Jour. 20; 52; Zimmer, 1912, Nebr. Univ. Studies 11: 226; Barber, 1914, Amer. Mus. Nat. Hist. Bul. 33: 522; Stoner, 1920, Iowa Univ. Studies in Nat. Hist. 8 (4): 77; Parshley, 1923, Hemip. Conn., p. 761;

Barber, 1923, Amer. Mus. Novitates 75: 12; Blatchley, 1926, Heterop. East. N. Amer., p. 126, fig 26; Barber and Bruner, 1932, Jour. Dept. Agr. Puerto Rico 16: 252; Wolcott, 1936, Insectae Borinquenses, Puerto Rico Univ. Jour. Agr. 20 (1): 175; Barber, 1939, Sci. Survey Porto Rico and Virgin Isls., vol. 14, pt. 3, p. 288.

Economic Literature on Solubea pugnax (Fabricius)

1867 *Mormidea (Oebalus) typhea*, Glover, U. S. Dept. Agr. Ann. Rpt., p. 71. (Recorded as seriously damaging wheat in Chesterfield County, Va.)

1880 Oebalus pugnax, Riley, C. V., U. S. Ent. Comm. Bul. 3: 36. [Predaceous on *Alabama argillacea* (Hubner).]

1882 *Oebalus pugnax*, Riley, C. V., U. S. Dept. Agr. Ann. Rpt., p. 138. (Mentioned as common on rice.)

1885 *Oebalus pugnax*, Riley, U. S. Ent. Comm. Rpt. 4, p. 97, fig. 21. [Predaceous on *Alabama argillacea* (Hubner).]

1887 *Oebalus pugnax*, Ashmead, U. S. Div. Ent. Bul. 14: 16. ("Considerable numbers feeding on corn pollen.")

1891 *Oebalus pugnax*, Garman, Psyche 6: 61. (Reports species as injurious to grasses, millet; discusses habits; describes eggs.)

1900 Oebalus pugnax, Lugger, Minn. State Ent. Ann. Rpt. 6: 91. (Records an outbreak in Minnesota during which wheat was damaged.)

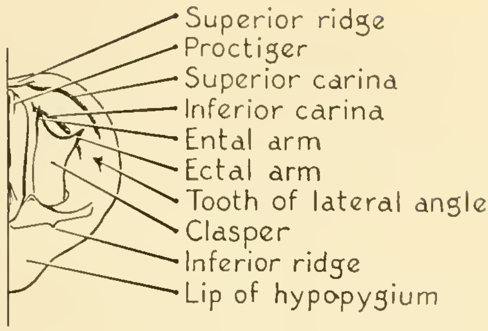
1905 *Oebalus pugnax*, Forbes, Ill. State Ent. Rpt. 23: 194–195, fig. 195. ("Especially injurious to grasses and wheat.")

1919 *Solubea pugnax*, Hart, Ill. Nat. Hist. Survey Bul. 8: 177, 179, 188. (Key beginning page 176 separates nymphs of the more common genera.)

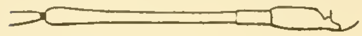
1920 revised 1924, *Oebalus pugnax*, Webb, U. S. Dept. Agr. Farmers' Bul. 1086: 6, fig. 6. (Nature of injury to rice and control.)

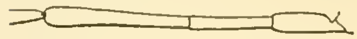
Explanation of Plate 10

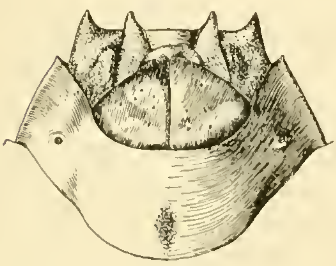
Figure 1. Diagram of male hypopygium showing names of parts.
Figure 2. *Solubea ypsilon-griseus*, three basal antennal segments.
Figure 3. *Solubea grisescens*, same.
Figure 4. *Solubea pugnax*, same.
Figure 5. *Solubea insularis*, ventral view of sixth abdominal segment and genital plates of female.
Figure 6. *Solubea ornata*, same.
Figure 7. *Solubea pugnax*, dorsoventral view of male hypopygium.
Figure 8. *Solubea pugnax torrida*, same.
Figure 9. *Solubea mexicana*, same.
Figure 10. *Solubea linki*, same.
Figure 11. *Solubea ypsilon-griseus*, same.
Figure 12. *Solubea grisescens*, same.
Figure 13. *Solubea insularis*, same.
Figure 14. *Solubea ornata*, same.
Figure 15. *Solubea poecila*, same.

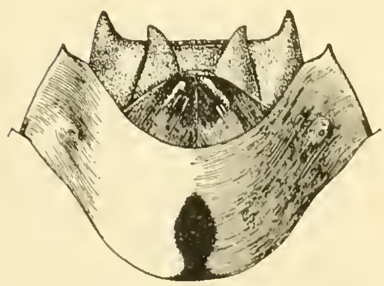



2.S.ypsilon-griseus


3.S. grisescens


4.S. pugnax

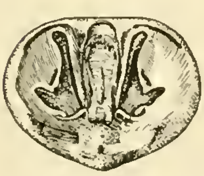

5.S. insularis

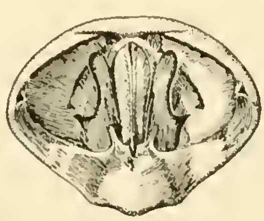

6.S.ornata

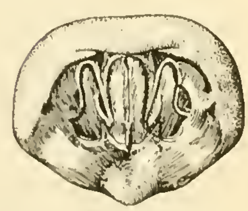

7.S. pugnax


8.S. pugnax torrida

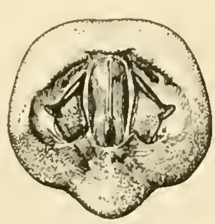

9.S. mexicana


10.S. linki


11.S. ypsilon-griseus


12.S. grisescens


13.S.insularis


14.S.ornata


15. S. poecila

1920 *Oebalus pugnax*, Chambliss, U. S. Dept. Agr. Farmers' Bul. 1092: 24. (A serious pest of rice, especially late in the season.)

1925 *Solubea pugnax*, Davis, Brooklyn Ent. Soc. Bul. 20: 147. (Pairs seen together during night on tops of Johnson grass.)

1927 *Solubea pugnax*, Ingram, U. S. Dept. Agr. Farmers' Bul. 1543: 1–4. (Life history; eggs, first and last instars and adult figured. Methods of control given.)

1932 *Solubea pugnax*, Douglas, La. Agr. Expt. Sta. Rice Expt. Sta. Jour. 35: 12.

1934 *Solubea pugnax*, Douglas, La. Agr. Expt. Sta. Rice Expt. Sta. Bien. Rpts. 1933–34: 25; 1935–36: 13; 1937–38: 17.

1936 *Solubea pugnax*, Hammer, Ohio Jour. Sci. 36: 157–160. (Study of alimentary tract.)

1938 *Solubea pugnax*, Jones et al, U. S. Dept. Agr. Farmers' Bul. 1808: 26.

1938 *Solubea pugnax*, Ryker and Douglas, La. Agr. Expt. Sta. Rice Expt. Sta. Bien. Rpt. 1937–38: 19. (Pecky rice.)

1939 *Solubea pugnax*, Douglas, Jour. Econ. Ent. 22 (2): 300–303, 1 table. (Estimate of losses, list of wild host plants in Louisiana, and habits.)

1942 *Solubea pugnax*, Dahms, Jour. Econ. Ent. 35 (6): 945–946. [Serious injury to Sorghums (*Sorghum vulgare* Pers.) in Oklahoma.]

References incorrectly assigned to *Solubea pugnax* (F.) in the "Index of American Economic Entomology," by Colcord:

Flint, 1927, Ill. State Hort. Soc. Trans. 61: 106. (No specific name mentioned. Injury not typical of *pugnax*.)

Drew, 1927, Fla. State Hort. Soc. Proc. 40: 44, 46. (Severe damage done to citrus by "stink bugs" migrating from *Crotalaria*. In view of the known hosts of *pugnax* this record in all probability applies to some other pentatomid.)

Color.—Head, pronotum, and scutellum straw yellow, frequently with a reddish cast. Numerous rufescent to fuscous punctures, causing these dorsal surfaces to appear somewhat darkened. These punctures sparse along median dorsal line, especially numerous and dense along median line of jugae, extending posteriorly to include ocelli, and on anterior angles of pronotum. Antennae pale reddish, first segment lightest. Median line of rostrum and most of apical segment fuscous. Pleura with spot on each coxal enlargement, on ostiolar surface posterior to auricle, and at anterior lateral angle of mesopleuron fuscous. Hemelytra pale yellow to vitreous, punctation finer and more sparse than on scutellum except along apical half of exocorial vein; exterior apical angle of corium with a fuscous spot; membrane pale. Hind wings iridescent and frequently appearing green as seen through hemelytra. Legs yellow; scattered, black, setiferous punctures on each femur and on fore tibia. An ovate area on mesosternum each side of tumid median line polished, pale yellow, but frequently infuscated along inner margin. Connexivum finely punctate and pale yellow. Venter pale yellow to reddish, with lateral line bearing numerous fuscous punctures, these forming a more or less darkened line which tends to be continued across pleura to hind margin of the eye; anterior margin of each segment with an elongate spot along median line, these sometimes fused to form a fuscous vitta. Spiracles black.

Structure.—Form elongate, narrow. Humeral spines prominent, sharply pointed, directed forward and slightly outward. Lateral margins of pronotum strongly concave, edge irregularly calloused. Antenna with second segment longer than first.

Length: Male, 9.0–10.0 mm.; female 9.5–11.5 mm. Width at base of hemelytra: Male, 3.75–4.0; female, 4.0–4.75 mm.

Male genitalia.—Hypopygium as viewed from beneath concave, without a median lobe on posterior margin. Inferior ridge not continuous, bearing a conical spine each side halfway between apex of proctiger and small black tooth on margin of lateral angle of genital cup. Anterior distance between superior carinae greater than their combined length. Area above base of proctiger smooth and rounded off. Inferior carina subequal in length, parallel or oblique to the superior carina, frequently with an indistinct or broken carina connecting their apices. Clasper with the ental arm elongate, apex narrowly rounded, convex along inner margin, concave, roughened and fuscous along outer margin; ectal arm reduced, tooth-like; base cylindrical, greatest thickness equal to one-third visible length. Proctiger concave dorsally on basal third, then drawn in and laterally compressed to dorsal apex; apical margin vertical and sutured along median line.

Female genitalia.—Sixth ventral abdominal segment with ventral posterior margin biconcave, thus forming a median lobe, this lobe often truncate medially. Genital plates contiguous along their inner margins, each with length along inner margin less than width; posterior margins swollen or thickened at lateral angles adjacent to bases of lateral plates. Subgenital plates bluntly acuminate apically, projecting slightly beyond posterior margin of dorsal plate; each with greatest width equal to one-half greatest length; face deeply sulcate basally. Lateral plates with inner margins tuberculate to conical basally; each contiguous with genital plate from apex of this process to basal angle.

Type.—Not seen; said by Stål, 1868, to be in the Fabrician collection, Kiel Museum. "Carolina."

Distribution.—Common in North America east of the Rocky Mountains as far north as southern Minnesota and New York. Also known in the West Indies and the northern Gulf Coast region of Mexico. Records exist for Central America and Colombia; however, it is not possible to verify these, and it is likely that they represent records for *pugnax torrida* or *mexicana*.

Variation.—Remarkably uniform throughout range.

Economic importance.—This species is undoubtedly one of the most injurious pentatomids in the Western Hemisphere. It is known to attack rice, wheat, sorghum, and many grasses. Damage is principally the result of feeding by the nymphs and adults on the immature or milk-stage grain. This is most important in the case of rice, where it results in what is known commercially as "pecky rice" and was estimated by Douglas in 1939 to be causing an annual loss of from $300,000 to $500,000 to the growers in Arkansas and Texas.

Hosts.—Reported by Douglas, 1939, from the following plants: *Panicum dichotomiflorum* Michx., *Panicum fasciculatum* Swartz, *Panicum* sp., *Digitaria sanguinalis* (L.) Scop., *Echinochloa colonum* (L.) Link, *Paspalum longipilum* Nash, *Paspalum urvillei* Stued. (most important in Louisiana), *Paspalum* sp., *Cynodon dactylon* (L.) Pers., *Sorghum halepensis* (L.) Pers. (Johnson grass). Also reported from *Zea mays* L. (corn), *Sorghum vulgare* Pers., and *Setaria* sp. In 1880, and again in 1885, C. V. Riley reported this species as predaceous on the cotton worm, *Alabama argillacea* (Hübn.). Since Riley illustrated the species at that time there is no question of misidentification; however, no additional records exist to confirm this observation.

Solubea pugnax torrida, new subspecies

(Pl 10, fig. 8)

All characters of color and body structure except the male genitalia fall within the range of individual variation exhibited by the typical form. Male: Length, 9.5 mm.; width at base of hemelytra, 4.0 mm.

Male genitalia.—Hypopygium as viewed from beneath concave and without a median lobe on posterior margin. Inferior ridge continuous, bearing a large conical spine on each side of proctiger; strongly concave, sharply carinate and infuscated between this spine and tooth on lateral angle. Superior carinae curved abruptly downward anteriorly and separated by three times the dorsobasal width of the proctiger. Inferior carinae oblique, length of each not greater than basal width of clasper. Clasper elongate, broadly rounded apically, almost straight along inner margin but slightly concave before small, obtuse, toothlike ectal arm. Distance from tooth to apex of ental arm less than one-half greatest overall length. Proctiger concave dorsally on basal third, compressed laterally to dorsoposterior apex, more gradually compressed ventrally to apex. Apical margin vertical and sutured along median line.

Holotype: Male, Colombia, collected by Gallego, 1937. United States National Museum Cat. No. 56806.

Study of additional material may show this form to be a distinct species. However, until more is known concerning the extent of individual variation it seems best to treat it as a subspecies of *pugnax*. It is probable that previous *pugnax* records from Colombia refer to this form.

Solubea mexicana, new species

(Pl. 10, fig. 9)

Closely related to *pugnax* but with the pronotum differently shaped, connexivum differently colored, and genitalia of both sexes distinct.

Color.—Very similar to *pugnax*. Antennae more rufescent, frequently almost fuscous; a linear infuscated spot on outer lateral margin of first segment; second and third segments with pronounced darkened areas at base of each setose hair. Connexivum with a small spot on anterior margin of each segment, last segment with inner margin infuscated. Median ventral line of abdomen with a small infuscated spot on anterior margin of each segment. Spiracles black.

Structure.—Form similar to that of *pugnax* but with humeral spines smaller, not longer than length of an eye, directed forward. Lateral margins of pronotum along anterior half strongly carinate, the edge of carina roughened, and appearing serrate. Connexivum not, or very narrowly, exposed.

Length: Male, 9.0–9.5 mm.; female, 9.25–11.00 mm. Width at base of hemelytra: Male, 4.0; female, 4.25 mm.

Male genitalia.—Hypopygium as viewed from beneath concave; secondary concavities each side of median line, thus producing a small median lobe, this not apparent from direct ventral view; margin at lateral limits of concavity obtusely angulate. Inferior ridge continuous, elevated to form a low spinose process each side of proctiger; large conical spine on median lateral portion connected to tooth on margin of lateral angle by a sharp-edged, infuscated carina. Lip with a short transverse infuscated carina just posterior to apex of proctiger. Superior carinae bluntly denticulate, curved downward anteriorly and each ending in a prominent tooth; separated anteriorly by a distance equal to twice length of a carina, this area smooth, rounded off to dorsal surface. Inferior carina smooth, oblique, not more than half length of superior carina. Clasper with ental arm strongly developed and continuous with basal portion, narrowly rounded apically, concave along inner margin and on outer margin before rounded projection representing ectal arm; this latter margin infuscated and appearing minutely striate from ental to ectal apices. Width of clasper through ectal arm equal to one-third greatest length. Proctiger regularly rounded dorsoventrally at base, a transverse indentation dorsally just before basal attachment; laterally compressed to dorsal and posterior margins; dorsal margin in lateral view regularly rounded from basal indentation to posterior apex.

Female genitalia.—Sixth abdominal segment with ventral posterior margin very shallowly concave each side of median line; median lobe thus formed very small. Genital plates not contiguous along entire inner margin, usually divergent from base; length along inner margin less than greatest width; disc of the plates swollen and polished; posterior margin to subgenital plates concave. Subgenital plates with apices bluntly acuminate, normally projecting noticeably beyond posterior margin of dorsal plate, face of each shallowly sulcate basally. Lateral plates with posterior spines broad, as wide basally as long; inner margin of each with angulate process contiguous with the genital plates.

Type Material.—Holotype: Male; Vulcano, Colima, Mexico, L. Conrad. United States National Museum Cat. No. 56807. *Allotype:* Female; same data as above. *Paratypes—MEXICO—;* 8 as above; 3, Cuernavaca, Morelos; 1, Cuernavaca, Sept. 1897, O. W. Barrett; 2, Cuernavaca, August 24, 1930, C. O. Plummer; 1, Cuernavaca, March 9, E.G. Smith; 18, Cuernavaca, July 30, 1903, W. L. Tower; 1, Omeltema, Guerrero, 8,000 ft., July, H. H. Smith; 1, Cajome, Sonora, W. M. Mann; 1, Matamoros, Tamaulipas, August 12, 1903, W. M. Tower; 1, Guadalajara, Jalisco, Sept.,

W. M. Tower; 1, Chapala, Jalisco, Sept. 11, 1938, L. J. Lipovsky; 3, Real de Arriba, Temascaltepec, Mex., July 13, 1933, Hinton and Usinger; 1, Temascaltepec, July 15, 1933, Hinton and Usinger; 3, Mexico.—*ARIZONA*—: 4, Santa Cruz River near Tubac, Oct. 23, 1937, P. W. Oman; 4, Tuscon Mountains, June 18, 1933, R. J. Beamer; 1, Patagonia, August 23, 1937, Drake and Andre; 3, Patagonia, August 16, 1937, H. M. Harris; 1, Tuscon, August 1934, C. J. Drake; 2, Nogales, August 23, 1937, Drake and Andre; 2, Bella Lama, August 13, 1937, Drake and Andre; Santa Cruz Valley, August 15, 1937, H. M. Harris; 5, Huachuca, August 8, 1924, E. P. Van Duzee; 4, St. Xavier Mission, Tuscon, August 12, 1924.

These paratypes are distributed in the following collections: 23, United States National Museum; 10, American Museum of Natural History; 9, California Academy of Science; 5, Snow Collection, University of Kansas; 5, Drake Collection; 9, Harris Collection; 4, Usinger Collection.

Distribution.—As summarized from above, Mexico and southern Arizona.

Variation.—Judging from the specimens at hand, this species is very uniform in color and structure. Two specimens from Cuernavaca, Morelos, Mexico, have humeral spines closely resembling those of *pugnax* but in other regards are normal.

Economic importance.—There are no Mexican records of damage by *pugnax*, the name with which this form has previously been associated. It is probable that this species is capable of damaging grasses and cereals in much the same degree as *pugnax*. The absence of records of damage probably reflects the lack of opportunity rather than capacity.

Solubea ypsilon-griseus (DeGeer)

(Pl. 10, figs. 2 and 11)

Cimex ypsilon-griseus DeGeer, 1773, Memoires, vol. 3, p. 333, pl. 31, fig. 9.

"Gryze Gestippelde Wanz" Stoll, 1788, Punaises, p. 84, fig. 144.

Cimex litteratus Gmelin, 1789, Syst. Nat. (Ed. 13)1: 2148.

Cimex inscriptus Fabricius, 1803, Syst. Rhyng., p. 159.

Oebalus ypsilon griseus (DeGeer), Stål, 1862, Stettin Ent. Ztg. 23: 102; 1868, Hemip. Fabriciana, vol. 1, p. 28; 1870, Enum. Hemip., vol. 2, p. 22.

Oebalus ypsilonoides Berg, 1879, Hemip. Argentina, p. 41; Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 125. (New synonomy.)

Oebalus ypsilon-griseus (DeGeer), Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 125.

Solubea ypsilongriseus (DeGeer), Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 62.

Solubea ypsilonoides (Berg), Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 62.

Readily distinguished from all other species of *Solubea* except *grisescens* by its apparently four-segmented antennae. The second segment is greatly shortened and fused to the third. The yellow calloused area on the pronotum usually serves to separate this species from *grisescens*. In some cases positive identification requires study of the male genitalia.

Color.—Very similar to *pugnax*. Differing in having the scutellum with yellow calloused marks laterally along basal half and on apex; pronotum with a small yellow impunctate spot behind inner posterior angle of callus; hemelytra without fuscous spot on apex of outer angle; incisures of connexivum each with a fuscous dot not reaching outer lateral margin, but usually connected by a rufescent area along inner margin; abdomen usually with three fuscous vittae, one along median ventral, and one on each lateral line, these varying much and frequently scarcely evident. Spiracles not infuscated, pale. Genital plate of female uniformly darkened. Humeral spines usually infuscated. Antennae yellowish with a slight reddish tinge.

Structure.—Form similar to that of *pugnax* but with humeral spines directed outward and slightly forward; body less elongate. Connexivum narrowly exposed. Antenna with second segment shorter than first and fused to third, second and third thus often appearing as a single segment.

Length: Male, 8.0–8.75 mm.; female, 8.5–10.0 mm. Width at base of hemelytra: Male, 3.5–4.0 mm.; female, 4 mm.

Male genitalia.—Hypopygium, as viewed from beneath, concave, and with a notch each side of median line producing a small truncate median lobe. Inferior ridge evident, with a spinose process each side of median line posterior to claspers, disappearing on posterior margin midway to small infuscated tooth on dorsal margin of lateral angle. Superior carinae separated anteriorly by a distance less than length of a carina. Inferior carina oblique, denticulate, as long as superior. Clasper with ental arm almost spatulate, broadly rounded apically; ectal arm small, acuminate, almost spinose; greatest width of clasper one-half overall length; inner surface with a pronounced longitudinal ridge beginning at base of ental arm. Proctiger elongate, compressed to sutured dorsomedian line; apex produced to form a laterally flattened process elevated above dorsal margin and overhanging inferior ridge.

Female genitalia.—Sixth abdominal segment with ventral posterior margin regularly concave. Genital plates polished, each convex, with a concave area before lateral angle, a few obsolete punctures on disc; inner margins usually overlapping slightly along basal two-thirds, divergent slightly along apical third; length of each along inner margin equal to greatest width. Subgenital plate longitudinally concave along basal half, apex bluntly acuminate and projecting slightly beyond posterior margin of dorsal plate. Lateral plate with the posterior spine strongly produced, projecting half overall length of plate beyond posterior margin of dorsal plate; inner margin rounded, edge thickened, in contact with genital plate basally.

Type.—Not seen. Should be in Naturhistoriska Riksmuseet, Stockholm.

Distribution.—Recorded from Dutch Guiana and Brazil by Kirkaldy in 1909. Additional records: Montevideo, Uruguay, March 6, 1940, H. L. Parker; Blairmont Plantation, British Guiana, H. E. Box; Corumba Matto Grosso, Brazil; Iquitos, Peru, March 1920, H. S. Parish, (United States National Museum). Rio Santiago, Peru, November 27, 1924, H. Bassler; Upper River Maranon, Peru, October 11, 1924, H. Bassler (American Museum of Natural History). Horqueta, 45 miles east, Paraguay, October 12, 1934, A. Schulze (John Lutz collection, Philadelphia, Pa.), Corrientes, Argentina, January 1921, De Carlo; Viscosa, Minas Geraes, Brazil, November 1938, B. I. Snipes (C. Drake collection, Ames, Iowa).

Variation.—The spinose condition of the humeri is not so stable in this species as in *pugnax* and *mexicana*. These spines are present though varying in size and stance in all the specimens at hand except those from Peru. The male genitalia of these specimens, however, appear to be identical with those of the eastern form, and it is doubtful if the western form represents more than a possible variety. The characteristic marking of the scutellum is very stable in the specimens at hand.

Economic importance.—No specific records of damage are known for this species; however, it is probable that some records attributed to other species actually imvolved this form.

Solubea grisescens, new species

(Pl. 10, figs. 3 and 12)

Very similar to *ypsilon-griseus* but without spinose humeri, the yellow cal_ oused areas on scutellum not more than narrowly indicated along lateral margin and apex; second segment of antenna more distinctly separated from third.

Color.—Generally as in *ypsilon-griseus*. The impunctate spot behind inner angles of calli may or may not be present. Basal angle of scutellum yellow and calloused, this area narrowly produced along lateral margin, apex almost impunctate but not calloused. Abdomen with infuscated vitta along median ventral line present, indistinct, or absent. Genital plates of female infuscated, usually lighter along lateral anterior margins. Lateral line of abdomen marked by infuscated punctures. Incisures of connexivum with a fuscous dot not reaching outer lateral margin but usually connected by a rufescent area along inner margin; spiracles pale. Antennae pale with a reddish cast.

Structure.—Form similar to that of *ypsilon-griseus;* elongate, narrow, gradually tapering posteriorly, abruptly anterior to humeral angles; lateral margin of pronotum slightly concave; humeri without spines, at most angulate. Antenna with second segment shorter than first but with suture between it and third strongly marked. Connexivum narrowly exposed.

Length: Male, 8.5 mm.; female, 10 mm. Width at base of hemelytra, 4 mm.

Male genitalia.—Similar to those of *ypsilon-griseus* but with tooth on lateral angle located just below rim on inner surface and not projecting above rim. Ental arm of clasper broad but with margins narrowly rounded, not edged as in the related species. Ectal arm projecting at almost a right angle from the base of the entral arm, apex narrowly rounded and infuscated. Inner surface of clasper angulate from base of ental arm to base of clasper. Width of clasper through ectal arm exceeding half overall length through ental arm.

Female genitalia.—Apparently similar in all respects to those of *ypsilon-griseus*.

Type material.—Holotype: Male, Misiones, Argentina, February 4, 1942, H. L. Parker, United States National Museum Cat. No. 56808. *Allotype:* Female, 45 miles east of Horqueta, Paraguay, October 28, 1933, A. Schulze. *Paratypes:* 2, above locality, October 12, 1933 (collection of John C. Lutz, Philadelphia, Pa.). 1, P. Alegro, Brazil, April 30, 1934, rice field, R. S. Castleman; 1, Rib. Preto est. Sao Paulo, Brazil, November 1936; 1, Ceara, Brazil, F. D. da Rocha (United States National Museum).

Distribution.—Northern Argentina, Paraguay, and southern Brazil.

Economic importance.—No records of injury; however, it should be noted that one of the specimens listed above is recorded from a "rice field".

Solubea insularis (Stål)

Pl. 10, figs. 5 and 13)

Pentatoma (*Mormidea*) *geographica* Guérin-Méneville, Sagra, 1857, Hist. Cuba Ins., p. 369. (Preoccupied.)

Oebalus insularis Stål, 1872, Enum. Hemip., vol. 2, p. 22; Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 125.

Mormidea guerini Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 123. (new name for *geographica*); Barber, 1914, Amer. Mus. Nat. Hist. Bul. 33 (31): 522; Van Duzee, 1917, Cat. Hemip. N. Amer., p. 39; Blatchley, 1926, Heterop. E. N. Amer., p. 125.

Solubea insularis (Stål), Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 61; Essig, 1928, Pan-Pacific Ent. 4 (3): 128 (of economic importance; mentions damage in Mexico); Barber and Bruner, 1932, Jour. Dept. Agr. Puerto Rico 16 (3): 252; Barber, 1939, Sci. Survey, Porto Rico and Virgin Islands, Vol. 14, pt. 3, p. 289.

This species belongs to a group within the genus *Solubea* which includes *poecila* and *ornata.* The structure of the genitalia is nearest that of *poecila.* It may be recognized readily by the symmetrical development of the arms of the clasper and the presence of a small tooth on the inner rim of the lateral angle of the genital cup.

Color.—Typical specimens almost uniformly ferruginous; some with areas in basal angle of scutellum, apex, and on apical quarter of corium calloused, yellow. These areas noticeably in contrast with general color. Corium with an impunctate hyaline to light-brown area on median portion of apical fourth. Connexivum with fuscous spot on each incisure reaching but not including edge of lateral margin. These spots connected along inner connexival margin by a rufescent to ferruginous area. Venter of abdomen with or without fuscous spots near anterior margin of each segment along median line. Spiracles darkened, never black. Antenna reddish or somewhat infuscated, basal portion of each segment usually lighter; three basal segments usually with minute fuscous spot surrounding base of setose hairs. Femora and tibiae of all legs with scattered conspicuous spots each bearing a setose hair.

Structure.—Less elongate than preceding species. Lateral margin of pronotum before humeri very slightly concave, disc strongly declivous before humeri, these at most acutely angulate. Antenna with second segment as long as or longer than first. Connexivum narrowly or not at all exposed.

Male genitalia.—Hypopygium as viewed from beneath not concave but strongly notched each side large semicircular median lobe. Ventral surface with a shallow concavity at base of median lobe. Inferior ridge evident only posterior to claspers; bearing a three-sided spine on each side of apex of proctiger, spines with posterior face grooved longitudinally, as long as ventral length of proctiger apex. Small black tooth on inner rim of each lateral angle of genital cup. Superior and inferior carinae parallel, latter not more than half length of former, never connected at anterior apices by a vertical carina. Clasper with ental and ectal arms of about equal length; ental arm bent far more abruptly than ectal arm posteriorly. Margin between apices of arms sharp or narrowly rounded, not marked by transverse striations. Width through apices of arms almost equal to greatest length of clasper. Proctiger with greatest width less than half greatest length, beveled off sharply each side of sutured median dorsal longitudinal line to floor of genital cup, dorsal outline strongly concave; hind margin of apex vertical in lateral view, bearing three carinae, one on median line and one each side laterally, these converging dorsally to form a blunt point.

Female genitalia.—Sixth abdominal segment with ventral posterior margin regularly concave. Genital plates very convex, basal lateral portions appearing swollen, inner margins slightly overlapping basally and slightly divergent apically; each with length along inner margin equal to that of posterior margin and to seven-ninths median ventral length of sixth abdominal segment. Subgenital plate almost acute at apex and noticeably produced beyond posterior margin of dorsal plate. Lateral plate with posterior spine produced beyond posterior margin of dorsal plate less than half length of inner margin of genital plate, portion on inner margin broadly rounded before contact with genital plate, margin thickened.

Type.—Not seen. Should be in Naturhistoriska Riksmuseet, Stockholm.

Distribution.—Recorded by H. G. Barber (1932, 1939) from Cuba, Mexico, Honduras, Panama, Florida, Colombia, Haiti, and Puerto Rico. Material studied by the author is from Cuba, Mexico, and Panama. The Haiti records and that from Puerto Rico are based on specimens treated here as *Solubea ornata*, new species. The Colombian record is based on the variety named by Kuhlgatz as *Oebalus insularis* var. *similis* which is treated here as a form of *S. poecila* (Dallas).

Variation.—As noted above, considerable variation in color is to be found in this species. Certain specimens show large yellow calloused areas covering the basal angles of the scutellum and prolonged posteriorly to the apical half, with apex of scutellum and a spot on the disc of apical fourth also impunctate and yellow. The existence of numerous intermediate specimens as well as a common range of distribution (specimens showing color pattern are more common from Mexico) would seem to indicate that this is probably no more than individual variation. Morphologically the forms appear identical.

Economic importance.—This species was reported by Essig (1928) as causing considerable damage in rice-growing areas of Mexico.

Solubea poecila (Dallas), new combination

(Pl. 10, fig. 15)

Surinaamsche Vlieg-Wantz Stoll, 1788, Cigates et des Punaises: 55, pl. 17, fig. 118. (Not binomial).

Mormidea poecila Dallas, 1851, List Hemip. Brit. Mus., p. 213 (does not describe but refers to Stoll's description and figure); Walker, 1867, Cat. Hemip., vol. 2, p. 253 (North America; probably an erroneous record); Stål, 1872, Enum. Hemip., vol. 2, p. 20; Berg, 1879, Hemip. Argentina, p. 38; Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 124; Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 60.

Oebalus rufescens Haglung, 1868, Stettin Ent. Ztg. 29: 155; Stål, 1872, Enum. Hemip., vol. 2, p. 22; Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 125. (New synonymy.)

Mormidea exigua Berg, 1891, Ann. Soc. Cient. Arg. 32: 239; Lethierry and Severin, 1893, Cat. Hemip., vol. 1, p. 123; Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 60. (New synonymy.)

Oebalus insularis variety *similis* Kuhlgatz, 1902, Berlin. Ent. Ztschr. 47: 253; Kirkaldy, 1909, Cat. Hemip., vol. 1, p. 61. (New synonymy.)

Economic Literature on Solubea poecila (Dallas)

1919 *Mormidea ypsilon*, Reyne (not L.), Verslag. van den Entomoloog Suriname, p. ? (not seen).

1921 *Mormidea ypsilon*, Reyne (not L.), Verslag. van den Entomoloog Suriname, p. ? (not seen).

1923 *Mormidea poecila*, Rpt. Brit. Guiana Dept. Sci. Agr. for 1922, p. 37.

1923 *Mormidea poecila*, Moreira, Almanak Agr. Brasileiro, pp. 193–194, São Paulo.

1926 *Mormidea poecila*, Cleare, Rpt. Brit. Guiana Dept. Sci. Agr. for 1925, p. 65.

1928 *Mormidea poecila*, Cleare, Brit. Guiana Dept. Agr., Agr. Jour. Brit. Guiana 1: 154.

1930 *Mormidea poecila*, Cleare, Rpt. Director Agr., Brit. Guiana, for 1929, p. 16.

1934 *Mormidea poecila*, Squire, Brit. Guiana Dept. Agr., Agr. Jour. Brit. Guiana 5: [245]–252, fig. 1, 3 tables. (A comprehensive work concerning the biology and habits.)

1935 *Mormidea poecila*, Costa Lima, Ferreira and Reiniger, O Campo 6 (1): 61–63. (Habits and injury to rice in Brazil.)

1935 *Mormidea poecila*, Costa Lima, O Campo 6 (2): 10, fig. 5. (Study of 2 microhymenopterous parasites of.)
1935 *Mormidea poecila*, Costa Lima, O Campo 6 (6): 22–23. (A new internal parasite of.)
1935 *Mormidea poecila*, Squire, Rpt. Director Agr., Brit. Guiana, for 1934, p. 32, 2 figs.. (Review of literature.)
1941 *Mormidea exigua*, Costa Lima, Insectos do Brasil, vol. 2, p. 57, fig. on p. 62.

This species is most closely related to *Solubea insularis* and to *S. ornata*. The typical form may be recognized from the former by the presence of pronounced humeral spines and from the latter by the presence of small infuscated spots on the hind tibiae. The atypical forms show a reduction of the humeral spines and tend to be concolorous, thus resembling *insularis* and making it necessary to examine the genitalia for a positive identification. It should also be noted that certain color phases of this species superficially resemble *Mormidea ypsilon* (L.) very closely.

Color.—Ranges from ferruginous to dark castaneous dorsally. The dark (typical) form bears a large reniform, yellow calloused spot on declivity of pronotum each side of median line, lateral margin yellow. Scutellum with a large, strongly calloused, yellow reniform area on each side of basal half, apex also impunctate and yellow; a yellow rectangular spot on disc of apical fourth of corium. In the specimens at hand a definite correlation is to be noticed between color and development of calloused areas. The lightest specimens show least development of these areas. Venter usually darker in females than in males. Typical form with thorax, except coxal enlargements and posterior lateral angles of meso- and meta-thorax, black. Abomen with incisures of connexivum, lateral line, median line, and intersegmental sutures black. From this extreme there is graduation to the light form where the venter is yellow with scattered rufescent punctures, these most numerous along the median line. Incisures of connexivum and apex of female genital plates always infuscated. Spiracles pale. Legs of all phases reddish; area around base of scattered setose hairs, particularly of tibiae, fuscous. Antenna with third and fourth segments infuscated on apical two-thirds, first often infuscated laterally; otherwise usually pale.

Structure.—Form elongate oval. Dorsum moderately convex. Pronotum strongly declivous before humeral angles; lateral margins slightly concave, more so in specimens with strongly developed humeral spines. Second segment of antenna longer than first.

Length: Male, 6.9–8.3 mm.; female, 7.4–9.5 mm. Width at base of hemelytra: Male, 3.4–3.8; female, 3.7–4.0 mm.

Male genitalia.—Hypopygium as viewed from beneath not concave; a strong median lobe describing an incomplete semicircle on hind margin, somewhat impressed on each side of lobe. Inferior ridge strongly developed posterior to claspers, produced into a strong spinose process on each side of apex of proctiger, these sulcate on posterior face. Dorsal surface of lip with a longitudinal carina along median line ending at base of median posterior lobe. Lateral angle of genital cup without tooth. Superior carina curved downwardly at anterior apex to meet and surpass the anterior apex of the otherwise parallel inferior carina. Inferior carina one-half length of superior. Clasper with ental arm more developed than ectal, both triangular, the former more broadly so; apical margin fuscous, flattened, roughened and usually appearing minutely striate; outline in lateral view straight to base of upcurved ectal arm. Proctiger with greatest width less than half greatest length, dorsal apex of basal attachment in contact with rim of genital cup; strongly flattened laterally to median line, which is sutured from base to apical process; outline of dorsal margin in lateral view straight to base of apical process; this process prominent, obtusely angulate to rounded lobe; in normal resting position hind margin vertical along median line.

Female genitalia.—Sixth ventral abdominal segment with ventral posterior margin regularly concave. Genital plates each with disc convex but not swollen, a concavity on posterior portion before the lateral angles; inner margins contiguous, slightly divergent at apices, hind margins to subgenital plates straight. Subgenital plates bluntly acuminate, projecting noticeably beyond dorsal plate; inner margins strongly curved, outer straight. Lateral plates spinose posteriorly but varying considerably in degree; inner margins almost straight, each contiguous with genital plates only at apex of basal angle.

Type.—If extant, location unknown.

Distribution.—Published records include Colombia, the Guianas, Brazil, and northern Argentina. Additional records are Reyes, Bolivia, October 1921, W. M. Mann; Ixiamas, Bolivia, December 1921, W. M. Mann; Ivon Beni, Bolivia, February 1922, W. M. Mann; Guayaquil, Ecaudor, 1941, C. L. Fagan; San Fernando, Trinidad (rice field); Misiones, Argentina, February 4, 1942, H. L. Parker; Province of Santa Fe, Argentina (United States National Museum). Horqueta, Paraguay, 57° 10″ W.–23° 24″ N., January 13, 1941, Alberto Schulze (John Lutz collection).

In 1851 Dallas recorded one specimen of this species in the British Museum "presented by M. Serville" as from "N. America." There is in the United States National Museum collection a single specimen of this species originally determined by Signoret, the label being in his handwriting and also bearing "Amy. & Ser." and locality, "United States." It seems likely that this specimen was a part of the same original series as the specimen treated by Dallas, and in view of the present distributional records for the species the locality record of that series is in error.

Variation.—*Solubea poecila* is an extremely variable species showing considerable differences in color and degree of development of the humeral spines within a series from a given locality. The darkest form, which also shows the greatest development of the humeral spines, is predominant along the eastern coastal region of Brazil and the Guianas. This form superficially resembles *S. ornata* very closely. The lighter form showing less spinose development of the humeri was described by

Kuhlgatz as *insularis* variety *similis*. In color and shape it does resemble *insularis* closely; however, the structure of the genitalia of both sexes associates the form with *poecila*. The specimens from Ecuador and Bolivia belong here, though some individuals approach the eastern or typical form very closely. The uniformity of genital structure throughout the range and the individual variation noted in series from given localities make it impossible to recognize any constant subspecific category.

Economic importance.—As indicated in the bibliography of this species, it is of considerable importance, particularly in the rice-growing sections of the Guianas and Brazil. It is said by Squire (1934, British Guiana) that the outbreaks of the insect are often spectacular and destructive but that the damage varies greatly from year to year and in different localities. He further states that "attacks are apt to be sudden, acute and localized, and are perhaps best explained as originating as invasions from over-populated grasslands which form the insects' normal habitat...the outbreak generally subsides and peters out completely in 2 or 3 weeks. In the meantime the toll taken is considerable and in severe cases a total loss of grain results." A chalcid egg parasite is considered by Squire as one of the important factors in control.

Solubea ornata, new species

(Pl. 10, fig. 6 and 14)

Solubea querini, Wolcott, 1936, Insectae Borinquenses, Puerto Rico Univ. Jour. Agr. 20(1): 175.

Solubea insularis, Barber, 1932, Jour. Dept. Agr. of Puerto Rico 16 (3): 252 (record for Haiti); Barber, 1939, Sci. Survey Porto Rico and Virgin Islands 14, pt. 3, p. 289.

Very closely related to *poecila* and similar in color to the typical form of that species, but without strongly spinose humeri. Most striking characteristic is the flattening of the ectal arm at right angles to the apical margin of the male clasper.

Color.—Dorsum dark ferruginous with large reniform area covering each basal angle of scutellum, apex of scutellum, and spot on apical fourth of corium yellow and calloused. Declivity of pronotum usually paler than posterior portion, typically not exhibiting calloused areas. Underside of abdomen lighter in males than females. Males usually with only ostiolar area, spot laterally on prostethus behind eye, and mesosternum infuscated. Female with pleural tergites, mesosternum, incisures of abdomen including connexivum, lateral line, median ventral line, and median apical area of genital plates fuscous. Spiracles pale. Antennae pale, fourth and fifth segments reddish. Legs pale with scattered fuscous setigerous spots on femora and tibiae; these spots absent or much reduced on hind tibiae, never so conspicuous as those on fore tibiae.

Structure.—Form elongate oval. Dorsum moderately convex. Pronotum strongly declivous before acute humeral angles, lateral margins slightly concave. Antennae with second antennal segment longer than first. Connexivum narrowly or not at all exposed.

Length: Male, 7.8–9.0; female, 8.5–9.7 mm. Width at base of hemelytra: Male, 3.7–4.0; female, 4.0–4.2 mm.

Male genitalia.—Hypopygium, as viewed from beneath, with hind margin slightly concave but concavity largely filled by the large median semicircular lobe, ventral surface shallowly concave before lobe. Inferior ridge strongly developed posterior to the claspers, produced into a strong spinose process each side of proctiger. These spines each strongly sulcate through apex on posterior surface, equal in length to dorsoventral length of proctiger apex. Dorsal surface of lip with median portion longitudinally, gradually raised to interior ridge. Lateral angles of genital cup without teeth. Superior carina heavy, coarsely and bluntly denticulate, overall length equal to apical margin of clasper, gradually curved downward anteriorly to surpass inferior carina. The latter with length equal to two-thirds the length of former. Clasper with ental arm more strongly developed than ectal; ental arm triangular in side view; apex acute, a curved carina running along inner surface from apex to base of clasper; ectal arm flattened at right angles to apical margin of clasper; dorsal margin of ental arm flat and minutely striate. Both this margin and ectal arm infuscated. Proctiger with greatest width equal to less than half greatest length; dorsal apex of basal attachment not in contact with dorsal rim of genital cup, strongly flattened laterally to median dorsal line, which is sutured from base to apical process; outline of dorsal margin in side view straight to base of apical process; apical process angulate with hind margin vertical, and strongly flattened laterally.

Female genitalia.—Sixth ventral abdominal segment with ventral posterior margin regularly concave. Genital plates each with disc convex but not swollen; inner margins contiguous, slightly divergent both at bases and apices. Subgenital plate narrowly rounded at apex, projecting noticeably beyond dorsal plate, inner margin broadly rounded, outer straight; face longitudinally sulcate at base. Lateral plate with posterior spine about one-third overall ventral length; inner margin almost straight, contiguous with genital plate only at apex of basal-angle.

Type material.—Holotype: Male, Hormigueros, Puerto Rico, October 11, 1943, J. Brunet; feeding on rice in the milk stage; United States National Museum Cat. No. 56809. *Allotype:* Female, same data. *Paratypes:* 69, same data. (This series was forwarded for identification to the Bureau of Entomology and Plant Quarantine by Mr. Harold Plank of the Department of Agriculture, Office of Experiment Stations); 11, San Domingo, injuring grass seed and rice, J. M. Stanton; 9, San Francisco, Santo Domingo, September 15, A. Busck; 1, Santo Domingo, August, A. Busck; 1, St. Marc, Haiti, May 21, 1925, G. N. Wolcott; 1, Letrou, Haiti, September 22, 1925; 10, Santo Domingo, May (Uhler collection); 2, Santo Cristobal, Santo

Domingo, July 26, 1917, H. Morrison (United States National Museum). 17, Sanchez, Santo Domingo, May 15-17, 1921 (American Museum of Natural History).

Distribution.—According to the known records as cited above, this species is limited to the islands of Hispaniola and Puerto Rico. Three additional specimens are in the United States National Museum collection bearing the label Cali, Colombia, W. F. H. Rosenburg. These specimens are typical in every respect, and since there are no specimens known from intervening islands or localities the probability that the Colombia specimens are mislabeled seems likely.

Variation.—Color and shape of the humeri are remarkably uniform in the specimens at hand.

Economic importance.—There are no published records of injury by this species; however, as noted above, two records, one in Santo Domingo and the other in Puerto Rico, indicate that any increase in the production of rice in these islands will involve an increased importance of this species as a pest of economic importance.

Solubea linki (Heidemann)

(Pl. 10, fig. 10)

Mormidea linki Heidemann, 1917, Carnegie Mus. Ann. 11: 351–352.

Solubea linki (Heidemann), Barber and Bruner, 1932, Puerto Rico Dept. Agr. Jour. 16 (3): 253.

This species differs markedly from the other species of the genus; however, as already pointed out by Barber and Bruner, it undoubtedly belongs in *Solubea.* The length of the bucculae and the genital structure of both sexes confirm this conclusion. It is readily distinguished from the other species by its small size and short scutellum.

Color.—Light yellowish, marked with rufescent to black punctures. Black punctures on head forming two vittae which are continued on pronotum. Humeral spines black, when present. Scutellum with strongly elevated, yellow, calloused areas on each side parallel with lateral margin from base to apical fourth; apex impunctate or nearly so and with lateral elevations forming a prominent V mark. Median line of scutellum and pronotum pale. Apex and inner angle of corium fuscous. Corium and disc of scutellum at each side of median line often castaneous. Connexivum pale except on infuscated apex of sixth abdominal tergite. Lateral plates of female with posterior spines black at apex and along inner margins. Abdomen with spiracles black, lateral line infuscated, median ventral line not marked, or indicated by fuscous spots at anterior margin of sclerite only. Thorax with conspicuous black spot on each coxal enlargement. Legs and antennae pale, with numerous fuscous punctures, fourth and fifth segments of antennae usually darker and without fuscous setigerous spots.

Structure.—Elongate oval, abdomen tapering gradually posteriorly. Dorsum convex. Pronotum with lateral margin strongly concave before humeral angles.

These angles spined or angulate. Spines when present directed forward and outward. Calli elevated, causing anterior portion of pronotum to appear transversely impressed. Antenna with second segment longer than the first. Scutellum with width at base equal to length.

Length: Male, 5.5–6.5 mm.; female, 6.0–7.0 mm. Width at base of hemelytra: Male, 2.8; female, 3.1 mm.

Male genitalia.—Hypopygium as viewed from beneath with hind margin concave; median lobe of hind margin small, strongly concave on ventral surface. Inferior ridge evident as a flattened triangular spinose process each side of apex of proctiger posterior to base of clasper, length of this spine barely exceeding one-half apical breadth of proctiger. Genital cup shallower than in any other known species of the genus. Lateral angles broadly rounded and without teeth. Length of superior carina equal to distance between apices of clasper arms; inferior carina equal to one-half length of superior carina, located twice its length below superior carina in oblique position. Clasper with ental arm strongly developed and spatulate at apex; ectal arm flattened ar right angles to dorsal margin of ental arm and curved outwardly; apical margin of clasper in side view concave along ental arm and sharply impressed before base of ectal arm; face of clasper with a strong carina from base to apical half of ental arm; surface longitudinally striate from carina to curve of ectal arm. Anterior surface of flattened portion of ectal arm with minute transverse striations. Proctiger with basal third of dorsal surface flattened, bearing strongly elevated carinae laterally; constricted to apical third, tricarinate over apex, median carinae very prominent and extending back to basal half, lateral carinae more prominent on apex. Outline of dorsal margin in side view straight to apex, where it curves sharply downward. Apex with breadth equal to depth.

Female genitalia.—Sixth ventral segment of abdomen with posterior margin concave, somewhat flattened medially. Genital plates swollen along posterior margins, concave or creased before the lateral angle; contiguous, slightly overlapping basally. Subgenital plate triangular, narrowly rounded apically and deeply sulcate on basal third. Lateral plate with posterior spine moderately elongate; inner margin rounded to obtusely angulate at point of contact wit genital plate. One-fourth of genital plate in contact with lateral plate.

Type material.—Eight cotypes, Isle of Pines. In Carnegie Museum.

Distribution.—Cuba and the Isle of Pines.

Variation.—The specimens at hand show considerable variation in size and development of humeral spines. Certain specimens exhibit pronounced humeral spines while the humeri of others are not more than acute or even obtusely angulate.

Economic importance.—There are no records of injury by this species.

NEW APTEROUS ARADIDAE FROM THE WESTERN HEMISPHERE (Hemiptera)

By H. M. Harris and C. J. Drake, *Ames, Iowa.*

The discovery of several species of wingless Aradidae in the western Hemisphere adds to the complexity of the family, particularly as it relates to generic kinships. The forms described below belong to the *Mezirinae*, and because of their peculiar structural features can not be assigned to any existing genera. The types are in the authors' collections.

ACARICORIS, new genus

Apterous, obovate, almost naked, shiny, strongly rugose, the rugae irregular and mostly longitudinal. Head subequally as long as broad, deeply grooved above, strongly narrowed behind eyes, the sides rough, but without post-ocular spines. Eyes exserted. Tylus moderately long, narrow. Jugae moderately slender, surpassing tylus, their tips bluntly pointed, slightly divaricating. Antenniferous tubercles stout, faintly divaricating, somewhat inflated beneath, their tips blunt. Antennae moderately stout, not quite twice as long as head, practically nude, minutely granulate, first segment longest and stoutest, slightly curved, second half as long as first, third slenderest, fourth enlarged distally, its apex with fine hairs. Rostrum not reaching base of head, its sulcus wide, shallow, with lateral edges and posterior end carinate. Thorax with indistinct separation between metanotum and abdomen, in front wider than head, the anterior angles rounded, gradually widened backwards, with only slight marginal indentations at the segmental junctures; pronotum with a fine collar, the posterior margin sinuate, its middle with a deep notch into which projects an angular prominence on front of mesonotum. Wing pads and triangular scutellum entirely absent. Legs wide apart, short, moderately stout, almost naked, the femora slightly granulate, unarmed. Connexivum wide, without conspicuous lateral expansions, separated from abdomen above and beneath by a distinct groove. Stigmata located along lateral margin, being placed progressively nearer the edge until the last two or three are in the margin and visible from above. Abdomen with disc arched above and beneath.

Genotype: Acaricoris ignotus, n. sp.

In body shape, somewhat suggestive of *Emydocoris* Usinger but markedly different in the characters of the head and antennae, the surface sculpture and in the location of the spiracles.

Acaricoris ignotus, new species

Small, ferrugineous-brown, shiny, almost naked. Head brown, about as long as broad (32:33), faintly widened in front of eyes, strongly, somewhat roundly narrowed behind eyes, the tip distinctly notched. Antennae brownish-black, segment 1 constricted at base, surpassing tylus by half its own length; proportional length of the segments, 16:8:14:13. Rostrum brownish. Thorax broader than long, strongly rugose, raised laterally, the mesonotum and metanotum with a median triangular raised area whose apex is at base of pronotum. Abdomen above with a raised blackish area near middle. Connexival segments (and abdomen above, though less distinctly so) with indications of the ringlike impressions evident on some other genera. Legs dark brown, the tibiae paler. Genital plates large, quadrangular.

Length, 3.90. *Width*, 1.9 mm, (abdomen) 2.0 mm.

Holotype.—Female, Winfield, Kisatche Forest, Louisiana, July 13, 1943, V. E. Shelford.

This is the first record of the occurrence of an apterous mezirine aradid in the United States. The species is unique in its evenly rounded ovate body, and at first glance has much the facies of an unfed tick.

GLYPTOCORIS, new genus

Apterous, oblong-oval, naked, shiny, with prominent elevations and pits above, the lateral edges and some of the elevations granulose. Head subquadrate, the post-ocular part very coarsely granulate. Tylus raised, narrow. Jugae narrow, slightly surpassing tylus, and slightly divaricating so that apex of head is notched. Antenniferous tubercules very stout, somewhat bulbous at base beneath, their tips blunt. Antennae not twice as long as head, rather stout, slightly granulate, first segment stoutest, curved, exceeding jugae by half its own length, second slightly enlarged distally, third slender, longest, fourth clavate, slightly longer than second, its apex narrowed and prominently setose. Rostrum short, the sulcus wide, shallow, with raised margins laterally and posteriorly. Thorax broader than long, with the segments sharply delimited, the lateral edges with small projections; pronotum in front wider than head, with prominent collar, the disc with a conspicuous excavation behind; mesonotum and metanotum with a granular median longitudinal prominence.

Legs widely separated, short, stout, the femora unarmed. Connexivum and abdomen, above and beneath, with a complicated pattern of elevations and depressions, the connexivum distinctly marked off. Stigmata laterad as in *Acaricoris*, n. genus. Male genital segment swollen above, suggestive of *Mezira*.

Genotype.—*Glyptocoris sejunctus*, n. sp.

Similar to *Acaricoris* new genus, in position of spiracles, but differing in body form, sculpture, antennal proportions, and in the subquadrate head.

Glyptocoris sejunctus, new species

Brownish-black, oblong-oval. Head subquadrate, rugose, slightly widened behind eyes, thence moderately roundly narrowed posteriorly; jugae projecting a little beyond tylus, rounded, the tips turned outward, not quite reaching middle of first segment of antennae. Antenniferous tubercles prominent, directed outwardly, terminating in blunt points. Antennae moderately stout, brownish, segment I very stout, bowed; II widened toward apex; III slender, sub-cylindrical; IV sub-clavate, with long hairs on distal half; proportions, 17:12:22:14. Rostrum short, brownish, not reaching the end of the wide sulcus; the sulcus with lateral edges and apex carinate.

Thorax widest at base, about one and one-half times as broad as long at midline, the sides scalloped, with short prominences; pronotum slightly longer than mesonotum, slightly elevated laterally, deeply narrowly excavated at middle behind; mesonotum and metanotum broadly elevated down the middle, with the median line sunken as a longitudinal groove. Abdomen above with three disc-like impressions on each side, connexivum with four shallower, but somewhat similar impressions; disc of abdomen with a very large, dark elevation near the center, this prominence somewhat impressed behind its summit.

Prosternum carinate along median line, mesosternum with a distinctly impressed area at the middle, metasternum with a similar but larger area. Abdomen beneath with smooth, flattened areas along the median line, the sixth segment with a somewhat obovate, raised area on each side. Legs moderately stout, rather short, brown, finely granulate. Genital segment blackish, swollen above.

Length, 4.50 mm. *Width*, 2.10 mm.

Holotype.—Male, Nova Teutonia, Brazil, Fritz Plaumann, collector.

This species has the post-ocular part of head more nearly like *Emydocoris testudinatus* Usinger than either of the other species.

ERETMOCORIS, new genus

Apterous, elongate-oval, shiny, the appendages and lateral margins setose. Head subequally as long as broad, faintly widened in front of eyes, strongly obliquely narrowed behind the eyes. Tylus high, narrow. Jugae slender, pointed, protruding beyond tip of tylus. Antenniferous tubercles rather stout, narrowed apically. Antennae moderately stout, first segment longest and stoutest, curved, projecting one-half its length beyond tip of jugae, second and third subequal in thickness and in length, fourth a little stouter and a little longer than third. Rostral sulcus very wide and shallow, its edges raised but not as incrassate as in related genera. Thorax with median ridge less pronounced than in related genera, the lateral edge sinuate, with projections, the pronotum distinct, the metanotum and first abdominal segment apparently fused. Legs short, stout, conspicuously setose, the setae short, bristly. Connexivum sharply marked off, slightly narrowed from base to middle, the edge somewhat sinuate, the apical segments prominently expanded laterally. Stigmata marginal in position, the posterior ones visible from above. Male genital capsule bulbous.

Genotype.—*Eretmocoris tatei*, n. sp.

Related to *Acaricoris*, n. genus in the position of the stigmata and the narrowed post-ocular part of head, but distinct by virtue of the expanded lateral margins, the bristly setose antennae and legs, the different nature of tylus, jugae, and sculpture.

Eretmocoris tatei, new species

Small, reddish brown, oblong-ovate. Head ridged, subequally as long as broad, strongly narrowed behind eyes; tylus long, narrow; jugae projecting in front of tylus, faintly divaricating. Antenniferous tubercles very prominent, divaricating, terminating in blunt points. Eyes moderately large, exserted. Rostrum short, brown, the sulcus very broad, shallow. Antennae rather stout, beset with bristly hairs, segment I stout, thickest beyond middle, faintly bowed, II and III subequal in thickness, IV stouter than III, thickest a little before apex; proportions, 24:11:13:15.

Thorax rugose, wider than long, ridged down the middle, with a median impressed line; prothorax shorter than mesothorax; meso- and metathorax progressively widened backwards. Abdomen with connexivum moderately raised outwardly, the fourth, fifth, and sixth segments with small lateral projections, the last named largest. Legs moderately stout, dark brown, beset with numerous, short bristly hairs. Body beneath reddish brown. Genital segments large, rounded above.

Length, 3.40 mm. *Width*, 1.55 mm.

Holotype.—Male, Lares, Puerto Rico, May 26, 1937, H. D. Tate, collector.

KEY TO AMERICAN GENERA OF APTEROUS ARADIDAE

1. Stigmata marginal or submarginal in position, located at or in lateral edge of connexival segments 3
   Stigmata located at or near middle of connexival segments, far removed from lateral edge 2
2. Head subquadrate, with large subangular lobes behind the eyes. Body surface entirely naked. Connexival segments not produced *Emydocoris* Usinger
   Head subtriangular, strongly narrowed behind eyes. Body surface clothed with short, appressed hairs. At least some of connexival segments strongly laterally produced into distinct lobes. *Notoplocoris* Usinger
3. Head subquadrate, with flattened, granular lobes behind eyes. Pronotum with front margin strongly excised each side of the well-developed collar. Metanotum not fused with first abdominal segment . . . . *Eretmocoris*, new genus
   Head subtriangular, strongly, obliquely narrowed behind eyes. Pronotal collar not sharply marked off. Metanotum and first abdominal segment apparently not distinctly separate 4
4. Form ovate, the margins rather evenly rounded and not conspicuously notched or lobulate. Surface conspicuously rugose. Legs and antennae practically naked, only with the very finest pubescence *Acaricoris*, n. genus
   Form oblong-ovate, the lateral margins conspicuously undulate, with distinct notches and lobulate projections. Surface sculptured with irregular depressions. Legs and antennae clothed with conspicuous short, bristly hairs . . . . *Eretmocoris*, n. genus

List of Apterous American Aradidae

1. *Notoplocoris montei* Usinger, 1941 .... Brazil
2. *Notoplocoris potentis* D. & H., 1944.. Brazil
3. *Emydocoris testudinatus* Usinger, 1941.. Brazil
4. *Acaricoris ignotus* H. & D., n.sp.. Louisiana
5. *Glyptocoris sejunctus* H. & D., n.sp.. Brazil
6. *Eretmocoris tatei*, H. & D., n.sp.. Puerto Rico

A CORRECTION IN ANOPHELINE NOMENCLATURE[1]
(Diptera : Culicidae)

By Kenneth L. Knight, Lieutenant, H-V(S), USNR[2] and
D. S. Farner, Lieutenant (jg), H-V(S), USNR[3]

A study of the literature and of recently collected specimens from Melanesia reveals that the name of the anopheline heretofore treated as *Anopheles punctulatus moluccensis* (Sw. and Sw. de Graaf), at least for material from the New Hebrides, must be corrected.[4] The following synonymy shows the necessity of designating this subspecies as *Anopheles punctulatus farauti* Laveran because of priority.

1902. *Anopheles Farauti* Laveran, C. R. Soc. Biol. Paris 54:908 (♀♀ only). **Type locality:** Faureville, Ile Vaté [Efate], New Hebrides. **Type material:** present location unknown. **Pertinent descriptive facts:** "Coloration générale brun foncé, noirâtre. Tête: Ecailles brunâtres, courtes à la nuque. Proboscide de même longeur que les palpes, blanchâtre à l'extremite apicale [labella]." [General coloration dark brown, blackish. Head: scales brownish, short on the nape. Proboscis of the same length as the palpi, whitish at the apical extremity.]

1920. *Nyssorhynchus annulipes* var. *moluccensis* Swellengrebel and Swellengrebel de Graaf, Geneesk. Tijd. Ned.-Ind. 60(1):29. [Received in USNM Library, June 8, 1920] (♂♂ and ♀♀). **Type locality:** None given, but the following collection localities are listed: Boeroe (Lisela, Namlea), Amboina (Roemah tiga, north coast of Binnenbaai, Gelala, Paso and Ambon), Ceram (Piroe, Boelabaai, and Amahei), Halmaheira

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[1] The authors wish to thank Dr. Alan Stone, Division of Insect Identification, U. S. Department of Agriculture, for his helpful suggestions and for his assistance.

[2] U. S. Naval Medical Research Unit No. 2, Division of Research, Bureau of Medicine and Surgery.

[3] Section of Epidemiology, Division of Preventive Medicine, Bureau of Medicine and Surgery.

[4] The opinions expressed in this article are those of the authors and are not to be construed as official or reflecting the views of the Navy Department, or of the Naval Service at large.

(Gita and Maidi), Ternate, Batjan (Laboeha), Sanana and Bandaneira in the Moluccas; and Kokas and Kaimana in Dutch New Guinea. **Type material:** present location unknown. **Pertinent descriptive facts:** "Proboscis zwartbruin, oliva geelbruin...Nog doet de vraag zich voor of deze vorm mogelijk identiek is met Dönitz' punctulata, maar dit denk beeld moet door de eenkleurigheid der proboscis van de eerste [*moluccensis*] verworpen worden." [Proboscis dark brown, labella yellowish brown...Further, there is the question whether this form is possibly identical with *punctulata* Dönitz; however, this idea must be discarded because of the unicolorous proboscis of the former.]

1921. *Anopheles punctulatus* var. *moluccensis* (Swellengrebrel). Edwards, Bull. Ent. Res. 12(1):71. Variety not fully accepted, but no strict synonymy indicated. Species association changed.

1924. *Anopheles* (*Myzomyia*) *punctulatus* Dönitz. Edwards, Bull. Ent. Res. 14(4):354 [Type form]. Obvious error, in which he somehow reversed the concept of the subspecies, i.e. describes *punctulatus* (type form) as having a dark proboscis.

1927. *Anopheles* (*Myzomyia*) *punctulatus* Dönitz. Buxton and Hopkins, Res. in Polynesia and Melanesia, pp.67–74. Mistaken identification of material from New Hebrides, resulting from following Edwards, 1924.

Only specimens with entirely dark probosces (excluding the labella) were found during the course of over a year's collecting in the coastal areas of the islands of Efate and Espiritu Santo (along with one collection from Port Sandwich, Mallekula Island) in the New Hebrides group by the senior author. There is, of course, the possibility of the introduction at any time of another anopheline species or subspecies.

Further research is necessary before it can be definitely decided whether the New Hebridean *farauti* is identical with *moluccensis* of the Moluccas and the remainder of Melanesia, although this seems quite probable. All material (several hundred specimens) seen to date from the Solomons and from eastern New Guinea would indicate this. However, de Rook (Geneesk. Tijd. Ned.-Ind. 64: 642–656. 1924) indicates that a considerable amount of variation in the color of the proboscis exists in western New Guinea where most of the females determined by him as *moluccensis* have a ventral pale area on the apical quarter of the proboscis. Consequently, because of de Rook's investigations, and in the absence of material from the Moluccas and western New Guinea, we are unwilling to synonymize the *moluccensis* of the Dutch entomologists with *farauti*.

MINUTES OF THE 544th REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON MARCH 2, 1944

The 544th regular meeting of the Society was held in Room 43 of the National Museum on Thursday, March 2, 1944, at 8 P. M. Vice President Poos presided and there were 19 members and 14 visitors present. The minutes of the previous meeting were read and corrections made.

The following new members were elected:

Mr. Edson J. Hambleton, Office of Foreign Agricultural Relations, U. S. Department of Agriculture, Washington, D. C.

Dr. Theodore K. Just, Librarian and Editor, Lloyd Library and Museum Cincinnati, Ohio.

Lt. Kenneth L. Knight, United States Navy.

Mr. William E. Simonds, Bureau of Entomology and Plant Quarantine , California Department of Agriculture, Sacramento, Calif.

Dr. Roger C. Smith, Prof. of Entomology, Kansas State College, Manhattan, Kansas.

Dr. Townes stated that cockroaches always have the left wing folded on top of the right wing. In a check of the Museum specimens this was found to be true for all species. It is more than a habit since the wings fold perfectly flat only in that position, owing to the presence on the right wing of a diagonal groove which accommodates the costal margin of the left. Also the color pattern of the front wings is not symmetrical when folded unless the left wing is on top. A study of other Orthoptera showed that the same left-over-right method of wing folding occurs in the long-horned grasshoppers and the Dermaptera. There was no regularity among the mantids, the short-horned grasshoppers, or the crickets. Specimens were exhibited.

The first paper on the regular program was given by W. A. Baker and was entitled: Colonization of European Corn-Borer Parasites.

Imported parasites of the European corn borer were first released in the United States in 1920. With the increase in distribution and abundance of the borer the program was expanded in 1929. At the present time parasite releases have been made in all but 4 of the States known to be infested by the borer. Twenty two species have been imported and released and 6 are known to be established in this country. Foreign importations, laboratory breeding, and domestic collections have all been used as sources of colonization material. Distribution to the field from central laboratories has been made most effectively by railway express, packing the adult parasites in insulated iced containers. Three of the 6 established species occur in abundance, *Ludella grisescens* along the Atlantic Coast, particularly in central New Jersey, and in proximity to the lake marsh environment on the western end of Lake Erie; *Inareolata punctoria* in the Connecticut River Valley in Connecticut; and *Macrocentrus gifuensis* in southeastern New England. Of the other 3 species, *Chelonus annulipes* is found south of Boston, Mass., *Phaeogenes nigridens* occurs north of Boston, and *Eulophus viridulus* is generally distributed in small numbers over the greater portion of Ohio. Factors involved in non-establishment of other species are general environmental resistance, lack of synchronization of seasonal development of host and parasite, lack of alternate hosts, and physiological incompatibility of host and parasite. Associated with recent and widespread increases in abundance and distribution of the borer, the parasite program is again being expanded in cooperation with many of the affected States, depending largely on domestic collections of parasites about the older colonization points to provide parasites for additional releases.

While there are no indications that parasites will be the complete answer to control of the European corn borer, progress in their utilization has been made, particularly along the Atlantic Coast, and it is possible that the new environments now infested by the borer in the midwest and the different biology of the borer in these environments may well result in an increase in their value in the corn belt. (Author's Abstract.)

Dr. Poos called for discussion, and Dr. Townes asked what had become of *Cremastus flavo-orbitalis.* Mr. Baker replied that it had been established at one time south of Boston but had since disappeared. Mr. Rohwer inquired if the parasites were really accomplishing anything, and Mr. Baker said that about 40 percent parasitization had been obtained. Mr. Rohwer explained that he was referring to protection of the crop. Mr. Baker replied that the fluctuation of borer populations depends on four factors: (1) weather control, (2) crop conditions, (3) influence of cultural control measures, (4) parasites. It has not yet been determined how much is due to the parasites alone. Mr. Rohwer then asked if cultural control interfered with the work of the parasites. Mr. Baker answered that cultural control was the same type of factor as parasite control, both depending for their effectiveness on the reduction of corn-borer progeny. Dr. Townes pointed out that only a few parasites enter the picture. Ichneumon adults are restricted largely to moist places since they require liquid water at some time during each day. Favorable habitats are along lake shores or where night dews occur. Field conditions suitable for the most are often to dry for the parasite. Braconids and chalcids are better able to withstand such field conditions than are ichneumons. Dr. Poos inquired whether there had been any successful attempts to establish corn-borer parasites on other insects in areas not infested by the borer. Mr. Baker answered that this method had been tried with parasites of the sugarcane borer on the corn borer and with parasites of the corn borer on both the sugarcane borer and the pink bollworm. The results were entirely negative.

Mr. J. C. Crawford presented the second paper: Some Remarks on Thysanoptera.

Thysanoptera are best collected in a solution of alcohol, glycerine and acetic acid and they present their own special problems of preparation for slide mounting. Even when extremely abundant they may be very localized and vary greatly in yearly abundance. Since they feed on green or decaying vegetation, on fungi or even fungus spores, they are found in almost all situations. Many species are confined to a single species of host or to a few most closely related species of plants. Some are predaceous, but this habit shows no relation to classification. The principal characters used in classification were given, together with a brief account of the development of the immature stages and of their polymorphism, especially the condition of there being apterous, brachypterous and macropterous forms in the same species at the same time in the same colony. Special problems including sibling species, heterogony, parthenogenesis and viviparity were discussed.

The amount of damage caused by their feeding, disease transmission, and annoyance to man by biting were mentioned as was the ease of transporting them from country to country. (Author's abstract.)

Dr. James opened the discussion which followed with an inquiry as to the predacious habits of Thysanoptera. Mr. Crawford said that they were predators of aleyrodids, plant lice, cocids, and of immature thrips. Dr. James asked if they ever fed on larger insects, and Mr. Crawford said they did not. Dr. Smith inquired whether there was any difference in the morphology of the mouth parts of immature and adult thrips which would explain why the larvae and not the adults of such species as *Thrips tabaci* should pick up the virus of wilt disease. Mr. Crawford answered that the mouth parts were essentially the same. Mr. Rohwer asked what diseases they were known to carry, and Mr. Crawford answered that thrips are known vectors of tomato spotted wilt and tobacco wilt, Kromnek disease in Africa (which may or may not be the same), pineapple yellow spot in Hawaii, and aster disease. Mr. Rohwer inquired about the native home of the greenhouse thrips. Mr. Crawford replied that, although the exact origin of this widely distributed insect is not known, it is a tropical species. Mr. Rohwer brought up the question of the effect of fumigants upon thrips, and Dr. Smith stated that his experiments with the gladiolus thrips had shown that eggs imbedded in the corms were more difficult to destroy by fumigation with methyl bromide than those in flower buds or on foliage. In the discussion which devellped over whether or not the economic importance of Thysanoptera had been sufficiently emphasized, Dr. Smith mentioned damage to gladioli, onions, and tobacco; Dr. Poos spoke of serious injury to peanuts; Dr. Siegler mentioned the injury to prunes caued by the pear thrips; and Mr. Todd discussed the olive thrips, *Liothrips oleae*, which is a major pest in Spain where it crumples the leaves, deforms the fruit, and kills the trees if neglected. Fumigation measures with cyanide under tents are carried out by the State over large areas at one time. Such fumigations are effective for about three years. Mr. Harned stated that about 15 species are known to attack cotton in this country, but do not cause serious losses except under drought conditions. Mr. Crawford said that in New Jersey he had known the chestnut oaks, an abundant forest tree in that section, to have every leaf crumpled during a dry season, but pointed out that this damage occurred one year only and, like so many thrips outbreaks, was not a consistent factor.

Lt. R. H. Daggy of the United States Naval Reserve was introduced to the Society.

The meeting adjourned at 9:43 P. M.

Ina L. Hawes, *Recording Secretary.*

Actual date of publication, May 31, 1944

ANNOUNCEMENT

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VOL. 46 June, 1944 No. 6

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 25, 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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PROCEEDINGS OF THE

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VOL. 46 JUNE, 1944 No. 6

THE BLACK FLEA BEETLES OF THE GENUS EPITRIX COMMONLY IDENTIFIED AS CUCUMERIS (HARRIS) (Coleoptera: Chrysomelidae)[1]

By L. G. GENTNER

Entomologist, Southern Oregon Branch Experiment Station, Talent, Oregon

Among the black flea beetles of the genus *Epitrix* which in the past have been commonly identified by specialists as *cucumeris* (Harris), those from certain western localities did not appear to be typical. Lack of time, however, prevented a careful study of these forms, so they continued to stand as *cucumeris*, and were supposed to be the same as the eastern potato flea beetle.

From time to time several entomologists had called my attention to the fact that potato tubers were usually seriously injured by flea beetle larvae, wherever the black *Epitrix* occurred in numbers in Oregon and Washington, while in the eastern states most of the injury to potatoes resulted from the feeding on foliage by adults, and tuber injury was seldom serious. This led me to make a very careful study of the related forms in order to determine their true taxonomic standing. An examination of large series of specimens and a study of published literature led to the conclusion that there are at least three distinct species involved, the potato flea beetle, *Epitrix cucumeris* (Harris), and two species which I am describing as new.

Epitrix tuberis, new species

Elongate ovate, piceous, moderately shining. Antennae rufotestaceous, outer five joints darker. Head smooth, with a few punctures near each eye. Eyes not prominent, their combined width when viewed from the front less than the interocular distance. Pronotum less than one-half wider than long, narrowed somewhat anteriorly, anterior angles obliquely truncate, sides moderately arcuate, disc convex, especially anteriorly, punctures moderately coarse, closely placed, usually separated by less than their diameters, somewhat finer and sparser anteriorly, transverse ante-basal impression sinuate, deep, with many fairly coarse punctures, longitudinal impressions at either end well marked. Elytra scarcely wider at base than pronotum, lateral margins somewhat subparallel, humeri not prominent, umbones moderately distinct, disc

[1] Published as Technical Paper No. 438 with the approval of the Director, Oregon Agricultural Experiment Station. Contribution of the Southern Oregon Branch Experiment Station.

feebly convex, striae feebly impressed, punctures large, closely placed, finer toward apex, intervals very narrow. Legs rufotestaceous, anterior and middle femora fuscous, posterior femora piceous. Males: length 1.60–1.96 mm., width 0.84–1.08 mm.; females: length 1.80–2.04 mm., width 0.96–1.12 mm.

Holotype.—Male, Scappoose, Ore., 1937 (Gray & Schuh). In Collection of California Academy of Sciences.

Allotype.—Female, same data, in same collection.

Paratypes.—OREGON: 1,108 specimens, same data; Scappoose, 6 ♂, 2 ♀, June 13, 1934, potato (D. C. Mote); 5 ♂, 1 ♀, July 10, 1935 (K. Gray); Monroe, 1 ♂, June 18, 1930 (M. H. Hatch); Summer Lake, 20 ♂, 12 ♀, Aug. 16, 1939 (Gray & Schuh). WASHINGTON: Bothell, 1 ♂, 1 ♀, June 29, 1939 (W. A. Collins); Castlerock, 1 ♀, July 28, 1928, potato (R. L. Webster); Chehalis, 1 ♂, July 28, 1928, potato (R. L. Webster); Ellensburg, 6 ♂, 5 ♀, Sept. 5, 1940 (E. W. Jones); Elma, 1 ♂, 1 ♀, July 25, 1928, potato (R. L. Webster); Enumclaw, 14 ♂, 3 ♀, June 5, 1934 (Mrs. A. E. Griffin); Holly, 16 ♂, 10 ♀, Aug. 20, 1929 (M. H. Hatch); Kennewick, 2 ♂, Sept. 4, 1933 (M. H. Hatch); LaGrande, 1 ♂, 1 ♀, July 7, 8, 1928 (M. H. Hatch); Manchester, 1 ♀, May 27, 1934; Megler, 2 ♀, June 17, 1930 (M. H. Hatch); Montesano, 1 ♂, June 22, 1927, tomato (R. L. Webster); 1 ♀, July 25, 1928, beans (R. L. Webster); 4 ♂, 6 ♀, Aug. 28, 1930 (A. J. Hanson); 30 ♂, 19 ♀, Aug. 17, 1931 (A. J. Hanson); Mt. Rainier, Longmire Springs, 6 ♂, 3 ♀, July 15, 1938 (A. T. McClay); Mt. Rainier, S. Puyallup River, 1 ♀, July 20, 1935 (M. H. Hatch); Oakville, 3 ♂, 1 ♀, Aug. 28, 1930 (A. J. Hanson); Olympia, 1 ♂, July 28, 1927, potato (R. L. Webster); Puyallup, 1 ♂, Sept. 4, 1930 (A. J. Hanson); Satsop, 1 ♀, Sept. 10, 1929 (M. H. Hatch); Satsop River, 3 ♀, June 14, 1930 (Robert Flock); Satus, 7 ♂, 5 ♀, June 27, 1940 (H. P. Lanchester); Stanwood, 3 ♂, 4 ♀, June 20, 1941 (E. W. Jones); Tenino, 1 ♀, July 3, 1930, ocean spray; Toppenish, 2 ♂, Sept. 15, 1934; 1 ♀, Apr. 28, 1938, alfalfa (K. Gray); Wapoo, 8, Oct. 14, 1935 (M. C. Lane). COLORADO: 1 ♀, 510; 1 ♂, 2304; Ft. Collins, 1 ♀, June 13, 1904; 4 ♂, 2 ♀, Oct. 30, 1904; 1 ♂, 1 ♀, July 18, 1905, potato; 2 ♂, 2 ♀, July 21, 1905, potato; 2 ♂, July 24, 1905, potato; 1 ♀, Aug. 1, 1905, potato; 1 ♂, May 18, 1906; 1 ♂, July 30, 1906, potato; 1 ♀, 1 ♂, Aug. 13, 1907, potato; 1 ♂, 1 ♀, Oct. 22, 1911; 1 ♂, June 16, 1924; 6 ♂, 5 ♀, Sept. 23, 1931; Golden, 1 ♀, June 23, 1911 (C. A. Frost); Greeley, 3 ♂, July 10, 1905; 1 ♂, 3 ♀, July 9, 1906, potato; 1 ♂, 3 ♀, June 28, 1907, potato; 2 ♂, 2 ♀, Aug. 2, 1907, potato; 1 ♀, Aug. 13, 1907, potato; 1 ♂, 3 ♀, Aug. 15, 1907, potato; 1 ♂, Aug. 28, 1907, potato; 1 ♀, Sept. 28, 1907, potato; 5 ♂, 1 ♀, Nov. 1, 1907, potato; 2 ♂, 2 ♀, June 5, 1909; 2 ♂, 2 ♀, June 11, 1909; 3 ♂, 1 ♀, June 30, 1909; 1 ♂, 2 ♀, Aug. 14, 1930 (L. B. Daniels); Jefferson Co., Bear Cr. Canyon, 1 ♀, Sept. 5, 1939

(M. H. Hatch); Timnath, 1 ♂, 4 ♀, Oct. 11, 1904. NEBRASKA: Gering, 3 ♂, 5 ♀, June 29, 1943, *Physalis* (R. E. Hill); Mitchell, 251, June 24, 1943, potato (R. E. Hill); 3 ♀, June 28, 1943, *Physalis* (R. E. Hill); Scottsbluff, 104, June 28, 1943, potato (R. E. Hill); 58, Sept. 27, 1940, potato (H. D. Tate). Paratypes will be placed in the collections of the California Academy of Sciences, United States National Museum, Canadian National Collection, Museum of Comparative Zoology, and others.

This species may be distinguished from *cucumeris* by its densely punctate pronotum, less prominent, more widely separated eyes, subparallel elytral margins, and somewhat subdepressed disc of the elytra.

Since it is of great economic importance in the potato districts in which it occurs, and since the greatest damage is the tuber injury by the larvae, I suggest the common name of "tuber flea beetle" for it. This name was adopted by the entomologists attending the third annual meeting of the Northwest Vegetable Insect Control Conference which was held in Pullman, Wash., and Moscow, Idaho, January 17 and 18, 1944.

Apparently the first account of the seriousness of injury to potato tubers by the larvae was published in 1904 by Johnson (50), referring to the Greeley, Colorado potato district. The loss to the potato crop in that section in 1904 was placed at $250,000, Hoerner and Gillette (48). This would suggest that the pest had been present for some time previous to that date. Since the larvae are known to develop in Colorado on the roots of wild ground cherry (*Physalis*), buffalo-bur (*Androcera rostrata* Ryb.), and nightshade (*Solanum*), Daniels (19), it is quite possible that the insect may have been a native of northern Colorado, living upon these wild hosts before the potato industry developed. Until 1933, Daniels (19), it had been a problem only in the northeastern, or Greeley potato district of Colorado, and in 1931 the loss to potato growers of Weld and Morgan Counties was placed at $436,603. The infestation gradually spread until in 1941 Daniels (21) reported its presence in injurious numbers in Weld, Morgan, and El Paso Counties of the eastern slope, in Mesa, Delta, and Montrose Counties of the western slope, and in the potato areas of southern Colorado. List (61) reported more "worm track" injury than usual in El Paso and Montezuma Counties.

The insect spread to western Nebraska, especially along the North Platte River Valley and in Dawes County, and work on its biology and control was begun in 1928, at which time serious losses were already occurring, Burr (12) and Swenk and Tate (75). Apparently there is no natural barrier between the Greeley, Colorado potato district and that of southwestern Nebraska.

In Washington it made its first appearance in Grays Harbor County, in the southwestern part of the state, according to information from Dr. R. L. Webster. Where it came from is problematical. Cowan (15) in 1926 reported that tuber injury had been recognized in Grays Harbor County for the past 10 or 15 years, but that it had been of importance in the larger acreages in the county only in the last three years. Hanson (38) reported that it first became of economic importance in the state in 1925. Baker (4) reported that by 1929 tuber damage had spread to Thurston, Mason, Pacific, Lewis, and Clark Counties, and that some damage also occurred in Pierce, King, Snohomish, Skagit, and Whatcom Counties. It is also reported from Cowlitz County (2, 87). Considerable injury to potatoes was caused by this insect in Kittitas and Yakima Counties in 1935 (5). Smith (71) in 1940 reported serious damage to potatoes in Wahkiakum County.

In Oregon this species has become increasingly injurious in Columbia County since 1925, according to an unpublished report by K. W. Gray. This county borders on the Washington state line. The flea beetles appeared first in the northern end of the county and have spread southward until by 1935 they were causing serious damage in both Washington and Clackamas Counties. Dr. Don C. Mote and Prof. Joe Schuh have informed me that the first serious injury in Hood River County occurred in 1936, and in Deschutes County in 1938, and that it was reported in 1939 from Malheur County in the eastern part of the state, but as yet no authentic records of its occurrence in that county have been taken. No infestation has been authentically reported from the potato growing sections of Klamath County.

The adult beetles feed on the foliage, riddling it with small, round holes, but by far the greatest injury is caused by larval feeding on the tubers. This latter injury is generally classed under three types. "Slivers" refers to the burrows of the larvae into the flesh of the tuber, when they have become filled with a brown, corky material. They usually extend into the potato somewhat at right angles to the surface, to a depth of one-fourth inch or less. "Pimples" are the raised portions at the mouths of the burrows which have become filled with the corky material, and give the potato a "pimply" appearance. "Worm tracks" are the long, serpentine tunnels of the larvae, extending just beneath the surface of the tuber. When they are made on young potatoes, they enlarge considerably as the potato grows. Metzger (64) mentioned that damage is worse in heavy, moist soils. MacMillan and Schaal (62) have shown that larval injury may be greatly increased by the introduction of the common scab organism and Rhizoctonia.

Wherever the tuber flea beetle, *Epitrix tuberis*, occurs in numbers there is serious tuber injury, and the feeding injury on foliage caused by adults is of lesser importance. Often most of the crop is classed as "culls," and in some sections potato growing has been discontinued because of this injury. Jones (53) stated that injured tubers in the Kittitas Valley, Washington, contained around 100 tunnels per tuber. On the other hand, where the eastern potato flea beetle, *Epitrix cucumeris*, is present, the most serious injury is caused by feeding of adults on foliage and only occasionally is reference made to tuber injury by the latter species—Craig (16), Crosby (17), Stewart (74), Webster (77). In these cases the larvae have been reported to cause "pimply" potatoes and "slivers," but in no instance have "worm tracks" been mentioned with reference to the eastern species. The latter type of injury seems to be characteristic of *tuberis* only. Messrs. Gray and Schuh have informed me that in their cage tests in Oregon they have obtained no tuber injury from the western potato flea beetle, *Epitrix subcrinita* (Lec.), which is very abundant in the western states, however, some entomologists have reported tuber injury by this species—Hanson (38), Smith (72), Wilson and Lovett 1913 (89), Yothers 1917 (91). Jewett (49) has reported tuber injury in Kentucky by the larvae of *Epitrix fuscula* Cr.

The following references published under the name of the potato flea beetle, *Epitrix cucumeris*, in reality refer to the tuber flea beetle, *E. tuberis*,: Nos. 2–15, 19–22, 27–41, 44–47, 50–54, 56, 58–64, 67–61, 73, 75–77, 79–87, 90. No. 1, published under the name of *E. subcrinita*, also refers to *tuberis*, as does the Oregon distribution given under *cucumeris* in No. 43.

The tuber flea beetle is known to occur in Oregon, Washington, Colorado, and western Nebraska. (All of the specimens which I have examined from eastern Nebraska were *cucumeris*, and also two specimens from western Nebraska). An attempt was made to determine whether it occurred in western states other than those already mentioned. Investigation indicated that this species does not occur in Idaho, Montana, and Wyoming. Edmundson (23) and Edmundson and Welsh (24) mention *E. cucumeris* as being found in Idaho gardens, and as being common on potatoes, cabbage, and tomatoes, however, the species was probably *E. subcrinita*. No black specimens of *Epitrix* from Idaho were found in the collection of the Department of Entomology, University of Idaho. Shull and Fisher (66) as late as 1940 mention only *E. subcrinita*. Severin (65) reported that no severe tuber injury had yet been found in South Dakota. All of the Utah *Epitrix* which I have examined were *subcrinita*. Knowlton (55) stated that the potato flea beetle, *Epitrix cucumeris* (Harris), and the western potato flea beetle, *E. subcrinita* (Lec.), cause damage to potato and tomato foliage every year, and sometimes tuber injury occurs in this state. Unfortunately none of the black *Epitrix* were available for examination. I have seen a few black *Epitrix* from Arizona which resemble *cucumeris*, but the males have a prominent, deep, circular concavity on the last ventral segment. Dr. J. R. Eyer recently sent me some black *Epitrix* which he had collected from potato at Mora and Bluewater, New Mexico. These are larger and differ from anything I have seen thus far. However, they will require further study. The black flea beetles of the genus *Epitrix* which I have examined from California are being described as a new species.

Epitrix similaris, new species

Somewhat broadly ovate, piceous, shining. Antennae rufotestaceous, outer joints darker. Head smooth with a few punctures near each eye. Eyes prominent, their combined width when viewed from the front equal to or slightly less than the interocular distance. Pronotum about one-half wider than long, scarcely narrowed anteriorly, considerably wider than head, anterior angles conspicuously obliquely truncate, sides feebly arcuate, disc feebly convex, punctures moderately coarse, closely placed, usually separated by less than their diameters, somewhat finer and sparser anteriorly, transverse ante-basal impression sinuate, deep, somewhat shiny, with moderately coarse punctures rather evenly spaced, longitudinal impression at either end well marked. Elytra wider at base than pronotum, lateral margins more or less broadly arcuate, humeri rounded, umbones not prominent, disc moderately convex, striae feebly impressed, punctures moderately closely placed, finer toward apex, intervals narrow. Legs rufotestaceous, anterior and middle femora fuscous, posterior femora piceous. Males: length 1.72–2.00 mm., width 0.92–1.04 mm.: females: length 2.00–2.12 mm., width 1.08–1.16 mm.

Holotype.—Male, Santa Barbara, Cal., April 16, 1932 (A. T. McClay). In collection of California Academy of Sciences.

Allotype.—Female, same data, same collection.

Paratypes.—CALIFORNIA: 5 ♂, 7 ♀, same data. Avalon, Catalina Island, 1 ♀, 1905; El Toro, 1 ♀, Sept. 23, 1931 (A. T. McClay); Fullerton, Orange Co., 1 ♀, Aug. 7, 1930, avocado (Bartholamew); Laguna Beach, 1 ♀, July, 1921 (C. T. Dodds); Los Angeles, 1 ♂, 2 ♀, Liebeck Collection; 1 ♂, 1 ♀, Van Dyke Collection; Mill Valley, Marin Co., 3 ♀, Oct. 3, 1926, Van Duzee Collection; Norwalk Co., 2 ♀, Aug. 24, 1932 (A. T. McClay); Palm Springs, 1 ♂, 1 ♀, May 20, 1916 (J. O. Martin); Playa del Rey, 3 ♂, 9 ♀, June 30, 1935 (A. T. McClay); Paraiso Springs, Monterey Co., 5 ♂, 2 ♀, May 5, 1922 (L. S. Slevin); 1 ♂, Sept. 28, 1922 (L. S. Slevin); Pasadena, 1 ♂, Oct. 10, 1897, Frederick Blanchard Collection; 2 ♂, April, A. Fenyes Collection; Saboba Springs, Riverside Co., 1 ♂, June 2, 1917 (E. P. Van Dyke); Sacramento, 1 ♀, Apr. 23, 1922 (Helen Van Duzee); San Diego, 1 ♂, June (F. E. Blaisdell); Santa Monica, 1 ♀, July 15, 1929 (A. T. McClay); Tustin, 1 ♀, Aug. 25, 1932 (A. T. McClay); Watsonville, 1 ♀, Mar. 9, 1937 (A. T. McClay). Paratypes will be placed in the collections of the California

Academy of Sciences, United States National Museum, Canadian National Collection, Museum of Comparative Zoology, and others.

This species is separated from *cucumeris* by its rather coarsely, closely punctate pronotum, and from *tuberis* by its prominent, more closely placed eyes, its more prominent, less convex pronotum, and the more rounded elytral margins.

Thus far it has been found only in California, from Sacramento southward to San Diego. Prof. E. O. Essig wrote me that this insect is one of the most economic species of flea beetles in California. Elmore (25) reported potato flea beetles (*Epitrix* sp.) as being very destructive to the lower leaves of producing tomato plants in Orange County, and Wilcox (88) reported potato flea beetles (*Epitrix* sp.) as damaging about 40% of tomato plants in the seedbed at Tustin, Orange County. Essig (26) gave a general discussion of *Epitrix cucumeris* without mentioning distribution, but he probably also refers to the species which is described as *similaris*.

At first I thought that the California specimens might be *Epitrix seminulum* which LeConte (57) described from one female with locality given as California. However, one character given in his very brief description, thorax sparsely punctate, will separate *seminulum* from *similaris*. Crotch (18) placed *seminulum* as a synonym of *cucumeris* and stated that he could not separate the California specimen from the latter. In 1926 I had examined the type specimen of *seminulum*, which is in the collection of the Museum of Comparative Zoology, Cambridge, Massachusetts, and at that time pronounced it not specifically different from *cucumeris*. Mr. Floyd G. Werner, Temporary Curator of Coleoptera at the Museum, compared some of the California specimens with the type of *seminulum* and pronounced them different. All of the many specimens of black *Epitrix* which I have seen to date from California have the closely punctate pronotum, with the exception of LeConte's one specimen of *seminulum*, which has a rather sparsely punctate pronotum. If the type locality for *seminulum* is correct, it will take further study to definitely establish its taxonomic standing.

Epitrix cucumeris (Harris)

Haltica cucumeris Harris (42)

Haltica pubescens (pars) Illiger (48)

Ovate, piceous, shining. Antennae rufotestaceous, sometimes one to three apical joints fuscous. Head smooth, with a few coarse punctures near each eye. Eyes moderately prominent, their combined width when viewed from the front about equal to the interocular distance. Pronotum less than one-half wider than long, slightly narrowed anteriorly, anterior angles obliquely truncate, sides feebly arcuate, disc convex, punctures moderately fine, usually moderately sparsely placed, always separated by more than their diameters, transverse ante-basal impression sinuate, deep, shining, sparsely punctate, longitudinal impression at either end well marked. Elytra wider at base than pronotum, humeri rounded, umbones moderately distinct, lateral margins regularly arcuate, disc regularly convex, with the area at the base noticeably raised, striae very feebly impressed, punctures moderately coarse, not closely placed, finer toward apex, intervals narrow. Legs rufotestaceous, posterior femora piceous. Males: length 1.56–1.84 mm., width, 0.88–1.00 mm.; females: length 1.76–1.92 mm., width 0.96–1.04 mm.

This species occurs from Canada to Florida and westward into North Dakota, South Dakota, Nebraska, and Kansas.

The pronotum is never as densely punctate as in the other two species, the elytra have a shorter appearance, and the area at the base of the elytra is more noticeably raised.

Key For Separating the Three species

Pronotum moderately finely, not closely punctate, punctures on disc always separated by more than their diameters.

Disc of pronotum convex, somewhat narrowed anteriorly; eyes moderately prominent, their combined width when viewed from the front about equal to the interocular distance; elytra with disc regularly convex, lateral margins conjointly oval .... *cucumeris*

Pronotum moderately coarsely, closely punctate, punctures on disc separated by less than their diameters.

Disc of pronotum convex, narrowed somewhat anteriorly; eyes not prominent, their combined width when viewed from the front less than the interocular distance; elytra with disc only feebly convex and lateral margins somewhat subparallel .... *tuberis*

Disc of pronotum feebly convex, scarcely narrowed anteriorly; eyes prominent, their combined width when viewed from the front equal to or slightly less than the interocular distance; elytra with disc moderately convex, lateral margins more or less broadly arcuate .... *similaris*

Relative Measurements of the Three Species

Species	Length mm.	Width mm.	Pronotum Width mm.	Pronotum Length mm.	Length Of Elytra mm.
Males					
E. cucumeris	1.56—1.84	0.88—1.00	.64 — .72	.40— .52	1.12—1.32
	(Av. 1.76)	(Av. 0.96)	(Av. .68)	(Av. .48)	(Av. 1.25)
E. tuberis	1.60—1.96	0.84—1.00	.60— .76	.44— .52	1.12—1.40
	(Av. 1.84)	(Av. 0.96)	(Av. .70)	Av. .48)	(Av. 1.32)
E. similaris	1.72—2.00	08.8—1.08	.64— .76	.44— .52	1.20—1.44
	(Av. 1.86)	(Av. 1.00)	(Av. .72)	(Av. .48)	(Av. 1.36)

Females					
E. cucumeris	1.76—1.92 (Av. 1.84)	0.96—1.04 (Av. 1.00)	.68— .76 (Av. .71)	.44— .52 (Av. .48)	1.24—1.40 (Av. 1.30)
E. tuberis	1.80—2.04 (Av. 1.95)	0.96—1.12 (Av. 1.04)	.72— .80 (Av. .74)	.44— .52 (Av. .51)	.128—1.48 (Av. 1.40)
E. similaris	1.80—2.12 (Av. 1.96)	1.00—1.20 (Av. 1.08)	.72— .84 (Av. .76)	.44— .52 (Av. .52)	1.36—1.56 (Av. 1.48)

The foregoing measurements were obtained from 18 males and 12 females of *cucumeris*, 27 males and 19 females of *tuberis*, and 18 males and 11 females of *similaris*. There is the usual variation in size within a given series, however, the *cucumeris* series is the smallest and the *similaris* series the largest. In *tuberis* and *similaris* the elytra are relatively longer in proportion to the length of the pronotum than in *cucumeris*.

The western potato flea beetle, *Epitrix subcrinita* (Lec.), which is found quite commonly on potato and related plants in the western states along with the black species, may be distinguished from these by its distinct brassy luster, its rather straight, more shallow transverse ante-basal impression of the pronotum, and more subdepressed form. It is generally of a dark reddish-brown color, but may be quite dark, practically black. However, there is always a heavy, brassy sheen visible, especially on the pronotum. In the black species the ante-basal impression is distinctly sinuate and quite deep.

The tobacco flea beetle, *Epitrix hirtipennis* (Melsh.)[2], also occurs on potato and related plants in these localities. This is easily distinguished by its smaller size, yellowish to light reddish-brown color, with darker clouded area on the elytra, and its finely punctate, faintly impressed pronotum.

Acknowledgments

I am greatly indebted to the many state, federal, and commercial entomologists of the western states for the loan of specimens for study, for information pertaining to distribution, and for aid in obtaining necessary reference materials; to Messrs. Nathan Banks and Fred G. Werner, Museum of Comparative Zoology, for comparisons with type material and loan of specimens; and to Messrs. C. F. W. Muesebeck and H. S. Barber, Division of Insect Identification, U. S. Bureau of Entomology and Plant Quarantine, and to Dr. Don C. Mote, Entomologist, Oregon State College, for reviewing the manuscript and giving helpful suggestions.

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A KEY TO THE GENUS ACANTHOGNATHUS MAYR, WITH THE DESCRIPTION OF A NEW SPECIES (Hymenoptera:Formicidae)

By Marion R. Smith

Bureau of Entomology and Plant Quarantine, United States Department of Agriculture

The genus *Acanthognathus* was described by Mayr in 1887 to include *ocellatus*, a new species collected in the province of Santa Catharina, Brazil. This remained the only known form until 1922 when Mann described *lentus* from specimens found at Progresso, Honduras. A third species, described below, was collected in 1943 on Barro Colorado Island, Canal Zone, by James Zetek. In addition to the previously mentioned locality, *ocellatus* has been reported from Para and the State of Rio, Brazil.

Very little is known about the biology of these ants. Collections have shown, however, that the colonies are small and that they are found in the soil or in rotting wood. No information is available on feeding habits, but the species of *Acanthognathus* are probably predaceous like some of their close relatives. Moeller observed workers of *ocellatus* transporting larvae by means of the accessory spines at the bases of their mandibles. He stated that the mandibles are held as widely open as possible when this action is taking place.

Important references have been cited for each species to aid the work of determination.

The author has examined a cotype of *lentus*, but he has not seen any specimens of *ocellatus*.

Key to Species

(For identification of workers)

1. Antennal scape unusually slender, with attenuated base; exceeding posterior border of head........ 2

   Antennal scape not unusually slender or with attenuated base; not attaining posterior border of head. (Inner border of mandible with a number of minute denticulae near the apex. Dorsal surface of thorax almost entirely smooth and shining.)........ *brevicornis*, new species

2. Head so densely sculptured as to give the surface a subopaque appearance. Enlargement toward apex of scape noticeably constricted near the funiculus. Emargination at posterior border of head angular........ *lentus* Mann

   Head not as densely sculptured as with *lentus*. Enlargement toward apex of scape not noticeably constricted near the funiculus. Emargination at posterior border of head broadly rounded....*ocellatus* Mayr

Acanthognathus brevicornis, new species

Worker.—Length (including mandibles) 3 mm.

Head subcordate, the posterior border strongly and angularly emarginate. Antenna 11-segmented; scape short (approximately three-fourths the length of the head measured from the anterior border of the clypeus to the posterior corner), not attaining the posterior border at any point, slender, curved and enlarged toward the apex but narrowing again before its junction with the funiculus; first, ninth, and tenth funicular segments long, the second through the eighth short and somewhat indistinct. Eye placed approximately at the middle of the side of the head, oval, well developed, with about 7 to 8 facets in its greatest diameter. Clypeus longer than broad, subtruncate anteriorly, with the posterior border extending between the frontal carinae to the approximate limits of the latter. Frontal carinae short, each forming a prominent lobe which conceals the insertion of the antenna. Mandibles 0.86 mm. long (slightly shorter than the head), elongate, slender, subparallel, porrect, each with 3 curved, hooklike apical teeth, the median of which is the longest. Inner border of mandible with a slight enlargement near the middle, and a number of very minute denticulae between the enlargement and the apex. Ventral surface of each mandible near the base with a slender, curved spine which is apically bidentate and is directed somewhat mesoposteriorly. Humerus of prothorax with a prominent, tuberclelike spine. Promesonotal suture more or less indistinct. Mesoepinotal impression pronounced. Epinotum higher than long and bearing a pair of well-developed, acutely tipped spines. Petiole strongly pedunculate. Petiole and postpetiole rather nodiform, and without spongiform processes such as occur in *Strumigenys.*

Head with a shining appearance due to the nature of the sculpturing which consists of rather sparse, subcircular depressions, each bearing a central elevation from which arises a short, curved, bluntly tipped or claviform hair. In the posterior part of the head the punctures are either absent or else separated by a space more than their greatest diameter. All the interspaces are smooth and shining. Thorax so weakly sculptured that it is also shining.

Body dark reddish brown with slightly lighter appendages.

Dealated female.—Length (including mandibles) 3.85 mm.

Besides the usual caste differences the female differs from the worker in its larger size, more convex and larger eyes (with 12–13 facets in their greatest diameter) and coarser sculpturing on the head. The punctures on the head are not dense enough to give the head a subopaque appearance.

Type locality.—Canal Zone: Barro Colorado Island (James Zetek).

Described from a holotype worker and an allotype female. Two paratype females do not differ appreciably from the allotype. All of these are deposited in the United States National Museum under U. S. N. M. No. 56862.

The ants were collected sometime during the period from June to October 1943, and bear the label, Zetek No. 5105. Nothing is known concerning their biology.

The length and shape of the antennal scape, and the nature of the sculpturing of the head and thorax readily distinguish the worker of *brevicornis* from those of the other species.

Acanthognathus lentus Mann

Acanthognathus lentus Mann, 1922, U. S. Natl. Mus. Proc. 61: 34–35, *worker*, *female*, fig. 16, head of worker.

Known only from the type series from Honduras.

Acanthognathus ocellatus Mayr

Acanthognathus ocellatus Mayr, 1887, Zool.-Bot. Gesell. Wien, Verhandl. 37: 579, *worker;* Mann, 1916, Harvard Univ. Mus. Compar. Zool. Bul. 60: 452, *female*, *worker*, pl. 5, fig. 38, *female;* Emery, 1922, Genera Insect. Fasc. 174 c: 317–318; Santschi, 1922, Soc. Vaud. des Sci. Nat. Bul. 54: 353–354, *worker*, pl. 1, fig. a, head of worker; Borgmeier, 1927, Arch. Mus. Nac., Rio de Janeiro 29: 120.

Apparently widely distributed in Brazil.

SUGGESTIONS FOR GROUPING THE FAMILIES OF ACALYPTERATE CYCLORRHAPHOUS DIPTERA ON THE BASIS OF THE MALE TERMINALIA

By G. C. Crampton, Ph.D.
Massachusetts State College, Amherst, Massachusetts

The following *purely tentative* arrangement of 34 of the principal families of Acalypteratae of phylogenetic importance (which are here grouped on the basis of the modifications of the male terminalia) is presented in the hope that other students of the Acalypteratae, who have different views concerning their arrangement, may be induced to contribute to the discussion of the proper grouping of the Acalypteratae according to their natural affinities.

A study of the modifications of the male terminalia (which include the parts of at least six segments—i.e. segments 6–11, inclusive—comprising a fairly large portion of the insect's body) would indicate that the more important families of the Acalypteratae, used as typical examples, may be distributed in two main divisions, as follows:

First division, the SYRPHOMORPHA. Characterized by having the sixth abdominal sternite asymmetrically developed, and displaced into the insect's left flank (excepting in the lower Syrphidae and primitive Pipunculidae).

Section A, the SYRPHIFORMES

Superfamily I, the **Syrphoidea.** Tergites of segments 6 and 7 usually distinct. The group was derived from the Cyrtidae, and is ancestral to the other Acalypteratae.

1. Syrphidae
2. Dorilaidae, or Pipunculidae.

Section B, the OTITIFORMES. Tergites 6 to 8 usually atrophied, and the corresponding sternites are clustered in the insect's left flank.

Superfamily II, the **Otitoidea.** The aedeagus usually spirally coiled, They are the direct descendents of the Syrphoidea.

3. Pyrgotidae
4. Piophilidae
5. Richardiidae
6. Pallopteridae
7. Otitidae, or Ortalidae: e.g. *Tetanops*, *Camptoneura* or *Delphinia*, *Seioptera*, *Euxesta*, *Ulidia*, etc. (See family 10. Chaetopsidae.)
8. Trupaneidae, or Trypetidae, or Tephritidae (descended from the Otitidae).
9. Platystomatidae: e.g. *Platystoma*, *Rivellia*, etc.
10. Chaetopsidae[1]: e.g. *Chaetopsis*, *Eumetopiella*, etc., but *not Seioptera Euxesta* and *Ulidia*.

Superfamily III, the **Opomyzoidea.**

11. Opomyzidae: e.g. *Opomyza*, *Anthomyza*, *Geomyza*, *Mumetopia*, etc.

Superfamily IV, the **Dryomyzoidea.** Aedeagus stout.

12. Dryomyzidae
13. Rhopalomeridae

Superfamily V, the **Helomyzoidea.** (Closely related to the Tetanoceratidae).

14. Coelopidae
15. Helomyzidae
16. Clusiidae. (Ancestral to the Calypteratae?)

Superfamily VI, the **Tetanoceratoidea** (Ancestral to the Drosophiloidea).

17. Tetanoceratidae, or Sciomyzidae
18. Sepedonidae (Possibly merely a subfamily of the Tetanoceratidae).
19. Sepsidae

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[1] *Seioptera* and *Euxesta* appear to be typical Otitidae, while *Ulidia* (the type genus of the family Ulidiidae) appears to be merely a modified Otitid. On the other hand. *Chaetopsis*. *Eumetopiella*, etc., are so highly modified that they appear to be worthy of being placed in a distinct group (here called the Chaetopsidae) characterized by having a pronouncedly flattened or depressed fifth segment, with the fifth tergite longer than broad, with the sixth and seventh sternites reduced to narrow strips which tend to unite, and with the inverted eight sternite (or pregenital plate) forming a somewhat narrowed transverse plate (i.e. transversely elongated.)

Superfamily VII, the **Borboroidea.**

20. Borboridae, or Cypselidae, or Sphaeroceridae
21. Ephydridae

Section C, the DROSOPHILIFORMES. Characterized by having only one dorsal pregenital plate (the inverted eighth sternite) between the fifth and ninth tergites. (Descended from *Sepedon*-like, or sepsid-like ancestors).

Superfamily VIII, the **Drosophiloidea.**

22. Chloropidae, or Titaniidae
23. Drosophilidae

Second division, the PLATYPEZOMORPHA. Characterized by having a normal, well developed sixth tergite and symmetrically developed, ventrally located sixth sternite, which (when present) is not displaced into the insect's left flank.

Section D, the PLATYPEZIFORMES. (The primitive representatives of the division).

Superfamily IX, the **Platypezoidea.** (Descended from the Pipunculidae and ancestral to the other members of the division).

24. Platypezidae, or Clythiidae

Superfamily X, the **Calobatoidea.** (An isolated, primitive group, with fairly normal sixth tergite and sixth sternite, with seventh sternite distinct and lateral and with inverted eighth sternite. Descended from the Pipunculidae or the Platypezidae).

25. Micropezidae, or Tylidae. (Ancestral to the Cordyluridae and lower Calypteratae?).
26. Calobatidae, or Trepidariidae
27. Neriidae

Section E, the LAUXANIIFORMES. With reduced sixth sternite. Seventh sternite not distinct, amalgamated with inverted eighth sternite, which may become atrophied.

Superfamily XI, the **Lauxanioidea.** (Derived from the Platypezidae).

28. Lauxaniidae, or Sapromyzidae
29. Chamaemyiidae, or Ochthiphilidae
30. Diopsidae

Superfamily XII, the **Hippoboscoidea.** (Derived from the Lauxaniidae or Platypezidae).

31. Braulidae
32. Streblidae
33. Nycteribiidae
34. Hippoboscidae

TWO NEW SPECIES OF PROCTOTRUPOIDEA FROM IOWA (Hymenoptera)[1]

By A. A. Ogloblin,
University of Buenos Aires, Argentina

The present paper contains the descriptions of two new species of proctotrupoids collected at Ames, Iowa. The types are in my collection.

Family Calliceratidae

Calliceras amesicola, new species.

Female. Length, 1.20–1.60 mm. General color light ochraceous yellow, tip of scapus, pedicellus and five basal funicular joints of antennae brown, the rest of antennae and head black. Anterior trochanters, posterior coxae (except extreme base) white. Meso- and metapleura, two oval laterodorsal spots of first abdominal tergite and dorsal spots of 2d, 3d and 7th tergites and sheath of ovipositor brownish-yellow. Mandibles, posterior teeth of propodeon and ovipositor reddish-yellow.

Head transverse, 0.312 by 0.407 mm. Eyes large, lateral, 0.348 mm., hairy; ocelli in almost equilateral triangle. Occipital margin with some short vertical ribs. Frons and vertex with a longitudinal furrow reaching the anterior hollow. Whole surface of head finely granulose, with short dark pilosity. Antenna (fig. 1); scapus with short radicula 23 by 30 microns. Measurements of antennal joints in microns: 238(53); 78(34); 57(34); 38(40); 38(43); 38(46); 46(50); 61(57); 65(58); 114(57). Antennal joints 7 – 9 with toothed distal border; all funicular joints with trichoid sensoria which increase in number from 2 to 15; tenth joint as long as two and one-half preceding joints combined.

Thorax, 0.429 by 0.362 mm. Pronotum only 0.04 mm. in the middle, distinctly raised before occipital articulation. Mesonotum finely cellulated, each cell with a short hair. Scutellum 0.232 mm. long, with the large axillae overlapping posteriorly to the narrow metanotum. Propodeon with two strong posterolateral teeth, the spiracles situated cephalad from them; part between teeth raised in a lamellar process so as to divide the propodeon into horizontal and vertical parts (figs. 3 and 4). Anterior and middle coxae finely cellulate; posterior coxae obliquely striated (fig. 4).

Wings short, reaching anterior third of first abdominal tergite (holotype) or slightly surpassing the posterior margin of propodeon (paratypes); stigmal vein evidently on the anterior margin of wing. Abdomen 0.94 by 0.48 mm., anterior border margined, with 10 short longitudinal ribs; anterolateral teeth very small; fourth tergite, like all representatives of subfamily Calliceratinae, with a peculiar organ (fig. 2) discovered by Waterston (Bull. Ent. Res. 14:116, 1923) who assumed it to be the respiratory in function. Ovipositor 0.528 mm., its base extending into second abdominal segment.

[1]Journal Paper No. J-1202 of the Iowa Agricultural Experiment Station, Ames, Iowa. Project No. 372.

Holotype (female and *paratype*, Ames, Iowa, October 1943; collected by C. C. Blickenstaff, who kindly presented the specimens to me.

This species is easily distinguished from *C. fuscipes* (Ashm.), *pallidipes* Fouts and *fasciata* Fouts, by the structure of the antennal segments.

A study of light and dark specimens of several species of the genus *Calliceras* shows that the peculiar structure described by Waterson (*loc. cit.*) has no connection with the tracheal system and that it is not respiratorial in function. The presence of a few very large cells close to the basal cavity of this structure (fig. 2) indicates the possibility of glandular function. I propose the name Waterston's organ for this interesting structure.

Family Scelionidae

Genus **TRICLAVUS** Brethes

Ann. Mus. Nac. Buenos Aires, 27:411, 1916.

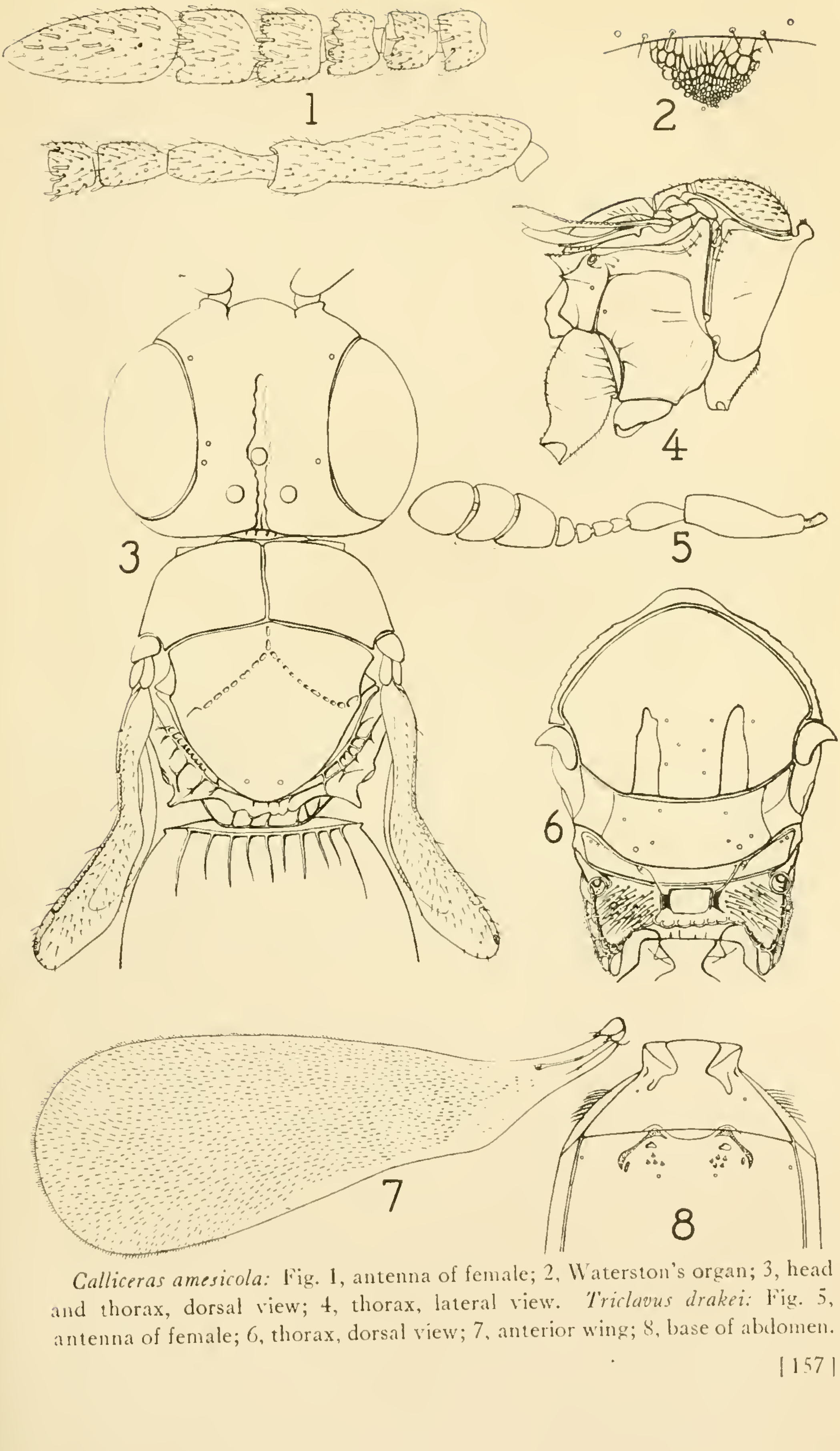
This genus was not included by J. J. Kieffer in his revision of the family, Das Tierreich Lief. 42, 1926, and apparently has never been reported from the United States. This warrants the description of a new species found by the author in Iowa. Several other undescribed species are known to the author from Argentina. The following lines are intended to complete the laconic diagnosis of the genus.

Female antenna with a three-jointed club; seventh and eighth joints not protruding as much ventrodistally as in *Allotropa;* flagellar joints of male antennae without whorls of long hairs. Mesoscuto-scutellar suture without foveae. Scutellum with well developed axillae, not overlapping metanotum posteriorly. Propodeon with two short, widely separated, longitudinal keels, distally and laterally bordered with a transparent, lamellar structure. Fore wing with a very short nervure only about one seventh of wing's length. Anterior abdominal tergites without parallel longitudinal striae, bearing some deep and irregularly shaped grooves.

Dr. G. von Szelenyi (Ann. Mus. Nat. Hung., 31: 126–128, figs. 12–16, 1938) recently described a new genus *Platyllotropa*, and evidently was unaware of Brethes' paper. Judging from the original description, *Platyllotropa* should be considered synonymous with *Triclavus;* the very elongate head of the latter is the only distinctive character and hardly sufficient to separate them as different genera.

Triclavus drakei, new species

Female. Length of body 0.99 mm. Black, antennae and legs light honey-yellow, the last three antennal joints light brown. Wings very slightly and evenly infumate. Head in vertical aspect transverse, 0.156 by 0.251 mm.



Calliceras amesicola: Fig. 1, antenna of female; 2, Waterston's organ; 3, head and thorax, dorsal view; 4, thorax, lateral view. *Triclavus drakei:* Fig. 5, antenna of female; 6, thorax, dorsal view; 7, anterior wing; 8, base of abdomen.

Eyes lateral, hairless. Antenna (fig. 5) 0.38 mm. in length; scape distinctly scaly-reticulate, with sparse white pilosity. Radicula 19 by 9 microns. Measurements of antennal joints in microns: 129(38); 57(24); 20(17); 20 (16,5); 19(19); 19(22); 53(43); 47(44); 56(38). Surface of head finely cellulate.

Thorax (fig. 6) 0.339 by 0.251 mm. Pronotum 0.113 by 0.245 mm., only 0.006 mm. at the middle, distinctly scaly; mesoscutum 0.164 by 0.232 mm., with broad, short, parapsidal furrows on the posterior half; surface finely cellulate, the pilosity very short and sparse. Scutellum 0.099 mm. long, the axillar parts separated by fine rugae. Metanotum only 0.019 mm. at the middle. Propodeon 0.131 by 0.228 mm., slightly carved cephalad, with faintly convergent lateral borders; posterior margin profoundly carved on both sides of petiolar process. Spiracles rounded, situated slightly cephalad from the posterior margin of metanotum, with a large transparent circle which is joined caudally to the lateral lamellar structure. Two stout widely separated keels united caudally with posterior lamellar process, the medial part between keels smooth, hairless; lateral parts with rather long white hair.

Fore wing (fig. 7) 0.77 by 0.267 mm.; vein 0.109 mm. long; covered with hair, 7 microns long, the longest bristle of marginal fringe 9 microns.

Hind wing 0.628 by 0.123 mm.; hamuli at 0.232 mm. from the base of wing; covering hair 4 microns., the longest bristle of marginal fringe 47 microns.

Abdomen 0.518 by 0.286 mm., all tergites with pleural parts completely separated by sutures; first tergite 0.085 mm. long, with two profound depressions having sparse white pilosity laterally; two round sensorial pustulae externally from depressions.

Second tergite 0.342 mm. long, with two oblique grooves, caudally with two groups of very small spines. Tergites 3–5 with a single row of sparse hairs near to posterior margin. Base of ovipositor at the cephalic border of second abdominal segment (fig. 8).

Holotype, female, taken by the author at Ames, Iowa, Oct. 3, 1943. It is my pleasure to dedicate this interesting species to Dr. Carl J. Drake, Ames, Iowa, with whom I have been closely associated while in the United States.

FOUR NEW SPECIES OF TYDEIDAE FROM MEXICO (Acarina)

By Edward W. Baker,

United States Department of Agriculture, Bureau of Entomology and Plant Quarantine

In the continuation of the study of the mites belonging to the family Tydeidae, four new species from Mexico are being presented. One belongs to the minute genus *Microtydeus*, and the other three to the genus *Tridilatydeus*, which has three eye spots and unsplit or entire pulvilli. The types will be deposited in the United States National Museum.

Microtydeus beltrani, new species

(Fig. 1)

Female.—Small, white mite; some with dark markings on the anterior portion of abdomen; narrow (all specimens on side in preparations); body furrow entire and simple; body rounded; abdominal outline wavy; skin finely striated and tuberculated. Rostrum of normal size or slightly larger; a pair of long anterior-median hairs on venter of rostrum, and a pair of the same length out under segment I of palpus. Palpus of normal length; distal end of segment II reaching to tip of rostrum; segment II about 11 μ long and 6 μ wide, with 2 dorsal hairs (same length as hairs on venter of rostrum); segment III about 4.4 μ long and 3 μ wide, with the 2 usual hairs; segment IV 7.2 μ long and 3 μ wide, enlarging toward tip, with perhaps 4 short to medium-length end hairs. Second mandibular segment longish, straight, and thickened basally. Thorax about 50 μ long; eye spots not seen; sensory setae pilose on distal half only, 23–28 μ long, seated in large pores and depressions; inner thoracic setae 11 μ long; anterior 8 μ long; shoulder setae about same length as those on abdomen. Abdominal hairs 11 μ long; posterior hairs perhaps slightly longer; apparently 5 pairs of posterior hairs, all hairs, except sensory, simple. Abdomen 100 μ long, 58 μ thick at anterior end. Anal opening on rear. Apparently 4 pairs of short genital hairs. Legs normal: I, 72 μ long; II, 58 μ; III and IV, 55 μ long. Tarsal pulvilli with hairs. Tarsus of leg I blunt, with a short, broad, clavate seta between posterior dorsal hairs; tarsus II with a similar seta which is shorter and broader. Length with rostrum 166 μ, width not determined, thickness 58 μ.

Type.—U. S. National Museum No. 1455.

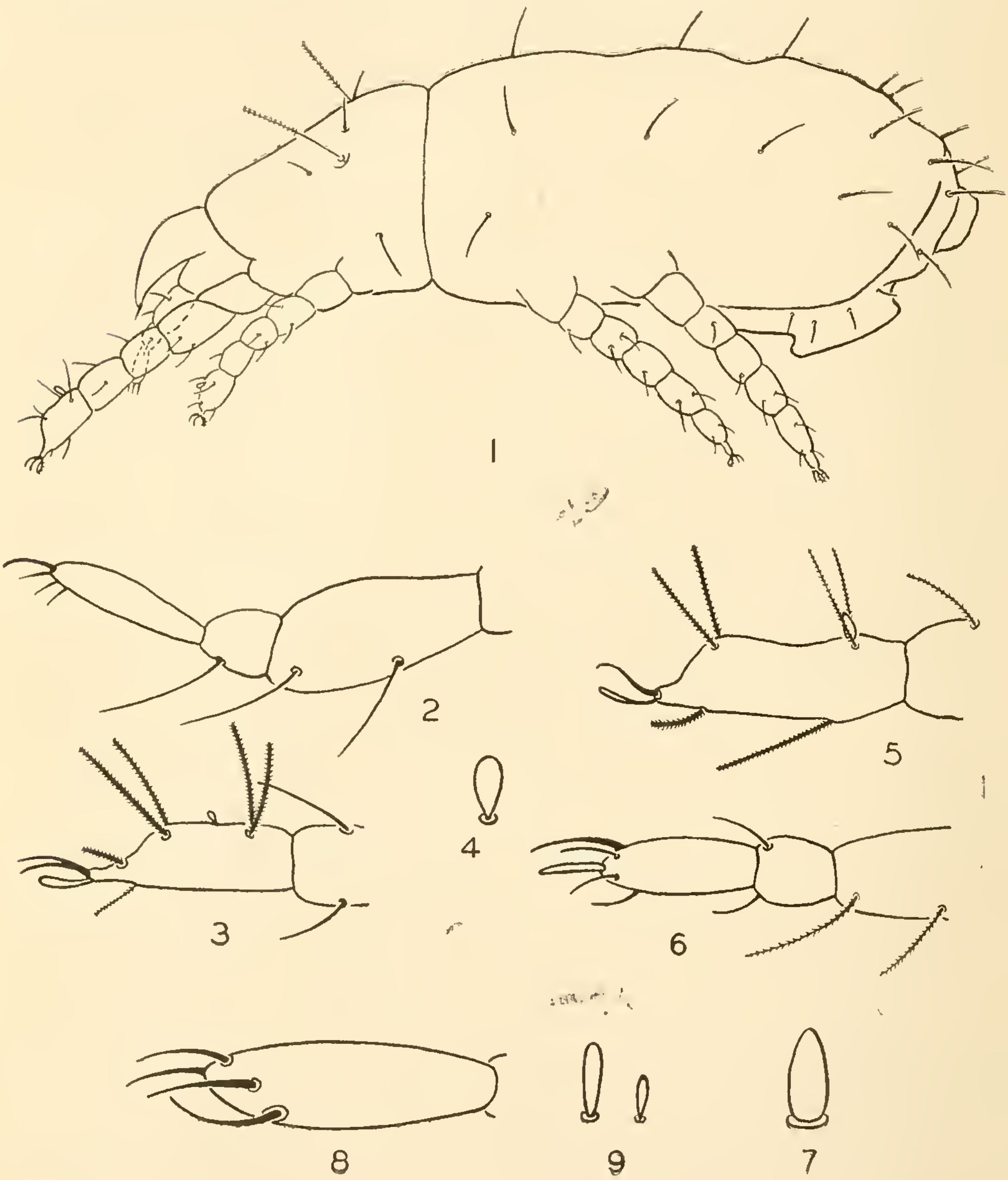
The type was taken from moss at the Desierto de los Leones, Mexico, February 7, 1943; the mites on the slide are from moss from the Laguna de Zempoala, Morelos, January 31, 1943. This species is named in honor of Professor Enrique Beltran.

The sensory setae, which are pilose in the distal half, are distinctive to this species.

Tridilatydeus globiferus, new species

(Figs. 2, 3, 4)

Female.—Small, rounded; body furrow not plain; color unknown. Skin finely striated-tuberculated. Rostrum normal; venter with a pair of hairs out under segment I of palpus, and a pair of posterior hairs of short to medium length. Second mandibular segment apparently long. Palpus of normal size; segment II 20 μ long and 10 μ wide, with 2 lateral hairs about 11 μ long; segment



Microtydeus beltrani, n. sp. Fig. 1, Lateral view of adult.
Tridilatydeus globiferus, n. sp. Fig. 2, Palpus. Fig. 3, Tarsus I. Fig. 4, Tarsus I sensory seta.
Tridilatydeus fragarius, n. sp. Fig. 5, Tarsus I. Fig. 6, Palpus. Fig. 7, Tarsus I sensory seta.
Tridilatydeus robustus, n. sp. Fig. 8, Palpus segment IV. Fig. 9, Tarsi I and II sensory setae.

III 7.5 μ long and 7.5 μ wide, with a single hair about 11 μ long; segment IV 17.5 μ long and 4 or slightly more μ wide, with 4–5 end hairs, the center hair strong, curved. Cephalothorax with 3 eyes; sensory setae (under oil) wirelike and apparently simple, 22.2 μ long; anterior to sensory setae a pair of short hairs, 8.5 μ long. Dorsal abdominal hairs 11.1 μ long; posterior abdominal hairs 16.6 μ long; under oil apparently simple. Genital opening with 5–7 short, pilose hairs. Legs normal; leg I about 100 μ long; II and III, 88 μ; IV, 111 μ. Tarsus I with a small, globular sensory seta (in *Tridilatydeus stonei* it is rodlike, and in *T. hirsutus* long, curved); pulvilli without hairs; all tarsi with heavy, finely pilose hairs; other leg hairs simple. Length with rostrum 222 μ, width about 78 μ.

Type.—U. S. National Museum No. 1456.

The type was collected from lichens on the Mexico-Cuautla Highway near the road to Mt. Popocatepetl, March 8, 1943.

This species differs from *Tridilatydeus stonei* in the shape of the tarsal sensory setae, and in the arrangement of the pilose hairs (in *T. stonei* only the ventral hairs on tarsus I are pilose); from *T. hirsutus*, by the shape of the tarsal sensory setae, and in the presence of the simple body hairs.

Tridilatydeus fragarius, new species

(Figs. 5, 6, 7)

Female.—Small, with parallel sides; body furrow simple, strong; amber color, lighter-colored rear and legs, with dark spots on dorsum. Finely striated, no tubercles seen. Rostrum normal; venter with a pair of pilose hairs of medium length out under segment I of palpus, and an antero-lateral pair of pilose hairs of medium length. Second mandibular segment long, curved. Palpus normal, segment II to tip of rostrum; segment II 25 μ long and 17.5 μ wide, with 2 pilose hairs of medium length; segment III 6 μ long and 5 μ wide, with 2 short-medium hairs which appear simple; segment IV 11 μ long and 4 μ wide, with a strong straight or only slightly curved center seta, and 4 other simple setae. First 3 segments striated transversally, 4th longitudinally. Cephalothorax with 3 eyes; sensory setae 15 μ long, pilose (all body hairs pilose); anterior thoracic setae 15 μ long; thoracic shoulder hair slightly shorter. Abdominal dorsal hairs 15 μ long; posterior abdominal hairs 20 μ long. Posterior abdominal suture present. Six pairs of pilose genital hairs. Legs normal; approximate lengths: I, 128 μ; II, 89 μ; III, 111 μ; IV, 122 μ. Tarsus I with a wide, short, sensory seta (somewhat like an elongated strawberry); pulvilli without hairs; anterior and ventral tarsal hairs strong, pilose; other leg hairs normal, pilose. Length with rostrum 229 μ, width about 83 μ.

Type.—U. S. National Museum No. 1457.

The type was collected from lichens from Michoacan, along the Mexico-Guadalajara Highway near km. 285, April 8, 1943. Paratype mite (female) from moss, Contreras, D. F., December 1, 1943.

The pilose ventral rostral hairs and the peculiar tarsal sensory seta are distinctive.

Tridilatydeus robustus, new species

(Figs. 8, 9)

Female.—Medium-size, broadish mite; amber colored with dark abdominal and thoracic markings, and lighter colored legs and beak; body furrow simple, entire. Striations typical. Rostrum normal; venter with a pair of hairs out under segment I of palpus, and a short, fine posterior pair. Second mandibular segment medium to long, curved. Palpus normal; segment II with a small, sharp lateral tubercle, and 2 long simple hairs; 17.5 μ long and 10 μ wide; segment III 6 μ long and 6.5 μ wide, with one long and one short hair; segment IV 18.7 μ long and 4.5 μ wide, with 4 end hairs, all appearing simple; striations typical. Cephalothorax with 3 eyes; sensory setae pilose, 22 μ long, anterior to the lateral eyes; lateral setae (near eyes) 12.5 μ long, pilose; anterior pilose setae (laterad to anterior median eye) 11 μ long. All body hairs pilose; abdominal shoulder hair 20 μ long; dorsal abdominal hair 10 μ long; posterior abdominal hair 25 μ long. Five to seven pairs of pilose genital hairs. Legs normal; approximate lengths: I, 122 μ; II, 89 μ; III, 100 μ; IV, 111 μ. All leg hairs pilose; tarsus I hairs heavy, pilose; sensory seta on tarsus I small, clublike, smaller on tarsus II; tarsal pads without hairs. Length with rostrum 233 μ, width 111 μ.

Type.—U. S. National Museum No. 1458.

The type specimen was collected from moss at the Desierto de los Leones, Mexico, December 5, 1943. On the same slide are specimens of *Tridilatydeus fragarius*.

The combination of the strong tarsal center seta, the tubercle on the 2nd segment of the palpus, and the pilose hairs is distinctive.

MINUTES OF THE 545TH REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON APRIL 6, 1944

The 545th regular meeting of the Society was held Thursday, April 6, 1944, at 8.10 P. M.. in Room 43 of the National Museum. President Annand presided and 38 members and 21 visitors were present. The minutes of the previous meeting were approved as read.

The following new members were elected:

Dr. Edward W. Baker, Division of Fruitfly Investigations, U. S. Bureau of Entomology and Plant Quarantine, Mexico City.

Miss Elizabeth E. Haviland, Graduate Assistant in Entomology, University of Maryland, College Park, Md.

President Annand requested Mr. Heinrich and Mr. Loftin. to prepare an obituary notice of August Busck.

Dr. Back showed photographs of an embiid found between the cement floor and the tar paper under the bales of wool in a warehouse at Houston, Texas. It did not appear to cause any damage and may have been feeding on molds. Dr. Townes said that embiids had been reported by Dr. E. S. Ross from flour mills in Mexico and that he, himself, had specimens of *Oligotoma saundersi* which had been spinning webs over the sacks in a Texas mill.

Mr. Rohwer called attention to an obituary notice of the Australian Entomologist, Henry Tryon, which had appeared in a recent number of the Queensland Agricultural Journal. (58 (1): 61–62, Jan. 1, 1944.)

Dr. Annand announced the appointment of Dr. George C. Decker as Chief Entomologist of the Illinois State Natural History Survey and of the Illinois Agricultural Experiment Station.

Lt. (j.g.) R. M. Bohart said that he had noticed many Florida insects, particularly wasps, showed a tendency to red coloration. Lower California wasps do not display this characteristic. Specimens were exhibited.

L. W. Orr gave the first paper on the regular program: Toxicity of DDT and Cryolite to Livestock. The experiments reported in this paper will later be published in detail.

Dr. Bishop stated that toxicological studies with DDT are being carried out by the U. S. Food and Drug Administration and by the U. S. Public Health Service. Since there is a marked difference in the reactions of various animals, tests must be multiplied many times before the complete picture can be established. There is also need for more careful study of its effect on plants and of residues deposited on plants. The paper was further commented upon by Miss Trembley, Mr. Rohwer, Dr. MacLeod, and Dr. Annand.

The second paper on the regular program was presented by Dr. H. K. Townes: Some Taxonomic and Biological Observations on the Chironomids. Lantern slides were shown.

The generic name *Chironomus* is a synonym of *Tendipes*. When the name *Chironomus* is discarded, the family name Chironomidae must also be discarded. If priority is used in selecting family names. the proper name for the family is Eretmopteridae. Some authors use Tendipedidae, which is based on the oldest included genus or on the idea of continuity in the typical genus of a family.

Recently, a revision of the Nearctic species of the tribe Tendipedini has been completed by the author. This tribe is roughly coextensive with the genus *Chironomus* of most authors. In the region covered, it contains fourteen genera, a number of subgenera, and 201 species. The characters used in distinguishing genera and species of Tendipedini were discussed and illustrated with lantern slides.

The more recent taxonomic history of the family and the subdivision of the family into subfamilies and tribes were outlined. Variation of color characters and of certain morphological characters and the variation of these characters in certain species were discussed. Notes were given on the ecological distribution of a few tendipedine larvae and it was shown that beyond its color, the red pigment of blood worms has little in common with haemoglobin. (Author's Abstract).

Dr. E. O. Essig was introduced by President Annand and addressed the Society briefly. Other visitors introduced were: Lt. (j.g.) R. M. Bohart and Mrs. Bohart, Lt. (j.g.) D. S. Farner, Lt. (j.g.) C. M. Meadows and Mrs. Meadows, Dr. N. S. Wilson, and Ensign F. F. Bibby.

The meeting adjourned at 10.02 P. M.

IRA L. HAWES,
Recording Secretary.

Actual date of publication, July 10, 1944.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions	$3.00
To members of the Society	$2.40

A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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

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

F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine,
Washington 25, 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 25, 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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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 46 OCTOBER, 1944 No. 7

TWO NEW SPECIES OF HAEMAGOGUS FROM COLOMBIA, H. ANDINUS AND H. BOSHELLI (Diptera: Culicidae)[1]

By ERNESTO OSORNO-MESA

Medical Entomologist of the Section of Special Studies of the Ministry of Labor, Hygiene, and Social Welfare of Colombia

In the course of a yellow fever survey conducted during the month of July 1942, at Bahía de Solano and Bahía Utria, Intendencia of the Chocó, on the Pacific Coast of Colombia, the author found in tree holes and in coconut shells on the ground, larvae of what later appeared to be a new species of *Haemagogus*. From those larvae, male and female adults were eventually obtained, some of them being kept individually with their associated larval skins. Similarly in May 1942 larvae of a second new species of *Haemagogus* were secured from holes in some of the shade trees of a coffee plantation near the town of Fusagasugá, in the Department of Cundinamarca. The recorded altitude of this locality is 1,746 meters (5,728 feet). This is the highest altitude at which any species of *Haemagogus* has been found hitherto in Colombia.

The morphological characteristics of these two species, heretofore undescribed, form the basis of the present communication.

Haemagogus boshelli, new species

Larva (Figs. 1–5). Head rounded, slightly broader than long; antenna medium in size, smooth, tapering near tip, with a single hair arising beyond the middle. Dorsal anterior head hairs usually double; posterior usually single. Ante-antennal tuft with five elements (Fig. 1).

Skin glabrous. The lateral comb on the eighth abdominal segment a triangular patch of about 34 blunt scales, disposed in three irregular rows. These scales are finely spinulate apically, a detail which is visible under high magnification only (Fig. 3). On both sides of the comb, both dorsally and ventrally,

[1] The studies and observations on which this paper is based were conducted with the support and under the auspices of the Section of Special Studies maintained by the Ministry of Labor, Hygiene, and Social Welfare of the Republic of Colombia and the International Health Division of The Rockefeller Foundation.

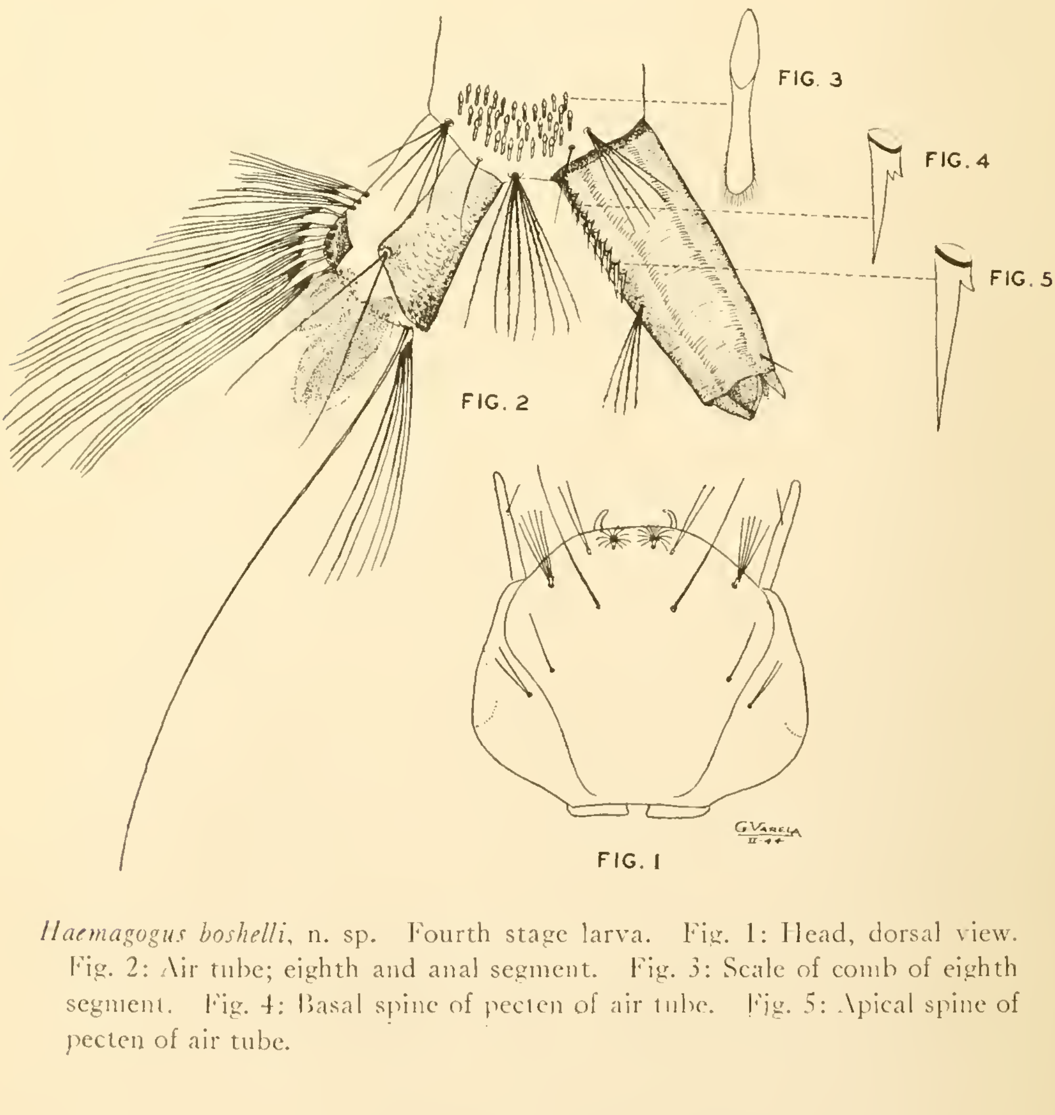
there are tufts of four or five hairs, and posteriorly there is another tuft composed of six slightly plumose elements; these latter arise from a strong sclerotized base, on each side of which a single simple hair arises, quite close to the comb.

Air tube approximately two and a half times as long as wide, bearing a pecten of about 14 spines, which reaches to its middle. The size of the spines increases progressively, starting from the base; the first two, which are quite rudimentary, bear two small teeth each, and the others only one (Figs. 4–5). Just beyond the pecten, there is a tuft of four plumose hairs.

Anal segment longer than wide. The dorsal plate, which extends laterally to the middle of the segment, has a moderately rugose and spiny appearance on the postero-dorsal surface; the dorsal tuft consists of a long hair and a brush on each side. Lateral tuft of two hairs; ventral tuft well developed, with three tufts preceding the barred area (Fig. 2).

Anal gills short, slightly rounded, the dorsal pair longer than the ventral.

Adult female. Proboscis slightly longer than femur, slender and curved, very dark blue with coppery reflection. Palpi short, one-tenth the length of the



Haemagogus boshelli, n. sp. Fourth stage larva. Fig. 1: Head, dorsal view. Fig. 2: Air tube; eighth and anal segment. Fig. 3: Scale of comb of eighth segment. Fig. 4: Basal spine of pecten of air tube. Fig. 5: Apical spine of pecten of air tube.

proboscis, and of the same color. Antennae with black tori and setae. Clypeus conspicuous, bare, black, and shiny. Occiput with a row of iridescent scales on the vertex and along the posterior margin of eyes, surrounding a zone of ultramarine blue; dorsal margin of eyes fringed by a row of stout, black setae. Vertex without white scales. Prothoracic lobes with dark-blue scales, and black bristles along the anterior edge. Mesonotum with integument black, entirely covered with bright emerald-green scales; a patch of blue scales anterior to the wing-base. Scutellum trilobed, clothed with blue scales, bearing long stout setae on the lobes. Sternopleura, mesopleura, mesepimera and coxae covered with silvery scales. Postnotum black, shiny, with two small setae posteriorly, near the base of the first abdominal tergite.

Abdomen purple with bronzy reflections. The dorsum of sixth and seventh segments with a few white scales basally; the first three abdominal sternites

FIG. 6

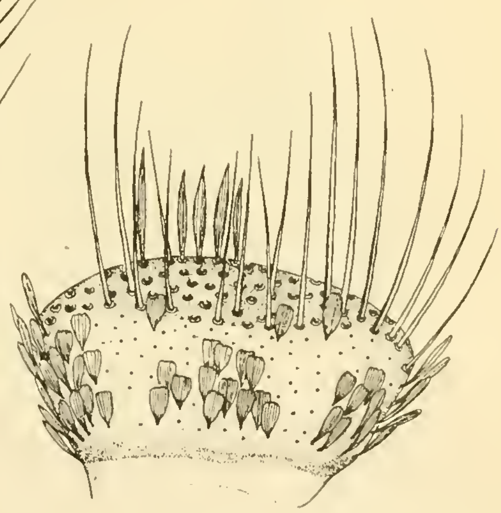


FIG. 7

Male terminalia of *H. boshelli*, n. sp. Fig. 6: Side-piece. Fig. 7: Eighth tergite.

covered with white scales; all the other segments with lateral patches of white scales. Legs: Femora violet blue with bronzy reflection; a mother-of-pearl sheen covers the medial aspect of the apical third of the fore legs, the inner edge of the middle legs, and the inner and lateral aspects of the apical half of

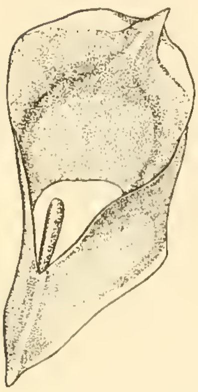


FIG. 8

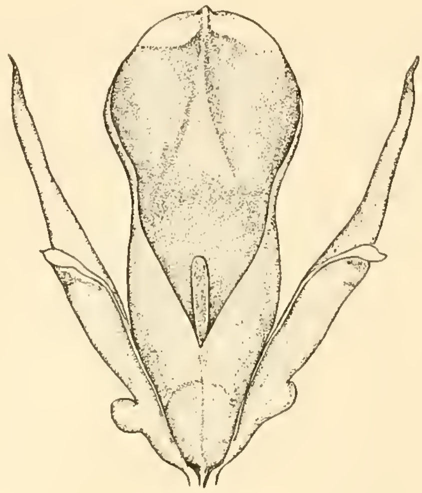


FIG. 9

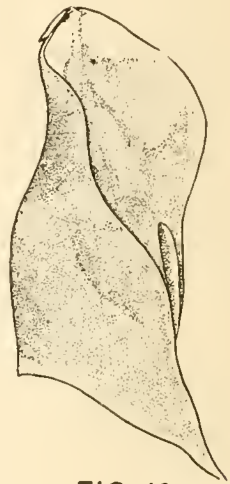


FIG. 10

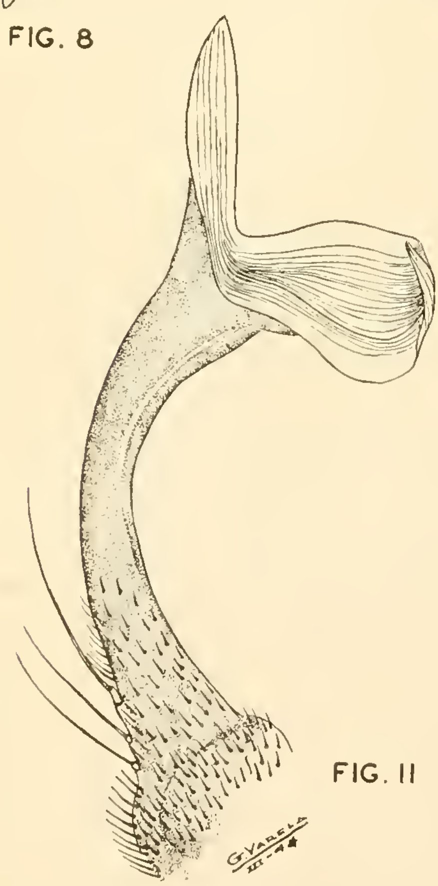


FIG. 11

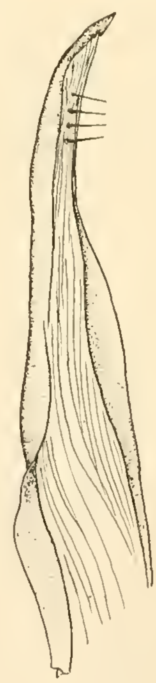


FIG. 12

Male terminalia of *H. boshelli*, n. sp. Fig. 8: Mesosome, vertical view. Fig. 9: Mesosome, dorso-ventral view. Fig. 10: Mesosome, lateral view. Fig. 11: Claspette. Fig. 12: Tenth sternite.

the hind legs. Claws simple. Wings slightly shorter than the abdomen, their scales with metallic reflection, more dense along the costa, subcosta, and first vein. Second marginal cell longer than its petiole, as measured from the third cross-vein.

Adult male. Same coloration as female. Palpi short, one-fifth as long as proboscis. Antennae sparsely plumose.

Claw formula: 1/0.1/0—0/0.0/0—0/0.0/0.

Male terminalia (Figures 6–12). Side-piece roughly conical and truncate, two and a half times as long as wide; basal lobes ample, well sclorotized, bearing numerous strong and slightly hooked setae of variable length, interspersed with small spatulate scales; the scales on the apical part of medial edge of the side-piece are crowded, striate, and lanceolate, of different shapes, and lengths, some of them curved (Fig. 6). Apical lobe clear cut, thumb-shaped, with numerous fine setae. Near the middle of the dorsal surface, there is an almost circular area from which arise a number of small, short, prong-like scales bordered externally by a row of saber-shaped ones. An oblique row of seven strong setae with curved tips is on the inner aspect, midway between the basal lobe, the circular patch of scales, and the apical one.

The clasper, which is two-thirds as long as the side-piece, is greatly hypertrophied, expanded, and curved at a right angle, near its middle. The apex is distinctly spatulate, and bears a long, spatulate appendicle, inserted subterminally. The claspette (Fig. 11) has a long stem, more slender in the middle, curved in its distal third, and finely setose at the base, especially on its medial surface, from which three stout setae arise. The filament of the claspette is large, leaflike, and striate; and flexed at a right angle towards its middle, forming a posterior narrow upright pointed portion, and an anterior portion which is widened, somewhat concave, and has a short reflexed tip. Tenth sternite (Fig. 12) long, strongly sclerotized, pointed, with three or four subapical setae.

The mesosome (Figs. 8–9–10) is roughly comparable to a hollow, irregular cylinder, slightly constricted near the middle, and expanded apically; being somewhat pear-shaped. A small erect appendage arises from the mid-ventral line; at the apex is a short, sharp point, projecting dorsally.

Ninth tergites with atrophied lobules, without setae.

Eighth tergites bearing a distal row of lanceolate scales, and numerous long and strong setae (Fig. 7).

Type locality.—Bahía de Solano, Intendencia of Chocó, on the Pacific Coast of Colombia, South America.

Additional material was obtained from Bahía Utria, to the south of the type locality, some 14 kilometers from the village of El Valle, also from Napipi on the Atlantic slope of the coastal range.

Type material.—Adults of both sexes, reared from larvae obtained from tree holes and coconut shells at Bahía de Solano and Bahía Utria, altitude from 2 to 20 meters, in July 1942.

Holotype male, allotype female, larval skin, and whole larva mount to be deposited in the U. S. National Museum, Washington, D. C., U. S. A.

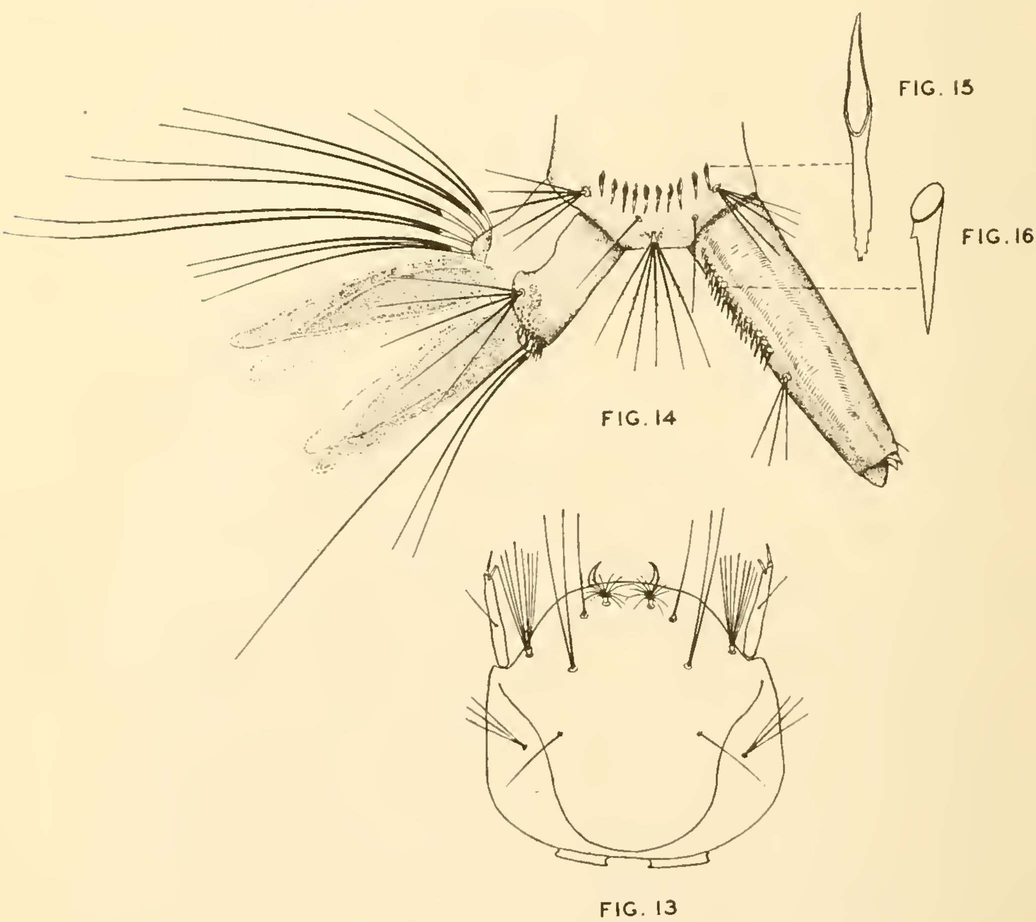
Paratype males and females, larval skins, and whole larva mounts to be deposited in the Yellow Fever Laboratory of the Section of Special Studies, Bogotá, Colombia; in the Institute of Natural Sciences, Bogotá, Colombia; and in the Laboratory of the Yellow Fever Service in Rio de Janeiro, Brazil.

This species is named *boshelli* in honor of my esteemed friend and associate in scientific investigations, Dr. Jorge Boshell-Manrique.

Haemagogus andinus, new species

Larva (Figs. 13–16). Head rounded, slightly wider than long; antenna moderate, smooth, and tapering, with a single hair at the middle. Anterior head hairs single, posterior double. Ante-antennal tufts with eight long elements, almost as long as the antenna (Fig. 13).

Skin glabrous; the lateral comb of the eighth segment consists of a curved line of ten blunt scales, serrate at their tips (Fig. 15). Dorsally and ventrally to the comb, there are tufts of five hairs each; and posteriorly, there is a tuft of six elements, minutely and sparsely feathered.



Haemagogus andinus, n. sp. Fourth stage larva. Fig. 13: Head, dorsal view. Fig. 14: Air tube; eighth and anal segments. Fig. 15: Scale of comb of eighth segment. Fig. 16: Spine of pecten of air tube.

The air tube is three times as long as wide. The pecten reaches to the middle of the tube and is followed by a three-haired tuft; the pecten is composed of about seventeen pointed spines, each of them with a single tooth at the base (Fig. 16).

Anal segment almost square. The dorsal plate is smooth and reaches to the middle on the sides; the posterior margin has numerous minute spicules and a patch of larger ones. Dorsal tuft of one long hair and a pair of shorter ones on each side. Ventral brush poorly developed, without any elements preceding the barred area. Lateral anal tuft of about five hairs.

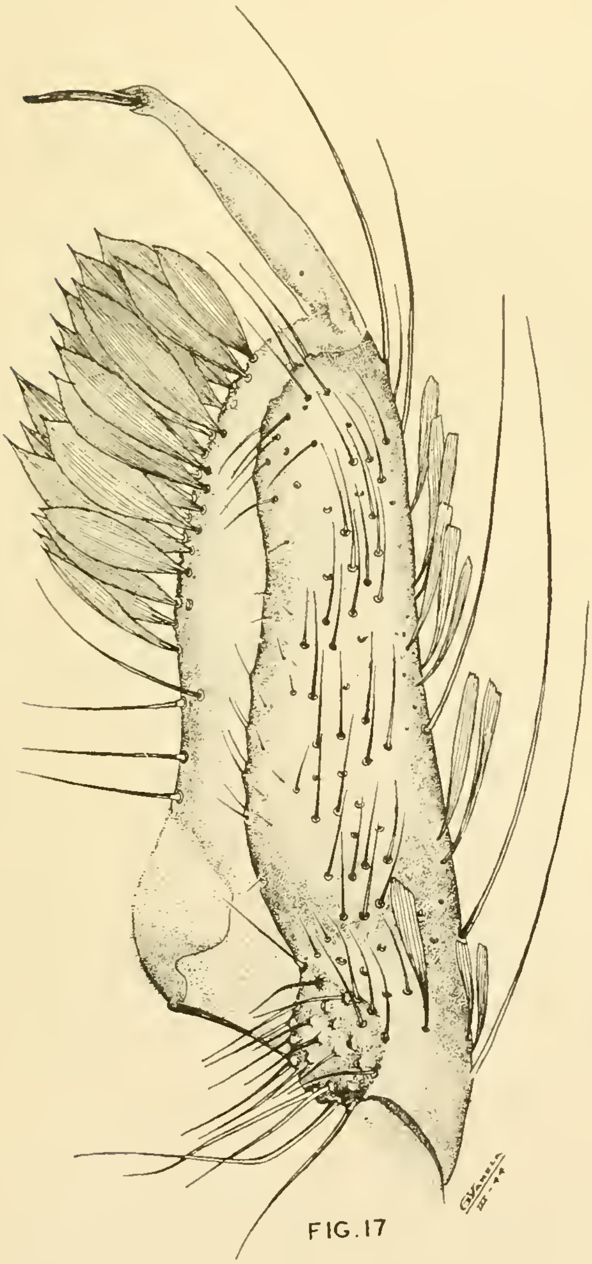


FIG. 17

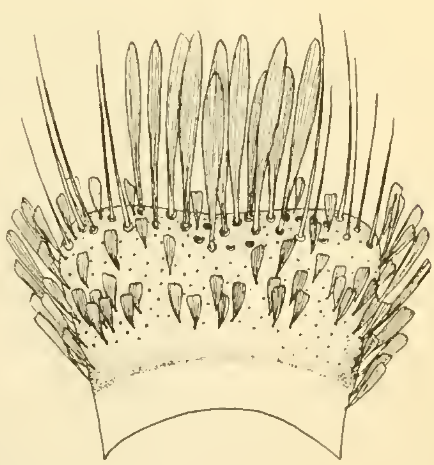


FIG. 18

Male terminalia of *H. andinus*, n. sp. Fig. 17: Side-piece. Fig. 18: Eighth tergite.

Anal gills long and tapering; the ventral ones slightly longer than the dorsal ones.

Adult female. Proboscis dark blue, curved, slightly longer than femur. Palpi dark, short, approximately one-eighth the length of proboscis. Clypeus black, bare, and shiny. Occiput with brilliant green scales; a line of white silvery scales, interrupted laterally, borders the dorsal margin of eyes; cheeks with a patch of white scales. Vertex without white scales.

Prothoracic lobes blue, with silvery scales on anterior border, and strong black marginal setae.

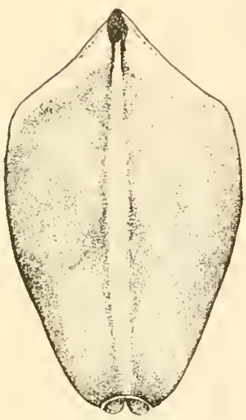


FIG. 19

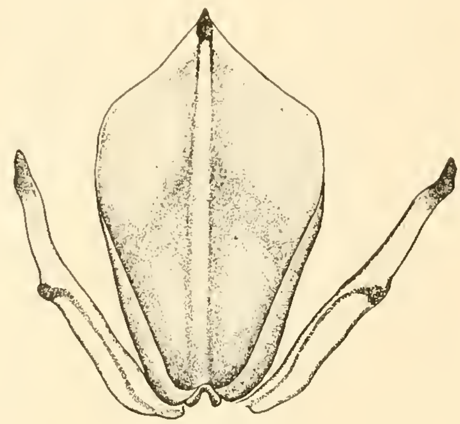


FIG. 20

FIG. 21

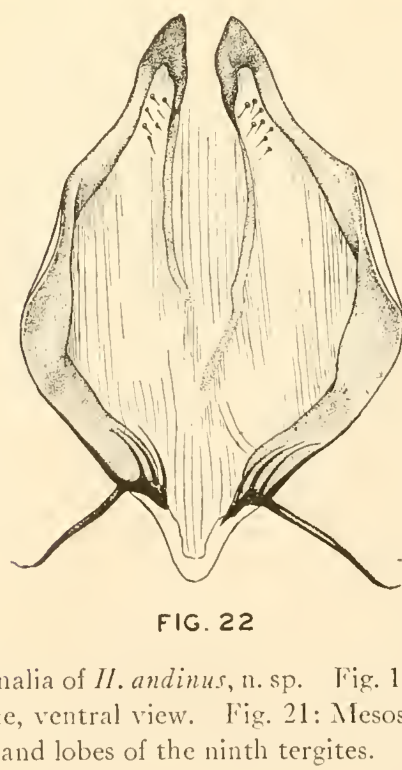


FIG. 22

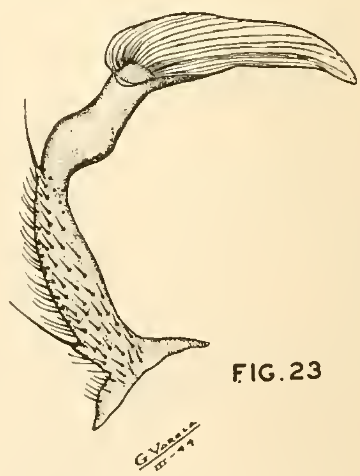


FIG. 23

Male terminalia of *H. andinus*, n. sp. Fig. 19: Mesosome, dorsal view. Fig. 20: Mesosome, ventral view. Fig. 21: Mesosome, lateral view. Fig. 22: Tenth sternites and lobes of the ninth tergites. Fig. 23: Claspette, Mesonotum with black integument, covered with oval, brilliant green scales in some specimens, and ultramarine ones in others. Scutellum with broad truncate scales of the same color as those on the mesonotum, and bearing long stout setae on the lobes. Pleura and coxae with white scales. The sternopleuron bears two black setae, of different sizes.

Abdomen covered dorsally with greenish scales. A lateral white patch on almost all segments, extending from the anterior to the posterior margin of the tergites.

Legs ultramarine blue. Anterior and mid femora speckled with white scales on inner surface of basal half, more extensively and intensively so on mid femur; similar scales forming a continuous patch extend over almost all the length of the posterior femur. There are distinct white rings at tips of mid and posterior femora.

Wings of the same length as abdomen, with iridescent scales. Second marginal cell longer than its petiole.

Claw formula: 1/1.1/1—1/1.1/1—0/0.0/0.

Adult male. Of the same type of coloration as the female; with short palpi and very plumose antennae.

Male terminalia (Figs. 17–23). Side-piece shaped like a sugar loaf, with a basal expansion, three times as long as wide, covered with long setae on its entire surface, with the exception of a longitudinal area on the internal aspect. On the basal third of this area, a few long setae are to be seen. Basal lobe well defined, bearing numerous setae of different lengths, none of them flattened. From the outer margin of the side-piece arise many long, striate, truncate scales, and a few large setae. Along the upper half of the internal border, is a crowded and homogeneous group of leaflike, striate, pointed scales.

Clasper slightly less than half the length of the side-piece, tapering apically, with a terminal spine about one-third its length.

Claspettes with stout stem (Fig. 23), bent at an angle of over 90° at the outer third; some irregularities in the width of the stem, which is larger in its basal third, narrowed below the angle of flexion, and expanded again beyond it, give to the stem a sinuous, crab, claw-like appearance; there are two strong setae on inner edge, one toward the base, and the other below the angulation; the basal two-thirds are covered with numerous short setae. The filament is striate, moderately broad, sickle-shaped in lateral aspect, with a slightly recurved tip.

Mesosome lightly sclerotized, narrow at base, expanding distally and then tapering abruptly to a reduced, sclerotized crista which projects to form a small beak. There is a narrow opening at base (Figs. 19–20–21).

Tenth sternites heavily sclerotized, especially at tip, with seven or eight small setae. The ninth tergites have three strong, curved setae on each side (Fig. 22).

The eighth tergite has a patch of long lanceolate scales apically, and a few long bristles on each side (Fig. 18).

Type locality.—Fusagasugá, Department of Cundinamarca, Colombia, South America.

Type material.—Adults of both sexes reared from larvae obtained from rot-holes in trees locally called "guamos" (*Inga* sp.), in Fusagasugá, Cundinamarca, Colombia (altitude 1746 meters), in May 1942.

Holotype male, allotype female, larval skin, and whole larva mount, to be deposited in the U. S. National Museum, Washington, D. C., U. S. A.

Paratype males and females, larval skins and whole larval mounts to be deposited in the Yellow Fever Laboratory of the Section of Special Studies, Bogotá, Colombia; in the Institute of Natural Sciences, Bogotá, Colombia; and in the Laboratory of the Yellow Fever Service, in Rio de Janeiro, Brazil.

This species is named *andinus*, because it is found at a high altitude in the butresses of the eastern cordillera of the Andes. It is the species occurring at the greatest altitude of any of the *Haemagogus* hitherto discovered in Colombia.

DISCUSSION

Haemagogus andinus is apparently closely allied to *H. equinus*, so far as the females and larvae are concerned. The femora of the mid and hind legs have an apical band of white scales. Both species have sternopleural setae, and wings with the petiole of the second vein (from the bifurcation to the cross-vein of the 3rd vein) equal to the length of the second marginal cell. The larvae have glabrous skins, scales of the eighth abdominal segment in a slightly curved line, and the dorsal head hairs simple.

The present study is based on the examination of a sufficient number of males and females; 23 larvae and 49 larval skins of *H. boshelli*, and 38 larval skins of *H. andinus*.

The principal differences between *H. equinus* and *H. andinus* are set forth in the following tabulation:

	H. equinus	*H. andinus*
Larva:		
Posterior head-hairs..........	single	double
Number of hairs in ante-antennal tuft..................	3	8
Number of scales in pecten of air tube..................	12	17
Number of hairs in the lateral tuft of the anal segment....	2	5
Proportion of length of air tube to width..................	2:1	3:1
Males:		
Palpi......................	long	short
Abdomen: dorsum...........	Dark-blue scales	greenish scales
venter............	few setae	many setae

Terminalia:		
Claspette....................	Stem thick, notably widened in apical half with a lateral membrane on each side; filament mushroom-shaped.	Stem slender; filament in shape of a narrow, pointed leaf, slightly folded.

SUMMARY

Two new species of *Haemagogus*, *boshelli* and *andinus*, are described. The former is from the Pacific coast of Colombia, and the latter from high altitudes. Each one of these species is a representative respectively of the two groups into which, taxonomically and logically, the eight species of *Haemagogus* found to date in Colombia may be placed. These two groups have the following characteristics:

a) larva with comb of eighth abdominal segment formed of scales in a patch; male with sparsely plumose antennae; females with simple tarsal claws and postnotal setae.

b) larva with comb of eighth abdominal segment formed of a few scales in a line; male with densely plumose antennae; females with toothed tarsal claws, and without postnotal setae.

ACKNOWLEDGMENTS

The author expresses his thanks to H. W. Kumm, Chief of the Section of Special Studies, for his continuous stimulation and kind collaboration in the course of this work; to Mr. W. H. W. Komp, entomologist of the U. S. Public Health Service, for his effective aid in the study of material of the two species here described; to Dr. J. Boshell-Manrique, with whom the author collected part of the material from the type locality of *H. boshelli;* to Sr. N. Cerqueira, for comparison of our species with others closely allied; and to Sr. G. Varela, the artist who drew the excellent figures which illustrate this paper.

MITES OF THE FAMILY BDELLIDAE

By EDWARD W. BAKER and JOHN W. BALOCK,
United States Department of Agriculture, Bureau of Entomology and Plant Quarantine

Comparatively little is known of the Bdellidae of the Western Hemisphere although they are widely distributed and of rather common occurrence. In order to extend our knowledge, this paper is being presented as the first of a contemplated series on this family of predaceous, prostigmatic Acarina. Since Sig Thor (Das Tierreich, 1931) has already discussed the family and has covered the European field, as Womersley (Roy Soc. South Australia, Trans., 57: 97–107, 1933) has done for the Australian species, it is hoped that this and the following papers will serve the same purpose for the North American forms, both new and already described. The types and cotypes, and the slide of *Biscirus lapidarius*, will be deposited in the United States National Museum, Washington, D. C.

MONOTRICHOBDELLA, new genus.

This genus is close to *Biscirus* in that it has the long 5th palpal segment which does not enlarge toward the tip, three pairs of dorsal thoracic hairs, no sclerotized plates, and differs in that the 5th palpal segment has only one long hair placed on the tip in place of the customary two; there is also present what is either an anterior median eye or a tubercle. *Monotrichobdella max-osburni* is designated as the type of the genus.

Monotrichobdella max-osburni, new species

(Figs. 1, 2)

Female.—A large, reddish, rounded egg-shaped mite; rostrum moderately long and slender. Palpus of moderate length, slender, the 5th segment characteristic in that it is long, slender, and narrowing toward the tip, and has only one long end hair (211 μ long); also 3 other short fine hairs; 5th segment 98.4 μ long and 19.6 μ wide; 4th segment 33.3 μ long and 16 μ wide, with 2 minute hairs; 3rd segment 37 μ long and 22 μ wide, with one minute hair; 2nd segment 168 μ long and 22 μ wide, with 2 minute hairs. Mandibles with 2 dorsal hairs, the proximal about in center, the distal about five-sixths from base; mandible 297 μ long and 45 μ wide (about 6½ times as long as wide), fine shears. Rostrum with 2 pairs of fine, apical hairs, and 2 pairs of ventral hairs. Thorax with 2 pairs of lateral eyes, and what is either an anterior median eye (as in *Cyta*) or a tubercle; no sclerotized shields; the striations, in the area formed by the 4 thoracic sensory hairs, break up into an irregular, broken-lined pattern surrounding the 2 median posterior thoracic hairs; the sensory hairs are simple, about 116 μ long; one pair of thoracic hairs, 56 μ long, in row with the posterior sensory hairs. Abdominal hairs 56 μ long; posterior abdominal hairs about 66 μ long. Anal opening of female with 2 pairs of anterior hairs. Female with 9 pairs of genital hairs. Legs appearing normal; distal ventral hairs of tarsi pilose; leg IV slightly past tip of posterior edge of body; legs I, II, and III small; IV slightly larger; leg I about 517 μ long; IV about 697 μ long. Body length with rostrum 1440 μ, width about 675 μ.

Type.—U. S. National Museum No. 1459.

The type and several paratypes were taken from lichens on the Mexico-Cuernavaca Highway near Tres Cumbres, Morelos, January 7, 1943; collected by J. W. Balock and J. G. Shaw. This species is named for Max Osburn of the Fort Pierce, Fla., Laboratory.

Biscirus lapidarius (P. Kram.)

(Figs. 3, 4, 5)

See Sig Thor. 1931. Das Tierreich, v. 56, p. 49.

This species is very close to *Biscirus lapidarius*, which has a rather general distribution in Europe and a questionable recording from Central America. The only difference that can be seen is that it appears to lack a hair on the 5th palpal segment. The following description is based on the Mexican form:

Female.—Large; brown, with darker dorsal spots. Rostrum slightly long and narrow. Palpus of medium length and normal thickness; 5th palpal segment 83.3 μ long and 21 μ wide, with 5 shorter hairs and 2 end hairs, 111 and 116 μ long; 4th segment 22.2 μ long and 16.5 μ wide, with 3 hairs; 3rd segment 22.2 μ long and 22.2 μ wide, with 1 lateral hair; 2nd segment 89 μ long and 22.2 μ wide, with 5 lateral hairs. Mandibles 205 μ long and 44.4 μ wide (almost 5 times as long as wide), the proximal hair about one-fifth out from base, the distal hair about in center. Rostrum with 2 pairs of tiny tip hairs and 6 pairs of ventral hairs. Thorax without dorsal shield lines; anterior sensory hairs 128 μ long, posterior 133 μ long; posterior thoracic hair 89 μ long. Lateral eyes widely separated. Abdominal setae 67 μ long. Genital opening with 7 pairs of hairs. Legs normal; distal tarsal hairs pilose. Length with rostrum 1133 μ, width about 466 μ.

A single specimen was obtained from moss collected by E. W. Baker at the Desierto de los Leones, Mexico, February 7, 1943.

Bdella chapultepecensis, new species

(Figs. 6, 7, 8)

Female.—Of medium size, somewhat narrow; color reddish. Mandibles and rostrum somewhat narrow. Palpus of normal thickness, short; 5th segment normal, 35.5 μ long and 16.6 μ wide, with 3 short hairs and 2 end hairs, the inner hair 100 μ long, the outer hair broken off at base; 4th segment 16.6 μ long and 11 μ wide, with 3 short hairs; 3rd segment 22.2 μ long and 16.6 μ wide, with one outer hair; 2nd segment 100 μ long and 16.6 μ wide, with 5 short hairs.

Mandibles 165 μ long and 27 μ wide (6 times as long as wide), the basal hair about one-fourth out from base and the distal hair about five-eighths out. Rostrum with 2 pairs of fine tip hairs and 2 pairs of ventral hairs. Thorax without shield lines; thoracic sensory hairs 89 μ long; anterior thoracic hairs 25 μ long, posterior thoracic hairs 33.3 μ long. Abdominal dorsal hairs 27.7 μ long, posterior abdominal hairs 39 μ long. Anal opening on rear and ventral, with 1 pair of anterior hairs. Apparently 12 pairs of genital hairs. Legs normal; distal ventral tarsal hairs simple; approximate lengths of legs: I, 266 μ; II, 244 μ; III, 333 μ; IV, 355 μ. Length with rostrum 684 μ, width about 200 μ.

Type.—U. S. National Museum No. 1460.

Type specimen taken from lichens, Chapultepec Park, Mexico, D. F., March 16, 1943, by E. W. Baker.

The rostral hairs and genital opening characterize this species.

Bdella rio-lermensis, new species

(Figs. 9, 10, 11)

Female.—Medium sized mite; egg shaped; amber to red with lighter-colored legs and beak and with darker markings on thorax and abdomen. Rostrum broad at base and narrow at tip. Palpus of normal length and size; 3rd segment reaching to tip of rostrum; 5th segment typical, 36.6 μ long and 16.6 μ wide, the end hairs 155 μ and 122 μ long, and with 3 medium-length lateral hairs; 4th segment 14.4 μ long and 14.4 μ wide, with 3 hairs; 3rd segment 22.2 μ long and 17.7 μ wide, with 1 hair; 2nd segment 111 μ long and 16.6 μ wide, with 6 short hairs. Mandibles 177 μ long and 33.3 μ wide (5.3 times as long as wide), proximal hair about one-fourth from base, distal hair about five-eighths from base; shears fine. Rostrum with 2 pairs of fine apical hairs and 2 pairs of ventral hairs. Thorax with 4 pairs of dorsal hairs; anterior sensory setae 88.8 μ long, posterior sensory setae 100 μ long; posterior thoracic hairs 38.8 μ long; Apparently a fine sclerotized plate on thorax. Abdominal dorsal hairs 33.3 μ long; posterior abdominal hairs about 44.4 μ long. Female with 9 pairs of genital hairs. Legs appearing normal; all tarsal hairs simple; approximate leg lengths: I, 311 μ; II, 266 μ; III, 355 μ; IV, 444 μ. Length with rostrum 800 μ, width 311 μ.

Tritonymph about same except having 5 pairs genital hairs.

Type.—U. S. National Museum No. 1461.

The type was taken from moss collected by E. W. Baker on the Mexico-Toluca Highway near Rio Lerma, Mexico, January 24, 1943.

The very faint dorsal shield lines and rostral hair pattern are distinctive of this species.

Bdella cronini, new species

(Figs. 12, 13)

Female.—Body long, somewhat pear shaped; red, with darker dorsal markings. Rostrum somewhat elongated. Palpus long, narrow; 5th segment typical, 39 μ long and 16.6 μ wide, 4 short hairs and 2 long end hairs, 122 μ and 200 μ long; 4th segment 22 μ long and 14.4 μ wide, with 4 short hairs; 3rd segment 22.2 μ long and 16.6 μ wide, with 1 hair; 2nd segment 122 μ long and 16.6 μ wide, with 6 hairs. Mandibles 188 μ long and 33.3 μ wide (about 5½ times as long as wide); the proximal hair about one-third out from base and the distal hair about two-thirds out. Rostrum with 2 pairs of tiny tip hairs and 2 pairs of ventral hairs. Thorax without shield lines; anterior sensory hair 144 μ long, posterior 211-222 μ long; anterior thoracic hair 55.5 μ long, posterior thoracic hair 70 μ long. Dorsal abdominal hairs about 66.6 μ long; posterior abdominal hairs about 77.7 μ long. Anal opening with 2 pairs of hairs. Seven pairs of genital hairs. Legs normal; ventral distal tarsal hairs simple; length of legs about: I, 360 μ; II, 315 μ; III, 360 μ; IV, 495 μ. Length 844 μ, width 388 μ.

Type.—U. S. National Museum No. 1462.

The type was collected from lichens by E. W. Baker from fig trees at Planada, Calif., June 13, 1936; paratypes from lichens from Planada, Calif., June 12, 1936, and 1937. Named for T. C. Cronin.

The lack of shield, the rostral hairs, the shape of mouth parts, etc., are distinctive of this species.

Bdella virgata Ewing

(Figs. 14–16)

Bdella virgata Ewing, 1909. Univ. Ill. Bul. vol. VII, p. 70.

Female.—Medium to large mite, pear shaped; reddish with darker dorsal markings. Palpus and rostrum small for size of body. Palpus short; 5th segment 39 μ long and 17.7 μ wide, with 4 short hairs and 2 terminal hairs, 166 μ and 111 μ long; 4th segment 16.6 μ long and 11.1 μ wide, with 4 short hairs; 3rd segment 28 μ long and 19 μ wide, with 1 short hair; 2nd segment 111 μ long and 19.4 μ wide with 6 short hairs. Rostrum with 2 pairs of fine tip hairs and 2 pairs of ventral hairs, and posteriorly a pair of tiny lateral hairs. Mandibles 166 μ long. Thorax without shield; anterior thoracic hairs 28 μ long; sensory setae 78 μ long. Abdominal setae 33.3 μ long. Twelve pairs of genital hairs. Legs normal; ventral distal tarsal hairs simple. Length with rostrum 933 μ.

Redescribed from Mexican material. The type in H. E. Ewing's collection, as far as can be determined, has 9 pairs of genital hairs (perhaps a male).

One adult specimen from lichens collected by E. W. Baker on the Mexico-Toluca Highway, near Rio Lerma, Mexico, January 24, 1943. Nymphs from moss collected by Mr. Donald Dodds at Valle del Bravo, Mexico, May 8, 1943.

The rostral hairs are distinctive of this species.

Bdella distincta, new species

(Figs. 17–19)

Female.—Medium size mite, egg-shaped. Color unknown as described from mounted specimens. Palpus short; 5th segment only slightly widening distally, 50 μ long by 16.6 μ wide, end hairs 150 μ long and 100 μ long respectively, a long distal lateral hair and 2 shorter lateral hairs; 4th segment 16.6 μ long by 14.4 μ wide with 3 short hairs; 3rd segment 22.2 μ long by 22.2 μ wide with a single short hair; 2nd segment 83.2 μ long by 22.2 μ wide with 4 hairs, the basal being the longest. Mandibles 177 μ long by 44.4 μ wide, 4 times as long as wide, the basal hair 22.2 μ from base of mandible, the distal hair at center. Rostrum with 6 pairs ventral hairs. Thorax with 4 pairs hairs; possibly a faint chitinous shield running from posterior to anterior sensory setae; anterior sensory setae about 89 μ long, posterior about 111 μ long. Dorsal body hairs as illustrated, about 39 μ long. Eight pairs of genital hairs. Legs normal, approximate lengths: I and II, 266 μ; III and IV, 311 μ. Body length with rostrum 768 μ, width 333 μ.

Cotypes.—U. S. National Museum No. 1463.

Two cotypes, one from pine cones, Hawaii at Houston, Texas, October 18, 1934, by O. D. Morris; the other from *Bambusa parvariabilis*, China at Washington, D. C., January 29, 1941 (collector's name not given).

The dorsal hairs are quite distinctive.

Bdella oblonga Say

(Figsl 20–23)

Bdella oblonga Say 1821. Acad. Nat. Sci. Phila., Jour., 2; 74.
Bdella cardinalis Banks 1894, Amer. Ent. Soc., Trans. 21:219.
Bdella oblonga Say, Jacot, A. P., 1938, Psyche, 45 (2–3): 126–128.

Female.—Large, egg-shaped; light red, with a lighter dorsal stripe. Palpus of moderate length, 3rd segment reaching to tip of rostrum; 5th segment long, enlarging normally toward tip 90 μ long and 29 μ wide, with 2 end hairs, 228 μ and 191 μ long, 5 other medium-length hairs; 4th segment 33 μ long and 26 μ wide, with 4 short hairs; 3rd segment 33 μ long and 31 μ wide, with 1 short hair; 2nd segment 180 μ long and 33.3 μ wide, with about 11 short hairs. Mandibles 279 μ long and about 72 μ wide (about 4 times as long as broad), the proximal hair in the basal one-fourth of the segment and the distal about four-sevenths out from base. Rostrum normal, with 2 pairs of fine tip hairs and 6 pairs of ventral hairs. Thorax with strong sclerotized shields [1] connected anteriorly, and on the lateral sides the shields forming a netlike pattern. Anterior sensory setae 116 μ long; posterior sensory setae 133μ long. Anterior thoracic hairs 46.6 μ long; posterior thoracic hairs 67.7 μ long. Abdominal hairs 89 μ long, and posterior abdominal hairs 105.5 μ; abdominal shoulder hair 105.5 μ long. Anal opening on rear and ventral, with 4 pairs of surrounding hairs. Seven pairs of genital hairs. Legs normal; distal ventral hairs of tarsi pilose; approximate leg lengths: I, 693 μ; II, 585 μ; III, 702 μ; IV, 765 μ. Body length with rostrum 1273 μ, width about 558 μ.

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[1] Those mites taken from alcohol had the sclerotized shield bleached, which made it difficult to find. Mites mounted immediately upon discovery had the shields blackish.

The Mexican material consists of a female taken from moss and lichens on the west slope of Mt. Popocatépetl, near the Pass of Cortes, at about 12,000 ft. elevation, December 29, 1942. Another was taken from moss at the Desierto de los Leones, Mexico, December 5, 1943; both collections made by E. W. Baker. Dr. F. Bonet collected four others, one from Monterrey, Nuevo Leon, July 15, 1942; two from Linares, Nuevo Leon, July 13, 1942; and one from Atoyac, Veracruz, May 30, 1941. It is also found from Texas to the east coast of the United States.

Dr. H. E. Ewing has in his personal collection a slide with a single female labeled *Bdella cardinalis* Banks; it was taken under bark of oak, Marshall, Illinois, October 10, 1908.

The bridged shield pattern with few reticulations is the principal difference between this species and *Bdella semiscutata* Sig Thor.

Bdella mexicana, new species

(Figs. 24, 25, 26)

Female.—Small, narrow mite, not rounded as is *Bdella virgata;* abdominal shoulders strong. Palpus short, tip reaching about to tip of rostrum, but in situ much shorter; 2nd and 3rd segments greatly enlarged; 5th segment only slightly enlarged toward tip, 44 μ long and 12 μ wide, end hairs 90 and 76.5 μ long, and 4 other hairs, 1 minute; 4th segment 20 μ long and 12 μ wide, 3 small hairs; 3rd segment 22 μ long and 22 μ wide, 1 small hair; 2nd segment enlarged distally, 55 μ long and 25 μ wide, with about 6 short hairs. Mandibles 150 μ long and 38 μ wide (4 times as long as wide), basal hair one-sixth out from base, distal hair half way out. Rostrum normal, with 2 pairs of tiny tip hairs and 6 pairs of ventral hairs. Thorax without dorsal shields; anterior sensory hairs 88 μ long, posterior sensory hairs about 111 μ long; anterior thoracic hairs 22 μ long, posterior thoracic hairs 27 μ long. Dorsal abdominal hairs 35.5 μ long; abdominal shoulder hairs 66 μ long; posterior abdominal hairs about 44 μ long. Anal opening on rear, with 3 pairs of anal hairs, one anterior-ventral, one centro-posterior, and one dorso-posterior. Eight pairs of genital hairs. Legs appearing normal; distal ventral tarsal hairs pilose; hairs on tarsus I long and numerous. Leg I about 233 μ long; II shorter; III reaching about to posterior margin of body; IV slightly past margin of body. Length with rostrum 540 μ, width at thorax 180 μ, at abdominal shoulders 235 μ.

Type.—U. S. National Museum No. 1464.

The type specimen was taken from moss collected by Mr. Donald Dodds at Valle del Bravo, Mexico, March 4, 1943. Paratype female from moss collected by E. W. Baker at Laguna de Zempoala, Morelos, Mexico, January 31, 1943.

The body shape and rostral hairs distinguish this species from the other closely related ones.

Bdella willisi, new species

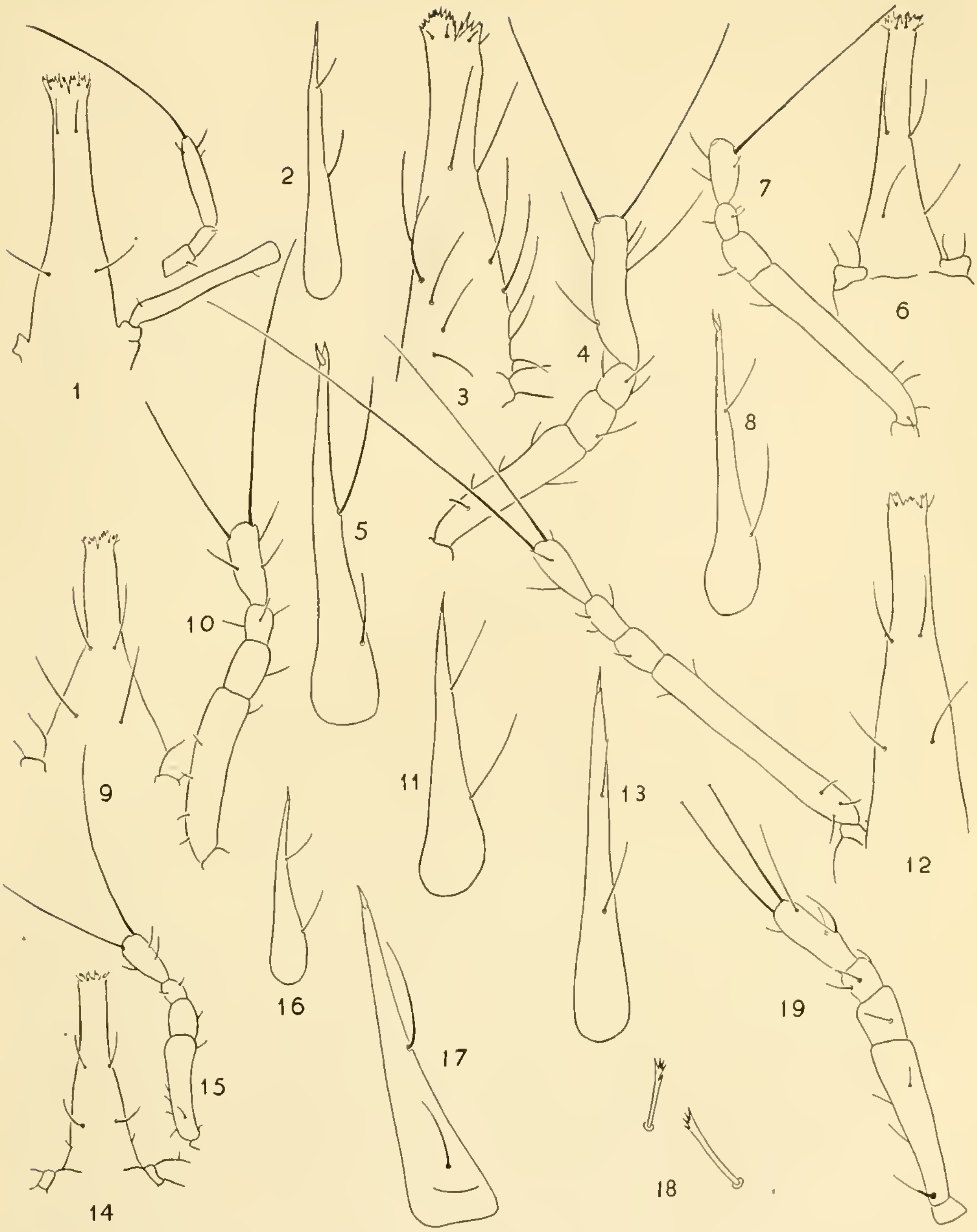
(Figs. 27, 28, 29)

Female.—Smallish, somewhat elongated mite, with strong (wide) abdominal shoulders; body color dark, with lighter thorax and legs. Palpus short, strong, elbowed, in situ not reaching tip of mandible; 5th segment only slightly enlarged toward tip, 44.4 μ long and 13.3 μ wide, 2 end hairs 100 and 78 μ long, 3 other short hairs; 4th segment 15.5 μ long and 13.3 μ wide, with 4 short, fine hairs; 3rd segment 22.2 μ long and 22.2 μ wide, with 1 fine hair; 2nd segment 55.5 μ long and 22.2 μ wide, with 4 tiny hairs, small at base and greatly enlarged at distal end. Mandibles 151 μ long and 38 μ wide (4 times as long as broad), the proximal hair in the lower fourth of the segment and the distal past the center. Rostrum of normal size, with 2 pairs of fine tip hairs and 6 pairs of ventral hairs. Thorax without sclerotized plates; posterior and anterior sensory setae about 78 μ long; posterior thoracic setae 28 μ long, anterior pair 22 μ long. Dorsal abdominal setae 30 μ long; posterior abdominal setae about 40 μ long. Anal opening with 3 pairs of longish hairs. Eight to nine pairs of fine genital hairs. Legs appearing normal; distal ventral tarsal hairs pilose; approximate leg lengths: I, 292 μ; II, 225 μ; III, 283 μ; IV, 297 μ. Body length with rostrum 667 μ, width of abdomen 235 μ, width of thorax 189 μ.

Type.—U. S. National Museum No. 1465.

The type slide of mites from moss, Laguna de Zempoala, Morelos, Mexico, January 31, 1943; paratype slide of mites from lichens, Chapultepec Park, Mexico, D. F., January 3, 1943; collected by E. W. Baker. Named for C. C. Willis.

The 5th palpal segment, rostral hairs, etc., appear to be distinctive to this species.



Monotrichobdella max-osburni, n. sp. Fig. 1, Venter of rostrum. Fig. 2, Mandible.

Biscirus lapidarius (P. Kram.). Fig. 3, Venter of rostrum. Fig. 4, Palpus. Fig. 5, Mandible.

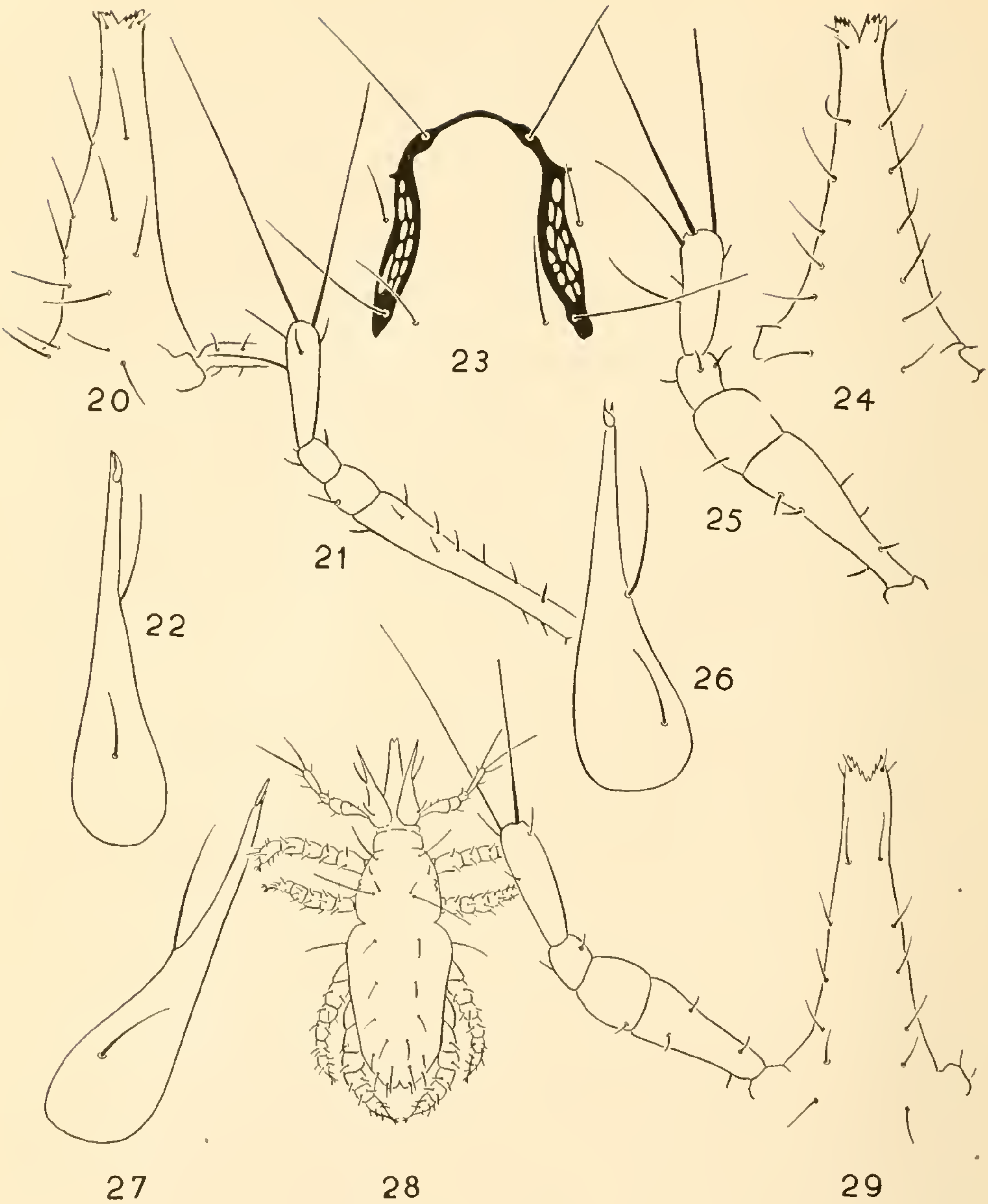
Bdella chapultepecensis, n. sp. Fig. 6, Venter of rostrum. Fig. 7, Palpus. Fig. 8, Mandible.

Bdella rio-lermensis, n. sp. Fig. 9, Venter of rostrum. Fig. 10, Palpus. Fig. 11, Mandible.

Bdella cronini, n. sp. Fig. 12, Venter of rostrum, and palpus. Fig. 13, Mandible.

Bdella virgata Ewing. Fig. 14, Venter of rostrum. Fig. 15, Palpus. Fig. 16, Mandible.

Bdella distincta, n. sp. Fig. 17, Mandible. Fig. 18, Dorsal body hairs. Fig. 19, Palpus.



Bdella oblonga Say. Fig. 20, Venter of rostrum. Fig. 21, Palpus. Fig. 22, Mandible. Fig. 23, Dorsal shield.

Bdella mexicana, n. sp. Fig. 24, Venter of rostrum. Fig. 25, Palpus. Fig. 26, Mandible.

Bdella willisi, n. sp. Fig. 27, Mandible. Fig. 28, Adult. Fig. 29, Venter of rostrum, and palpus.

THE MORPHOLOGY OF THE TEGMINA AND WINGS IN FULGOROIDEA (Homoptera)

By R. G. Fennah

Entomologist, Food-crop Pests Investigation, Windward and Leeward Islands, B. W. I.

Metcalf (1913) published an account of the homologies of the wing veins in certain families of the Fulgoroidea, using the nomenclature of the Comstock-Needham system as then current. Ten years later Muir (1923) briefly discussed Fulgoroid wing-venation and raised the question whether the vein generally termed the costa is not really an anterior (humeral) branch of the subcosta; he recorded that in the tegmen the first branch of the radius was never distinct and free from the remainder, and that the vein associated with the claval suture was a second main branch of the cubitus, and not the first anal vein as hitherto accepted. He considered that "the Y veins of the clavus" were formed by the first and second anal veins, and noted that in some members of the family Fulgoridae a third anal vein is present.

In view of the unsettled homology of the "costa", of the prevailing uncertainty regarding the anterior tegminal veins of the Tropiduchid genus *Alcestis* (Melichar 1914: 142, 144; Muir 1923: 225; Metcalf 1938: 383), and of recent interpretations of R, M, and the cubito-anal group of veins in other orders in the light of fossil and morphological evidence there is room for a reexamination of the morphology of the tegmina and wings of Fulgoroidea.

The relationship of the principal wing veins to those of Orthoptera may be established by reference to their antecedent tracheation, to their convexity or concavity, and to their associations with the axillary sclerites at the wing base.

The disposition of the main tracheal trunks in the tegmina and wings of all Fulgoroidea so far examined by the writer is quite uniform and is shown in Fig. 1. The material dissected included the fore and hind wing-pads of early fifth instars of the following genera: *Oliarus*, *Bothriocera* (Cixiidae), *Peregrinus* (Delphacidae), *Patara* (Derbidae), *Toropa*, *Taosa*, *Dictyophara* (Dictyopharidae), *Laternaria* (Fulgoridae), *Alcestis*, *Cyphoceratops*, *Neotangia* (Tropiduchidae), *Acanalonia* (Acanaloniidae), *Thionia*, *Colpoptera* (Issidae), *Bladina* (Nogodinidae), *Poekilloptera*, and *Ormenis* (Flatidae). The number of dissections made of material in each genus varied between two and fourteen; in the longer series some dissections were discarded because they did not satisfactorily display the oblique basal trachae from which the tracheae of the wing-pads arise. It is not uncommon for this basal trachea during dissection to become broken between M and Cu_1, giving rise to the illusion that the wing pads are each supplied by two distinct tracheae which give off the costo-medial group and cubito-anal group of tracheae respectively; in all cases of such apparent separation seen by the writer a careful examination of the basal trachea revealed the point of breakage between M and Cu_1. No example was found in which the tracheae of the wing-pad truly arose from more than one basal trachea.

Another point which calls for comment is the basal union of the first two tracheae. Muir (1923: 216) refrained from pursuing his speculation that the anterior wing vein in Fulgoroidea is Sc or the humeral vein in deference to two figures given by Metcalf (1913: figs 5 and 27) of the tegmina of *Amphiscepa bivittata* Say and *Thionia simplex* Germar which show the anterior and second veins arising separately from the basal trachea. Muir recorded that in all his own dissections the anterior trachea was seen to arise from the subcosta, a condition shown in Metcalf's figures 8, 23, 28 and 48. The writer found in all dissections that the anterior and second veins join in a short common stalk before entering the basal trachea ("alar bridge" of Muir). The wing pads of fourteen specimens of *Acanalonia* spp. and of ten *Thionia* were dissected specifically to determine whether the condition figured by Metcalf for the anterior veins of *Amphiscepa bivittata* and *Thionia simplex* was typical; in all these dissections the two anterior veins were found to unite basally in a distinct common stalk, and it is concluded that the separate origin of these veins represented in the two figures already mentioned is not typical of the genera of families concerned. (*Amphiscepa bivittata* Say is currently recognized as belonging in *Acanalonia*).

The trachea of the radius and that of the media rise separately from the basal trachea as a single stem which may fork distally. The tracheae of veins Cu_1 and Cu_2 are of interest in being united basally in a common stem which curves posteriorly to lie along the basal trachea before entering it. The vein posterior to this common Cu stem is apparently always simple and curves almost parallel with the basal portion of the Cu stem and enters it at the point of its junction with the basal trachea. Posterior to this single trachea a short stem arises from the basal trachea and forks into two main branches, the posterior of which may give off a delicate ramus following the scutellar margin of the wing pad.

The anterior of these tracheae that lie behind the cubitus possesses the characteristics of the postcubital trachea of other orders in being unforked, in having a separate origin from the basal trachea and in being closely associated with the common base of Cu_1 and Cu_2. The hindmost trachea arising from the basal trachea represents both in its position and its bi-or trifurcate form the trachea which supplies the vannal area of the wings in orthopteroid forms.

Before homologising the tracheae of the wing pads with those of other orders it is necessary to consider the mechanical relationships of the veins of the adult wing which they respectively traverse.

The structure of the articular area of the wings has been found to be uniform in all genera examined by the writer, which include *Pintalia*, *Mnemosyne* (Cixiidae), *Bytrois* (Kinnaridae), *Delphacodes* (Delphacidae), *Derbe* (Derbidae), *Taosa* (Dictyopharidae), *Laternaria*, *Cathedra* (Fulgoridae), *Catonia* (Achilidae), *Neotangia* (Tropiduchidae), *Thionia* (Issidae), *Acanalonia* (Acanaloniidae), *Bladina* (Nogodinidae), and *Poekilloptera* (Flatidae). The elements composing the articular area, as exemplified by those found in *Taosa* and *Poekilloptera* respectively are shown in Figs. 5 and 6.

The tegula, which roofs over the axillary region of the tegmen, is attached at the middle of its inner surface to the anterior margin of the articular membrane. Just distad of this point of attachment a small lobe is developed on the anterior margin and at maturity becomes sclerotised as a semilunate plate, the *humeral plate*, sometimes bearing a minute peg-like eminence at its distal angle. The anterior wing vein, in all cases examined, was found to be approximated basally to this plate, but separated from it by a very narrow groove of flexible membrane. This vein, therefore, whether lying along the wing margin or some distance remote from it bears the anatomical relationship of the costal vein of other orders, while its tracheation agrees with that of the primitive costa as envisaged by Lameere.

There is no trace of a precostal vein in the ontology of Fulgoroidea so far studied by the writer, nor does such a vein appear to have been detected in any fossil ascribable to this superfamily.

The precostal area of the tegmina, which is found in Flatidae, Ricaniidae, Nogodinidae, Lophopidae, Eurybrachydidae, and certain Fulgoridae Tropiduchidae, and Issidae, appears to have arisen independently in each. In the Fulgorid genus *Laternaria* the narrow precostal area is formed by the dorsal sclerotised arch basally overlying the costal trachea becoming elevated, then bent forward, and finally more distally being produced in a short lamina, as shown diagramatically in fig. 8. In the primitive Fulgoroid tegmen, as seen in *Pintalia* or *Mnemosyne*, the anterior edge of the sclerotised tract above the costal trachea is beset with a regular row of microtrichia. In forms with a precostal area this row is carried forward on the anterior margin of the expanding area but retains its association with the haemocoelic channel in which the costal trachea lies by means of a series of channels from the haemocoele underlying the microtrichia to the peritracheal haemocoele. In *Laternaria* the channels are irregular and frequently anastomose; in the Tropiduchidae they are regular and usually oblique distally; in many species of this family which are not regarded as possessing a precostal area the separation of the microtrichous tract from the trachea in the distal portion of the costa gives rise to a series of tenuous oblique blood channels. The only difference between such channels and transverse precostal veins is that in the latter the integument overlying these channels is sclerotised to a perceptibly greater degree than that overlying the areas between the channels. The cross-veins of the precostal area in certain families such as Flatidae and Nogodinidae are traversed by slender tracheal filaments arising from the costal trachea (fig. 11). In these families the disposition of the marginal microtrichia and the regular development of the transverse sclerotised bars in the basal portion of the precostal area indicate that this area has been developed by a uniform protraction of the primitive sensillar margin without any accompanying torsion.

In the hind wing of adult Fulgoroidea the costal trachea is marginal and the overlying sclerotised arch simple. It may be noted, however, that the hind wing pads of certain Flatidae such as *Ormensis antoniae* Mel. possess a series of short transverse precostal blood channels which become obscured in the adult wing (cf. fig. 3).

It appears to have been the difficulty of accounting for the presence of a precostal area in the tegmen—"a condition recognized in no other order of insects"—that led Muir (1923: 216) to suggest that the apparent costa in Fulgoroidea is really the humeral vein or Sc, and not the homologue of the orthopteroid costa. According to this view the precostal area which lies anterior to the presumed Sc would have to be regarded as the costal cell which had persisted after the primitive marginal costal vein had disappeared. The theory, however, is beset with two difficulties: It is under the onus of demonstrating how the supposed humeral vein acquired in Fulgoroids the same relationship to the humeral plate as the costal vein bears to it in other orders of insects, and secondly it would necessitate the conclusion that in species which have a vein along the anterior margin of the tegmina the vein Sc has acquired this position as the result of a further tegminal specialization in which the costal cell has been lost in addition to the loss of the costal vein. If this were the sequence of modification then tegmina with a precostal area (the "costal cell" of the above theory) would have to be considered more primitive than those without it (where it would be presumed to have been lost). This would imply that the tegmina of Flatidae or Ricaniidae were more primitive in this respect than those of Cixiidae or Tettigometridae, a conclusion which would not be acceptable to workers familiar with this superfamily, and would not have been acceptable to Muir, who wrote (1923: 217) "I consider that the most normal and primitive type of venation of recent Homoptera is to be found among the Cixiidae.".

Some of the most curious modifications of the costa are to be found in the Tropiduchid genus *Alcestis.* In this genus platygenesis of the tegmen has been brought about by expansion of the costal cell. In some species a precostal area is developed: it is usually small and situated in the basal half of the tegmen, but in *A. lunata* Fen. the greater part of the costa is remote from the margin (fig. 7). Whatever the position this anterior vein may assume, its relation to the humeral plate remains constant. In a few Otiocerine Derbidae (e. g. *Sayiana*) the costal margin is produced near the base and more or less reflected dorsally.

The subcostal trachea, which basally forms a common stalk with that of the costa, is always approximated to the trachea of the radius in the region adjoining the anterior end of the M-Cu strut. In the tegmina of some families and in hind wings generally Sc and R lie apposed for the greater part of their length and are covered by a common sclerotised roof. At its base the sclerotised wall of the vein passes in front of the second axillary sclerite to associate with the anterior point of the first axillary, a relationship characteristic of this vein in other orders. In species having supernumerary veins in the tegmina, Sc may give off distally several secondary branches; in less specialized Fulgoroidea, however, it is either simple or forks once near the apex and typically joins the anterior margin at the apex of the costa, which may be slightly curved posteriorly, as in Cixiidae, or rather markedly so, as in Achilidae. The point where the costa and Sc meet at or near the margin is the *node* (nodus) and is of importance mechanically in being the anterior termination of the transverse line of weakness along which the relatively flexible membrane is hinged to the more coriaceous disc of the tegmen. The cell enclosed by the margin and the distal veinlets of Sc in certain families becomes differentiated as the *stigma*, either by an increase in thickness brought about by minutely vesicular sclerotisation (fig. 9) and corresponding pigmentation, as in most Cixiidae, or by increased pigmentation alone, as in Dictyopharidae; while sometimes only the basal portion of the cell may be thickened, as in some Kinnaridae, or the thickening may occur without increase in pigmentation, as in some pale Cixiidae. In Cixiidae the stigma is traversed near its posterior border by the costal trachea and a branch of the subcosta which lie side by side, the latter having curved anteriorly at the base of the stigma to lie close to the costa; distad of this point both tracheae curve away from the margin and almost form the posterior border of the stigma.[1]

In families in which supernumerary venules have been developed the distal portion of Sc breaks down into a correspondingly greater number of branches which follow the same general course as the single vein. In such cases the node occurs where the anterior venule meets or most closely approaches the costa, and this may occur at a point remote from the margin of the tegmen, as in the Fulgorid genus *Laternaria.* The stigma is usually not developed in forms with a precostal area, but its position may be indicated by a close grouping of the transverse subcostal veins, as in Nogodinidae (fig. 10). An interesting modification of this arrangement is found by the Apatesonine Achilidae, where the disto-stigmal area is traversed by a series of subcostal veinlets, though the tegminal venation as a whole is reduced. In some genera of this family the stigmatal sclerotisation may occur in two adjoining marginal cells, as this part of the tegmen accommodates both a hinge and a fold-line.

The trachea of the radius is usually forked and both branches may give off veinlets distally. The anterior primary branch of this vein has been identified by Tillyard (1926: 142) as R_1, his conclusion being based on the convexity of this branch in the fossil Scytinopteridae; the distal branches, which are primitively two, are accordingly R_{2a} and R_{1b} respectively. The posterior primary branch of the radius, which is concave in Scytinopteridae, is the radial sector and in this family reaches the margins unforked, but in recent Fulgoroidea is usually forked. The convexity of the anterior main branch of the radius has not been observed by the writer in the most primitive forms of Recent material so far examined, as in the distal portion of the tegmen, where this vein is separate, the primitive folding has been lost. The very marked convexity of the common basal stem of R, in which is included the concave Sc, indicates the presence of R_1 in this portion. The radius is associated at its origin with the second axillary sclerite.

The media arises from the basal trachea as a single stem which forks distally, usually into two main branches. The common basal stalk of this vein appears to be concave in the hind wing of such forms as *Laternaria*, and the vein would appear to represent only the posterior branch of the primitive media, the anterior convex branch having been lost. In the adult tegmen M subtends the greater part of the apical margin, and reaches its

[1]Carpenter (1939) has shown that in the Archescytinidae Sc is approximated to R as far as the margin and that this common vein forms the proximal boundary of the stigma in this group while a branch of R forms its distal boundary. This is a specialization which removes the Archescytinidae from the direct line of ancestry of all recent Fulgoroidea.

greatest complexity in *Derbe*, where it gives off a series of parallel branches to the margin; in the wing it is comparatively simple, usually forking once, though occasionally, as in *Derbe*, it may be many-branched. At the base of M in the tegmen an oblique sclerotised strut, always devoid of a preceding or accompanying trachea, is developed between M and the base of Cu_1 (fig. 14). On this strut, or, in a few species, on Cu_1 near it, a vertical plate or peg is produced by heavy sclerotisation (see notes on the external wing-folding apparatus below).

The tracheae Cu_1 and Cu_2 arise from the basal trachea on an elongate stem. Cu_1 is typically forked distally (Cu_{1a} and Cu_{1b}) while in the wing secondary branching is common and this vein frequently subtends a considerable portion of the apical margin. The vein Cu_1 is strongly convex, being with R the most prominent vein in the tegmen. Cu_2 is markedly concave, and leaves Cu_1 near the base and passes without forking to the commissural margin. Cutting across its base and lying immediately anterior to it in the tegmen is the claval suture, a thin flexible line along which the clavus is hinged to the main body of the tegmen. In every specimen so far examined by the writer Cu_2 lies posterior to the suture, which anteriorly is bordered by a very narrow sclerotised band which is less conspicuous than the Cu_2 vein, and unlike the latter is not tracheate nor ornamented with macrotrichia in those species which possess them. Tillyard (1926: 158) has rather unfortunately termed the fulgoroid second cubital vein the *vena dividens* on the ground that it separates off "the very distinct anal area or *clavus* from the rest of the wing". Such a vein is not homologous with the "*vena dividens*" in the forewing of Orthoptera, nor with the true counterpart of the latter in the hind wing of certain Fulgoroidea.

The trachea which follows the Cu stem arises separately at its base and lies close against it, curving forward before turning obliquely backward and outward. This trachea is always simple, and the vein which it traverses in the mature tegmen is unattached basally and is unforked, meeting at its apex in the tegmen the vein lying close to the commissural margin to form the so-called Y vein of the clavus. Its separate tracheal origin, its close approximation to the base of Cu and its lack of attachment to the third axillary sclerite reveal this vein to be the postcubitus of Snodgrass, a vein regarded by Comstock and Needham in Homoptera as the second anal and by Tillyard as the first anal.

In the larger Fulgoridae such as *Laternaria* or *Cathedra*, a spurious concave vein is formed in the wing between the post cubital and first anal vein. This vein is weak, devoid of a basal portion and of a corresponding trachea. Its interest lies in the fact that it is this vein which should be termed the *vena dividens*, as it is an exact counterpart, though independently acquired, of the supernumerary vein of the same name found in Orthoptera, being adventitious, concave, and dividing off the remigial area from the vannal. No *vena dividens* of this type is developed in the tegmen.

The last of the primary wing tracheae arises from the basal trachea just posterior to the point of attachment of the post cubital, and curves outward and obliquely posteriorly, forking into two or three branches not far from its point of origin. In the mature tegmen the vein which is traversed by the anterior of these branches is firmly hinged at its base to the distal arm of the third axillary sclerite. When this tripodal sclerite rocks on its anterior and proximal points of attachment in response to the pull of the flexor muscle on its inner face the vein is pulled into parallelity with the axis of the body, thus folding the wings. By its possession of these tracheal and morphological characters this vein is established as the first anal vein of the orthopterous wing pattern. In the hind wing the first anal vein generally forks once, and behind the posterior branch lies a furrow along which the vannal portion is hinged. This is the *anal furrow*, a structure not present in the tegmen as a functional element, but perhaps vestigially represented by the line of deflexion of the commissural margin of the clavus.

The posterior trachea arising from the common anal stem traverses the second anal vein in the adult, and passes down the posterior margin of the tegmen as far as the apex of the clavus, and in the wing lies somewhat arcuately across the inner portion of the vannal area. In families where this area is large the vein gives off approximately at right angles two or three delicate atracheate struts to the inner margin of the vannal fold. In the Issid genus *Thionia*, which possesses an exceptionally large anal lobe in the wing, the second anal vein forks distally and may give off five ultimate branches to the distal margin.

The vannal area of the tegmen is not supplied with veins, and is reduced to a small triangular membranous area lying between the third axillary sclerite, the inner (scutellar) margin of the clavus and the axillary cord.

An axillary cord is present in fulgoroidea, both in the tegmina and wings, joining the inner end of the hind margin to the end of the posterior marginal fold of the respective alinota.

There are several structures in the fulgoroid wing which though of little morphological significance are functionally important. These comprise the anterior and posterior nodes, the nodal line, the accessory wing-locking mechanism, the wing coupling apparatus and, when present, the tegminal stridulatory organs.

In many families of Fulgoroidea the distal field of the tegmina, occupying very approximately one-third of the total remigial area, is thinner and more flexible than the basal area. In some genera, such as the fulgorid *Scaralis* or the tropiduchid *Remosa*, the difference in texture between the two areas is obvious; the quasi-heteropterous condition thus produced has led systematists to adopt the terms "corium" and "membrane" for these areas. The membrane is hinged to the corium along a line from the junction of C and Sc to the apex of the clavus, where Cu_2 meets the commissural margin. This hinge is the *nodal line*. The line is frequently translucent (as in some Cixiidae), and does not interrupt the main longitudinal veins, but may be marked by a series of transverse bars which may lie in a straight line or, as is more usual, in zig-zag formation with each section being progressively displaced towards the base. Along this line sclerotised transverse struts are developed, devoid of tracheae. In some Flatidae (e. g. *Antillormenis*) the nodal series of such transverse "veins" is absent or very irregular and the line of flexion can be seen as an oblique transparent depression. The posterior end of the hinge adjoins the apex of the clavus and is developed as a *claval node* between the apex of the united Pcu and A_1 vein (the "Y vein"), the tip of Cu_2 and that of a recurrent branch of Cu_{1b} (fig. 13). In the families Fulgoridae and Achilidae Cu_2 does not approach the Pcu-A_1 common vein distally, so that the end of the clavus is open, and the clavus is terminated by the hinge line being produced beyond the claval node to the commissural margin (cf. fig. 12). In families where the tegmina are wholly coriaceous (Issidae, Acanaloniidae) or where the tegmina are much narrowed distally (Flatidae: Selizini) the nodal hinge line is absent.

Cross veins in the form of atracheate sclerotised struts appear to have been acquired independently by several families. In general they are few in small forms, or may be absent, and their number and complexity appear to be broadly correlated with the size of the tegmina and wings. They are more numerous in the tegmina than in the wings. On the corium they are usually irregularly developed and in some genera branch or anastomose; if the tegmina are heavily sclerotised the cross-veins may be absorbed into the general corial surface, though their presence is detectable by suitable illumination (examples of such modification are provided by the fulgorid *Scaralis* and Issidae such as *Thionia* or *Colpoptera* and members of the subfamily Hemisphaeriinae or by those of Calisceline Dictyopharidae or Hiracine Tropiduchidae). In the membrane, the cross veins are usually more or less at right angles to the longitudinal veins. In certain families (such as Fulgoridae, Dictyopharidae, and Tropiduchidae) there is a tendency for cross veins to be arranged progressively more regularly in the membrane in proportion as they become fewer. In the Ricaniidae, Nogodinidae and Cryptoflatine Flatidae the cross veins of the membrane generally tend to be regular, and may be confined to a single even line subparallel to the apical margin, lying distad of the nodal line. This line is the *apical line* of Muir (1st subapical of Melichar), and terminates posteriorly at the apex of the clavus, while anteriorly it may curve basally to join the apical portion of the costa, or, as in some Cryptoflatini may end abruptly against one of the distal branches of the radius.

In Fulgoroidea the tegmen and wing of each side are coupled together during flight and form a single flight organ, with the stiff tegmen forming the remigium and the wing the functional vannus. The means by which this coupling is effected appears to be uniform throughout the superfamily: The wing margin at the apex of the costa is curved upward and looped slightly posteriorly and this engages with a minute ledge developed on the deflexed commissural margin of the clavus. In some species, a few minute spinose macrotrichia are present on the costa of the wing just basad of the marginal fold, but it is very doubtful whether these play any part in uniting the wings.

An accessory wing-locking apparatus is present on the base of each tegmen and wing ventrally and is apparently employed to adjust the wings and tegmina into their normal position of rest. It comprises (1) a vertical plate or peg developed on the ventral surface of each tegmen by a sclerotic outgrowth from the oblique strut between M and Cu_1, or on Cu_1 itself near the point of junction with this strut, and (2) an eminence on the ventral surface of Sc+R basally in the wing bearing a group of setae directed vertically downward. These setae may be sparse (about four are present in Cixiidae and as few as two in some Delphacidae), or may form a dense tuft (as in large Fulgoridae such as *Laternaria*). As the tegmina close, the tegminal plate presses on the base of the anterior wing margin and holds the latter in their folded position. The group of setae below Sc in each wing presses against the lateral field of the metanotum, and perhaps also enters a cavity below the wing base, and possibly by its resilience keeps the anterior portion of the wings in contact with the tegmen while at rest. In the genus *Derbe* and probably other Derbinae no sclerotised plate is developed on the tegmina at the base of Cu_1, and it would seem that in this genus the ventrally sclerotised base of Sc+R, which projects prominently downward, performs a similar function. The tegmina when closed are partially kept in position by the scutellar margin of the clavus fitting into the reversed notal suture of the mesonotum lying above the lateral fields of the mesoscutellum and between the mesoscutum and the posterior alinotal fold.

Organs of stridulation occur on the wings of certain derbid genera and are considered to be present also in some Araeopidae (Kirkaldy 1907: 7, 8, and Pl. XX). They are developed in both sexes. In Derbidae a portion of the inner margin of the anal lobe of the wing is thickened and corrugated. When the wing is jerked upward this corrugated plate is rapidly scraped across a group of setae situated on the side of the third abdominal tergite (fig. 15).

The plate on the anal lobe is formed by the inward prolongation of the minute sclerotised band that binds the hind margin of the wing, and the parallel ridges on it are produced by the inward extension of every second member of the series of sclerotised loops that support the marginal band (fig. 17). The prominence of this stridulatory area varies greatly in different species; in Zoraidine Derbidae, some Derbinae, certain Cenchreini such as *Patara*, and Otiocerini (*Otiocerus*) it is conspicuous. In Cenchreine genera such as *Cedusa* and *Neocenchrea* it is obscure, and it is difficult to ascertain whether its traces are of functional value or not. In the aræopid *Perkinsiella vitiensis*, a member of a genus in which stridulation has been reported, the sclerotisation at the point where the corrugated plate occurs in Derbidae is scarcely more pronounced than elsewhere on the inner margin, while the same is true of species of *Delphacodes* seen by the writer and it would seem questionable whether in such cases effective stridulation is possible by this means. In *Derbe*, the anal border of the wing is emarginate and the basal portion projects as a rather narrow subrectangular lobe (fig. 18). This is pigmented but not appreciably thickened. The margin of the lobe is minutely spiculate, as is the whole of the posterior wing margin in this genus. A group of setae occurs on each of the lateral fields of the third abdominal tergite. It is possible that in this large species the general sclerotisation of the anal lobe is adequate for sound production. The setae over which the marginal plate is drawn are directed outward and downward (fig. 16). They are generally similar, except perhaps in point of size, to the setae sparsely scattered over the abdominal sclerites, and the group may have been formed by a local congregation of such setae.

In addition to the stridulatory organs found on the wings, many species of Derbidae bear series of large setiferous plates on the tegminal veins. These may occur on the common stem Sc+R, on M, Pcu, and A_1. In *Derbe* a row of 12 to 15 lies along Sc+R, while a series of four occupies the basal part of M. The Cenchreine genus *Patara* has them on Sc+R, Pcu and A_1, *Neocenchrea* on Pcu and A_1 only, while they are absent or very obscure in the genus *Cedusa*.

These structures occur only on the veins. Each consists of a subtriangular orifice, with the lip strongly raised on the proximal side, and a small round plate set immediately below the uppermost part of the orifice. From this plate a long slender seta projects horizontally distad, i. e., posteriorly, when the tegmina are folded (fig. 19). The tegminal veins in general are studded with minute setae, each of which arises from an oval or rounded plate. It would seem that these larger plates have originated by an elaboration of one of the smaller type. The function of the long seta is unknown, but the plates themselves exude filaments of pearly wax. Metcalf (1938: 304,313) refers to these organs as stridulatory, but it is difficult to see against what they could be rubbed as they cannot be apposed to any other part of the body, including the tegmina of the opposite side in all positions. They are not confined to species which possess a stridulatory apparatus: they are absent or very reduced in *Otiocerus* which has stridulating organs, and abundantly present in *Neocenchrea* which has apparently none.

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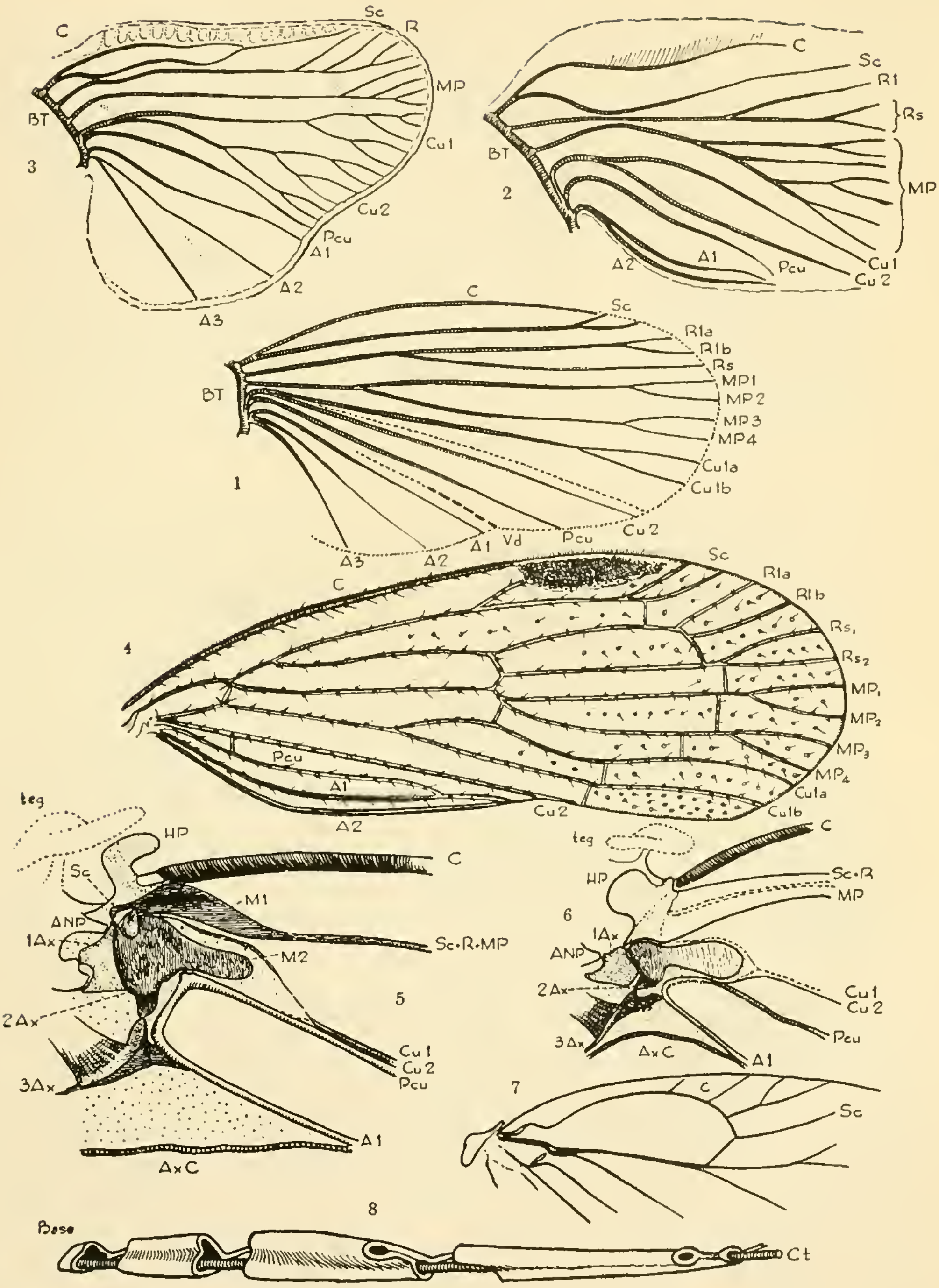
Explanation of Plates

(Plate 14)

1. General plan of tracheation of Fulgoroid wing.
2. Tracheae of fore wing pad of *Poekilloptera phalaenoides* (L.) (Flatidae).
3. Tracheae of hind wing pad of *Poekilloptera phalaenoides* (L.).
4. Tegmen of *Mnemosyne arenae* Fen. (Cixiidae), an example of a generalized fulgoroid wing type.
5. Base of right tegmen and axillary sclerites of *Taosa herbida* Walk.
5. Base of right tegmen and axillary sclerites of *Taosa herbida* Walk. (semi-diagrammatic).
6. Base of right tegmen and axillary sclerites of *Poekilloptera phalaenoides* (L.) (semi-diagrammatic).
7. Anterior portion of right tegmen of *Alcestis lunata* Fen.
8. Diagram showing mode of development of pre-costal area in tegmen of *Laternaria* (Fulgoridae).



3
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Rs
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MP4
Cu1a
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BT
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Vd
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C
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Rs1
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MP1
MP2
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MP4
Cu1a
Cu1b
Pcu
A1
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Cu2
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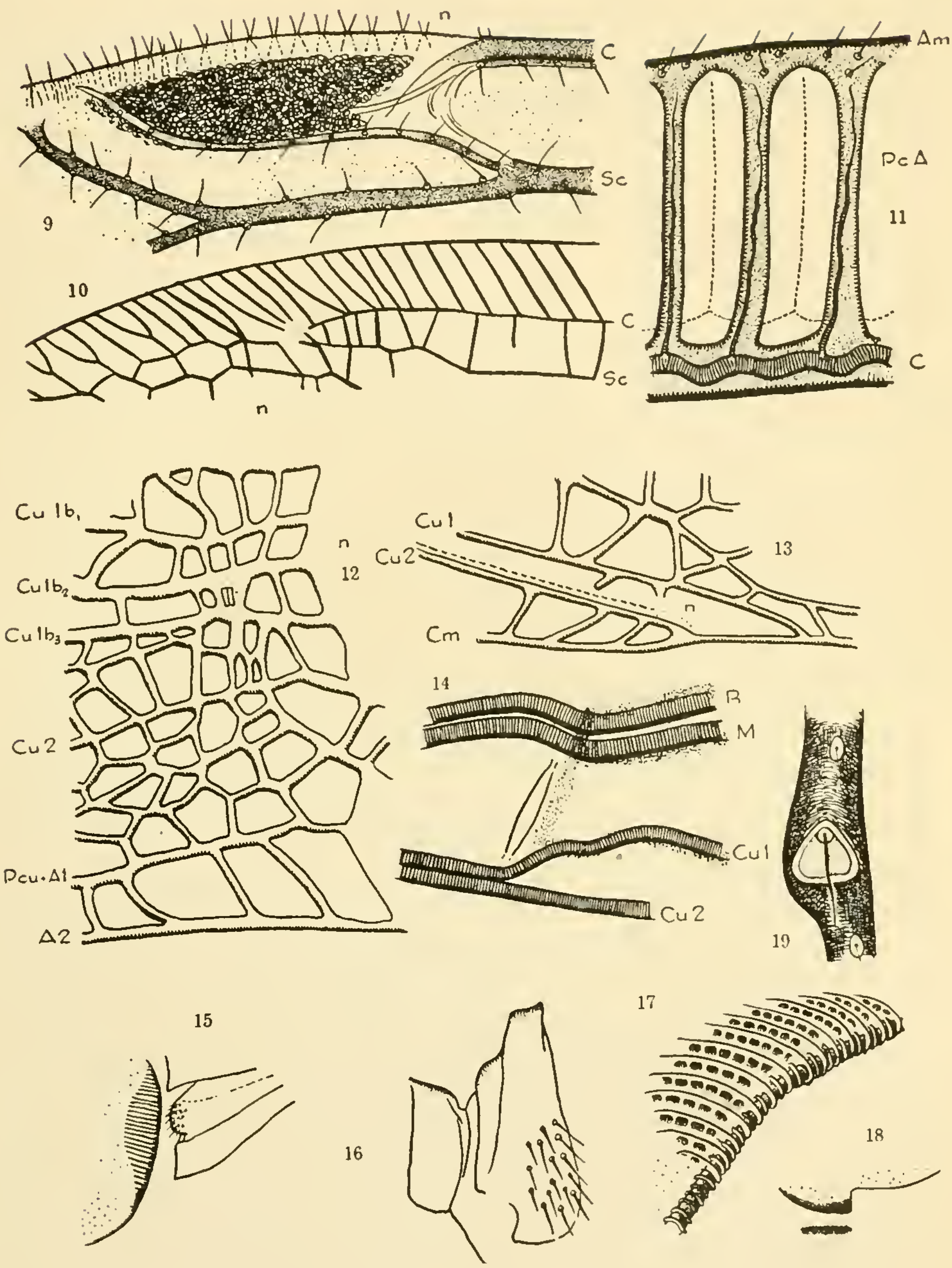
HP
Sc
C
M1
ANP
1Ax
Sc·R·MP
M2
2Ax
Cu1
Cu2
Pcu
3Ax
A1
AxC
6
teg
C
Sc·R
HP
MP
1Ax
ANP
2Ax
Cu1
Cu2
Pcu
3Ax
AxC
A1
7
C
Sc
8
Base
Ct

(Plate 15)

9. Stigma and node in left tegmen of *Mnemosyne arenae* Fen.
10. Precostal area and node in left tegmen of *Bladina* (Nogodinidae).
11. Portion of costa and precostal area of *Ormenis antoniae* Mel. (The dotted lines show lines of great attenuation of the membrane.)
12. Posterior node at apex of Cu_{1b} in right tegmen of *Laternaria* (an example of this structure in an open clavus).
13. Posterior node between apices of Cu_1 and Cu_2 in right tegmen of *Bladina* (an example of this structure in a closed clavus).
14. The atracheate sclerotised M-Cu basal strut and accompanying pigment band in right fore wing pad of *Alcestis lunata* Fen.
15. Stridulatory apparatus of *Patara* sp. (Derbidae), showing corrugated margin of anal lobe of wing and setae on side of abdominal tergite (dorsal view, semi-diagrammatic).
16. Side view of base of abdomen of *Patara* showing setose portion of stridulatory apparatus.
17. Diagrammatic representation of structure of marginal corrugation on anal lobe of wing in *Patara*.
18. Dorsal view of portion of emarginate anal lobe of wing of *Derbe* (Derbidae), showing pigmented but not corrugated margin zone, and (below) minute setae on lateral portion of adjacent abdominal tergite.
19. Wax-bearing plate on tegminal vein of *Derbe*.

Explanation of Lettering

A1, A2, A3—First, second and third anal veins.
A. m —Anterior margin of tegmen.
ANP —Anterior notal wing process of tergum.
1Ax, 2Ax, 3Ax—First, second and third axillary sclerites.
Ax. C—Axillary cord.
BT —Basal trachea.
C —Costa.
C. m —Commissural margin of tegmen.
Ct —Costal trachea.
Cu1, Cu2—First and second branches of Cubitus.
HP —Humeral plate.
MP —Posterior branch of primitive Media.
M1, M2—First and second median plates.
n —Node.
P-c. a—Precostal area.
Pcu —Postcubital vein.
R —Radius.
Rs —Radial Sector.
Sc —Subcosta.
teg —Tegula.
V. d. —Vena dividens.


9
n
C
Sc
10
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A NEW SERICOTHRIPS FROM BRAZIL (Thysanoptera: Thripidae)

By J. C. Crawford

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

This species is described at the present time because its name is needed in connection with a study of insect vectors of plant diseases by the Instituto Biologico, São Paulo, Brazil.

Sericothrips sidae, new species

Female (macropterous).—Length (fully distended) 1.2 mm. Head brown, with a slight reddish tinge, the occipital line almost black, protergum [1] well delimited by being light brown, the dorsum elsewhere translucent light yellow, mesoscutum and metanotum dark brown, metapostnotum very light brown, abdominal terga I–VI light brown (in immature adults the brown not completely covering the terga), VII–IX dark brown, X and the median apical margin of IX light brown in fully matured adults (in the lighter specimens not yet fully colored these parts almost white), sterna of pterothorax and abdomen beyond segment VI dark brown; coxae rather dark brown, femora light brown, distinctly lighter at bases and apices, tibiae and tarsi very lightly tinged with brownish, forewing dark brown basally, including most of anal lobe, subhyaline beyond to between the first and second setae of the row distad of the basal series of three, thence dark brown to apex of wing; all body setae, including those on appendages, dark brown; antennal segments I and II brownish yellow, III yellowish white but faintly brownish just beyond a narrow whitish line at base and again at circlet of major setae, IV with pedicel light brown, beyond shading from very light brown to dark brown just before circlet of major setae, lighter brown beyond this; V shading from very light brown at base to dark brown at apex, VI–VIII dark brown.

Head broad, widest across eyes, eyes protruding, cheeks almost straight, strongly converging posteriorly, slightly notched at juncture with eyes; whole dorsal aspect with dark, close, sparsely anastomosing lines, those back of occipital line slightly closer and more delicate; occipital line marking the posterior margin of a poorly defined groove; interocellar setae inserted well back of median ocellus, 24 μ long and 20 μ apart; inner pair of postocellars 60 μ apart, 36 μ long, outer pair of anteocellars 36 μ long, somewhat longer than inner pair; posterior ocelli about 12 μ in diameter, 32 μ apart; pedicels of antennal segments IV and V very short, VI not pedicellate; antennal segments III and IV strongly narrowed to apices but not vasiform; frontal costa almost rectangularly emarginate, interval between bases of antennae 22 μ.

Thorax having the protergum with transverse, subparallel, dark lines about 2 μ apart, the rest of dorsum with the lines wider apart, but very infrequently anastomosing, not forming reticles; seta at posterior angle about 54 μ long, between posterior angulars a single pair of setae 33 μ long; discal setae mostly confined to a transverse row near anterior margin of dorsum and a row near

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[1] This is the saddle-shaped mark of the pronotum, or the pronotal blotch of authors, but it is the true tergum, that is, the sclerotized portion of the dorsum, as defined by Snodgrass, "Principles of Insect Morphology," 1935, p. 82.

anterior margin of tergum; tergum widely, shallowly emarginate anteriorly, posterior margin more deeply but narrowly emarginate; mesoscutum with close, dark, transverse lines, those on the extreme anterior portion very fine and close but readily discernible (under a magnification of 440 diameters); vein of fore-wing with 3+ about 15 setae, 2 setae in a row posterior to vein and close to apex of wing; hind wing with a median longitudinal dark stripe fading out just before apex of wing; legs not excessively long, hind tibia 204 μ long.

Abdomen with the minute pubescence black, absent on median part of segments II–VIII, except a basal median patch, and completely absent on segment IX; antecostal line deep black on terga II–VIII, present but not so dark on terga IX and X; comb complete on tergum VIII, the medial teeth 20 μ long, on tergum VII with teeth on median fifth either barely discernible stubs or more or less irregular teeth hardly half as long as those laterad; on other segments the comb widely interrupted.

Measurements (in microns). Head, median length 100, greatest width, across eyes, 152, least width, at base, 124; prothorax, median length 124, width 180.

Antenna:	1	2	3	4	5	6	7	8
	23	41	56	52	46	54	12	14

Male (macropterous).—Length 0.95 mm. Smaller than, but very similar to, the female except in sedondary sexual characters and with abdominal terga I–VII light brown, the apical median portion of tergum IX and all of X only slightly lighter in shade than the preceding terga; groove in front of occipital line better defined; comb on tergum VII widely interrupted medially.

Measurement of antenna (in microns):

1	2	3	4	5	6	7	8
20	36	52	46	40	43	9	12

Type locality.—São Paulo, Brazil.

Host.—*Sida rhombifolia* L.

Type Catalog No. 56959, U. S. National Museum.

Described from 10 females and 2 males received from Sr. R. L. Araujo, of the Instituto Biologico, São Paulo, Brazil, with the information that this species was used in the study of insect vectors of infectious chlorosis of malvaceous plants.

In its general color pattern this species resembles *Seriocothrips basilaris* Hood from Cuba, but differs in its antennal formula, in not having antennal segments 3 and 4 vasiform, in the heavily marked antecosta of terga 8–10, in the well-delimited protergal mark, and in sculptural details.

MINUTES OF THE 546th REGULAR MEETING OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON, MAY 4, 1944

The 546th regular meeting of the Society was held at 8 P. M., May 4, 1944, in Room 43 of the National Museum. Vice President Poos presided and there were 31 members and 19 visitors present. The minutes of the previous meeting were read and approved.

New members were elected as follows:

Lt. George E. Bohart (H-V(S)), U. S. Naval Reserve.
Lt. (j. g.) Richard M. Bohart (H-V(S)), U. S. Naval Reserve.

Dr. Poos pointed out that it was most unusual to have brothers elected to membership at the same meeting.

Mr. Sailer called the attention of the Society to a subfamily in the *Naucoridae* described Dr. R. L. Usinger under the name *Potamocorinae*. The material on which the subfamily is based was collected in Paraguay, and it is distinguished from the rest of the *Naucoridae* by the small size of the species. The specimens exhibited were presented to the National Museum by Dr. G. B. Hungerford.

Mr. Snodgrass said that he had examined the feeding mechanism of fleas and found that the supposed mandibles are unquestionaly laciniae of the maxillae, and also that the supposed labium is in reality the hypopharynx. Details will be published later.

Comment by R. A. Cushman followed.

Dr. Siegler passed around samples of 2 new insecticides. The first, DD Mixture is a 50–50 mixture of Dichloropropylene 1:3 and Dichloropropane 1:2, and is especially useful as a soil fumigant. The second, DDT (or Dichloro-diphenyl-trichloroethane), is a whitish powder insoluble in water, has a very low vapor pressure, and is an unusually promising insecticide.

Mr. R. A. Cushman read part of a letter from John D. Sherman, who wrote of a visit to Dr. L. O. Howard and his pleasure in finding Dr. Howard still actively interested in entomologists and their doings.

Dr. G. F. MacLeod presented the first paper on the regular program: Potential Relation of Insect Nutrition to Insect Control.

If we consider plant feeding insects, without necessarily excluding pests of animals, however, there are three basic assumptions of interest in the subject under discussion.

1. The food of any given plant varies.
2. The composition of any given plant varies.
3. The food of any insect feeding on any given plant varies.

The specific question to be examined can be stated thus: Is it possible to control destructive insect pests of plants by changing the food of plants, thus creating nutritive disturbances which will weaken or kill the insects which feed upon them?

The literature affords proof that selenium in soils is taken up by plants and kills insects or mites feeding on such plants. This has been demonstrated to be true for aphids and mites feeding on wheat, rye, oats, and corn. In field experiments it has been shown that selenization of soils on which cotton was growing provided practical control of several hemipterous insects. The concentration of selenium required to do this is too low to adversely affect plant growth.

The work of De Long with the toxicity of bordeaux mixture on potato plants to potato leafhoppers is too well known to need much discussion. While there may be some question as to the particular compound or mechanism involved, the protection afforded potato plants from leafhoppers with bordeaux sprays is recognized.

There is also recorded the fact that bean plants treated with derris sprays absorbed or adsorbed and translocated some compound which prevented the re-establishment of aphid colonies on those plants. Recently rabbits fed DDT and pyrethrum were found to have in their tissues or blood streams some ingredient toxic to bed bugs which fed on the rabbits.

Results of research work in California definitely proved that the toxicity of naphthalene fumes to red spiders varied with the host plant upon which they were feeding.

The evidence now available in the literature definitely indicates that crop infesting insects may be killed or their susceptibility to economic poisons changed through changes in nutritional background of the plants on which they feed. Both organic and inorganic chemicals have been used to alter plant constituents to a degree where the insect enemies were affected with no visible changes in plant vigor. (Author's Abstract.)

There was discussion by Hambleton, Rohwer, Snodgrass, Packard, and Poos during which Mr. Hambleton mentioned that a similar phenomenon is observed in the varying reaction of bees to the same disease in different localities, which might indicate that food was involved; Mr. Packard said that there is evidence to indicate that the pea aphid on alfalfa only attacks those parts of the plant that are alkaline in reaction, which suggests the possibility of changing the chemistry of plants to make them distasteful to insects; Dr. Poos stated that in tests with the potato leaf hopper it had not been possible to get the plants to absorb enough copper to kill the insects on the hosts used.

The second paper on the regular program was read by Mr. Arthur D. Cushman: The Delineation of Insects.

The task of a scientific illustator of insects is the production of minutely accurate, neatly executed representations of insects or parts of them. Economy of reproduction usually must also be considered. The techniques necessary vary with almost every specimen. Drawing has advantages over photography in that salient points of difference may be emphasized although not over-exaggerated. The inherent lack of discernment and shallow focal plane at high magnifications provide the greatest limitations for the camera in scientific illustration.

The most important consideration in scientific drawing is that the parts as well as the whole "work". That is, by mechanical exactness they are automatically correct in form and proportion. Insects lend themselves particularly well to this concept. This applies as well to the simple sketches prepared for bulletins and folders, and such drawings, although having the aspect of cartoons, should be accurate in all of the details shown.

There are six fundamental tools or techniques used in pen and ink rendering. The master key to all techniques is the convention of a fixed light source which makes possible the representation of depth by shading. The combination of structural shading and color values sometimes produces extremely difficult technical problems. (Author's abstract.)

Mr. Cushman exhibited a series of lantern slides. Comment followed by R. C. Smith, Mr. Snodgrass, and Mrs. James.

The following visitors were introduced to the Society:

C. A. Clark of the European Corn Borer Parasite Laboratory at Toledo, Ohio.

Lt. C. A. Wilson of the U. S. Public Health Service.

As there was no further business, the meeting adjourned at 9:50 P. M.

Ina L. Hawes,
Recording Secretary.

Actual date of publication, October 31, 1944.

ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions........................	$3.00
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A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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F. M. WADLEY,
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VOL. 46 November, 1944 No. 8

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 25, 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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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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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 46 NOVEMBER, 1944 No. 8

STUDIES ON MOSQUITOES FROM THE PHILIPPINE ISLANDS AND AUSTRALASIA (Diptera: Culicidae)

By ALAN STONE, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture*, and RICHARD M. BOHART, *Lieutenant (jg) H–V(S), USNR., U. S. Naval Medical Research Unit No. 2.*

A large amount of mosquito material from the islands of the Pacific has become available for study as a result of recent extensive collecting by Army and Navy personnel. In the identification of these specimens several new species have been discovered, as well as a need for a revision in our concept of some others previously described. This paper is presented to make the names of 8 new species and 2 new subgenera available for those engaged in mosquito work in the Pacific area, and to point out characters that will separate species which have been confused in the past. We are particularly indebted to entomologists of the Army and Navy for submitting this material for study. Holotypes of all the new species are deposited in the U. S. National Museum.

Figures 1 to 10 were drawn by R. M. Bohart, figures 11 to 14 by Arthur D. Cushman.

THE AEDES (FINLAYA) KOCHI GROUP

Mosquitoes of the *kochi* group are characterized by having spotted wings with broad wing scales, many-banded femora, banded or spotted tibiae and tarsi, spotted or variegated abdomen, indefinite yellowish or whitish scutal pattern, both broad, appressed, and narrow, curved scales on the vertex and on the scutellum, and outstanding scales apically on some of the abdominal sternites. Superficially the group separates into two color types: Black and whitish species such as *kochi*, *poicilia*, *knighti*, and *samoanus;* and black and yellow species such as *flavipennis*, *avistyla*, *aranetanus*, *wallacei*, and *solomonis*. A study of male genitalia, however, indicates that *solomonis* is much more closely related to *kochi* than to *aranetanus* or *flavipennis*.

Brug (1934) points out differences among *kochi*, *samoanus*, *poicilia*, and *aranetanus* in the claspette (harpago) of the male. In order properly to appreciate such differences the claspette should be removed from the genitalia and mounted separately in order to obtain a profile view. The apical bladelike portion of the claspette is slender and sharply pointed in *aranetanus*, *flavipennis*, *avistyla*, and particularly in *poicilia*. It is sharply pointed but broadly triangular in *samoanus*, whereas in *knighti*, *kochi*, and *solomonis* it is rather broad with the apex blunt.

It appears likely that all species of the group breed in water collected in plants. All known larvae have characteristic stellate hairs on the thorax and abdomen.

Key to Adults of the Kochi Group

1. Femora without prominent, apical, ventral tufts of long outstanding scales; tarsi mostly yellow, spotted with black 2
   Femora with prominent, apical, ventral tufts of long outstanding scales.. 3
2. Abdominal tergites 2 to 4 with lateral margins almost entirely yellow, particularly in the male, or with yellow in longitudinal streaks (Philippines) .... *aranetanus* (Banks)[1]
   Abdominal tergites 2 to 4 with lateral margins dark or variegated, yellow markings appearing as spots or transverse, irregular marks, not as longitudinal streaks (Philippines) .... *flavipennis* (Gile).
3. First hind tarsal segment white and yellow, spotted with black, or at least with more than 3 pale rings; second and third with black reduced. 4
   First hind tarsal segment with 3 whitish rings; second and third with broad basal dark bands 5
4. Fourth hind tarsal segment black and yellow, second and third yellow with narrow rings of white and black; apical three-fifths of proboscis in female largely or wholly yellow (Solomons)... *solomonis*, new species.
   Fourth hind tarsal segment all black, second and third white with narrow rings of yellow and black; proboscis of female with a median yellow ring (New Ireland) .... *wallacei* Edwards.
5. Pale bands of second and third hind tarsal segments about one-fourth the length of the segments (New Georgia) .... *knighti*, new species.
   Pale bands of second and third hind tarsal segments one-third to one-half the length of the segments 6
6. Wing with 4 to 5 white spots on apical half of costa; female palpus with apical third above snowy white (India and Malaysia) .... *poicilia* (Theobald).
   Wing with not more than 3 pale spots on apical half of costa; female palpus with less than apical fourth pale 7
7. Dark costal spot just beyond middle of wing usually at least twice as long as the following pale spot (New Guinea, New Britain, New Ireland, Solomons, Queensland) .... *kochi* (Doenitz).
   Dark costal spot just beyond middle of wing usually less than twice as long as the following pale spot (Samoa) .... *samoanus* (Gruenberg).

[1] We have not seen specimens of *avistyla* Brug (1939), but judging from Brug's discussion and figures it would probably run to *aranetanus*, from which it can be separated by male genitalia.

Key to the Kochi Group Based on Male Genitalia

1. Dististyle with a strong subapical prong on the inner side............ 2
   Dististyle without a prong on inner side............................ 3
2. Basistyle with a subapical, ventral scale tuft in addition to the inner scale tuft..................................... *aranetanus* (Banks).
   Basistyle only with an inner scale tuft.................. *avistyla* Brug.
3. Basistyle without a specialized seta arising on the inner surface between the claspette and the scale tuft................................ 4
   Basistyle with a specialized seta arising on the inner surface between the claspette and the scale tuft.................................. 6
4. Dististyle strongly bent at apical third; basistyle ventrally with 3 very strong bristles toward base and a clump of 5 to 6 strong bristles near apex.................................... *flavipennis* (Giles).
   Dististyle somewhat curved but not strongly bent; basistyle without strong bristles arranged as above................................ 5
5. Longest scales of scale tuft less than half the length of the basistyle..... *poicilia* (Theobald).
   Longest scales of scale tuft about half the length of the basistyle........ *knighti*, new species.
6. Specialized seta with basal half about as broad as apical half; a row of strong lateroventral bristles running from base to apex of basistyle.... *samoanus* (Gruenberg).
   Specialized seta with basal half very slender, apical half flattened and enlarged... 7
7. Basoventral patch of bristles on basistyle only slightly concentrated basally...................................... *kochi* (Doenitz).
   Basoventral patch of bristles on basistyle extending as far apically as scale tuft, but concentrated basally into a well-defined circular clump.. *solomonis*, new species.

Aedes (Finlaya) aranetanus (Banks)

(Fig. 3)

Finlaya aranetana Banks, 1906: 1001.
Aedes flavipennis (Giles), Edwards, 1922b: 465 (in part); 1926: 105; 1932: 149; Brug, 1934: 513; 1939: 107.

Following Edwards (1922b) this species has been treated as a synonym of *flavipennis* (Giles) and was discussed and figured under that name by Brug (1934, 1939). It differs markedly in the male genitalia as shown in figures 3 and 4. The species is known only from the Philippines, where Banks (1906) recorded it as breeding in the axils of banana leaves.

Material studied: 1 ♀ and 2 ♂♂ cotypes, Negros Occidental; 1 pair, Fort McKinley, Rizal, Luzon; 1 ♀, Camp Stotsenberg, Pampanga, Luzon.

Aedes (Finlaya) avistyla Brug

(Fig. 5)

Aedes flavipennis avistyla Brug, 1939: 107.

According to Brug (1939) this species is hardly separable from *aranetanus* (given by Brug as *flavipennis*) except in the male genitalia, which have only a single scale tuft in *avistyla*. The type series from Celebes and Boeton was collected as larvae in leaf axils of taro and in a bamboo stump. As figured by Brug, the postclypeal hair (d) of the larva has 3 to 4 branches, the lower head hair (B) has 2 branches; the siphon is bare with an index of about 2.4, and with 7 to 10 pecten teeth.

Aedes (Finlaya) flavipennis (Giles)

(Fig. 4)

Finlaya flavipennis Giles, 1904: 366.

Popea lutea Ludlow, 1905: 96.

Aedes flavipennis (Giles), Edwards, 1922b: 465 (in part); 1926: 105; 1932: 149.

The species is known only from the Philippine Islands. According to Ludlow (1905) the holotype male of *lutea* from Camp Stotsenberg was collected near banana trees.

Material studied: A long series of specimens labeled "*Popea lutea* Ludlow, P. I."; a series of specimens labeled "P. I."; and 1 ♀ from the island of Samar.

Aedes (Finlaya) solomonis, new species

(Fig. 9)

Aedes flavipennis (Giles), Knight, Bohart, and Bohart, 1944: 68.

Male.—Length 3–4 mm., wing 2.4–2.6 mm. Median area of vertex with broad, appressed, dark, and some pale, scales, mixed with narrow, curved, whitish and upright, forked, dark scales, a few pale, upright scales anteriorly; sides of vertex with broad, appressed, white scales and a spot of dark ones. Torus dark brown with a patch of small, broad, yellow scales on inner side. Proboscis about one-fourth longer than fore femur, rather stout, median dorsal line mostly yellow, undersurface and sides of basal half clothed with somewhat outstanding black scales, apical two-fifths with a mixture of yellow and dark scales. Palpus slightly longer than proboscis, slightly swollen apically, banded and spotted with yellow and white scales, penultimate segment mostly white and yellow, apical segment dark in middle. Scutum with mixed narrow, curved brown and whitish scales, the latter in indefinite patches; pronotum with broad appressed white scales, posterior pronotum with a few yellow, and sometimes with a few black, broad scales; scutellum with black, yellow and white, broad, appressed scales and a few narrow, curved, pale ones. Pleuron with 2 or 3 postspiracular and no lower mesepimeral bristles; dark brown with many white, broad scales in an irregular band and a patch beneath it. Wing elaborately spotted with yellow, white, and dark brown, broad scales, 4 large, irregular, pale spots along front margin, 2 of which are beyond middle of wing; fork of vein 2 slightly basad of that of vein 4. Halter all yellow or with a few dark scales on knob. Legs: Coxae black with some pale scales; femora whitish to yellow, and with many spots and bands of dark scales, apices with prominent tufts of long, outstanding, yellow and black scales; tibiae and tarsi mostly yellow, spotted with black; first hind tarsal with apical, basal, and medial white bands, second and third hind tarsals whitish apically and narrowly dark basally, fourth hind tarsal yellow with a variable amount of black, fifth all yellow; outer claw of fore and mid tarsi with a strong tooth, hind tarsal claw simple. Abdomen mostly yellow dorsally, with median indistinct dark spots and some scattered dark scales; venter mostly dark scaled with some yellow and white scales and many long golden hairs, outstanding dark scales at apices of sternites V to VII. Genitalia (fig. 9): Basistyle about 3 times as long as width at base, with a long membranous inner surface bearing a long tuft of scales and a hair patch medially, many curved hairs and a specialized seta basally; claspette long, slender, flattened toward apex, which is narrowly rounded; basistyle with a basoventral patch of bristles extending as far apically as scale tuft but concentrated basally into a well-defined circular patch, about 7 moderately long, lateral bristles, stronger apically, many other smaller bristles and lateral scales; dististyle slender, slightly curved, apical spine about three-fifths as long as dististyle; lobes of ninth tergite with 1 or 2 bristles; mesosome simple.

Female.—Differs from male chiefly as follows: All upright scales of vertex dark, proboscis slightly shorter than fore femur, apical two-thirds yellow, basal third dark; palpus about one-fourth as long as proboscis, white-tipped and with a few other pale scales. Mid and hind tarsal claws simple. Abdomen mostly dark above, tergites II to V usually with 3 yellowish median spots.

Larva.—Very similar to *Aedes samoanus* (Gruenberg) but differing chiefly as follows: Postclypeal hair (d) with 4 to 6 branches, lower head hair (B) with 3 to 4 branches; gills somewhat longer and more slender; siphon with an index of about 2.5, very finely pilose, and with 10 or more pecten teeth.

Holotype.—♂, Guadalcanal, Solomon Islands, March 1, 1944, reared from larvae taken from palm tree (Lechner collector). Paratypes: 9 ♂♂ and 13 ♀♀, same data as holotype; 3 ♂♂ and 7 ♀♀, Bougainville, Solomon Islands, April 7, 1944 (C. R. Bruck); 1 ♂, Bougainville, March 6, 1944, reared from larvae collected in "axils of plants in swamp" (A. B. Gurney); 3 ♂♂, 1 ♀, Bougainville, April 24 and May 12, 1944, reared from larva taken from "Arum-like plant in swamp" (A. B. Gurney); 1 ♀, Bougainville, April 27, 1944, reared from larvae from *Pandanus* trees (A. B. Gurney). Type material deposited in U. S. National Museum (Cat. No. 56977), British Museum, and University of Sydney.

This species is remarkably similar in coloration to *aranetanus*, but the shaggy apices of the femora and the male genitalia clearly indicate a close relationship to *kochi*. The latter is superficially very different, however.

Aedes (Finlaya) wallacei Edwards

Aedes wallacei Edwards, 1926: 105; Taylor, 1934: 234; Knight, Bohart, and Bohart, 1944: 34.

This species is known only from New Ireland. It was recorded by Taylor (1934) as breeding "exclusively in the axils of the leaves of the various species of *Pandanus*." Taylor further stated that the species entered houses to bite during the night.

Aedes (Finlaya) knighti, new species

(Fig. 7)

Male.—Length 3.5 mm., wing 2.2 mm. Vertex clothed with 5 spots of white, and 4 spots of dark, broad, appressed scales, median area with a sprinkling of dark, upright, forked, and pale, narrow, curved scales. Torus brown with a patch of small, broad, yellow scales on inner side; proboscis about one-fourth longer than fore femur, basal half mostly dark, yellowish median ring fairly broad, apical third mostly dark above and with at least a broken line of pale scales ventrally. Palpus slightly longer than proboscis, basal half with 3 broad, pale bands, penultimate segment mostly dark, last segment with middle third dark. Scutum with mixed brown and pale yellow, narrow, curved scales, the latter in indefinite patches; pronotum with broad, appressed, yellowish scales on both lobes; scutellum with narrow and broad, yellowish scales, a patch of broad, dark scales on median lobe. Pleuron with about 5 postspiracular bristles and no lower mesepimeral bristles; an irregular band of broad, whitish scales and a patch beneath it. Wings spotted with groups of broad, pale, and dark scales, 4 large pale spots along front margin, 2 of which are beyond middle of wing; fork of vein 2 somewhat basad of that of vein 4. Halter all pale. Legs: Coxae brown with small patches of pale scales; femora with many black and whitish bands, apices with moderate tufts of long, outstanding, yellow and black scales; tibiae with 6 to 8 black and a similar number of whitish bands; first hind tarsal with 3 narrow white bands, second and third with apical white bands which are hardly one-fourth as long as their segments, fourth hind tarsal all black, fifth all white; outer claw of fore and mid tarsi with a strong tooth, hind tarsal claw simple. Abdomen yellow above, variegated with dark scales, apically mostly yellow; venter mostly dark scaled with some yellowish scales and many long golden hairs; outstanding dark scales at apices of sternites VI and VII. Genitalia (fig. 7): Basistyle about 3.5 times as long as broad at base, with a long membranous inner surface bearing a long tuft of scales and a hair patch medially, many curved hairs but no large specialized seta basally; claspette long, slender, flattened toward apex and blunt; basistyle with about 7 moderately long lateral bristles in addition to many smaller bristles and lateral scales; dististyle slender, slightly inflated medially, less than half as long as basistyle, apical spine at least three-fourths as long as dististyle; lobes of ninth tergite with a single bristle; mesosome simple.

Holotype.—♂, and 2 ♂♂ paratypes, Rendova Is., New Georgia Group, Solomon Islands, August 1943 (K. L. Knight). Types in the U. S. National Museum (Cat. No. 56978).

The restricted white bands on the second and third hind tarsal segments distinguish *knighti* from the 3 similarly marked species of the group, *kochi*, *samoanus*, and *poicilia*. The male genitalia are similar to those of *poicilia* in lacking the specialized seta of the basistyle and in having a short dististyle with a long apical spine. However, *knighti* differs from *poicilia* in having a longer scale tuft and a stouter basistyle.

Aedes (Finlaya) poicilia (Theobald)

(Fig. 6)

Finlaya poicilia Theobald, 1903: 283; 1907: 520 (in part); 1910: 464 (in part).

Finlaya poicilipes Theobald, 1903: xvii, plate 13 (lapsus).

Finlaya poialia (Theobald), Giles, 1904: 366 (emendation?).

Aedes poicilia (Theobald), Edwards, 1922a: 260; 1922b: 465; 1924: 380; 1932: 149.

Aedes kochi poicilia Edwards, 1926: 104; Brug, 1931: 23; 1934: 513.

Aedes poecilius (Theobald), Barraud, 1934: 157 (emendation).

According to Barraud (1934), *poicilia* occurs in India, the Malay Peninsula and Archipelago, and the Philippines. The type locality is Penang, Straits Settlements. The larval habitat is recorded as the leaf axils of taro and *Crinum* in Java. The larva, described by Brug (1931), has a finely pilose siphon, 3-branched postclypeal hair (d), and 2-branched lower head hair (B).

Material studied: A long series of specimens from Mindanao, Luzon, and Samar. Some of the Luzon (Camp Stotsenberg) specimens were reared from a hole in a banana tree.

Aedes (Finlaya) kochi (Doenitz)

(Fig. 10)

Culex kochi Doenitz, 1901: 38.

Finlaya poicilia Theobald, 1907: 520 (in part).

Aedes kochi (Doenitz), Edwards, 1924: 380 (in part); 1926: 105; 1932: 149; Brug, 1934: 513; Knight, Bohart, and Bohart, 1944: 34.

There are specimens in the U. S. National Museum from New Guinea (type locality), New Britain (Rabaul), Solomon Islands (Bougainville, Treasury, Florida, Guadalcanal), and Queensland (Palm Island and Malanda). It has also been recorded from New Ireland, Tulagi, and Fiji. However, the specimens from Fiji may represent an undescribed species, according to the description of the larva and male genitalia given by Edwards (1935). A larva from Fiji in the U. S. National Museum resembles that of *samoanus* in having the siphon bare instead of finely pilose as in *kochi*.

Aedes kochi has been reported as frequently entering habitations and as breeding in axils of *Pandanus* and taro and in coconut shells.

The larva closely resembles that of *solomonis*. It differs in having the postclypeal hair (d) with 6 to 8 branches, the lower head hair (B) with 5 to 6 branches; the siphon somewhat more strongly pilose, with an index of about 4.0, and with no more than 8 pecten teeth.

Aedes (Finlaya) samoanus (Gruenberg)

(Fig. 8)

Finlaya samoana Gruenberg, 1913: 130.

Aedes kochi samoana (Gruenberg), Edwards, 1926: 105; 1928: 44; 1932: 149; Brug, 1931: 23; 1934: 513.

Aedes kochi (Doenitz), Buxton and Hopkins, 1925: 298.

Aedes samoana (Gruenberg), Edwards, 1935: 129.

Aedes samoanus (Gruenberg), Knight, Bohart, and Bohart, 1934: 34.

The adult of this species is very similar to that of *kochi*. The markings are somewhat variable and identification is best made on the basis of the small specialized seta of the male basistyle. It is probable that the species is restricted to Samoa, Tonga, and associated islands. All the specimens in the U. S. National Museum are from Samoa. The record of a female *samoanus* from Roviana, New Georgia, made by Paine and Edwards (1929) may refer to *knighti*.

According to Edwards (1928), *samoanus* is a persistent and irritating night biter. The larvae are found in the axils of *Colacasia*, *Alocasia*, and *Cyrtosperma*. The larva has been described by Buxton and Hopkins (1925). From an examination of a series of larvae in the U. S. National Museum, the species is characterized by having the postclypeal hair (d) with 2 to 4 branches and the lower head hair (B) with 2 branches; gills somewhat stouter than in *kochi;* siphon bare, with an index of about 2.4, and with 8 to 10 pecten teeth.

NEW SUBGENERA AND SPECIES OF AEDES

LUZONUS, new subgenus

Mottled species with very broad-scaled and spotted wings. Male antenna with hairs directed mainly dorsally and ventrally. Male palpus (broken) with first 2 segments as long as seven-eighths of proboscis. Proboscis about two-fifths longer than front femur in male, swollen on apical one-fourth in male, apical one-fifth in female. Vertex and scutellum with both broad and narrow scales. No lower mesepimeral bristles. Fore and mid tarsal claws of male with a basal tooth, hind tarsal claws simple. Eighth sternite of female not retracted; cerci very small. Male genitalia with simple, apically spined dististyle, tenth sternite lobe 3-toothed, mesosome simple, claspettes absent.

Subgenotype, *Aedes* (*Luzonus*) *clavirostris*, new species.

This subgenus resembles *Finlaya*, but the absence of claspettes and the apically swollen proboscis in both sexes are distinctive.

Aedes (Luzonus) clavirostris, new species

(Fig. 2)

Male.—Length about 3.5 mm., wing 3 mm. Median area of vertex with narrow, curved, creamy-colored and upright forked, brown to creamy scales, vertex laterally with a small patch of broad, appressed, black scales and a large patch of broad, appressed, whitish ones. Torus dark brown with many small, oval, yellow scales on inner and dorsal surfaces; proboscis about two-fifths longer than front femur, basal one-fifth dark with some outstanding scales beneath, following two-fifths slender and yellow, apical two-fifths swollen and with black and yellow scales mixed. Palpus broken beyond second segment, basal half and apex of second segment mostly dark, bristles inconspicuous except at apex of second segment. Scutum with narrow, curved, pale and dark scales arranged in indefinite patches; pronotum with small, broad, appressed scales, cream-colored on anterior pronotum, mostly dark on posterior pronotum. Scutellum with broad, appressed, dark and cream-colored scales, some narrow, curved, pale scales on lateral lobes. Pleuron with a few dark integumental spots below anterior spiracle, broad cream-colored scales in a small patch on postspiracular area, other cream-colored scales in 4 inconspicuous patches; apparently 2 postspiracular bristles. Wing speckled with very broad mostly heart-shaped black and yellow scales not arranged in definite spots, fork of vein 2 basad of that of vein 4. Halter yellow basally, brown-scaled on knob. Legs: Coxae partially dark scaled; femora in front mostly dark-scaled speckled with pale scales, mostly pale behind on mid and hind legs; tibiae yellow, speckled with brown, and with a dark apical spot; tarsi yellow, first segment speckled and with a subapical dark spot, second tarsal with 2 dark spots, third tarsal with a broad, dark, median spot, fourth and fifth tarsals with some dark median scales most numerous on hind legs. Abdomen with a median dorsal stripe of dark scales, sides of tergites and venter yellow with a speckling of dark scales, venter with many long golden hairs. Genitalia (fig. 2): Dististyle slender, tapering, with a short apical spine; basistyle with a pair of long, inner basal bristles, no claspettes; lobe of tenth sternite with 3 apical teeth; mesosome simple.

Female.—Differs from male chiefly as follows: Apical swelling of proboscis smaller and comprising only one-fifth of its length, proboscis about one-third longer than front femur; palpus about one-sixth as long as proboscis.

Holotype.— ♂, Camp Nichols, Rizal, Luzon, Philippine Islands, December 14, 1924 (G. McDonald). Paratype: 1 ♀, Camp Stotsenberg, Pampanga, Luzon, Philippine Islands, October 18, 1922. Type material in U. S. National Museum (Cat. No. 56979).

The superficial resemblance of *clavirostris* to *Aedes* (*Finlaya*) *flavipennis* (Giles) and *A.* (*Finlaya*) *aranetanus* (Banks) is remarkable. Among other points the unbanded femora, swollen proboscis, and broader wing scales of *clavirostris* readily distinguish it, however.

LEVUA, new subgenus

Dark species, without ornamentation. Scales on vertex narrow and curved medially, broad and appressed laterally. Proboscis somewhat longer than fore femur, not swollen. Palpus of female scarcely longer than clypeus, of male about one-fifth length of proboscis. Male antenna not strongly plumose. Scutellum probably with narrow scales only. No lower mesepimeral bristles. Claws of female all simple; inner fore claw of male toothed. First hind tarsal segment shorter than hind tibia. Cerci of female long. Male genitalia: Basistyle with basal lobe but no apical lobe; dististyle rather short, with stout subapical spine; claspette present, with slender terminal filament; mesosome simple; ninth tergite with prominent lobes.

Subgenotype, *Aedes* (*Levua*) *suvae*,[1] new species.

This subgenus most closely resembles *Geoskusea*, but the presence of claspettes and the very differently shaped dististyle and its terminal spine readily separate it. The female differs from *Geoskusea* in having the median scales of the vertex narrow.

Aedes (Levua) suvae, new species
(Fig. 11)

Male.—Length about 3 mm., of wing 2.35 mm. Head dark brown; vertex medially with narrow, curved, brown scales, laterally with broad, appressed, dark scales; many erect, forked, dark scales. Torus orange brown, with a few narrow, dark scales; flagellum orange brown, the verticils composed of 10–12 evenly spaced hairs. Palpus dark, straight, slightly widened apically. Proboscis slightly longer than fore femur. Scutum rather dark orange brown, the scales slender, curved, brown, the setae abundant, nearly black. Pronotum without scales; scutellum slightly paler, with very few scales (probably denuded); postnotum bare, yellow brown; pleuron orange brown, paler along the sutures, without scales except for a few broad, appressed, purplish-brown ones on sternopleuron. Wing with scales entirely dark, those on costa, subcosta, and vein 1 somewhat broadened, the rest narrow. Halter with stem yellow, the knob darker, with dark, rather broad scales. Legs dark brown, the coxae yellowish. Abdomen dark brown. Genitalia (Fig. 11): Basistyle rather stout, with stout setae on ventral margin near middle and 3 or 4 very stout setae on inner margin near apex; a round, flattened, setose, basal lobe; a short claspette, with densely setose stem and short attenuated filament; dististyle rather stout, curved, with a stout, short, curved, black subapical spine; mesosome oval, setose, with a median fold; tenth sternite with rounded, heavily sclerotized apex; ninth tergite somewhat triangular, with short setae from tubercules on the inner surface.

Female.—Length 4 mm., length of wing 3 mm. As in male except as follows: Palpus about length of clypeus, the last segment flattened and turned inward;

[1] Since the manuscript of this paper went to the printer, we have received a copy of the "Mosquito Control Training Manual," by David W. Amos, printed by the Fiji Times & Herald, Suva, 1944. In this publication, what appears to be this species is given under the name of *Aedes geoskusea*. This inadvertent use of a subgeneric name as a specific name apparently validates it as a specific name, and hence *geoskusea* replaces *suvae*.

verticils of flagellum with 5–6 setae; postnotum darker; eighth tergite and cerci pale yellowish brown, the latter long oval.

Larva.—Length 6 mm. Head distinctly broader than long. Antenna slender, tapering slightly and evenly, its length slightly less than one-half width of head; a very few fine spicules on apical half; hair tuft 2-branched, placed slightly before middle. Clypeal spines moderately stout, yellow, curved downward and slightly inward; anteantennal hair (A) with about 8 branches; lower head hair (B) single, about as long as antenna, placed about on line between hairs A; upper head hair (C) with 5–6 branches, placed almost directly behind B; no postclypeal hair (d); sutural hair (e) and transutural hair (f) both double. Thorax: Prothoracic submedian hairs in a longitudinal row, the anterior one short, double, the other two longer, single, the posterior one longest; a small multiple tuft posterior and laterad of these. Mesothoracic pleural hair and metathoracic pleural hairs each with a very short basal spine. Abdomen: First segment with 1 single and 1 double lateral hair; lateral hairs of segments 2–4 double. Comb scales of eighth segment in a large patch, the individual scales very small, yellowish, broadened apically, with an apical fringe; eighth segment with 2 siphonal tufts, one short and multiple, one longer and single; 2 large, multiple subsiphonal tufts; 2 anal tufts, 1 single, 1 triple. Siphonal index about 3, tapering very little; pecten of about 15 evenly spaced teeth on basal half, each with 1, or occasionally 2, fine lateral teeth; a large multiple tuft, with a swollen base, a short distance beyond the pecten. Dorsal saddle of anal segment small, indistinctly defined; dorsal hair group a long single hair and a shorter multiple tuft; gills 4, very short and stout, the ventral pair slightly longer than the dorsal pair; ventral brush well developed.

Holotype.—♂ and paratype ♀, Suva, Fiji, 1944, collected by S. T. Helms. Types in U. S. National Museum (Cat. No. 56980).

The larval description is based on five specimens collected in crab holes at the type locality by S. T. Helms.

Aedes (Geoskusea) daggyi, new species

(Fig. 12)

Male.—Length 3–4 mm., wing 2.4–2.7 mm. Scales of head broad, appressed, dark brown, with lavender reflections, a few near eye margin yellowish; erect scales of vertex dark brown. Torus dark brown, without scales. Proboscis dark brown, about one-fourth longer than fore femur, the basal three-fifths compressed, the apical portion depressed. Palpus about one-sixth to one-seventh length of proboscis, slightly swollen apically. Thorax rather dark brown, somewhat paler along the pleural sutures and bordering the supra-alar area; pronotum without scales; scutum with dark brown, lanceolate scales; scutellum with rather broad, appressed, dark-brown scales. Several strong sternopleural bristles; no lower mesepimeral bristles; a few broad, yellowish scales on sternopleuron and upper mesepimeron. Wing scales all dark brown, mostly narrow; fork of vein 2 slightly distad of that of vein 4. Halter pale yellow, with knob dark brown. Legs: Coxae yellowish brown, the fore coxa with brownish scales anteriorly, the hind coxa with pale yellow-brown scales; rest of legs with dark-brown scales except for yellowish scales on posterior surfaces of fore and mid femora ventrobasally and on anterior and posterior surface of hind femur on basal half or more; hind tibia on apical half posteriorly with semi-erect scales but with only a few scattered bristles; first hind tarsal segment with similar scales on basal fourth ventrally; outer claw of fore tarsus with a strong tooth; claws of mid and hind tarsi simple. Abdomen dark brown with basal yellow bands, broadened at sides and greatly narrowed or even broadly interrupted medially. Genitalia (fig. 12): Basistyles nearly 6 times as long as width at base, with a large ventrally directed lobe at apical third; portion of basistyle basad of this lobe strongly bowed outward, the portion beyond parallel with that of other side; lobe acuminate, about as long as dististyle, heavily clothed with fine yellowish hairs on the somewhat flattened median surface; basistyles with setae the entire length, finer and denser on inner surface of curved portion; dististyle about one-third length of basistyle, narrow, with an apical spine about half as long as dististyle; lobes of ninth tergite small, each with 2 or 3 setae; mesosome simple.

Female.—Only slightly larger than male; structure as in male except for the sexual differences in the antenna and abdomen, and the simple tarsal claws; proboscis slightly shorter in relation to fore femur. Color as in male.

Larva.—Length about 6 mm. Head slightly broader than long; antenna slender, tapering slightly and evenly, its length about one-half width of head; spicules sparse and fine; hair tuft 2–4 branched, placed slightly before middle. Clypeal spines very slender, nearly straight; anteantennal hair (A) with about 10 branches; lower head hair (B) single, longer than antenna, placed slightly posterior to hair A; upper head hair (C) nearly as long as hair B, 2–3 branched, located about width of antenna from hair B and at 45 degrees; the two C hairs about 3.5 times as far apart as C is from B; postclypeal hair (d) very small, about 3-branched, the branches again branched; sutural hair (e) simple; transutural hair (f) with 4 or 5 branches. Thorax: Prothoracic submedian hairs; inner long, double, median short, multiple, outer rather short. 2-branched, the median one most posterior, the outer one most anterior. Mesothoracic pleural hair group with a rather short basal spine; metathoracic pleural hair group with a very short basal spine. Abdomen: Lateral tuft of first segment with 1 triple and 1 single hair, of segments 2–4 double. Comb scales of eighth segment in a large patch, the individual scales very small, yellowish, broadened apically, with an apical fringe; eighth segment with 2 siphonal tufts, one short and double, one longer and single; 2 larger subsiphonal tufts, one with 4 hairs, one single; 1 anal tuft with 6 short hairs. Siphonal index about 2.4; pecten of about 16 evenly spaced teeth on basal half; each tooth with 1, or occasionally 2, lateral spines; tuft of 3 hairs, situated about length of pecten tooth from end of pecten. Dorsal saddle of anal segment not reaching middle of side; dorsal hair group a long single hair and a shorter tuft; gills 4, stout, about as long as saddle; ventral brush well developed.

Holotype.— ♂, Espiritu Santo, New Hebrides, July 24, 1943, R. H. Daggy. Paratypes: 15 ♀♀, 53 ♂♂, Espiritu Santo, New Hebrides, July, August, and October; 1 ♀, Te Ai River, Efate I., New Hebrides, October 27, 1943; 1 ♂, Yankee Creek, Teneru Area, Guadalcanal, Solomon Is., December 21, 1943; 1 ♀, 3 ♂♂, Cervaga Creek, Guadalcanal, Solomon Is., June 26, 1943; 2 ♀♀, 2 ♂♂, Tillotsen Cove, Banika I., Russell Group, Solomon Is., August 21, 1943. Paratypes collected by R. H. Daggy and by Kenneth L. Knight. Type material deposited in U. S. National Museum (Cat. No. 56981), British Museum, University of Sydney, and University of Minnesota.

This species is closely related to *Aedes fimbripes* Edwards from New Britain but lacks the characteristic long hairs of the hind tibia of the male of that species. The genitalia also differ in having hairs on the basistyle basad of the lobe.

The larval description is based upon two lots of material from the New Hebrides. One of these lots was collected from ground water pools on Pellikula Peninsula, Espiritu Santo, November 1, 1943, by Dr. Knight, and the second from land crab holes on Ulilappa I., south of Espiritu Santo, July 25, 1943, by Dr. Daggy. The specimens from Ulilappa Island differ slightly from the others in having the lateral spines of the pecten teeth slightly shorter and more distad. All the adults were found in crab holes.

Aedes (Stegomyia) gurneyi, new species

(Fig. 14)

Male and female.—Head, thorax, and legs apparently colored exactly as in *Aedes* (*S.*) *albopictus* (Skuse), the pleural scales being in irregular patches rather than arranged in straight lines. Abdomen much as in *albopictus*, but the white bands on tergites III to VI, at least, are distinctly separated from the bases of the segments, with the anterior margin of each distinctly curved, rather than being entirely basal and straight anteriorly. Male genitalia (fig. 14): As in figure. The rather elongate basal lobe of the basistyle, with its straight setose surface, and the shape of the ninth tergite readily distinguish this from *albopictus* and related species.

Larva.—Length 6.5–7.0 mm. Head slightly broader than long; antenna about 6 times as long as width at base, scarcely tapering, its length about one-third width of head; no spicules; a single antennal hair about at middle. Clypeal spines small and slender, curved downward; anteantennal hair (A) double or triple; lower head hair (B) and upper head hair (C) both single, the latter about opposite hair A and almost directly behind hair B; postclypeal hair (d) of 20 fine hairs, or more, arising at the same level from a common stem; sutural hair (e) and transutural hair (f) both very fine, single. Thorax: Prothoracic submedian hairs 3, one double, one single, and one triple, the latter posterior and considerably the largest; mesothoracic and metathoracic pleural hair groups each with a very short basal spine. Abdomen: Lateral tuft of segment 1 of 4–5 hairs; of following segments variable, 1-3. Comb scales of eighth segment 5–8, the bases of most or all of them joined by a sclerotized area; each scale with a long slender apical tooth without a lateral fringe, but occasionally a few small lateral teeth at base; 2 siphonal tufts, one single, one triple; 2 subsiphonal tufts, one single, one 4-haired; 1 anal tuft of 4 hairs. Siphonal index 2.6–3.0, its greatest width near middle; pecten of 6–7 rather irregular spaced teeth, reaching about to middle of siphon, each tooth with one or several small lateral teeth; hair tuft well beyond pecten, with 3 or 4 hairs. Dorsal saddle well sclerotized, not joined ventrally; saddle hair double or triple, arising from a non-sclerotized spot; dorsal hairs long, 1 single, 1 double; anal gills 4, stout, about as long as siphon; ventral brush of about 6 bars with relatively few hairs.

Holotype.— ♂, Bougainville, Solomon Islands, January 28, 1944 (reared from tree hole in jungle), A. B. Gurney collector. Paratypes: 28 ♀♀, 25 ♂♂, collected on Bougainville during January, February, and March, 1944, by A. B. Gurney and by C. R. Bruck. Type material deposited in U. S. National Museum (Cat. No. 56982), British Museum, and University of Sydney.

The larval description is based upon specimens reared from tree holes on Bougainville. The larva has also been collected from a swamp pond on Bougainville and from *Pandanus* leaf on Guadalcanal, Solomon Islands. It can readily be distinguished by the sclerotized area surrounding the bases of the comb scales.

Aedes (Stegomyia) marshallensis, new species

(Fig. 13)

Male.—Head apparently exactly as in *Aedes* (*S.*) *hebrideus* Edwards except that the white spots on the palpus, particularly the two basal ones, are usually considerably smaller. Thorax as in *hebrideus*, with the pleural scales arranged in two well-defined parallel stripes. Wings entirely dark scaled. Legs as in *hebrideus* except as follows: No white spot at tip of fore femur; white spot at base of fore tarsus 2 greatly reduced or absent; white tarsal bands of mid legs considerably reduced; bands of hind tarsus much narrower, each never more than one-fourth of length of segments 1–4 and not more than one-half of length of segment 5. Abdomen colored much as in *hebrideus*, the bands considerably behind anterior margins of segments, and broadly broken on tergite II, usually narrowly so on tergite III; spot on side of tergite II broad, not forming a narrow crescent. Genitalia (fig. 13): Resembling that of *hebrideus*, but differing markedly in the shape of the basal lobe, as shown in figure.

Female.—Coloration essentially as in male. White of palpus confined to a small spot at apex.

Larva.—Length 6.0–6.5 mm. Head slightly broader than long; antenna slender, scarcely tapering, its length about one-third width of head; no spicules; a single antennal hair at, or slightly beyond, middle. Clypeal spines very slender, curved downward; anteantennal hair (A) double; lower head hair (B) and upper head hair (C) both single, both anterior to hair A; hair C well behind hair B; postclypeal hair (d) a tuft of about 9 hairs arising at the same level from a common stem; sutural hair (e) and transutural hair (f) both very fine, single.

Thorax: Prothoracic submedian hairs 2 tufts of 3 hairs each, one directly anterior to and smaller than the other; mesothoracic and metathoracic pleural hair tufts each with a very short basal spine. Abdomen: Lateral tuft of first segment of 5–6 hairs; of second, 2–3; of segments 3–5 double; of 6 single; of 7 double. Comb scales of eighth segment 8–12, in a curved row, each with a single sharp apical spine or 2 or even 3 equal spines, and a lateral fringe of fine hairs on each side; eighth segment with 2 siphonal tufts, one of 4–5 hairs, one single; 2 subsiphonal tufts, one single, one of 5–6 hairs; 1 anal tuft of 5 hairs. Siphonal index 2.0–2.4; pecten of 7–8 evenly spaced teeth, each with 1 or 2 lateral spines; a tuft of 3 hairs at about middle of tube, beyond last pecten tooth. Dorsal saddle of anal segment reaching nearly to midline but never joined ventrally; saddle hair double; dorsal hairs long, 1 single, 1 double; gills 4, stout, usually twice length of saddle, sometimes considerably shorter; ventral brush of about 6 bars with relatively few hairs.

Holotype.—♂, Airok Island, Ailinglaplap Atoll, Marshall Islands, June 6, 1944. Paratypes: 2 ♂♂, 12 ♀♀, same locality, June 4–6, 1944; 4 ♂♂, 6 ♀♀, Ebon Island, Ebon Atoll, Marshall Islands, June 11–13, 1944; 2 ♂♂, 8 ♀♀, Namarik, Namarik Atoll, Marshall Islands, June 17, 1944; 1 ♂, 6 ♀♀, Kili Island, Marshall Islands, June 8, 1944. All collected by D. A. Treat. Type material deposited in U. S. National Museum (Cat. No. 56983), British Museum, and University of Sydney.

The larval description is based upon specimens from Namarik, but larvae were collected at all of the four localities at which adults were taken. Probably the best characters to distinguish the larva from that of *hebrideus* are the frequent occurrence of 2-spined, or even 3-spined, comb scales, the spines of approximately equal length, and the incomplete sclerotization of the anal segment.

A REVIEW OF THE TYPE MATERIAL OF CULEX FIDELIS DYAR

Culex fidelis Dyar was synonymized by Edwards (1929) with *Culex brevipalpis* (Giles). An examination of the four cotype males of *fidelis* in the U. S. National Museum shows that this synonymy is correct for three of the cotypes, but the fourth cotype proves to be a new species belonging to the subgenus *Lophoceraomyia*.

We have used the original spelling for this subgenus rather than *Lophoceratomyia* as used by Edwards and other authors. As Neave (1939: 996) has indicated, the name *Lophoceraomyia* Theobald has priority over *Lophoceratomyia* Theobald. *Lophoceraomyia* Theobald is a monobasic genus with *uniformis* Theobald as type. The type of *Lophoceratomyia* is given by Edwards as *fraudatrix* Theobald.

Culex (Lophoceraomyia) lavatae, new species
(Fig. 1)

Culex fidelis Dyar, 1920: 180 (in part).

Male.—Length 3.0 mm., wing 2.2 mm. Vertex with hairlike, yellowish, and narrow, curved, white scales intermixed with many upright, forked, brownish scales, a patch of broad, appressed, white scales at extreme side of vertex. Torus unscaled, with a strong, toothlike prominence at inner dorsal angle; flagellum without specialized setae on VI (torus counted as segment I), 4 slender setae on VII, a short tuft of 6 setae and 2 longer setae on VIII, a long tuft of 4 setae on IX. Proboscis dark, about one-fifth longer than front femur, some stiff bristles beneath at base. Palpus longer than proboscis by half length of last segment, barely swollen at apex, dark, with very few bristles. Scutum with narrow, curved, uniformly golden-brown scales, a few similar scales on pronotum. Scutellum with very narrow scales, which are somewhat paler scales than those on scutum. Pleuron without visible scales. Wings dark scaled. Halter ochreous with a few dark scales on knob. Legs brown, femora paler beneath. Abdomen brown, unbanded, paler beneath and with many long fine hairs. Genitalia (fig. 1): Basistyle with an inner row of 6 bristles; subapical lobe bearing a rod, 2 slightly longer bent-tipped setae, 4 stout bristles, and a slender leaflet; dististyle somewhat curved, evenly tapering, with a small apical tooth; mesosome with lateral process spiny tipped and toothed along outer side, median process bladelike.

Holotype.—♂, Los Baños, Philippine Islands, July 28, 1915. U. S. National Museum (Cat. No. 56984).

The holotype specimen is one of the four cotypes of *Culex* (*Neoculex*) *fidelis* Dyar, the other 3 being specimens of *brevipalpis* (Giles). Dyar's description of the male palpi and genitalia indicates that *fidelis* should be given as a synonym of *brevipalpis*. Of the two females tentatively associated with the males of *fidelis* by Dyar, one is *C.* (*Culex*) *fuscocephalus* Theobald and the other is a *Lophoceraomyia* possibly referable to *lavatae*.

Culex lavatae belongs in the *mammilifer* group of *Lophoceraomyia* by virtue of the inner dorsal projection on the male torus. The relatively simple male antenna indicates a relationship to *minor* Leicester and *minutissimus* (Theobald), but the presence of setae on segments VII to IX in *lavatae* is distinctive. The mesosome differs from any previously described.

Culex (Neoculex) brevipalpis (Giles)

Stegomyia brevipalpis Giles, 1902: 384.
Culex fidelis Dyar, 1920: 180 (in part).

The cotype specimen on which Dyar based his original description of the male genitalia is here designated as the lectotype of *fidelis* Dyar.

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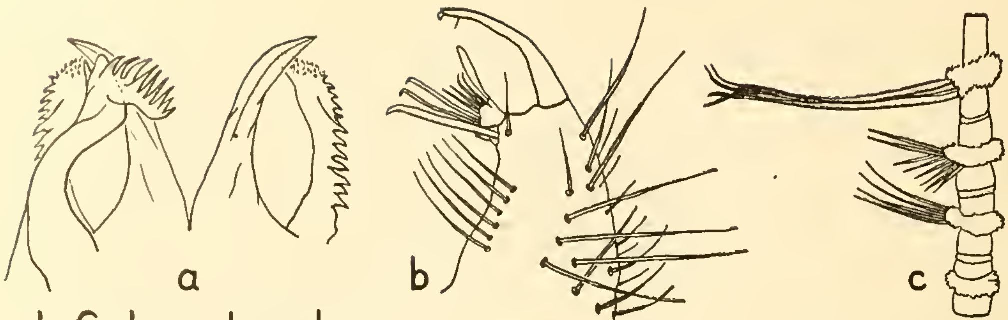
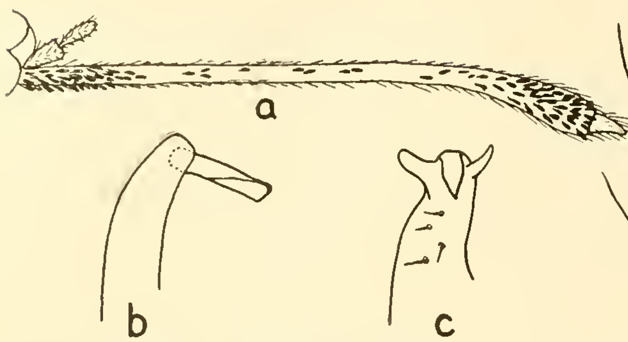
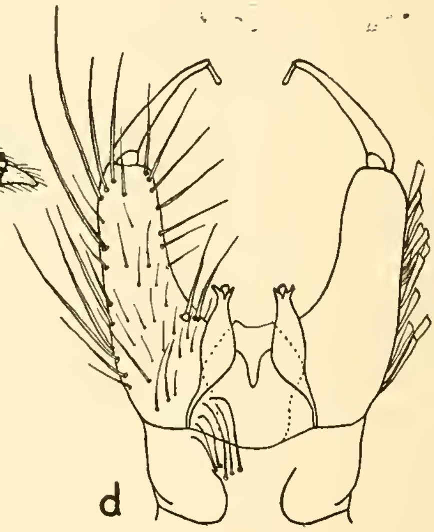


1. Culex lavatae





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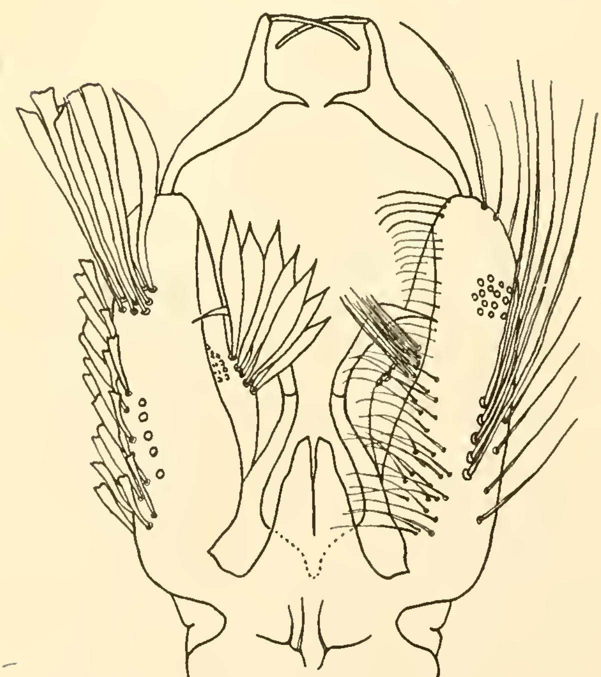
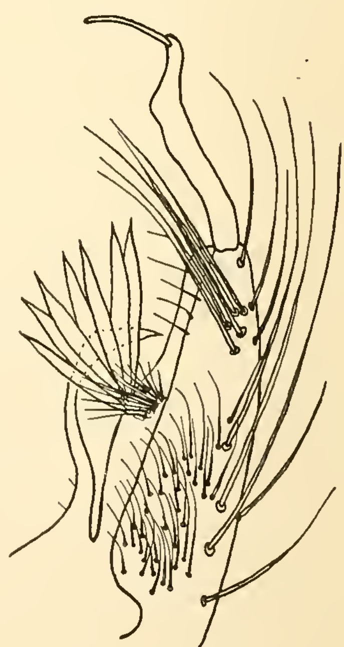


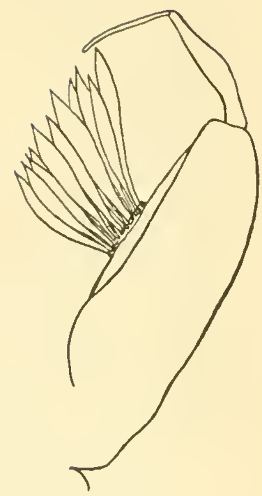
3. Aedes aranetanus



4. Aedes flavipennis

5. avistyla

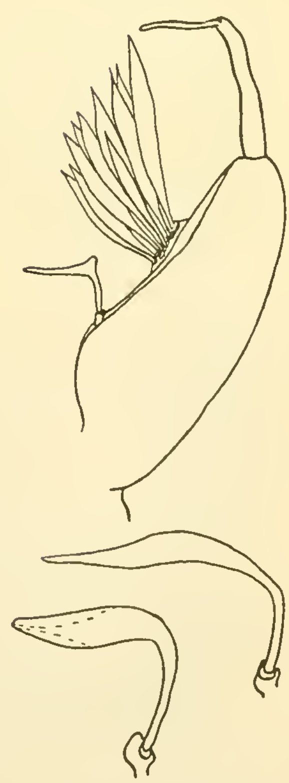
6. poicilia



7. knighti

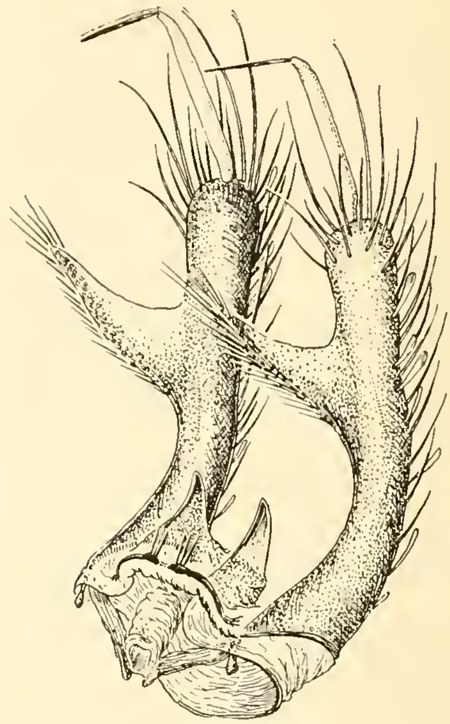
8. samoanus

9. solomonis

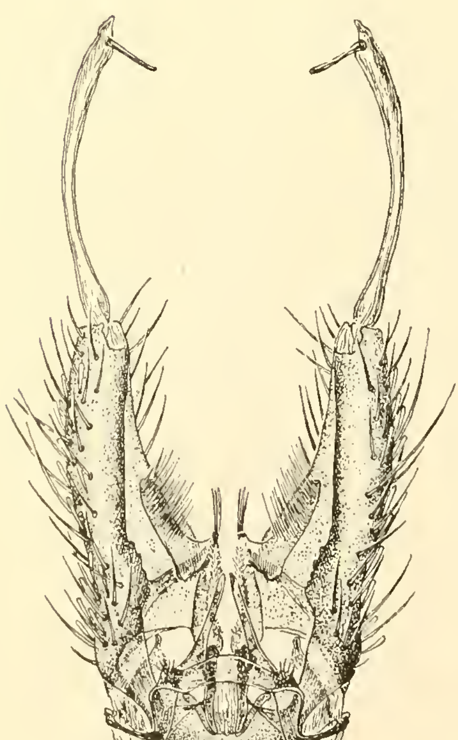


10. kochi

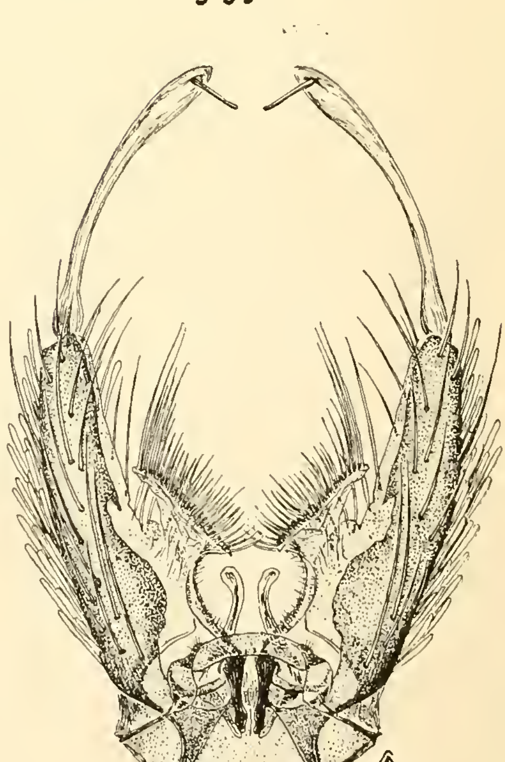
11. suvae



12. daggyi



13. marshallensis



14. gurneyi

Explanation of Figures

1. *Culex lavatae*, n. sp., male; *a*, ventral view of mesosome, tenth sternite included on left; *b*, basistyle and dististyle; *c*, antennal segments 6 to 9 (torus counted as 1). 2. *Aedes clavirostris*, n. sp.; *a*, palpus and proboscis of female; *b*, tip of dististyle enlarged; *c*, tip of tenth sternite enlarged; *d*, male genitalia, ventral, bristles shown at left, scales at right. 3. *Aedes aranetanus* (Banks), male genitalia, ventral, scales on left, bristles on right. 4. *Aedes flavipennis* (Giles), dististyle, basistyle, and claspette of male.

5. *Aedes avistyla* Brug, outline of basistyle and dististyle (redrawn from Brug, 1939). 6. *Aedes poicilia* (Theobald), outline of basistyle and dististyle. 7. *Aedes knighti*, n. sp., outline of basistyle and dististyle. 8. *Aedes samoanus* (Gruenberg), outline of basistyle, dististyle, and two enlarged views of specialized seta. 9. *Aedes solomonis*, n. sp., same view as preceding but with bristles shown. 10. *Aedes kochi* (Doenitz), same view as preceding but bristles omitted.

11. *Aedes suvae*, n. sp., male genitalia, ventral. 12. *Aedes daggyi*, n. sp., male genitalia, oblique ventral view. 13. *Aedes marshallensis*, n. sp., male genitalia, ventral. 14. *Aedes gurneyi*, n. sp., male genitalia, ventral.

THE GENUS LACHNOMYRMEX, WITH THE DESCRIPTION OF A SECOND SPECIES (Hymenoptera: Formicidae)

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

Since 1910 the genus *Lachnomyrmex* has been known from the single species *scrobiculatus* Wheeler, of Guatemala. This article describes a second species from Barro Colorado Island, Canal Zone. In reviewing the generic and specific descriptions, the author has found a number of mistakes which should be corrected, especially since these errors unfortunately have already been repeated in literature, by both Wheeler and Emery.

LACHNOMYRMEX Wheeler

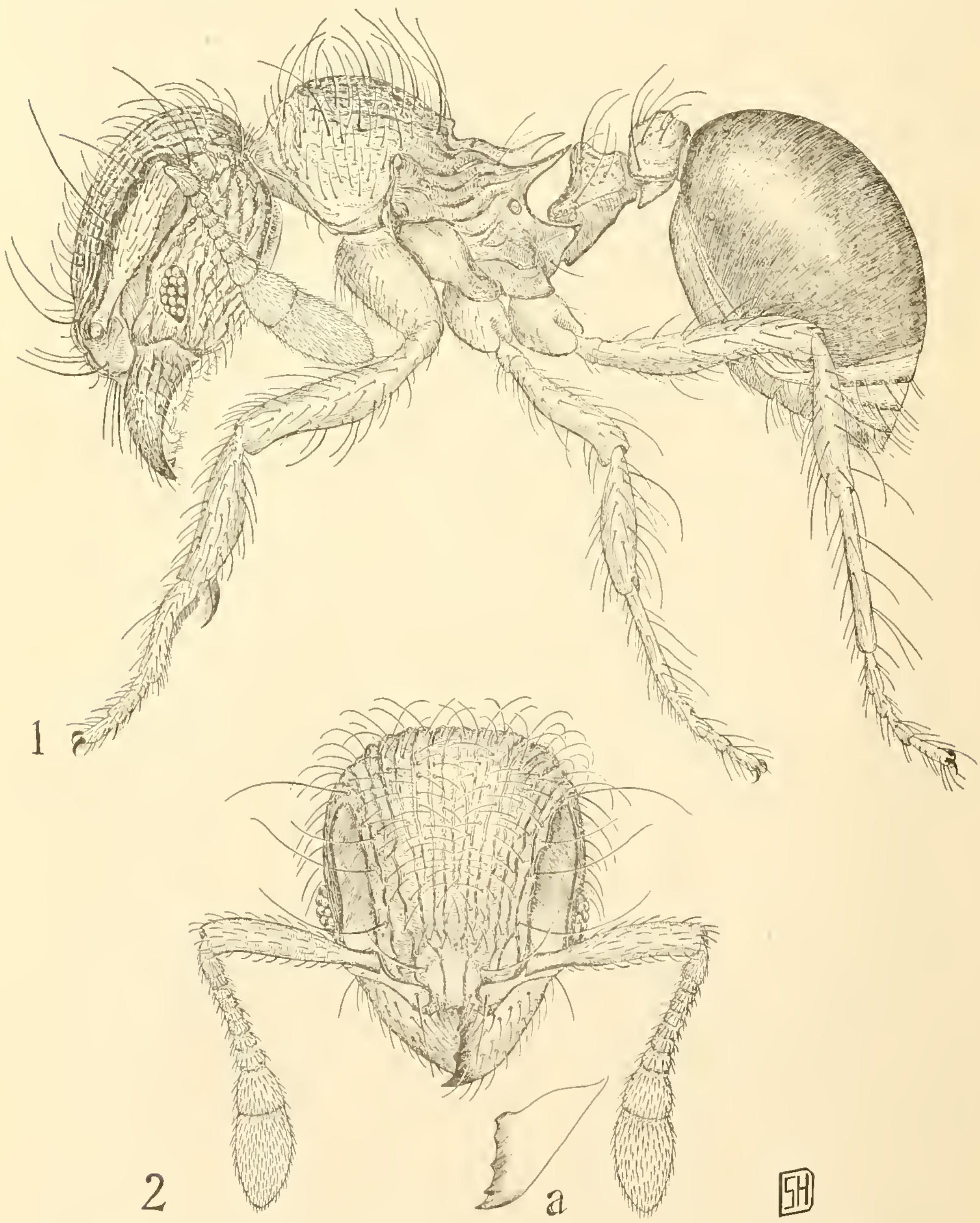
Lachnomyrmex Wheeler, 1910, Amer. Mus. Nat. Hist. Bul. 28: 263; Emery, 1922, Genera Insect. Fasc. 174 C: 245, 269; Wheeler, 1922, Amer. Mus. Nat. Hist. Bul. 45: 670. Genotype, *Lachnomyrmex scrobiculatus* Wheeler Monobasic.

Corrections and additions to the detailed generic description given by Wheeler: Antenna of worker and female 11-segmented, not 12-segmented as stated. Anterior border of clypeus not rounded and entire as described but with a median incision and a slight emargination on each side of the incision. Eye of worker with approximately 5–7 facets in its greatest diameter, ending anteroventrally in a distinct angle. Mandible of worker with 4 or 5 teeth, 2 near the apex of the masticatory border, 1 near the middle, and 1 or 2 near the base.

The following key will distinguish the workers of the two species:

Head distinctly longer than broad (approximately one and one-tenth times as long as broad). Mesonotum, in profile, meeting the mesoepinotal impression in a very distinct angle. Epinotal spines neither unusually long nor directed dorsally at a very pronounced angle. Sculpturing of head and thorax mainly rugulose.................. *haskinsi*, new species

Head not distinctly longer than broad. Mesonotum, in profile, not meeting the mesoepinotal impression in a very distinct angle. Epinotal spines unusually long, directed dorsally at a very pronounced angle. Sculpturing of head and thorax very coarse, mainly rugulose reticulate. (Color dark reddish brown)................................ *scrobiculatus* Wheeler



Lachnomyrmex haskinsi, new species. Fig. 1.—Profile of worker. Fig. 2.—Head; *a*, mandible. (Illustrations by Sara H. DeBord.)

Lachnomyrmex haskinsi, new species

(Figs. 1, 2, and 2a)

Worker.—Length 2.3 mm.

Head, exclusive of mandibles, approximately one and one-tenth times as long as broad, with rounded posterior border and rounded posterior corners. Frontal carinae distant from each other, almost right angular in front, continued posteriorly on each side as the mesal border of the very prominent antennal scrobe. Eye placed anterior to middle of side of head, with 5 facets in its greatest diameter, ending anteroventrally in a distinct angle. Broad antennal scrobe above eye not attaining posterior border of head, anteriorly confluent with antennal fovea. Antenna 11-segmented; scape incrassated throughout approximately two-thirds its length; funiculus with a prominent 2-segmented club which is approximately as long as remainder of funiculus, the terminal segment about twice length of preceding segment. No frontal area or frontal groove. Anterior border of clypeus with a distinct median incision and an emargination on each side of incision. Mandible with 5 teeth; 2 at apex of masticatory border, 1 near middle, and 2 near base. Promesonotum convex but not so strongly as in *scrobiculatus*, the suture separating pronotum from mesonotum absent. Posterior part of mesonotum, in profile, meeting the mesoepinotal impression in a very distinct angle. Epinotum lower than promesonotum, bearing 2 spines which are directed dorsally only moderately, base of epinotum shorter than declivity. Metasternal angle on each side sharp, spinelike. Middle and hind tibiae without spurs. Petiole, in profile, with a short node, the ventral surface of peduncle carinate and also with a small tooth near base. Postpetiole, in profile, with a distinct anteroventral tooth; from above, postpetiole approximately two and one-third times as broad as long, with a straight anterior border and somewhat converging sides posteriorly. Gaster globose, without basal angles.

Mandible with a few scattered, piligerous punctures in addition to the fine striae near base. Middle of clypeus with 4 longitudinal rugulae including the ones at lateral borders. Head, thorax, petiole, and postpetiole sculptured for the most part with longitudinal rugulae, the sculpturing especially coarse on head and thorax. Antennal scrobes, epinotal declivity, and gaster smooth and shining. Mandibles shining regardless of the sculpturing.

Hairs rather abundant, varying from long to unusually long, somewhat curved; absent from most of gaster except apex, more reclinate on appendages.

Brown; gaster darker than remainder of body; sides of prothorax,apex of gaster, and appendages lighter.

Type locality.—Barro Colorado Island, Canal Zone.

Described from a single worker collected in a Berlese trap by James Zetek during February or March 1944 and bearing Zetek No. 5121 and U. S. National Museum No. 56906.

This ant is named for Caryl P. Haskins.

Lachnomyrmex scrobiculatus Wheeler

Lachnomyrmex scrobiculatus Wheeler, 1910, Amer. Mus. Nat. Hist. Bul. 28: 263–265, fig. 3 *a*, *b*, and *c*; *worker, female.*

Type locality.—Cacao, Trece Aguas in Alta Vera Paz, Guatemala, E. A. Schwarz and H. S. Barber. Described from 1 female and 6 workers which bear U. S. National Museum No. 13199. The author has examined the female and 2 workers. Wheeler (p. 265) states, "this ant is evidently a timid species, living in small concealed colonies like the species of *Rogeria* and *Leptothorax*."

Actual date of publication, November 21, 1944.

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VOL. 46 December, 1944 No. 9

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 25, 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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AUGUST BUSCK

PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 46 DECEMBER, 1944 No. 9

AUGUST BUSCK
1870–1944

August Busck, past President of this Society and an active member since 1896, died on March 7, 1944. He had been in poor health for more than a year but was active until within a few weeks of his death. With his passing America loses her foremost microlepidopterist and the present generation of American lepidopterists their most helpful friend. During the greater part of the past half century three names, Walsingham, Meyrick, and Busck, held preeminence in the taxonomy of the Microlepidoptera. Busck maintained an intimate and friendly relationship with his two colleagues and deferred to them as his seniors in science and to Edward Meyrick in particular as the master lepidopterist of his time; but in some respects Busck was the most progressive of the three. His chosen field was narrower, for he confined himself almost exclusively to the American fauna and to the lepidopterous groups formerly known as the Tineina and Tortricina. He described a few exotic genera and species, and his knowledge of the Old World fauna was comprehensive; but the bulk of his descriptions, something over six hundred, were of American groups. If he had so chosen, he could have added a thousand more names to our lists, but he was loath to describe a new species unless there was some real scientific or economic need for a designation. He was no species monger, nor was he fixed in any convenient rut of taxonomic procedure. Thoroughly abreast of every new departure in technique and taxonomy he was ready to try any one that promised to advance a more natural classification however much it might disturb traditional practices or concepts, and was one of the first to apply genitalic characters consistently to the classification of the various categories in the Microlepidoptera.

August Busck was born in Randers, Denmark, February 18, 1870, and educated at Ordrup College and the Royal University, Copenhagen, at which latter institution he studied under Professors Lutken, Steenstrup, and Warming, receiving his M. A. and Ph. B. degrees in 1893. Between 1889 and 1893 he served as an instructor in zoology and botany at Ordrup College and the Copenhagen High School. In 1893 he came to the World's Columbian Exhibition at Chicago as a tourist and that same year moved to Charles Town, W. Va., where he became a partner in the wholesale floristry business of F. M. Pennock & Co. At Charles Town he became a citizen of the United States and until his death retained his voting privileges in West Virginia. In March 1896 he was appointed assistant to the late Theodore Pergande in the Division of Entomology of the U. S. Department of Agriculture, becoming shortly thereafter specialist in Microlepidoptera and continuing his connection with the Department of Agriculture without interruption until his retirement in 1940.

He was a member of the U. S. Fish Commission Expedition to Puerto Rico in 1898–99, making a general entomological survey of the island and, especially, collecting the scale insects there. In 1901 he investigated the Cocos-palm disease in Cuba and in 1904 was in charge of the U. S. Bureau of Entomology exhibit at the World's Fair of St. Louis, Mo. He investigated the mosquito fauna of the West Indies from Trinidad to Santo Domingo in 1905 under the auspices of the Carnegie Institute, and made a similar investigation of the mosquito fauna of the Canal Zone for the Panama Canal Commission in 1907. The results of these two expeditions were embodied in the Howard, Dyar, and Knab monograph of the "Mosquitoes of North and Middle America and the West Indies." During 1908 he visited England, collaborating with his friend Lord Walsingham on the Microlepidoptera (vol. 4) of the Biologia Centrali-Americana. He was a member of the Smithsonian Panama Expedition of 1911–12, which resulted in the largest single collection of insects made in that region. The Lepidoptera he collected there were reported on by Dyar and himself in separate papers in the Proceedings of the U. S. National Museum for 1915. In 1915 he made an investigation of the pink bollworm of cotton in the Hawaiian Islands for the Federal Horticultural Board. From 1917 to 1919 he was their representative in charge of investigations of the same insect in Mexico, and in 1921 conducted a pink bollworm survey in British Guiana and the West Indies. During 1925 he visited Canada and in 1932 made a second trip to England and Denmark. He retired as entomologist of the Bureau of Entomology and Plant Quarantine on his seventieth birthday in February 1940, and shortly thereafter went to Hawaii on a Yale Fellowship to arrange and identify the Microlepidoptera of the Bernice P. Bishop Museum. In November 1942 he was recalled to active service with the Bureau of Entomology and Plant Quarantine. His last entomological work was the editing of the manuscript on Aegeriidae of his friend and colleague, the late George P. Engelhardt.

Throughout his professional career Busck was intimately associated with the U. S. National Museum. Its collection of Microlepidoptera is the second most extensive and important in the world, and for this eminence Busck must be given the chief credit.

"A. B.," as he was known to his intimates, was an outstanding man in many respects, a naturalist of broad interests, a good father and an ardent friend to all who won his affection. For those who needed his help he would go to no end of trouble. His convivial nature made him many friends wherever he traveled, and his robust enthusiasm for entomology converted many younger people into amateur collectors. We who have been associated with him in study of the Lepidoptera will always hold ourselves in his debt.

He is survived by his wife Villa Busck, two sons, Paul Gunni Busck and Commander Vilhelm Klein Busck, U. S. N., and a daughter Gerda Katty Busck.

In addition to his active membership in the Entomological Society of Washington, of which he was President in 1913, he was a member of the Biological Society of Washington and of the American Association for the Advancement of Science.

A bibliography [1] of his published works follows:

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1900. New American Tineina: Journ. N. Y. Ent. Soc., 8: 234–248, pl. 9.

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1902. Notes on North American Tineina: Journ. N. Y. Ent. Soc., 10: 89–100, pl. 12.

1902. Descriptions of *Gnorimoschema coquillettella* and *Gracilaria* (*Dialectica*) *pnosmodiella* in H. G. Dyar, Proc. U. S. Nat. Mus., 25 (1290): 405, 406, and 409 (1903).

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[1] Compiled by Miss Mathilde M. Carpenter, Librarian, Division of Insects, U. S. National Museum.

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1903. Notes on the *Cerostoma* group of Yponomeutidae, with descriptions of new North American species: Journ. N. Y. Ent. Soc., 11: 45–59.

1903. On the generic name of the codling moth: Journ. N. Y. Ent. Soc., 11: 106–111.

1904. A new species of *Ethmia* from the Boreal Region of Colorado: Journ. N. Y. Ent. Soc., 12: 44.

1904. A case-bearer injurious to apple and plum in China (*Coleophora nevinsiella*, new species): Journ. N. Y. Ent. Soc., 12: 45, 46.

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CARL HEINRICH and ULPHIAN C. LOFTIN

FIRST INSTAR LARVA OF ACRIDIOPHAGA CARIDEI (BRETHES) (Diptera: Sarcophagidae)

By IRMA SANTORO DE CROUZEL

Instituto de Sanidad Vegetal, Ministerio de Agricultura, Buenos Aires

This work was done at the Instituto de Investigaciones Sobre la Langosta, at José C. Paz, Buenos Aires. *Acridiophaga caridei* (Brèth.) is the most important parasite of the grasshopper *Schistocerca paranensis* Burm. among all those studied at that Institute from 1938 to 1940. The present paper is on the so far undescribed first instar larva on which I have made a detailed morphological study with material bred at the laboratory. All drawings that appear in this work were done with an Abbe camera lucida.

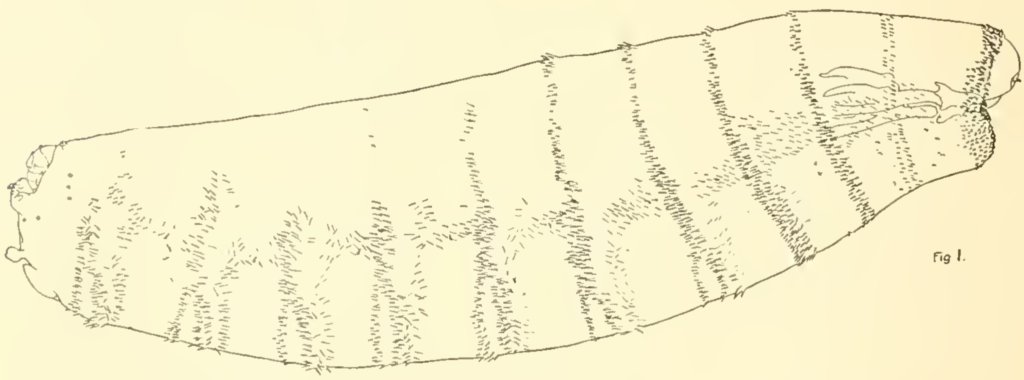
Acridiophaga caridei (Brèthes)

Sarcophaga caridei Brèthes, 1906, An. Mus. Nac. Buenos Aires, (3) 6: 297–301.
Acridiophaga caridei (Brèthes): E. E. Blanchard, 1939, Physis, 17: 842.

This fly in its larval stage, like all the Diptera Cyclorrhapha passes through three distinct morphological phases separated by two moults. The first instar larva to the naked eye appears like a tiny line of an ivory white color, which crawls rapidly with wormlike movements.

Morphology: (Figs. 1 and 9) shows it as it appears under a microscope, spindle-shaped with its extremities blunt, the anterior somewhat more pointed. It has definitely spaced rings of brown spines. Eleven segments and the head are easily visible. The integument is transparent, and through it may be seen the complicated structure of the cephalopharyngeal apparatus and part of the tracheal trunks.

Measurements.—Length, taken dorsally from the anterior edge of the first thoracic segment to the farthest point of the last segment (not the anal tubercles) 1.140 to 1.365 mm. Width: first segment, 0.113 to 0.150 mm.; widest diameter (between the sixth and seventh segments), 0.225 to 0.360 mm.; last segment, 0.120 to 0.233 mm.

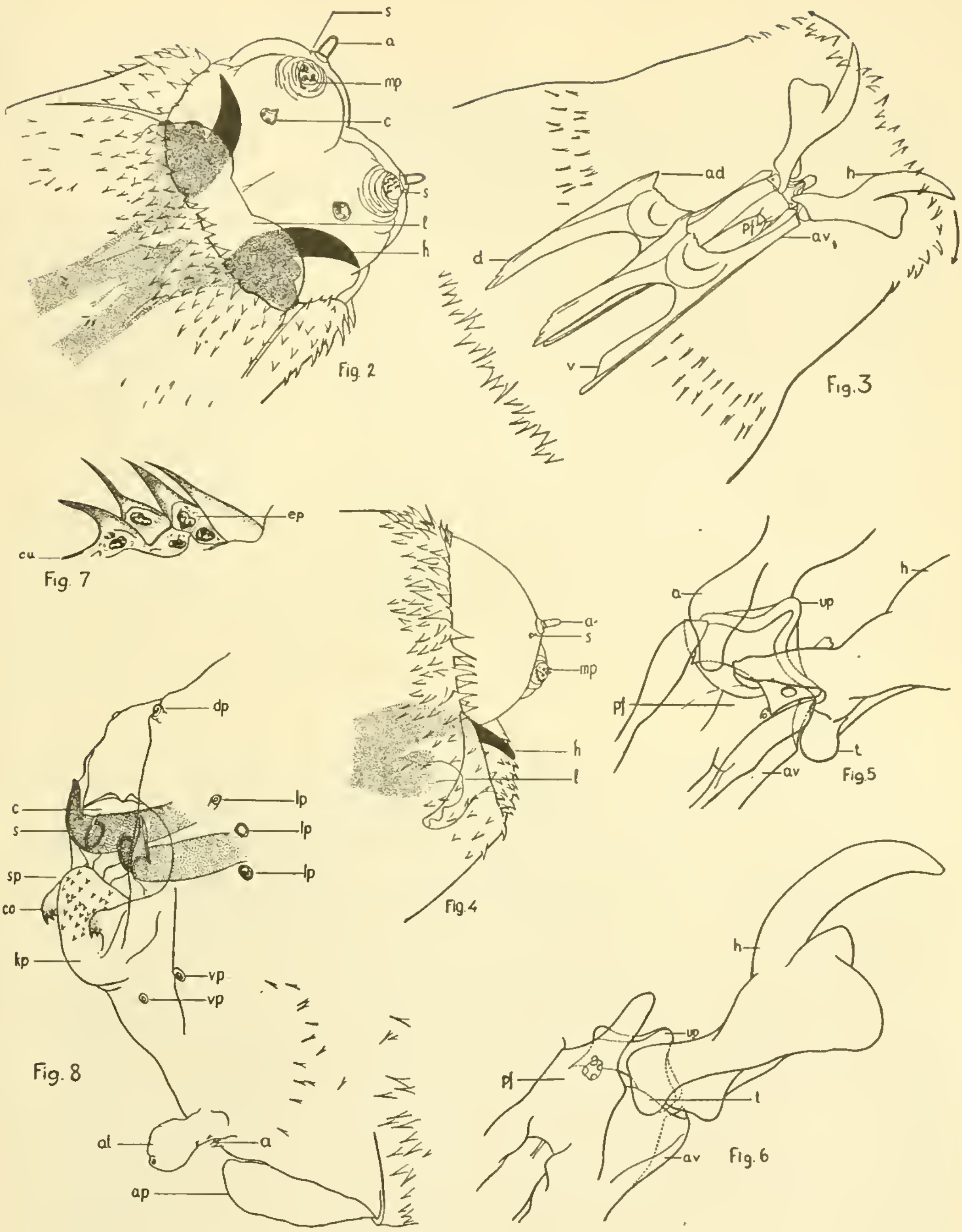


Acridiophaga caridei. Fig. 1, first instar larva, lateral view.

Observed with a higher power, the following structures can be defined:

Head.—According to the concepts of SNODGRASS (1924) the head of the larva (figs. 2 and 4) is almost completely invaginated. Usually the only things seen are the antenno-maxillary complex (KEILIN, 1915–1916) which are like two hemispheric knobs located symmetrically on the antero-dorsal region of the head. The mouth opens in the ventral region back of the antenno-maxillary complex. The mouth has underneath a thin, transparent and retractile *labium* (l). Over the antenno-maxillary complex in a latero-dorsal position are found the antennae (a). These are transparent, bell-shaped structures, articulated at their lower bases to the integument of the head. Near the base each has a dark ring. Very near each one of them is a small cane-like structure (s), possibly a *sensorium.* (The small size of this organ prohibited me from describing its structure even with the immersion powers.) The maxillary palpi (mp) appear as knobs underneath the antennae. Each palpus is surrounded by many concentric sclerotized wrinkles, and ends in various sensitive papillae of different shapes. There are other sensitive structures (c), called "c organs" by Keilin (1915–1916), which he states to be common to all cyclorrhaphous larvae and which he supposes to be part of the maxillary palpi. These are found on ventral face of the head, back of the palpi and on each side of the mouth.

Cephalopharyngeal structure.—The complicated sclerotized skeleton which



Acridiophaga caridei. Fig. 2, anterior extremity, ventral view. Fig. 3, cephalo-pharyngeal structure, dorsal view. Fig. 4, anterior extremity, profile. Fig. 5, detail of cephalopharyngeal structure, dorsal view. Fig. 6, detail of cephalo-pharyngeal structure, ventral view. Fig. 7, histological section of spines. Fig. 8, last segment, profile.

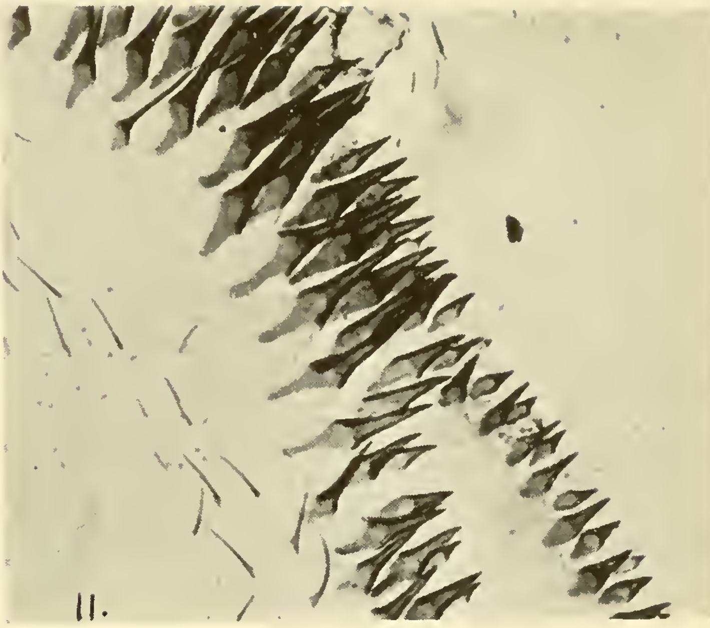
forms the walls of the pharynx constitutes the cephalopharyngeal sclerites and supports the oral hooks.

This skeleton is retractile and when in repose reaches to the third segment. It is mostly formed by two parts, one pharyngeal and one oral (figs. 3 and 10). The former consists of the cephalopharyngeal skeleton proper. It is formed by a pharyngeal sclerite composed of two vertical wings, one dorsal (d) and one ventral (v), both extending backwards; a rather short, transparent, very slightly scleritized projection (ad) and another ventral projection (av), both extending toward the front. The latter extends forward to unite with the one opposite and to form the floor of the pharynx (pf) (figs. 3–5–6) which bears a more weakly sclerotized plate with 4 perforations (rarely 5 or 6) and which is prolonged sharply toward the front. Articulating with the dorsal part of the anterior ventral pieces (av) is a small unpaired piece (up) (figs. 5 and 6); this is well sclerotized, irregularly pentagonal, and has two orifices; it exists only in the first instar.

The oral part is formed by the oral hooks. These hooks are heavily sclerotized and present a complicated structure. They consist of a body and the hook (h) (figs. 5 and 6). The former, subpyramidal, less sclerotized in the middle, is articulated by the trochlea (t) to the latero-external face of the antero-ventral sclerites and to one apophysis (a) which lengthens dorsally with the unpaired piece (up) of the cephalopharyngeal mechanism. The latter is pointed, sharp and heavily sclerotized. It extends toward the front and then curves outward.

The peculiarity shown by this structure is in the operation of the oral hooks which instead of moving in a vertical plane, as occurs in other larvae and in the following instars, move horizontally from within to without. When in repose the skeleton is retracted with the hooks extending forward. During activity these are projected and move laterally (fig. 3). It is by this movement, aided by the spiny rings, that the larva cuts the tissues and opens the way for entry into the body.

Body.—(Figs. 1 and 9). This is formed by eleven segments which are clearly visible, thanks to the rings (at times incomplete) with spines on each front edge. The first segment has a thick border in front, encircled by a wide ring. This latter consists of irregular rows of spines; each spine is strong, curved, pyramidal, and in the form of a large triangle at the base; they diminish in number and size from the first (18 to 6 microns) to the last segment (4 to 1 microns) and are shorter and more numerous in the ventral region than in the dorsal. The anterior margin of the second segment is marked by an unarmed stripe. Immediately following is a ring, wider ventrally than dorsally, formed by two or three rows of short, thin spicules (9 to 2 microns). The third and fourth rings are narrower than the first. The spines are pyramidal; they are considerably elongated, especially on the sides (21 to 24 microns). Both rings tend to curve toward the cephalic extremity on the middle ventral part and have a smaller number of rows and spines on the dorsal region. The rings of the fifth, sixth and seventh segments (Fig. 11) have the largest spines (up to 30 microns) mostly on the sides where they often extend perpendicularly. Ventrally the rings are divided into two stripes, the anterior with more rows and larger spines than the posterior. In the dorsal region the spines diminish and at times the



Acridiophaga caridei. Fig. 9, ventral view. Fig. 10, anterior extremity. Fig. 11, spines and hairs of the fifth segment. Fig. 12, sensorial organs of the second segment.

seventh ring is incomplete. On the eighth, ninth, tenth and eleventh segments the rings are similar to the previous ones in the ventral region but are incomplete on the dorsum. At times the eighth retains some very short spines.

On the sides, along the full length of the body from the first to the tenth segment, are found other cuticular formations, which look like long, thin hairs (fig. 11). These hairs extend onto the ventral surface from the fifth segment to the tenth and eleventh, in front of the spiny rings. For the name of these external formations of the body wall I have followed the concepts of SNODGRASS (1935). In. fig. 7 is shown a histological section of one of these spiny formations. The epidermal cells can be seen (ep) entering the spiny formations and in different places the cuticle (cu) follows faithfully the relief pattern.

The last segment (fig. 8) has on its posterior face the spiracles (s) which open into a small cavity (c). Under this cavity is seen a kidney-like protuberance (kp), sprinkled with small spicules frequently located in rows (sp). *On each side of this protuberance occurs a brown, strong, sclerotized claw-like organ which terminates in three or four sharp downwardly curved points* (co). The position of these organs close to the respiratory organs, their claw-like form, and the spiney form of the spiracles (as shown further on) make me suppose that their function consists in grasping the tracheae of the host into which the larva introduces its own spiracles. I have also seen this organ in other parasitic larvae of the same family, such as *Tephromyiella neuquenensis* Blanch. among the Argentine species and *Sarcophaga reversa* Ald., *S. aculeata* Ald., *S. atlanis* Ald., *S. coloradensis* Ald., and other unnamed species among the Canadian Sarcophagidae. The study of these latter were made in the Canadian Parasite Laboratory, Belleville, Ontario, with material furnished by them, to whom I am very appreciative. *Sarcophaga hunteri* Hough. and *Protodexia australis* Blanch. do not have these organs.

In the last segment is found, too, the anus (a), surrounded by several spines and located behind the anal protuberance (ap) and in front of two prominent anal tubercles (at). We also find a dorsal papilla (dp), three lateral papillae (lp), the middle one of which is flattened and scarcely visible, and two ventral papillae (vp), symmetrically located with respect to the sagittal plane.

Spiracles.—This larva, as the major part of the Diptera Cyclorrhapha in the first instar, is *metapneustic.* Its spiracles are also characteristic; they are small and terminate in two digital prolongations, which are sharp and directed vertically upwards. There is no stigmatic plate. The spiracles open directly from a filiform canal, which I was able to see only in the outer of these prolongations. In the inner prolongation is seen a sharp nail-like formation. The external part of these four formations is composed of a gray refringent cap. On the interior can be noted a delicate sprinkling of yellow; this is the "chambre feutrée" of Keilin (1915–1916) which unites the stigma with the trachea. The tracheal trunks are united by a transversal bridge in the eleventh segment.

Sensorial organs.—In each of the first three segments, symmetrically located with respect to the sagittal plane, is found a pair of sensorial organs. These are formed by three hairs which radiate from a common point and usually are in form of a Y (fig. 12). They should correspond to the vestiges of the legs cited by Keilin. Referring to them Keilin says: "elles existent aussi bien chez les larves libres, ayant les habitats les plus divers, que les larves parasites des plantes (Agromyzinae) et des animaux (Oestridae). Ces formations sont toujours placés dans le voisinage inmédiat des disques imaginaux des pattes; ne seraint-elles pas un dernier vestige des pattes larvaires? Cette hipothèse parait vraisemblable, car, si l'on en trouve dans certaines familles de Coléopteres (*Larinus maculosus* et autres), on voit ces rudiments, sous forme de petits mamelons incapables de servir à la locomotion, et neanmoins surmontés de poils sensoriels. Ainsi: la patte des larves d'Insectes, organe à la fois ambulatoire et sensitif, pourrait disparaitre en tant qu'organe ambulatoire, mais persisterait toujours en tant qu'organe sensoriel." Another class of sensorial organ consists of a pair of small cylindrical processes articulated at the base which are found on each segment from the first to the tenth and are located more or less laterally. (Fig. 12.)

SUMMARY

This work is on the first instar larva of *Acridiophaga caridei* (Brèth.), the most effective parasite of *Schistocerca paranensis* Burm. Two particularities must be pointed out: The operation of the oral hooks which move in a horizontal plane and the presence of a pair of claw-like organs, close to the posterior spiracles.

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SOME AFRICAN MEGACHILID BEES

By T. D. A. Cockerell

All the bees recorded here will be returned to the British Museum when circumstances permit, except *Megachile natensiella*, which goes to the Museum at Pretoria.

Megachile (Creightonella) weenenica, new species

Male.—Length about 15 mm.; rather slender, with parallel-sided abdomen; black, including antennae and mandibles, but front femora and tibiae suffused with red in front, apical margin of transverse keel of sixth tergite red, and seventh tergite dusky red; head and thorax with abundant white hair, but scutellum with an admixture of long, black hairs; sides of first tergite with long, white hair, second to fourth with broad, white hair bands at sides, reduced to a line or broken in middle; fifth tergite with a white hair band, overlapped with orange hairs except at sides; sixth with the basal two-thirds, on each side of the longitudinal keel, covered with dense, bright, orange-fulvous hair; face considerably longer than broad, if we include the front; mesonotum entirely dull; tegulae small and black; wings hyaline, a little dusky, with the broad outer margin darker; first recurrent nervure ending far from base of second submarginal cell; front tarsi with red hair on inner side; front coxae with stout spines; hind tarsi with pale yellow hair on inner side, contrasting with the long, pure white hair of femora and tibiae; transverse keel of sixth tergite with many small teeth, but not emarginate.

Natal: Weenen, January 1926 (H. P. Thomasset). Allied to *M. lichtenburgensis* Brauns from the Transvaal but easily distinguished by the large patches of orange hair on sixth tergite; also, the teeth on margin of keel of sixth tergite are more numerous, about 10.

Megachile natensiella, new species

Male.—Length about 6.5 mm.; aspect of *M. gratiosella*, but with slender black tarsi, small dark tegulae; sixth tergite with a very small inconspicuous incision, bounded on each side by a small sharp tooth. The anterior coxae are toothed. It is close to *M. sarna* Cam., and has similar venation, but the stigma is pale yellowish and the keel of sixth tergite is not deeply incised. The wings are hyaline. The abundant hair of the face is white, with a faint yellowish tinge. The flagellum is considerably shorter than in *M. gratiosella* Ckll. The fifth tergite lacks the white hair band present in *M. gratiosella;* the sixth tergite above is densely covered with white hair, except in middle.

Nata River, Makarikari, August 24–27, 1930. Collected by G. van Son on the Vernay-Lang Kalahari Expedition, and accidentally overlooked when the report on the bees of that expedition was prepared.

Megachile pondonis, new species

Female.—Length about 15 mm.; rather slender, with long tapering abdomen; black, including antennae, mandibles and legs, except that the tarsi are reddish apically, and the tibiae have a red spot at apex externally; head and thorax with mainly dull white hair, but on face yellowish, long and abundant as in a male; vertex and scutellum with black hair, and short black hairs on mesonotum; abdomen with a large patch of cinereous tomentum, contracted in middle, on fifth tergite; abdomen otherwise almost nude, but the tergites with white hair bands at sides, reduced to a line or almost failing in middle, so that the abdomen does not appear conspicuously banded; the extreme bases of the tergites, when extended, are seen to be red; ventral scopa white at base, but on sternites 2–4 bright fox red, on fifth black; lower margin of hind tibiae and tarsi with silvery white hairs; hind basitarsi broad; mesonotum dull; a little pale hair in suture between mesonotum and scutellum, but not enough to form a conspicuous band; tegulae with a black disc and broad reddish margin; wings dusky hyaline not darkened apically; first recurrent nervure ending some distance from base of second submarginal cell.

Pondoland: Port St. John, December 1923 (R. E. Turner). This is closely allied to *M. callichlora* Ckll., a species of tropical Africa, and it has a faint greenish tint on abdominal tergites 2 and 3. It is distinguished from this by the yellowish hair of face and the pubescence of the fifth tergite of abdomen. It is also close to *M. caricina* Ckll., from Benguella, but that is smaller, with pure white hair on face, and better developed abdominal bands.

Megachile flavipes Spinola

Egypt: Aswan, February 8, 1921. ♀ (Capt. K. J. Hayward.)

Megachile chrysorrhoea Gerstaecker

Megachile nasalis volkmanni Friese

These two species were taken at Grootfontein, South-West Africa, by J. N. Justice. They are superficially alike yet structurally so different as to be placed in different subgenera.

Megachile caerulea Friese

North Bechuanaland: Ghanzi, Mongalatsila, both sexes, November 26, 1924, nesting in the ground (J. Maurice). This is definitely the same as a female from Gwelo, Southern Rhodesia (Miss Skaife). The antennae are entirely black. A male from Ghanzi, April 19, also collected by J. Maurice, is *M. konowiana* Friese.

Hoplitis rhodesiae, new species

Male.—Length, with abdomen curved downward, about 11.5 mm; if abdomen were extended it would be fully 13 mm.; wings short, anterior wing about 7 mm.; black including mandibles, antennae and legs, except that the tarsi are light reddish apically; mouth parts elongated, maxillary palpi extremely small; face (including front) narrow, the orbits parallel, face covered with a long dense brush of white hair, which has a faint yellowish tint; vertex shining on each side at level of top of eyes, but the top of head is dull; antennae with a stout scape and a long slender flagellum; mesonotum and scutellum entirely dull; thorax densely covered with long hair, white at sides and posteriorly, dorsally fulvescent; a channel across base of metathorax shining; tegulae pale testaceous; wings hyaline, faintly dusky; stigma very small. reddish; basal nervure going considerably basad of the oblique nervulus; second submarginal cell receiving both recumbent nervures, the first far from base, the second near apex; legs with appressed silvery hair, long and loose on front tibiae, the front femora with long loose hair, which is lacking on the middle and hind ones; hind tarsi long and slender; abdomen moderately shining, the tergites with marginal hair bands, very weak on first, successively stronger and orange-tinted on the others, the orange hairs overlapping a narrow band of white; discs of tergites with thin reddish tinted hair; sixth tergite with an impressed line down the middle; there is a small tooth at each side of sixth tergite; seventh tergite produced into two broad, elongate, somewhat divergent lobes. Pulvilli distinct.

Northern Rhodesia: Algoa, March 5, 1910 (Silverlock). Two specimens. The parapsidal marks are linear, and the second abdominal tergite has at base a deep shining sulcus. The posterior coxae are not distinctly carinate. The species can go in *Hoplitis*, but probably should be made the type of a new subgenus which will probably include also *Osmia forficulina* Ckll. from Basutoland, which is readily distinguished by the long apical spines of abdomen and other characters. The caudal lobes are suggestive of *Osmia karooensis* Brauns.

Osmia ausica, new species

Female.—Like *Osmia mediorufa* Ckll., but less robust, the thorax not so broad; tegulae light red; hair of scutellum and base of abdomen white; abdominal bands purer white. The shining keel down middle of clypeus is very distinct.

South-West Africa: Aus, November 8–30, 1929 (R. E. Turner). This is perhaps only a desert race of *O. mediorufa*. It is also closely allied to *O. elizabethae* Brauns.

NOTES ON FIVE WEST INDIAN CHRYSOMELIDAE (Coleoptera)

By Doris H. Blake

The following species have come to the writer's attention in the course of recent work at the United States National Museum. The two species of *Hadropoda* were distributed in the collection too late to be included in my paper on that genus published in 1943.[1]

Chlamys conifera Lacordaire

(Pl. 22, fig. 2)

Chlamys conifera Lacordaire, Phyt., 2; 733, 1848.

This was described by Lacordaire from Brazil. His detailed description fits two specimens from Cuba, one collected by Mr. F. Zayas on the Finca Maicas, near the Pan de Matanzas Mountain, Matanzas Province, in May 1933, on *Malpighia*

[1] Blake, New Species of the Genus *Hadropoda* Suffrian from the West Indies: Bull. Museum Comparative Zoology, 92(8) :413–441, 1943.

cubensis H. B. K., and the other collected by I. C. Scaramuzza and S. B. Bruner at Arroyo Naranjo, Habana Province, May 16, 1937. Apparently this beetle has not been collected since Suffrian in 1866 [2] mentioned Cuban specimens collected by Gundlach and determined by the collector as *Chlamys conifera* Lac. Suffrian remarked that its exact correspondence with Lacordaire's description left no doubt that this was that species. He questioned the authenticity of the locality, Brazil, given by Lacordaire, and believed it to be erroneous. This additional collection of the beetle is worth noting and a drawing has been made for the benefit of future workers on the genus.

Metachroma chapini, new species

(Pl. 22, fig. 5)

About 5 mm. in length, oblong, somewhat shining, very finely alutaceous, the head and prothorax reddish brown with darker shadings, elytra paler yellow brown; antennae and legs pale, the latter with the apices of femora dark ringed; anterior and posterior femora strongly toothed.

Head reddish brown with a darker marking on occiput and down the middle of the front, lower front paler with the mouthparts dark; surface smooth, shining and with numerous coarse punctures; groove about the inner side of eye well marked. Antennae not extending to the middle of the elytra, reddish brown, the tips of the six outer joints darker. Prothorax smoothly convex above and somewhat contracted anteriorly with a little depression on either side; sides arcuate, basal margin straight, a tooth at each corner with a seta-bearing pore; disc finely alutaceous and covered with numerous punctures, distinct but not so coarse as on head; reddish brown with deeper brown shadings forming a scroll-like pattern nearly across the pronotum. Scutellum pale with a deeper colored margin. Elytra shining and tending to be paler than the prothorax, in one specimen, the male, entirely pale yellow brown, in the female, an indefinite dark area on either side below the humerus; in this specimen also the striate punctures deeper in coloring and thus appearing coarser than in the pale male; striate punctures distinct to the apex. A distinct basal callosity and an intrahumeral sulcus. Body beneath reddish brown, shining, covered with very fine and rather long pubescence, more conspicuous and longer down the middle and between the coxae, the space between the anterior coxae also conspicuously punctate. Legs pale with darker rings at the apices of the femora; anterior and posterior femora each with a pronounced tooth. Tibiae of the middle and posterior legs deeply emarginate near the apex. Length 4.9–5.2 mm.; width 2–2.2 mm.

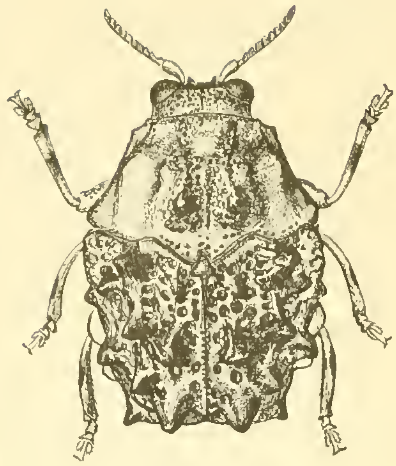
Type male and paratype female, U. S. N. M. Cat. No. 56947.

Type locality.—Newport, Jamaica, collected April 21, 1937 by E. A. Chapin and R. E. Blackwelder.

Remarks.—This robust species of *Metachroma* with its well developed legs has the anterior and posterior femora each with a prominent tooth such as occurs in the Cuban species, *Meta-*

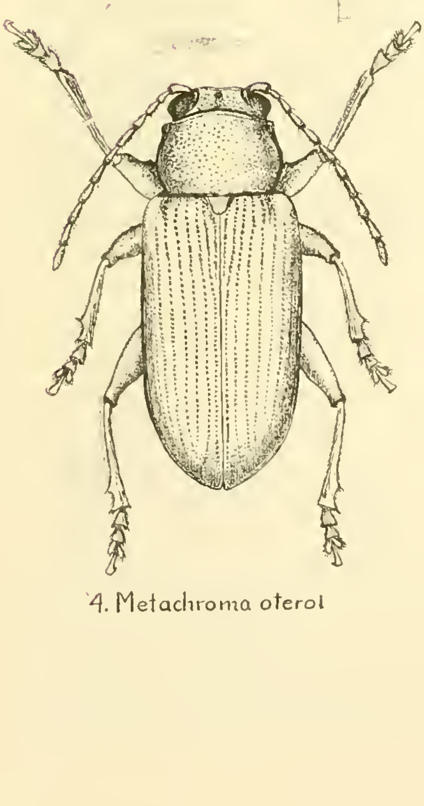
[2] Suffrian, Archiv. f. Naturg., 32:289, 1866.

1. Hadropoda poikila

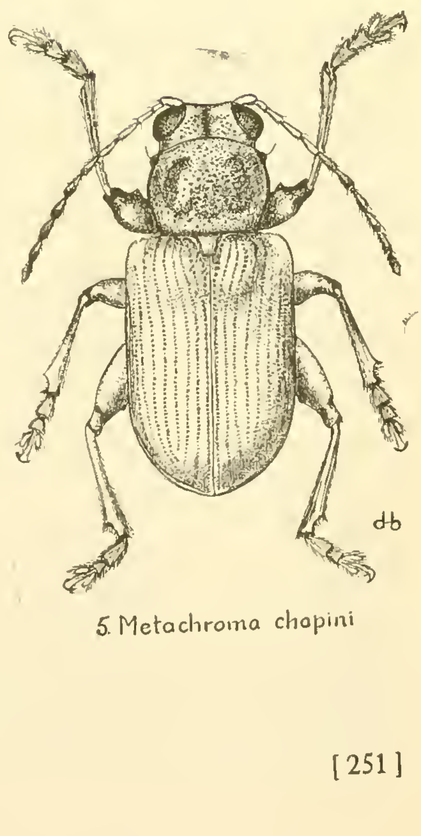


2. Chlamys conifera Lac.

3. Hadropoda aspila



4. Metachroma oteroi



5. Metachroma chapini

chroma gracile Blake. Unlike that species, however, it has no trace of elytral costae. I take pleasure in naming the species for Dr. Chapin.

Metachroma oteroi, new species

(Pl. 22, fig. 4)

About 5 mm. in length, elongate oblong, moderately shining, pale yellow brown with a darkened depressed area running from the occiput down the vertex, dark mouthparts, dark lateral edges on both prothorax and elytra, elytra long and narrow and without elevations or depressions and with straight lines of punctation.

Head pale with dark mouthparts and median occipital depressed area; groove on inner side of eye well marked, surface moderately shining, very finely alutaceous and with numerous distinct punctures. Antennae not extending to the middle of the elytra, reddish brown with the apices of the joints darker. Prothorax pale with piceous lateral margins, shining, moderately convex, sides arcuate, a sharp tooth at each corner; surface moderately densely and distinctly punctate. Elytra elongate, without depressions or elevations, the striate punctures running in regular straight lines; between the striae the intervals very finely and not densely punctate. Margin in the basal half piceous. Body beneath and legs pale yellow brown, shining, finely and sparsely pubescent. Front femora distinctly toothed, hind femora with very faint indication of toothing not distinct enough, however, to be definitely called toothed. Length 5.3 mm.; width 2 mm.

Type male?, U. S. N. M. Cat. No. 46948.

Type locality.—Santiago de las Vegas, Cuba, collected May 16, 1932, by Angel Otero.

Remarks.—This species is closely related to *M. gracile* Blake, also a Cuban species, but differs in not having the hind femora toothed. It is also distinguished by the regular and straight striate punctation and lack of any basal prominence on the elytra. Mr. Otero for whom the species is named has supplied me with a number of interesting specimens.

Hadropoda poikila, new species

(Pl. 22, fig. 1)

About 4 mm. in length, elongate oblong, reddish brown, covered with pale golden appressed pubescence with darker brown pubescence forming an irregular pattern on apical half of each elytron; antennae extending below the middle of the elytra. Prothorax only a little wider than long.

Head closely punctate and pubescent over occiput and front, with a deep median line down the front, a short, narrow, elevated line running down from between the antennae and meeting with the ridge running down below the antennal sockets, lower front shiny, nearly glabrous. Antennae with joints 3–6 long and very slender, entirely pale, outer ones more pubescent. Prothorax about as long as wide with sides slightly rounded and widest before the middle, disc not much depressed below the middle, covered with a short, fine, and closely appressed pubescence. Elytra with well developed basal callosity and a distinct sulcus extending from within the humerus down below the callosity nearly to the suture; punctures of the elytral striae visible through the fine short, appressed pubescence, the pubescence mainly golden in color but with dark brown patches, especially noticeable in one specimen and forming a semicircular pattern, in the other something of a transverse fascia in the apical half. Body beneath and legs shining brown, lightly pubescent, the back of the hind femur with dense pale pubescence. Length 4.2 mm.; width 1.8 mm.

Type male and paratype female, U. S. N. M. Cat. No. 56949.

Type locality.—Dominica, B. W. I., collected in June–July by H. W. Foote of the Yale expedition of 1913.

Remarks.—This species is similar to *H. stenotrachela* Blake also from Dominica, in having the prothorax nearly as long as broad and not much depressed. It is, however, a larger, more robust species, lacks the pronotal median line, and has varicolored elytral pubescence.

Hadropoda aspila, new species

(Pl. 22, Fig. 3)

About 3 mm. in length, oblong, pale yellow brown, without markings of any sort above, the lower surface darker, densely covered with short, appressed, pale, pubescence; antennae extending to the middle of the elytra; prothorax nearly as long as wide.

Head finely and densely punctate over occiput and with an inconspicuous short pubescence; frontal tubercles separated by a deep median line; interantennal area short and blunt. Antennae long, the basal joints very slender, entirely pale. Prothorax, as in the preceding species, nearly as long as broad, in this species, the disc clearly depressed in basal half and with a small median depression anteriorly; densely covered with a short, fine pubescence. Elytra with prominent basal callosities and a deep intra-humeral sulcus extending nearly to the suture. Striate punctation visible through the dense pale appressed pubescence, at apex the hairs tending to become erect. Body beneath deeper in color, and in one specimen, except for the tip of the abdomen, deep reddish brown; lightly pubescent. Legs pale, finely pubescent, the back of the hind femur more densely and coarsely pubescent. Length 3.2–3.3 mm.; width 1.4–1.5 mm.

Type male and 3 paratype females, U. S. N. M. Cat. No. 56950.

Type locality.—Dominica, British West Indies, collected by H. W. Foote, Yale expedition, 1913.

Remarks.—Like *H. poikila*, this species resembles *H. stenotrachela* Blake in having a narrow prothorax. It appears that this is a peculiarity of the Dominican species. The present species, although approximately of the same size as *stenotrachela*, is stouter and without markings.

A SECOND SPECIES OF GLAMYROMYRMEX WHEELER
(Hymenoptera: Formicidae)

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

The genus *Glamyromyrmex* was described by Wheeler in 1915 for a single new species, *beebei*. A second species, from Barro Colorado Island, Canal Zone, has been named *wheeleri* in honor of the late W. M. Wheeler, and is described below.

The following key will apparently serve to identify the workers of the two species, although the author has not seen any specimens of *beebei*.

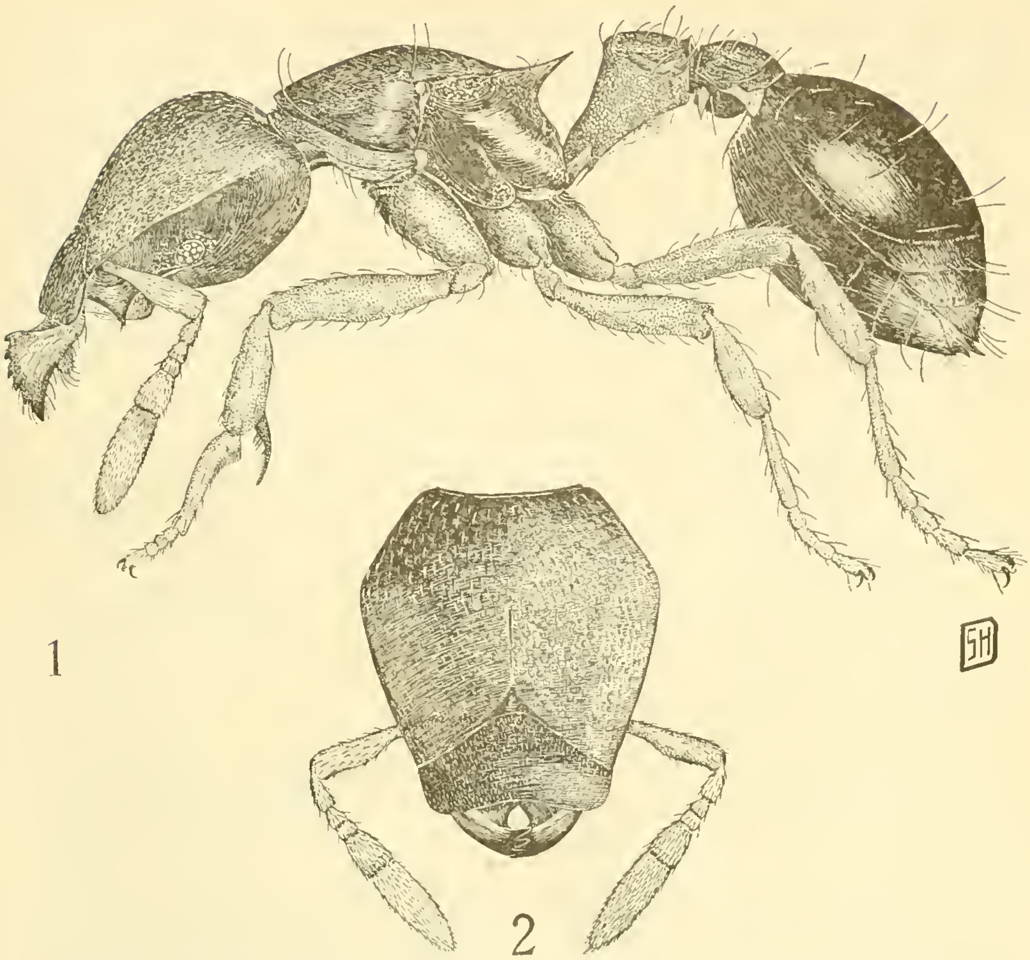
Posterior border of head weakly excised. No metasternal angles. Anterior surface of peduncle, in profile, meeting dorsal surface of petiolar node in a very pronounced angle. Each side of petiolar node lacking a spongiform process.................................... *wheeleri*, new species

Posterior border of head deeply excised. With metasternal angles. Anterior surface of peduncle, in profile, meeting dorsal surface of petiolar node in a curve. Each side of petiolar node with a spongiform process.. *beebei* Wheeler

Glamyromyrmex wheeleri, new species
(Figs. 1 and 2)

Worker.—Length 1.6 mm.

Head, exclusive of mandibles, approximately one and one-tenth times as long as broad when measured through its greatest length and breadth. Posterior border of head weakly excised, sides anteriorly divergent to about posterior third of head (where the head is broadest), then convergent to clypeal suture, from which point it is slightly divergent again before attaining anterior border of clypeus. Posterior half of head much more convex dorsally than remainder. Frontal area obsolescent. Side of head and clypeus extended horizontally as a translucent plate which occupies about four-fifths of length of head and helps to form a scrobe in which the antenna and eye are entirely concealed from above. Clypeus approximately twice as broad as long with a median emargination on anterior border and posterior border subangular, more or less indistinct. Mandible prominently extended in front of clypeus, its superior border forming a more or less horizontal plate or tooth, a great deal of which is concealed by the clypeus; apical border with 6 well-developed teeth. Antenna 6-segmented; scape subclaviform, slender at base; last 2 funicular segments enlarged, forming a club, the last segment of which is approximately as long as remainder of funiculus. Antenna concealed in a deep scrobe dorsal to eye. Eye small, with not more than 4 or 5 facets in its greatest diameter, placed somewhat posterodorsad of a sharp carina which ends anteriorly near base of mandible in a prominent, acute, ventrally directed spine or tooth. Pronotum with a distinct, transverse carina posterior to the collarlike extension back of head. Thorax compressed, the region from posterior corners of prono-



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Glamyromyrmex wheeleri, new species. Fig. 1.—Profile of worker. Fig. 2.—Head. (Illustrations by Sara H. DeBord.)

tum to base of epinotal spines more or less marginate. Promesonotal and mesoepinotal sutures obsolescent. Epinotal spines prominent, slightly exceeding length of their interbasal space. Thorax, in profile, moderately arched-the arch reaching its highest elevation at approximate junction of promesono, tum. Metasternum not angled or spined. Anterior surface of peduncle, in profile, meeting dorsal surface of petiolar node in a very pronounced angle. Petiolar node, from above, one and one-third times as long as broad, with somewhat rounded anterior border, subparallel sides, and subtruncate posterior border. Postpetiolar node subrectangular, approximately one and six-tenths times as broad as long. Ventral surface of petiole, sides of postpetiole, and anteroventral surface of gaster with spongiform processes. Dorsal surface of gaster with a few longitudinal striae near base.

Dorsal surface of head with sparsely distributed, fine, very closely appressed hairs. Thorax with a pair of unusually long, slender hairs at humeral angles and also at posterior corners of pronotum. Dorsal surface of petiole and postpetiole, and both dorsal and ventral surfaces of gaster with sparsely distributed, erect hairs. Hairs on legs rather appressed.

Dorsal surface of head with a very fine sculpture which has a somewhat coriaceous appearance. Body smooth and shining except for ventral portion of antennal scrobe, collarlike extension of prothorax, legs, and much of petiole which are punctulate, subopaque.

Dark brown, approaching black; with lighter mandibles, translucent border of head and clypeus, antennae, and legs.

Type locality.—Barro Colorado Island, Canal Zone.

Description based on the holotype and a paratype, both workers, collected by James Zetek in December 1943 or January 1944. The specimens bear Zetek No. 5114 and U. S. National Museum No. 56903.

Glamyromyrmex beebei Wheeler

Glamyromyrmex beebei Wheeler, 1915, Harvard Univ. Mus. Compar. Zool. Bul. 59: 488–491, *worker, female, male.* Worker, fig. 2 *a* and *b*, female *c*, male *d*, *e*, and *f*.

Type locality.—Suburb of Para, Brazil, C. William Beebe.

Cotypes in the Harvard University Museum of Comparative Zoology under M. C. Z. No. 9039.

TWO MAYFLY GYNANDROMORPHS (EPHEMEROPTERA)[1]

By Richard H. Daggy

During a survey of the mayfly fauna of Minnesota over the period 1936–1941, large numbers of mayfly adults were examined from all parts of the state. In the course of the study, two interesting gynandromorphs were noted. Since this condition has not commonly been reported in the mayfly literature, these two unique specimens are described below.

The first, a specimen of *Blasturus nebulosus* (Walker), occurred in a large series of this species collected by the writer from Mille Lacs Lake, Mille Lacs Co., Minnesota, on June 3, 1937.

The dimorphism so characteristic of most mayflies is especially striking in *B. nebulosus*. Males, in general, are smaller than the females and have the fore wings conspicuously marked with a brown cloud over the distal third, while in the female the wings are unmarked. The compound eyes of the male are very large while those of the female are much smaller. The fore legs of the male are much longer than those of the female, and the presence of forceps and penes lobes form a conspicuous structure peculiar to the male. Usually the caudal filaments are relatively longer in the male than in the female. In general, the above characteristics apply to the different sexes of most species of mayflies.

[1] Paper No. 2192 of the Scientific Journal Series of the Minnesota Agricultural Experiment Station.

In general appearance, this first gyanndromorph most resembles an ordinary female imago, but the writer's attention was first attracted when the "female" bore the external genitalia of the male sex. Further examination disclosed a mosaic type of gynandomorphism in which the left side showed certain male characteristics while the right side showed almost all female characteristics.

The body size (12 mm.) and wing length (12 mm.) are those of the average female in this species. The two fore wings appear similar and are wholly unlike the male in lacking the familiar brown cloud so distinctive of that sex in this species. One slight wing difference was discovered. A minute part of the wing along the margin between vein M_1 and the intercalary between M_1 and M_2 (Needham-Traver system) showed a trace of the typical brown cloud of the male. This minute pigmented area occurred on the left or "male" side. The cloud, although very faint, shows some relation to the male wing, but the pigment will probably fade out entirely in alcohol as so frequently occurs even in normal male wings in time.

The compound eyes are those of the female and show no differences nor any resemblance to the relatively huge eyes of the normal male. The left ocellus ("male" side) is fully twice the size of the right ("female") side), and the median ocellus is deflected slightly to the left. The lateral ocelli are conspicuously larger in the normal male when compared with those of the normal female.

Unfortunately, the fore legs and median caudal filament are lacking. Any difference in length of left and right fore legs would have been of great interest since the fore legs differ greatly in length in normal males and females. The other legs showed no apparent differences on the two sides.

The dorsal abdominal color pattern is symmetrical and is characteristic of the normal female. The ventral markings of the gynandromorph are decidedly abnormal. Typically, the male is darker than the female ventrally. In this specimen, the thoracic venter and first abdominal sternum are distinctly divided into two halves—the left or "male" half is solidly blackish-brown while the right or "female" half is entirely pale. A midventral dividing line along the other sterna is distinct in that the two halves of any one sternum do not resemble each other in color pattern. This pattern is not a continuation of the thoracic pattern just described but seems to separate a patchwork of dark and light colored areas. Sterna 2–3 are essentially alike on each side, but 5, 6 and 8 show more dark areas on the right, while 7 and 9 have the dark markings on the left. Light and dark markings are equally distributed on 4 but in different patterns on each half sternum.

The external genitalia are almost wholly male. The left or "male" side shows the normal penis and normal forceps limb, but the right or "female" side lacks the penis, and the forceps limb is rudimentary (see Fig. 1). The caudal filaments are asymmetrical—the left or "male" filament is distinctly thicker and longer (33 mm.) than the right or "female" filament (23 mm.). In normal males, the caudal filaments are always stouter and longer than in the female.

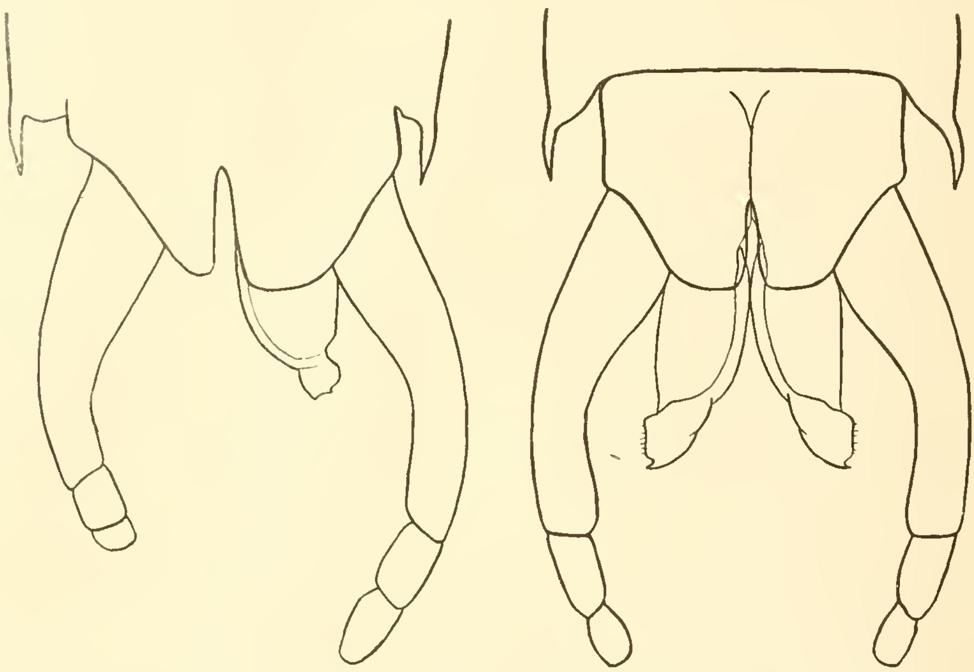

Fig. 1. Genitalia of the normal male, *Blasturus nebulosus*, and of the gynandromorph.

Oddly enough, the second gynandromorph noted in this study of Minnesota mayflies occurred in the same genus. This specimen, identified as *Blasturus cupidus* (Say), was taken at Taylor's Falls, Minnesota, on the St. Croix River, May 31, 1938, by the writer.

At first glance, the dried specimen appeared to be a normal female, even to the extent of having the abdomen packed with eggs in the usual manner. The coloration and size were those of the normal female. The eyes were conspicuously different, however, that on the left being large, the size of the normal male eye. There was no difference in the relative lengths of the fore legs, their length being that of the normal female. The genitalia are especially peculiar. Forceps limbs are present, but the right one, corresponding to the side with the "female" eye, is stunted. The left forceps limb, on the side with the "male" eye, is apparently the size of the normal male. No penes lobes are discernible. Unfortunately, the right fore wing and right caudal filament are missing in this unusual specimen.

Needham, Traver and Hsu (1935), p. 114, record the occurrence of a gynandromorph in which a species of *Stenonema* (*interpunctatum* group) combines male and female characteristics. It resembles the *Blasturus nebulosus* gynandromorph described above in that it is predominately female. In the *Stenonema* gynandromorph, the left half possesses the male coloration on the dorsum of the thorax and the half-forceps and single penis at the end of segment 9. The head, legs and caudal filaments are those of the female. This specimen was collected by J. R. Traver on Lake Erie, July 7, 1934.

Spieth and Ide (1939) have described four more gynandromorphs from North American material occurring in their collections. The species involved are *Leptophlebia mollis* (Hagen), *Stenonema terminatum* (Walsh), *Stenonema rubromaculatum* (Clemens), and *Potamanthus flaveola* (Walsh). Various combinations of male and female characteristics were observed in these specimens. In the gynandromorph of *Leptophlebia mollis*, the characteristics of the female were present at the anterior end, those of the male at the posterior end, including well developed male genitalia. The others showed a mosaic mixture of characteristics of both sexes.

The two gynandromorphs described in this paper, one described by Needham, Traver, and Hsu, and the four noted by Spieth and Ide make a total of seven described mayfly gynandromorphs for North America.

Tiensuu (1937) has summarized the European literature in regard to this interesting condition in European mayflies. Previous to the publication of his paper, the only intersexes discussed in this literature were of the same species, *Baetis rhodani* Pictet. Tiensuu describes five new anomalies from material collected in Finland. The three intersexes described include specimens of *Baetis scambens* Eaton, *Baetis* sp, (? *bioculatus*) and *Cloeon praetextum* Bengston. All of these individuals show peculiar intersexual mingling of male and female characteristics, although they are not bilaterally symmetrical.

Literature Cited.

Needham, J. G., Traver, J. R., and Hsu, Yin-Chi. 1935. Biology of Mayflies. Comstock Publishing Co., Ithaca, N. Y.

Spieth, H. T. and Ide, F. P. 1939. Some gynandromorphs of Ephemeroptera. Canad. Ent. 1939. 71 (8): 165–168.

Tiensuu, L. 1937. Anomalous mayfly individuals (Ephemerida). Suomen Hyonteistieteellinen Aikakauskirja. Annales Entomologici Fennici, 217–223.

NOMENCLATURE OF THE GENUS NYSIUS AND ITS ALLIES (Lygaeidae: Heteroptera)

By R. L. Usinger, *U. S. Public Health Service*, and R. I. Sailer, *U. S. Department of Agriculture*

Recently (China, The Generic Names of British Insects, pt. 8, p. 236, 1943) it has been shown that under the International Rules of Zoological Nomenclature *Nysius* Dallas, 1852, is not applicable to the genus universally known under that name. Through an oversight China cited *Macroparius* Stål, 1872, as the correct name instead of *Artheneis* Spinola, 1837, which he listed as a synonym. In recent correspondence he has agreed that the latter name must be employed for this genus of Lygaeidate. Unfortunately, this change would produce much confusion in literature of economic entomology since the name *Nysius* has become virtually synonymous with "false chinch bug" and "Rutherglen bug," two important pests of agricultural crops in Europe, North America, and Australia. It seems advisable, therefore, to request the International Commission on Zoological Nomenclature to take appropriate action under suspension of the Rules in order to maintain *Nysius* for the genus of bugs to which it has long been applied.

The change to either *Macroparius* or *Artheneis* is not made necessary through any misconception of the groups involved but simply through two unfortunate genotype selections. Distant (1903), ignoring the carefully defined subgenera of Stål (Enum. Hemipt. 4: 119–122, 1874), and Horvath (Rev. d'Ent. 9: 185–191, 1890) considered the genus *Nysius* as a unit and designated *Nysius zealandicus* Dallas as its type. *Zealandicus* had previously been set apart by Stål (1868) in a monotypic subgenus, *Rhypodes*, and *Nysius* was used for the cosmopolitan group including *thymi* and its allies. This did not exclude *zealandicus* from consideration as the genotype of *Nysius*, since Dallas included it as one of the original species. Distant continued to use the name *Nysius* for the false chinch bug and its allies until his death. However, Evans (1929) raised most of the subgenera, including *Rhypodes*, to full genera. This should have precipitated the matter because the name *Nysius* should have been used in place of *Rhypodes*, and the next oldest synonym should have been selected for *Nysius* auct. nec. Dallas. However, Distant's type fixation was overlooked, and it remained for Mr. China to point out the nomenclatural inconsistency in 1943.

Meanwhile, Kirkaldy (1909) noted that, as Spinola himself had suggested, *Artheneis* Spinola, 1837 (a common European genus and type of the subfamily Artheneinae), actually comprised two genera. Instead of following general usage and designating *foveolata* as the type of *Artheneis*, Kirkaldy cited "(type *eymoides*), = *Nysius* Dallas, 1852" (sic!), thus confusing the *Nysius* picture and necessitating a new name, *Tyrrheneis*, which he proposed for *Artheneis* auct., nec. Kirkaldy. It is not clear whether Kirkaldy intended to replace *Nysius* with *Artheneis* or not. He described many new species of *Nysius* in 1910 but the paper was published posthumously. We have seen no evidence in his published works or in his private collection to indicate that he contemplated a change in the name *Nysius*.

Oshanin (1912) ignored the earlier genotype fixations and designated genotypes designed to legalize current usage. Oshanin's type designations were accepted by Van Duzee in his "Check List" (1916) and "Catalogue" (1917) and have been generally, though incorrectly, accepted by hemipterists up to the present time.

Thus we are faced with a situation in which two authors designated genotypes which completely upset existing usage. The changes were entirely unnecessary and it seems clear that the authors had no intention of changing anything, because they failed to make the changes in their own subsequent work. Under the Rules their intentions are, of course, of no consequence, but considered in connection with the economic importance of the group and the universal acceptance of the names in current usage, it seems justifiable to consider action under suspension of the Rules which would permit retention of the name *Nysius* for the concept with which it has been universally associated.

We, therefore, respectfully recommend that the International Commission on Zoological Nomenclature exercise the plenary power conferred on it by the International Zoological Congress and that the following actions be taken:

1. Reject Distant's (1903) designation of *Nysius zealandicus* Dallas in favor of Oshanin's (1912) designation of *Lygaeus thymi* Wolff, 1804, as type of *Nysius* Dallas, 1852.
2. Reject Kirkaldy's (1909) designation of *Artheneis cymoides* Spinola, 1837, in favor of Oshanin's (1912) designation of *Artheneis foveolata* Spinola, 1837, as the type of *Artheneis* Spinola, 1837.

CONCLUSIONS

Suppression of the Distant and Kirkaldy genotype designations will result in the following:

Nysius Dallas, 1852, type *Lygaeus thymi* Wolff, 1804.
(= *Macroparius* Stål, 1872), type *Heterogaster graminicola* Kolenati, 1846.

Rhypodes Stål, 1868, type (*Nysius zealandicus* Dallas, 1852) = *R. clavicornis* (F.), 1794.
(= *Myersia* Evans, 1929), type *Lygaeus clavicornis* F., 1794.

Artheneis Spinola, 1837, type *Artheneis foveolata* Spinola, 1837.
(= *Tyrrheneis* Kirkaldy, 1909), type *Artheneis foveolata* Spinola, 1837.

SUMMARY OF LITERATURE

Nysius Dallas, 1852, List of Hemiptera, vol. 2, p. 551. (No type designated.)

Nysius, Distant, 1903, Fauna Brit. India, vol. 2, p. 17 [Type designated as (*Nysius zealandicus* Dallas) = *Rhypodes clavicornis* (F.).]

Nysius, Oshanin, 1912, Kat. Palae. Hemip., p. 28. (Type designated as *N. thymi* Wolff.)

Macroparius Stål, 1872, Ofv. K. Svensk. Vet.-Akad. Forh. 29 (7): 43. (Type, *Heterogaster graminicola* Kolenati, 1846; the only included species.)

Rhypodes Stål, 1868, Hemip. Fabr., p. 76. [Type, (*Nysius zealandicus* Dallas, 1852) = *Rhypodes clavicornis* (F.), the only included species.]

Myersia Evans, 1929, Bull. Ent. Res. 19: 353.[Type, (*Lygaeus clavicornis* F., 1794) = *Rhypodes clavicornis* (F.).]

Artheneis Spinola, 1837, Essai Hemip., p. 250. (No type designated, but genus divided into two subdivisions.)

Artheneis, Kirkaldy, 1909, Canad. Ent. 41: 31. (Type designated as "*eymoides*.")

Artheneis, Oshanin, 1912, Kat. Palae. Hemip., p. 31. (Type designated as *Artheneis foveolata* Spinola.)

Tyrrheneis Kirkaldy, 1909, Canad. Ent. 43: 31. (Type designated as "*foveolata*.")

ENTOMOLOGICAL SOCIETY OF WASHINGTON, 547TH REGULAR MEETING, JUNE 1, 1944

The 547th regular meeting of the Society was held Thursday, June 1, 1944, in Room 43 of the National Museum with President Annand presiding. Twenty seven members and 17 visitors were present. The minutes of the previous meeting were read and approved.

New members were elected as follows:

Mayor Roberto Levi Castillo, P. O. Box 759, Guayaquil, Ecuador.

Capt. John N. Belkin, 20th Malaria Survey Unit, APO 709, c/o P. M., San Francisco, Calif.

Dr. W. H. Mitchell, Bibliography Division, Library, U. S. Dept. Agr., Washington, D. C.

Mr. Sailer stated that the species of bedbug collected at Gainesville, Florida, in 1938 was definitely the tropical species, *Cimex hemipterus*. Its identity had been tentatively confirmed by Dr. G. M. List in 1940. There are now records from 7 localities, indicating a widespread distribution in the State. He also referred to an unusual family of Hemiptera, the Enicocephalidae, members of which he had observed in his own back yard hovering about 6 feet above the ground in swarms of 50 to 100 individuals. Specimens were circulated. There were comments by Mr. Muesebeck and Dr. Townes.

Mr. A. J. Kramer of the Solicitor's Office, U. S. Department of Agriculture gave the first paper on the regular program: Patents from the Point of View of the Deparment of Agriculture.

The Department of Agriculture embraces one of the largest research organizations in the world which is financed by the people of the United States through the medium of taxation and therefore inventions made through the Department's research efforts are regarded as belonging to the people. Patents are obtained to protect this public investment and also to permit certain administrative control over exploitation in the interests of health, safety and morals. Congressional authority is needed to permit the Department to issue exclusive licenses under its patents to encourage exploitation requiring large capital investments. A bidding system employing time schedules of production as the bidding factor could be employed to select exclusive licensees, if such authority were granted. The term of license would be the time bid plus a further period thereafter agreed upon.

Two types of public service patents are obtained, namely, the dedicated patent which is used when administrative control over exploitation is unnecessary or undesirable, and the assigned patent whereby the Secretary can control exploitation through issuance of licenses. (Author's Abstract).

Mr. Rohwer and Dr. Annand commented on the various types of patents issued to the Bureau, methods of making patents available, and means of enforcing licensing regulations. Mr. Kramer referred to the forthcoming report of the National Patent Planning Commission.

The second paper was by Mr. H. H. Stage: Observations on Mosquito Conditions in the Muskeg and Tundra of Northern Canada. Mr. Stage illustrated his talk with colored slides.

In July, 1943, I had an opportunity to make a few brief observations on mosquito ecology in the muskeg and tundra of northern Canada. The trip was made at the request of the Quartermaster General's Office and the Surgeon General's Office, United States Army. Its purpose was to make practical field tests of mosquito repellents and other mosquito equipment. Information was obtained on mosquito conditions the length and breadth of Manitoba and certain points in the Northwest Territories.

Two officers and twelve enlisted men were detailed to assist Dr. Terris Moore of the Quartermaster General's Office and myself. In order to simulate practical field conditions, a march into typical muskeg and tundra country under forced-march conditions was made by the party. We followed no trails. We carried our food, shelter, and all equipment and packs strapped to our backs, and it was up to us to protect ourselves by any means we could against the myriads of mosquitoes which were constantly present. Our special equipment included several kinds of head nets, clothing, foot gear, sleeping bags, pup tents, and several insect repellents.

During the march, several hundred tests were made with the repellents on the bare arms and legs of the members of the party.

We met with tremendous hordes of mosquitoes practically every hour of the march. For example, in making the round of the tents one evening, I estimated rather closely that 1900 mosquitoes were roosting on one of the tents. The following morning I counted in the two ventilators of the tent 126 dead specimens which had been carried inside accidentally by the two occupants and killed the night before with the aerosol bombs. The mosquitoes were so abundant that, as we prepared our meals over the fire in the open, several fell into our rations at each meal.

At the end of the march, the group voted unanimously in favor of the use of repellents rather than of head nets and heavy clothing as a means of protection against the mosquitoes encountered. A few observations were made on the comparative responses to colors of mosquitoes in this area. Counts were made of the numbers on black, white, and khaki-colored shirts during periods of thirty seconds each. The mosquitoes alighting on the white shirts averaged 2, on the black shirts 8, and on the khaki shirt 35. On bare backs, an average of 97 mosquitoes were counted per 30-second interval.

In southern Manitoba *Aedes vexans*, *A. flavescens*, *A*, *cinereus*, *A. dorsalis*, *A. spencerii*, and *A. excrucians* are first seen in early June. In northern Manitoba *Aedes cataphylla* and *A. nearcticus* put in an appearance in July, and close to the Arctic Circle *Aedes nigripes* appeared late in July and were found in pure cultures only. In the latter instance the larvae were found in water which probably never exceeded 40° F. Some idea of the tremendous area over which these mosquitoes breed in prodigious numbers can be gained by referring to a map of northern Canada. The muskeg and tundra extends three or four thousand miles east and west and at least one thousand miles north and south. Over practically every square mile there are large and small pools of water fed from below by melting ice. Practically all of these pools give rise to large broods of the mosquito species mentioned.

It is difficult to imagine how the tremendous hordes of mosquitoes are able to obtain blood meals in these trackless wastes, for in much of the area visited there was very little sign of animal life. The great numbers of mosquitoes and the apparent lack of suitable food raise the question whether these species can lay fertile eggs without blood meals. Plant specimens associated with *Aedes nearcticus* and *A. cataphylla* close to the northern limits of tree growth were *Salix* sp., Labrador tea, sedge, lousewort, Alpine bearberry, buffaloberry, crowberry, mountain avens, reindeermoss, sweet coltsfoot, whortleberry, black spruce, birch, and larch. (Author's Abstract.)

Discussion followed by Mr. Rohwer, Mr. Wood, Dr. Bishopp, Dr. McGovran, Dr. Anderson, Dr. Stone, and Lt. Daggy.

The following visitors were introduced to the Society: Dr. A. L. Ayroza Galvão of Brazil, Ensign C. E. Hopla, and Lt. (j. g.) Donald J. Borrow.

There being no further business, the meeting was adjourned at 9:35 P. M.

INA L. HAWES,
Recording Secretary.

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Actual date of publication, December 30, 1944.

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ANNOUNCEMENT

Memoir Number 2, **"A Classification of Larvae and Adults of the Genus Phyllophaga,"** by Adam G. Böving, is now available for distribution.

To non-members and institutions	$3.00
To members of the Society	$2.40

A morphological and taxonomic study of this economically important genus of beetles, with keys to the larvae, and a classification based upon both larval and adult structures.

Back numbers of the Proceedings are available at the general rate of 50 cents per number. Some of the older articles are also available as reprints. Memoir Number 1, "The North American Bees of the Genus Osmia," by Grace A. Sandhouse, is for sale at $3.00 ($2.50 to members of the Society). Members are entitled to discounts on certain types of orders. We welcome inquiries concerning this literature.

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

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

F. M. WADLEY,
Corresponding Secretary,
Address: Bureau of Entomology and Plant Quarantine
Washington 25, D. C.

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