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VOLUME 61

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REPORT ON CROSSBREEDING EXPERIMENTS IN TROGODERMA

(COLEOPTERA, DERMESTIDAE)[1]

RICHARD S. BEAL, JR.[2] and GARTH H. SPITLER[3]

In November 1956, a few *Trogoderma* larvae were found with characters which appeared to be intermediate between those of *glabrum* (Herbst) and the khapra beetle, *granarium* Everts. Although the specimens were eventually assigned to another species, their discovery focused attention on the possibility that *glabrum* and *granarium* might not be wholly distinct species but subspecies or color phases of one another. This possibility was heightened by some successful matings between *glabrum* and *granarium* achieved in December 1956 and January 1957, in a short series of preliminary experiments by Scott Radcliffe at the Khapra Beetle Laboratory, A.M.S., in Mesa, Arizona. In view of the measures being taken by the U. S. Department of Agriculture toward the control of the khapra beetle, it seemed essential to clarify its specific relationship with *glabrum* and several closely allied forms. Since species of *Trogoderma* breed readily under laboratory conditions, it appeared feasible to test the reproductive isolation of the forms in question by a series of crossbreeding experiments.

This is a report of the crossbreeding experiments carried out for the most part in the summer and fall of 1957 at the Khapra Beetle Laboratory in Mesa. The experiments are far from complete, and conclusions based on them must be tentative. It was necessary to terminate them before all of the potentially significant crosses could be

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[1]For assistance in obtaining cultures of species used in the experiments, we are greatly indebted to F. O. Marzke of the Dairy Product Insects Laboratory, Madison, Wisconsin; to T. J. Schmitt, Plant Pest Control Division, A.R.S., Phoenix, Arizona; and to H. H. Walkden and his associates at the Stored-Grain Insects Laboratory, A.M.S., Manhattan, Kansas.

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tested, because of the quarantine measures imposed by the program for the eradication of the khapra beetle.

The specimens used in the crosses were individually isolated as pupae and held until maturity. Pairs to be tested were placed in petri dishes with pollen, wheat germ, or dried insects for food, and the dishes were kept in a temperature cabinet at about 95° F. Parent stocks or breeding pairs of each species were maintained under the same conditions for a check on the ability of each species to reproduce under those conditions. When possible, tests were made not only with single pairs but with several individuals of each sex. This was to increase the possibility of obtaining matings in the event of a weak ethological barrier between the forms.

Two major difficulties hampered the satisfactory completion of the experiments. One was the problem of obtaining sexually potent individuals of two particular cultures at the same time. To some degree it was possible to adjust the maturation rate of the cultures by placing them in warmer or in cooler situations. However, it sometimes proved difficult to gauge the rate of maturation of a culture, especially since species of *Trogoderma* have no fixed number of instars. It was found inadvisable to keep active adult specimens for more than ten days before using them for a test, since the ability of older adults, particularly males, to copulate successfully appeared to decrease markedly after this time.

The second difficulty was an infection of some of the cultures by an unidentified schizogregarine parasite, which made it hard to make a final conclusion on the degree of reproductive isolation existing between *granarium* and *glabrum*. When the experiments were begun, all the hybrids of *granarium* and *glabrum* died before reaching maturity. The mortality was found to be the result of an infection brought in with a stock culture of *glabrum* from Kansas. An uninfected culture of *glabrum* was obtained from Wisconsin and used for further experiments. Nevertheless, about fifty percent of the resulting hybrid cultures of *granarium* and *glabrum* eventually showed infection by the parasite. No infection had been suspected in the stock cultures of *granarium*, since they showed no significant larval mortality. Subsequent investigation, however, showed that most of the cultures of *granarium* used for experiments at the Khapra Beetle Laboratory in Mesa were infected with the parasite, but that the parasite only occasionally caused the death of the hosts of this species before maturity. On the other hand, cultures of *glabrum* showed complete or nearly complete mortality of the larvae within the same generation after infection. Insufficient time and the inability to carry out sterile techniques with available laboratory facilities made it impossible to develop an uninfected culture of *granarium* for further experimentation.

Figure 1 shows the various crosses which were attempted. No progeny resulted from any of the combinations except for the *glabrum x granarium* cross and its reciprocal and two instances of *simplex x granar-*

ium crosses. Where attempts were made to cross *granarium* with species other than *glabrum*, the failure to obtain hybrids cannot have been the effect of the schizogregarine parasites in *granarium*. The parasite apparently does not impair the ability of *granarium* to mate and produce viable eggs, and specimens of the other species involved were demonstrated to be free of the parasite.

On the other hand, every cross attempted between freshly emerged specimens of *glabrum* and *granarium* was successful. In most of them the number of eggs laid appeared to be normal for each species and no eggs were observed which did not hatch. In some of the experiments counts were kept of the number of progeny produced, but these are not considered significant, since under the conditions of the tests females ate their own eggs whenever they found them. No special methods were used to isolate females from their eggs except to keep the females in dishes with an abundance of food. Ordinarily being deposited between the food particles, the eggs were usually not found by the females.

FEMALES / MALES	SIMPLEX	GRASSMANI	STERNALE MADERAE	PARABILE	INCLUSUM	TEUKTON	GLABRUM	GRANARIUM
GRANARIUM	See discussion		2-1	2-1 1-1	2-1 4-1 1-1	2-1 10-10	all successful	
GLABRUM	4-2				3-2 2-1	4-2		all successful
TEUKTON	2-2 3-2				2-3 1-1 2-4		1-1	1-1 10-10
INCLUSUM	1-1 1-1			1-1 4-1		4-1 4-1		5-5 1-1 4-1
PARABILE			1-1		2-1	1-5	1-1	2-3 2-1
STERNALE MADERAE	1-1	1-1						
GRASSMANI			1-1					
SIMPLEX					1-1 1-2 1-5	1-1 1-1		See discussion

Fig. 1. Successful and unsuccessful cross-matings attempted between species of *Trogoderma*. Each combination of numerals represents an unsuccessful experiemnt; the first numeral indicates the number of males used and the second the number of females used in each test.

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One preliminary experiment was conducted to discover whether, given an opportunity to select between one species or the other, *granarium* males would more readily choose mates of their own or of the other species. Two freshly emerged, unmated males of *granarium* were placed in a dish with five freshly emerged, virgin females of *granarium* and five of *glabrum*. After five days the males were removed and each female was isolated to determine which would lay viable eggs. Three *granarium* females and one *glabrum* female were discovered to have been mated.

A similar experiment was conducted using two *glabrum* males. In this case it was found that four *granarium* females had mated and one *glabrum* female had mated.

It is not possible to draw conclusions as to the degree of preference which a male of one species may have for a female of his own or the other species from only two such experiments. The experiments show that, if a sexual barrier between the species exists, it is not very strong, and that there may be no such barrier at all.

Figure 2 shows the number and types of crosses attempted using the hybrids of the two species. Only one of these was productive, a backcross of a *glabrum x granarium* male to a *glabrum* female. Larvae from this cross developed to maturity. Some of these progeny were demonstrated to be infected with the schizogregarine parasite, and probably all of them were. At any rate, further breeding experiments with them were fruitless.

Most of the females in these unsuccessful matings produced eggs, one as many as twelve. This is not considered significant, since a vir-

FEMALES / MALES	GRANARIUM	GRANARIUM X GLABRUM	GLABRUM X GRANARIUM	GLABRUM
GRANARIUM		PO	PP	XXXXXX
GRANARIUM X GLABRUM	PP	PPPO	PPPO	POO
GLABRUM X GRANARIUM	PPO	OOO	OOOO	XOP
GLABRUM	XXXX	OO	PO	

Fig. 2. Crossing experiments with *Trogoderma granarium* and *T. glabrum*. Each letter represents the result of an attempted cross; *X*, successful cross; *P*, unsuccessful cross in which there was evidence of parasitization of one or both sexes by a schizogregarine; *O*, unsuccessful cross in which no evidence of schizogregarine infection was found.

gin female *granarium* was observed to lay five eggs, and virgin females of other species have frequently been observed laying one to a few eggs, none of which were viable.

Whether matings might have been successful in combinations where one or both adults subsequently proved to be infected with the schizogregarine parasite is impossible to say. These experiments provide evidence, however, that most of the hybrids of *granarium* and *glabrum* are sterile. On the other hand, there is also evidence of limited hybrid fertility between the species.

First-generation progeny of matings between *glabrum* and *granarium* appear to be nearly exact intermediates between the two species. In the adults about the same degree of color variation exists as is found in *granarium*, except that the specimens all tend to be darker. The pattern of elytral maculation and pubescence is more pronounced than is usual for *granarium*, but somewhat more suffused than for *glabrum*. The male genital structures may resemble those of either one or the other parent species. The larvae are also intermediate between the two species. The dark color found in *glabrum* larvae is more or less limited to the sides of the tergites, the median area retaining the light color of *granarium*. This gives the larvae an appearance almost identical to that of larvae of *T. teukton* Beal. The antecostal suture of the eighth abdominal tergum is completely absent, or nearly so. No differences could be found between hybrids of a *glabrum* male with a *granarium* female and hybrids of the reciprocal cross.

Seven crosses were attempted between specimens of *simplex* and *granarium*. The number of specimens of each sex used and the result of each test are as follows:

Test No.	Males	Females	No. of Progeny
M-13	1 *simplex*	3 *granarium*	0
S-10	1 *simplex*	3 *granarium*	29
S-11	2 *granarium*	1 *simplex*	0
S-12	2 *granarium*	1 *simplex*	0
S-27	2 *simplex*	15 *granarium*	0
S-27A	2 *simplex*	15 *granarium*	2

In tests S-10 and S-27A the progeny resembled *granarium* in every respect in both larval and adult stages. Only seven of the progeny were allowed to reach maturity, but these included both males and females. Possibly these progeny do not represent actual hybrids, but are the product of gynogenesis, a type of parthenogenesis in which insemination is necessary to initiate development of the egg. Gynogenesis is known in a number of species of nematodes, planarians, and earthworms (White, 1954), in one species of mite belonging to the family Anoetidae (Hughes & Jackson, 1958), and in the ptinid beetles (Woodroffe, 1958). Parthenogenesis is not unexpected in *Trogoderma*, since it occurs in another species of the same tribe, *Perimegatoma vespulae* Milliron.

Three other mating experiments were attempted besides those indicated in figures 1 and 2. These were tests between a male *teukton* and a female *granarium x glabrum* hybrid, a male *teukton* and a female *glabrum x granarium* hybrid, and a male *granarium x glabrum* hybrid and a female *teukton*. Each was unsuccessful.

As far as they go, these experiments confirm the taxonomic judgments made on the basis of the study of museum specimens of the various species of *Trogoderma*. Although reproductive isolation between *granarium* and *glabrum* is not complete, it is evidently an effective barrier between them. Such introgressive hybridization as may occur in nature is not likely to affect their status as valid species. The evidence is even more positive that *granarium* is specifically distinct from *teukton*, *inclusum* LeConte, and *parabile* Beal, forms which belong to the same general species group.

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MUSCA AUTUMNALIS DeGEER IN VIRGINIA

(DIPTERA, MUSCIDAE)

Previous North American records of this European species of *Musca* have been confined to the northeast, since its discovery in Nova Scotia in 1952. The most southern record in the United States has been its discovery at Riverhead, Long Island, N. Y., in 1953 by H. C. Huckett. A second New York record was Oswego County, 1956 (Sabrosky, 1957, Proc. Ent. Soc. Wash. 58:347). Since then, I have seen other specimens from Oswego County and several from Ithaca, N. Y., the latter taken in a house with a number of cluster flies, *Pollenia rudis* (F.).

Early in December, 1958, a box of flies was received from Mr. Charles D. Lewis, Little Spring Farm, Leesburg, Va., with a note that they infested his house in the fall. Most of these were *Pollenia rudis*, as expected, but included were three males of *Musca autumnalis* DeGeer. Late in January, 2 ♂♂, 4 ♀♀ of *autumnalis*, taken in a house with *Leptocoris trivittatus* (Say), were received from Mrs. P. F. Dove, Hillsboro, Va. (NW of Leesburg). These records represent a significant extension of the known distribution. The distance from previous records suggests either a separate introduction, or a wider distribution than yet known for a hitherto little noticed species.—

CURTIS W. SABROSKY, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

CARABUS AURATUS L. AND OTHER CARABID BEETLES INTRODUCED AS GYPSY MOTH PREDATORS[1]

(COLEOPTERA, CARABIDAE)

MARION E. SMITH, *University of Massachusetts, Amherst*

R. T. Bell, in a recent short note (1957), reports the finding of the European beetle, *Carabus auratus* L., in the towns of Plainfield and South Barre, Vermont, as apparently the first collection of the species in North America.

This beetle, however, was one of several species of predaceous beetles imported from Europe in the early years of the fight against the gypsy and brown-tail moths in Massachusetts. But, as Clausen (1956) remarks, "The data relating to the importance and colonization of [the species] are incomplete."

Six hundred adult beetles were received from Europe during 1907 (Kirkland 1908) by Mr. W. F. Fiske, in charge of the Gypsy Moth Parasite Laboratory then located in No. Saugus, Mass. However, none are recorded as having been released during that season, nor is there any record of a 1907 release on the gypsy moth file cards now at the Northeast Forest Experiment Station in New Haven, Conn., where the headquarters of the gypsy moth program, headed by Dr. R. C. Brown, are currently located. However, the card record shows that sixty-four males and forty-two females were released in Winchester, Mass., during 1908 (according to a personal communication from Mr. Philip P. Dowden, entomologist at the New Haven Laboratory, who writes that the cards give a far from complete picture of this species). It is not clear whether the 1908 release represented an additional shipment of beetles from Europe, or a portion of the 1907 shipment held over in the laboratory. But records in the literature do show that 478 individuals were liberated through 1910 (Howard & Fiske 1911) and that there were no further releases (Burgess & Crossman 1929).

The first published report of the beetle's successful establishment was apparently that given in 1924 by Crossman and Webber, who include it on a list of introduced parasites and predators of the gypsy and brown-tail moths as one of the three carabid beetles positively established. Mr. Dowden writes (1958): "We have two specimens in our collection, indicating it was recovered there [i.e., in Winchester, Mass., its place of release] in 1920 by C. W. Collins." In the University of Massachusetts collection there are six specimens from Winchester, collected in June, 1920, and very probably a part of the original recovery.

In 1954 Lindroth reported the existence of New England specimens in the collection of the Museum of Comparative Zoology at Harvard; Dr. W. L. Brown, Jr., of that museum, writes (1958) that the seven-

[1]Contribution No. 1302 from the Entomological Laboratories of the University of Massachusetts.

teen specimens there were collected in Winchester, Mass. (1) in 1924; in Arlington, Mass. (12) in 1924, 1926, 1930, and 1933; in Lexington, Mass. (2), one in 1955; in Orono, Maine (1) in 1932; and in Plainfield, Vermont (1) in 1950; the latter specimen bears the same collection data as the three Plainfield specimens mentioned by Bell. According to Brown, "The Massachusetts records are all concentrated in one small area, and particularly in the vicinity of a range of low hills near the boundary separating these three towns." Seven additional University of Massachusetts specimens were collected in Arlington, Stoneham (1934 and 1953), and Woburn (1942); Stoneham and Woburn both adjoin Winchester, to the north of Boston. In addition, the personal collection of Mr. C. A. Frost contains specimens from Arlington and one from Natick, several townships to the southwest of Arlington. Dates of collection of the various specimens range from April 18 through July 3. Although one or two specimens of the beetle are collected in the eastern part of the state by University of Massachusetts students nearly every spring, the species is certainly nowhere abundant.

Because of the wide separation in both time and distance between the introduction of the species in Winchester in 1907 or 1908 and its present occurrence in north central Vermont as well as in Massachusetts near the point of its introduction, it is indeed possible, as Bell suggests, that accidental introductions through commerce, in the manner suggested by Van Dyke (1944) for *Carabus nemoralis* Müll., may account for the Vermont colonies of this species. In any event, the "Golden Gardener," as Fabre has called the insect, is a colorful addition to the beetle fauna of New England.

Ten species of Carabidae were liberated in New England during the gypsy moth program, but only three are known to be established. The colonization of *Calosoma sycophanta* L. was eminently successful (Burgess & Crossman 1929). From 1906, when 389 specimens of the 693 received alive were liberated, through 1910, 4,045 beetles were received from Europe and 2711 of these released. No additional specimens were imported, for the species was by then so firmly established that field collections and laboratory rearing yielded sufficient material for further releases. In all, 35,830 adults and 19,930 larvae were liberated in New England, the majority in Massachusetts, Maine, and New Hampshire, with smaller numbers in Connecticut and Rhode Island. The species is steadily increasing its range. Excellent accounts of its introduction and colonization are given by Burgess (1911) and by Burgess and Collins (1915).

An interesting note is that while continued efforts were being made to introduce predaceous beetles into the New England area, the establishment of *Calosoma sycophanta* was so successful that more than 10,821 field-collected or reared individuals were shipped out of that area into other states and Canada for control of various insect pests (Burgess & Crossman 1929). Between 1912 and 1916, 5331 specimens were shipped to the Dominion Biological Control Laboratory in New

Brunswick, where a severe infestation of the brown-tail moth existed. Although released in large numbers in five Canadian provinces, the beetle failed to establish itself (Baird 1956). Other shipments went to New Mexico (1,750 in 1914 alone) in an unsuccessful effort to introduce the beetle for control of the New Mexico range caterpillar. A further introduction of some 300 adults in 1930, when the range caterpillar again threatened to become a serious pest, was likewise unsuccessful, apparently due to lack of shelter, scarcity of suitable host material, and the sporadic and localized nature of the range caterpillar outbreaks (J. C. Frankenfeld, in correspondence, 1958). Although released specimens survived the first winter in both New Brunswick and New Mexico (Burgess & Collins 1917) there seems to have been no permanent establishment of the species. Additional shipments of this species went to California (1,030) in 1913 and 1918; Colorado (1,010) in 1915; New York (180) in 1915; Washington (200) in 1919; North Carolina (178) in 1921; and Alabama (50) in 1921 (Burgess and Crossman, 1929). According to Clausen (1956) the species has not been recovered in the southern and western states.

The third carabid introduced in the gypsy moth work, *Carabus nemoralis* Müll., is now the most frequently collected *Carabus* in the vicinity of Amherst. Since only 136 individuals were liberated (Burgess & Crossman 1929), 100 of them prior to 1911 (Howard & Fiske 1911), and published records by Brown (1940) and Van Dyke (1944) indicate that the species was found in North America as early as 1890, it is quite evident that the present population of this species has resulted from multiple introductions, probably in great part accidental.

No recovery has been made of the remaining seven species which were released in New England in small numbers between 1906 and 1928. According to Burgess and Collins (1917), 353 adults of *Calosoma chinense* Kby. were received from Japan in 1910 and 1911; 140 were liberated in Cambridge and Stoneham, Mass., in 1911 and 1912, and 128 reared larvae in Pelham, N. H., in 1912. Five hundred and fifteen living adults of *Calosoma inquisitor* L. were received from Europe from 1906 through 1910; 259 adults and 9 larvae were released in Lynnfield (1906), Melrose (1909), and Saugus, Mass. (1911). In 1924 (Burgess & Crossman 1929) an additional 599 living beetles of this species were received from Spain; these were used for life history studies, and 18 reared larvae were later released. Of 124 living adults of *C. reticulatum* Fab. received between 1907 and 1911 from Europe, 83 were released in Winchester, Mass., in 1908 and 27 reared larvae in No. Saugus in 1911.

Of the species of *Carabus*, all from Europe, fewer details have been reported. According to Howard and Fiske (1911), 108 specimens of *Carabus arvensis* Hbst. and 62 *C. violaceus* L. were released prior to 1911. Burgess and Crossman (1929) report that a total of 63 specimens of *C. violaceus* and *C. glabratus* Payk., mixed, and 75 *C.* (*Procrustes*) *coriaceus* L. were liberated, prior to 1929. It seems not surprising that there was no recovery from such small introductions. In addition to the ten species imported and liberated, 719 living adults of *Habrocarabus latus* var. *gougeleti* Reiche were received from Spain in 1924; however, as laboratory studies revealed that the species would probably not be important in gypsy moth control, none were released (Burgess & Crossman 1929).

In addition to the eleven carabids imported for study or release, one silphid beetle, *Xylodrepa quadripunctata* L., was imported (Burgess & Crossman 1929). Three hundred and seventy living adults of this species were received from Europe from 1924 through 1926; 100 adults and 15 reared larvae were liberated. It is not known to have become established.

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CORRECTION

The dates of publication of Vol. 60 were shown erroneously on p. 291 of Vol. 60, No.. 6, 1958. They should read as follows: No. 1, pp. 1-48, March 10, 1958; No. 2, pp. 49-96, April 18, 1958; No. 3, pp. 97-144, June 27, 1958; No. 4, pp. 145-192, Sept. 4, 1958; No. 5, pp. 193-240, Nov. 10, 1958; No. 6, pp. 241-300, Dec. 18, 1958.—Ed.

A NEW SPECIES OF SCAPHINOTUS DEJ., INTERMEDIATE BETWEEN SCAPHINOTUS S. STR. AND IRICHROA NEWMAN

(COLEOPTERA, CARABIDAE)

ROSS T. BELL, *Zoology Department, University of Vermont, Burlington*

Scaphinotus webbi, new species

Head elongate, relatively large; clypeus smooth; frons and occiput finely, transversely rugose; pronotum (Fig. 4) subcordate, its greatest width located one-third of distance from apex to base; greatest width one-and-one-third times greatest length; lateral margins strongly curved anteriorly, oblique but not sinuate posteriorly; pronotum strongly narrowed posteriorly, basal width equal to apical width, about one-half of greatest width; disc of pronotum finely, transversely rugose; disc with extreme lateral margins and ill-defined basal impressions sparsely, finely punctate; median, basal, and apical grooves distinct, moderately deep; lateral margins broadly reflexed, sharply marked off from disc by distinct crease; anterior angles slightly produced; posterior angles strongly produced, projecting about .3 mm. behind basal margin; posterior portion of lateral margin strongly reflexed dorsally, meeting basal margin at about a 45 degree angle, lying in a single plane, uninterrupted by swellings or sulci; lateral margin at about a 90 degree angle with inner margin of posterior lobe; posterior angles obtuse; basal margin narrow; anterior marginal seta present, at lateral end of distinct transverse carina, in outer third of reflexed margin at point of greatest width of pronotum; posterior marginal seta present, at lateral end of fine oblique carina, four-fifths of distance from basal impression to posterior angle.

Elytra ovate in outline; margins entire; margin slightly reflexed in humeral region; fifteen distinct striae present; striation slightly confused at extreme lateral margin and posteriorly; intervals smooth, slightly convex; striae moderately deep, punctate; fifth interval represented by distinct carina apically; elytral epipleurae finely punctate, rest of ventral surface smooth.

Anterior tarsi of male with adhesive hairs of first segment limited to apical third; aedeagus cylindrical, moderately curved; basal lobes over one-half as long as aedeagus, expanded distally, parallel and narrower in proximal half; parameres elongate, their sides subparallel, their basal margins scarcely emarginate; apices of parameres suddenly narrowed, filamentous, apparently flexible; a few very small setae immediately proximal to filamentous apex; internal sac sclerotized, its basal portion poorly differentiated, not suddenly and conspicuously narrowed, middle and apical portions not differentiated, folds of sac longitudinal.

Frons, disc of pronotum shining, dark metallic purple; reflexed lateral margins tinged with bluish purple; elytra shining metallic purple, more reddish than pronotum; occiput, legs, four basal segments of antennae black; ventral surface black with slight purplish tinge; mouthparts, outer segments of antennae brown. Total length, 30.3 mm.; greatest width 13.9 mm.

Holotype.—Male, Campbell County, ten miles southwest of Lynchburg, Virginia, Glenn R. Webb, July 20, 1952. According to the collector, the beetle was taken in a woods near a roadside spring on U. S. Highway 29.

Discussion.—This species could not be traced to subgenus in Valentine's (1935) key, since it combines the widely reflected prothoracic margins of *Scaphinotus s. str.* with the two pairs of marginal setae of *Irichroa*. From *Scaphinotus* (*Irichroa*) *viduus* (Dej.) (Fig. 2) it is easily distinguished by the broadly reflexed pronotal margins. The form of the pronotum is sufficient to separate it from both the known species of *Scaphinotus* from the eastern United States. In both of these species, the pronotum is much wider at the base than at the apex (Figs. 4 and 6), and the reflexed lateral margin is directed more laterally, rather than dorsally. The posterior portion of the reflexed margin meets the basal margin at an angle of about 30 degrees. The corresponding angle in *S. webbi* is about 45 degrees. In appearance, the new species is closer to *Scaphinotus unicolor* (Fab.) than to *S. elevatus* (Fab.). The latter species is much smaller than the others, and has a proportionally wider pronotum.

The discovery of *S. webbi* destroys the clear-cut boundary between the two subgenera. *Irichroa*, which is monotypic, is therefore considered to be merged with *Scaphinotus s. str.*, and *S. webbi* and *S. viduus* can be added to the species listed by Van Dyke (1938). The phylogeny within the group is puzzling. On the basis of external morphology, one would expect that *S. elevatus* and *S. unicolor* would be closely related, with *S. webbi* and *S. viduus* occupying isolated positions, equidistant from the first two species, and from each other. The male genitalia (Figs. 1, 3, 5, 7) do not bear out this conclusion. All four species have highly distinct genitalia. Those of *S. elevatus* and *S. unicolor* show no particular resemblance to one another. Superficially, at least, *S. elevatus* looks closest to *S. viduus*, the species to which it has the least resemblance in external appearance. The character of the internal sac separates *S. webbi* from the other species, all of which have a distinct basal duct which is much narrower than the sac proper. The great enlargement of the basal lobes of the aedeagus is also unique to the new species.

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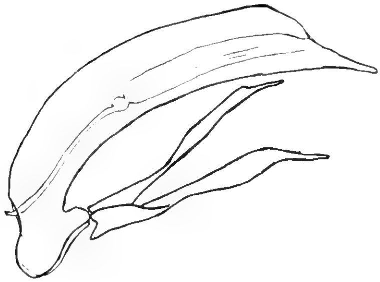
Fig. 1, aedeagus of *Scaphinotus viduus leonardi*, from Vermont; fig. 2, pronotum of *Scaphinotus viduus irregularis*, from North Carolina; fig. 3, aedeagus of *Scaphinotus webbi*, type specimen, from Virginia; fig. 4, pronotum of same; fig. 5, aedeagus of *Scaphinotus unicolor heros*, from Alabama; fig. 6, pronotum of same; fig. 7, aedeagus of *Scaphinotus elevatus flammeus*, from Illinois; fig. 8, pronotum of same.



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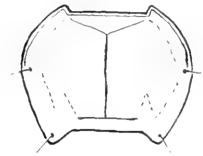

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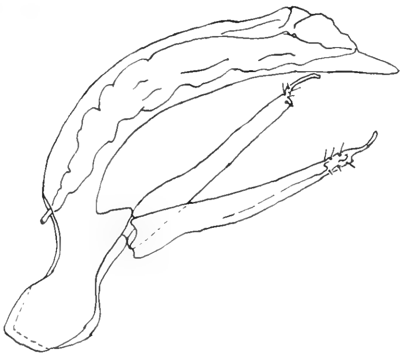

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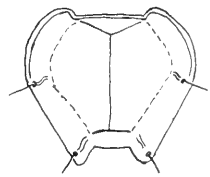

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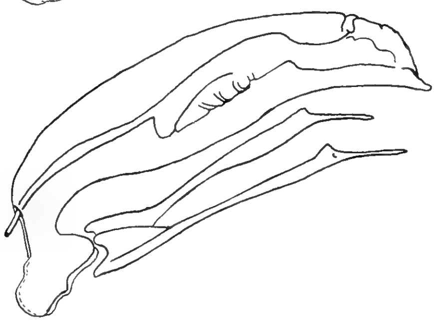

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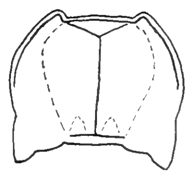

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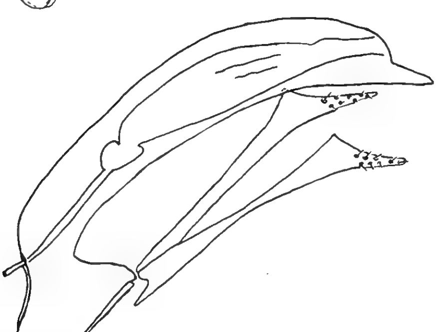

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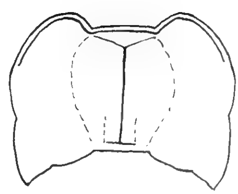

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A NEW SPECIES OF PTEROMICRA REARED FROM LAND SNAILS, WITH A KEY TO THE NEARCTIC SPECIES OF THE GENUS (DIPTERA, SCIOMYZIDAE)

BENJAMIN A. FOOTE, *Department of Entomology and Limnology, Cornell University, Ithaca, N. Y.*

During the course of an investigation into the biology of the sciomyzid flies[1], the new species described below was reared from puparia found in shells of a locally common land snail. In order to facilitate the preparation of a more extensive paper on the biology of various species of *Pteromicra* it was decided to publish the new species description at the present time.

Three new species of the genus have been recognized since Steyskal (1954) published a key to the known species, and it was felt that an expanded key to the North American species would be of value. The recently discovered species are *inermis* Steyskal (1956), *perissa* Steyskal (1957) and *steyskali* of the present paper.

Pteromicra steyskali, sp. nov.

Male.—Length of body: 2.8-3.7 mm. Length of wing: 2.5-3.2 mm. **Head:** yellowish, shining, upper occiput blackish, posterior half of front brownish, parafrontal stripes darker. Face and cheeks yellowish. Palpi wholly yellow. Antennae yellowish, third segment blackish apico-dorsally, arista black, short plumose. Two fronto-orbital bristles, anterior one about half length of posterior bristle. No distinct eye pattern in dried specimens. **Thorax:** largely yellowish, anterior half of mesonotum dark brown to black dorsally, yellowish laterally. Metapleura and pteropleura somewhat brownish, remainder of pleura yellowish. Vallar ridge brown. Pteropleura with homogeneous patch of bristly hairs. **Wings:** membrane hyaline, without darker markings. Halteres with tips whitish. **Legs:** anterior coxae whitish; fore femora with pecten, basal one-fourth to one-third yellowish, remainder black; fore tibiae wholly black; fore tarsi with apical one or two segments whitish, basal segments black. Middle and hind legs wholly yellow. **Abdomen:** brownish, more yellowish basally. Andrium blackish, shining. Terminalia as figured; spiracles of segments six and seven disposed as in figure 3; sixth and seventh sternites very narrow; sixth tergite represented by very slender sclerotized strip; posterior surstylus broad basally, abruptly tapering to a mesally directed point, clothed with numerous dark hairs; anterior surstylus well-developed, turning mesally, more or less rounded apically and with broad lobe posteriorly, clothed with short black hairs.

Female.—Length of body: 3.0-3.8 mm. Length of wing: 2.9-3.5 mm. Coloration as in male.

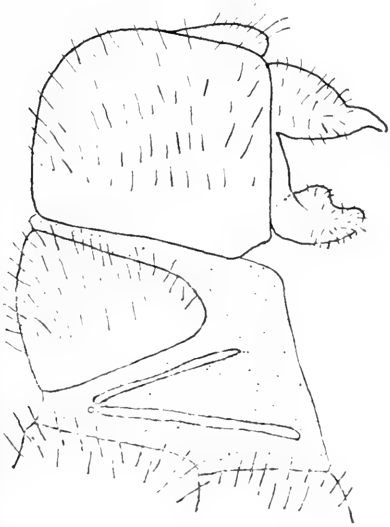
Holotype (*male*) *and allotype.*—Inlet Valley, Ithaca, New York, adults emerged May 1, 1957 from puparia found in shells of terres-

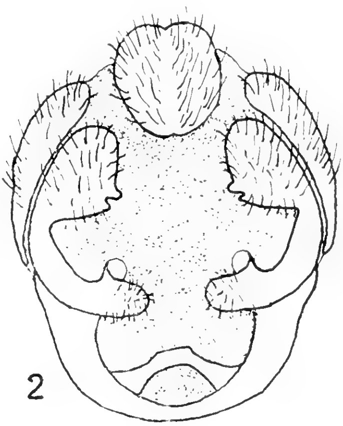
[1]This investigation was supported by a research grant (E-741) from the National Institutes of Allergy and Infectious Diseases, Public Health Service.

trial snail, *Discus cronkhitei* (Newcomb) collected February 24, 1957, rearing number 5703 (B. A. Foote). In Cornell University Collection.

Paratypes.—7 males, 4 females, same data as for holotype, adults emerged April 9 to April 16, 1957. 3 males, McLean Reservation, Tompkins Co., N. Y., adults emerged April 29 and May 1, 1957, rearing number 5707B (B. A. Foote). 7 males, 2 females, Inlet Valley, Ithaca, N. Y., adults emerged May 10, 1957 (B. A. Foote). 1 male, Ames, Iowa, June 10, 1929 (Hasiabe). All paratypes in Cornell Collection except for the Iowa specimen which is in the Iowa State College Collection.

Remarks.—This species is obviously close in its characters to *P. leucopeza* (Meigen), from which species it can be distinguished by the largely yellowish thoracic dorsum and the distinctive terminalia. I take pleasure in naming this species for Mr. George C. Steyskal, whose numerous papers have contributed greatly to a clarification of the taxonomy of the North American Sciomyzidae.





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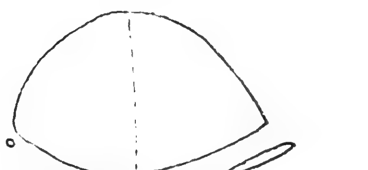

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Pteromicra steyskali, new species: fig. 1, sinistral profile of male terminalia; fig. 2, ventral view of same; fig. 3, diagram of protandrium as if flattened and viewed dorsally (D = mid-dorsal line).

Key to the Nearctic Species of Pteromicra Lioy

(Modified from Steyskal, 1954)

1. Fore femora without pecten (a series of closely spaced spinules located apically on antero-ventral side of femora); pteropleura with two or three long bristles in addition to several shorter bristly hairs; two fronto-orbital bristles 2
   Fore femora with pecten; pteropleura with small patch of short hairs only 4
2. Palpi black, fore femora mostly yellowish .... **anopla** Steyskal
   Palpi yellowish; fore femora mostly black 3
3. Fore femora completely black; tarsi whitish basally .... **perissa** Steyskal
   Fore femora yellowish on basal one-fourth to one-third; tarsi uniformly black .... **inermis** Steyskal
4. Palpi completely yellow 5
   Palpi blackish, at least apically 10
5. Two fronto-orbital bristles 6
   Only one fronto-orbital 8
6. Fore tarsi completely black .... **glabricula** (Fallen)
   Fore tarsi with distal segments whitish 7
7. Dorsum of thorax shining black .... **leucopeza** (Meigen)
   Dorsum of thorax mostly yellowish, blackish only anteriorly .... **steyskali,** sp. n.
8. Thorax wholly black; head largely black .... **nigrimana** (Meigen)
   Thoracic pleura mostly yellowish; head extensively yellow 9
9. Last segment of fore tarsi of female whitish; wing crossveins not darkened .... **apicata** (Loew)
   Last one or two (male) or three (female) segments of fore tarsi whitish; wing veins bordered with grayish .... **pectorosa** (Hendel)
10. Two fronto-orbital bristles 11
    Only one fronto-orbital 12
11. Metapleura black; hind legs wholly yellow .... **albicalceata** (Cresson)
    Metapleura mostly yellowish; apex of hind femora blackish .... **similis** Steyskal
12. Front yellowish apico-medially; antennae reddish; fore tarsi with apical two or three segments whitish .... **sphenura** Steyskal
    Head completely black (occasionally pruinose on facial orbits) 13
13. Arista white; third antennal segment black; apical two or three segments of fore tarsi whitish .... **leucothrix** Melander
    Arista blackish; third antennal segment reddish; fore tarsi entirely black .... **melanothrix** Melander

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SOME NEW FLIES OF THE GENUS BATHYPOGON LOEW
(DIPTERA, ASILIDAE)

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This paper presents the descriptions of several new species of *Bathypogon* Loew, a member of the Dasypogoninae, which is restricted to the lower part of South America and to Australia.

Bathypogon ochraceus, new species

A quite small species characterized by the pale brownish or yellowish red face, tibiae, posteritor half of legs. The tarsi are pale ochraceus. The first segment of the antenna is yellowish. Terminalia with slender, needle-like processes on the basal plate. Length 11-12 mm.

Male. *Head:* The occiput, front and vertex black in ground color; the lower occiput with grey pollen, the upper occiput and front and vertex with yellowish brown pollen, paler on the front. The face is light reddish to yellowish brown in ground color with quite pale brownish yellow pubescence and similarly colored bristles on the lower three-fourths of the face; the elevation is gentle and low. The first antennal segment is pale yellowish brown, the second medium brown, the third dark brown. The palpi are light red in color to medium brown in color. Proboscis more or less reddish on the base. All bristles of head are pale.

Thorax: The mesonotum is black down the middle and laterally, rarely reddish along the sides. In typical specimens only the humeri are light reddish brown. The central part of the mesonotum has olive brown pollen; pollen along the sides brownish yellow. Pleuron chiefly reddish in ground color with a large, diffuse, central, black spot in the middle of the mesopleuron, anteroventral half of sternopleuron and ventral half of hypopleuron; pollen brownish yellow. The complement of thoracic bristles consists of 1 post humeral, 2 notopleural, 1 supraalar, 2 postalar, 2 scutellar pairs, 3 postdorsocentral and 2 or 3 differentiated metapleural bristles.

Legs: The anterior surface of the anterior and middle femora and lateral surface of hind femora are dark reddish brown, their remainder light brownish red. The posterior tibia laterally are dark brown, the anterior tibia and middle tibia light brown anteriorly and pale brownish red or orange posteriorly. Tarsi pale brown.

Wings: The wings are dilutely tinged with brown. The lower end vein of the discal cell makes a strong angle with the lower end vein of the fourth posterior cell. Veins dark brown.

Abdomen: The abdomen is reddish brown, rather dark dorsally, becoming pinkish brown along the lateral margins. The dorsal pollen is medium brown with a golden cast, the lateral pollen pale pinkish brown. The terminalia light reddish brown, a little darker in the middle of the superior forceps and again laterally at the base of the basal plate. The ventral process of the hypandrium, while small, is quite characteristic and consists of a slender, erect, needle-like process.

Female. The female is similar to the male, including the color of the abdomen. The last 2 tergites are entirely shining; the third tergite is widely shining and without pollen dorsally. All of the pollen in the female is pale, yellowish brown.

Type.—Male, Owieandana, North Flinders Range, collected by Hale and Tindale; allotype, female, same data; paratype, male, same data. No dates given. The types are in the South Australian Museum, Adelaide; paratype in the collection of the author.

Bathypogon macrodonturus, new species

A small species characterized by the general reddish coloration, the rather strongly thickened femora, the pale bristles. The first 2 antennal segments are pale, and there is a flared triangular process on the basal plate. Length 15 mm.

Male. *Head:* The occiput, front and vertex are black in ground color, the face and cheeks light brownish red. The pollen of the head is everywhere deep reddish to golden brown, except on the lower occiput where it is paler. The pubescence of the face is pale, reddish yellow. The first 2 segments of the antenna are light brownish orange, the extreme apex of the second a little darker, the third segment missing. The face has a comparatively strong elevation, extending over nearly five-sixths of the face; beginning near the antenna it bears numerous, long, stout, brownish bristles. Palpus unusually slender and small, reddish brown in color. Base of proboscis reddish. Occipital bristles yellowish brown.

Thorax: The thorax is black broadly down the middle, the sides widely reddish, including the humerus, a short border posterior to the humerus and a more narrow medial border. The pollen of the mesonotum is reddish brown, more yellowish laterally. The pleuron is reddish brown, a little darker on the anterior half of the mesopleuron, which is perhaps nearly blackish; there is a large, blackish triangle on the sternopleuron, a small, dark rectangle on the hypopleuron; pleural pollen brownish yellow. The complement of bristles on the thorax consists of 1 posthumeral, 2 notopleural, 1 supraalar, 2 postalar, 3 pairs of scutellar bristles, 4 postdorsocentral, and 3 weakly differentiated metapleural bristles; all thoracic bristles are brownish yellow. Scutellum is sepia brown on the disc, pale reddish along the margin.

Legs: The legs are unusually stout, reddish brown with the anterior surface of the anterior and middle femora brownish to black, except at the apex, and this color leaves the whole apex and ventral portion of the apical half obliquely reddish. Hind femur blackish lateraly and along the dorsal margin from base to apex, leaving the medioventral and ventrolateral surfaces red. The hind tibia dark reddish brown laterally; all the remaining tibiae and tarsi pale brownish red. Pile and bristles of legs light reddish brown. The claws are only moderately sharp and red on the basal third.

Wings: The wings are subhyaline, tinged with pale, reddish brown, especially on the apical fourth. The lower end vein of the discal cell makes a strong angle with the end vein of the fourth posterior cell. Veins dark reddish brown, the first 3 more yellowish brown.

Abdomen: The abdomen is reddish brown, slightly darker across the middles of the second and third tergites. All of the pollen light, reddish brown. Terminalia reddish brown, a little darker on the convex portion of the superior forceps. Hypandrium with a pair of strong, triangular, bluntly pointed, thin, lappet-like processes.

Type.—Male, Mullewa, West Australia, collected by Miss F. May. No date given. Type in the South Australian Museum, Adelaide.

Bathypogon cinereus, new species

A small, black and dark brown species with greyish white pollen. The bristles in part are pale. The bristles of the vertex are black. The bristles of upper occiput, posterior mesonotum and scutellum, most of the tarsal bristles, and the upper tibial bristles are dark sepia brown. Length 15 mm.

Male. *Head:* The head is black in ground color, except on the face, which is brown. The pollen is greyish white, the facial pubescence white with a yellowish to a greyish tint and the pollen on the upper half of the front somewhat yellowish. The suborbital bristles on the upper half of the occiput are black and white intermixed; there is a cluster of postvertical bristles on each side, which contains eight bristles that are dark brown in color. The bristles of the vertex are nearly black; frontal bristles dark brown. Lateral bristles of the face white, the medial bristles pale brownish white or yellow. The first segment of the antenna and the base of the second and the basal fourth of the third pale yellowish brown. The rim of the first segment and the remainder of the second segment is dark brown; the remainder of the third segment brownish black. Third segment short and strongly dilated. Pile of antenna and of the black palpus and proboscis white.

Thorax: The mesonotum is black with the humeri, and the lateral margins, and the apical third of the scutellum dark reddish brown. The mesonotal pile is chiefly black with a patch of medial white pile on the anterior margin, again before the scutellum and on the sides of the post calli. The mesonotal pollen is sepia brown, becoming grey white on the humeri and this lateral stripe is conspicuously contrasted. From above, the medial stripe of the mesonotum is scarcely evident; viewed anteriorly it is distinct but narrow. Pleuron is black with 1 or more quite dark brown areas, including the lower propleuron, posterior mesopleuron, pteropleuron and metapleuron, and much of the hypopleuron. The pollen is greyish white. Metapleural bristles are pale with only 2 strong, differentiated elements. The mesonotal complement of bristles consists of 1 posthumeral, 2 notopleural; the posthumeral and the lower notopleural bristles are light brown in color and all remaining bristles of the mesonotum and scutellum are dark sepia brown and consist of 1 supraalar, 2 postalar, 2 scutellar pairs and 4 or 5 strong, long, postdorsocentral bristles.

Legs: The legs are black and white pilose with the following parts quite dark brown: Medial and ventral surface of the hind femur, posterior and ventral surface of the anterior and middle femora, medial surface of the hind tibia. The posterior surfaces of the remaining tibiae are only a little lighter in color. Tarsi quite dark brown. The base of the claws reddish. Tarsal bristles and the dorsal tibial bristles quite dark brown; remaining bristles chiefly whitish.

Wings: The wings are subhyaline, tinged with grey. The apex is darker and with villi. The lower end vein of the discal cell and the end vein of the fourth posterior cell nearly aligned.

Abdomen: The abdomen is black dorsally with thin, scanty, sepia pollen and brownish white pile. The lateral margins of the tergites are reddish brown and this reddish brown color is extended inward along the posterior margins for a short distance. The terminalia are black, the apices of the superior forceps divergent and the hypandrium has a pair of protuberances which in lateral view appear as sharp, curved, sickle-like hooks, but posteriorly appear as rounded, bluntly pointed, scoop-like structures.

Type.—Male, collected 37 miles southeast of Perth on the Brookton Highway, January 6, 1954 by F. M. Hull. The type is in the collection of the author.

BOOK REVIEW

THE TARANTULA, by William J. Baerg. University of Kansas Press, Lawrence, 89 pages, 17 figures. $3.00.

From 35 years' association with tarantulas, visiting them at their homes in the field, entertaining them as pets in his own home or his laboratory at the University of Arkansas, Dr. Baerg in this book gives us an intimate account of the nature, habits, and life history of the American spiders known as tarantulas. Since the life span of these spiders may be as long as 24 years, the author says the subject is not taken up by many researchers, and he adds that he is perhaps the only one who has followed the development of a tarantula from its infancy to old age.

It must, of course, be understood that the spider first called a tarantula is a European wolf spider, *Lycosa tarantula*, named from the city of Taranto in Italy. The bite of this spider was reputed to produce a physical condition called tarantism, which was followed by sure death unless the victim was exposed to some particular musical tune, which, when heard, induced wild, uncontrolled dancing, succeeded by exhaustion, but reprieve from death. This is a strange piece of fiction. The spiders we know as tarantulas, of which Baerg gives us a trustworthy account, belong to the Mygalomorphae, which includes also the trapdoor spiders.

The best way to review this book will be to give an abstract of the life of the tarantula as the author describes it. Both sexes live under stones or in holes in the ground and take from 10-13 years to reach maturity. They feed on most any available insects, but it appears that if the diet of the female lacks beetles she cannot produce eggs. The male tarantula, after a final moult, is mature and is now provided with bulbs on the ends of his pedipalps, which are essential for his sole business of inseminating the female. First, however, he must fill the bulbs with sperm, which he does in the manner of all spiders by spinning a flat web, on the under side of which he ejects a drop of sperm. Then getting on top of the web he takes the sperm into his pedipalp bulbs. The process is best followed in observation jars. Males confined with females may mate immediately after filling their receptacles. One caged male made 17 sperm webs in six weeks, and mated 12 times with five females. In the field, however, the males travel far and wide in search of females. When a receptive female is encountered a courtship performance is begun in which the male raises the female to an upright position so that he can thrust his sperm-filled bulbs into her receptacles on the base of the abdomen. Mating takes place in the fall and after one season the males are exhausted and soon die.

The inseminated female retires to her den and there spends the winter. On emerging in the spring she must construct a cocoon for holding her prospective eggs. Cocoon-spinning itself is an arduous task, and the author devotes over four pages to a description of it. Briefly, a hammocklike sheet of silk is first laid down and the eggs are deposited on it. Then a canopy is spread over the eggs, and the whole is rolled up into a sac or ball. In the laboratory the eggs may hatch in three weeks, but in the field the incubation period is longer, from 45 to 65 days. The young may remain in the cocoon as long as five weeks, during which time the female sedulously guards them. Emergence takes place in August, and for several days the spiderlings remain about the cocoon, but usually they scatter after three to six days and disappear. Shortly thereafter the mother undergoes a moult and is ready for another mating. She may live for 12 years after her first brood, moulting and producing a new family each year. (As if to prevent overpopulation, she sometimes eats her young in the cocoon.)

All this and much more is described in great detail by the author. In addition to his studies of the species of Arkansas and the southwestern States, he records many observations on other species made during extensive travels in Mexico, Central America, and the Caribbean Islands, including Trinidad. The author says he has met and observed at least 35 different species.

A major part of the author's interest in tarantulas has been a testing of the reputed poisonous nature of their bite. During 35 years, he says, he has made poison tests for 26 species, 86 on white rats, guinea pigs, and white rabbits, and 12 on himself. The results on the animals were variable with the animals themselves as well as with different species of tarantulas; in some cases the animals died, in others they recovered, and others showed no effects. From experiments on himself with 9 species of tarantulas, the author concludes that only a Panama species is definitely poisonous to man, but its effects are local and not general.

The Tarantula is an important contribution to arachnology. To the general reader it should be not only entertaining, but instructive as showing that the life even of a spider can be full of interest. Moreover, the book is an example of what a lifetime study of one subject can produce.—

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THREE NEW BLACK FLY RECORDS FROM UTAH

(DIPTERA, SIMULIIDAE)

During recent investigations on the taxonomy and biology of the black flies of Utah, three new state records were obtained. These include *Eusimulium latipes* (Meigen), *E. bicornis* (Dorogostajskij, Rubtzov and Vlasenko), and *Simulium nigricoxum* Stone. *Eusimulium latipes* is known to occur in California and Wyoming and its presence in Utah was not surprising. In North America, *Eusimulium bicornis* was previously known only from Alaska, and *Simulium nigricoxum* from the Northwest Territories, Yukon Territory, and Alaska. The presence of these latter two species in Utah extends markedly southward their known geographical range. Extensive collections throughout the Rocky Mountains of western North America should reveal a much broader distribution of these species than is now known.—

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SOME RECORDS OF PARASITES AND OTHER INSECTS ASSOCIATED WITH EGGS OF THE MANTID GENUS TENODERA

(ORTHOPTERA, MANTIDAE)

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SUMMARY

Records are presented of four insect species which emerged in containers enclosing oothecae of two species of *Tenodera*. *Podagrion mantis* Ashmead has been found to parasitize oothecae of *Tenodera angustipennis* Saussure much more heavily than those of *T. aridifolia sinensis* Saussure. *Eupelmis neococcidis* Peck is recorded from oothecae of the genus *Tenodera*, and *Pseudogaurax anchora* (Loew) from oothecae of *T. angustipennis* and *T. aridifolia sinensis*. Specimens of the weevil *Gymnaetron pascuorum* (Gyll.) have appeared from oothecae of *angustipennis* and *sinensis*; the relation between the weevil and the mantid oothecae is not clear.

In the spring of 1950 oothecae of *Tenodera angustipennis* Saussure (narrow-winged mantis) and *T. aridifolia sinensis* Saussure (Chinese mantis) were collected in Falls Church, Va., not removed from the substrate, and kept for hatching and parasite emergence in small, individual, net-covered glass jars. In the spring of 1956, and again in 1957, oothecae of both species, collected during the previous December to early April in a neglected field in Hyattsville, Md., were confined in half-gallon ice-cream cartons, each fitted with a horizontal glass tube (25 x 100 mm.). Each carton contained about 20 oothecae of one mantid species, all removed from the twigs, weeds or grass stems which constituted the substrate. The oothecae were stored in an unheated garage until shortly before hatching began, when they were kept indoors at room temperatures. Any emerged insects appearing in the tubes were removed daily; later a few other specimens were taken from the cartons. The numbers of *angustipennis* and *sinensis* oothecae, respectively, handled were as follows: 1950, 18 and 124; 1956, 160 and 118; 1957, 85 and 224; a total of 155 for *angustipennis* and 466 for *sinensis*. Illustrations of oothecae and brief notes about each mantid were published in 1951 (Gurney, Smithsonian Ann. Rept. for 1950: 339-362, pls. 1-9). Breland's 1941 paper on mantid egg parasites (Ann. Ent. Soc. Amer. 34: 99-113) has been very helpful concerning life histories.

The associated insects obtained from the oothecae were identified by my colleagues B. D. Burks (Hymenoptera), C. W. Sabrosky (Diptera), and Rose Ella Warner (Coleoptera). I am also grateful to them for other assistance such as supplying additional records and suggesting references.

Podagrion mantis Ashmead (Hymenoptera, Torymidae)

Reared material.—2 specimens (emerged May 22, 1956) from oothecae of *sinensis*; 113 specimens (emerged May 17-30, 1956) from oothecae of *angustipennis*; 42 specimens (emerged May 12-19, 1957) from oothecae of *angustipennis*.

The most extensive notes on the biology of *P. mantis* are by Breland (l. c.). Its hosts were listed by Peck (*in* Muesebeck *et al.* Hym. of Amer. N. of Mex., U. S. Dept. Agric. Monogr. 2, pp. 583-584, 1951) as *Stagmomantis carolina* (Joh.), ? *S. limbata* (Hahn), *T. angustipennis*, and *T. aridifolia sinensis*. My records of *P. mantis* from eggs of the two species of *Tenodera* that have been introduced into North America from eastern Asia are in general agreement with those of Fox (Ann. Ent. Soc. Amer. 32: 561-563, 1939), obtained from oothecae collected in Cape May County, N. J. Fox found that parasitism by *Podagrion* was nearly 30 times greater in *angustipennis* oothecae than in *sinensis*, and he expressed the opinion that the thicker covering of spongy oothecal material over the eggs of *sinensis*, which made oviposition by the parasite more difficult, is the explanation. Emergence of *Podagrion* in my cages, with respect to the number of oothecae, was 140 times greater from *angustipennis* than from *sinensis*. The average number of parasites per ootheca (*sinensis* 0.0042, *angustipennis* 0.59) is less than that obtained by Fox (*sinensis* 0.037, *angustipennis* 0.87).

During my observations of *angustipennis* and *sinensis* oothecae in the Washington, D. C., area, no parasite-emergence holes were noted in fall and winter. Climatic conditions may be responsible for the difference between this area and central Texas, where Breland observed emergence from *Stagmomantis* oothecae through the fall and winter and into early spring.

Eupelmus neococcidis Peck (Hymenoptera, Eupelmidae)

Reared material.—One female (emerged May 25, 1956) from oothecae of *angustipennis*.

This wasp was discussed in some detail, under the name *E. coccidis* Girault, by Breland (l. c., pp. 108-112), who obtained numerous examples from eggs of *Stagmomantis carolina* near Austin, Texas. Its hosts were listed by Peck (l. c., p. 510) as *S. carolina*, *S. limbata*, *Mantis* sp., and *Coccus hesperidum* (L.).

Pseudogaurax anchora (Loew) (Diptera, Chloropidae)

Reared material.—Four specimens (emerged May 27, 29, 1950) from oothecae of *sinensis*; 2 specimens (emerged May 9, 10, 1956) from oothecae of *angustipennis*; one specimen (emerged April 27, 1957) from oothecae of *sinensis*.

Although the related *P. signatus* (Loew) has been reported several times as reared from mantid oothecae (Breland, l. c., p. 111; Hall, Jour. Washington Acad. Sci. 27: 255-261, 1937), and *P. longilineatus* Sabrosky has been reared from mantid eggs in Brazil (Travassos and

Carrera, Rev. Brasil Biol. *9:* 97-101, 8 figs., 1949), no published records of *anchora* from mantid eggs have come to my attention. However, Mr. Sabrosky has identified three specimens [Pa. State Univ.] which emerged Aug. 3 and 7, 1946, from mantid eggs collected by H. Pealing at Glen Mills, Pa.

Several publications include data on the biology of *anchora,* though involving other hosts: Howard, U. S. Dept. Agric., Div. Ent. Bull. *5:* (Tech. Ser.): 44-45, 1897; Howard's Insect Book, fig. 106, p. 184, 1901; Kaston and Jenks, Bull. Brooklyn Ent. Soc. *32:* 160-165, 1937; Auten, Ann. Ent. Soc. Amer. *18:* 244, 1925. The biology of *anchora* probably is comparable to that of *P. signatus*, which has been studied most as an egg predator of black widow spider eggs, often under the synonymous name *Gaurax araneae* Coq. (Jenks, Pop. Sci. Monthly *129:* (2): 32-34, 24 figs., 1936; Nat. Mag. *28*(5): 286-288, 1936; Natural History *42:* 52-57, 1938; Kessel and Kessel, Pan-Pac. Ent. *13:* 58-60, 1937.) It appears that *anchora* is a general scavenger and egg predator on cocoons and egg masses of insects and spiders, and that it feeds on both living and dead material.

Gymnaetron pascuorum (Gyll.) (Coleoptera, Curculionidae)

Reared material.—Three specimens (emerged May 2, 6, 7, 1956) from oothecae of *angustipennis*; one specimen (emerged May 2, 1957) from oothecae of *sinensis.*

This weevil was first noted from America by Sleeper (Ent. News *65:* 129-130, 1954), who recorded specimens from Delaware and Pennsylvania. Additional Nearctic specimens in the U. S. National Museum are from New Jersey, Maryland, Virgina, and the District of Columbia. Hustache (Ann. Soc. Ent. France *100:* 410, 419, fig. 326, 1932) said that *pascuorum* is one of the commonest French weevils, and found on *Plantago* in prairies and waste fields. It is not known whether the specimens obtained from mantid oothecae developed in or closely associated with those oothecae, or whether they were hibernating in the oothecae into which they crawled in the fall.

NOTE ON ANDRICUS FOLIAFORMIS GILL.

(CYNIPOIDEA)

This species was described in 1888 from a single specimen from a gall on a leaf of *Q. alba* in Michigan. The holotype and gall were not found. No gall like the published figure has since been found on this host. However, *Andricus foliosus* Weld was described from a similar gall on *Q. bicolor* at Evanston, Ill. Comparison of these adults with the original description of *foliaformis* leads to the conclusion that *foliosus* is a synonym of *foliaformis* (**new synonym**).

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A NEW SPECIES OF DISCOCORIS FROM COLOMBIA
(Hemiptera, Thaumastocoridae)

James A. Slater[1] and Peter D. Ashlock[2]

The genus *Discocoris* was established by Kormilev in 1955 for *Discocoris vianai* Kormilev from Argentina. Kormilev considered the genus as representative of a new subfamily in the family Thaumastocoridae, but Drake & Slater (1957) placed it in the subfamily Xylastodorinae Barber. This subfamily is confined in distribution to the Western Hemisphere and to the present time has contained only two species, the above mentioned *Discocoris vianai* Kormilev from Argentina and *Xylastodoris luteolus* Barber from Cuba and Florida. It is therefore of much interest to be able to report an additional species of *Discocoris* from northern South America. Although known from a single specimen the zoogeographic importance of the record and the apparent specific distinctions of the Colombian specimen has prompted us to describe the species formally at this time.

Discocoris drakei, new species
(Fig. 1)

Coloration nearly uniform light testaceous, basal angles of scutellum brown, eyes bright red, explanate pronotal and corial margins translucent; dorsal surface bearing small, shallow, inconspicuous rather evenly spaced setigerous punctures, surface otherwise glabrous.

Head broad, non-declivent, juga strongly arcuate, inner margin rather sinuate, juga and tylus extending forward an equal distance, the latter narrowing anteriorly, spine at anterior angle of eye short, but acute, extending only half way to apex of first antennal segment, length head .48 mm., width across eyes .71 mm., interocular space .45 mm.; pronotum with anterior margin very deeply and sinuately concave, the antero-lateral angles produced forward to center of lateral margin of eye, lateral pronotal margins broadly, smoothly and evenly rounded, posterior margin straight adjacent to scutellum, beyond becoming somewhat irregular and curving slightly antero-laterad to humeri, median length pronotum .52 mm., maximum length .70 mm., maximum width 1.40 mm.; length scutellum .55 mm., width .65 mm.; hemelytra with clavus slightly narrowing posteriorly, claval commissure present, corium moderately convex, lateral margins strongly explanate and broadly arcuate, considerably exceeding apex of abdomen, distance apex clavus-apex corium 1.00 mm.; femora very slightly enlarged, mutic; apex of labium obscured, apparently at least attaining or nearly attaining mesocoxae; length antennal segments I, .08 mm., II, .14 mm., III-IV—missing. Total length 2.60 mm.

Holotype.—Female, Buenaventura, COLOMBIA, V-10-1951, E. S. Ross, Collector. Deposited in California Academy of Sciences.

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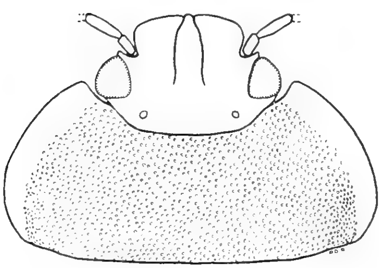
[2]Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.

We take pleasure in dedicating this species to Professor C. J. Drake for his many contributions to our knowledge of the Heteroptera.

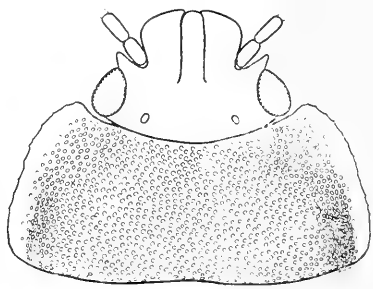
D. drakei is very closely related to the type species *vianai* (Fig. 2), agreeing in all respects with the generic diagnosis and differing little in general size and habitus. The two species may be separated by means of the following couplet:

Lateral pronotal margins evenly and smoothly rounded; pronotal and corial punctures small, weak and shallow, the distance between them greater than diameter of a puncture; head spine at antero-mesal angle of eye short, extending only one-half distance to apex of first antennal segment; ocelli placed posterior to a line drawn across the posterior margins of the compound eyes; color nearly uniformly light testaceous; tylus narrowed anteriorly (Fig. 1) .... *drakei*, new species

Lateral pronotal margins bearing small but distinct crenulations; pronotal punctures large and coarse, the distance between them much less than diameter of a puncture; head spine at antero-mesal eye angle attaining or almost attaining distal end of first antennal segment; ocelli located almost on a line drawn across the posterior margins of the compound eyes; color bright brown; tylus of uniform width (Fig. 2) .... *vianai* Kormilev



1. DRAKEI, n. sp.



2. VIANAI Korm.

Figs. 1 and 2. Head and thorax of *Discocoris* spp.

Literature Cited

Drake, C. J. & J. A. Slater, 1957. The phylogeny and systematics of the family Thaumastocoridae (Hemiptera: Heteroptera). Ann. Ent. Soc. Amer. 50: 353-370.

Kormilev, N. A., 1955. Una curiosa familia de Hemipteros nueva para la fauna Argentina, Thaumastotheriidae (Kirkaldy), 1907. Rev. Soc. Ent. Argentina 18:5-10.

JAPIGIDAE OF SOUTH AMERICA I. NEW GENUS AND SPECIES OF THE DINJAPYGINAE
(DIPLURA)

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The subfamily Dinjapyginae was erected by Womersley (1934) to contain the single genus *Dinjapyx* Silvestri (1930). This subfamily was characterized by the absence of labial palpi and the presence of sense setae (trichobothria) on antennal segments IV to XX. The genus was established on the male holotype alone and the typical species is *Dinjapyx barbatus* Silvestri. The female is as yet unknown. Our knowledge of the characteristics of the genus was amplified in 1948 when Silvestri described D. *marcusi* and D. *manni*. For each of these species he described both the male and the female. In both species the female was described as possessing large, conspicuous, lateral subcoxal organs, so we may conclude this is a generic character.

In 1951, E. S. Ross and A. E. Michelbacher were collecting insects in Peru for the California Academy of Sciences. They collected two species of the Dinjapyginae which cannot be placed in the genus *Dinjapyx* because the females have no subcoxal organs, and the males have a large bilobed process at the postero-lateral angles of tergite VII, whereas *Dinjapyx* has a single lobe. All previously known japygids, as far as I know, possess subcoxal organs in both male and female, and these structures are present even in the mobile nymphal stages. Since the females herein discussed are without subcoxal organs, I name the new genus *Leipojapyx* from the Greek leipo meaning "to be without."

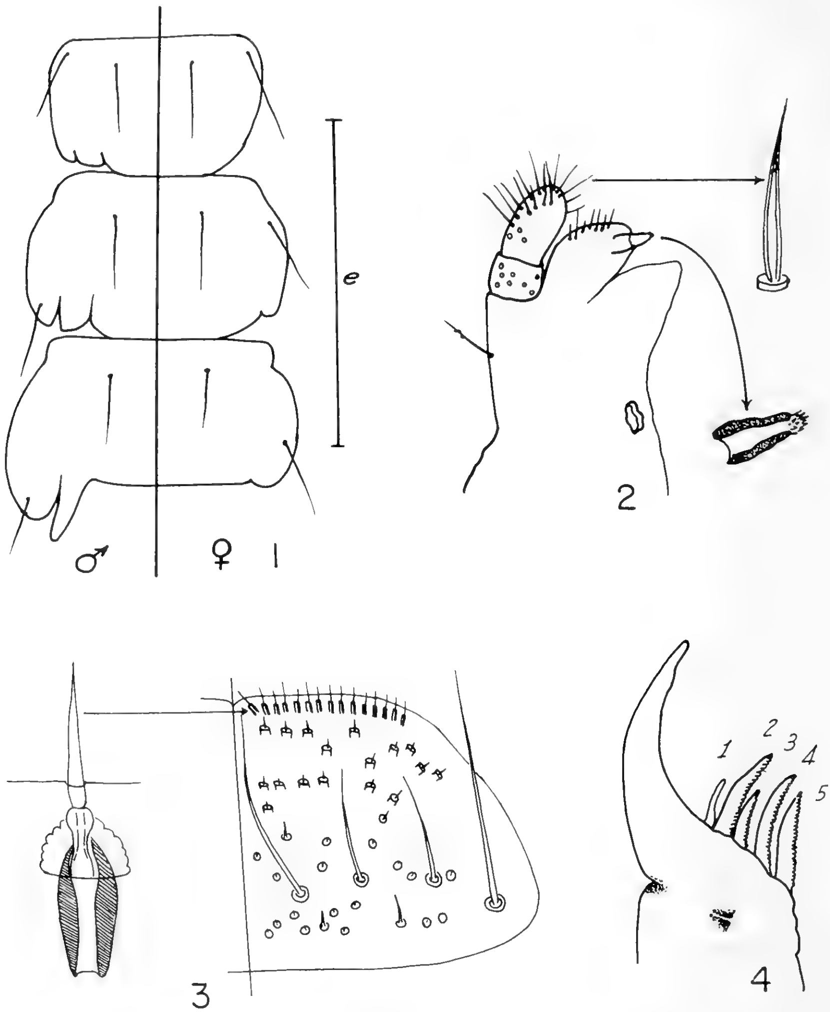
The addition of a new genus and two species in this paper, brings the known members of the Dinjapyginae to two genera and five species. All members of this subfamily were collected at high elevations in the Andes Mountains in Peru and Bolivia. They are all found within 400 miles of one another.

Leipojapyx L. Smith, new genus

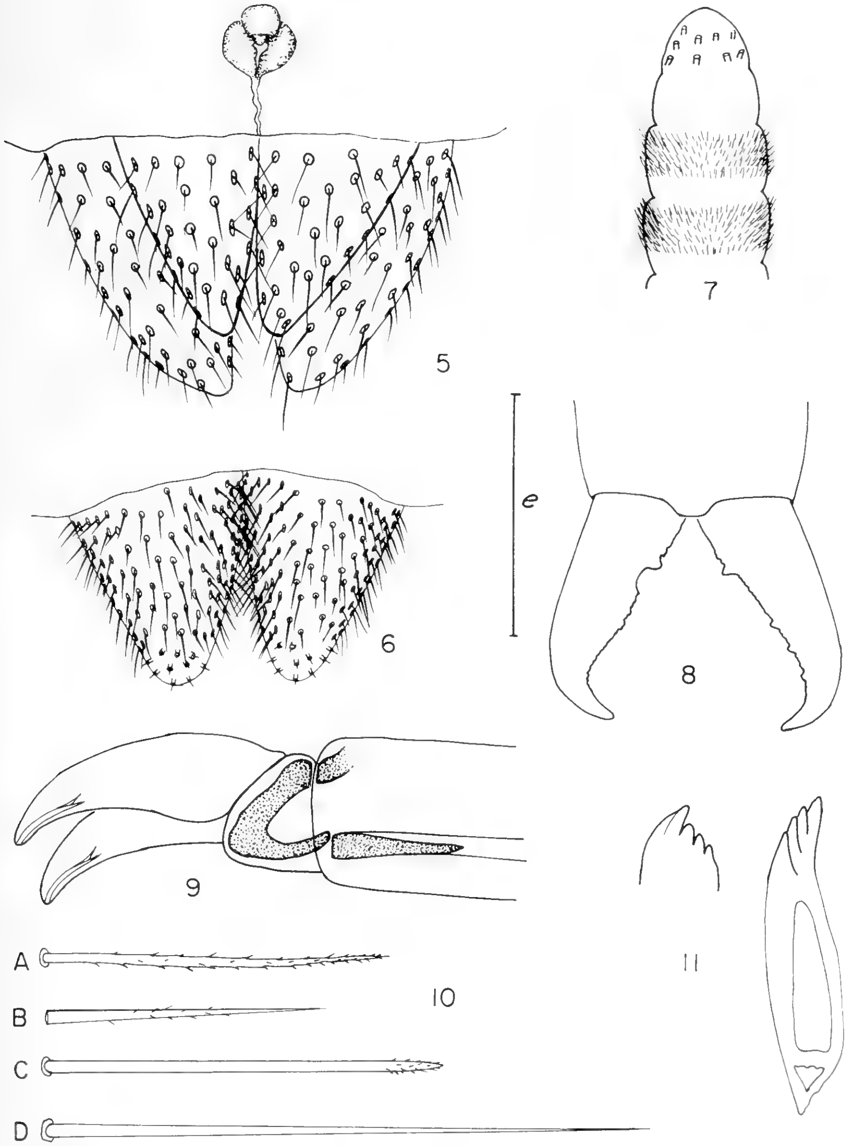
Type species.—Leipojapyx rossi L. Smith

Female.—**Head.** Slightly longer than wide, narrowing slightly anteriorly, with many setae of various lengths; antennae attenuate, many segmented (for example 48 segments in type species), antennal setae dark brown, very long on basal segments, becoming progressively shorter anteriorly, antennal setae biserially pinnate on basal segments, but simple on the distal 15 to 20 segments, segment XX with 400+ setae, becoming fewer toward each end of antenna; sense setae on segments IV to at least XX; in type species IV to XXVII; labrum with a row of special short setae along lower margin, each with a conspicuous heavily sclerotized basal attachment; galea with a heavily sclerotized thumb-like process; lacinia with five laminae: number 1 a short rod, numbers 2, 4, and 5 pectinate, subequal in length, number 3 pectinate, shorter than the other combs; maxillary palpus, two segmented, basal segment ring-like, without setae, distal segment ovoid with many setae, some very long; mandible short, broad, with 4 teeth; labium with numerous long, hollow setae, and a few normal, solid setae; labial palpi absent.

Thorax. Pronotum with many setae of various lengths, some very long; meso- and metanotum with many similar setae; legs relatively short, with numerous setae either simple or minutely plumose near tip; dorsal apex of femur with a close row of 15+ subequal setae all minutely plumose near apices; tarsi with two well-defined



Leipojapyx rossi, n. sp.: fig. 1, tergites V, VI, and VII, left male, right female, only a few of the largest setae shown, e = 4.0 mm.; fig. 2, galea and maxillary palpus, e = 0.82 mm.; fig. 3, front view of right half of labrum and one sensilla enlarged, for labrum, e = 0.45 mm.; fig. 4, lacinia, dorsal view, e = 0.82 mm.



Leipojapyx rossi, n. sp.: fig. 5, genital papillae and spermatheca of female, e = 0.22 mm.; fig. 6, genital papilae of male, e = 0.22 mm.; fig. 7, terminal segments of male antenna, setae omitted from last two segments to show distribution of sensoria, e = 0.24 mm.; fig. 8, tenth segment and forceps, dorsal view, male, e = 2.00 mm.; fig. 9, ungues, pretarsus and tip of tarsal segment, side view, female, setae omitted to show sclerotized internal structures, e = 0.22 mm.; fig. 10, setae (A, seta from lateral subcoxal organ, male; B, tip of tapered seta showing few plumulae, MP; C, blunt, plumose, not-tapered seta, MB; and D long, straight, tapered, simple seta, M); fig. 11, left mandible, ventral view and inset lateral view, e = 1.63 mm.

rows of ventral setae, 10+ setae per row; pretarsus with a large internal sclerotized ventral hook between the claws and a heavily sclerotized internal rod in the tarsus visible only in cleared specimens.

Abdomen. Subcoxal organs absent; abdominal sternites: prescutum with a scattered row of 30+30 or more long subequal setae, scutum with numerous similar setae; styli each with 1 to 3 setae laterad and one sunken seta mesad, or mesad seta may be absent; tergites with posterior corners not projected to the rear; segment X, carinae distinct; tergum with 20+20 or more setae between carinae; sternum with about 50+50; forceps, each with about 100 simple setae of various lengths. Right forcep with one large tooth and many smaller pointed teeth, left forcep with a concave inner margin opposite the large tooth of right forcep, and many smaller pointed teeth; both forceps biserially dentate.

Entire body, (head, thorax and abdomen) covered with minute pores, more or less uniformly spaced from one another at a distance of about 0.02 mm.; large, brown, hair-like setae over whole body set in indistinct setal sockets or no sockets at all; other setae of normal type and hollow setae set in usual type of socket.

Male.—Similar to female except subcoxal organs with a single straight row of identical setae, about 80+80, each minutely plumose; grandular area with scarcely visible pores or setae; posterior corners of tergites VI and VII strongly projected to the rear as a bilobed process; posterolateral corners of segments VIII and IX projected to rear, rounded and heavily sclerotized.

This genus is close to *Dinjapyx* Silv. but can be distinguished by: no subcoxal organs in the female; posterior lobe of galea not sclerotized; sunken seta, mesad, on stylus; tergites V, VI, and VII of the male with postero-lateral angles bilobed.

Leipojapyx rossi L. Smith, new species

Female.—**Head.** Width 2.04, length 2.21 mm. tapering slightly anteriorly; clypeus wtih 5+5 MP[1], occiput with 9+9 MB; antenna with 48 segments, tapering toward the tip, fourth segment width 0.37 mm., fortieth segment width 0.15 mm.; third antennal segment with an apical whorl or 6M much longer than on any other antennal segment, longest seta in the whorl 0.77 mm.; setae on other basal antennal segments about 0.20 mm.; sense setae on segments IV-XXVII; labrum with 4+4 m and about 50+50 hollow microsetae with deep sockets. Lower edge of labrum lined with a tight row of 15+15 hollow microsetae with heavily sclerotized brown internal sockets; mandible with 4 blunt teeth, ventral tooth much thicker than the other three; lacinia falciform, lamina number 1, a rod half as long as lamina number 2, lamina 3 three-fourths as long as lamina number 2, laminae numbers 4 and 5 slightly longer than lamina 2; lamina number 2 pectinate with 23 teeth, laminae 4 and 5 pectinate, with 26 teeth each; posterior lobe of galea not sclerotized, anterior lobe with heavily sclerotized brown thumb bearing about 20 minute teeth at apex, outer surface with 11 short hollow setae; basal segment of palpus ring-like, no setae, but with 10 pores, distal segment ovate with

[1] Abbreviations: M = macrosetae, brown, tapered, not plumose; MP = macrosetae, brown, tapered, plumose; MB = macrosetae, brown not tapered, blunt, plumose; m = submacrosetae, any short setae, more or less hyaline, tapered, simple.

about 20 hollow setae; labium with about 38+38 hollow setae and 1+1 M; labial palpi absent.

Thorax. Pronotum 16+16 MB and 1+1 M measuring 0.94 mm.; meso- and metanotum: prescutum with about 10+10 MB, scutum with about 33+33 MB irregularly grouped at sides of sclerite; legs: femora with numerous scattered MB, basally a few longer MP; and at the dorsal apex a row of 15 uniform shorter MB; tibiae with numerous scattered MP and some M three of which nearly equal tarsus in length; tarsi with numerous M and no MB or MP; ventral setae per row on tarsus 12.

Abdomen. Tergite 1 prescutum 6+6 MP and 1+1 MB laterad, scutum 19+19 MP; lateral and median subcoxal organs absent; styli short and broad with two simple setae laterad, one twice as long as the other, and one short sunken seta mesad; tergite V postero-lateral angles rounded, not projected to rear; VI with slight lateral indentation suggesting a lobe; VII conspicuous indentation suggesting a lobe, VIII slightly tapered anteriorly, width 2.55, length 1.70 mm., tergite with numerous (50+) M and MB at each side, sternite with 21+29 M and MP, and 1+ MB in each corner; genital opening with one pair of anterior and one pair of posterior papillae each with about 50 m; pleurite on abdominal segments II-IV divided into anterior and posterior parts by a vertical suture with setae as follows II anterior to suture 1 M and 2 MB, posterior to suture 1 M, 9 MB, and 1 m; III anterior, 1 M, 4 MB, and 1 m, posterior 8 M (longest 1.02 mm.), 1 MB, and 7 m; V anterior 3 M, 4 MB (longest 0.26 mm.) and 4 m, posterior 10 M, 2 MB, and 6 m, pleuron on segments II-IV divided horizontally by a fold into dorsal and ventral parts, II dorsal, two irregular rows of 9 setae each (16 M and 2 MB) ventral, upper row 9 M, lower row 9 MB; sternite VIII with 27+27 M and 16+16 m, segment X tapering posteriorly, width 1.87, length 2.38 mm., acropygidium slight, gently rounded; with 1+1 M laterad, 1.10 mm. long, and about 50+50 MB.

Forceps. Biserially dentate from base to tip; right with one prominent tooth, 21 teeth (3 larger than the others) distal to prominent tooth and basally two rows visible in prone profile, one with three teeth and one with one, left forcep with a concavity opposite the prominent tooth on the right arm, with 14 teeth distal to the concavity and basally two rows, one with three teeth and one with one, forcep width 0.77 mm., length 1.53 mm.

Length of body including forceps, 30 mm.

Male.—Similar to female, except lateral subcoxal organs present with 64+60 similar, multilaterally serrate setae in a single row; glands and glandular area present, without visible pores and no glandular setae; tergites V-VII with postero-lateral corners with a bilobed process becoming more developed posteriorly; length of mesad lobe VII 0.51 mm.; forcep width 0.77, length 1.70 mm.

Length of body including forceps, 30 mm.

I have studied a series of 6 females, 6 males, 2 juvenile females and one juvenile male. A few of these have 49 segments in the antennae. They were collected 40 miles east of Abancay, Peru, March 4, 1951. I take pleasure in naming this species after E. S. Ross.

Types.—Holotype and allotype, California Academy of Sciences, paratype ♀ and ♂ U.S.N.M.

Leipojapyx michelbacheri L. Smith, new species

Female.—Similar to *rossi,* except antennae with 45 segments; fourth segment width 0.30 mm., fortieth segment 0.16 mm., third antennal segment with 4 long setae, 3 laterad and one mesad; longest seta in whorl 0.59 mm.; sense setae on segments IV-XXIV.

Male.—Unknown.

I have studied a series of four adult females and one juvenile female. One adult has 44 segments in the antennae. They were oclleeted 20 miles south of Cuzco, Peru by Ross and Michelbacher. I take pleasure in naming this species after Dr. A. E. Michelbacher.

Types.—Holotype ♀ and paratype ♀, California Academy of Sciences, paratype ♀ U.S.NM.

In his works on the anatomy of *Dinjapyx marcusi* Silv., Dr. Harry Marcus (1948 and 1951) states that these insects feed on moss and algae which grow on rocks or wood. Most of the specimens of *Leipojapyx* which I have studied contain fragments of various insects, but ants predominate. One individual contains parts of approximately 20 ants.

Key to the Genera and Species of the Subfamily Dinjapyginae

1. Females with subcoxal organs; males with postero-lateral angles of tergite VII with a single lobe .... **Dinjapyx** Silv. ... 2
   Females without subcoxal organs; males with postero-lateral angles of tergite VII bilobed .... **Leipojapyx** L. Smith n. gen. .. 4
2. Antennae 46 segmented, body 32 mm. .... **D. barbatus** Silv.
   Antennae less than 46 segments 3
3. Body 23 mm., tergite VII distinctly lobed .... **D. marcusi,** Silv.
   Body 18 mm., tergite VII less distinctly lobed .... **D. manni** Silv.
4. Antennae 48 to 49 segmented, sense setae on antennal segments IV to XXVII inclusive .... **L. rossi,** L. Smith, n. sp.
   Antennae 44 to 45 segmented, sense setae on antennal segments IV to XXIV inclusive .... **L. michelbacheri** L. Smith, n. sp.

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ECTOPARASITES OF RATTUS RATTUS (L.) IN THE BERMUDA ISLANDS, WITH A NOTE ON CTENOCEPHALIDES FELIS (BOUCHÉ) (SIPHONAPTERA, PULICIDAE) [1,2]

ROGER W. WILLIAMS, *School of Public Health and Administrative Medicine, Columbia University, New York*

Studies by Williams (1956a, 1956b, 1956c, 1958) and Wirth and Williams (1957) disclosed that there existed in the Bermudas a considerable number of insects, many of potential medical importance, which had not been reported in earlier surveys by Johnson (1913), Ogilvie (1928) or by Waterston (1940).

In an effort to obtain more complete information on the arthropods which might be of some medical importance in this group of islands an attempt was made to conduct an ectoparasite survey of the domestic rodent population.

Ogilvie (1928) reported *Ctenocephalides* (*Ctenocephalus*) *canis* (Curtis), *Pulex irritans* L., *Echidnophaga gallinacea* (Westwood) and *Tunga penetrans* (L.) as occurring in the Bermudas but indicated that the latter species was probably no longer present there. No other fleas have been reported and no surveys had previously been made of parasitic mites and lice.

METHODS

Eight standard live rat traps were used in this study. Animals trapped were released into white muslin, draw string bags and carried to the laboratory where the bag and contents were placed for a number of minutes into a chloroform killing jar. The contents of the bags were shaken into a white enamel pan and the inner surface of the bags carefully searched for ectoparasites. The animals were combed over the pan with a fine toothed comb and the pan examined for parasites. The animals were then submerged in magnesium sulphate solution and again combed. Any parasites removed floated to the surface.

RESULTS

The local health department began an extensive and successful rodent control campaign in 1951. As a result the rodent population was at a minimum and it was with great difficulty that rodents were

[1] Contribution No. 236 of the Bermuda Biological Station. This investigation was supported by research grant E-1350 from the National Institute of Health, Public Health Service and from the Child Frick Fund of the Bermuda Biological Station.

[2] Thanks are due to Mr. Percy M. Wright, Health Inspector in charge of rodent control of the Bermuda Health Department, for suggestions in trapping and for specimens of 4 rats and 1 mouse; to Dr. Edward W. Baker, Bureau of Entomology and Plant Quarantine, Agricultural Research Administrations of the U. S. Department of Agriculture for his comments on *Androlaelaps* sp. and his examination and comments on *Marquesania*; to Mr. G. J. Love, then Acting Chief of the Newton Field Station, Communicable Disease Center, Public Health Service, Newton, Georgia, for the loan of the live rodent traps; and to numerous residents of the Bermuda Islands who permitted traps to be placed on their property.

trapped. According to Mr. Percy M. Wright, who is in charge of this campaign, *Rattus norvegicus* (Erxleben) remains in very small numbers on the islands but none were captured. *Mus musculus* L. was taken four times but only louse eggs were found on a single specimen. Twenty-seven *Rattus rattus* (L.) were captured in 5 of the 9 parishes.[3] No parasites were found on 6 of these animals. Three species of mites of the family Laelaptidae were recovered from 16 animals: *Androlaelaps* sp. was taken from 3 rats from Smith's Parish with 5 being the maximum recovered from any rat. *Laelaps nutalli* Hirst, ranging from 10 to 40 in number, was recovered from 7 rodents captured in the parishes of Paget, Pembroke, Smith's and St. George's. *Echinolaelaps echidninus* (Berlese) was found on 6 *Rattus* from Paget, Smith's, and St. George's. The maximum number taken from any animal was 17. The mite family Listophoridae was represented by *Marquesania expansa* (Ferris) which was found on 2 rats from St. George's parish. The hair of these animals was covered with the mites and it appeared that their numbers must have been in the several thousands.

The flea, *Xenopsylla cheopis* Roths., was taken from 3 animals 1 of which was trapped in each of the parishes of Southampton, Pembroke and Smith's. Six was the maximum number taken from any animal.

The louse, *Polyplax spinulosa* (Burmeister), likewise was recovered from 3 animals from the same 3 parishes as was the flea. The maximum number on any one animal was 5.

Discussion

As a result of the efficient rodent control campaign conducted by the local health department this survey represents a much more limited one than was originally planned. However, since no rodent ectoparasite survey had previously been conducted none of the 6 species of ectoparasites recovered from *R. rattus* had been reported from this area. It is felt that there are probably other species present on rodents and that more extensive work in the future might bring some of these to light.

Dr. Edward W. Baker was of the opinion that until the taxonomy of the genus *Androlaelaps* is more clearly elucidated that it would not be possible to determine the species found here. Dr. Baker also stated (personal communication) that the genus *Marquesania*, to the best of his knowledge, has not been previously reported from the New World. *Marquesania expansa*, originally described from the Marquesas, by Ferris (1932) as *Listrophoroides expansus*, has apparently never been reported elsewhere.

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[3] See Williams (1956c) for a map giving the location of the parishes of the Bermudas.

A Note on Ctenocephalides felis (Bouché)

Fleas were extremely common on dogs and cats and in many human habitations. An examination of 12 collections of fleas from such sources disclosed *Ctenocephalides felis*, the cat flea, to be the most common. *C. felis* had not previously been reported from the Bermuda Islands. Since no *C. canis* were observed it may be possible that the report of this species by Ogilvie was in error and that he was actually dealing with *C. felis*. *Pulex iritans* L., previously reported from the Bermudas, was taken twice from human habitations.

Summary

An examination of 27 *Rattus rattus* collected from 5 of the 9 parishes of the Bermuda Islands disclosed 21 of them to be infested with one or more of the following ectoparasites: *Androlaelaps* sp., *Laelaps nuttalli, Echinolaelaps echidnius, Marquesania expansa, Xenopsylla cheopis,* and *Polyplax spinulosa.* These are reported from this geographical area for the first time. The genus *Marquesania* has apparently not been previously reported from the New World and *M. expansa* from anywhere except the Marquesan Islands. The cat flea, *Ctenocephalides felis,* also reported for the first time from the Bermudas, was very common on cats and dogs as well as being present in many human habitations. *Pulex irritans,* previously reported, was also found in dwellings.

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HAROLD S. McCONNELL, 1893-1958

Harold Sloan McConnell was born on December 30, 1893 at Anderson, South Carolina, the son of James N. S. and Frances C. Duckworth McConnell. His boyhood was spent on the farm near Anderson which is still in the possession of the family. He graduated from Clemson Agricultural College in 1916 and came to Maryland State College as an assistant in entomology the same year. He began work with E. N. Cory on insect pests of apples and in promoting fruit production as part of the war effort. His first publication, in collaboration with E. N. Cory, was an Extension Bulletin entitled *Insects and Rodents Injurious to Stored Products.* He was elected to membership in the Entomological Society of Washington at the 303rd meeting on April 5, 1917. He was present at several of the meetings at the Saengerbund Hall at which there were sometimes fervent discussions by Schwarz, Busck and others "with European accents."

In January 1918, McConnell enlisted in the Army Medical Corps. He studied at Walter Reed Hospital, the Rockefeller Foundation in New York, and in New Haven, Connecticut, prior to being commissioned in the Sanitary Corps. He served in the American Expeditionary Force in Europe from August 1918 to June 1919 as water supply investigator. Upon his discharge he served as research assistant entomologist at the South Carolina Experiment Station until 1924. South Carolina Circular 31 states, "H. S. McConnell, an entomologist of some years experience, was employed as assistant entomologist to conduct field plat work in Dillon, Dorchester, Barnwell and Clarendon Counties." Several publications of the South Carolina Station on the boll weevil were based largely on McConnell's work.

In July 1924, McConnell returned to the University of Maryland and resumed his research work on fruit insects. He was married to Pearl Anderson, herself a zoologist and entomologist, in 1926. There were numerous publications on oriental fruit moth and other fruit insects between then and 1942. In 1932 he received the Master of Science degree, and the title of his thesis was *Parasites of the Strawberry Leaf Roller,* Ancylis comptana *Forel, in Maryland.*

Professionally Harold McConnell will be best remembered for his work on scale insects. His interest in this group was aroused by Philip Garman about 1921, at which time MacGillivray's "The Coccidae" was published. In 1939 he initiated a course in coccidology for graduate students. This course was taught not more than twice. It involved the techniques of slide preparation as a prerequisite to knowledge of scale insects. Because of the limited time available the students could only scratch the surface, but they received an appreciation of the immense amount of preparatorial work necessary for scale insect studies.

McConnell's first taxonomic paper on the Coccidae appeared in 1941. There were several outstanding publications, primarily Maryland Agricultural Experiment Station Bulletin A-75 on the family Aclerdidae and Bulletin A-84 on the Planococcini in collaboration with a student, Y. M. Ezzat. His study on the comparative morphology and classification of the species of the Aclerdidae is particularly noteworthy because of his success in presenting the often confused and obscured details of the structure of these much-modified coccids.

McConnell re-entered the Army Sanitary Corps during the Second World War and served as an entomologist from March 1943 to November 1945. Following the Second World War he devoted considerable time to European corn borer investigations. For ten years he conducted an annual population survey and also distributed corn borer parasites and studied their effectiveness. McConnell devoted much time to studies of the green peach aphid on tobacco, and he developed improved methods for control of tobacco hornworms.

His membership in the Entomological Society of Washington presumably lapsed after 1917, and he was elected to membership again on February 4, 1932. He became a member of the American Association of Economic Entomologists in 1928. In 1947 he served as secretary-treasurer of the Association and business manager of the Journal of Economic Entomology.

Those closely associated with McConnell immediately acquired great respect for him primarily because of his vast fund of knowledge and his willingness to put it to use in assisting others. He was extremely well versed in systematic botany and in French, German, and Latin. He was a highly competent photographer and taught many others various techniques. He identified quickly almost any insect that was brought to him. Few entomologists know as much entomology as he did.

McConnell's outstanding characteristic was his meticulous attention to details. He was a perfectionist. This attribute was a handicap in that it meant that his research work proceeded slowly. Nevertheless his painstaking efforts are clearly reflected in his publications, particularly the taxonomic studies. His contributions as an entomologist will be long remembered, and those who knew him will miss him as a friend and adviser.

He died of cancer on May 11, 1958, and is survived by his wife and two sons, Harold M. and James F.

W. H. Anderson
T. L. Bissell
Harold Morrison
W. E. Bickley

List of Publications by Harold S. McConnell

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McConnell, H. S. 1942. The pistol casebearer in Maryland. Md. Agr. Exp. Sta. Bul. A7:171-187.

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SOCIETY MEETINGS

673rd Meeting, June 7, 1958—

The annual picnic was held at the Log Lodge, Agr. Res. Center, Beltsville, Maryland. Over 100 members and guests from the Insecticide Society of Washington and our Society enjoyed the smorgasbord, which included fried grasshoppers and chocolate ants.

674th Meeting, October 16, 1958—Held in U. S. National Museum

Copies of the recommended revision of the proposed Bylaws were distributed among the members and some of the major changes were pointed out by Dr. H. H. Shepard, who is chairman of the Committee on Constitution and Bylaws. The Society voted to accept the report of this committee.

Dr. A. B. Gurney proposed the names of the five following candidates for membership: *Dr. Allen L. Steinhauer,* Dept. of Entomology, University of Maryland; *Paul J. Spangler,* U. S. National Museum; *Major Herbert C. Barnett,* Walter Reed Army Institute of Research; *Dr. Frank M. Hull,* University of Mississippi; and *Peter D. Ashlock,* U. S. National Museum. These were unanimously elected.

The death of Mr. H. S. McConnell of the University of Maryland was mentioned by President Sailer, and Mr. T. L. Bissell commented briefly on his accomplishments. Dr. Sailer named Doctors W. H. Anderson, Harold Morrison, and W. E. Bickley (chairman) as a committee to prepare an obituary for the *Proceedings.*

Once again national entomological meetings are interfering with our regular December meeting. Judging by last year's small turnout and by the number of officers and members attending the Salt Lake City meetings, it was voted that we postpone our meeting date until December 11.

The winner of the Prince Georges County Science Fair, Richard Thomas, who was unable to be with us in May, explained his interesting exhibit on subterranean termites.

Dr. R. H. Foote called our attention to two new books: one, the "World of Butterflies and Moths," by A. Klotz; and two, the first supplement to the "Hymenoptera of North America, Synoptic Catalog," under the direction of Carl Krombein.

Dr. Sailer exhibited *Anasa tristis* De Geer that were parasitized by the tachinid fly, *Trichopoda pennipes* (F.). He pointed out that the eggs of the fly were attached to the integument of the bugs and to the fly puparia. According to the literature, the overwintering generation of the fly is supposed to remain as puparia in the dead body of the host until spring. Under laboratory conditions it was found that the larva left the host and behaved no differently than larvae that matured in July.

We were fortunate to have Dr. Caryl Haskins, President of the Carnegie Institution of Washington, to present a highly intellectual address on the "Social Evolution in the Formicidae." It was also a treat to have Dr. J. T. Salmon of New Zealand speak to us on the insect fauna of that country. Dr. Salmon, a world authority on Collembola, is the systematic entomologist in charge of the Insect Collection of the Dominion associated with the University of Wellington.

675th Meeting, November 6, 1958—Held in U. S. National Museum

After a lengthy discussion, the new Bylaws of the Society became a reality. Dr. A. B. Gurney moved that the Bylaws be accepted as amended at this meeting, and the motion was seconded by Dr. Snodgrass. There was unanimous approval by the membership present. After the passage of the Bylaws, a motion was made by Dr. Bickley and seconded by T. L. Bissell, that the transition from the former Constitution and Bylaws of the Society to the new Bylaws be left to the discretion of the present Executive Committee. This motion was carried.

The following were elected to membership: *Dr. Mario Vaughn R.*, Managua, Nicaragua; *Dr. Thomas W. Haines*, National Cancer Institute; *Dr. Kurt K. Bohnsack*, Dept. of Zoology, San Diego State College; and *Mr. Robert L. Linkfield*, ICA.

Officers suggested by the Nominating Committee for 1959 are as follows: President, *R. H. Nelson*; President-Elect, *P. W. Oman*; Recording Secretary, *Helen Sollers*; Corresponding Secretary, *P. A. Woke*; Treasurer, *Price Piquette*; Editor, *R. H. Foote*; Custodian, *H. Conkle*; Program Committee Chairman, *John Fales*; Membership Committee Chairman, *A. B. Gurney*; and Executive Committee Member, *R. I. Sailer.*

Dr. T. E. Snyder presented a note of interest on *Reticulitermes hageni* Banks in a new area. On August 26, 1958, this species was found flying in a building at Trenton, New Jersey. The most northern previous record was Wash., D. C. *R. hageni* ranges south to Florida and west to Kansas. It is a late summer and fall ''swarmer'' and, being light yellow-brown, it is mistaken for a drywood termite. All other species, including African, European, and Indo-Malayan, are black except a Japanese species with a yellow thorax. It is believed that the trend toward milder winters in recent years is responsible for this northern spread. *R. virginicus* (Banks) has spread to Long Island, New York, and *R. lucifugus* (Rossi) has spread northward in France and Italy.

President Sailer called our attention to a correction to be made in the numbering of the last several meetings.

Dr. J. F. Gates Clarke, Curator of Insects, U. S. National Museum, gave us one of his usual fine talks. The subject, ''The Smithsonian Bredin Caribbean Expeditions 1956 and 1958,'' was accompanied by colored Kodachrome slides.

A number of visitors were present. Among those mentioned or introduced were *Dr. and Mrs. W. R. Thompson,* Canada; *Dr. and Mrs. J. A. Munro, Doctors Waldo L. Schmitt, A. C. Smith,* and *C. N. Shuster, Jr.*—Helen Sollers, *Recording Secretary.*

CORRECTION

In Proc. Ent. Soc. Wash. 60(3):141, 1958, change 700th meeting to read 670th; 60(4):190, 1958, change 701st to read 671st and 702nd to read 672nd.

NEW BYLAWS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

Notes on The History of The Constitution

The constitution of the Entomological Society of Washington has been amended many times since formation of the Society in 1884. The present is the fifth printing in its entirety, the second in which the document has been largely or entirely rewritten. The several printings are to be found in the Proceedings of the Society. These and such amendments as were adopted since 1937 may be located by reference to the following issues:

Vol. 1(1): 5-7 (1886), original constitution.
11(1): 4-6 (1909), reprinted to include several amendments.
14(1): 19-21 (1912), reprinted as amended in 1911.
39(1): 8-13 (1937), rewritten "Constitution and By-Laws," "all articles but the first being changed."[1]
43(4): 90 (1941), added retirement privileges.
49(6): 172 (1947), amendment concerning honorary members.
52(1): 49-50 (1950), changed the duties of the Corresponding Secretary and added a Custodian to officers of the Society.
53(1): 53-54 (1951), amended both constitution and by-laws mainly to increase dues, to shift the time of reports of officers, and in general to improve the efficiency of financial planning and activities.
55(4): 206 (1953), added a Program Chairman to the elected officers.
59(2): 90-91 (1957), replaced articles of the constitution on objects of the Society, member privileges, and the special publication fund.

The present revision of the Society's rules was undertaken to simplify them and to improve functioning of the organization. The former constitution and bylaws are consolidated into a single set of bylaws to permit easier reference to any particular topic. The office of Second Vice-president is dropped and that of First Vice-president changed to President-elect. The composition of the Executive Committee is revised and certain standing committees formalized and their duties set forth.—

Committee on Constitution and Bylaws:
William H. Anderson
Edward F. Knipling
Harold H. Shepard, *Chairman*

[1]H. E. Ewing and J. S. Wade, "Notes on the history of the constitution of the Entomological Society of Washington," Proc. Entomol. Soc. Wash. 39(1): 13-14 (1937).

BYLAWS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON[2]

Article I.—**Name**

The name of this organization is "The Entomological Society of Washington."

Article II.—**Object**

Section 1.—The object of the Society is to promote the study of entomology in all its aspects and to cultivate mutually advantageous relations among those in any way interested in entomology.

Section 2.—Among the means to be employed to this end shall be meetings for the discussion of entomological topics, and publications of such nature as may be deemed desirable.

Article III.—**Membership**

Section 1.—Members shall be persons who have demonstrated interest in the science of entomology.

Section 2.—Applications for membership shall be made to the Membership Committee in writing, with the endorsement of two members in good standing. They shall be accompanied by brief statements of qualifications.

Section 3.—Election of members shall be the responsibility of the Membership Committee in accordance with the procedure outlined in Article VII, Section 2.

Section 4.—Any person who has been a member of the Society for five years and who has paid up his or her dues may become a Life Member by paying $75.00. Any member who has paid up his or her dues may become a Sustaining Member at any time by paying $150.00. Life and Sustaining Members are exempt from paying further dues.

Section 5.—Members of 15 years or more standing, not in arrears for dues or otherwise indebted to the Society when retiring from income-producing employment, may request, and be continued by, the Executive Committee as members without further payment of dues. Members thus relieved of the payment of dues will not be sent copies of the Proceedings.

Section 6.—The Society may elect honorary members in recognition of long and meritorious effort to advance entomological science. Individuals so recognized shall be approved unanimously by the Executive Committee and by two-thirds vote of members present at any regular meeting. Honorary members shall be elected for life, shall pay no dues, and shall be accorded all privileges of members. The number of honorary members carried concurrently on the membership roll shall not exceed three, except when an honorary member is chosen Honorary President, in which case there may be four.

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[2]Approved and adopted by unanimous vote of members present at the 675th regular meeting of the Entomological Society of Washington on Nov. 6, 1958.

Article IV.—Dues

Section 1.—There shall be an initiation fee of one dollar.

Section 2.—The annual dues shall be five dollars payable January 1. Members elected prior to October shall pay dues for the full year within one month after their election and receive all numbers of the Proceedings for that year. Members elected after September may choose to be exempt from dues for the calendar year in which they are elected and receive the Proceedings beginning with January of the next year.

Section 3.—The Treasurer shall notify those members one year in arrears for dues. After one month's notice, if dues are not paid the member's name shall be removed from the mailing list for the Proceedings. The member shall be notified of such action by the Corresponding Secretary. A member who is two years in arrears for dues may be dropped from membership by vote of the Executive Committee after two months' notice.

Section 4.—A member shall be considered to be one year in arrears if he has not paid his dues by March of the year following the year in which they were payable.

Section 5.—Members dropped for non-payment of dues, or those who have resigned, may be reinstated by payment of dues for the current year and by payment at membership rates for all copies of the Proceedings for which they are delinquent.

Article V.—Officers

Section 1.—The elected Officers of the Society shall be a President, a President-elect, a Recording Secretary, a Corresponding Secretary, a Treasurer, an Editor, a Custodian, a Program Chairman, and a Membership Chairman. These shall be chosen from resident members.

Section 2.—The President or, in his absence, the senior officer present (as listed in the previous Section) shall preside at all meetings of the Society and of the Executive Committee. The President or his substitute shall have authority to and shall appoint any standing or special committees whose services are required in the interests of the Society. He shall conduct such correspondence as should appropriately bear his signature as presiding officer. If he is a member of the Washington Academy of Sciences, he shall represent the Society as Vice-president of the Academy; or he may appoint to substitute for him a qualified member of the Society. The President shall deliver an address on some subject pertinent to the objectives of the Society at the first or second meeting subsequent to the completion of his term of office.

Section 3.—The Recording Secretary shall make and preserve a record of the proceedings of the Society and of the meetings of the Executive Committee, and shall submit a record of the Society's proceedings to the Editor for publication.

Section 4.—The Corresponding Secretary shall conduct all official correspondence of the Society except as otherwise provided, shall keep a list of all members and subscribers together with their addresses, and shall be responsible for the mailing of the Proceedings.

Section 5.—The Treasurer shall have charge of and be responsible for all funds and investments of the Society, and shall make routine disbursements. Unusual disbursements and investments shall be made only at the direction of the Executive Committee. He shall collect all sums due to the Society from any source, notify all members and subscribers who are in arrears, and shall present to the Executive Committee an annual report on the financial status of the Society, and conduct such correspondence as is necessary to carry out these duties. The fiscal year of the Society shall be November 1 to the following October 31. The Treasurer shall close his books at the end of the fiscal year, so the accounts of the Society may be audited prior to its annual meeting.

Section 6.—The Editor shall be responsible for editing all publications of the Society, and shall conduct such business as is necessary to carry out this responsibility.

Section 7.—The Custodian shall have charge of the reserve stock of the Society's publications, and shall make such sales as lie within the interests of the Society.

Section 8.—The Program Chairman shall be responsible for arranging, with the assistance of the members of the Program Committee, the program of each meeting of the Society and for notifying the resident members of the Society of all meetings. Those members living in metropolitan Washington and nearby areas shall be considered resident members.

Section 9.—The Membership Chairman shall be responsible for activities of the Membership Committee as provided for in these Bylaws. He shall notify the Corresponding Secretary of the names and addresses of new members, and cooperate with that officer and the Treasurer in maintaining an accurate membership list.

Section 10.—At the annual meeting, having before it the list of candidates submitted by the Nominating Committee, the membership present may make other nominations from the floor. A separate election by written ballot shall be held for each office for which there are two or more candidates, the ballots being distributed, collected and counted by tellers appointed by the President. When only one candidate for an office is before the Society, election shall be *viva voce* on motion and second from the floor and in that case two or more offices may be treated in one motion.

Section 11.—The officers shall serve for one year, assuming their duties at the end of the Annual (December) Meeting and serve until their successors are elected; except the Treasurer who shall assume his duties as soon as arrangements can readily be made with his predecessor and the banks for transfer of Society funds. The Executive Committee may ask for such reports of officers as are deemed necessary. Except for the President and President-elect, who cannot hold office for two consecutive years, there shall be no limitation as to the number of terms to which an officer may be elected.

Section 12.—Vacancies in any office shall be filled by appointment by the Executive Committee. Members selected to fill such vacancies shall hold office only until their successors are elected, except as noted in Section 10.

Section 13.—The Society may elect an additional officer to be known as Honorary President who shall serve in that capacity during the remainder of his life. His nomination shall be approved unanimously by the Executive Committee. Election shall be by three-fourths majority of the membership present at a regular meeting. The Honorary President shall be exempt from the payment of dues and shall be accorded all privileges of members.

Article VI.—**Executive Committee**

Section 1.—The activities of the Society shall be guided by an Executive Committee. The Committee membership shall consist of all officers and the last available past president.

Section 2.—The Executive Committee shall assume the responsibility for and shall conduct the activities of the Society, direct finances, and provide for meetings and publications. As provided elsewhere in these Bylaws, the Committee shall report fully to the Society once each year, on its conduct of the Society's business, either through the different officers or by specially approved representative. The report shall include an approved audit of the Treasurer's accounts. The Committee shall also consider and present to the Society proposals for change or improvement, and shall transact all other business requiring attention and not otherwise assigned.

Section 3.—The Executive Committee shall hold such meetings as are required to transact the business of the Society during the year. One of these shall be sufficiently prior to the Annual Meeting to permit consideration and approval of a summary report for presentation by the President at the Annual Meeting on the state of the Society and the work of the officers. Other meetings of the Executive Committee may be called at any time by the President or his substitute and shall be called promptly by the presiding officer on request of any three members of the Committee other than the presiding officer. The presence of five members of the Executive Committee at any meeting shall establish a quorum.

Article VII.—**Standing Committees**

Section 1.—The standing committees of the Society shall consist of a Membership Committee, a Program Committee, a Publications Committee, an Advertising Committee, a Finance Committee, and a Nominating Committee. New non-elective members of these committees shall be appointed by the incoming President each year. The Committees shall report to the Society at one of its meetings or to the Executive Committee as may be required.

Section 2.—The Membership Committee, consisting of the elected chairman and four appointed members, shall search for prospective new members of the Society among professional workers, students and amateurs in entomology, see that their applications are properly executed, and by majority vote approve the candidates' qualifications for membership. The name of each new electee shall be reported by the Membership Committee at a regular meeting and in the absence of adverse notice from the members the electee's name shall be read as a new member at the next regular meeting, and if feasible he shall be introduced by a sponsoring member. If the committee receives an adverse notice concerning an electee, the candidate's name shall be referred to the Executive Committee and final approval shall be by majority vote of that committee with formal announcement of membership to be made in the usual manner at the next regular meeting following action by the Executive Committee.

Section 3.—The Program Committee, with the elected Program Chairman serving as head, shall arrange for the programs and meeting places of all regular meetings of the Society. This Committee shall consist of the Chairman and three members, the latter to be appointed each year.

Section 4.—The Publications Committee shall consist of the Editor as Chair man and three appointed members. The appointed members shall assist the Editor in matters of policy, format and finances of the Proceedings and other publications of the Society. The committee shall consider and put into execution plans for promoting the sales of Society publications. It shall review manuscripts for the Memoirs and any other special publications, and make recommendations to the Executive Committee regarding their publication. The appointed members of the Publications Committee shall serve for three-year terms staggered so that one member is replaced each year.

Section 5.—The Advertising Committee consisting of two members, one appointed each year for a two-year term, shall solicit advertising for the publications of the Society as may be directed by the Executive Committee.

Section 6.—The Finance Committee, consisting of the Treasurer as chairman, the Editor, the Custodian, the Program Chairman, and the Advertising Chairman, shall assist the Treasurer in matters of finances of the Society and make recommendations to the Executive Committee relative to these matters. It shall be a particular duty of this Committee to prepare for the Executive Committee at the beginning of each year a statement of the income and expenditures of the preceding year and to prepare a budget based on the estimated receipts and disbursements of the coming year, with such recommendations as seem desirable.

Section 7.—The Nominating Committee of three members shall prepare a list of candidates comprising one nominee for each office for presentation to the membership at the regular meeting one month before the annual meeting. The Committee shall secure the acquiescence of each candidate before presentation.

Section 8.—Not later than October of each year, the President shall appoint an Auditing Committee of three persons to inspect the accounts of the Treasurer and report to the Society at its next annual meeting.

Section 9.—Such other Standing and Special Committees as the Executive Committee deems necessary shall be appointed by the President.

Article VIII.—**Meetings**

Section 1.—The regular meetings of the Society shall be held, unless otherwise ordered by the vote of the Society or of the Executive Committee, on the first Thursday of each month except June, July, August and September. The annual meeting for the election of officers shall be the regular meeting for the month of December. Special and field meetings may be called by the Executive Committee. The Program Committee or committees appointed for special meetings may, with the approval of the Executive Committee, incur reimbursable expenses. Twenty members shall constitute a quorum.

Section 2.—The recommended order of business at the regular meetings, except the annual meeting, shall be as follows:

1. Reading and approval of minutes.
2. Reports of officers and committees.
3. Introduction of new members.
4. Miscellaneous business.
5. Presentation of notes and exhibition of specimens.
6. Presentation of announced topics.
7. Introduction of visitors.
8. Adjournment.

Section 3.—The recommended order of business at the annual meeting in December shall be:

1. Reading and approval of minutes.
2. Introduction of new members.
3. Presentation by the President of a summary report on the state of the Society and the work of the retiring officers.
4. Election of new officers.
5. Miscellaneous business.
6. Presentation of notes and exhibition of specimens.
7. Presentation of announced topics.
8. Introduction of visitors.
9. Installation of newly elected President.
10. Adjournment.

Section 4.—Either the first or the second regular meeting following the annual meeting shall be set aside for the delivery of the annual address of the retiring President.

Article IX.—**Publications**

Section 1.—Publications of the Society shall consist of a periodical to be known as the Proceedings of the Entomological Society of Washington which shall contain the proceedings of the Society and such papers as are accepted for publication in it, a series of Memoirs, and such miscellaneous handbooks or other special publications as may be deemed desirable. Each member, in good standing, except a retired member relieved of payment of dues, is entitled to one copy of each issue of the Proceedings (see Art. IV, Sec. 3).

Section 2.—Financial support of the Proceedings shall be provided by the annual dues, from subscription revenues and from such other funds as the Executive Committee shall determine.

Section 3.—The Society shall maintain a separate fund to be known as the Special Publication Fund. At the discretion of the Executive Committee, any unrestricted portion of the Special Publication Fund may be used for publishing memoirs, handbooks, or other special publications. In any one year, a sum not exceeding the previous five years' income from interest on the Fund monies may be taken from this Fund and applied toward the publication of the Proceedings; such sum to be returned to the Special Publication Fund at the discretion of the Executive Committee. The Special Publication Fund will be derived from bequests and gifts, from the sale of complete sets of the Proceedings of the Entomological Society of Washington, from the fees of life and sustaining members, and from the sum of fifty cents from the annual dues of each member.

Section 4.—Members shall be given preference over non-members in the publication of manuscripts.

Article X.—**Amendments**

These Bylaws may be amended at any regular meeting by a two-thirds vote of the members voting, if the total number voting represents a quorum, provided that such amendment has been passed by a two-thirds vote of the Executive Committee and presented to the Society in written form at the meeting prior to the meeting at which the vote is taken.

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Vol. 61 APRIL, 1959 No. 2

PROCEEDINGS

of the

ENTOMOLOGICAL SOCIETY of WASHINGTON

U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

PUBLISHED BIMONTHLY

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Regular meetings of the Society are held in Room 43 of the U. S. National Museum on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

MEMBERSHIP

Members shall be persons over 18 years of age who have an interest in the science of entomology. Annual dues for members are \$5.00; initiation fee is \$1.00 (U. S. currency).

PROCEEDINGS

Published bimonthly beginning with February by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are \$5.00 per year both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington.*

The Society does not exchange its publications for those of other societies.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about \$12.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines should indicate present mailing address of the author and his organizational affiliation, if possible. Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding references in which author, year, title, name of publication, volume and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 61 **APRIL, 1959** **No. 2**

MALE GENITALIA IN THE SUBFAMILY CHEILOSIINAE. GENUS CHRYSOGASTER s. l.

(DIPTERA, SYRPHIDAE)

YALE S. SEDMAN, *Department of Biological Sciences, Western Illinois University, Macomb, Ill.*

The use of the male genitalia in attempting to delimit supra-specific groups is relatively new in syrphid studies. Fluke (1950) has shown how rewarding such studies can be in determining relationships in groups where much confusion is found. Stuckenberg (1954a, b) utilizes a character not previously used by syrphid workers to further aid in elucidating relationships within genera. From studies of a large number of genera of syrphid flies, it was seen that the use of the axial genital system, as proposed by Stuckenberg, is helpful in many difficult groups.

Preparation of materials used in this study is similar to the methods of Metcalf (1921), and others. Pinned specimens to be studied were relaxed in a moist chamber containing paradichlorobenzene and phenol. The genitalia were removed, macerated in 10% potassium hydroxide for 24-72 hours, rinsed in acidic water, and stored in glycerine filled micro-vials which could be pinned below the specimen. Drawings and observations were made while the genitalia were held in place in a spot dish with a dab of vaseline or boric acid. After drawings were completed, dissection of the peripheral system followed. The axial system, superior and inferior lobes of the peripheral system were dehydrated, infiltrated with xylene, and mounted in balsam under separate cover slips. The remainder of the peripheral system was replaced into the micro-vial.

Synonymies for the species studied include only the citation of the original description and most recent revision.

I am indebted to P. H. van Doesburgh, Willi Hennig, and C. L. Fluke for specimens used in this study. In addition, I would like to express my gratitude to C. L. Fluke for encouragement and generous help throughout this study.

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Subfamily Cheilosiinae

Tribe **Chrysogastrini**

Subtribe **Chrysogastrina**

Genus **Chrysogaster** s. l.

The genus *Chrysogaster* Meigen (1800) has been subdivided into a number of groups based on antennal, facial and wing characteristics. The use of generic or subgeneric ranking is not consistent in syrphid literature and the same author may use these terms interchangeably The following synonymy will serve to show the changes in the nomenclature of this group of syrphids. Three generic names are not included since their status is not known to me; two of the genera are Australian, *Plesia* Macquart and *Hemilampra* Macquart, while the third, *Liochrysogaster* Stackleberg, is known from Chinese Turkestan.

Chrysogaster

Meigen, 1800 (8). Nouv. Classif.: 32(no species listed); 1803, Illig. Mag II: 274 (He lists *coemeteriorum* (= *solstitialis* Fall.), *metallinus*, and *umbrarum* Fabr. Zetterstedt (1843) designated *solstitialis* Fall. as genotype.)

Rondani, 1957. Dipterol. Ital. Prodr. *I*: 52 (*Campyneura*, also spelled *Camponeura*, *Campineura*, *Camptoneura*); Dipterol. Ital. Prodr. *II*: 166 (*Melanogaster*).

Orthoneura

Macquart, 1828. Recueil Soc. Sic, Agricult. Lille *1828*: 188 (for *elegans* Meig.)

Bigot, 1859. Rev. et Mag. de Zool., ser. 2. *XI*: 308 (*Cryptoneura*, also spelled *Cryptineura*).

Barberiella

Shannon, 1922. Ins. Ins. Menst. *10*: 122 (genotype-*chilosoides* n. sp.)

Sulcatella

Goffe, 1944. Ent. mon. Mag. *80*: 128-129 (designates *tarsata* Megerle (= *splendida* Meigen).

Rondani, 1857. Dipterol. Ital. Prodr. *2*: 166 (*Lejogaster*, also spelled *Leiogaster*, *Liogaster*).

A key which has been taken from a number of sources based on the external morphology excluding use of the male genitalia differentiates these groups as follows:

Key to Groups of Chrysogaster s. l.

1. Frons bare; second antennal segment above and below with bristles greater in length than third antennal segment; apical cross-vein directed outward .... **Barberiella** Shannon

   Frons pilose; condition of second antennal segment and apical cross-vein differing from the above 2

2. Apical cross-vein meets third vein making an angle of more than 90°, or if junction is nearly at right angles, the lower cross-vein and the distance from the end of the lower cross-vein to beginning of the apical cross-vein is quite short .... **Chrysogaster** Meigen
Apical cross-vein joining third vein definitely at right angles or even recurrent. The lower cross-vein is always oblique to the wing margin; distance from the end of the lower cross-vein to beginning of the apical cross-vein is considerable 3
3. Eyes dichoptic in males; metallic species .... **Sulcatella** Goffe
Eyes holoptic in males; usually less metallic; third antennal segment elongate .... **Orthoneura** Macquart

This key is not too unsatisfactory but studies of the male genitalia indicate a different alignment of species within these groups. The Orthoneurae have always presented a perplexing problem and the group has been alternately discarded and resurrected over the years. *Barberiella* was discarded by Hull (1949) and resurrected by Fluke (1949).

Male Genitalia

The genitalia in this group seem to show evolution gone wild. There are few similarities between groups, and within the Orthoneurae there are few similarities between species. Even the cerci, which are little used for species or generic differentiation, show wide variations. In a few species the cerci show an apparent segmentation while *C.* (*Barberiella*) *alaskensis* Shannon can be identified by the shape of the cerci alone. The styli are furcate or simple and may be greatly elongated.

The penis sheath shows great variation on its cephalic margin and a definite, paired lingula may be present (*O. brevicornis* Lw.) or lateral projections occur which do not fit the general concept of a lingula or there may be no lingula or lingula-like structure. The superior lobe is usually well developed and easy to identify while in a few cases its presence is doubtful since there is no separation from the penis sheath observable. The inferior lobe is usually little developed and usually very poorly differentiated. In *C. unicolor* Shan., however, it is present, very well developed, and toothed while in *C. pulchella* Will., it is very large, extending ventrad and almost equal in size to the penis sheath.

The axial system is divided into two portions, the chitinous box and sustenacular apodeme. The chitinous box is simple or subdivided into ejaculatory process and ejaculatory hood, or otherwise highly modified. In *Barberiella*, the chitinous box bears an ejaculatory process without a well-developed ejaculatory hood.

Subgenus **Chrysogaster** Meigen

Chrysogaster (Chrysogaster) solstitialis (Fallen) (Pl. 1, fig. 3; Pl. 2, fig. 14)
1817. Dipt. Suec., Syrphici: 56 (*Eristalis*); 1843. Zetterstedt, Dipt. Scand. *2*: 817; 1930. Sack, in Lindner, Flieg. der Pal. Reg. 31: 37-38.

Epandrium normal. Styli with short hairs dorsally; sub-rectangular, notched medio distally. Cerci elongate, normal.

Penis sheath bearing ventro-lateral flaps but without a definite lingula. Superior lobe narrow, elongate, and hooked downward distally. Inferior lobes poorly developed. Ejaculatory hood visible between superior lobes for about one-half the length of the superior lobe. Superior lobe almost one-half as long as penis sheath.

Chitinous box simple, without ejaculatory process, ejaculatory hood or a sclerotized, distinct ejaculatory duct.

C. (C.) texana Shannon (Pl. 1, fig. 6; pl. 2, fig. 13)

Very similar to *solstitialis* (Fall.). Differing in the following ways: epandrium more elongate dorso-ventrally; styli shorter, broader, subquadrate, notched at distro-ventral margin; superior lobes shorter, much less than one-half the length of the penis sheath; lateral flaps more definite, pointed; chitinous box more concave dorsally but very similar.

C. (C.) nigripes Loew (Pl. 2, fig. 15)

1863. Loew, Berlin. Entom. Zeitsch. *7*: 307; 1916. Shannon, Proc. Ent. Soc. Wash. *18*: 107.

Epandrium, styli and cerci indistinguishable from those of *texana* Shan. Superior lobes very similar; the distal, downward projecting portion is more elongate. Chitinous box more arched dorsally and distally, almost lobed proximo-dorsally.

These three species (plus others which will be found to fall here from further study) form a tightly knit group with little variation. This is more typical of the condition among syrphid species than the condition found among the species in the subgenus *Orthoneura*.

Subgenus **Orthoneura** Macquart

C. (Orthoneura) elegans Meigen (Pl. 1, fig. 5; pl. 2, fig. 17)

1822. System. Beschreib. *3*: 272; 1829. Macquart, Recueil Soc. Sci. Agri., Lille *1828*: 188; 1930. Sack, in Lindner, Flieg. der Pal. Reg. *31*: 28-29.

Epandrium subquadrate, normal. Styli subtriangular, slightly hooked distally and carved out ventrally; hairy dorsally. Cerci divided into two distinct areas by a median unsclerotized area; in addition, there is a highly sclerotized lobe present

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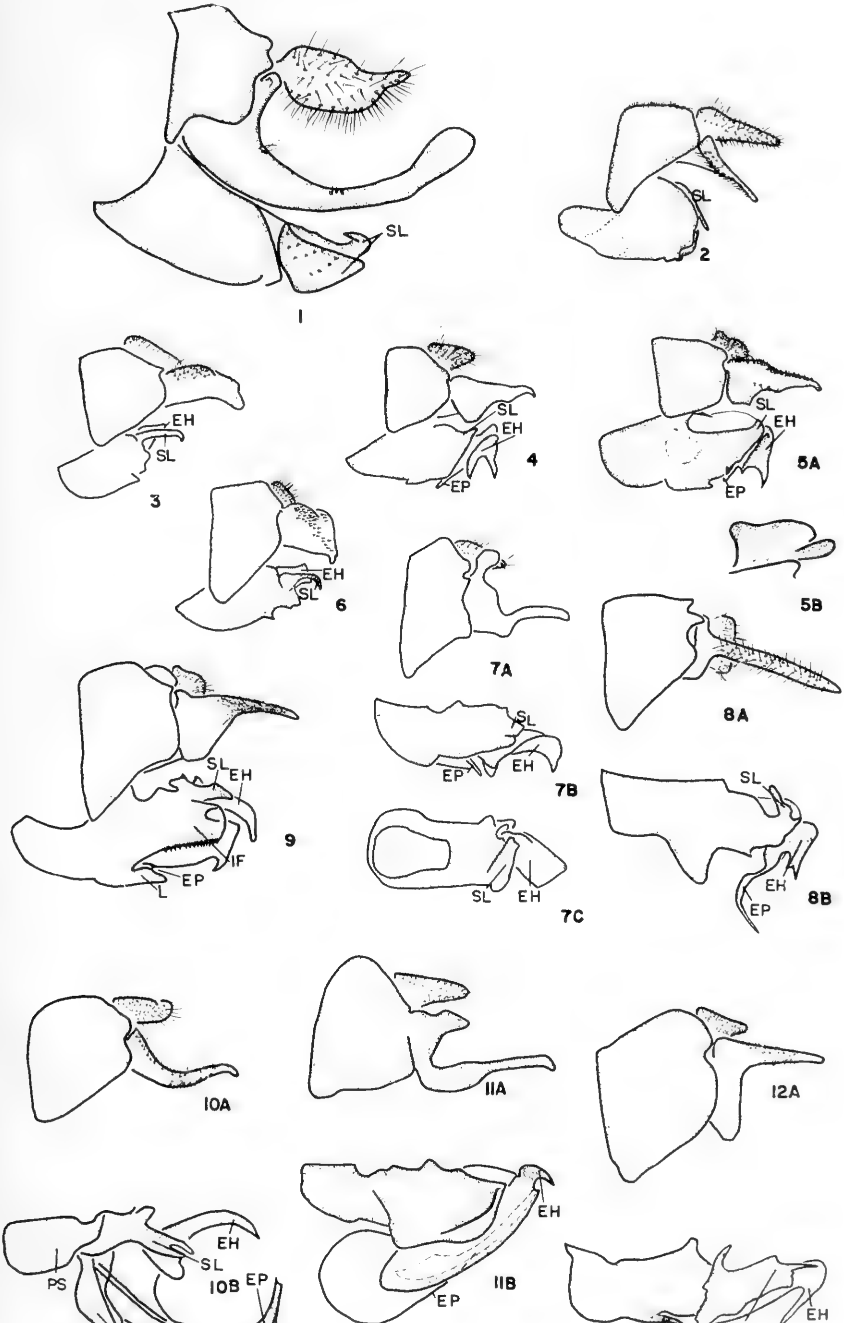
Fig. 1, *Chrysogaster (Barberiella) alaskensis* Shan., male genitalia; fig. 2, *C (Sulcatella) splendida* Meig., male genitalia; fig. 3, *C. (Chrysogaster) solstitialis* (Fall.), male genitalia; fig. 4, *C. (Orthoneura) stigmata* Will., male genitalia; fig. 5, *C. (O.) elegans* Meig. (A, male genitalia; B, cercus, 75×); fig. 6, *C. (O.) texana* Shan., male genitalia; fig. 7, *C. (O.) nitida* Wied. (A, epandrium and associated organs; B, inner copulatory organ; C, dorsal view of inner copulatory organ); fig. 8, *Ci (O.) parve* Shan. (A, epandrium and associated organs; B, inner copulatory organ); Fig. 8, *C (O) parva* Shan. (A, epandrium and associated organ); Fig. 8, *C. (O.) parva* Shan. (A, epandrium and associated organs; B, inner copulatory organ); fig. 9, *C. (O.) unicolor* Shan., male genitalia; fig. 10, *C. (O.) pulchella* Will. (A, epandrium and associated organs; B, inner copulatory organ); fig. 11, *C. (O.) bellula* Will. (epandrium and associated organs; B, inner copulatory organ); fig. 12, *C. (O.) brevicornis* Lw. (A, epandrium and associated organs; B, inner copulatory organ). All except 5B drawn at 30×. Abbreviations: EH—ejaculatory hood; EP—ejaculatory process; IL and IF—inferior lobe; L—lingula; PS—penis sheath; SL—superior lobe.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10B
EP
IL
EH
EP
11B
L
EP
SL
EH
12B

PLATE I

ventro-distally, projecting laterad and not normally seen from a lateral view; this lobe is unique in bearing no hairs on its surface in contrast to the normally hirsute cerci proper.

Penis sheath with a lightly sclerotized area medially appearing almost window-like; dorsally a thin lightly sclerotized membrane covers the penis sheath. Superior and inferior lobes poorly defined and their margins indefinite. Ejaculatory hood and ejaculatory process visible.

Chitinous box divided into ejaculatory process basally and ejaculatory hood apically; the ejaculatory hood bears two projections, the more distad projects ventrally for a distance about one-half or more of the length of the ejaculatory hood while the proximal projection is very short. The ejaculatory process ends as membraneous, unsclerotized tube.

C. (O.) **stigmata** Williston (Pl. 1, fig. 4; pl. 2, fig. 23)

1882. Amer. Phil. Soc. *20*: 313; 1916. Shannon, Proc. Ent. Soc. Wash. *18*: 103.

This species is very closely related to *elegans* (Meig.). The cerci are very definitely divided into two "segments" but there is no lobe present. Other differences between these species are as follows: the penis sheath is without a window-like area or dorsal membranous covering; the projections of the ejaculatory hood are almost equal in length; the development of the chitinous box is more elaborate.

C. (O.) **nitida** Wiedemann (Pl. 1, fig. 7; pl. 2, fig. 16)

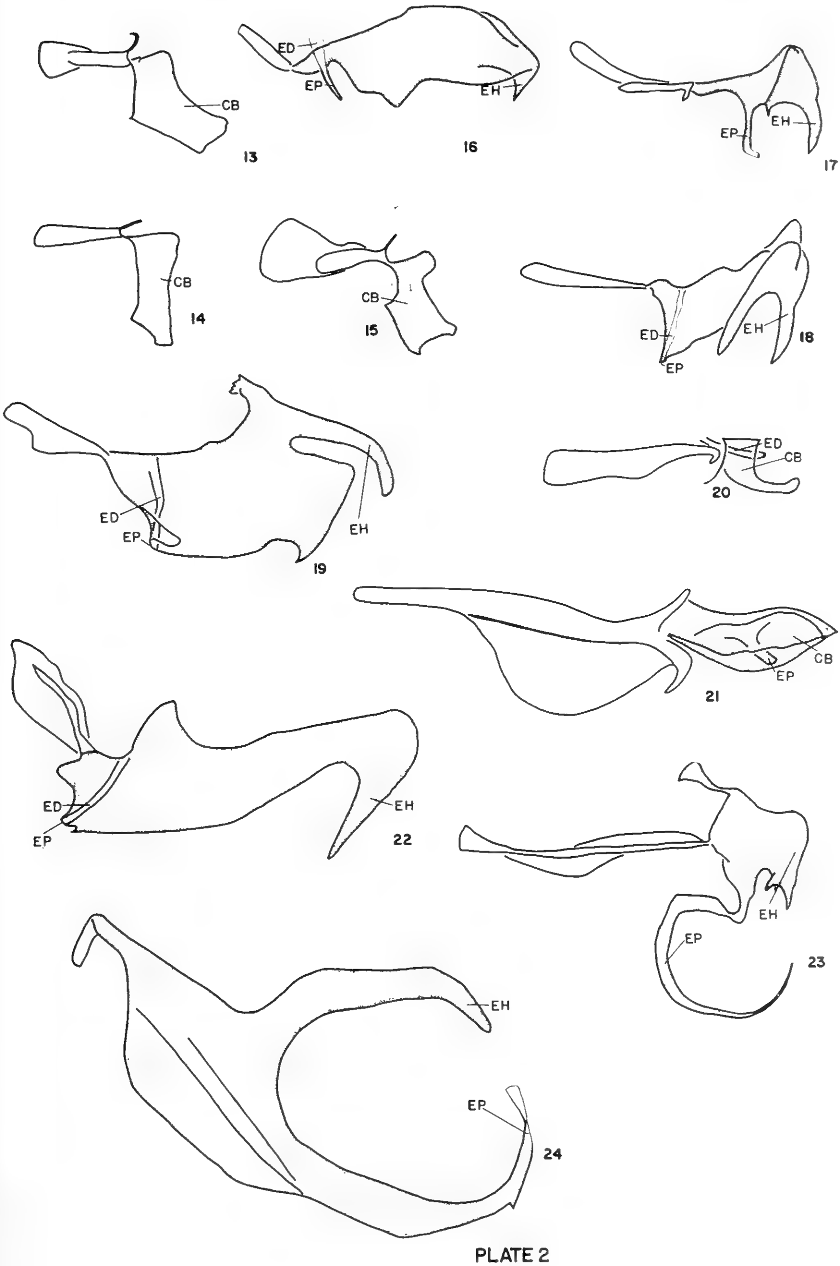
1830. Ausseurop. Zweifl. Ins. *2*: 116; 1916. Shannon, Proc. Ent. Soc. Wash. *18*: 102.

Epandrium narrowed antero-posteriorly. Styli elaborate; divided into a dorsal knob-like lobe and a ventral porrect rod. Cerci subtriangular.

Penis sheath contorted with left side extending below margin of right side. Superior and inferior lobes poorly defined and the superior lobes contorted; right superior lobe large and extending over the midline while the left lobe is reduced. Ejaculatory hood twisted to the right. Ejaculatory process visible below margin of penis sheath.

Sustentacular apodeme reduced. Chitinous box very large and bearing the ejaculatory hood apically and the ejaculatory process basally. Ejaculatory hood beak-like. Ejaculatory process needle-like with accompanying ejaculatory duct running almost perpendicular to the plane of the chitinous box; at least one-half of the chitinous box concealed by the penis sheath.

Axial systems of *Chrysogaster*. Fig. 13, *Chrysogaster (Chrysogaster) texana* Shan.; fig. 14, *C. (C.) solstitialis* (Fall.); fig. 15, *C. (C.) nigripes* Lw.; fig. 16, *C. (Orthoneura) nitida* Wied.; fig. 17, *C. (O.) elegans* Meig; fig. 18, *C. (O.) parva* Shan.; fig. 19, *C. (O.) unicolor* Shan.; fig. 20, *C. (Sulcatella) splendida* Meig.; fig. 21, *C. (Barberiella) alaskensis* Shan.; fig. 22, *C. (Orthoneura) brevicornis* Lw.; fig. 23, *C. (O.) stigmata* Will.; fig. 24, *C. (O.) pulchella* Will. Abbreviations: CB—chitinous box; ED—ejaculatory duct; EH—ejaculatory hood; EP—ejaculatory process.


CB
13
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16
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EH
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ED
CB
20
CB
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21
ED
EP
EH
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EH
EP
24

PLATE 2

C. (O.) bellula Williston (Pl. 1, fig. 11)

1882. Williston, Proc. Amer. Phil. Soc. *20*: 303-304 (*bellulus*); 1916. Shannon, Proc. Ent. Soc. Wash. 18: 102.

Epandrium subtriangular. Styli divided into two parallel lobes, the dorsal lobe shorter and broader. Cerci subtriangular.

Penis sheath opened broadly distally with a greatly elaborated chitinous box between its lateral margins. Superior and inferior lobes present but not clearly differentiated; the superior lobe projects laterally over the inferior lobe. Ejaculatory hood beak-like. Ejaculatory process heavily sclerotized, rod-like and thin, emerging from the posterior margin of the ventrally opened penis sheath, curving ventrad and anteriorly; its distal one-half or less, runs in a trough formed by the ventral margins of the chitinous box; ejaculatory duct opens just ventrad to ejaculatory hood.

Sustentacular apodeme greatly reduced. Chitinous box with numerous ridges laterally.

C. (O.) brevicornis Loew (Pl. 1, fig. 12; pl. 2, fig. 22)

1843. Stettin Entom. Zeit. *4*: 249; 1930. Sack, in Lindner, Flieg. der Pal Reg. *31*: 35.

Epandrium normal. Style with one dorsal porrect narrow arm while the proximal margin of the style extends ventrally at least three times the width of the dorsal arm; without a ventral arm or lobe. Cerci normal.

Penis sheath slipper-shaped; bearing a heavily sclerotized narrow pair of lingulae which almost touch on their inner margins. Superior lobe very large and distinct from penis sheath; irregular in outline, with a proximo-dorsally projecting arm and a dorso-distally projecting icicle-like arm;very heavily sclerotized. Inferior lobe apparently absent or consolidated into the superior. Chitinous box and ejaculatory hood visible ventrally and distally below the large superior lobe. Ejaculatory hood long and narrow, directed caudo-ventrad and shaped like a bird's head.

Sustentacular apodeme reduced. Chitinous box large with well-developed ejaculatory hood and a definite ejaculatory process at its proximo-ventral margin.

C. (O.) parva Shannon (Pl. 1, fig. 8; pl. 2, fig. 18)

1916. Proc. Ent. Soc. Wash. *18*: 104-105.

Epandrium normal. Styli elongate, porrect and covered with heavy hairs. Cerci sometimes displaced between styli but usually normally placed at apex of dorsal margin of epandrium.

Penis sheath with large lateral flaps extending ventrad. No definite lingula. Superior lobe projecting dorso-caudad. Inferior lobe indistinct. Ejaculatory hood beak-like with two triangular teeth ventrally and a short third tooth between these two; heavily sclerotized. Ejaculatory process sickle shaped and heavily sclerotized on its basal three-fourths.

Sustentacular apodeme elongate. The chitinous box bears a sclerotized flap at its caudo-dorsal margin which attaches to the penis sheath.

C. (O.) unicolor Shannon (Pl. 1, fig. 9; pl. 2, fig. 19)

1916. Proc. Ent. Soc. Wash. *18*: 108.

Epandrium normal. Styli finger-like, much as in *brevicornis* Lw. Cerci normal. Penis sheath bearing a large paired, heavily sclerotized lingula and differentiated into well-developed superior and inferior lobes. Superior lobe heavily sclerotized with anterior and posterior projecting portions. Inferior lobe large, subquadrate and heavily sclerotized; a row of irregular teeth are present on the ventral margin. Ejaculatory hood divided into two portions; the dorsal portion is finger-like and curved ventrally; the ventral portion is subquadrate and hooked disto-ventrally; as in *parva* Shan., a distinct dorsal flap is present which attaches to the penis sheath.

Sustentacular apodeme reduced, less than one-half length of the chitinous box. Ejaculatory process present and located as in *stigmata* Will. and *brevicornis* Lw.

C. (O.) pulchella Williston (Pl. 1, fig. 10; pl. 2, fig. 24)

1886. Bull U. S. N. M. 31: 35; 1916. Shannon, Proc. Ent. Soc. Wash. *18*: 102.

Epandrium normal. Styli sinuate, finger-like. Cerci normal.

Penis sheath very greatly reduced, about equal in size to the inferior or superior lobes. Superior lobe with a ventral lightly sclerotized flap; on its distal margin furcate and with a projection on its mid-dorsal margin. Inferior lobe absent on right side but present and extending ventrad as a broad sinuate pointed lobe on the left side. The chitinous box is extremely large and the dorsal ejaculatory hood and ventral ejaculatory process are present appearing much like ice-tongs in their relation to one another. The ejaculatory process bears a short ventral spur about one-fourth the distance from its opening to the outside.

Sustentacular apodeme very much reduced. The ejaculatory process ends as a short unsclerotized membranous tube.

The species studied belonging to the sub-genus *Orthoneura* comprise a compact and probably closely related group. It seems logical to place them as derived from a *Chrysogaster s.s.*-type ancestor. Of the species discussed, *elegans* Meig., *nitida* Wied., *stigmata* Will., *unicolor* Shan., and *brevicornis* Lw., fall together on the basis of the development of the chitinous box. It is then possible to derive *unicolor* Shan., *elegans* Meig., and *stigmata* Will. from *brevicornis* Lw. or *nitida* Wied., which in turn could be derived from the species in *Chrysogaster s.s.*

Subgenus **Barberiella** Shannon

C. (Barberiella) alaskensis Shannon (Pl. 3, fig. 25; pl. 4, fig. 29)

1922. Ins. Ins. Menst. *10*: 124; 1949. Fluke, Proc. U. S. N. M. *100* (3256): 47-48.

Epandrium small in relation to other parts and in comparison to the other species in this genus. Styli greatly enlarged and strongly bowed. Cerci greatly enlarged, almost as large as the epandrium; covered with strong hair; subquadrate, with a projection dorso-distally.

Penis sheath simple. Superior lobes large, triangular, and asymmetrical; each lobe bears a beak-like projection which curves anteriorly; short blunt elevations are present on the outer surface.

Sustentacular apodeme elongate. Chitinous box simple, flattened; open ventrally. Ejaculatory process present, originating on the ventral internal surface of the chitinous box. The axial system is not visible from a lateral view of the genitalia.

This species is apparently intermediate between *Chrysogaster s.s.* and *Orthoneura*. The chitinous box is differentiated into ejaculatory process and what may be considered a primitive, weakly developed ejaculatory hood.

Subgenus **Sulcatella** Goffe

C. (Sulcatella) splendida Meigen (Pl. 1, fig. 2; pl. 2, fig. 20)

1822. Meigen, System. Beschreib. *3*: 271; 1930. Sack in Lindner, Fleig. der Pal. Reg. *31*: 34.

Epandrium normal. Styli narrow, elongate finger-like. Cerci triangular, very large.

Penis sheath with a large triangular area which is very lightly sclerotized. Superior lobe elaborate but not visible in a lateral view; composed of one extremely short stub and two heavily sclerotized elongate, finger-like projections.

Chitinous box with a ventral projection. Ejaculatory duct empties dorsad of the shelf-like projection of the chitinous box but no sclerotized ejaculatory process present.

This species is very aberrant and is the only *Chrysogaster* with the ejaculatory duct opening dorsally.

It is possible to construct a key to these subgenera using the variations in the construction of the chitinous box. The following key represents my views on the groups studied.

Subgenera of Chrysogaster s. l.

1. Chitinous box simple .... **Chrysogaster** *s.s.*
   Chitinous box with ejaculatory hood and/or ejaculatory process present, or with hood-like structure ventrally and ejaculatory opening dorsal 2
2. Chitinous box with beak-like ejaculatory hood distally; ejaculatory process present .... **Orthoneura**
   Chitinous box not beak-like 3
3. Ejaculatory hood weakly developed, not beak-like; ejaculatory process well developed .... **Barberiella**
   Ejaculatory hood absent; ejaculatory process absent .... **Sulcatella**

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A NEW SYNONYMY IN THE TEPHRITIDAE

(DIPTERA)

Epochra canadensis (Lw.), a Transition-zone tephritid known in the northern United States and southern Canada as the "currant fruit fly", attacks both wild and cultivated currants and gooseberries, sometimes occurring in numbers large enough to occasion considerable concern to commercial growers.

The wing pattern, the coloration of the abdomen, and the position of the frontal hairs of the adult of *canadensis* are quite variable, but a study of specimens in the U. S. National Museum does not reveal any geographic or host correlation whatever. Hering (1940, Siruna Seva 2:5) erected *Epochra lunifera* based on a specimen from Sumner, Washington, as a result of comparison with material from Maine and Eastern Canada. The Washington specimen, in contrast to the eastern ones, was said to have the following characters: No dark banding on the male abdomen; the distance between the second (middle) and third (posterior) lower frontoorbital at least twice that between the first (anterior) and second; cell R_5 with a large hyaline spot at extreme apex; dark band over vein m ending well behind vein R_{4+5}; and that band separated at hind margin from the band lying upon vein r-m. A Yakima, Washington, female in the National Collection has characters that fit Hering's description very well, but it is one in a series of integrating forms from Maine and the western States in which the characters mentioned above occur without any regularity whatever. For this reason, *Epochra lunifera* Hering, 1940, is to be considered a synonym of *Epochra canadensis* (Loew, 1873). (New synonymy).—

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BOOK NOTICE

COLLECTING, PRESERVING AND STUDYING INSECTS, by Harold Oldroyd, M.A., F.R.E.S. The Macmillan Co., New York. 327 pp., 135 figs., 1 map, 14 pls. 1958.

"Collecting insects may be an end or a beginning." Thus does the author introduce his up-to-date recommendations for equipment and methods to be used for the accumulation of an insect collection. Mr. Oldroyd gives a brief introduction to the principles of zoological classification and nomenclature and some instructions for describing and illustrating new species. The informal style of writing marks this as a book of instruction for the beginner as well as a text of reference for the advanced amateur and professional.—ED.

BOOK REVIEW

INSECTS AND MITES OF WESTERN NORTH AMERICA, by E. O. Essig. University of California at Berkeley. xiii + 1050 pp., 774 figs. The Macmillan Co., New York. 1958. Price $18.00.

This is the second publication of a book (The Insects of Western North America, 1926, by E. O. Essig) that has been regarded for years as an important source of information on the biology and economic importance of the subject insects. It has long been a standard reference text for entomologists in many fields, and students year after year have availed themselves of Prof. Essig's store of knowledge as expressed in its pages.

Regrettably, this reviewer, who himself ''cut his teeth'' on ESSIG, has no choice but to condemn the reprinted version. The publisher advertises it by stating, ''No other book . . . is such an up-to-date source for the correct spelling of the common and scientific names of insects,'' and again, ''You will be interested in the vast number of references that . . . make ESSIG a definitive authority.''

The so-called ''revisions,'' aside from an added section on mites, consist of textual rearrangements within almost the same number of pages as contained in the original text, and are not revisions at all but virtually unedited reprintings of certain sections, some with changes that tend to make the edition much less useful than the original. In this reviewer's groups of specialization, for instance, there are several annoyances. On p. 541, an illustration of a *Culicoides* (incidentally with an out-of-date name) placed within the section on gall midges has eliminated all of the references to the family Itonididae; on p. 543, a gall midge description headed ''Clinodiplosis pucciniae Pritchard, new species'' is not an original description at all, but the repetition of a description published elsewhere in 1948; on p. 604, references to *Rhagoletis* species, economically one of the most important North American dipterous genera, have been deleted to the disadvantage of the reader. More important, the use in the present volume of out-of-date names and the omission of recent accounts of advances in our knowledge of some species completely negates the publisher's claims. A census reveals that this is the case not only in the insect families discussed above, but throughout the text, often affecting discussions of economically important species.

The guidance of students in the profession of entomology is at best difficult, and encouraging students to use this kind of misinformatiton not only complicates the task of the teacher in many ways but stands in the way of our ultimate progress in science. This reviewer holds the opinion that the press the world over has an inescapable responsibility—to print the truth. To those of us who deal with information that is primarily factual, the ''revision'' of ESSIG is a gross misuse of that responsibility.—

RICHARD H. FOOTE, *3610 Quebec St., N.W., Washington 16, D. C.*

MARCH FLIES AND GALL MIDGES (Bibionidae by D. Elmo Hardy; Itonididae by A. Earl Pritchard and the late E. P. Felt). Sixth Fascicle in Part VI. The Diptera or True Flies of Connecticut, of the *Guide to the Insects of Connecticut* series. Connecticut State Geological and Natural History Survey Bulletin, 216 pp., 16 plates. 1958. Price, $2.50.

NOTES ON NEOTROPICAL ARADIDAE II

(HEMIPTERA)

NICHOLAS A. KORMILEV, *367 Lincoln Pl., Apt. 8, Brooklyn 38, N. Y.*

Summary.—The author describes two new genera of the subfamily Mezirinae Oshanin: *Diphyllonotus* n.g., and *Mapiri* n.g., and eight new species respectively: *Diphyllonotus explanatus* n.g., n.sp. (Perú), *Miorrhynchus proseni* n.sp. (Bolivia, Brazil, Perú), *M. bolivianus* n.sp. (Bolivia), *M. championi* n.sp. (Bolivia), *M. brasiliensis* n. sp. (Brazil), *Artagerus martinezi n. sp.* (Bolivia, Perú), *A. plaumanni* n. sp. (Brazil), and *Mapiri paradoxa* n. g., n. sp. (Bolivia). The keys for the species of *Miorrhynchus* Champion and *Artagerus Stal,* are given.

I express my sincere gratitude to Dr. Eva Halaszfy, keeper of the Department of Zoology, Hungarian National Museum, Budapest; Messieurs Antonio Martinez and Alberto Prosen, entomologists in Buenos Aires; and Mr. Fritz Plaumann, Nova Teutonia, Santa Catharina, Brazil, by whose kind offices I could examine the material which served me for the preparing of this paper.

Diphyllonotus, n.g.[1]

Head longer than wide through the eyes; clypeus small, slender, much shorter than the jugae; the latter long, parallel, anteriorly cleft, project far beyond the tip of clypeus; antenniferous tubercles narrow, exteriorly parallel; eyes small, excerted; postocular tubercles robust, adherent to the eyes; the borders behind them are convergent. Antennae long and slender, longer than the head, pronotum and scutellum together; the first segment clavate, the 2d and 3d cylindrical, the 4th fusiform; the 2d the shortest, the 3d the longest. Rostrum short, reaches to the hind border of the rostral groove, the latter is closed posteriorly. *Pronotum* divided into two lobes; antero-lateral borders produced into big, expanded lobes; fore border emarginate, and deeply incised between the collar and expanded parts of the fore lobe. Anterior angles widely rounded and projected forward; exterior borders slightly convex, without lateral notch; posterior angles slightly produced backward, rounded; interlobal furrow distinct. Fore disc with a pit on the median line, and two (1 + 1) rounded callosities laterally of it. Hind disc with dispersed granulation. *Scutellum* triangular, roughly, transversely rugose, and with an elevated median line. *Hemelytrae* reach to the fore border of tergum VII, sometimes are abbreviated, but still composed of a clavus, corium and membrane; the latter with somewhat obliterated, anastomosed veins. *Abdomen* subparallel, posteriorly convergent; the postero-exterior angles of the connexiva not produced, those of segment VII produced into angulated lobes. Spiracles of segments II to V ventral, progressively nearing to the border, those of VI to VIII very small, lateral, and visible from above. The hypopygium small, cordate; genital lobes (VIII) clavate, not expanded. *Scent gland openings* big, elongate. *Legs* long and unarmed.

[1]The second species, *Diphyllonotus brachypterus* Kormilev, 1956, was published in the An. Soc. Cient. Arg.; vol. CLXII, p. 151, figs. 4-5, whereas the description of the genus and its typical species was delayed until now, not dependent on my will.

Genotype.—Diphyllonotus explanatus, n. sp.

The new genus is allied to *Phyllotingis* Walker, 1873, but differs from it by the subparallel abdomen, without expanded connexiva; normal, fusiform, genital lobes, etc.

Diphyllonotus explanatus, n. sp.

Male.—Head longer than wide through the eyes (17:13.5); anterior process reaches to 3/5 of the first antennal segment; antenniferous tubercles acute, subparallel, reach almost to the tip of the clypeus; postocular tubercle blunt, don't project beyond the outer border of the eyes. The proportions of the antennal segments (1 to 4) are: 11:7:13:11. *Pronotum* shorter than wide across the humeri (17:30); collar rather badly separated from the disc; the real lateral borders of the fore lobe convergent, but the expanded antero-lateral angles give to the pronotum almost a rectangular shape. *Scutellum* shorter than wide at the base (11:13); the median carina tapering toward the tip. *Hemelytrae* without granulation, only the veins of the corium are granulated. *Abdomen* with the segment V narrower than the segments IV and VI, but sometimes this narrowing is not pronounced; the lateral borders of segment VI are parallel anteriorly, then convergent, forming an obtuse angle at ¾ of their length; posterior angles of segment VII almost reach the tip of the hypopygium; tergum VII very short and elevated in the middle; genital lobes slender, almost reaching the tip of the hypopygium. *Color*: yellow to ochre-yellow, with some darker spots.

Total length 6.0 mm.; width of the pronotum 1.9 mm.; width of the abdomen 2.3 mm.

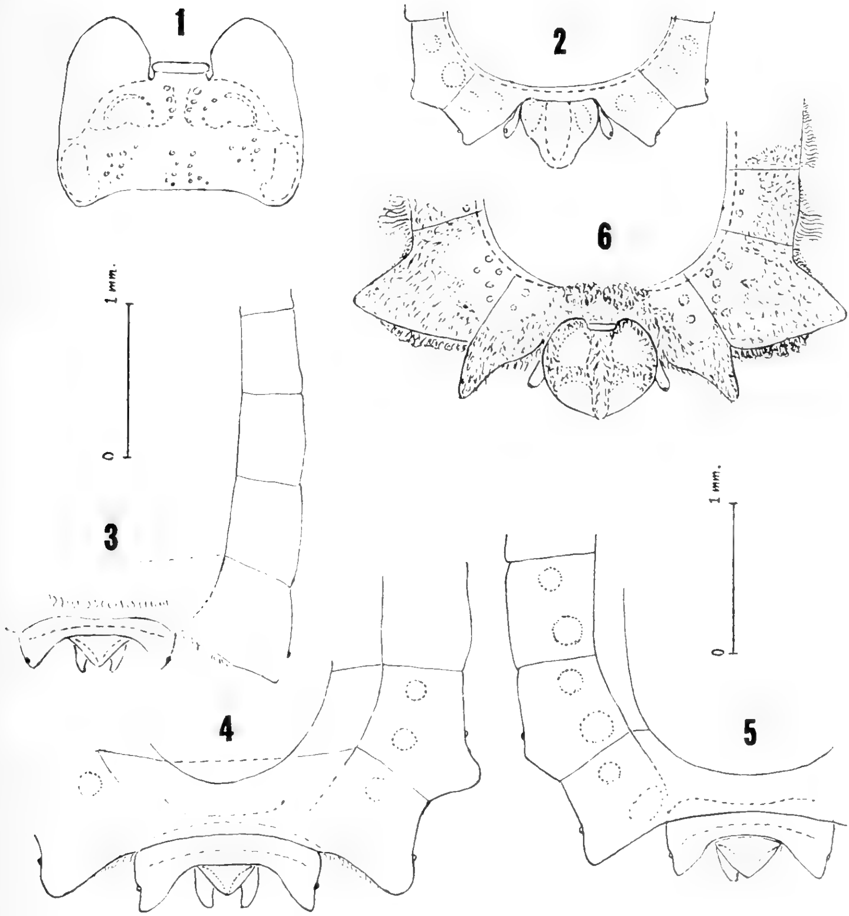
Holotype.—Male, Pachitea, Perú; deposited in the Hungarian National Museum, Budapest.

Miorrhynchus Champion, 1898

All species of the genus *Miorrhynchus* Champion may be separated into two groups: with only one spiracle lateral and visible from above (besides those of the genital lobes, which are also lateral), and with two spiracles lateral and visible from above. To the first group belong two, and to the second all other species.

Key to the Species of Miorrhynchus Champion

1. Abdomen with only one spiracle (VII) lateral and visible from above 2
   Abdomen with two spiracles (VI and VII) lateral and visible from above 3
2. Shorter, distinctly widening backward, ratio between length of the abdomen (from the tip of the scutellum to tip of segment IX) and the width of it, in the females, less than 1.25:1 .... **paraguayensis** Kormilev, 1952.
   Longer, subparallel; ratio between length and width of abdomen, in the females, more than 1.35:1 .... **proseni,** n. sp
3. PE-angles (postero-exterior) of connexivum VI produced laterally as rounded lobes; maximum width of abdomen is across the latter 4
   PE-angles of connexivum VI not produced, at most slightly convex; maximum width of abdomen is across segment IV or V 5
4. Body longer and narrower; first antennal segment distinctly longer than head (26:23); in the females, ratio between length and width of abdomen



Diphyllonotus explanatus, n. sp. Fig. 1, ♂, pronotum; fig. 2, tip of abdomen. Fig. 3, *Miorrhynchus proseni*, n. sp., ♀, tip of abdomen. Fig. 4, *M. bolivianus*, n. sp., ♀, tip of abdomen. Fig. 5, *Miorrhynchus brasiliensis* n. sp., ♀, tip of abdomen. Fig. 6, *Artagerus martinezi*, n. sp., ♂, tip of abdomen.

more than 1.22:1 .... **longipes** Champion, 1898.
Body shorter and wider; first antennal segment subequal in length to head; in the females, ratio between length and width of abdomen less than 1.15:1 .... **bolivianus,** n. sp.
5. First antennal segment much longer than head (♀-26:22, ♂-22:19) .... **championi,** n. sp.
First antennal segment subequal to or shorter than head 6
6. First antennal segment as long as third .... **usingeri** Kormilev, 1952.
First antennal segment much shorter than third 7
7. Smaller, less than 6 mm.; in the females, genital valves distinctly longer than oviduct, therefore the tip of segment IX notched .... **plaumanni** Kormilev, 1956.
8. Larger, more than 6.5 mm.; in the females, genital valves as long as oviduct, the tip segment IX tricuspidate .... **brasiliensis,** n. sp.

Miorrhynchus proseni, n. sp.

Elongate, abdomen slightly convex laterally in the females, subparallel in the males.

Females.—*Head* slightly longer than wide through the eyes (♀-20:18, ♂18:16); anterior process blunt, reaches to the basal quarter of the first antennal segment; antenniferous tubercles dentiform, blunt, exteriorly slightly convex, subparallel; eyes feebly excerted; postocular border convex, but unarmed. Antennae very long, slender, longer than the head, pronotum and scutellum together (72.5:69); the proportions of the antennal segments (1 to 4) are: ♀22½:12:27:11, ♂20:11:23:- (the last segment lacking). Infraocular carinae lacking; vertex with a "V"-shaped setigerous granulation; lateral shelves slightly convex. Rostrum reaches to the hind border of the rostral groove; the latter closed posteriorly. *Pronotum* shorter than wide across the humeri (♀-30:45, ♂-28:42); the fore lobe narrower than the hind lobe (♀—30:45, ♂—28:42); collar prominent, anteriorly emarginate; lateral borders of the fore lobe rounded; disc with two (1 + 1) interior callous spots, and two (1 + 1) exterior curved ridges. Lateral borders of the hind lobe subparallel, convergent anteriorly; disc with dispersed setigerous granulation; hind border truncate. *Scutellum* shorter tha nwide at the base (♀-19:27, ♂-17:23); lateral borders straight, rimmed; disc roughly transversely rugose, and with a thin median ridge. *Hemelytrae* almost reach the hind border of tergum VII; corium in both sexes slightly exceed the apical border of connexivum II (the first visible); membrane with anastomosed veins. *Abdomen* long and narrow (♀-81:60, ♂-73-50), its maximal width is across segment IV; lateral borders from segment II to VI inclusively, in the females, evenly, feebly convex; in the males, parallel, converging anteriorly; lateral borders of connexivum VII feebly emarginate; PE-angles of the same produced backward as big triangular lobes, but don't reach the tips of the genital lobes (VIII); segment IX in the female emarginate; in the males (hypopygium) shorter than wide at the base (15:18). Spiracles II to V ventral, placed far from the lateral borders, those of VI also ventral, but placed near the border; those of VII and VIII lateral and visible from above. *Color* ferrugineous; head, antennae, pronotum, scutellum, and femora sometimes darker, almost piceous; rostrum and tarsi yellow; membrane brown, covered with whitish incrustation.

Total length.—♀ 7.65, ♂-7.00 mm.; width of the pronotum ♀-2.25, ♂-2.10 mm.; width of the abdomen ♀-3.0, ♂-2.5 mm.

Holotype.—Female, Chaparí de Chipiririí, Cochabamba, Bolivia—A. Prosen collector, III-950; deposited in the collection of the author.
Allotype.—Male, Santarem, Brazil; deposited in the U. S. National Museum, Washington, D. C., U.S.A.
Paratype.—1 ♀, Pachitea, Perú; in the collection of the author.

The new species is allied to *M. paraguayensis* Kormilev, 1952, differing from it by the characters indicated in the key.

It is a pleasure to dedicate this species to the collector of the holotype, Mr. Alberto Prosen, entomologist in Buenos Aires.

Miorrhynchus bolivianus, n sp.

Belongs to the species with two spiracles lateral and visible from above (VI & VII), and with PE-angles of connexivum VI produced as rounded lobes (the maximal width of the abdomen). It is closely allied to *M. longipes* Champion, 1898, but differs from it by: shorter and wider body; the first antennal segment subequal in length with the head; the ratio between the length and the width of the abdomen less than 1.15:1. *Color:* ferrugineous or brown; tibiae with yellow rings in the upper half; the 3d antennal segment reddish brown with fuscous tip.

Female.—*Biometrical measures:* head 22:18; the proportions of the antennal segments (1 to 4) are: 22:10½:24:9; pronotum 27:45; the ratio between the fore and the hind lobe as 32:45; scutellum 18:25; abdomen 77:67. Other characters as in the preceding species. *Total length* 7.5 mm.; width of the pronotum 2.25 mm.; width of the abdomen 3.35 mm.

Holotype.—Female, Tacú-Polilla, Santa Cruz, Bolivia, *A. Martinez* collector, III-951; deposited in the collection of the author.

Paratype.—1 ♀, Chaparé, Cochabamba, Bolivia, A. Martinez coll., XI-953; in the same collection.

Miorrhychus championi, n. sp.

Miorrhynchus longipes Kormilev (nec Champion), 1952, Pan. Pac. Ent. 23: 119, fig. 1.

Also belongs to the group with two spiracles lateral and visible from above (VI & VII), but the PE-angles of connexivum VI are not produced into rounded lobes, the maximal width of the abdomen being across segment IV. Allied to *M. usingeri* Kormilev, 1952, differing from it by: the first antennal segment is far longer than the 3d, and the hypopygium of the male is as long as wide at the base. *Color:* brown; the 3d antennal segment, a ring on the upper half of the tibiae, callous spots on the connexiva, rostrum, and tarsi, are yellow. *Biometrical measures:* head ♀-19:17, ♂-18:22; the proportions of the antennal segments (1 to 4) are: ♂-22:10:23:9, ♀-26:12½:28:10; pronotum ♂-28:44, ♀-33:50; the ratio between the width of the fore and hind lobes of the same being ♂-29:44, ♀-35:50; scutellum ♂ 17:23, ♀-20:26; abdomen ♂-77:55, ♀-84:55.

Total length ♂-7.25, ♀-8.0 mm.; width of the pronotum ♂-2.2, ♀-2.5 mm.; width of the abdomen ♂-2.75, ♀-2.75 mm.

Holotype.—Male, Buena Vista, Santa Cruz, Bolivia, A. Martinez coll., II-951; deposited in the collection of the author.

Allotype.—Female, Mapirí, Bolivia; deposited in the Hungarian National Museum, Budapest.

Paratype.—1 ♀, Bolivia; deposited in the collection of the author.

Miorrhynchus brasiliensis, n. sp.

Also belongs to the species with two spiracles lateral and visible from above (VI & VII), and PE-angles of connexivum VI not produced into rounded lobes, but is more allied to *M. plaumanni* Kormilev, 1956. From the latter it differs by the bigger size, the tip of segment IX, in the female, is tricuspidate, the genital valves being as long as the oviduct. The joint between connexiva VI and VII is angularly emarginate (roundly in *M. plaumanni*); the first antennal segment is as long as the head wide through the eyes (distinctly shorter in *M. plaumanni*); the ratio between the length and the width of the abdomen is less than 1.16:1 (more than 1.26:1 in *M. plaumanni*). *Color:* ferrugineous; the 3d antennal segment pale brown; a ring on the upper half of tibiae, antero-lateral angles of the connexiva II to VII, and rostrum, are yellowish.

Female.—*Biometrical measures:* head 20:18, the proportions of the antennal segments (1 to 4) are: 18:10:23:10; pronotum 27:43; the ratio between the width of the fore and hind lobes of the same being 32:43; scutellum 20:25; abdomen 73:62. *Total length* 7 mm.; width of the pronotum 2.15 mm.; width of the abdomen 3.1 mm.

Holotype.—Female, Rio Caraguatá, Mato Grosso, Brazil, F. Plaumann collector, III-953; deposited in the collection of the author.

Miorrhynchus paraguayensis Kormilev, 1952

Miorrhynchus paraguayensis Kormilev, 1952, Dusenia 3:54, fig. 4.

Originally it was described only the female, now I am giving the description of the male.

Male.—Smaller than the female, with the sides of the abdomen less convex. Color is the same as in the female. *Biometrical measures:* head 18-16; the proportions of the antennal segments (1 to 4) are: 16:8:20:7½; pronotum 23:39; the ratio between the width of the fore and hind lobes is 27:39; scutellum 15:20; abdomen 62½:46; the maximal width of the abdomen being across segment VI.

Male.—Total length 6.1 mm.; width of the pronotum 1.99 mm.; width of the abdomen 3.18 mm.

Allotype: male, Nova Teutonia, Santa Catharina, Brazil, F. Plaumann collector, XII-955; deposited in the collection of the author.

Artagerus Stal, 1860

All species in the genus show a rather developed sexual dimorphism so that separate keys for the males and for the females are necessary. I could not examine *Artagerus montandoni* Bergroth, 1894, and the original description is not sufficient enough to permit the including of this species into the key, so it is omitted.

Key to the Species of the Genus Artagerus Stal—Males[2]

1. The first antennal segment is longer than the head (30:27), about three times as long as the 2d (30:11); PE-angles of the connexiva II to V slightly angularly produced, subequal in size between themselves; PE-angles of VI produced into big triangular lobes (the maximal width of the abdomen); abdomen truncate posteriorly, connexiva VII placed between connexiva VI .... **setosus** Stal

   The first antennal segment is always shorter than the head, at most subequal in length with it; connexiva VII placed behind, not between, connexiva VI 2
2. Connexiva V produced into big, acute, subtriangular lobes (the maximal width of the abdomen), directed slightly backward; connexiva VI are produced into smaller lobes; connexiva VII in the shape of long, curved spurs .... **histricus** Stal

   Connexiva V produced into smaller lobes, and connexiva VI into bigger lobes (the maximal width of the abdomen) 3
3. The disc of the hypopygium with a longitudinal carina, anteriorly produced into big horn; lobes of connexiva VII acute, almost spur-shaped .... **hispidus** Champion

   The disc of the hypopigium with a cross-shaped elevation, but without horn; lobes of connexiva VII are blunt and wider .... **martinezi,** n. sp.

Key to the Species of the Genus Artagerus Stal—Females

1. The first antennal segment is much longer than the head; the lobes of connexiva VI are much longer than any other .... **setosus** Stal

   The first antennal segment is always shorter than the head; the PE-angles of connexiva VI are without long lobes 2
2. The first antennal segment is slightly shorter, or almost as long as the head (22:25), about one time and a half as long as the 3d (22:16) .... **crispatus** Stal

   The first antennal segment is much shorter than the head (16:22 to 13:21) 3
3. The antero-lateral angles of the pronotum produced sideways into relatively long lobes .... **histricus** Stal

   The antero-lateral angles of the pronotum produced forward, or rounded, never sideways 4
4. The antero-lateral angles of the pronotum rounded, not produced; smaller species, less than 6.5 mm. .... **plaumanni,** n.sp.

   The antero-lateral angles of the pronotum produced forward; bigger species, more than 7 mm. 5
5. Antennae short, only about one and a half time as long as the head (36:25) .... **hispidus** Champion

   Antennae longer, about twice as long as the head (50:25) .... **martinezi,** n.sp.

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[2] The males of *A. crispatus* Stal and *A. plaumanni* Kormilev are yet unknown.

Artagerus martinezi, n. sp.

The first two antennal segments, body, femora and tibiae, partially covered with long, curved hairs, accumulating the dirt, which disfigure the genuine shape of the sames, and should be removed before identifying.

Male.—*Head* almost as long as wide through the eyes (♂—25:26, ♀—27:27); anterior process short, blunt, reaches to the basal third of the first antennal segment; antenniferous tubercles rubust, dentiform, slightly divaricating, reach to the middle of the anterior process. Antennae long and slender, but the first segment appears much thicker because of the accumulated dirt; the proportions of the antennal segments 1 to 4) are: ♂—16:10:15:7, ♀—18:9:15:17. Eyes big, pedunculate; postocular border rounded, unarmed; infraocular carinae lacking; vertex longitudinally elevated; lateral shelves slightly convex, nacked. Anterior process, antenniferous tubercles, interior border of the eyes, postocular border, median elevation of the vertex, and the first antennal segment, covered with long, curved bristles, accumulating dirt. Rostral groove long, parallel, transversely rugose, posteriorly open; rostrum reaches to the hind border of the groove. *Pronotum* shorter than wide (♂—26:51, ♀—30:58), divided into two lobes, of which the fore lobe is much narrower than the hind lobe (♂—33:51, ♀—37:58); collar small, but distinct; anterior angles slightly produced forward, projecting beyond the fore border of the collar; lateral borders of the fore lobe, slightly rounded; disc with two (1 + 1) outer, higher, and two (1 + 1) inner, lower tubercles; medium line depressed. The antero-lateral borders and tubercles covered with long, curled hairs. Hind lobe much higher than the fore lobe, convex; on the fore border with four (2 + 2) small tubercles. Posterior border slightly, evenly convex. The lateral borders, humeri, small tubercles, and a fringe along the hind border, with long, curved bristles. *Scutellum* shorter than wide at the base (♂—17:23, ♀—25:30), elevated on the median line, and roughly, transversely rugose; medium ridge with short bristles; lateral borders rimmed; the tip emarginate. *Hemelytrae* reach to the fore border of tergum VII; the baso-lateral border of the corium reflexed, and covered with long bristles; hind border exteriorly rounded, interiorly emarginate. *Abdomen* shorter than wide across segment VI (58:65); from the base to segment V subparallel, anteriorly slightly convergent; exterior borders of connexiva II to IX with a fringe of short hairs, which makes them appear festooned; connexiva V with two (1 + 1) small, apically rounded, and slightly curved backward, lobes; connexiva VI with similar, but bigger lobes (the maximal width of the abdomen); connexiva VII with two (1 + 1) long, lenguiform lobes, projected back, and upward. Tergum VII strongly raised in the middle for the reception of an ovate hypopygium, which is dorso-caudal in position; the disc of the latter with a cross-shaped elevation. Venter without either hairs, or incrustation. Sterna II to V elevated in the middle and along the hind borders; sternum VII very big, smooth. Spiracles II to VII ventral, those of the genital lobes (VIII) terminal, all placed on high tubercles.

Female.—*Abdomen* ovate, as long as wide across segment V (75:75); lateral borders even, but the fringe of the short hairs give them appearance of festoons. Venter with sparse, short hairs, particularly the subgenital plates. Genital lobes short, conic, with terminal spiracles; all other spiracles ventral. *Color* dark ferrugineous to fuscus; membrane dark brown; rostrum and tarsi yellow.

Total length.—♂—6.2, ♀—7.85 mm.; width of the pronotum ♂—2.55, ♀—2.9 mm.; width of the abdomen ♂—3.25, ♀—3.75 mm.

Holotype: male, Chaparé, Cochabamba, Bolivia, A. Martinez coll. IV-953; deposited in the collection of the author.

Allotype: female, Yungas del Palmar, Cochabamba, Bolivia, A. Martinez coll., IV-953; in the same collection.

Paratypes: 1 ♂, & 1 ♀, Chaparé, Cochabamba, Bolivia, A. Prosen coll., IV-953; 1 ♀, Chapare, Cochabamba, Bolivia, A. Martinez coll., XI-953; 1 ♂, Perú; 1 ♂ & 1 ♀ (in copula), Chapare, Cochabamba, Bolivia, A. Prosen coll., IV-953; all in the same collection; 2 ♂ & 3 ♀, Perú; deposited in the Hungarian National Museum, Budapest, and Colegio Máximo, San Miguel, Buenos Aires.

A. martinezi n. sp. is allied to *A. hispidus* Champion, but differs from it principally by the relatively longer antennae; lobes of connexivum VII are wider, and the hypopygium is without long horn at the upper end of the cross-shaped median carina.

It is a pleasure to dedicate this species to the collector of the holotype, Mr. Antonio Martinez, entomologist in Buenos Aires.

Artagerus plaumanni, n. sp.

Female.—Closely allied to *Artagerus hispidus* Champion, 1898, but smaller, antennae relatively longer, one and a half time as long as the head (36:21), whereas in *A. hispidus* they are shorter (36:25). The antero-lateral angles of the pronotum rounded, project neither fore, nor sideways. The curled hairs are relatively shorter. Looking perpendicularly on the disc of the genital plates, the genital lobes (VIII) are slightly shorter than the tip of the subgenital plates (IX), whereas in *A. hispidus* they are slightly longer.

Biometrical measures.—Head 21:23; the proportions of the antennal segments (1 to 4) are 13:7:10:6; pronotum 25:48; the ratio between the width of the fore and hind lobes is 33:48; scutellum 18:25; abdomen 61:60, the maximal width is across segment IV.

♀, Total length 6.4 mm.; width of the pronotum 2.4 mm.; width of the abdomen 3.0 mm.

Holotype: female, Nova Teutonia, Santa Catharina, Brazil, F. Plaumann coll., V-953; deposited in the collection of the author.

It is a pleasure to dedicate this species to Mr. Fritz Plaumann, Nova Teutonia, S. Catharina Brazil, who collected so many rare Aradidae.

Mapiri, n. gen.[3]

Ovate, rather flat, without granulation (only the veins of the clavus are granulated), partially covered with curled hairs.

Head almost rectangular, slightly longer than wide through the eyes; anterior process long, robust, parallel; jugae longer than the clypeus, contiguous; antenniferus tubercles strong, dentiform, divaricating; eyes small, semiglobose; postocular

[3] "Mapirí" is the name of a river in which valley was found this peculiar genus.

borders parallel; postocular tubercles small, remote from the eyes don't project beyond the outer border of the eyes. Antennae rather slender; the first antennal segment clavate, projecting beyond the tip of the anterior process, the 2d and 3d slender, the 4th elongately pyriform; the 3d the longest. Rostrum short, don't reach the hind border of the rostral groove, the latter is closed posteriorly. *Pronotum* subtrapezoidal, divided into two lobes by a transverse furrow; collar very small; anterior border subtruncate; lateral borders of the fore lobe rimmed, and slightly reflexed, forming two teeth; the fore disc with a ''T''-shaped median depression, and laterally of it with four $(2 + 2)$, rather obliterated, callosities. The hind disc is wider and higher than the fore disc; its lateral borders parallel, anteriorly convergent, and rimmed; the rim forming an acute angle with the rim of the fore lobe; posterior border truncate in the middle; posterior angles produced backward, rounded. *Scutellum* triangular, shorter than wide at the base; disc elevated and transversely rugose; median carina high and narrow. *Hemelytrae* project beyond the fore border of tergum VII; the basolateral border reflexed, and projecting beyond the outer border of the abdomen. Clavus distinctly separated from the corim; the latter indistinctly separated from the membrane; clavus with two rows of granulae. The apical angle of the corium acute; the apical border deeply emarginate. Membrane with ramificated, and somewhat obliterated veins. *Abdomen* ovate, flat, almost as long as wide, with the lateral borders convex and slightly elevated; the PE-angles of the connexiva slightly, obliquely truncate; the PE-angles of connexivum VII produced as short and wide triangles. In the female tergum VII posteriorly emarginate; segment VIII, and segment IX declivous; the genital lobes (VIII) short, conic, with the terminal spiracles. Spiracles II and IV ventral, placed far from the lateral border; those of V and VI sublateral, scarcely visible from above; those of VII lateral and well visible from above. Venter slightly convex in the middle; the hind borders of sterna II to VI slightly elevated; along the fore borders of sterna V to VII run fine, transverse carinae, similar to those in *Neuroctenus* Fieber. The genital and subgenital plates are relatively smaller than in the genera *Mezira* A.S. or *Neuroctenus* Fieber, therefore the hind border of sternum VII is only slightly emarginate in the middle for the reception of the genital plates. *Mesosternum* subtriangularly depressed in the middle. Scent gland openings big, conspicuous. *Legs* short, unarmed; femora fusiform, tibiae cylindrical.

Genotype: Mapirí paradoxa n. sp.

The new genus is not particularly allied to any known genus of Mezirini; the general appearance resembles somewhat *Pictinus* Stal, or *Aphleboderrhis* Stal, particularly by the presence of incrustated, curled hairs, but the carinated fore borders of sterna V to VII place it near the genera *Ctenoneurus* Bergroth and *Neuroctenus* Fieber, but it is not closely allied to them either.

Mapiri paradoxa, n. sp.

Female.—Color yellowish-brown or ochraceous; disc of the pronotum, scutellum, and membrane, are darker, testaceous; posterior half of the connexiva III to VII, and tibiae, pale yellow.

Biometrical measures.—Head 17:13½; anterior process reaches to the apical quarter of the first antennal segment; the proportions of the antennal segments

(1 to 4) are: 8:5:8:6; pronotum 14:28; scutellum 11:15; abdomen 45:42; genital lobes (VIII) reach to the middle of segment IX, the tip of the latter is notched, the genital valves being slightly, but perceptibly longer than the oviduct.

Total length 6.0 mm.; width of the pronotum 1.75 mm.; width of the abdomen 2.62 mm.

Holotype.—Female, Mapirí river, Bolivia; deposited in the Hungarian National Museum, Budapest.

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HEMIPTERAN BITES HUMAN

(HEMIPTERA, REDUVIIDAE)

On October 1, 1958 while I was standing dictating a letter to my secretary, I placed my right arm on the top of a row of letter files and immediately I had the painful sensation as if a wasp had stung me. Instantly drawing my hand up with fingers clenched to see what had caused the discomfiture, I noticed a Reduviid nymph caught between my fingers. I hastily placed it in a vial so as to make certain of its identity because I was surprised that it would cause such a painful effect. Dr. R. I. Sailer, U. S. Dept. of Agriculture, kindly furnished the specific identification as *Zelus exsanguis* (Stal). Dr. Sailer stated that he had found no evidence of a published record of any instance in which man has been bitten by *Zelus exsanguis*, but that there are records involving the related genus *Sinea*.

The wound was located one-half inch from the tip of my third finger on the surface between the middle and third finger. On October 23 there was still noticeable a small (2 mm.) raised blister-like area in the epidermis. Immediately after the "bite" the pain began and was as intense as any I had ever experienced from a large wasp or bumble bee. This pain lasted for around thirty minutes according to my watch. Within a minute the apical end of the third finger became swollen (a tight feeling), much more reddish in color than the normal fingers, and felt quite hot to the touch. More than normal perspiration was noticeable in the wound area. The swelling lasted for about four hours. In the days following, the epidermis seemed to become normal with no pruritus noticed.—

DAVID L. WRAY, *Division of Entomology, North Carolina Department of Agriculture, Raleigh.*

NOTES ON NERTHRA UNICORNIS (MELIN)

(HEMIPTERA, GELASTOCORIDAE)

The following notes on *Nerthra unicornis* (Melin), described in Zoologiska Bidrag Fran Uppsala (12:195, 1929), are intended to rectify my inadvertent omission of such notes in the specific treatment in Proc. Ent. Soc. Washington (59(4):150, 1957), and to discuss other specimens now available for study.

The seven specimens now under study are labeled as follows: 1 male and 2 females (Naturhistorisches Museum, Wien, Austria) Rio Grande do Sul, Stieglmayr; 1 male (Zoologisches Museum, Hamburg, Germany) Surinam, November 12, 1901, Will. Meier and 1 female and 2 nymphs (C. J. Drake Collection, Washington, D. C.) Bagé, Rio Grande do Sul, Brazil, January 1943, Silveira. On the basis of these specimens and those previously studied (Todd, 1955, Univ. Kansas Sci. Bull., 37, pt. 1(11):378) the range in size is: Male.—Length, 7.1 to 7.7 mm.; width of pronotum, 4.5 to 4.7 mm.; width of abdomen, 4.5 to 4.8 mm. Female.—Length 8.1 to 8.2 mm.; width of pronotum, 5.0 to 5.3 mm.; width of abdomen, 5.4 to 5.7 mm.

N. unicornis (Melin) is very similar to *N. nepaeformis* (Fabr.) but *unicornis* may be easily separated by the presence of clumps of dark, clavate setae on the lateral areas of the scutellum and on the corium of the hemelytron just lateral of the distal end of the claval suture. The setae of the dorsal surfaces of specimens of *nepaeformis* are usually not darker than the integument and are sparsely distributed, not forming clumps as in *unicornis*. Other differences exist between the species, but they are for the most part slight and are mainly differences of degree. The apical teeth of the frontal margin of the head are partially fused together in *unicornis* but separate in *nepaeformis;* the apex of the head is also slightly more produced in *unicornis*. The lateral margin of the pronotum is not so broadly expanded in *unicornis*, the distance from the outer edge of the humeral elevation of the pronotum to the posterior lateral angle of the lateral margin being no more than 0.4 mm.; in addition, the lateral margin is relatively straight in *unicornis* but slightly crenulate in *nepaeformis*. The parameres of the males are only slightly different (see Todd, 1955, *loc. cit.*, figs. 57 and 77). The ventral abdominal sternites of the female are similar except that the emargination of the last visible abdominal sternite is more rounded in *nepaeformis* than in *unicornis*. The shape of the emargination in *unicornis* is rather pointed anteriorly and is more or less intermediate between that of *nepaeformis* and that of *N. terrestris* (Kevan).—

E. L. TODD, *Falls Church, Virginia.*

BOOK NOTICE

CHECK-LIST AND BIBLIOGRAPHY ON THE OCCURRENCE OF INSECTS IN BIRDS' NESTS, by Ellis A. Hicks, Iowa State College Press, Des Moines. 681 pp. 1959. Price, $8.50.

The most inclusive check-list on the subject ever to appear, this book encompasses 18 orders of insects and 26 orders of birds. Two lists, one by insect, the other by bird, facilitate its use.—ED.

POLISTES WASPS SWARMING AROUND OAK TREES

(HYMENOPTERA, VESPIDAE)

Each fall, for several years, swarms of wasps have been observed around willow-oak trees (*Quercus phellos* L.) on the College Park campus of the University of Maryland. They seem to avoid lower limbs but are abundant at about 25 feet above ground and higher. Trees and tall shrubs near buildings seem especially attractive to the wasps, and they are most active in bright sunlight. Because they remained so far above ground great difficulty was experienced in netting the wasps, but with repeated attempts six were collected. They were identified as *Polistes exclamans exclamans* Vierick, 1906, and confirmation was given by Dr. Karl V. Krombein. H. T. Fernald (Ann. Ent. Soc. Amer. 33: 33-34, 1940) reported that this species was swarming around a water oak and gathering on a twig in Winter Park, Florida, on November 10, 1939. According to Hopkins' Bioclimatic Law there should be a difference in seasonal activity of about 44 days between Winter Park, Florida, and College Park, Maryland. Great activity by the wasps was, in fact, noted on the expected date, September 27, 1958.

The reason for the swarming of the wasps is obscure. Fernald (*loc. cit.*) stated that Dr. J. C. Bequaert believed that the swarming and clustering were prenuptial gatherings. No clustering was observed in Maryland. All specimens collected were females, and no evidence of mating was obtained. The wasps land on leaves and appear to select leaves that are turning brown. They move their heads down and "go through the motions" of feeding. However, there is no evidence of a liquid exudation on the leaves which might serve as food. Furthermore, it does not appear likely that the wasps masticate the leaves because no holes in or damage to the leaves could be seen.

Nests of *Polistes* are found under the eaves of three-story buildings. Overwintering females were seen on a very warm day, January 15, 1959, emerging from cracks in the wooden trim of Symons Hall, home of the Department of Entomology.—

CYRIL J. HODAPP *and* WILLIAM E. BICKLEY, *University of Maryland, College Park.*

BOOK NOTICE

INSECT MIGRATION, by C. B. Williams. The Macmillan Co., New York. 235 pp., 48 figs., 16 pls. Nov. 18, 1958. Price, $6.00.

This book is the summary of a subject which has occupied the writer for most of his life; only in recent years, however, has the importance or prevalence of insect migration been realized. Dr. Williams' book brings together the outstanding hypotheses about this phenomenon; illustrates his own theories by examples gathered from all over the world; and presents the whole in his inimitable writing style which everyone who knows Dr. Williams will recognize.—ED.

A NEW SPECIES OF SOLIERELLA FROM SOUTHERN CALIFORNIA
(Hymenoptera, Sphecidae)

Francis X. Williams, *Research Associate in Entomology, San Diego Natural History Museum*

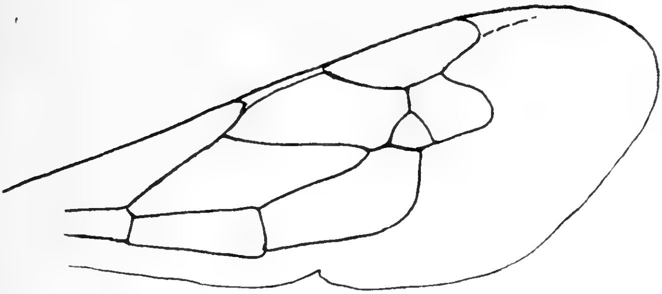
Recently a number of wasps of the genera *Solierella* and *Plenoculus* were submitted to me for determination by Karl V. Krombein, Entomology Research Division, U. S. Department of Agriculture. This interesting collection was made by Dr. W. R. M. Mason, Division of Entomology, Ottawa, Canada.

I take pleasure in naming the distinct species of *Solierella* described below in honor of Dr. Mason, whose careful collecting further reveals the richness of the wasp fauna of the desert regions of Southern California.

Solierella masoni Williams, new species
(Figures 1-5)

Female (holotype).—Length 5.50 mm. Moderately shining. Head and thorax black, abdomen orange red, mandibles honey yellow, clypeus anteriorly slightly darker than the mandibles, scape with some yellowish brown at base and apex, fore and mid femora generally blackish, hind femora yellowish brown, darker above, fore tibiae dark brown, paler beneath and at base and apex, mid and posterior tibiae and all tarsi except their apices, yellowish brown; venation testaceous. Clypeus cuneate mesad and rimmed, the arched ridge from between the base of the antennae ending near its apex; mandibles not emarginate, the malar space scarcely equalling one-half the basal width of the mandicles; antennae slender, some of the flagellar articles three times as long as wide, diminishing in length and width from about article 7; ocelli arranged in about an equilateral triangle, each posterior one less than its diameter removed from the compound eye. The front expands widely to the clypeus, the abundant silvery pile conceals much of its sculpture, it is rather gently angled back from above the wide antennal fossae, from between the lobes of which commences an indistinct V, the arms of which diverge rather narrowly as ill-defined ridges to nearly opposite the fore ocellus. The vertex is coriaceous. The pronotum is notched mesad, and the whole dorsulum finely and closely punctate. The disc of the propodeum is coriaceous, narrowed by infringing pile, the pleurae very finely wrinkled-reticulate, the posterior face shining, with some transverse wrinkles and an incised obcuneate depression. Fore tarsal comb sparse but with the latero-distal bristles twice as long as the width of their respective articles at the point where these bristles originate. In the forewing the marginal and third submarginal cells are about equidistant from the apex of the wing; first and second submarginal cells each receiving a recurrent vein. Vestiture: the silvery pile is dense on the head, parts of the thorax and propodeum and on the fore and intermediate femora, it is finer and somewhat patchy on the abdomen.

Solierella masoni, n. sp., holotype (female): Fig. 1, forewing; fig. 2, anterior view of head; fig. 3, antenna, first 6 segments. *S. masoni*, n. sp., allotype (male): Fig. 4, clypeal margin (freehand sketch); fig. 5, aedeagal lobe from side (some transmitted light).



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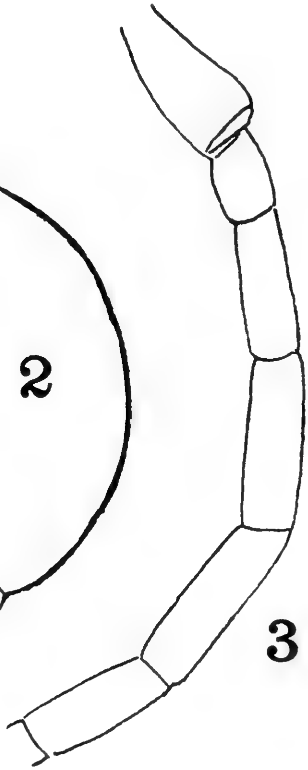

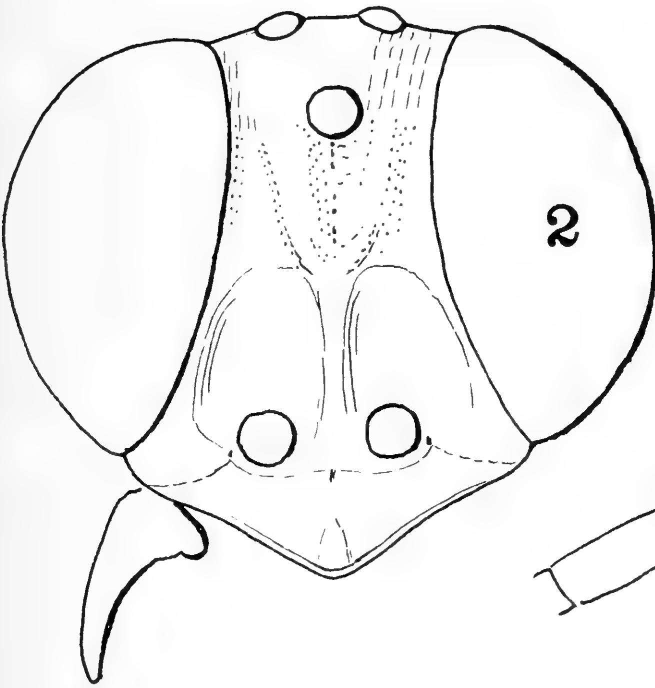

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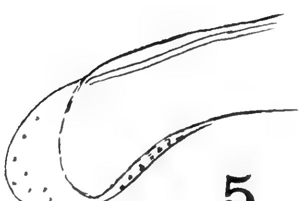

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Male (allotype).—Length 4.20 mm. Marked much as in the female. Mandibles and extremity of clypeus pale yellowish brown, all femora blackish. Silvery pile dense. Clypeus rather narrowly subtruncate from the sloping sides, its small subcuneate projection rather swollen and receiving the strongly arched keel. Malar space about 4/5 the basal mandibular diameter. Antennae rather slender but the articles much shorter than in the female; article 3 longer than 2 and expandnig apically so as to equal about ¾ its length, a little shorter than 4, 13 a little shorter than 11 plus 12; all articles less than twice the length of their apical diameters; articles 4-13 in profile showing above rather close-set short bristles. Ocelli in about an equilateral triangle. Pronotum notched mesad. Disc of propodeum very finely sculptured, narrowed by encroaching pile. Venation as in the female. Terminalia: Uncal lobes, from above, forming a strong bilobation; laterally each is clavate, with no teeth showing; on the inner side of each paramere is a sclerotized ridge with many stout backward-projecting teeth.

Holotype, allotype, 1 female and 3 male paratypes, Thousand Palms, Colorado Desert, Riverside County. Holotype, allotype and 2 male paratypes, 27-IV-1955; 1 female and 1 male paratype, 7-IV-1955 (W. R. M. Mason).

Somewhat intermediate between the large *Solierella* of the *striatipes* and *major* group, resembling these in having long slender antennal articles in the female, but on the other hand, resembling most of the other groups in having a more evenly triangular second submarginal cell that receives only the second recurrent vein.

THE PRESENT CONDITION OF THE GRAVENHORST COLLECTION OF ICHNEUMONIDAE

(HYMENOPTERA)

HENRY TOWNES, *Museum of Zoology, University of Michigan, Ann Arbor*

The I. L. C. Gravenhorst collection contains the most important set of types of European Ichneumonidae. Not only are there many hundreds of types, but the species were described quite early, in 1829, or some of them before. In April, 1958, I had opportunity to study parts of this collection, which is now at Wroclaw, Poland, in the Zoological Museum of the University of Wroclaw, under the care of Prof. Jan Noskiewicz. During my stay Prof. Noskiewicz made me welcome, provided working facilities, and gave me the recent history of the collection, as reported below.

Before World War II (1940), the Gravenhorst collection was in the Zoological Museum of the University of Breslau, Germany, which is the same place that it now occupies except that "Breslau" is now called "Wroclaw" and is part of Poland rather than of Germany.

During the war it was transferred to the town hall of Kanth, a few miles southwest of Breslau, because it was thought to be safer there. Other collections from the Zoological Museum were also stored in various buildings outside of Breslau. At the end of the war, Poland got possession of Breslau, changed its name to Wroclaw, moved all the Germans into East Germany, and moved in Poles from the eastern part of Poland that was taken over by Russia. The record of where the various collections were stored outside of Breslau had been lost. One German, formerly on the Musuem staff, supplied information from memory on the location of some of the collections, but had no knowledge about the Gravenhorst collection. It was discovered by chance in 1948, and brought back to the Zoological Museum in Wroclaw by Prof. Noskiewicz.

Before the war the collection was in 25 glass-topped drawers, arranged and labeled as in Gravenhorst's "Ichneumonologia europaea," 1829. The drawers were numbered, starting with number 6 (first drawer) and ending with number 30 (last drawer). When discovered in Kanth in 1948, six of the drawers were missing. Nothing is now known about their location. Below is a list of the *missing* drawers, and the specimens (mostly types) that they contained.

Drawer no. 11, containing the species described in "Ichneumonologia europaea," vol. 1, p. 588 to vol. 2, p. 61. (*Ichneumon* no. 247 through *Tryphon* no. 38, and part of series of *Tryphon* no. 39.)

Drawer no. 13, containing the species described in "Ichneumonologia europaea," vol. 2, p. 176-297. (*Tryphon* nos. 114-198.)

Drawer no. 21, containing the species described in "Ichneumonologia europaea," vol. 3, p. 55-151. (*Pimpla* nos. 29-77.)

Drawer no. 24, containing the species described in "Ichneumonologia europaea," vol. 3, p. 260-370. (*Pimpla* no. 117 through *Bassus* no. 35.)

Drawers nos. 27 and 28, containing the species described in "Ichneumonologia europaea," vol. 3, p. 583-703. (*Ophion* nos. 88-141.)

Exceptions to the above generalizations are as follows:

1. The type of *Tryphon scabriculus* is present. It should have been in drawer no. 13 (missing) but was in another drawer and not lost.
2. The Xoridini and Poemeniini lent to E. Clément for his studies have been returned but not been put back into the collection. They are in a separate drawer.
3. About 25 species are absent from the collection, but with the species labels and pin holes opposite them to show their former presence. These seem to have been taken out for study prior to the war, while the collection was under the care of Prof. Karl Hedwig, and never returned.

The collection has been fairly well preserved but has suffered from dermestid damage, including some damage since it was studied by J. F. Perkins late in the 1930's. There are dermestid castings on top of some of the lectotype labels he used. The series under the labels in the drawers often contains more than one species and since there are usually no labels on the pins themselves, some care is needed to be sure that one is dealing with a correctly determined type. Parts of the collection have been lent to various European entomologists, which gave oppertunity for some mixing of specimens. Some lectotypes have been labeled in the collection but are mostly unpublished. J. F. Perkins has labeled lectotypes of the species in Gravenhorst's "subgenera" *Pimpla*, *Glypta*, and *Lissonota;* G. J. Kerrich has labeled lectotypes of Ctenisciui; R. Hinz has labeled lectotypes of some of the Porizonini and a few others; and I have labeled lectotypes of some genotype species. While the Gravenhorst series are often mixed, they usually contain at least one specimen of the species commonly interpreted as the one he described.

Gravenhorst had a wide correspondence and determined ichneumonids for many entomologists. I saw specimens that he had presumably determined and which in some cases would be cotypes in the Spinola collection in Turin, in the Manger collection in Berlin, and in the Leiden museum. A comprehensive list of the Gravenhorst types or lectotypes, with a taxonomic interpretation of them would be very desirable. Some able men have treated parts of his species in this way, but the various contributions need to be brought together into a single list and the incomplete sections finished.

BOOK NOTICE

ACTA HYMENOPTEROLOGICA, vol. 1, no. 1, 1958. The first number of a new journal devoted to Hymenoptera exclusively has just appeared under this title. It is under the able editorship of Professor Keizô Yasumatsu, Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan. The first number of 93 pages is available from the publisher, Mr. R. Ishikawa, 756, Yoyogi-machi, Shibuya-ku, Tokyo, Japan, at $1.50. It contains articles on New Zealand ants by W. L. Brown, taxonomic notes on several genera of Braconidae by C. Watanabe, embryology of a Japanese sawfly by H. Ando and M. Okada, number of ovarian eggs of Japanese Ichneumonidae by K. Iwata, and biological investigations on a Japanese scelionid by T. Hidaka. It is expected that one or two numbers will be issued each year at prices determined by the content. The journal is intended primarily for invitational papers. Correspondence concerning publication of manuscripts should be addressed to Dr. Yasumatsu.—

KARL V. KROMBEIN, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

NOTES ON THE TYPE MATERIAL OF TWO NAMES PROPOSED BY BAKER FOR FLEAS OF THE GENUS FOXELLA

(SIPHONAPTERA, CERATOPHYLLIDAE)

G. H. E. HOPKINS[1] and PHYLLIS T. JOHNSON[2]

The situation with regard to the type material of many of the fleas described by C. F. Baker (1904) is complicated. A large part of this material is in the United States National Museum and another large portion is in the British Museum (Natural History), the latter specimens having been obtained by N. C. Rothschild when he bought Baker's collection. There are a few specimens in other collections in the United States of America and perhaps elsewhere.

Since Baker never made holotypes (an apparent exception will be dealt with below), except in instances in which he had only one specimen, all specimens from the type series of the species he described are syntypes and have equal claim to consideration when selecting a lectotype. The apparent exception is the case of his paper of 1904, in which he states (p. 380) "*Type.*—Cat. No. 6895, U.S.N.M." This looks very like a definite designation of a holotype, but the appearance is illusory because the numbers (put on the slides by some one other than Baker, probably Coquillett) do not refer in every case to a single specimen but usually to several, the entries in the type catalogue of the museum (made by Coquillett) merely say "Type," with varying numbers of specimens listed for each species, and all the members of each series (with some exceptions of which an example will be discussed later) are labeled "Type" in Baker's writing. In the circumstances all members of the type series of the species described by Baker in 1904 are syntypes, like those in his other publications. It is perfectly clear that Baker did not restrict the term "Type" to one specimen, or even to one specimen of each sex, and he presumably meant nothing more by "Type" than that the specimen was typical—a usage maintained until quite recently by some old-fashioned authors. Certain other peculiarities of Baker's methods in this connection are excellently exemplified by the two names which he proposed for fleas now referred to the genus *Foxella*, and we think it important to examine this case in detail before any more lectotype selections are made for Baker's names of fleas. We are in agreement that the over-ruling consideration in making such selections must be the condition of the specimens as affecting their value as a criterion of the species concerned, although the fact that Baker's statements of 1904 about types have always been taken at their face value gives the material in the U. S. National Museum a strong claim to preference in the selection, other things being equal.

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The earliest name for any *Foxella* is *Pulex ignotus* Baker, April 1895 (*Canad. Ent.* 27:110, 112), closely followed by *Typhlopsylla americana* Baker, July 1895 (*l.c.*: 189, 191). These names must be discussed together because they are considered to be subjective synonyms and Baker's peculiar labelling of some specimens from the type-series of *americana* has led to the erroneous belief that they are syntypes of *Foxella i. ignota*. Baker described his *Pulex ignotus* from two specimens, without host-record, received from Prof. Herbert Osborn of Ames, Iowa; all the particulars he gives refer to the female sex only, so it seems certain that both the specimens were females. He does not specifically state that Professor Osborn had obtained them at Ames, but it has always been assumed that he did and, although the assumption that a collector obtained certain specimens near his home is often far from safe, it seems from later evidence to be justified in this instance.

Typhlopsylla americana was described from "specimens from Ames, Iowa, taken on *Geomys bursarius* (Osborn). At Fort Collins I have found it on a large brown mole, and Prof. Gillette has taken it at the same place on the pocket gopher." A specimen from Moscow, Idaho, is mentioned as differing in one respect.

Osborn (1896, pp. 154, 155, figs. 86, 87) placed *ignota* as a synonym of *americana*, apparently because the latter had been described in what he considered to be the correct genus. The most useful points in his account, so far as concerns the type-material, are that he had repeatedly taken the species from "our common pocket gopher, *Geomys bursarius*" (the word "our" must surely imply that the gophers were taken at or near Ames), and that he does not give any indication of having collected specimens on any other host or at any other locality, since this supports Baker's assumption that the specimens sent to him by Osborn were from Ames. Another relevant consideration, in view of the way in which Baker labeled certain specimens, is that Wagner (1898, p. 560) referred *ignotus* to *Ceratophyllus* and this placing of the species was accepted by Baker in 1904 (pp. 388, 416, 443, pl. 21 figs. 1-6), since it means that any specimens purporting to be type material of either *ignotus* or *americana* but referred to the genus *Ceratophyllus* must have been relabelled.

Ignoring for the moment all labels not in Baker's writing, the U. S. National Museum and the British Museum (Natural History) contain the following specimens which are, or might be, type-material of either of Baker's names:

1 ♂ in USNM "Typhlopsylla americana [Type] Baker. On Geomys bursarius. Ames, Ia. 9.5.89. Prof. H. Osborn."

1 ♀ in USNM and 1 ♂ 1 ♀ in BM. "Ceratophyllus ignotus (Baker). On Geomys bursarius, Ames, Ia. 9.5.89. Osborn. This was the type of P. ignotus."

1 ♂ 1 ♀ in USNM. "Typh. americana. Big Brown Mole. Ft. Collins, Colo. 7.23.92. R.C.S."

2♂ 1 ♀ in BM. "Ceratophyllus ignotus (Baker). On Pocket Gopher. Fort Collins, Colo. C. F. Baker."

Enquiries from museums which seemed likely to possess other type material of either of Baker's names (Nebraska State University, Cornell University, and University of Colorado) showed that the first museum has a female labelled by Baker as type of *Typhlopsylla americana* and with the same data as the first male listed above, but no specimens were found in the Cornell and Colorado collections.

The exact correspondence of the data of the specimens in the British Museum and United States National Museum with the information given in the original description of *Typhlopsylla americana* suggests strongly that all of them, however labelled, are part of the type material of this name. The males from Ames labelled "This was the type of *P. ignotus*" cannot possibly be type-material of that name as it was based on females only, and the fact that these, together with all the females from Ames and the male which Baker labelled "*Typhlopsylla americana* [Type]" (the square brackets are his own) are from one batch collected on *Geomys bursarius* on 5. ix. 1899, whereas the type material of *Pulex ignotus* had no host-record and may or may not have been dated, makes it plain that most or all of these must be syntypes of *T. americana*, not of *P. ignotus*.

There seem to be only two likely possibilities with regard to the two female syntypes of *Pulex ignotus*, of which one is that they have been lost. The other is suggested by the fact that all the specimens labelled "This was the type of *P. ignotus*" by Baker were also determined by him as "*Ceratophyllus ignotus* (Baker)" since the species was not referred to this genus until 1898. Clearly the specimens must have been relabelled by Baker at some time in or after 1898, and it seems just possible that he had meantime been informed by Osborn that the syntypes of *P. ignotus* had the same data as the Ames portion of the type series of *T. americana* and had relabelled them accordingly. But in either event the result is the same: either the two syntypes of *P. ignotus* have been lost, or they are among the syntypes of *T. americana*, are indistinguishable from them owing to relabelling, and are equally effectively lost in consequence. It now becomes necessary to examine the validity of previous selections of lectotypes for the two names.

Jordan and Rothschild (1915, pp. 54, 55, fig. 57) described and figured Baker's male from Ames, then in the Rothschild collection which now forms the major part of the British Museum collection of fleas. They rightly remarked that although it was labelled "This was the type of *P. ignotus*" the statement could not be true since it is a male, and they referred to it as "the above-mentioned ♂ from Ames, which we must consider the type of *americana*." Since Jordan and Rothschild invariably used the word "type" for a single specimen, this is a selection of a lectotype, and even if objection were to be raised to it on the grounds of its informality the same specimen would still be the lectotype of *americana* because Jordan (1929, p. 33) stated unequivocally that this specimen had been selected as type in 1915. Jordan and Rothschild's published selection of this specimen would completely over-ride the unpublished fact that he had labelled another specimen "Type" even if he had done this in the case of only one specimen, whereas he had actually labelled several specimens thus. The specimen is in poor condition and we considered whether it ought to be set aside because of this, but it is not so bad as to be useless as a lectotype. It has been labelled "*Typhlopsylla americana* Baker, 1895. Lectotype."

Jordan (1929, p. 33), misled by Baker's labelling, purported to select as type (i.e. lectotype) of *Pulex ignotus* Baker a female in the United States National Museum but, as we have shown, this specimen is not a syntype of *P. ignotus* but of *T. americana*, so the selection is invalid.

The only remedy for this unfortunate situation is to erect a neotype for *Pulex ignotus* Baker, 1895. The specimen selected for this purpose is a male in the United States National Museum and is the specimen which Baker labelled "*Typhlopsylla americana* [Type]," but which became merely an ex-syntype when Jordan and Rothschild selected another specimen as lectotype of this name. Its genitalia are shown in Fig. 1. It bears in Baker's writing the particulars: "*Typhlopsylla americana* [Type] Baker. On Geomys bursarius, Ames, Ia., 9.5.89.

Fig. 1. *Foxella ignota* (Baker), genitalia of male neotype (bristles of 8th tergum omitted).

Prof. H. Osborn," and an additional label: "*Pulex ignotus* Baker, 1895. Neotype (Hopkins and Johnson, 1958)."

In all characters which can be checked the much-damaged lectotype of *Typhlopsylla americana* agrees with the neotype of *Pulex ignotus*, except that the apical projection of st. VIII is longer, as it is also in a topotype collected in 1937. The two specimens are from the same locality and host and were collected on the same day. We have, therefore, by our present action, put on a firm basis the long-held belief that *Typhlopsylla americana* Baker, July 1895, is a subjective synonym of *Foxella ignota ignota* (Baker, April 1895).

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CASES OF CANNIBALISM IN THE BASILICA SPIDER, ALLEPEIRA LEMNISCATA WALCKENAER

(Araneida, Argyropidae)

Donald H. Lamore, *Biology Department, Cottey College, Nevada, Mo.*

In three instances, one on the 27th and two on the 28th of July, 1958, while observing webs of the basilica spider, *Allepeira lemniscata* Walck., on privet hedges, *Ligustrum vulgare*, at Greenbelt, Prince George's County, Maryland, I noted a female basilica spider preying on a male basilica spider. In each case the male's legs, especially the tibiae and tarsi, were thoroughly trussed up together distally with silk, with some silk strands wrapped also about the abdomen and a lesser quantity about the cephalothorax. One male had legs and cephalothorax that were completely empty. In another case the abdomen was empty, completely flat, and had shrunk to the extent that it was not clearly visible to the naked eye. In the third case, the only one in which the identity of the prey as the male of the species was certain at a glance, the female was feeding on one of the male's legs, and the male was still in good condition. The female spiders involved were all large, two of them having a noticeably swollen abdomen typical of a female that is about to lay its eggs.

In another case, which is not typical, August 4, 1958, a male was feeding upon the deflated abdomen of a female killed recently by a larva of an insect endoparasite which had almost completely emerged vertically from the ventral surface of the spider's abdomen near the left lung slit. The male, whose body was aligned with that of the female, was right behind her feeding on the posterior tip of her abdomen. Two hours earlier, I saw the male courting this large-abdomened female which was then alive. At that time, she showed no sign of the parasite which was soon to kill her and withdrew alertly when the male approached in courting. Examination of the female did not reveal silk-bound legs and body typical of other victims of the basilica spider.

Out of thousands of observations on hundreds of individuals throughout several breeding seasons, the above are the only instances where I have noted basilica spiders feeding on other spiders. However, cannibalism may not be as rare as the circumstances indicate because these spiders habitually eliminate many of their discarded victims from the web. Broad-leaved plants located under webs of these spiders may have their leaves littered with spider prey removed from the web.

Large, pregnant female spiders often repulse courting males. They may pursue the persistent males vigorously and repeatedly, sometimes to the extremities of the labyrinths. At times the fleeing male escapes by the narrowest of margins. However, I have yet to witness a capture. Also, I have never seen a female capture a male with which it was mating although she may try to, when the male is obviously smaller than she, and the mating process is interrupted suddenly causing the pair to separate abruptly. Several times, I have seen a copulating female leave her mate suddenly to secure an insect struggling in the snare. The insect escaped, and, with her preying instinct aroused, she rushed for the male which withdrew hastily. Savory, (1928, The Biology of Spiders), suggests that the male is relatively safe from attack by the female when he is performing the acts of courtship. Except in the instances of sudden interruptions during mating outlined above, Savory's idea seems to hold for basilica spiders.

There is proof that certain males, even mutilated individuals, mate with a female and appear later in other webs. On the 8th of August 1958, a male lacking the right rear leg courted, but to my knowledge did not mate with, a large female which already had made two cocoons. The day after, the same male mated with a female which already had one cocoon and whose web was about 4 feet from that of the previous female. Two days later, this male was back in the female's web where it was originally noted. In a similar case, a male, marked by cutting off its right rear leg just below the patella, was released in the web of a female which had no cocoons. The male disappeared for two days and then appeared under the web dome of another female, about 7 feet from the first web, and was filling its palps from a sperm web about two inches from the female. This male mated the following day with a different female which had three cocoons and whose web was situated about 4 feet from the preceding web. Three days later, the same male turned up in the dorsal labyrinth of the web of yet another female which had three cocoons and was about 7 feet from the preceding web.

Evidence indicates that male basilica spiders do not all die at the hands of the females. Outside of the unmistakable examples of cannibalism described above, the cause of death of most dead spiders which I have taken from webs is not clear. Few had the body bound in silk with which both sexes characteristically wrap their prey. In some cases only one spider had been observed previously in the web where I collected the dead one later. Many show no apparent injury. Some, mutilated from prior struggles, may lack one or more legs. Many probably die a natural death toward the end of summer and in the autumn, the male's life span being shorter than the female's. Others, no doubt, are killed in struggles with insect predators.

That female spiders eat male spiders is a well-known fact. Bristowe, (1941, The Comity of Spiders), points out that it is not a universal habit and that it occurs mainly toward the end of the breeding season. Evidence shows that cannibalism does occur at times in the basilica spider; that it may occur close to the height of the breeding season; that females eat males; and that certain males, even mutilated ones, mate and live to court other females.

RAPHIGNATHUS TESSELLATUS EWING, 1909, A NEW SYNONYM OF LEDERMUELLERIA CLAVATA (CAN. AND FANZ., 1876)

(Acarina, Stigmaeidae)

Two of the species of *Ledermuelleria* which occur in the United States were originally described in the genus *Raphignathus* by Ewing. One of his species, *L. pectinata* (Ewing, 1917, Bull. Amer. Mus. Nat. Hist. 37:149-72), has been illustrated and redescribed from material collected in Utah and California (Summers, 1957, Proc. Ent. Soc. Washington 59(2):49-60). The status of the other species, *Raphignathus tessellatus* (Ewing, 1909, Trans. Amer. Ent. Soc. 25:401-18), could not be clarified in the 1957 study because the only specimen available, a type specimen in the U. S. National Museum collection, had collapsed due to breakdown of its non-resinous mounting medium.

Another specimen of this mite was recently discovered in the British Museum of Natural History by Mr. Donald Macfarlane and loaned to the writer for study. The specimen found is apparently an undesignated paratype female included in exchange material sent to A. D. Michael by Ewing. It bears an original, tentative label: *Tetranychus tessellatus* n. sp., Mahomet, Illinois, April 17, 1908 ,H.E.E.

This recently-found specimen has been determined to be conspecific with specimens which the writer (1957) redescribed as *L. clavata*. *Raphignathus tessellatus* Ewing is therefore a synonym of *Ledermuelleria clavata* (Can. and Fanz.).—

F. M. Summers, *University of California, Davis.*

A NEW ECUADOREAN MITE
(ACARINA, TETRANYCHIDAE)

E. A. McGREGOR, *P. O. Box 70, Whittier, Calif.*

A spider mite received from H. R. Yust, then Director of Plan Azuay Canar, occurring on *Camellia* in Ecuador, cannot be referred to a know species and appears to be undescribed.

Oligonychus yusti McGregor, new species

Female.—Tibia I with 7 tactile setae and one sensory seta; tarsus I with 4 tactile setae and one sensory seta proximad to the duplex setae. Tarsal claw I with five pairs of ventral spines these, shorter than the claw. Palp-tarsus about as long as thick. Peritreme consisting of a straightish, narrow tube, terminating in an oval chamber.

Male.—Aedeagus with shaft portion not noticeably narrowing caudad; the hook element is sharply deflexed, its beginning portion thick, then abruptly narrowed distally into a fingerlike noticeably truncated tip. The anterior outline of hook at right angles to the axis of shaft (not slanting anteriorad as in *O. coiti* (McG.).

Type Material.—Yust No. 312.

Type Locality.—Cuenca, Ecuador, April 24, 1957, H. R. Yust.

Food Plant.—Camellia.

The present mite was submitted to E. W. Baker for an opinion as to its identity. In reply he stated that it seemed to be closely allied to *Oligonychus coiti* McG.

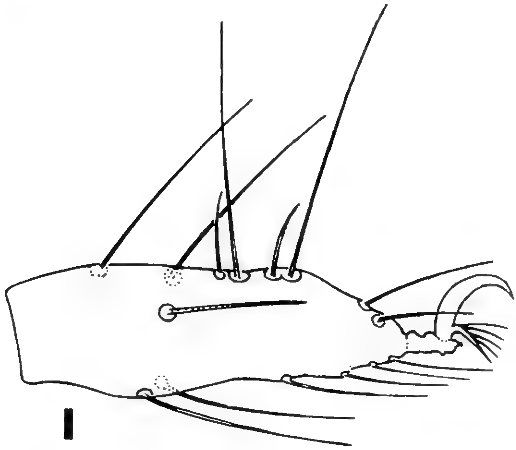
As a result of additional study, the writer detected the following outlined differences between the Ecuadorean mite and *O. coiti*, which would seem to be sufficient to separate these species:

Oligonychus coiti (McGregor). *Female.*—With 4 pairs of ventral spines on tarsal claw I; these spines are conspicuously longer than the claw. The palp-tarsus about twice as thick as long. *Male.*—The shaft portion of aedeagus with its greatest thickness fully half that of its length; the aedeagus begins bending abruptly ventrad shortly distad of the base of the shaft. The terminal, fingerlike portion of the aedeagus is bent very noticeably anteriorad.

Oligonychus yusti McGregor. *Female.*—With five pairs of ventral spines on tarsal claw I; these spines are shorter than the claw. The palp-tarsus is fully as long as thick. *Male.*—The shaft of aedeagus nearly 3 times as long as its greatest thickness, and it continues for most of its length in the same general axis as that of the inner lobe of the aedeagus. The terminal poriton of the hook of the aedeagus (particularly its anterior margin) is not directed anteriorad.

O. yusti also resembles *O. platani* in some respects, but it differs in that the tarsal claw has 5 pairs of ventral spines (*platani* has 4 pairs), and these spines are shorter than the claw (they are longer in *platani*).

Oligonychus yusti, n. sp. Fig. 1, tarsus I of female (tenent hairs not shown); fig. 2, peritreme; fig. 3, tip of palpus of female; fig. 4, aedeagus; fig. 5, tibia I of female.



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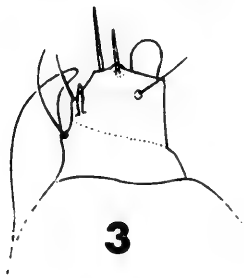

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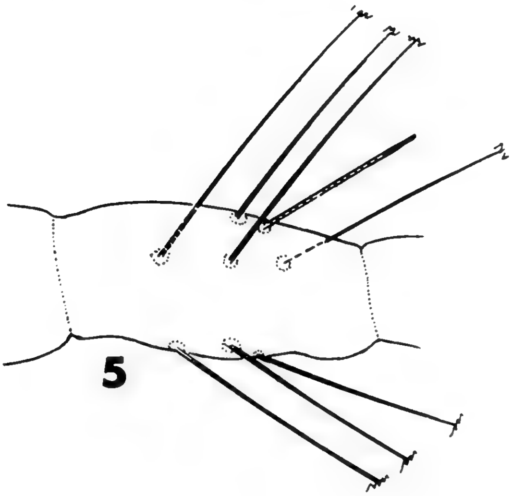


5

A NEW SPECIES OF TYPHLODROMUS NEAR T. BAKERI (GARMAN) AND A CONSIDERATION OF THE OCCURRENCE OF T. RHENANUS (OUD.) IN CALIFORNIA

(Acarina, Phytoseiidae)

Robert O. Schuster, *University of California, Davis*

Two species resembling *Typhlodromus rhenanus* (Oud.) and *T. bakeri* (Garman) have been recognized in central California. Until Dosse described and illustrated the spermathecae or coxal glands of these species it was impossible to determine the status of the two species occurring here. On the basis of his publication it now appears that (1) *T. rhenanus* is probably represented in California although differing from European specimens in numerous minor characters, and (2) the second species is closely related to *T. bakeri* but is undescribed.

Typhlodromus (T.) caudiglans, n. sp.

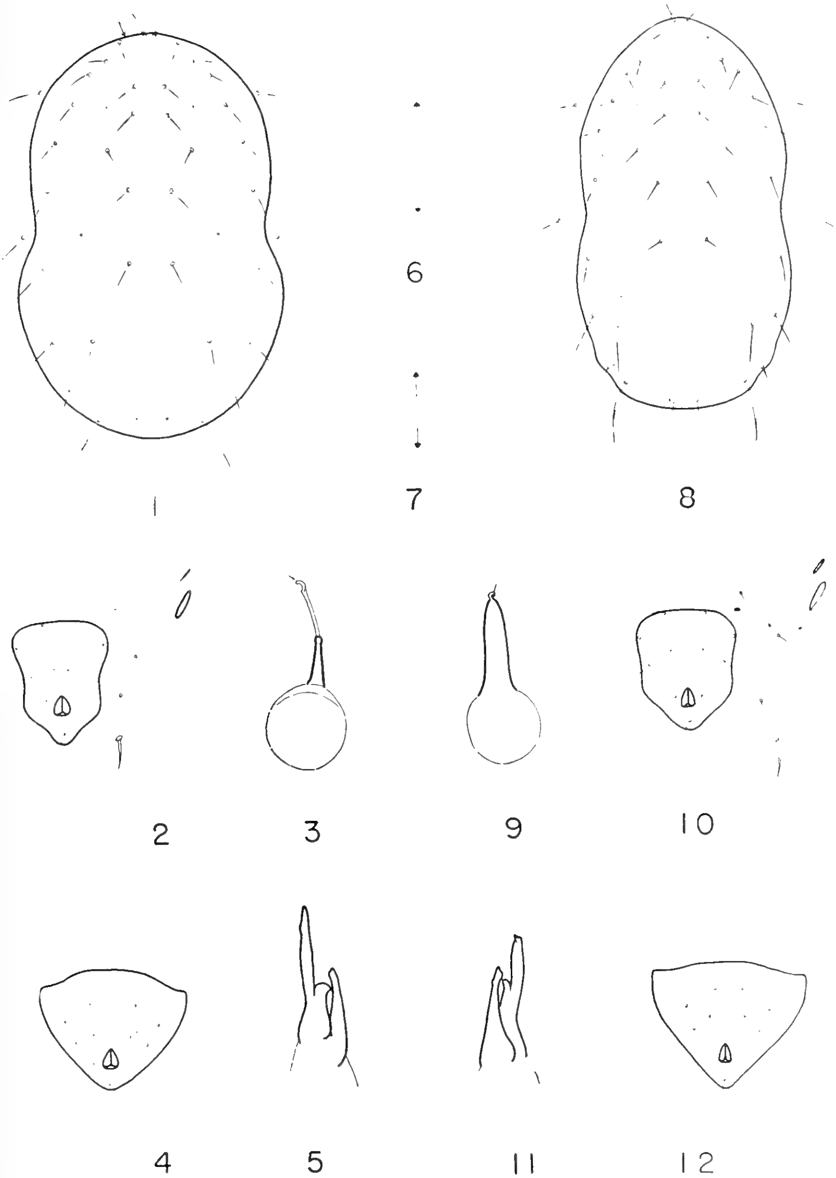
Female.—Dorsal shield 353 μ long x 228 μ wide (fig. 1); off-white; reticulate; 18 pairs of dorsal setae, 10 pairs marginal; M2 paired with L8; approximate lengths of setae in microns are: S1 29, S2 25, L1 24, L2 21, L3 24, L4 27, L5-7 29, L8-9 28, L10 53, M1 19, M2 31, D1 25, D2 16, D3 17, D4 18, D5-6 11; fixed member of chelicera with 4 teeth; movable member slightly shorter than fixed, ramus with a single tooth; sternal shield indistinct, bearing 2 pairs of setae (the 3rd pair possibly contiguous with the posterior extention of the shield); metapodal plates indistinct, 4 or 5 times the area of the setal insertions; peritreme extending forward past base of seta L1 (indicated by arrow on fig. 1); ventrianal shield lacking wrinkles or patterns, with 4 pairs of preanal setae and a pair of small pores; 4 pairs of setae on membrane surrounding ventrianal shield (fig. 2); 2 pairs of parapodals, the anterior pair minute; leg IV lacking macroseta, the setae present not set on tubercles; coxal gland of characteristic shape (fig. 3).

Male.—Chelicera as illustrated (fig. 5); ventrianal shield with 4 pairs of preanal setae and a pair of pores (fig. 4).

Immature stages.—Unknown.

The type is from Davis, Yolo County, California, collected IX-23-57 by R. O. Schuster and is deposited in the California Academy of Sciences. Twenty-four female and 9 male paratypes are also from Davis, collected between June and August, 1957 by Leslie M. Smith and R. O. Schuster. Other specimens have been recorded from Contra Costa, Napa and San Joaquin Counties. Most of these mites have been collected in association with eriophyids. They have been collected from a variety of plants including grape, olive, pear, peach, plum and walnut.

T. caudiglans superficially resembles *T. rhenanus* but the true relationship to *T. bakeri* is apparent in the form of the coxal gland. The neck of this gland is narrower in *T. caudiglans* which further differs from *T. bakeri* in the following characters: The anterior parapodals are nearly obsolete, the setal insertions are normal, the ventrianal



T. caudiglans, n. sp. Fig. 1, dorsal shield of female; fig. 2, ventrianal shield and associated setae; fig. 3, coxal gland; fig. 4, ventrianal shield of male; fig 5, male chelicera; fig. 6, 100.8 microns, scale for illustrations of shields; fig. 7, 16.9 microns, scale for coxal glands and chelicerae. *T. rhenanus* (Oud.). Fig. 8, dorsal shield of female; fig. 9, coxal gland; fig. 10, ventrianal shield; fig. 11, male chelicera; fig. 12, ventrianal shield of male.

shield has no pattern superimposed, and the movable digit of the chelicera has only a single tooth. The position of seta M2 in relation to L8 is not constant, M2 occasionally being posterior to L8. A pair of extremely minute pores occur on the ventrianal shield of *T. bakeri*. Those of *T. caudiglans* are larger.

The California specimens which presumably are *T. rhenanus* (Oud.) have been compared with specimens from Kent, England, loaned by Dr. D. A. Chant. They possess the coxal gland as illustrated by Dosse although this structure is usually a little larger in the California material. Specimens from the California population are further atypical in the lengths of setae L7, L8 and M2 which are longer and in L2 and L9 which are shorter. M2 is more closely associated with L8 and the dorsum has a number of small pores. Although this number of minor differences exists, the range of variability of either the European or California populations is not known and it seems unwise to consider the California form as a distinct species unless additional morphological characters are found or ecological observations indicate the existence of two species.

Illustrations of *T. rhenanus* are included: (1) to define the mite that is referred to as *T. rhenanus* in California, and (2) as an aid in distinguishing *T. caudiglans* which is superficially similar.

Literature Cited

Dosse, Von Gudo, 1958. Die Spermathecae, ein zusatzliches Bestimmungsmerkmal bei Raubmilben. Pflanzenschutz-Berichte 20(½):1-11.

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Respectfully submitted, PAUL A. WOKE, *Corresponding Secretary.*

TREASURER

General Fund

Cash on hand—January 1, 1958	$ 8.57	
Receipts during 1957	3,929.70	
Total		$3,938.27
Cash on hand—December 31, 1958	29.14	
Expenditures during 1958	3,909.13	
Total		$3,938.27

Publication Fund

Cash and deposits on hand—January 1, 1958	$4,778.55	
Receipts during 1958	852.05	
Total		$5,630.60
Cash and deposits on hand—December 31, 1958	5,378.27	
Expenditures during 1958	252.33	
Total		$5,630.60

Copies of the complete Treasurer's report, approved by the Auditing Committee, are on file with the Corresponding Secretary and Treasurer.

Respectfully submitted, FLOYD P. HARRISON, *Treasurer.*

CUSTODIAN

During the calendar year 1958 the value of items sold by the Custodian's office amounted to $613.42, of which $439.70 was for 62 copies of the Memoirs, $167.32 for copies of the "Proceedings," and $6.40 for miscellaneous papers and reprints.

Sales for Memoir No. 5, "A Classification of the Siphonaptera of South America" have been very slow, amounting to a total of only 34 during the year.

A copy of the complete, detailed report for the calendar year is on file wtil the Recording Secretary.

Respectfully submitted, H. J. CONKLE, *Custodian.*

EDITOR

Six numbers of Vol. 60 of the *Proceedings* have been published in 1958. Of the 304 published pages, 14 and one-half have been devoted to advertising and 289 and one-half to scientific papers, notes, book reviews, obituaries, minutes of meetings, and announcements. The size of Vol. 60 is exactly the same as that of Vol. 59; the slight reduction in size of both volumes under that of Vol. 58 is accounted for by the increase in printing costs initiated in 1957. Volume 60 contains 48 reports of original work, averaging about 5 and one-half pages.

Respectfully submitted, RICHARD H. FOOTE, *Editor*

SOCIETY MEETINGS

Held in U. S. National Museum

676th Meeting, December 11, 1958

The following motion concerning the new Bylaws was made by Dr. H. H. Shepard and seconded by Dr. Campbell: "I move that the old Constitution and bylaws be revoked and replaced at this time by the new bylaws, the business of the Society to henceforth be conducted in conformance with these new bylaws, except in the matter of the fiscal year which shall not begin until the conclusion of the current fiscal year as established under the old Constitution; the present treasurer to retain his position through the current fiscal year and hold office until his books can be audited and arrangements made with his successor and the banks for transfer of Society funds." The motion was unanimously approved.

Benjamin A. Foote, Dept. of Ent., Univ. of Idaho and *Robert E. Lewis*, University of Illinois, were elected to membership.

President Sailer reported on the state of the Society and its activities during 1958.

As a quorum was present, the election of the officers for 1959 proceeded rapidly. The names of the officers will appear in the next issue of the Proceedings.

Dr. Shepard reported that a headquarters office of the Washington Academy of Sciences has been established at 1530 P St. N. W. to house Academy records and serve as a mail address for Academy business. As this office develops into a smooth operation there will be improved facilities for assistance to the affiliated societies. Some thought by the Entomological Society of Washington might be given to the ways in which our Society can utilize the Academy headquarters.

The Academy, a number of the affiliated societies, as well as others interested in the publication of membership lists in the scientific fields of the Washington area, have indicated a need for a comprehensive directory on some type of file cards suitable for sorting and reproduction. It has been suggested that copies of current membership lists of affiliated societies (mimeographed or otherwise) could be filed with the Academy as a start in this direction.

"Insects of Hawaii"—Macrolepidoptera, Vol. 7, by E. C. Zimmerman was published in 1958 and brought to the Society's attention by Dr. J. F. G. Clarke.

Everyone enjoyed the "Report on Ninth Pacific Science Congresses (Bangkok, Thailand) and Entomological Observations in Hawaii" presented by the speaker of the evening, Dr. C. H. Hoffmann.

Two visitors, *Dr. and Mrs. S. Johnson*, were introduced.

The new president, Dr. R. H. Nelson, was formally installed. The meeting adjourned at 9:40 P. M.

677th Meeting, January 8, 1959

The name of *Mr. Tony Roberts* of New York was proposed by Dr. Gurney, Chairman of the Membership Committee. This constitutes the first reading of the applicant's name. He will become a member at the next meeting following lack of objections from the membership.

President Nelson appointed the following committee members: **Membership,** *A. B. Gurney* (chairman, elected), *J. R. Foster, W. S. Murray, Bohdan Maksymiuk* and *Henry Fuller;* **Program,** *J. H. Fales* (chairman, elected), *F. L. Campbell, Howard Baker, Karl Krombein;* **Publications,** *Richard H. Foote* (chairman, Editor, elected), *C. F. W. Muesebeck* (3 years), *Kellie O'Neill* (2 years), *D. G. Hall* (1 year); **Advertising,** *Norman Mitlin* (chairman, one year) and *Roy Barker* (two years); **Finance,** *P. G. Piquett* (chairman, Treasurer, elected), *Richard H. Foote, H. J. Conkle, J. H. Fales* and *Norman Mitlin;* **Nominating,** *Alan Stone* (chairman), *W. L. Bickley* and *F. W. Poos;* and **Auditing,** *G. J. Haeussler* (chairman), *L. B. Reed* and *Floyd P. Harrison.*

"Insects of Micronesia, Heteroptera: Lygaeidae," by H. G. Barber was announced by Dr. Sailer. The book was published in 1958, has 218 pages and is volume 7, number 4, of the Insects of Micronesia.

J. H. Fales spoke of his work on the marking of swallowtail butterflies in southern Maryland. Individual insects were observed in a given area up to 12 days after marking and 32 percent recovery was obtained. Color Kodachrome slides were shown of his work.

Dr. Gurney announced the death of Mr. C. T. Greene, a well-known taxonomist in Diptera, who was retired from the former Bureau of Entomology and Plant Quarantine. Mr. Nelson appointed *Richard H. Foote* (chairman), *W. S. Fisher* and *David Hall* as the obituary committee.

The speaker of the evening, Charles Pomerantz, President of the Bell Exterminating Company, New York City, gave a lively paper entitled, "The Role of the Pest Control Operator in the Management of Insect Phobias."—

HELEN SOLLERS, *Recording Secretary.*

PUBLICATION DATES

The date of publication of Vol. 61, No. 1, of the *Proceedings* was March 6, 1959. Date of publication of Vol. 61, No. 2, will be found in Vol. 61, No. 3.

NOW AVAILABLE

Memoir 5
of the
Entomological Society of Washington

A CLASSIFICATION OF THE SIPHONAPTERA OF SOUTH AMERICA

WITH DESCRIPTIONS OF NEW SPECIES

by Phyllis Truth Johnson

The study of South American fleas was begun in 1879 when Weyenbergh published the first descriptions of species from that region, using specimens mounted on cardboard as was usual in that day. These fleas were restudied in balsam by Jordan and Rothschild in England shortly after the turn of the century, and from that time to the present day a large number of siphonapterologists, both in England and the Americas, have contributed to this study. Dr. Johnson's work is the first comprehensive taxonomic treatment of the fleas of the region, which comprises Trinidad and all of the continent and its coastal islands. The contemplated 275 page volume will be indispensable to the serious student of this important order of insects.

Memoir 5 opens with two discussions of morphological characters, one devoted to the terms used in the taxonomic section and the other to their taxonomic validity and possible phylogenetic significance. All the families, tribes and genera known to occur in South America are completely described and illustrated, and the species within each genus have been listed with host and locality data. Descriptions of 17 new species and two new subspecies bring the total number to 170. Keys to families, tribes, genera, and species are included. The discussion of each genus is terminated by a section giving the synonymies of the hosts concerned. The 114 plates are said to contain among the best illustrations of fleas currently available, and are grouped according to family. A section listing hosts, each with the fleas known to occur on it, recapitulates the host-flea information; sections dealing with references, systematic index and list of abbreviations close the volume.

Orders at the price of $9.00 to members and $10.00 to non-members may be placed with the *Society* for Memoir No. 5. Orders should be addressed to *Mr. Herbert J. Conkle, Custodian, Plant Quarantine Branch, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.*

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Figs – For control of dried fruit beetles and vinegar flies. Use Emulsifiable Liquid or dusts at recommended rates. Apply when necessary up to 3 days from harvest.

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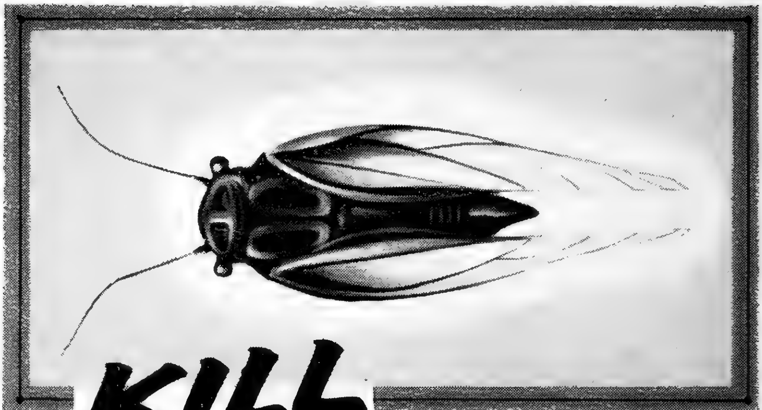

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(Continued from Front Cover)

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of the
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Regular meetings of the Society are held in Room 43 of the U. S. National Museum on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

MEMBERSHIP

Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are $5.00; initiation fee is $1.00 (U. S. currency).

PROCEEDINGS

Published bimonthly beginning with February by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are $5.00 per year, both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

The Society does not exchange its publications for those of other societies.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about $12.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines should indicate present mailing address of the author and his organizational affiliation, if possible. Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding references in which author, year, title, name of publication, volume and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

Proportions of full-page illustrations should closely approximate 4-5/16 x 6" (26 x 36 picas); this usually allows explanatory matter to appear on the same page. Cost of illustrations in excess of that for one full-page line cut will be borne by the author.

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 61 JUNE, 1959 No. 3

THE GENUS ANISEPYRIS IN AMERICA NORTH OF MEXICO

(HYMENOPTERA, BETHYLIDAE)

HOWARD E. EVANS, *Cornell University, Ithaca, N. Y.*[1]

Anisepyris is one of the most distinctive genera of Bethylidae: the pronotal disc is margined on three sides by a carina and the male antennae are apparently only 12-segmented. Some of the species are fairly large (for bethylids) and some of them are brightly colored with metallic blue or green, giving them a superficial resemblance to cleptids and chrysidids. Aside from Kieffer's work (1914, Das Tierreich, 41: 434-444), there have been no revisionary studies of this group, and identification of species has been impossible, especially since several of Ashmead's species properly belonging here have been assigned by Kieffer and others to other genera. The present paper is an attempt to remedy this situation.

Anisepyris is a strictly American genus, with its center of distribution in the islands and continental areas surrounding the Caribbean Sea and the Gulf of Mexico. Kieffer recognized three species from the United States, seven from Central America, five from the West Indies, and six from Trinidad and northern South America. In the present paper the number of species known to occur in the United States is increased to twelve, four times the number recognized by Kieffer. The number of neotropical species will, I am sure, eventually be increased by at least as many times. I had hoped to include at least part of the neotropical fauna in this study, but because of the unavailability of Kieffer's types and the ambiguity of his descriptions this has proved impossible.

Material studied.—Specimens of *Anisepyris* are not common in collections, and I have had to borrow material from many different

[1] The Grace H. Griswold Fund, Entomology Department, Cornell University, is acknowledged for assuming the expense of two plates.

SMITHSONIAN INSTITUTION JUN 29 1959

sources on which to base this study. I have listed in the following paragraph these various sources of material and have indicated the abbreviations used for them in this paper. Arrangement is alphabetical with respect to the abbreviations. I wish to express my thanks to all who have loaned material for use in this study.

American Museum of Natural History, New York (AMNH); Academy of Natural Sciences, Philadelphia (ANSP); California Academy of Sciences, San Francisco (CAS); California Insect Survey, Berkeley (CIS); Carnegie Museum, Pittsburgh (CM); Cornell University, Ithaca (CU); Florida State Plant Board, Gainesville (FPB); Henry K. Townes, Ann Arbor, Mich. (HKT); Illinois Natural History Survey, Urbana (INHS); Kansas State College, Manhattan (KSC); Karl V. Krombein, Arlington, Va. (KVK); Museum of Comparative Zoology, Cambridge, Mass. (MCZ); Oregon State College, Corvallis (OSC); R. R. Dreisbach, Midland, Mich. (RRD); University of Arizona, Tucson (UA); University of California, Davis (UCD); University of Idaho, Moscow (UI); U. S. National Museum, Washington (USNM).

Systematic position.—There can be little doubt that *Anisepyris* represents a single, rather specialized phyletic line which has arisen from some element in the much more protean, cosmopolitan genus *Rhabdepyris.* I would expect it to have evolved from that stock which includes, for example, the southwestern U. S. species *megacephalus* Ashmead. In this species the body form is very suggestive of *Anisepyris*, the male genitalia approach those of that genus, and the third antennal segment of the male is nearly as much reduced. However, the pronotal disc is not margined by a carina. Several other species (so far as I know all undescribed) possess a carina on the anterior margin of the pronotal disc, but not on the sides, and show a still further tendency for the third antennal segment of the male to become reduced and consolidated with the fourth. It is not at all difficult to visualize *Anisepyris* as having arisen from a *megacephalus*-like stock and to point out certain species which appear to represent stages in this evolution.

These facts make it uncertain as to whether *Anisepyris* deserves full generic status. It is quite possible that when the generic classification of the Bethylidae has been finally settled, *Anisepyris* as here understood will constitute no more than a subgenus of *Rhabdepyris* or some other inclusive genus. However, since *Anisepyris* is easily recognizable and apparently monophyletic, I see no harm in continuing to recognize it for the present as a full genus.

Ethology.—I have examined over 400 specimens of this genus, but not one of them bears any host data. Other Epyrini attack the larvae of Coleoptera and Lepidoptera (see summary by Yamada, 1955, Mushi, 28: 14-16). I would expect *Anisepyris* to do likewise, but I have no idea precisely what they may attack. Specimens are most often taken close to the ground, especially where the soil is somewhat sandy; they are often collected by sweeping low grass or other vegetation. More than most other Bethylidae, adults of this genus feed on honeydew, and are probably more often taken on foliage covered with honeydew than anywhere else. There are also several records of them visiting flowers for nectar.

Structure and terminology.—The species of *Anisepyris* vary in length from 3 to 8 mm. Both sexes are fully winged. The antennae are 13-segmented in both sexes, but in the male the third segment is reduced to a barely visible ring-segment closely consolidated with the fourth (fig. 7), such that the antennae appear 12-segmented. The mandibles have five apical teeth (rarely four). The clypeus has a strong median carina which apically may form a small tooth. The eyes are large and are hairy. Certain measurements of the head have been found useful for separating species. The term *vertical facial line* is used for an imaginary line drawn from the top of the vertex to the bottom of the clypeus, in full frontal view. The term *transfacial line* is used to denote the greatest width of the head, including the eyes, again in full frontal view. The *middle interocular line* is an imaginary line drawn between the eyes at the narrowest part of the front. Eye height is measured in lateral view. The *ocello-ocular line* is one drawn from the nearest eye margin to a lateral ocellus; the *width of the ocellar triangle* includes the two lateral ocelli as well as the space between them.

The pronotum is flat or slightly convex dorsally and bears a strong transverse carina anteriorly as well as a pair of lateral carinae, so that the disc is margined on three sides. In many species there is a groove running parallel to the posterior margin, often more or less punctate or foveolate. The mesoscutum bears a pair of strong notauli which diverge slightly anteriorly and do not quite reach the anterior margin. The scutellum has at its base a strong transverse groove which is slightly expanded on each side. The propodeum has five (fig. 11) or seven (fig. 2) discal carinae, and two carinae on each side, the lateral and sublateral carinae; there is a strong carina separating the disc from the declivity, and the latter has a median carina and numerous transverse rugae. The mesopleuron has numerous large and small foveae. At the extreme top is an elongate submarginal fovea; below this is a series of two foveae, often connected, which I call the *upper mesopleural foveae;* below this is another large fovea (fig. 13) or series of two foveae (fig. 8) which I call the *lower mesopleural foveae.* The wing venation is like that of other Epyrini and appears to show no diagnostic characters on either the generic or the species level.

The last sternite of the male, or subgenital plate, is subtriangular and truncate or emarginate apically (figs. 5, 16). The genitalia are characteristic of the genus and show only minor differences between the species (fig. 3). The aedeagus is slender and of simple structure. The parameres form large lateral lobes bearing numerous setae and having a somewhat reticulate surface (fig. 4). The structures between the aedoeagus and the parameres constitute the somewhat complex volsellae. The more median appendage is the digitus, a somewhat shoe-shaped structure with a series of small apical serrations. The lateral appendage is the cuspis, which is divided apically into dorsal and ventral arms, both of which bear a few small setae.

Nomenclature.—The genus *Anisepyris* was described by Kieffer in 1905 (*In* André, Spec. Hymen. Eur. Alg., v. 9, p. 248), although both Neave's Nomenclator and that of the Prussian Academy (as well as Kieffer himself) date the genus from 1906 (Ann. Soc. Sci. Bruxelles, 30: 137). Muesebeck and Walkley (1951, U. S. Dept. Agri. Monogr. no. 2, p. 730) correctly date the genus and also point out that the type species is *Epyris amazonicus* Westwood, the only described species mentioned by Kieffer in his original description. Kieffer designated *A. aeneus* Kieffer as type, but this was a *nomen nudum* until a year later. I have seen no specimens of *amazonicus*, but have no reason to doubt that it is congeneric with the species here treated under the name *Anisepyris.*

Key to Species

Females

1. Pronotal disc with numerous longitudinal carinae; teeth of mandibles irregular, the basal one very small, fig. 28; clypeus yellowish, with a narrow black apical border; pronotum and mesonotum contrasting in color, the former greenish, the latter bluish .... 12. **rugosicollis** Brues
   Pronotal disc without longitudinal carinae, except one on each side; teeth of mandibles more regular; clypeus black; pronotum and mesonotum not contrastingly colored 2
2. Mandibles with four teeth, the upper tooth broad and blade-like, fig. 27; mandibles with a strong ridge on the outer side; head and thorax bluish or greenish, the abdomen rufous at least apically .... 11. **analis** (Cresson)
   Mandibles with five similar teeth in an oblique series and without a ridge on the outer side, figs. 22, 23, 26; color variable, rarely as above 3
3. Anterior part of front rectangularly produced so that the ridge above the antennal orbits is far below the bottoms of the eyes, the antennal scrobes nearly vertical and not margined above by a carina, fig. 21; lateral carinae of pronotal disc weak .... 10. **dietrichorum,** new species
   Anterior part of front not rectangularly produced, the ridge above the orbits closer to the bottoms of the eyes, the scrobes more oblique and margined above by a carina, figs. 1, 12, 20; lateral carinae of pronotal disc strong 4
4. Middle tibiae very weakly spinose, fig. 6; lower mesopleural fovea divided in two or at least strongly constricted in the middle, figs. 8, 9; propodeum with seven discal carinae, fig. 2 (**columbianus** group) 5
   Middle tibiae spinose above for most of their length, fig. 14; lower mesopleural fovea entire, its upper margin often weakly defined, fig. 13; propodeum usually with five discal carinae, occasionally with seven (**occidentalis** group) 8

5. Head and thorax black or weakly aeneous or violaceous; middle interocular line usually considerably exceeding the eye height 6
Head and thorax strongly aeneous or bluish, the propodeum and gaster contrastingly black with deep blue reflections; middle interocular line barely exceeding the eye height 7
6. Lower mesopleural fovea almost always completely divided by a vertical ridge, fig. 8; punctures of front separated from one another by from 1 to 3 times their own diameters; legs wholly ferruginous .... 1. **columbianus** (Ashmead)
Lower mesopleural fovea constricted in the middle, but rarely divided except occasionally by a very narrow line, fig. 9; front generally more closely punctate, the punctures separated from one another by from 0.5 to 2 times their own diameters; basal parts of legs dark brown (except legs wholly ferruginous in specimens from Arizona and southern California) .... 2. **williamsi,** new species
7. Head and thorax aeneous or bluish-green; front shining, weakly to moderately alutaceous; size smaller, 4.0-5.2 mm. .... 3. **aeneiceps** (Ashmead)
Head and thorax dark blue, without any greenish reflections; front very weakly shining, strongly alutaceous; size larger, about 6 mm. .... 4. **grandis** (Ashmead)
8. Pronotum with a well-defined punctate groove paralleling the posterior margin; species of western distribution, east to Idaho and Arizona 9
Pronotum without a groove paralleling the posterior margin, or such a groove weakly developed on the sides and absent medially; chiefly eastern and midwestern species, west to Colorado and British Columbia 11
9. Front narrow and eyes relatively large, the middle interocular line subequal to the eye height, fig. 18; vertex but little produced above the tops of the eyes; propodeum with seven discal carinae, but with the sublateral carinae obsolescent, fig. 19 .... 7. **laticeps,** new species
Front broader, the middle interocular line at least 1.25 times the eye height, figs. 12, 15; vertex extending well above the tops of the eyes; propodeum with five discal carinae (rarely with seven, but the additional two weak) the sublateral carinae strong, fig. 11 10
10. Vertex broad, more or less squared off, the occipital carina weak and not or barely visible in anterior view, figs. 10, 12; ocello-ocular line considerably greater than the width of the ocellar triangle .... 5. **occidentalis** (Ashmead)
Vertex narrow and more rounded, the occipital carina strong, visible in anterior view at the top of the vertex, fig. 15; ocello-ocular line barely if at all exceeding the width of the ocellar triangle .... 6. **arizonicus,** new species
11. Upper part of front, in profile, relatively flat, the lower part strongly swollen, fig. 23; mandibles unusually broad, the basal four teeth very broad and blunt, figs. 23, 26; head and thorax dark blue .... 9. **gibbosifrons,** new species
Front, in profile, rather evenly rounded, fig. 22; mandibles not unusually broad; color black, the head and thorax sometimes more or less bluish .... 8. **subviolaceus** Kieffer

Males

(Males of *aeneiceps, analis, arizonicus, dietrichorum,* and *rugosicollis* are unknown.)

1. Ocellar triangle relatively small, the ocello-ocular line exceeding the width of the ocellar triangle; lower mesopleural fovea divided in two by a vertical ridge; base of digitus of genitalia with only about two small setae, fig. 3 (**columbianus** group) 2
   Ocellar triangle larger, the ocello-ocular line equal to or shorter than the width of the ocellar triangle; lower mesopleural fovea undivided, often incomplete or obsolescent; base of digitus with numerous large setae, figs. 17, 24, 25 (**occidentalis** group) 4
2. Head and thorax with a rather strong dark bluish cast; legs mostly bright ferruginous .... 4. **grandis** (Ashmead)
   Head and thorax black, with at most obscure bluish reflections; legs black, the tarsi and sometimes the tibiae brownish 3
3. Punctures of front generally obscured by the strong microscopic sculpturing; pronotal disc strongly alutaceous, rather dull; lower mesopleural fovea generally divided by a flat-topped ridge ... 1. **columbianus** (Ashmead)
   Punctures of front small but clearly evident; pronotal disc weakly alutaceous, shining; lower mesopleural fovea generally divided by a narrow carina .... 2. **williamsi,** new species
4. Pronotum without a punctate groove paralleling the posterior margin, except on the extreme sides; head with a strong bluish cast .... 9. **gibbosifrons,** new species
   Pronotum with a punctate groove paralleling the posterior margin (occasionally somewhat weakened medially); head with at most a very weak bluish cast 5
5. Front strongly alutaceous, strongly and closely punctate, the punctures separated by no more than their own diameters; head very broad, the transfacial line 1.15 times the vertical facial line ....7. **laticeps,** new species
   Front weakly to moderately alutaceous, the punctures separated by more than their own diameters (occasionally obsolescent); transfacial line from 1.05 to 1.15 times the vertical facial line 6
6. Wings pale, the veins light yellowish-brown, the setulae on the membrane light brown to nearly white; antennal flagellum yellowish ventrally and apically, sometimes almost wholly yellowish; front weakly to strongly shining, noticeably alutaceous .... 8. **subviolaceous** Kieffer
   Wings darker, the veins brown, setulae on the wing membrane brown; antennae black, the terminal segments often suffused with brown; front strongly shining, weakly alutaceous, the punctures strong (rarely nearly absent) .... 5. **occidentalis** (Ashmead)

Columbianus Species-Group

This group contains four species which are exceedingly similar in form, even to having virtually identical male genitalia in which the setae at the base of the digitus are small and only about two in number. In the female the middle tibiae are weakly spinose and the propodeal disc has seven carinae. The lower mesopleural fovea is

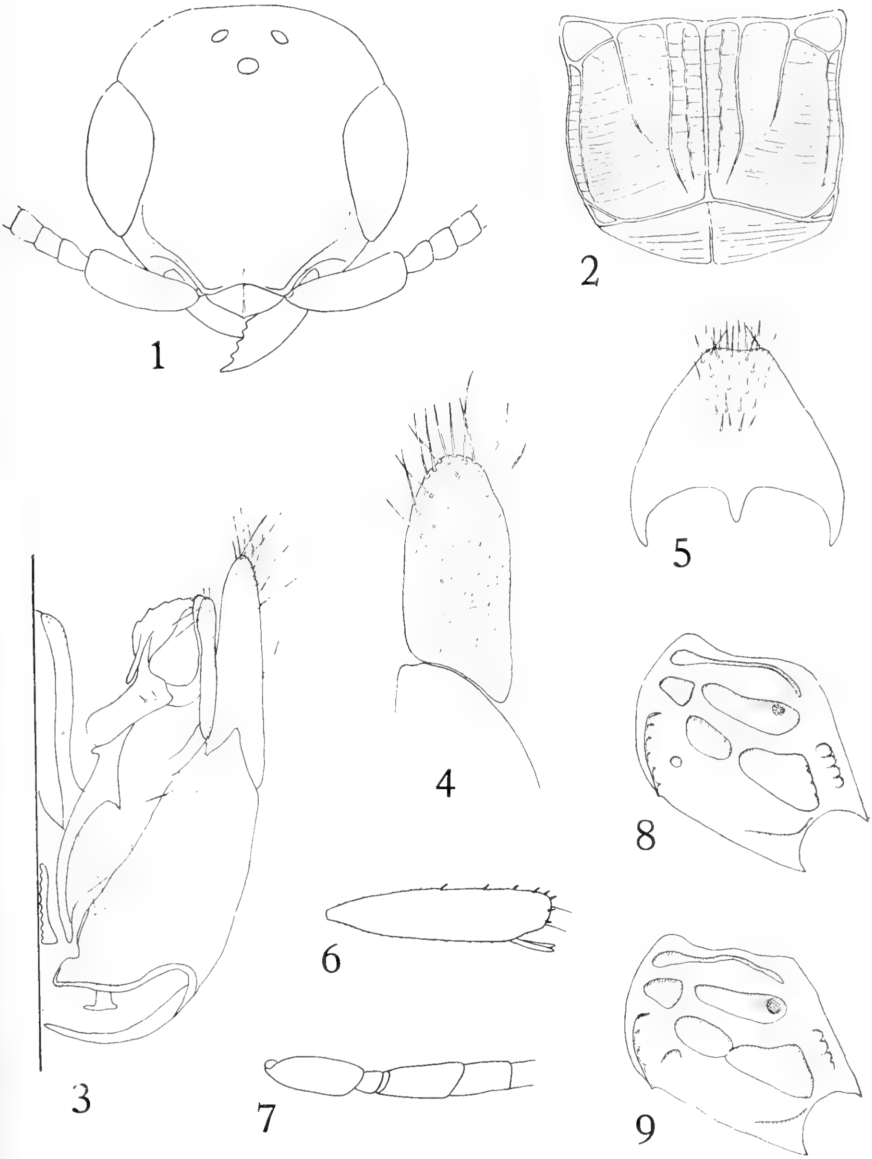

Fig. 1, *Anisepyris columbianus* (Ashmead), anterior aspect of head of female. Fig. 2, same, dorsal view of propodeum of female. Fig. 3, same, ventral aspect of left half of male genitalia. Fig. 4, same, lateral view of paramere of male. Fig. 5, same, ventral aspect of subgenital plate of male. Fig. 6, same, middle tibia of female. Fig. 7, same, basal five segments of antenna of male. Fig. 8, same, lateral view of mesopleuron of female. Fig. 9, *A. williamsi*, new species, lateral view of mesopleuron of female.

divided in two or nearly so. The ocellar triangle is small, with the ocello-ocular line exceeding the width of the ocellar triangle in both sexes.

1. **Anisepyris columbianus** (Ashmead)

(Figs. 1-8)

Epyris columbianus Ashmead, 1893, Bull. U. S. Nat. Mus., 45:58, 60-61. [Type: ♀, Washington, D. C., USNM no. 14065.] —Brues, 1907, Bull. Wisc. Nat. Hist. Soc., 5:98.

Rhabdepyris (Trichotepyris) columbianus Kieffer, 1908, Genera Insectorum, 76:31.

Rhabdepyris (Rhabdepyris) columbianus Kieffer, 1914, Das Tierreich, 41:348, 357.

Anisepyris pulchellus Fouts, 1928, Proc. Ent. Soc. Wash., 30:126. [Type: ♀, Glen Echo, Md., Aug. 1, 1921 (R. M. Fouts), coll. R. M. Fouts.] New synonymy. —Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 730.

Rhabdepyris columbianus Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 729.

Anisepyris columbianus Krombein, 1958, Proc. Ent. Soc. Wash., 60:50.

This appears to be the commonest *Anisepyris* east of the Great Plains. It has been taken in Berlese samples, at light, sweeping grasslands, on honeydew, and on the flowers of *Asclepias* and *Ameliancher*. In the South it appears to occur throughout the year; in the North most records are from the late summer months.

Female.—Length 4-6 mm.; fore wing 2.5-3.3 mm. Color black, head and parts of thorax sometimes faintly aeneous; mandibles dark ferruginous; antennae ferruginous, slightly infuscated apically; legs, including coxae, bright ferruginous. Wings nearly hyaline, with a faint, diffuse brownish cloud in outer part of submedian cell and a larger, more distinct brownish cloud around and below radial vein. Mandibles with five simple teeth in an oblique series. Head subcircular in anterior view, transfacial and vertical facial lines subequal, fig. 1. Clypeal carina, in profile, weakly arched. Front moderately shining, distinctly alutaceous, punctures small but well-defined, separated from one another by from 1 to 3 times their own diameters. Middle interocular line .57 to .63 times transfacial line, 1.0 to 1.25 times eye height; ocello-ocular line from 1.2 to 1.4 times width of ocellar triangle; carina above antennal scrobes strong, reaching nearly to the eyes. Pronotal disc moderately shining, alutaceous, sparsely punctate; anterior and lateral carinae strong; subapical foveolate groove well-defined, complete. Mesocutum sparsely punctate. Propodeum with seven discal carinae and transversely striolate as shown in figure 2. Mesopleuron with the lower fovea divided in two by a vertical ridge which is often wide, sometimes very narrow, rarely incomplete, fig. 8. Middle tibiae with subappressed hairs among which are a few small spines, mostly toward the apex, fig. 6.

Male.—Length 3-5 mm.; fore wing 2.0-2.9 mm. Color black; apex of mandibles ferruginous; antennae varying from pale brown to nearly black; legs black, the tarsi and sometimes the tibiae brown; wings subhyaline. Mandibles with five teeth; clypeal carina strongly arched. Front very weakly shining, strongly alutaceous, the punctures small, shallow, and usually scarcely visible amid the strong microscopic sculpturing. Basal antennal segments as shown in figure 7. Middle interocular line .63 to .67 times transfacial line, 1.3 to 1.42 times eye height; ocello-ocular line 1.05 to 1.20 times width of ocellar triangle; carina above antennal scrobes strong. Pro- and mesonota weakly shining, moderately alutaceous, weakly punctate; pronotal disc with margining carinae and posterior groove very strong. Propodeal disc about as in female, but the two carinae close beside the median carina often weak, so that there are only five well-defined discal carinae. Mesopleura about as in female. Subgenital plate, fig. 5, truncate or very weakly concave apically. Genitalia, figs. 3, 4, with only two small setae at the base of the digitus and with the two arms of the cuspis both linear or nearly so.

Distribution.—This species ranges from Florida and central Texas north to Kansas, Illinois, New York, and Massachusetts. I have examined 102 specimens from the following localities: MASSACHUSETTS: 1 ♂, Woods Hole (K. Cooper) [USNM]; NEW YORK: 1 ♀, 1 ♂, Ithaca, July, Sept. (H. Evans) [CU]; 1 ♂, Granby Center, July (H. Evans) [CU]; 1 ♀, Central Park, L. I. (G. Engelhardt) [MCZ]; 1 ♂, Cold Spring Harbor, L. I., July [AMNH]; NEW JERSEY: 1 ♂, Princeton, Oct. (K. Cooper) [USNM]; PENNSYLVANIA: 1 ♀, Philadelphia (C. F. Baker) [USNM]; 1 ♀, Edge Hill, May [ANSP]; 1 ♀, Hanover, June (Bridwell & Barber) [USNM]; 2 ♂ ♂, Ohio, Pyle, Aug. [CM]; MARYLAND: 4 ♀ ♀, 2 ♂ ♂, Cabin John, Glen Echo, Takoma Park, Piney Pt., June-Oct. [USNM, HKT, coll. R. M. Fouts]; DISTRICT OF COLUMBIA: 1 ♀, Washington [USNM]; VIRGINIA: 18 ♀ ♀, 4 ♂ ♂, Barcroft, Falls Church, Arlington, Glencarlyn, Clifton, Vienna, Dunn Loring, Apr.-Sept. [USNM, MCZ, AMNH, HKT]; WEST VIRGINIA: 1 ♂, Lost River State Park, Hardy Co., Aug. (K. Krombein) [KVK] NORTH CAROLINA: 1 ♀, Elizabethtown, Apr. H. & M. Townes) [HKT]; 1 ♀, Hamrick, Aug. (H. & M. Townes) [HKT]; 3 ♀ ♀, Wallace, June (H. Townes) [HKT]; SOUTH CAROLINA: 1 ♀, 3 ♂ ♂, Columbia, Aug.-Sept. (L. & G. Townes) [HKT]; 1 ♀, Florence, Feb. (C. Rainwater) [USNM]; 1 ♀, 4 ♂ ♂, Greenville, Aug.-Sept. (L. & G. Townes) [HKT]; 2 ♂ ♂, Table Rock, Aug. (G. & L. Townes) [HKT]; GEORGIA: 1 ♀, Zebulon, Apr. (P. Fattig) [USNM]; 1 ♂, LaGrange, Aug. [AMNH]; FLORIDA: 1 ♂, Jacksonville [USNM]; 1 ♀, Edgewater, Feb. (C. Frost) [MCZ]; 1 ♀, Marion Co., March (H. Weems) [FPB]; ALABAMA: 2 ♀ ♀, Auburn (C. F. Baker) [USNM]; TENNESSEE: 1 ♂, Gatlinburg, July (R. Whittaker) [USNM]; OHIO: 1 ♀, Shaker Heights, Aug. (E. McDonald) [USNM]; ILLINOIS: 11 ♀ ♀, 2 ♂ ♂, Urbana, Jan-Dec. [INHS, AMNH]; 1 ♀, Thebes, Apr. (Ross & Sanderson) [INHS]; 1 ♂, Evergreen Park, Aug. (Ross & DeLong) [INHS]; 1 ♂, Elizabethtown, July (Ross & DeLong) [INHS]; 1 ♀, Plainview, June [INHS]; MISSOURI: 1 ♂, Springfield, Sept. (R. Crandall) [UA]; KANSAS: 3 ♂ ♂, Riley Co., July-Aug. [KSC, USNM]; 1 ♀, Lawrence, June [CM]; LOUISIANA: 1 ♀, Tallulah [USNM]; TEXAS: 1 ♀, no further data [ANSP]; 1 ♀ Kerrville, June (F. Pratt) [USNM]; 1 ♂, College Station [USNM]; 1 ♂, Brownwood, July

[USNM]; 1 ♂, Mercedes, Feb. [USNM]; 1 ♀, Denton Co., Dec. [INHS]; 1 ♂, S. F. Austin St. Pk., near Sealy, May (H. Evans) [CU]; 4 ♂ ♂, 5 mi. N. of Sinton, May (H. Evans) [CU].

2. **Anisepyris williamsi,** new species
(Fig. 9)

This species inhabits the Pacific coastal states, east to Utah and Arizona. It is very similar to *columbianus* and may represent only a western race of that species; however, on the basis of present data there seems to be a wide gap between the ranges of the two species. As in *columbianus,* there is a tendency for specimens from southern parts of the range to be somewhat more brightly colored and to have the front narrower in relation to the eye height.

Female.—Length 4-5.5 mm.; fore wing 2.6-3.2 mm. Color black, head and parts of thorax frequently faintly aeneous or violaceous; mandibles dark ferruginous; antennae brownish, somewhat ferruginous beneath; legs dark brown, tarsi and sometimes the tibiae light yellowish-brown (in specimens from Arizona and southern California the legs and antennae are mostly bright ferruginous). Wings subhyaline, with weak, diffuse infuscated areas in outer part of submedian cell and around and below radial vein. Mandibles with five simple teeth in an oblique series. Front weakly to moderately shining, distinctly alutaceous, punctures of moderate size, separated from one another by from 0.5 to 2 times their own diameters. Middle interocular line .59 to .65 times transfacial line, 1.1 to 1.35 times eye height; ocello-ocular line 1.0 to 1.25 times width of ocellar triangle. Carina above antennal scrobes strong, reaching at least halfway to eyes. Pronotal disc moderately shining, sparsely punctate; anterior and lateral carinae strong; subapical marginal punctate groove well-defined. Mesoscutum weakly punctate; propodeum as described and figured for *columbianus.* Mesopleuron with lower fovea typically constricted sharply in the middle, fig. 9, in one specimen actually divided in two. Middle tibiae weakly spinose.

Male.—Length 3-5 mm.; fore wing 2-3 mm. Color black; apex of mandibles dark ferruginous; antennae dark brown to black; legs black except tarsi and sometimes tibiae brownish; wings nearly hyaline. Mandibles 5-toothed; clypeal carina strongly arched. Third antennal segment minute, barely visible; fourth segment 1.6 times as long as its greatest thickness. Front moderately shining, alutaceous, punctures weak, shallow, separated by 1 to 2 times their own diameters. Middle interocular line .63 to .66 times transfacial line, 1.3 to 1.5 times eye height; ocello-ocular line from 1 to 1.15 times width of ocellar triangle; carina above antennal scrobes strong, reaching nearly to eyes. Pro- and mesonota shining, weakly punctate; pronotum with margining carinae and posterior submarginal groove strong. Propodeum with five or seven discal carinae, the carinae close beside the median carina varying from weak to quite strong. Mesopleuron with the lower fovea divided (or nearly so) by a narrow (rarely a broad) vertical ridge. Subgenital plate and genitalia as described for *columbianus.*

Types.—Holotype ♀, Danville, Contra Costa Co., Calif., July 12, 1949 (F. X. Williams); allotype ♂, same data but Aug. 2, 1949 [both

CAS]. The remaining specimens listed below are to be regarded as paratypes.

Distribution.—Arizona and southern California north to Oregon, Idaho, and Utah. I have examined 40 specimens from the following localities: CALIFORNIA: 3 ♀♀, 2 ♂♂, Danville, July-Aug. (Williams) [CAS, USNM]; 1 ♂, Mt. Diablo, Aug. (Williams) [CAS]; 2 ♀♀, Woodland, Aug. (A. McClay) [UCD]; 1 ♀, Strawberry, Tuolumne Co., June (J. Rozen) [CIS]; 1 ♀, Tuolumne City, June (Rozen) [CIS]; 1 ♀, Lemon Cove, Tulare Co., July [CU]; 1 ♀, 1 ♂, San Diego, Aug. (H. & M. Evans) [CU]; 1 ♀, Carmel, May (E. VanDyke) [CAS]; 1 ♀, San Jose, June [CAS]; 1 ♀, San Mateo Co., June (W. Giffard) [CAS]; 1 ♀, Redwood Canyon, Marin Co., May (VanDyke) [CAS]; 1 ♀, N. Sacramento, Nov. (stinging Mrs. A. P. Messenger) [USNM]; 1 ♂, Lindsay, March, on *Asclepias* (W. Davidson) [USNM]; 1 ♀, Stanford Univ., Feb., on pepper tree (F. Sumner) [CAS]; 1 ♂, Cedar Pass, Modoc Co., Oct. (E. Schlinger) [UCD]; 1 ♂, Niles Canyon, July (W. Giffard) [CAS]; 1 ♂, Clayton, Shasta Co., July (E. VanDuzee) [CAS]; 1 ♂, no further data [paratype of *occidentalis* Ashmead, USNM]; OREGON: 4 ♀♀, 3 ♂♂, Corvallis, July-Oct. [USNM, OSC]; 2 ♀♀, 2 ♂♂, Woodburn, Aug., on wild carrot (R. Rieder) [OSC]; 1 ♂, Cornelius, Aug. (Schuh & Gray) [OSC]; IDAHO: 2 ♂♂, 12 mi. NW Regina, Ada Co., July, on *Helianthus* (W. Barr) [UI]; UTAH: 1 ♂, Fernow Valley, Juab Co., June (R. Fautin) [CAS]; ARIZONA: 1 ♀, 30 mi. E. of Quijotoa, Pima Co., Aug. (J. Bradley) [CU].

3. **Anisepyris aeneiceps** (Ashmead), new combination

Epyris aeneiceps Ashmead, 1893, Bull. U. S. Nat. Mus., 45:58, 59. [Type: ♀, Fort Capron, Florida, Nov. 4 (E. A. Schwarz) USNM no. 14064.] —Brues, 1907, Bull. Wisc. Nat. Hist. Soc., 5:98.

Rhabdepyris (*Trichotepyris*) *aeneiceps* Kieffer, 1908, Genera Insectorum, 76:31.

Rhabdepyris (*Rhabdepyris*) *aeneiceps* Kieffer, 1914, Das Tierreich, 41:347, 356.

Rhabdepyris aeneiceps Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 729.

This species is also very similar to *columbianus* and may possibly represent a South Florida race of that species. However, the difference in color is striking, and I have seen no intermediates. I have seen only three specimens, all females.

Female.—Length 4-5.2 mm.; fore wing 2.5-3 mm. Color black, the head and thorax with strong metallic reflections which vary from aeneous to greenish-blue, contrasting to the color of the propodeum and gaster, which is shining black with faint bluish reflections; mandibles, antennae, and legs wholly bright ferruginous; anterior, depressed portion of pronotum dark ferruginous; tegulae testaceous. Wings subhyaline, with brownish clouding about as in *columbianus* but more intense. Mandibles with five simple teeth in an oblique series. Clypeal carina in profile nearly straight; carina above the antennal scrobes weak, reaching about halfway to the eye margins. Front shining, moderately alutaceous, punctures separated from one another by from 1.5 to 2 times their own diameters. Middle interocular line .56 to .59 times transfacial line, 1.0 to 1.1 times eye height; ocello-ocular line 1.1 to 1.3 times width of ocellar triangle. Pronotal disc weakly punctate, margining carinae fairly strong, but groove paralleling the posterior margin rather weak, shallow. Mesoscutum alutaceous, weakly punctate. Propodeum as described and figured for *columbianus*, fig. 2, the transverse striations on the posterior part of the disc a little weaker. Lower mesopleural fovea divided in two by a vertical ridge which may be narrow or fairly broad.

Male.—Unknown.

Distribution.—Southern Florida. I have examined three specimens, as follows: FLORIDA: 1 ♀, Fort Capron, Nov. (E. A. Schwarz) [type, USNM]; 1 ♀ So. Miami, Oct. (S. Graenicher) [MCZ]; 1 ♀, Pinellas Co., Feb. 22, 1930 (B. Moora) [USNM].

4. **Anisepyris grandis** (Ashmead), new combination

Goniozus grandis Ashmead, 1887, Ent. Amer., 3:76. [Type: ♀, Jacksonville, Fla. USNM no. 14066.]

Epyris grandis Ashmead, 1893, Bull. U. S. Nat. Mus., 45:58, 61. —Brues, 1907, Bull. Wisc. Nat. Hist. Soc., 5:98.

Rhabdepyris (*Trichotepyris*) *grandis* Kieffer, 1908, Genera Insectorum, 76:31.

Rhabdepyris (*Rhabdepyris*) *grandis* Kieffer, 1914, Das Tierreich, 14:347, 355.

Rhabdepyris grandis Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 729.

This species is known only from the type and from a single male assigned here tentatively. With so little material available, it is difficult to be certain that it represents a distinct species from *aeneiceps* or *columbianus*, but my present feeling is that it does. Ashmead's male allotype, which he described at length in 1893, is an *Epyris*. The venational character with Ashmead mentions is not present in his type female.

Female.—Length 6 mm.; wings incomplete. Color black, head and thorax with strong bluish reflections, propodeum and gaster shining black, with faint blue reflections; mandibles, antennae, and legs wholly bright ferruginous; tegulae testaceous. Mandibles with five simple teeth in an oblique series. Carina above the antennal scobes rather strong, but reaching only about halfway to eye margins. Front weakly shining, strongly alutaceous; punctures large, in the center of the front removed from one another by from 1 to 1.5 times their own diameters. Middle interocular line .58 times the transfacial line, 1.12 times the eye height; ocello-ocular line 1.25 times width of ocellar triangle. Pronotal disc moderately shining, weakly punctate; margining carinae fairly strong, groove paralleling the posterior margin only weakly foveolate. Mesonotum weakly punctate. Propodeal disc essentially as described and figured for *columbianus*, fig. 2. Lower mesopleural fovea divided in two by a broad, vertical ridge.

Male.—Length 4.3 mm.; fore wing 2.6 mm. Color black, head and thoracic dorsum with strong, deep blue reflections; apex of mandibles and tip of abdomen dark ferruginous; antennae dark brown, lighter toward apex; legs bright ferruginous, coxae and middle and hind femora tinged with fuscous; wings subhyaline. Mandibles with five teeth; clypeal carina strongly arched; carina margining the antennal scrobes strong, reaching more than halfway to eye margins. Front weakly shining, strongly alutaceous, punctures shallow and barely evident amid the microscopic sculpturing, 1-2 times their own diameters apart. Middle interocular line .65 times transfacial line, 1.3 times eye height; ocello-ocular line 1.15 times width of ocellar triangle. Pro- and mesonota moderately shining, strongly alutaceous, the punctures shallow and inconspicuous. Propodeum with seven discal carinae; lower mesopleural fovea divided in two by a broad ridge. Subgenital plate and genitalia not differing noticeably from those of *columbianus*, figs. 3, 4, 5.

Distribution.—Known only from northeastern Florida. I have seen two specimens as follows: FLORIDA: 1 ♀, Jacksonville [type, USNM]; 1 ♂, Welaka, May 1-4, 1955 (H. E. & M. A. Evans, on thistle honeydew) [CU].

Occidentalis Species-Group

This group contains five species which are closely related although slightly more diverse structurally than are members of the preceding group. In the female the middle tibiae are strongly spinose and the propodeum usually has only five discal carinae. The male genitalia have a group of 7 or 8 strong setae at the base of the digitus. In both sexes the lower mesopleural fovea is undivided and its upper margin often somewhat ill-defined. The ocellar triangle is fairly large, and in the male the ocello-ocular line measures shorter than the width of the ocellar triangle.

5. **Anisepyris occidentalis** (Ashmead), new combination
(Figs. 10-14, 16-17)

Epyris occidentalis Ashmead, 1893, Bull. U. S. Nat. Mus., 45:58, 59 [type: ♀, Poway, Calif., USNM no. 14062.][2] —Brues, 1907, Bull. Wisc. Nat. Hist. Soc., 5:98.

Anisepyris punctaticeps Kieffer, 1906, Ann. Soc. Sci. Bruxelles, 30:139. [Type: ♂, "Ormsby, Nev." (location unknown); paratype ♂, Ormsby Co., Nev., July (C. F. Baker), CU no. 369.] New synonymy. —Kieffer, 1914, Das Tierreich, 41:434, 436. —Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 730.

Rhabdepyris (Trichotepyris) occidentalis Kieffer, 1908, Genera Insectorum, 76:32.

Rhabdepyris (Rhabdepyris) occidentalis Kieffer, 1914, Das Tierreich, 41:347, 356.

Rhabdepyris occidentalis Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 729.

This is apparently a not uncommon species in western United States. Both sexes exhibit a certain amount of variation in the size and proximity of the punctures of the head and thorax. Females from southern California often have the head behind the eyes much enlarged, giving

[2]Ashmead's male allotype is a specimen of *A. williamsi*, new species.

them a very different appearance, fig. 10. I had originally set these females aside as a different species, but it soon became apparent that some specimens are intermediate between this "macrocephalous" condition and the more normal head shape of the species, fig. 12.

Female.—Length 4.0-6.2 mm.; fore wing 2.8-3.6 mm. Color black, head and thorax sometimes obscurely violaceous; mandibles and antennae fusco-ferruginous; coxae and femora black or dark fusco-ferruginous, tibiae light or dark fusco-ferruginous, tarsi yellowish-brown (in Arizona specimens legs entirely bright rufous). Wings hyaline, fore wing slightly clouded along the radial vein; veins brown. Mandibles rather broad, terminating in five strong teeth in an oblique series. Clypeus very short, truncate apically, its median carina short, weakly arched in profile. Front strongly shining, very weakly alutaceous; punctures usually strong, separated from one another by from 2 to 5 times their own diameters. Middle interocular line .61 to .67 times transfacial line, 1.3 to 1.5 times eye height; ocello-ocular line 1.1 to 1.25 times width of ocellar triangle. Vertex extending well above tops of eyes and somewhat squared off, figs. 10, 12; carina above antennal scrobes strong, reaching about two-thirds distance to eye margins. Pronotal disc strongly shining, weakly alutaceous, punctate; margining carinae strong; subapical transverse groove well-defined, complete. Mesoscutum moderately shining, sparsely punctate. Propodeum with five discal carinae and transversely striate as shown in figure 11; in a few individuals an additional pair of weak carinae is present close beside the median carina. Mesopleura with the lower fovea large, its upper margin not sharply defined, fig. 13. Middle tibiae with numerous strong spines over entire upper surface, fig. 14.

Male.—Length 3.5-5.0 mm.; fore wing 2.3-3.1 mm. Color black; palpi light brown; mandibles dark ferruginous apically; antennae black, often somewhat paler toward the apex; legs black except the tarsi, which are light to dark yellowish-brown; tip of abdomen sometimes suffused with reddish-brown; wings hyaline, veins and stigma brown, setulae on membrane brown. Mandibles with five strong teeth; clypeal carina strongly arched. Front strongly shining, weakly alutaceous, strongly punctate (rarely weakly punctate), the punctures separated by from 1.5 to 3 times their own diameters. Middle interocular line from .61 to .68 times transfacial line, 1.33 to 1.62 times eye height; ocello-ocular from .75 to .95 times width of ocellar triangle. Carina above antennal scrobes strong, reaching nearly to eye margins. Pro- and mesonota strongly shining, weakly punctate; groove paralleling the posterior margin of the pronotum very strong. Propodeal disc with five carinae, like that of female but in general less heavily sculptured. Mesopleura as in female. Subgenital plate arcuately emarginate apically, fig. 16. Genitalia similar to those of *columbianus* except for certain features of the vol-

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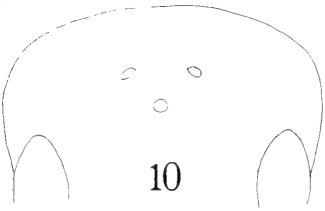
Fig. 10, *Anisepyris occidentalis* (Ashmead), anterior aspect of upper half of head of a female from Sonoma Co., Calif. Fig. 11, same species, dorsal view of propodeum of female. Fig. 12, same species, anterior aspect of head of a female from Ada Co., Idaho. Fig. 13, same species, lateral view of mesopleuron of female. Fig. 14, same, middle tibia of female. Fig. 15, *A. arizonicus*, new species, anterior aspect of head of female. Fig. 16, *A. occidentalis* (Ashmead), ventral aspect of subgenital plate of male. Fig. 17, same, volsella of male, ventral aspect. Fig 18, *A. laticeps*, new species, anterior aspect of head of female. Fig. 19, same, dorsal view of propodeum of female.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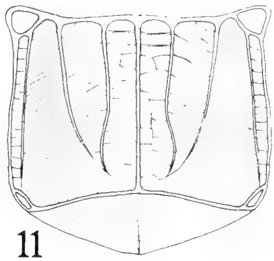
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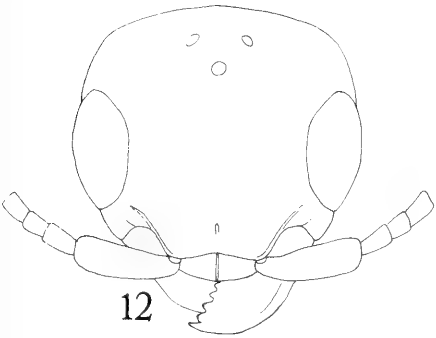
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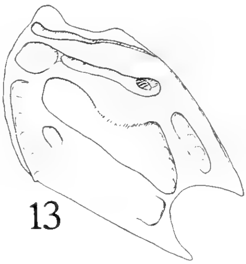
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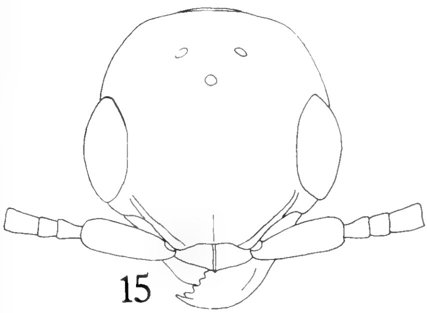
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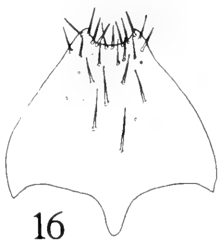
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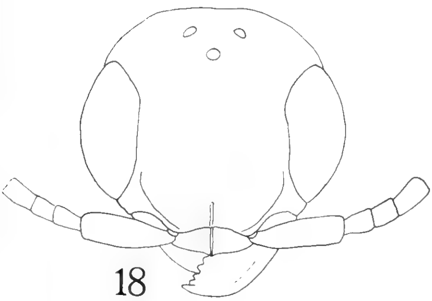
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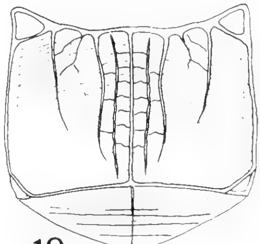
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sellae, fig. 17; the hooklet along the inner margin is more acute, there are seven or eight large setae at the base of the digitus, and the ventral arm of the cuspis is broader and abruptly narrowed subapically.

Distribution.—Arizona and southern California north to Idaho and Washington. I have examined 104 specimens from the following localities: ARIZONA: 2 ♀♀, 5 mi. W of Portal, Cochise Co., Mar., Apr. (M. Cazier) [AMNH]; CALIFORNIA: 1 ♀, Poway, San Diego Co. [type, USNM]; 1 ♀, Lindsay, May, on *Asclepias* (W. Davidson) [USNM]; 1 ♀, San Diego (F. Blaisdell) [CAS]; 1 ♀, Gilroy, Sept. (K. Hagen) [CIS]; 2 ♀♀, Mesa Grande, Sonoma Co., July (Blaisdell) [CAS]; 1 ♀, San Francisco, April (E. VanDyke) [CAS]; 1 ♀, Big Dalton Dam, Los Angeles Co., June (J. MacSwain) [CIS]; 2 ♀♀, without further data [MCZ, ANSP]; NEVADA: 2 ♂♂, Ormsby Co., July (C. Baker) [CU]; UTAH: 1 ♀, Garland, July (G. Knowlton) [USNM]; IDAHO: 66 ♀♀, 18 ♂♂, 12 mi. NW Regina, Ada Co., July, on *Helianthus* (W. Barr) [UI, USNM]; 1 ♀, 9-18 mi. E. Weiser, Washington Co., July, on Grindelia (W. Barr) [UI]; 1 ♀, 1 ♂, Shoshone, July (W. Shull) [UI]; OREGON: 1 ♂, Corvallis, July [CU]; WASHINGTON: 1 ♂, Walla Walla, June (G. Bohart) [CIS].

6. **Anisepyris arizonicus**, new species
(Fig. 15)

This species is similar to *occidentalis* in most respects, but the much narrower vertex, with the occipital carina visible at its crest in anterior view, readily distinguish it. It is known from only three specimens, all females.

Female.—Length 5.2-6.2 mm.; fore wing 3.0-3.6 mm. Color black; mandibles ferruginous; antennae pale ferruginous basally, weakly infuscated toward apex; tegulae testaceous; legs bright ferruginous except coxae, which are mostly infuscated. Wings hyaline, veins and stigma light brown. Mandibles with five teeth; clypeal carina strongly arched in profile. Head slightly higher than wide, transfacial distance about .95 times vertical facial distance, fig. 15. Front strongly shining, weakly alutaceous, punctures strong, separated from one another by from 1.5 to 3 times their own diameter. Middle interocular line .63 to .65 times transfacial line, 1.25 to 1.30 times eye height; ocello-ocular line equal to or slightly greater than width of ocellar triangle. Vertex extending well above eye tops, rather narrowly rounded; occipital carina strong, visible at the top of the vertex when the head is viewed from directly in front. Carina above antennal scrobes strong, reaching nearly to eye margins. Pronotal disc about twice as broad as long, moderately shining, with strong punctures; margining carinae strong; punctate groove paralleling the posterior margin distinct for its entire length. Mesoscutum moderately shining, moderately punctate. Propodeal disc with five carina, its sculpturing not differing noticeably from that of *occidentalis*, fig. 11. Mesopleura also as described and figured for *occidentalis*, fig. 13.

Male.—Unknown.

Types.—Holotype ♀, Santa Rita Mts., Ariz., June 16 (E. A. Schwarz); 2 paratype ♀♀, same data but May 20 and 21 [all USNM, type no. 64395].

Distribution.—Known only from the type locality.

7. **Apisepyris laticeps**, new species
(Figs. 18, 19, 24)

This small and rather distinctive species is also known only from southern Arizona, in this case from one female and one male. This sex association is a tentative one, although it seems logical enough on the basis of presently available material. Both sexes possess an unusually broad head and closely punctate front, characters which separate the species readily from *occidentalis* and *arizonicus*.

Female.—Length 4.7 mm.; fore wing 2.7 mm. Color black; thorax with a faint bluish cast; mandibles and antennal flagellum dusky ferruginous; scape and legs beyond coxae bright ferruginous; tegulae testaceous; apical abdominal tergite suffused with brown. Wings hyaline, veins and stigma brown. Mandibles with five sharp teeth in an oblique series. Clypeus broadly truncate apically, its median carina weakly arched in profile. Head slightly wider than high, transfacial line 1.05 times vertical facial line, fig. 18. Front moderately shining, strongly alutaceous, strongly and closely punctate, punctures separated by little more than their own diameters. Middle interocular line .57 times transfacial line, approximately equal to eye height; ocello-ocular line subequal to width of ocellar triangle. Pronotal disc strongly alutaceous, sparsely punctate, with a strong groove paralleling the posterior margin. Mesoscutum and scutellum alutaceous, weakly shining, sparsely punctate. Propodeum with seven discal carinae, the sculpturing otherwise rather weak, the sublateral carinae obsolescent, fig. 19. Mesopleural foveae much as in *occidentalis*, but the upper margin of the lower fovea more distinct. Middle tibiae slightly less strongly spinose than in *occidentalis.*

Male.—Length 3.3 mm.; fore wing 2.6 mm. Color black; apex of mandibles and last abdominal segment suffused with dark ferruginous; flagellum brown; tegulae brown; legs dark brown except the tarsi lighter. Wings hyaline, veins and stigma light brown. Clypeal carina strongly arched; carina margining the antennal scrobes above very strong. Head much broader than high, transfacial line 1.15 times vertical facial line. Front moderately shining, moderately alutaceous, strongly and closely punctate, the punctures separated from one another by approximately their own diameters. Middle interocular line .64 times transfacial line, 1.4 times eye height. Vertex very broad, rather evenly rounded; ocello-ocular line .9 the width of the ocellar triangle. Pronotal disc moderately shining, alutaceous, weakly punctate; margining carinae strong; groove paralleling posterior margin strong and complete. Mesoscutum and scutellum moderately shining, weakly and sparsely punctate. Propodeum with five discal carinae, between which are some irregular rugae; posterior part of disc smooth and shining. Mesopleural foveae as in female. Subgenital plate weakly arcuately emarginate apically. Genitalia very much like those of *occidentalis,* but the dorsal arm of the cuspis somewhat broader, fig. 24.

Types.—Holotype ♀, Southwestern Research Station, 5 mi. W. of Portal, Cochise Co., Arizona, May 14, 1956 (M. Statham) [AMNH]; allotype ♂, Douglas, Arizona, Sept. 18, 1938 (R. H. Crandall) [USNM].

Distribution.—Known only from extreme southeastern Arizona.

8. **Anisepyris subviolaceus** Kieffer
(Figs. 20, 22)

Anisepyris subviolaceus Kieffer, 1910, Ann. Soc. Ent. France, 79:39. [Type: ♀, Denver, Colo. (C. F. Baker) (location unknown).] —Kieffer, 1914, Das Tierreich, 41:435-436. —Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 731.

This species poses a number of problems. First of all, I have not seen the type or any paratypes of *subviolaceus*. However, the species I am treating under that name is the only one I know to occur in Colorado. There is reasonably good agreement with Kieffer's brief description, except for Kieffer's statement ''mésonotum et scutellum à reflet faiblement violacé.'' The usual color of females of this species is glossy black, with weak bluish reflections over the entire body, and this is true of the Colorado specimens I have seen. However, I have seen a few specimens, including two from Nebraska, in which the entire head and thoracic dorsum is quite conspicuously dark blue. Eastern specimens often have the head conspicuously bluish, the thorax less so. I have seen no specimens whatever in which the scutellum and mesoscutum are more evidently violaceous than other parts of the body. The females exhibit not only an unusual amount of variation in color, but also in pronotal shape and density of punctation. The males show much variation in punctation of the front and in the strength of the groove paralleling the posterior margin of the pronotum. It is entirely possible that I am confusing more than one species under the name *subviolaceus*. Only further collecting can solve this problem.

Female.—Length 4.0-5.6 mm.; fore wing 2.5-3.4 mm. Color black, with bluish reflections which are usually faint, but sometimes rather strong on the head and/or thorax; mandibles dark ferruginous; antennae ferruginous, often slightly dusky toward apex; tegulae testaceous; legs bright ferruginous except front coxae fuscous, the other coxae often partially infuscated. Wings hyaline, veins and stigma brown. Mandibles moderately broad, basal four teeth rather broad, fig. 22, but less so than in the following species. Clypeus short, its median carina strongly arched. Carinae margining the antennal scrobes above strong, reaching nearly to eye margins. Front moderately to strongly shining, usually rather weakly alutaceous, punctures strong, separated by from 2 to 3.5 times their own diameters (or sometimes very small and separated by as much as 6 times their diameters). Middle interocular line .66 to .70 times transfacial line, 1.40 to 1.73 times eye height; ocello-ocular line 1.05 to 1.3 times width of ocellar triangle. Front, in profile, evenly convex, fig. 22; vertex, in anterior view, extending well above the eye tops, very broadly rounded, almost rectangular, fig. 20. Pronotal disc convex, moderately to strongly shining; margining carinae well developed, but groove paralleling the posterior margin absent or very nearly so. Mesoscutum with strong, widely spaced punctures. Propodeal disc with five carinae, in general similar to that of *occidentalis,* but with the sculpturing inclined to be somewhat reduced posteriorly. Mesopleura with the upper fovea elongate, often entire, the lower fovea large, undivided, its upper margin poorly defined. Middle tibiae strongly spined above.

Male.—Length 3.3-4.8 mm.; fore wing 2.2-3.1 mm. Color black; palpi brownish; mandibles rufous apically; antennae with the scape blackish, the flagellum brown, grading into light yellowish-brown ventrally and apically, sometimes almost wholly yellowish; legs black, tibiae light to dark brown, tarsi light brown; tip of abdomen sometimes suffused with brownish. Wings hyaline, with a whitish cast, veins and stigma light brown, setulae on the membrane light brown to whitish. Mandi-

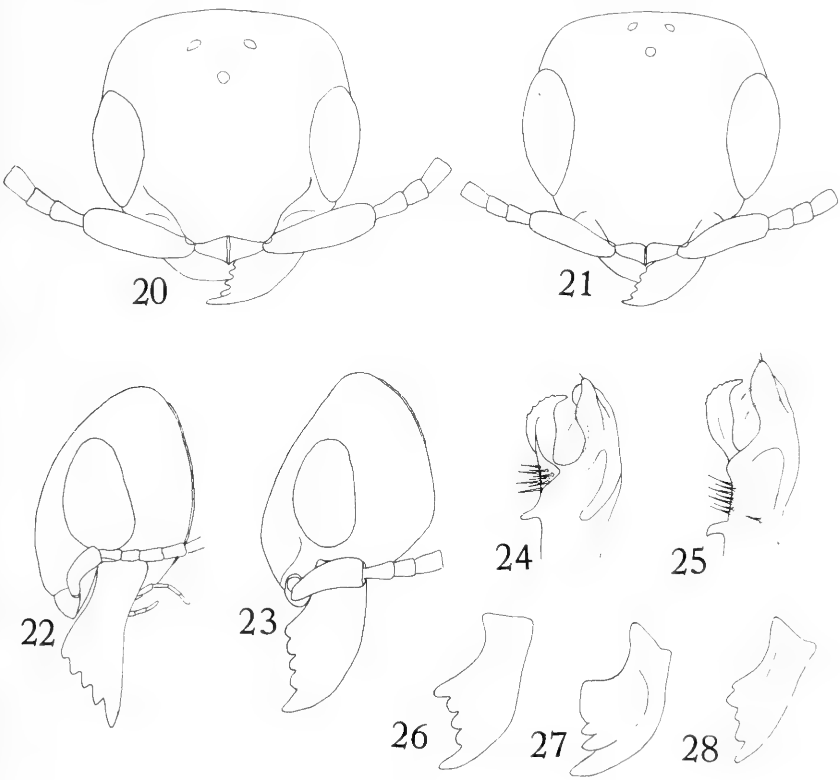

Fig. 20, *Anisepyris subviolaceus* Kieffer, anterior aspect of head of female. Fig. 21, *A. dietrichorum,* new species, anterior aspect of head of female. Fig. 22, *A. subviolaceus* Kieffer, lateral aspect of head of female. Fig. 23, *A. gibbosifrons,* new species, lateral aspect of head of female holotype. Fig. 24, *A. latifrons,* new species, volsella of male, ventral aspect. Fig. 25, *A. gibbosifrons,* new species, volsella of male, ventral aspect. Fig. 26, same species, mandible of female paratype. Fig. 27, *A. analis* (Cresson), mandible of female. Fig. 28, *A. rugosicollis* Brues, mandible of female.

bles with five strong teeth. Apex of clypeus with a median tooth; clypeal carina strongly arched. Front moderately to strongly shining, alutaceous, punctures very variable, sometimes large and distinct, sometimes small or even nearly absent. Middle interocular line .64 to .69 times transfacial line, 1.33 to 1.58 times eye height; ocello-ocular line .75 to 1.0 times width of ocellar triangle. Pronotal disc weakly to rather strongly alutaceous; margining carinae strong; punctate groove paralleling the posterior margin usually strong and complete, sometimes weakened or even obsolete medially. Mesonotum moderately alutaceous, weakly punctate; propodeal disc with five carinae; mesopleura as in female. Terminalia not differing markedly from those of *occidentalis*, but subgenital plate only weakly concave apically and hooklet on inner margin of volsella less acute.

Distribution.—This species ranges from Florida, Texas, and New Mexico north to Pennsylvania, Michigan, Wyoming, and British Columbia; it appears to be especially characteristic of the Great Plains, where it is the dominant species of the genus. I have examined 84 specimens from the following localities: FLORIDA: 1 ♀, Jacksonville [USNM]; 1 ♂, Osceola Co., Aug. (J. Kirkland) [USNM]; 20 ♂♂, Welaka, April, on thistle honeydew (H. & M. Evans) [CU]; SOUTH CAROLINA: 1 ♀, Columbia, Aug. (L. & G. Townes) [HKT]; PENNSYLVANIA: 1 ♀, Philadelphia (C. Baker) [USNM]; MICHIGAN: 1 ♂, Cheboygan Co., Aug. (R. Dreisbach) [RRD]; 1 ♀, Missaukee Co., July (R. Dreisbach) [RRD]; ILLINOIS: 1 ♂, Algonquin, Aug. [USNM]; 2 ♀♀, 1 ♂, St. Anne, July, Aug. [INHS]; NEBRASKA: 1 ♀, Dunning, Aug. (R. Dreisbach) [RRD]; 2 ♀♀, Mullens, July (R. Dreisbach) [RRD]; IOWA: 1 ♂, Co. no. 44, July [USNM]; KANSAS: 2 ♀♀, 4 ♂♂, Manhattan, July-Sept. [KSC]; 2 ♂♂, Riley Co., June, Sept. [KSC]; 1 ♂, Dickinson Co., Aug. (J. Bridwell) [USNM]; 1 ♂, Trego Co. [KSC]; TEXAS: 1 ♀, Victoria, July, under dry cowchips (J. Mitchell) [USNM]; 1 ♂, Fedor, Lee Co., June [USNM]; 13 ♂♂, 5 mi. N Sinton, May, on thistle honeydew (H. Evans & O. Flint) [CU]; 1 ♂, Inez [IHNS]; 3 ♂♂, Brownsville (J. Bridwell) [USNM]; 1 ♂, 6–10 mi. W Ft. Davis, July (H. Evans) [CU]; NEW MEXICO: 1 ♀, Springer (C. Ainslie) [USNM]; COLORADO: 3 ♀♀, 2 ♂♂, Fort Collins, May-Aug. (C. Baker) [USNM]; WYOMING: 5 ♂♂, Powder River, Aug. (Dreisbach & Schwab) [RRD]; IDAHO: 2 ♀♀, 6 ♂♂, 12 mi. NW Regina, Ada Co., July, on *Helianthus* (W. Barr) [UI, USNM]; BRITISH COLUMBIA: 1 ♂, Vernon, Aug. (H. Leech) [CAS].

9. **Anisepyris gibbosifrons**, new species

(Figs. 23, 25, 26)

This is a very distinctive species and little difficulty should be experienced in its recognition. I would judge it to be the most highly evolved member of the *occidentalis* group.

Female.—Length 5-6 mm.; fore wing 2.9-3.6 mm. Color black; front and pro- and mesonota with strong deep blue reflections; mandibles dark ferruginous; antennae and tegulae dusky ferruginous; legs bright ferruginous, coxae somewhat infuscated. Wings subhyaline. Mandibles very large, their apical width three-fourths as great as their maximum length; apical tooth sharp, the other four teeth unusually broad and blunt, fig. 23; in the female paratype the most basal tooth is more prominent than the other three, fig. 26. Clypeus very short, barely visible in full frontal view, its carina strongly arched. Front nearly flat above, very strongly swollen below bottoms of eyes, fig. 23; carinae margining antennal scrobes above rather strong; vertex produced far above tops of eyes, nearly rectangular, very weakly emarginate medially. Front alutaceous but rather strongly shining, punctures distinct, separated from one another by from 2 to 4 times their own diameters. Middle interocular line .70 to .72 times transfacial line, 1.7 times eye height; ocello-ocular line 1.2 to 1.3 times width of ocellar triangle. Pronotal disc alutaceous, shining, sparsely punctate; margining carinae fairly strong, but posterior margin without a well-defined subapical groove except on the sides. Mesoscutum slightly more closely punctate than the pronotum. Propodeal disc with five carinae, more or less transversely striate, but the postero-lateral angles smooth and shining. Mesopleura with the lower fovea large, undivided. Middle tibiae strongly spinose.

Male.—Length 4.8 mm.; fore wing 3.1 mm. Color black, the front strongly reflecting dark blue; apex of mandibles ferruginous; antennae suffused with yellowish ventrally, the apical few segments wholly yellowish-brown; tibiae light brown, tarsi yellowish-brown; wings subhyaline. Mandibles with five sharp teeth; clypeal carina strongly arched. Front strongly alutaceous, moderately shining, with strong punctures which are separated by 1 to 2 times their own diameters; carinae margining the scrobes above strong; front with a pair of weak ridges closly paralleling the upper inner orbits. Middle interocular line .64 times transfacial line, 1.26 times eye height; ocello-ocular line .9 the width of the ocellar triangle. Pro- and mesonota weakly shining, strongly alutaceous, fairly closely punctate; pronotal disc with the margining carinae strong, but the groove paralleling the posterior margin virtually absent. Propodeum and mesopleura about as in female. Subgenital plate very weakly emarginate apically. Genitalia very similar to those of *occidentalis* and *subviolaceus;* volsellae with the basal hooklets rather thick, both dorsal and ventral arms of the cuspis rather stout, fig. 25.

Types.—Holotype ♀, Clementon, N. J., May 24, 1902 (J. C. Bradley) [USNM, type no. 64396]; allotype ♂, Welaka, Fla., Apr. 18-20, 1955, on thistle honeydew (H. & M. Evans) [USNM]; paratype ♀, Sanford, Fla., Apr. 27, 1908 (VanDuzee) [AMNH].

Distribution.—Atlantic coastal plain, Florida to New Jersey.

Anomalous Species

The three species which follow can not be placed in either of the preceding two species-groups, nor are they closely related to one another. All of them are restricted to the extreme southern United States and two of them, at least, have their closest relatives in the neotropics. All three are known from the female sex only.

10. **Anisepyris dietrichorum**, new species
(Fig. 21)

This species resembles the members of the *occidentalis* group in several respects, but the tibiae are weakly spinose and the propodeum has seven discal carinae. The antennal scrobes are nearly vertical and are ecarinate, a character shared only with *rugosicollis*.

Female.—Length 4.5 mm.; fore wing 2.6 mm. Color black; mandibles dark ferruginous; antennae brownish-ferruginous, yellowish-brown beneath; coxae black, trochanters light brown, femora dark brown, paler apically, tibiae and tarsi light brown; apical abdominal segment suffused with dark ferruginous. Wings subhyaline. Mandibles with five simple teeth; clypeal carina strongly arched. Front strongly alutaceous, rather weakly shining; punctures weak, separated from one another by 1 to 2 times their own diameters. Anterior part of front somewhat rectangularly produced, so that the antennae arise far below the level of the bottoms of the eyes; antennal scrobes nearly vertical, not margined by a distinct carina, fig. 21. Middle interocular line .62 times transfacial line, 1.2 times eye height; ocello-ocular 1.2 times width of ocellar triangle; head rather narrow, vertical facial line 1.1 times transfacial line. Pronotal disc alutaceous, weakly shining, weakly punctate; anterior transverse carina strong, but lateral carinae very delicate; groove paralleling the posterior margin moderately strong but without a series of close-set punctures. Mesoscutum alutaceous, very weakly punctate, notauli strongly diverging in front; groove at base of scutellum narrow, abruptly expanded at each end. Propodeum with seven discal carinae, transversely striate between the carinae, not dissimilar to *columbianus*. Upper mesopleural fovea divided into a small anterior and a more elongate posterior fovea; lower fovea undivided, not sharply defined. Middle tibiae with a few short, weak spines above.

Male.—Unknown.

Type.—Holotype ♀, Arivaca, Pima Co., Arizona, June 2, 1953 (Alice & Henry Dietrich) [USNM, type no. 64387].

Distribution.—Known only from the type.

11. **Anisepyris analis** (Cresson), new combination

Epyris analis Cresson, 1872, Trans. Amer. Ent. Soc., 4:193-194. [Type: ♀, Texas (G. Belfrage), USNM no. 1662.] —Ashmead, 1893, Bull. U. S. Nat. Mus., 45:60. —Brues, 1907, Bull. Wisc. Nat. Hist. Soc., 5:98.

Rhabdepyris (*Trichotepyris*) *analis* Kieffer, 1908, Genera Insectorum, 76:31.

Rhabdepyris (*Rhabdepyris*) *analis* Kieffer, 1914, Das Tierreich, 41:356.

Rhabdepyris analis Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 729.

This remarkable species can scarcely be confused with any other. The mandibles are unlike those of any other Nearctic species, but like those of certain West Indian species such as *planiceps* (Fabricius). Probably *analis* is a derivative of this or a related West Indian species and entered our fauna through Florida. Florida specimens differ markedly in color from specimens from other parts of the range: the head and thorax are a much more brilliant green and the gaster is wholly rufous. However, Georgia and South Carolina specimens are somewhat intermediate, so it does not seem wise to recognize a separate subspecies for the Florida population.

Female.—Length 5.5-7.5 mm.; fore wing 3.4-4.6 mm. Head and thorax bluish green to bright metallic green; propodeum black; gaster black, apical segments bright ferruginous, or abdomen (in Florida specimens) wholly ferruginous; palpi light brown; mandibles and antennae ferruginous; tegulae testaceous; legs ferruginous except front coxae blackish, the other coxae weakly infuscated. Fore wings tinged with brown on the basal .4 and also with a large brown cloud in the vicinity of the radial vein, the area between (below the stigma) paler, the apical .2 of the wing also paler; hind wing hyaline basally, weakly clouded apically. Mandibles very broad apically, strongly curved and with a distinct ridge on outer side, apex with only four teeth, basal tooth broad and blade-like, fig. 27. Clypeal carina strongly arched. Front with a distinct median impression just above the antennal bases; carinae margining the antennal scrobes above strong, reaching nearly to the eye margins and then turning upward parallel to the margins before fading out. Front shining, alutaceous, with strong punctures which are separated from one another by from 1 to 2 times their own diameters. Middle interocular line .61 to .65 times transfacial line, 1.05 to 1.23 times eye height; ocello-ocular line 1.5 to 1.8 times width of ocellar triangle. Pronotal disc moderately shining, alutaceous, punctate; margining carinae strong; groove paralleling posterior margin strong, complete. Mesoscutum and scutellum weakly punctate. Propodeal disc with seven carinae, strongly transversely striate between the carinae. Upper mesopleural fovea divided into a small anterior pit and a larger subtriangular posterior fovea; lower fovea complete, somewhat ill-defined. Middle tibiae not spinose.

Male.—Unknown.

Distribution.—Florida and Texas north to Tennessee and North Carolina. I have seen 10 specimens from the following localities: FLORIDA: 1 ♀, Crescent City, March (H. Hubbard) [USNM]; 1 ♀, Welaka, June (Downes) [USNM]; 1 ♀, Lake City, July (B. Smith) [USNM]; GEORGIA: 1 ♀, St. Simon Isl., May (J. Bradley) [CU]; SOUTH CAROLINA: 1 ♀, McClellanville, May (H. & M. Townes) [HKT]; NORTH CAROLINA: 2 ♀♀, Wallace, June (H. Townes) [HKT]; TENNESSEE: 1 ♀, Clarkville, April [USNM]; TEXAS: 2 ♀♀ (no further data) [ANSP, USNM].

12. **Anisepyris rugosicollis** Brues
(Fig. 28)

Anisepyris rugosicollis Brues, 1908, Bull. Wisc. Nat. Hist. Soc., 6:48-49. [Type: ♀, Esperanza Ranch, Brownsville, Texas (C. Schaeffer), USNM no. 42712.] —Kieffer, 1914, Das Tierreich, 41:435, 436. —Muesebeck and Walkley, 1951, U. S. Dept. Agri. Monogr. 2, p. 731.

This form possesses an abundance of specific characters and shows no close relationship to any other known species. Doubtless it will prove to occur widely in Mexico and Central America.

Female.—Length 4.0-4.5 mm.; fore wing 2.5-3 mm. Head bronzy-green, with violet reflections; pronotal disc bronzy-green; mesopleura and sides of pronotum bronzy bluish-green; mesoscutum and scutellum violet with some bronzy reflections; mouthparts and adjacent parts of under side of head rufo-castaneous; clypeus and area around antennal sockets rufo-castaneous, except apical margin of clypeus narrowly black; antennae rufous, somewhat dusky apically; anterior part of pronotum (i.e., the collar) rufous; tegulae brown; front and middle legs dark reddish-brown, tarsi yellow-brown; hind legs light reddish-brown; propodeum and gaster black. Wings hyaline, fore wings bifasciate, with a distinct brown cloud in outer part of median and submedian cells and a second cloud above and below the radial vein. Mandibles with five teeth which are somewhat irregular, the innermost tooth weak, fig. 28. Clypeal carina broad, not arched. Antennal scrobes not margined above by a carina. Front somewhat shining, very strongly alutaceous, punctures small and barely evident. Middle interocular line .62 times transfacial line, 1.15 times eye height; ocello-ocular line 1.1 times width of ocellar triangle. Vertex extending well above eye tops, rounded. Pronotal disc with the margining carinae strong, groove paralleling the posterior margin consisting of a series of rather large foveae; area set off by the margining carinae and posterior groove filled with numerous (more than 20) somewhat irregular, anastomosing longitudinal carinae. Mesonotum strongly alutaceous; groove at base of scutellum very narrow, connecting two large pits. Propodeal disc with five carinae, transversely striate between the carinae. Mesopleura strongly alutaceous, upper and lower foveae both elongate and complete. Middle tibiae not spinose.

Male.—Unknown.

Distribution.—Known only from Brownsville, Texas. I have examined three ♀♀ from Brownsville, all USNM.

THE SCOLYTOIDEA OF THE NORTHWEST, by W. J. Chamberlin. Oregon State College Monographs, Studies in Entomology, No. 2, 1958, 205 pp., 113 figs., $2.50.

This is the second extensive publication on this important group of insects by Dr. Chamberlin. The former one was photolitho offset in 1939 under the title: The bark and timber beetles of North America. It contained 513 pages with many illustrations and an extensive bibliography. The present publication is essentially a condensation of the former work, with an elimination of those species that do not occur in the Northwest. The first 30 pages or so are full of information on such subjects as types of galleries, biologies, lists of host plants, etc. Keys to subfamilies, genera and species, and treatment of individual species make up the bulk of the publication. Many helpful illustrations are included, some original, others taken from miscellaneous sources. There are some errors or deficiencies in the paper, but it is essentially a very good treatment of the species known to occur in the Northwest.

—W. H. Anderson, *Entomology Research Division, U. S. Department of Agriculture, Washington, D. C.*

THE SUBFAMILY LEPTOHYPHINAE. PART II: FIVE NEW SPECIES OF TRICORYTHODES

(EPHEMEROPTERA, TRICORYTHIDAE)

JAY R. TRAVER, *University of Massachusetts, Amherst*

Characters of the genus *Tricorythodes* Ulmer have been presented adequately in previous papers (Ulmer, 1919; Needham, Traver, Hsu, 1935; Traver, 1958). The following qualification of a statement by Traver (1958) should be made in regard to the membranous processes from the wing roots extending backward from the mesonotal scutellum: in an occasional male subimago as well as in female subimagos such processes do occur but in the male are usually very short, barely long enough to show beyond tip of scutellum. In the present paper, three new species of this genus from Mexico and two from Uruguay are described.

Tricorythodes mulaiki, sp. nov.

Represented by 39 male imagos; 36 in alcohol, 3 mounted on slide. Several lack one or more legs or parts thereof.

Size.—Body 3¼-5 mm.; wing 4-5 mm.

Synopsis.—Fore claws of male similar, blunt; forceps base excavated shallowly or not at all; *hind femur longer than hind tibia and tarsus combined;* hind tibia almost 3 times length of tarsus. Abdomen paler reddish brown than thorax, concolorous above and below except for slight darker shading in mid-areas only of basal and apical tergites.

Holotype male (in alcohol, parts not dissected; median as to color characters). **Head:** vertex rather reddish brown, tubercles near posterior margin darker; basal half of pedicel of antenna brown, remainder yellowish; filament broken, its basal portion yellowish. **Thorax:** Pronotum yellowish in middle third, smoky gray patch occupying center of anterior margin, median line narrowly black; lateral areas bright reddish brown, with oblique black line on each side and two paler patches, the anterior of these the smaller, oval. Mesonotum very dark red-brown except for somewhat paler middle strip which in turn has a narrow median line; yellowish areas separate mesonotum from pleura and from scutellar area. Scutellum yellow-tipped, this preceded by a wide dark gray-brown transverse band. Metanotum largely reddish brown. Pleura yellowish with large reddish brown patches: one anterior to each leg, one laterad of scutellum; patch anterior to middle leg continues around on to sternum. Sternum yellowish, somewhat grayed in middle region, laterally with brown patches continued from pleura. **Legs:** Fore trochanter brownish with gray shading, two blackish dots at apex, one on each side; fore femur brownish with two longitudinal yellow streaks, narrow black line across apex preceded by grayish spot; fore tibia largely gray, knee brown, whitish area near base; tarsus missing on holotype, on several of the paratypes gray, first joint pale at base. Middle and hind coxae with reddish brown band, trochanters with black dots at apex; femora yellowish with some brown shading, narrow black band at apex; black streak on knee, tibiae elsewhere yellowish white; tarsi whitish.

Hind femur 1¼ times length of tibia and tarsus combined. **Wings:** Subcosta and radius, and costa at base, very dark gray; R_s, MA and MP_1 faintly gray, all other veins mainly silvery white.

Abdomen practically concolorous light reddish to olive brown; intersegmental areas pale; mid-dorsal line black on tergite 1, pale on middle tergites, pale line also along pleural fold. Faint grayish black shading in mid-areas only on basal tergites 7-8; basal and apical tergites darker red-brown. Two blackish patches (testes?) on sternite 9, within a dark brown triangular area. Forceps and forceps base pale yellowish white; apical margin of forceps base with very slight excavation only. Tails blackish at base for several segments; following this, several silvery white segments, grayish beyond; joinings in basal third blackish to deep gray.

Paratypes resemble holotype except for some slight differences in color, some being rather paler, others darker; some appear to have the sternites slightly deeper in color than the tergites. In these specimens, the apical margin of the forceps base varies from a very slight excavation to a straight line, and even a slight bulge outward.

Holotype.—Male imago. Four miles south of the Rio Papagayo Bridge on Rio Zalope, Guerrero, Mexico; Jan. 4, 1948. S. Mulaik, collector. In private collection of J. R. Traver.

Paratypes.—38 male imagos. Same data. Several in collection of G. F. Edmunds Jr., Univ. of Utah. Genitalia as shown in Figs. 4 and 11.

The species is named in honor of Dr. Stanley Mulaik, of the University of Utah, who collected these and many other specimens which are now in my collection.

The shape of the apical margin of the forceps base places this species in the same group with *explicatus* Eaton; *fallax* Traver; *lichyi* Traver; and *minutus* Traver. It is smaller and much paler than *explicatus;* it lacks the extensive dark markings on the abdominal tergites found in *fallax* and in most specimens of *lichyi*. In general color and appearance it resembles *minutus* so closely that it would certainly have been considered the small form of that species, were it not for the differences in relative lengths of tibiae and tarsi of middle and hind legs; tails are darker at base and gray beyond base rather than brownish as in *minutus*, fore femur and tibia grayish rather than white. Moreover,

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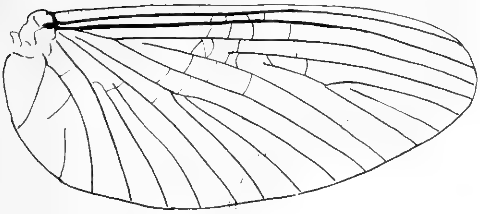
Fig. 1, *Tricorythodes santarita*, n. sp., wing of female holotype; fig. 2, *Tricorythodes arequita*, n. sp., genitalia of male (subimaginal cuticle, partially shed, not shown in figure); fig. 3, *Tricorythodes mulaiki*, n. sp., third leg of male imago (above, tarsus enlarged; below, entire leg, tarsal segmentation omitted); fig. 4, *T. mulaiki*, penes, enlarged; fig. 5, *Tricorythodes comus*, n. sp., genitalia of male imago; fig. 6, *Tricorythodes arequita*, fore leg of male, claws and distal portion of tarsus; fig 7, *T. arequita*, penes, enlarged; fig. 8, *Tricorythodes comus*, penes, enlarged; fig. 9, *Tricorythodes santarita;* third leg of female imago (above, tarsus and base of tibia, enlarged; below, entire leg); fig 10, *Tricorythodes angulatus*, n. sp., genitalia of male imago; fig. 11, *Tricorythodes mulaiki*, genitalia of male imago; fig. 12, *Tricorythodes angulatus*, penes, enlarged.



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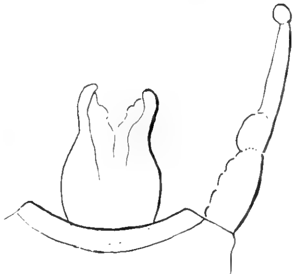

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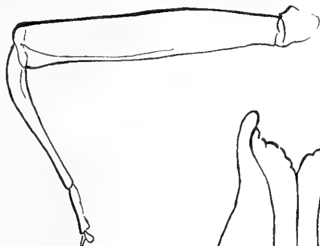

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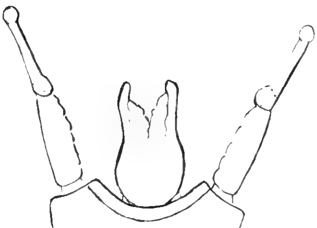

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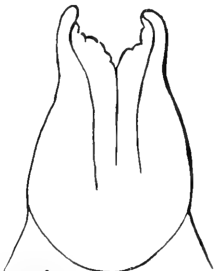

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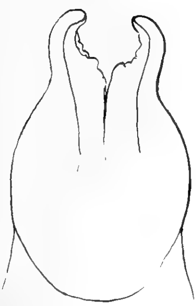

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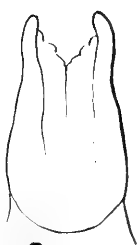

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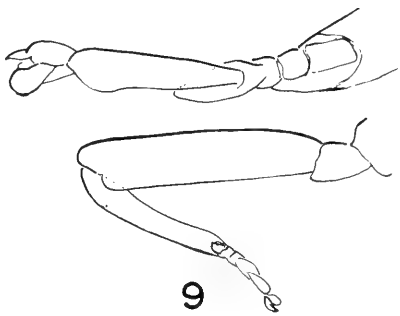

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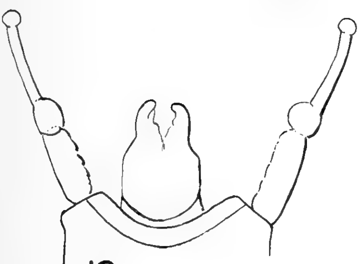

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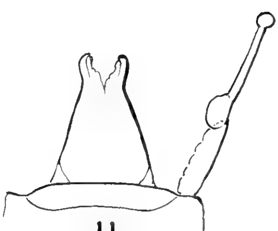

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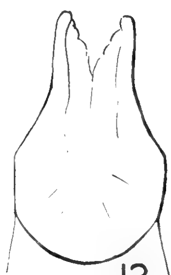

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in both *minutus* and *lichyi* the forceps base, though shallow, is nevertheless deeper than in *mulaiki*. From all of these, as well as from all other species thus far described, *mulaiki* differs in the relative shortness of the hind tibia and tarsus, with the resultant apparent greater length of the hind femur. In all other species studied, hind femur equals tibia plus first, *or* first *and* second, joints of hind tarsus, while in *mulaiki* this femur is 1¼ times as long as tibia and tarsus combined (see Fig. 3). Likewise, in the majority of other species, the hind tibia is twice the length of the hind tarsus (varies, however, from 1½ to 2-2/5 as long), while in *mulaiki* it is almost 3 times the tarsal length. In *mulaiki*, fore tibia is 3½ times as long as the second tibia, varying in other species from 2⅓ to 3 times its length.

Had only a single specimen been available for study, such discrepancies in proportions of leg joints would have been considered aberrant, atypical, perhaps due to injury. But when the same features are found to occur among many specimens, it seems logical to assume that one is dealing, not with aberrations, but with bona fide specific characters.

Tricorythodes comus, sp. nov.

Represented by about 100 male imagos; 2 mounted, others in alcohol.

Size.—Body 3-3½ mm.; wing 3½-3¾ mm.

Synopsis.—Fore claws of male similar, blunt; forceps base with moderately deep excavation on apical margin; pronotum black, contrasting with pale flesh-colored head; abdomen yellowish with rather limited blackish markings.

Holotype male.—**Body** 3 mm.; wing 3½ mm. **Head** flesh-colored, no dark marking except a narrow black line anterior to lateral ocelli; antennae flesh-colored with some gray shading at base, filament absent. **Thorax:** Pronotum black with some very narrow scroll-like yellow markings. Mesonotum deep mahogany brown, antero-median lobe slightly paler, contrasting with the yellowish pleural area on each side, remainder of pleural areas pale reddish brown; tip of scutellum yellowish, preceded by smoky markings; margins, median and submedian lines of mesonotum narrowly black. Metanotum paler reddish brown. No conspicuous dark markings on pleura. Sternum reddish brown except for mid-areas, whitish on prosternum and yellowish to flesh-colored on meso- and metasterna. *Legs.* Coxae and trochanters reddish brown; two conspicuous blackish dots at apex of each trochanter. Fore femur pale reddish brown, margins darker brown, two paler areas near base; apex narrowly darker, preceded by narrow gray longitudinal streak. Fore tibia deep smoky gray, paler just beyond the dark reddish brown knee, on which is a black spot. Fore tarsus paler gray, 3rd and 4th joints still paler basally, claws and distal joint faintly brown-tinged. Femora of second and third legs pale reddish brown with slight gray shading near the dark gray upper margins; tibiae and tarsi yellowish with very pale reddish brown tinge; prominent black knee spot. **Wings:** Costa narrowly purplish brown, not margined; Sc and R purplish gray, the former widely margined except in apical fourth. Other longitudinals as far as CuA pale grayish, silvery white in some lights; subcostal and radial cross veins grayish, others pale, inconspicuous.

Abdomen pale yellowish white tinged faintly below with reddish brown; apical segments reddish brown. Tergites banded with deep smoky to blackish; on 1-3 and 8-9, dark bands extend practically across the segments, but on 4-7 limited to meson; intersegmental areas and anterior margins pale. Mid-dorsal line narrowly black on tergite 1, white on 2-7. On 2, 8 and 9, a short black dash above pleural fold. Sternites pale reddish brown; intersegmental areas pale, so that sternum appears banded; some gray shading on sternite 8, sternite 9 deeper red-brown proximally; rather indistinct narrow dark dashes next to pleural fold on basal and middle sternites. **Tails** pale gray, somewhat darker at base, where joinings are also very narrowly darker. **Genitalia** yellowish white. Forceps base moderately excavated apically, this excavated area relatively narrow.

Paratypes similar to holotype, except as noted below. Antennal filament gray, whitish at base. Abdomen may be pale fawn-colored dorsally, deeper in color ventrally. Variable amount of gray shading on tergites. In a few, inconspicuous shading is present on meson of middle tergites and apical margins of basals only; in these, the femora lack gray shading, and no dark lines are present above, on or below the pleural fold. In many others, all shading on tergites is more intense than on holotype, although similarly distributed; femora of second and third legs quite extensively gray-shaded, this shading composed of many minute dark dots closely spaced; tibiae of these legs similarly shaded; all joinings of tail joints except at extreme tip may be narrowly darker. Still other specimens have blackish shading on basal and apical tergites, gray on the middle ones. The amount of pale ground color between dark bands on the tergites likewise varies considerably; often a pale space occurs between tergites 7 and 8, and all dark bands seem well separated. Genitalia of paratypes shown in Figs. 5 and 8. In some specimens, the penes may appear relatively narrow.

Holotype.—Male imago, in alcohol, parts not dissected. Four miles south of the Rio Papagayo Bridge on Rio Zalope, Guerrero, Mexico; Jan. 4, 1948. S. Mulaik, Coll. In private collection of J. R. Traver.

Paratypes.—47 male imagos, same data. Some of these in collection of G. F. Edmunds, Jr., University of Utah.

In addition to the specimens selected as types, 54 others are held as of this species, these taken at same date, same locality. Many of these have lost one to several legs, antennal filaments, sometimes parts of wings.

Other known species having a black pronotum are *explicatus, atratus* McDunnough, *stygiatus* McD., *lichyi* and *peridius* Burks. From all of these except *peridius* it is distinguishable by reason of the pale head contrasting markedly with the black pronotum; from some of these species it differs in shape of wing and in color of abdomen and legs. From *peridius,* it differs as follows: no conspicuous freckles on femora or on tibiae; no black line on posterior margin of head; no subapical band on femora; larger black knee spot; smaller size. It would appear also that the excavation on the apical margin of the forceps base is deeper and narrower.

Tricorythodes angulatus, sp. nov.

Type material consists of 98 male imagos and one female imago.

Size.—Male. Body 3½-4 mm., wing 4-4½ mm. *Female.* Body 4½ mm., wing 5 mm.

Synopsis.—Fore claws of male similar, blunt; penes quite angulate laterally; forceps base quite deeply emarginate, this excavated area relatively narrow; abdomen yellowish to whitish, rather heavily marked with blackish; legs typically freckled with black.

Holotype male.—Body 3½ mm., wing 4½ mm. **Head:** Flesh-colored, including tubercles; antennae whitish; eyes and heavy rings at base of each ocellus black; a narrow black line on posterior margin adjoining eye. **Thorax:** Pronotum yellowish in mid-area, reddish brown laterally, extensively marked with narrow black pencilings, which extend transversely over part of the pale central area. Mesonotal shield very dark reddish brown, the anterior lobe chestnut brown; shield sharply distinct from the paler yellowish pleural areas adjacent to it; scutellum grayish or yellowish at tip, preceded by small black spot; grayish bands likewise margin the hinder portion of this shield. Metanotum reddish brown in center, yellowish laterally, with some black marking. Large dark reddish brown patches on pleura precede middle and hind legs and continue down on to sternum; pale areas of pleura with a few faint dark pencilings. Prosternum yellowish with several black markings; meso- and metasterna dark reddish brown except for yellowish ganglionic areas. **Legs.** Coxae, trochanters and femora light reddish brown; some gray shading on coxae; the usual two dark brown spots at apex of each trochanter. Femora narrowly margined with blackish brown; near middle of each is a pale narrow longitudinal streak; small black dots, freckle-like, singly or in groups, on outer surface form irregular dark pencilings; on inner surface of fore femur a row of 5-7 somewhat larger black dots form an irregular line. On second femur and to a lesser extent on the third, the dots on the outer surfaces tend to occur mainly in two groups, near base and apex respectively. Fore tibia silvery to very pale pearly gray; knee brown with a prominent black spot; apex narrowly pale reddish brown; a row of black dots along outer margin in mid-area. Fore tarsus grayish white basally, fifth segment brownish; V-shaped support of claws blackish; a few scattered black dots irregularly arranged along length of tarsus. Second and third tibiae very pale brownish; black knee spot; near middle of each tibia, a group of small black dots form quite an extensive band. Tarsi of these legs likewise very pale brown except for whitish terminal joints; V-shaped support of claws faintly brown; an occasional black dot present, these scattered irregularly along each tarsus. **Wings.** Costal margin tinged with grayish lavendar, most pronounced along Sc. Cross veins of subcostal, radial and first space of sector fairly distinct; pale grayish. Cubito-anal veins silvery white; other longitudinals very faintly gray-tinged, but appear silvery in some lights. CuP only slightly more arcuate than 1st anal, considerably less arcuate than in wing of *T. albilineatus* Berner.

Abdomen yellowish with faint reddish overcast, apical segments pale reddish brown. Tergite 1 heavily shaded with black laterally, widely yellow in center. Wide bands of grayish black occupy most of the meson of the middle tergites, leaving however a rather wide yellowish mid-dorsal line and yellow lateral areas.

Pale mid-dorsal area widest on tergite 8; posterior half of tergite 7 largely yellowish. Black dashes along pleural fold on all tergites, most prominent on 2 and the apicals; gray line along posterior margin of 7 is connected laterally to black dash on pleural fold. Gray shading on sternites in form of paired submedian dashes, most evident on apicals, and on each a dash adjacent to pleural fold; posterior margins of sternites narrowly and inconspicuously darker. **Tails:** First two segments of outer tails, and basal one only of middle tail, deep slate gray; following segments paler gray, becoming still paler toward tips. At each joining in basal half, spical end of each segment narrowly darker, basal portion of succeeding segment paler. Genitalia yellowish; structure as shown in Figs. 10 and 12. Note angulate appearance of penes.

Male paratypes differ from holotype only as indicated: In many, yellow median area of pronotum not gray-shaded, dark shading on lateral areas may be more intense. Abdomen sometimes whitish rather than yellowish; brown transverse bands on sternites may be more distinct, so that abdomen appears darker ventrally than dorsally; submedian gray streaks may be confined to apical sternites. Number and arrangement of black freckles on femora somewhat variable. Some variation also in depth of excavation on apical margin of forceps base.

Allotype female.—Body 4½ mm.; wing 5 mm. Fore legs missing, tails broken except at base. Very similar to male except for usual sex differences. Body still filled with orange-colored eggs. Markings on sternites less well defined than in most males, but gray streaks next to pleural fold present, also submedian streaks on apical sternites. All longitudinal veins and most of the cross veins dark gray. Stubs of tails yellowish.

Holotype.—Male imago. Body in alcohol, parts dissected and mounted. Rio Santa Lucia, Mexico, Dec. 28, 1947. S. Mulaik, Coll. In private collection of J. R. Traver.

Allotype.—Female imago. Same data.

Paratypes.—97 male imagos. Same data. Several in collections of Dr. G. F. Edmunds Jr., Univ. of Utah, and of Dr. L. Berner, Univ. of Florida. Remainder in private collection of J. R. Traver.

This species is related to *albilineatus* and to *fictus*, as regards structure of genitalia and general color pattern. Although the name *angulatus* has been given to call attention to the angular appearance of the penes, this same feature occurs also in both of the other species just mentioned. Comparison with specimens of *albilineatus* sent to me by Dr. Berner reveals that in that species the fore claws of the male are dissimilar, one blunt, one sharp-pointed; likewise the vein CuP is considerably more arcuate than in *angulatus*. No such morphological features distinguish *angulatus* from *fictus*, however. Color differences between *angulatus* and *albilineatus* are: entire head and thorax of *angulatus* paler, with a tendency for more contrast between mesonotal shield and surrounding lateral areas; abdomen less heavily marked in most specimens; tails darker gray. As compared with paratypes of *fictus*, *angulatus* has paler head and abdomen, black shading on tergites less intense and less extensive, with paler areas therefore *more* extensive; pale mid-dorsal strip on dorsum of abdomen rather wide and continuous; legs generally paler, black knee spot more conspicuous, black freckles present; cross veins in subcostal, radial and first space of sector distinct; ganglionic areas of thorax and abdomen not darkened; tails darker gray. Further, there is usually a conspicuous pale spot on middle of tergite 1, continuing on to mid-basal part of tergite 2.

Admittedly the differences which distinguish *angulatus* from *fictus* are entirely comparative, with the exceptions of the slightly smaller size of the former and the presence of black freckles on the legs, yet I believe *angulatus* to be a distinct species. Inasmuch as the size and number of these black freckles is variable, there is some question as to the value of this feature as a specific character. Such small black freckles on the legs occur also in *albilineatus*, in *peridius* and in *atratus*. The black head and pronotum of this latter species distinguish it from *angulatus*, likewise some differences in the structure of the genitalia.

In addition to the specimens selected as paratypes, several hundred others from the same locality are held under the name *angulatus*, among them 8 females. It is probable that specimens from another area in Mexico belong here also. These, collected by Dr. H. H. Hobbs and sent to me by Dr. Berner, come from Hacienda Potrero at Potrero Viejo, Paraje Nuevo, Vera Cruz, Dec. 23, 1941; all have legs and bodies heavily marked with black; fore claws of male similar, blunt. All are much faded except for the black markings; all the females are spent, their abdomens shriveled.

Tricorythodes arequita, sp. nov.

Represented by three male subimagos, subimaginal cuticle partially shed.

Size.—Body 4½ mm.; wing 4½-5 mm.

Synopsis.—Fore claws of male dissimilar, one blunt, one sharp-pointed; minute black dots forming bands on femora; forceps base shallowly excavated.

Holotype male.—**Head:** Pale flesh-colored, posterior margin black; antennae pale. **Thorax:** Pronotum yellowish; narrow black pencilings along anterior and lateral margins, mid-line narrowly black; triangular lateral brownish patches from which a brown streak extends down on to fore coxa. Mesonotum dark reddish brown; black triangle on scutellum. Metanotum and pleura somewhat paler reddish brown; darker markings anterior to wing bases. Persistent short extensions of wing roots protrude slightly from mesonotal scutellum, more so than in most male subimagos of this genus. Prothoracic sternum and mid-areas of meso- and metasterna pale flesh-colored; lateral margins of meso- and metasterna reddish brown. **Legs:** Coxa and trochanter of fore leg shaded with brown, margins black; dark dot at apex of each. Fore femur yellowish brown, margins and longitudinal band on outer surface dark brown; minute dark dots form partial median and incomplete preapical blackish band. Fore tibia largely dark smoky gray; knee reddish brown, narrow pale spot just beyond it; apex narrowly pale, preceded by a black subapical area. Tarsus yellowish, basal joints and base of claws shaded with smoky. Claws dissimilar. Black dots at apices of trochanters of middle and hind legs. Middle and hind femora yellowish white; incomplete basal and preapical gray bands and wider gray median band formed by minute blackish dots; tibiae pale, incomplete black band on knee, black band preceding apical flange, narrow black triangle midway between base and apex. Tarsi pale yellowish white, claws faintly brown-tinged. **Wings:** Longitudinal veins of costal margin dark gray, Sc and R gray-margined, especially in basal half; R2 + 3, R4 + 5, MP and CuA narrowly gray, other longitudinals mainly pale, as are cross veins.

Abdomen yellowish white. Pale gray transverse bands on basal and apical tergites, on middle tergites confined mainly to posterior margins; lateral margins pale, bounded above by narrow dark line. Large blackish blotch on tergite 3 and continuous on part of 4, near pleural fold; smaller black dots on tergites 5 and 6. Mid-dorsal line black, complete on basals and apicals, incomplete on middle tergites; short black stigmatic mark on each basal and middle segment. Sternites pale, some slight brownish shading next to pleural fold; black dot preceding each ganglionic area, smaller on middle sternites. Apical sternites deeper yellow than those preceding; reddish brown line laterally on 9, paralleling pleural fold; *very narrow* blackish transverse lines across each sternite, probably along tracheae. **Tails** yellowish white, pale gray basally; joinings narrowly darker at base, pale beyond. Genitalia as in Figs. 2 and 7; forceps base only shallowly excavated.

Paratype males differ somewhat from holotype, as follows: Pronotum paler, dark markings less distinct; in one, meso- and metanota paler red-brown, in the other a pale band precedes mesonotal scutellum, which lacks the black triangle. Fore femur slightly red-tinged. Basal and middle abdominal tergites paler; gray bands almost obsolescent; mid-dorsal line marked by small black dots, or by a line on tergite 1 and no dots on 2-6; black dots only on mid-dorsum of 7-9, or mid-line narrowly blackish on these tergites. Black blotches on 3-4, as in holotype. in one paratype a dark dot also on 5. Tails on one specimen faintly darker at joinings.

Holotype.—Male subimago, cuticle partially shed. In Entomological Collection of the Department of Entomology, Faculted de Humanidades y Ciencias of Uruguay. Lavalleja, Arequita, Uruguay, Jan. 2, 1951; attracted by light at night, on banks of Santa Lucia River. Collected by Dr. C. S. Carbonell and associates, in field trips organized by the Departments of Zoology and Entomology, Facultad de Humanidades y Ciencas, Uruguay.

Paratypes.—2 male subimagos, shedding cuticle. Same data as holotype. One in Entomological Collection of Dept. of Entomology, Uruguay, as above; the second, in private collection of J. R. Traver.

Because of the dissimilarity of the fore claws, a feature uncommon in the genus *Tricorythodes*, the erection of a new species for these specimens seems justified, especially as each of the three males has almost completed the change to the imago state. It is doubtful if any marked differences in color or structure would be found in the mature imago. The species resembles *albilineatus* in this unlikeness of the fore claws,—it might perhaps be considered the South American counterpart of that North American species. Aside from the important difference in geographical distribution, *arequita* may be distinguished from *albilineatus* by these features: Forceps base much less deeply excavated, CuP less arcuate; Sc and R somewhat less heavily shaded; black dots on legs smaller, not freckle-like; tibiae of middle and hind legs with black median triangle and black apices; black markings on abdominal tergites much less extensive, black blotch on 3 and 4 more prominent, mid-dorsal line black instead of white.

Tricorythodes santarita, sp. nov.

Represented by a single female imago, which is distinctively marked.

Size:—Female imago, body 2¾ mm.; wing 3 ¾ mm.

Synopsis.—Basal third of wing heavily gray-shaded; vein which seems to represent CuP arises further from base than normal and does not reach margin; meso- and metathorax seem unusually large.

Holotype female.—**Head** dark grayish brown, heavily marbled with black above except for frontal area. Eyes black, ocelli black-ringed at base. Antennae grayish. **Thorax:** Pronotum heavily shaded with black except for four somewhat oval yellowish areas laterally, each of which is surrounded by black. Unsclerotized area between head and pronotum wide, yellowish. Mesonotum very pale reddish brown; wide black median stripe except on anterior lobe; grayish black shading all around mesonotal shield; scutellum and adjoining carinae black. Metanotum yellowish with black shading. Black markings on pleura on each side of anterior lobe of mesonotum, and narrowly above bases of legs, elsewhere without gray shading. Thoracic sternum pale reddish brown, ganglionic areas slightly paler. *Legs:* Pale yellow, very heavily shaded with grayish black. Coxae and trochanters each with two black streaks; usual two dark dots at apices of trochanters. Wide dark preapical band on femora, still wider but incomplete median band; small spot at base of each; margins prominently gray-shaded. Tibiae with wide dark median band, two dark longitudinal streaks, black knee spot. Middle tarsal joints black shaded. Third leg as in Fig. 9. **Wings:** *Membrane of entire basal region of wing shaded* with purplish gray, including almost half of the costal area and most of the anal lobe, although space between MP_1 and CuA is paler. Entire costal space gray. Note the unusual arrangement of veins (presumed to be cubital intercalaries and CuP), as shown in Fig. 1. Venation normal for the genus in other respects.

Abdomen: Tergites yellowish with slight reddish tinge; heavily shaded with black except for lateral portions of middle segments, pale area on posterior margin of 9, paler submedian areas anteriorly on 10. Blackish brown median stripe on 10, posterior margin brown. Pleural fold distinctly black margined on basal tergites, and on 7-9; short black dash only, on middle tergites. Sternites very similar in color to thoracic sternum, but a trifle paler; no dark shading. Abdominal segments 7, 8 and 9 rather wide and well extended laterally (specimen is spent). **Tails** broken off a short distance beyond base; parts remaining are yellowish white, not darker at joinings. Subanal plate appears to be *slightly emarginate* on apical margin,—in most females of this genus, slightly obtuse.

Holotype.—Female imago, spent. In alcohol. Paysandú, Santa Rita, (Rio Uruguay), Uruguay, Nov. 8, 1955. C. S. Carbonell, Coll. Dr. Carbonell's notes: "River very deep and wide. In this particular spot, bottom of rock or mud at the banks. Sandy islands nearby. The exact locality is called 'Puerto de Pepe Ajf' ". In Entomological Collection of the Department of Entomology, Facultad de Humanidades y Ciencias of Uruguay.

Ordinarily it is not good policy to describe a species from a single female specimen. In this case it seems admissible to do so, because of (1) the unusual extent of the dark shading on the wings; (2) the peculiar disposition of veins in the cubito-anal region; and (3) the emarginate character of the subanal plate. Although differing from the usual conditions found in the genus *Tricorythodes* by each of the three features enumerated, it seems best to consider the species an aberrant member of that genus, as in the case of *T. australis* (Banks). It cannot be placed in any of the other known genera of the subfamily Leptohyphinae, in which group it unquestionably belongs. The alternative,—the erection of a new genus for a single female specimen,—certainly is not warranted.

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BOOK NOTICE

OBLIGATORY AND FACULTATIVE INSECTS IN ROSE HIPS, by W. V. Balduf. Illinois Biological Monographs, No. 26, 194 pp., 12 plates. The University of Illinois Press, 1959.

Dr. Balduf's book is the culmination of 15 years of observations and research on the insect community of rose hips. It is especially valuable to the interested biologist in outlining the details of the bionomics of the primary phytophagous inhabitants as well as that of their parasites and inquilines, and discusses in detail the relation of the various rose species to their visitors. A rather comprehensive bibliography based on the world literature is another valuable feature of the volume. The illustrations are excellent.—

RICHARD H. FOOTE, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

NOW AVAILABLE

Memoir 5
of the
Entomological Society of Washington

A CLASSIFICATION OF THE SIPHONAPTERA OF SOUTH AMERICA

WITH DESCRIPTIONS OF NEW SPECIES

by Phyllis Truth Johnson

The study of South American fleas was begun in 1879 when Weyenbergh published the first descriptions of species from that region, using specimens mounted on cardboard as was usual in that day. These fleas were restudied in balsam by Jordan and Rothschild in England shortly after the turn of the century, and from that time to the present day a large number of siphonapterologists, both in England and the Americas, have contributed to this study. Dr. Johnson's work is the first comprehensive taxonomic treatment of the fleas of the region, which comprises Trinidad and all of the continent and its coastal islands. The contemplated 275 page volume will be indispensable to the serious student of this important order of insects.

Memoir 5 opens with two discussions of morphological characters, one devoted to the terms used in the taxonomic section and the other to their taxonomic validity and possible phylogenetic significance. All the families, tribes and genera known to occur in South America are completely described and illustrated, and the species within each genus have been listed with host and locality data. Descriptions of 17 new species and two new subspecies bring the total number to 170. Keys to families, tribes, genera, and species are included. The discussion of each genus is terminated by a section giving the synonymies of the hosts concerned. The 114 plates are said to contain among the best illustrations of fleas currently available, and are grouped according to family. A section listing hosts, each with the fleas known to occur on it, recapitulates the host-flea information; sections dealing with references, systematic index and list of abbreviations close the volume.

Orders at the price of $9.00 to members and $10.00 to non-members may be placed with the *Society* for Memoir No. 5. Orders should be addressed to *Mr. Herbert J. Conkle, Custodian, Plant Quarantine Branch, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.*

THE LARGEST COCKROACH
(ORTHOPTERA, BLATTOIDEA)

ASHLEY B. GURNEY, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

A recent indication by Joyce (Proc. Hawaiian Ent. Soc. *16:* 327, 1958) that the largest cockroaches belong to the genus *Blaberus*, and another by Day (Australian Jour. Sci. Res., Ser. B. *3:* 62, 1950) that *Macropanesthia rhinocerus* Sauss. may be the largest cockroach[1], raises the question as to what cockroach merits the term "largest".

The largest in overall length (including portions of folded front wings (tegmina) extending behind the body) which has come to my attention is a female of *Megaloblatta blaberoides* (Walk.) from Andagoya, Rio Tadosito, Choco, Colombia, collected in May 1957 by Marte Latham, deposited in the U. S. National Museum. Measurements (in millimeters) of this specimen are: Overall length, 100; body, 66; tegmen, 83; total expanse, 185; ootheca, 41.

A colored illustration of *Megaloblatta longipennis* (Walk.), showing the typical appearance of members of this genus, was given by Shelford (Gen. Insectorum *74:* fig. 7, 1908). The genus occurs from Guatemala to the Guianas, Brazil, and Peru, and specimens approximating the size of the one cited above are not rare in collections, though specimens of *Megaloblatta* are not encountered with great frequency. A male of *M. blaberoides* from Buena Vista, Colombia (USNM), and a female of *M. regina* Sauss. from Banos, Ecuador (USNM), each has an overall length of 95 mm. A female of *regina* in the Academy of Natural Sciences of Philadelphia, apparently the one noted by Hebard (Proc. Acad. Nat. Sci. Phila. *76:* 127, 1924), has an overall length of 97 mm. One of the females on which Dohrn (Stett. Ent. Zeit. *48:* 409, 1887) based the original description of *M. peruviana* had the tegminal length of 82 mm., and an expanse of 182 mm.

Specimens of the essentially Neotropical genera *Blaberus* and *Archimandrita*, especially the former, are encountered more often than those of *Megaloblatta*, so their large size may have been more publicized, especially since cultures of one or more species of *Blaberus* occur in zoos and laboratories. Some examples of *B. giganteus* (L.) are 80 mm. in overall length and 60 mm. in body length, and a male of *Archimandrita tesselata* Rehn (USNM) measures 85 mm. and 70 mm. I do not know of larger specimens belonging to these genera.

While *Megaloblatta* apparently includes the largest species, when overall length is considered, the body length of at least two other

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[1]Day referred to Tepper's statement (Trans. Roy. Soc. S. Australia *18:* 179, 1894) about the largest cockroach known to him, and some readers may be confused because Tepper placed his comments under *Geoscapheus giganteus* Tepper. Shaw (Proc. Linn. Soc. N. S. Wales *1:* 211, 1925) explained that Tepper's "Female", the larger sex before him, proved to be a male of *M. rhinocerus*, while Tepper's "male", selected as holotype (lectotype) of *giganteus* by Shaw, was found to be a species distinct from *rhinocerus*.

genera may be greater. Day (l. c.) gave 75 mm. as the approximate length of *Macropanesthia rhinocerus* of Australia, and Brunner (Nov. Syst. Blatt., p. 333, 1865) cited a male of the Madagascan *Gromphadorhina portentosa* Schaum 78 mm. in length. I am indebted to Dr. Louis M. Roth, of the Quartermaster Research and Engineering Center, Natick, Mass. (*in litt.*, Oct. 6 ,1958) for the information that two adult females of *G. portentosa* in his collection measure 59 and 60 mm., respectively. A nearly mature male nymph in his possession is 60 mm.; apparently this is the larger of the two sexes in this species. Both of the latter species are heavily bodied, wingless, burrowing types. It is seen readily that differences of a few millimeters in body length are relatively unimportant among these large insects, when the variation in the abdomen due to physiological conditions or methods of preservation is involved.

A few citations from general writers and specialists on the subject of large cockroaches may be of interest. Sharp (Cambridge Nat. Hist. *5:* 235, 1895) mentioned *G. portentosa* and its 78 mm. length; Handlirsch (Schröder's Handb. d. Ent. *3:* 482, 1925) gave the length of cockroaches as ranging from 2 to 100 mm., and (in Kukenthal and Krumbach's Handb. d. Zool. *4:* 837, 1930) said that *Megaloblatta* is the largest living cockroach. Rehn and Hebard (Bull. Amer. Mus. Nat. Hist. *54:* 191, 1927) said that *Megaloblatta* "contains the largest known cockroaches, when the area of the organs of flight is considered"; Costa Lima (Insetos d. Bras. *1:* 217, 1939) cited *Megaloblatta* at the upper limit of size, about a decimeter; Bei-Bienko (Fauna U.S.S.R., n. s. *40:* 9, 1950) said body length reaches 70 to 75 mm. in *Blaberus* and *Megaloblatta.*

It is often supposed that certain extinct cockroaches were extremely large. However, Dr. F. M. Carpenter, Harvard University, Cambridge, Mass. (*in litt.*, Sept. 29, 1958) has kindly informed me that the largest known fossil cockroaches have wings "somewhat over three inches in length." This would suggest an overall length approaching that of the largest specimens of *Megaloblatta.* He has pointed out elsewhere (Carpenter, Psyche *54:* 80, 1947; Yearbook of Agric., U. S. Dept. Agric., p. 16, 1952) that none of the fossil cockroaches exceeded in size the largest living species. Scudder, the leading early student of fossil cockroaches, also noted (p. 206, in Miall and Denny's "The Cockroach", 1886) that none was so large as the largest living forms, and that the average size of those known was very nearly that of *Periplaneta americana.* Many fossil cockroaches are known only from a single wing or part of a wing, so details of body dimensions frequently are lacking.

ANNOUNCEMENT

The annual subscription price for the *Proceedings* will be advanced from $5.00 to $6.00 effective 1 January 1960, beginning with Volume 62. The price to agencies will be $5.75.

NOTES ON THE TYPES OF NEARCTIC TENDIPEDINI IN LONDON AND COPENHAGEN

(DIPTERA, TENDIPEDIDAE)

HENRY TOWNES, *Museum of Zoology, University of Michigan, Ann Arbor*

In 1945 I published a revision of the Nearctic Tendipedini (Amer. Midland Nat. 34: 1-206). The types in North America had been studied but not the types in Europe. Fortunately, Prof. O. A. Johannsen had seen the types in Europe and gave the use of his notes on them. Most of the problems of specific nomenclature could be solved in this way, but not all. In 1958 I had the opportunity to study types in London and Copenhagen, which resulted in answers to many of the remaining questions. Notes on the types studied are below. Bibliographic references which concern them are in the revision cited above, pages 171 to 174. Approximately the same information is in my synopsis of the Connecticut Tendipedini (1952. Bul. Conn. Geol. Nat. Hist. Surv. 80: 102-103). When "London" is given as the location of a type (below), this means the general collection of Diptera in the Natural History Museum, Cromwell Road, London. When "Copenhagen" is given as the location of a type (in *Chironomus cristatus*), this means the collection of Fabricius' types in the Universitetets Zoologiske Museum, Krystalgade St., København.

Chironomus albistria Walker, 1848. Type: ♂ (London), lacking abdomen beyond third segment, left flagellum, left front tarsus, right front tarsus beyond basitarsus, left middle and hind legs, right middle leg beyond tibia, and right hind leg beyond basitarsus. This is a specimen of *Tendipes riparius* Meigen, 1804, with which *C. albistria* is hereby synonymized.

Chironomus anticus Walker, 1848. Type: ♂ (London), lacking front tarsi. This is a *Microtendipes,* to which genus it is hereby referred. It is a species of the coastal plain of the southeastern states, where I have collected it several times. At the time of my revision I had no specimens, so it was not included. It differs from all other Nearctic species in the genus by having the apical half of the wing weakly infuscate.

Chironomus attenuatus Walker, 1848. Type: ♀ (London), lacking front legs beyond trochanters. This is a rather dark-colored specimen of *Tendipes decorus* Johannsen, 1905, which is hereby synonymized with (*Chironomus*) *Tendipes attenuatus* Walker (new combination).

Chironomus bimacula Walker, 1848. Type: ♀ (London), in poor condition but at least one of all paired appendages present. This belongs in the subfamily Hydrobaeninae.

Chironomus borealis Curtis, 1835. The type could not be found in London. Most if not all of Curtis' collection went to the National Museum of Victoria, at Melbourne, Australia.

Chironomus brunneus Walker, 1848. Type: ♀ (London), reasonably complete but in poor condition. This belongs in the tribe Calopsectrini.

Chironomus confinus Walker, 1848. Types: ♂ and 2♀ on same mount (London), the male without genitalia. This belongs in the tribe Calopsectrini.

Chironomus crassicollis Walker, 1848. Type: ♂ (London), in reasonably good condition. This belongs in the genus *Smittia,* to which it is hereby transferred. Vein Cu_2 is strongly sinuate.

Chironomus cristatus Fabricius, 1805. Type: ♂ (Copenhagen), lacking front tarsi and abdomen beyond sixth segment. This is a rather small specimen of *Tendipes plumosus* Linnaeus 1758, with which *C. cristatus* is hereby synonymized.

Chironomus fimbriatus Walker, 1848. Type: ♂ (London), in reasonably good condition. This belongs in the subfamily Pelopiinae, apparently in the genus *Pentaneura.*

Chironomus flavicingula Walker, 1848. Type: ♂ (London), lacking flagella, hind legs, and front tarsi. This belongs in *Tanytarsus,* subgenus *Stictochironomus.* It is very similar to *Tanytarsus varius* Townes 1945, from which it differs only in having a median fuscous band on the middle tibia. Clarification of specific limits in this area is needed before a definite statement can be made about the status of *flavicingula.*

Chironomus lasiopus Walker, 1848. Type: Should be in London but is lost. The original description fits both *Tendipes attenuatus* Walker and *T. riparius* Meigen. It seems best to dispose of the name, so it is hereby synonymized with *Tendipes attenuatus* Walker, 1848.

Chironomus nigritibia Walker, 1848. Type: ♀ (London), lacking flagella, front tarsi, and abdomen beyond first segment. This belongs in *Glyptotendipes,* subgenus *Demeijerea,* to which it is hereby referred. It is the same as either *G. brachialis* or *G. atrimanus,* the front tarsus being needed to decide which.

Chironomus polaris Kirby, 1821. There is a female specimen in London, consisting of head (without flagella) and thorax (lacking legs, left wing, and postnotum). This fragment fits the original description perfectly but is not the type. It is a female rather than a male as originally described and is labeled ''*Chironomus Polaris* Kirb., Capt. Jas. Ross.'' It has the accession number '684'' which indicates that it came from the Saunders collection. It was probably collected by Ross on his second trip to the American Arctic, when he was a captain. The types were collected on Ross' first trip, before he was a captain.

The specimen above is *Tendipes pilicornis* Fabricius 1794, and since the original description fits *T. pilicornis, Chironomus polaris* Kirby is hereby synonymized with *T. pilicornis.*

Chironomus redeuns Walker, 1856. Type: ♀ (London), a fragment consisting of head with one antenna, thorax, right wing, and halters. This is a specimen of *Tendipes attenuatus* Walker 1848, with which *Chironomus redeuns* is hereby synonymized.

The changes in the list of Nearctic Tendipedini required by these studies are the replacement of the name *Tendipes decorus* Johannsen 1905 with *Tendipes attenuatus* Walker 1848, and the addition of *Microtendipes anticus* Walker 1848 as a valid species.

AN UNDESCRIBED ERIOCOCCUS FROM MEXICO

(HOMOPTERA, COCCOIDEA)

BURRUSS MCDANIEL, *Insect Control & Research, Inc., Baltimore 28, Maryland*

Several species of scale insects were collected by Dr. W. Gibson and staff at the Rockefeller Foundation located in Londres, Mexico. With but one exception, all were found to be common species previously recorded from North America. However, one species of the genus *Eriococcus* cannot be associated with any species presently described.

Eriococcus gerbergi, n. sp.

Female.—Adult female with spines present over the entire surface of the dorsum, arranged in definite rows on the abdomen and thorax, scattered irregularly over the cephalic region. Marginal spines stout, conical and slightly pointed, of various sizes. (Fig. 1). Each abdominal segment normally with two large spines, one or two smaller spines at each lateral margin. Dorsal spines resembling those of the margins in form, rather few in number. Anal lobes reduced in size, chitinized only along the mesal margin and on the ventral side of lobe. Each with three slender ventral setae and three dorsal spines of which two are longer and more slender than the marginal spines. Anal lobe setae three times as long as anal ring setae. Antennae normally 7-segmented. Legs stout and moderately short, claw with distinct tooth, posterior coxae and femur with a few pores. Ducts with a rather shallow cup.

Male.—Not available.

Habitat.—Collected from *Fraxinus* sp., Distrito Federal Mexico by T. Macias. Notes on the appearance in life not available, type specimens found beneath the enlarged adults of another species of scale insect so far referred to as *Lecanium* sp. It is probable that a quite distinct ovisac is formed.

Type.—U.S.D.A. Collection, Washington, D. C.

Remarks.—*Eriococcus gerbergi* closely resembles *E. arenosus* Cockerel in the distribution of the dorsal spines. However, the two may be easily separated because of the apparent reduction in size of the anal lobes on *E. gerbergi.*

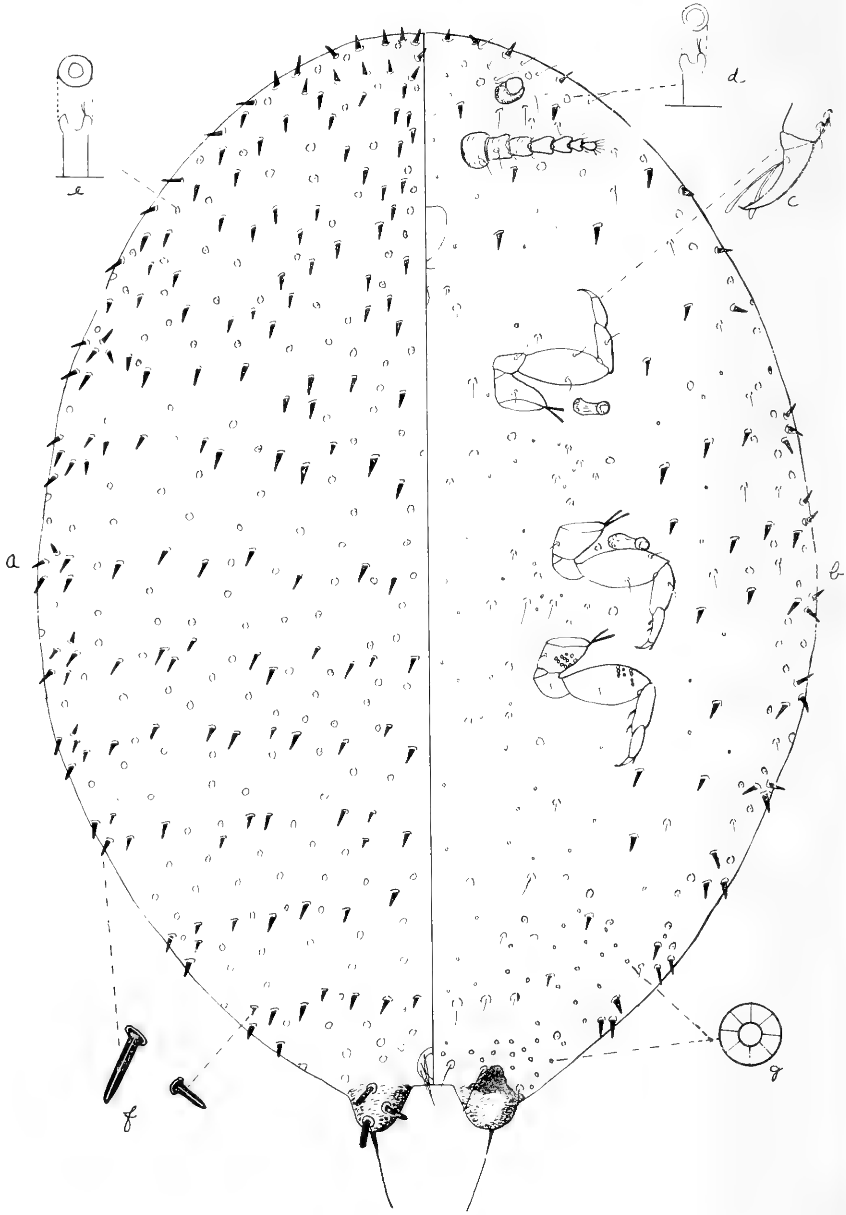

Fig. 1.—*Eriococcus gerbergi*, n. sp. *a*, dorsal surface; *b*, ventral surface; *c*, enlarged tarsus; *d*, microduct; *e*, macroduct; *f*, enlarged setae; *g*, enlarged pore.

DR. MARTIN L. ACZÉL, 1906-1958

The untimely death of Dr. Martin L. Aczél on April 28, 1958, came at the peak of his brilliant career as a Diptera taxonomist. His passing comes as a great loss to entimology since he was a leading authority on several families of Diptera, especially for the Neotropical Region.

Dr. Aczél was born in Budapest, Hungary, June 8, 1906. He received his doctorate degree at the Royal Hungarian University of Sciences in 1933 in plant anatomy and systematic botany. He taught systematic botany and phytogeography from 1931 to 1934.

From 1934 to 1945 Dr. Aczél worked as an applied entomologist for the Royal Hungarian Institute for Plant Protection. It was during this period that he became interested in the taxonomy of Diptera and published his first entomological paper on the taxonomy of fruit flies in 1937.

He made many important contributions to the study of biology and the control of injurious insects. He also did pioneer work in insect toxicology, including some of the first testing work on DDT.

Dr. Aczél was granted three successive awards for scientific investigations by the Royal Hungarian Council for Scholarships, and in December 1943 he was appointed professor of Dipterology at the Royal Hungarian University of Sciences.

Dr. Aczél's career was temporarily disrupted by events which took place after the close of World War II. He and his family were forced to leave Hungary and live in displaced persons camps in the French occupied zone of Austria for more than two years.

In 1948 he immigrated to South America and accepted a post as contract professor of entomology at the Instituto Miguel Lillo, University of Tucuman, Argentina. When the Aczéls reached South America the professor wrote to me how thankful the family was to be at last free of the "living nightmare" they had experienced.

"Now I can live with my family in liberty, quietly do my work again and try to forget the misery, the hate and the fear forever."

He took up dipterology studies once again and before long became one of the leading authorities on Neotropical flies. His investigations were concerned chiefly with the following families: Dorilaidae (Pipunculidae), Tephritidae (Trypetidae), Tylidae, Neriidae, Musidoridae (Lonchopteridae), Muscidae, Clythiidae (Platypezidae) and Pyrgotidae.

He published many important monographic studies and for many years devoted time to the preparing of catalogues on Neotropical Diptera. Up to the time of his death, he published some 53 papers on Diptera taxonomy, 2 on botany, and approximately 150 articles on applied entomology and toxicology. He left nearly a dozen completed manuscripts. Three of these have since been published and the remainder await publication.

Dr. Aczél was a man of many interests and accomplishments. Besides his work with the Diptera he was thoroughly trained in plant anatomy, economic entomology, zoogeography, chemistry, comparative morphology, and biometry. He was a remarkable linguist and published papers in four languages: German, Hungarian, English and Spanish.

Dr. Aczél died after a long and painful illness. He worked until very late each evening through his last days trying to finish his last great work.—

D. Elmo Hardy, *University of Hawaii, Honolulu.*

SOCIETY MEETINGS

Held in U. S. National Museum

678th Meeting, February 5, 1959—

The report of the Auditing Committee, presented by Mr. Howard Baker who found the treasurer's books in good order, was approved by the Society. Mr. H. J. Conkle's report as custodian for the Society was also accepted.

Mr. Simon Ratner's name was read for the first time by the Membership Committee. Following the second reading of *Mr. Tony Roberts'* name, he became a new member when no objection was raised by the membership.

Dr. H. H. Shepard was appointed by President Nelson to represent the Society as Vice President of the Washington Academy of Sciences. The Committee on Constitution and Bylaws, which was relieved of its duties, is to be congratulated on its fine work in framing the new Bylaws.

The subject of a contribution of our Society toward the budget of the Science Fair was brought up by President Nelson. Dr. Roy Barker felt that a small contribution from us would be extremely helpful. The matter was deferred until the next meeting.

A very interesting illustrated talk on the habits and sexual behavior of walking sticks was given by Dr. Don Pirone.

Mr. J. H. Fales showed the group a specimen of the giant cockroach, *Blaberus giganteus*, mounted in plastic.

''Experimental Systematics'' was the title of a stimulating and scholarly address delivered by our retiring President, Dr. Reece I. Sailer. [Note.—His abstract is reproduced here in full.—Ed.]

Systematics in biology is concerned with methods and principles relating to identification and classification of organisms. For the most part, research has been of the empirical kind in the sense that biological phenomena have been observed, described, analyzed and collated. The validity of conclusions derived from these technics must be measured by the degree to which they are reproducible or to which patterns of facts are repetitive. While these methods provide generally adequate classifications useful for purposes of identifying organisms and associating them together into biologically meaningful categories, they do not explain the underlying principles governing organic relationships. In order to understand such basic phenomena as (1) the obvious stability of species, (2) the equally obvious variation within species, and finally (3) how new species arise, it is necessary to resort to experimentation.

Principles relating to stability and variation of species are reasonably well understood, for they have been the object of intense experimental study by geneticists over a period of nearly a half century and such studies are properly considered to fall within the scope of experimental systematics. However, the origin and evolution of species continues to be a field that is long on speculation and short on experimentation. This is especially true in zoology where emphasis has been on the gradual accumulation of mutations accompanied by assortment, recombination and selection as the factors responsible for evolutionary change. Limited experimental work concerned with these processes has largely been concerned with the mechanics of heredity and with improvement of domestic animals. The changes involved were generally of an infraspecific level referred to as micro-evolution.

At present, the most promising method of attacking the "speciation" problem appears to be interspecific hybridization. By means of this technic, it is possible to obtain populations that differ from their parent species by differences approaching the magnitude of those distinguishing the parents. While the technic has been used extensively in botany and botanists generally agree that interspecific hybridization has played an important role in plant evolution, zoologists have mostly held that interspecific hybridization in nature is a rare occurrence, having some interest as a novelty but little if any bearing on evolution. The novelty of such occurrences is refuted by the large and rapidly growing literature reporting field and laboratory examples of crosses between species. Such reports involve a cross-section of the animal kingdom. In addition, an increasing number of taxonomic papers are appearing in zoology that call attention to interspecific relationships and to intraspecific variation that can best be explained as resulting from interspecific hybridization. In order to obtain experimental evidence that would support or refute this hypothesis, I have been rearing and crossbreeding stink bugs (Hemiptera, Pentatomidae) for nearly ten years.

By crossbreeding the sympatric species, *Euschistus servus* (Say) and *E. variolarius* (P. de B.) and establishing selected hybrid lines from the few fertile offspring obtained from such crosses, populations have been obtained that demonstrate a high degree of reproductive isolation from the parental species. In no case has this isolation been sufficiently complete to warrant recognition of a hybrid line as a synthetic species. However, in five generations anatomically uniform populations have been obtained that demonstrate virtually complete isolation from the parent species which they most closely resemble, though not from the one they resemble least. Such a situation in nature would result in the hybrid strain being classified erroneously as a subspecies of the anatomically similar parent species. Indications are that further selection for non-interbreeding will, after three to five additional generations, establish complete reproductive isolation between one or more hybrid lines and their parent species. In the meanwhile, it has been possible to transfer a semilethal dominant gene from *Euschistus servus* to *Euschistus variolarius* through introgressive hybridization, thus producing a polymorphic situation in both species characteristic of many natural populations occurring in related species of other insect genera.

Thus it appears that experimentation, utilizing the technics of hybridization and selective breeding, offers a promising approach to an understanding of basic principles underlying the mechanics of organic evolution.

The two visitors introduced were *Mr. K. Kanungo* of the University of Maryland and *Mrs. Pirone.*

679th Meeting, March 5, 1959—

Following the second reading of *Mr. Simon H. Ratner's* name, he was elected to membership in the Society.

Of the proposed 1959 budget of approximately $4100.00 for the Society, $100.00 was set aside for the Science Fair. Some of the latter amount will be used to purchase prizes for the Science Fair winners selected by the members of our Society as the best entomological exhibits.

The American Entomological Society of Philadelphia celebrated its one-hundredth anniversary on March 26, 1959. Richard H. Foote and Curtis Sabrosky were chosen to represent our Society at the celebration.

Dr. A. B. Gurney exhibited three bound volumes comprising the complete entomological works of the late Dr. G. C. Crampton (1881-1951), who had been one of his professors at the University of Massachusetts. The works, consisting of 105 papers and 3 book reviews, were assembled by Dr. Gurney and presented to the insect library of the National Museum. It is believed that this set, formed by adding to an initial collection obtained from the dealer, John D. Sherman, about 20 years ago, is almost unique, and it corresponds to a mimeographed list of Dr. Crampton's titles assembled by Dr. John F. Hanson about 1955.

Local science trends as viewed through publications such as ''Capital Chemists,'' ''Washington Science Trends,'' ''The Reporter—for Mathematics and Science Teachers,'' and the first issue of the ''Journal of Wildlife Disease,'' which consists of a 3x5 microfilm card and 1 sheet of abstracts, were brought to the Society's attention by Dr. F. L. Campbell.

The two speakers, Dr. Sarah Pipkin and Mr. W. N. Sullivan, presented a noteworthy paper entitled, ''A Search for Genetic Change in *Drosophila melanogaster* Exposed to Cosmic Radiation at Extreme Altitude.'' Dr. S. R. Dutky added remarks concerning his results with exposure of milky white disease spores.

Visitors who were introduced included the following: *Dr. Marie Taylor, Mr. E. L. Mayer, Dr. Magdolna Iranyi* and *Dr. Myron Wolbarsht. Dr. Tom Haines,* one of our new members, was presented. — HELEN SOLLERS, *Recording Secretary.*

PUBLICATION DATES

The date of publication of Vol. 61, No. 2, of the *Proceedings* was April 30, 1959. Date of publication of Vol. 61, No. 3, will be found in Vol. 61, No. 4.

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Vol. 61 AUGUST, 1959 No. 4

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of the
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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON 1884

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MEETINGS

Regular meetings of the Society are held in Room 43 of the U. S. National Museum on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

MEMBERSHIP

Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are $5.00; initiation fee is $1.00 (U. S. currency).

PROCEEDINGS

Published bimonthly beginning with February by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are $5.00 per year, both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

The Society does not exchange its publications for those of other societies.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about $12.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines should indicate present mailing address of the author and his organizational affiliation, if possible. Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding references in which author, year, title, name of publication, volume and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

Proportions of full-page illustrations should closely approximate 4-5/16 x 6" (26 x 36 picas); this usually allows explanatory matter to appear on the same page. Cost of illustrations in excess of that for one full-page line cut will be borne by the author.

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 61 AUGUST, 1959 No. 4

THREE NEW WASPS FROM FLORIDA AND TAXONOMIC NOTES ON ALLIED FORMS

(HYMENOPTERA, ACULEATA)

KARL V. KROMBEIN, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

This contribution describes three new subspecies, *Rygchium molestum boharti* and *Stenodynerus (S.) pulvinatus surrufus* in the Vespidae and *Trypoxylon (Trypargilum) tridentatum archboldi* in the Sphecidae, collected at the Archbold Biological Station, Lake Placid, Florida, and in other Floridian localities. Some taxonomic notes are presented also on the typical races of *Rygchium molestum* (Saussure), *Trypoxylon (Trypargilum) collinum* Smith, and *Trypoxylon (Trypargilum) johannis* Richards.

FAMILY VESPIDAE

Rygchium molestum boharti[1], new subspecies

(Figure 1)

Leionotus turpis (Saussure), Robertson, 1910. Canad. Ent. 42:325 (records stylopized specimen from Inverness, Fla.)—Robertson, 1925. Trans. St. Louis Acad. Sci. 25:279 (records additional material from Inverness, Fla.) [MISIDENTIFICATION]

Rygchium molestum (Saussure) is a polytypic species ranging from Maryland south to Florida and west to Kansas, Oklahoma, and Texas. It may be distinguished at once from any of the other species of *Rygchium* occurring in the eastern United States by the moderately long (equaling the diameter of an ocellus), dense, erect vestiture on dorsum of head, thorax, and abdomen. Although the species is rare in collections, occasionally it may be reasonably abundant locally, as at Kill Devil Hills, North Carolina (Krombein coll.).

The Floridian race is known only from the few individuals listed below, mostly from peninsular Florida. Intergrades between the two races are known from several localities in the northern part of the

[1] Named for Dr. Richard M. Bohart in recognition of his valuable contributions to the taxonomy of the solitary vespids of North America.

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range of *m. boharti. R. m. boharti* has the propodeum produced above into a pair of huge acute teeth (fig. 1), while in typical *molestum* the propodeum either is not produced at all or such development is limited to a pair of small, very low, blunt tubercles. Additional char-

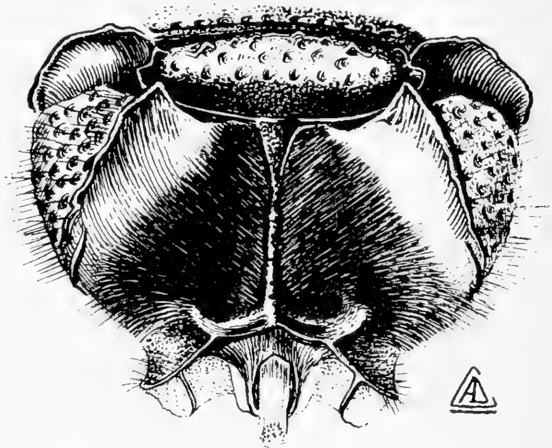

Fig. 1. *Rygchium molestum boharti*, allotype female; propodeum as viewed from behind and slightly above. Drawing by A. D. Cushman. 20 X.

acters separating the two are that *m. boharti* has rather extensive reddish markings on pronotum, propodeum, first abdominal segment and legs (red confined to legs in typical specimens of *m. molestum*) more strongly infumated wings, and the clear lemon yellow markings of typical *molestum* are replaced by a deeper yellow or orange.

Type. Male: Lake Placid, Highlands County, Florida; April 1, 1954 (K. V. Krombein; visiting avocado flowers) [U. S. National Museum, Type No. 64277, by transfer from author's collection].

Length 11 mm. (head to apex of second tergum 8.4 mm.), forewing including tegula 8.7 mm. Black, the following reddish: antennal scape above and next two segments, pronotal dorsum, tegula, propodeum except most of concavity and lower part of lateral surface, legs except coxae, trochanters and bases of femora in part, and disk of first tergum except apex; the following deep yellow to orange—mandible, clypeus, small spots on supraclypeal area and on front above antennae, line along inner eye margin, spot behind eye on vertex, spot on mesopleuron below tegula, small paired spots on scutellum, short band on postscutellum, narrow apical bands on first five terga and second sternum, those on first two terga broader than others. Vestiture and sculpture as in typical *molestum* except that propodeum above is produced into a pair of huge acute teeth. Wings more strongly infumated than in typical race.

Allotype. Female: Lake Placid, Fla.; April 4, 1953 (K. V. Krombein) [USNM].

Length 13.6 mm. (head to apex of second tergum 12.3 mm.), forewing including tegula 10.8 mm. Coloration as in type except that third to fifth terga lack apical bands, supraclypeal area and antenna except scape are dark. Sculpture and vestiture as in typical *molestum* except that propodeum above is produced into a pair of huge acute teeth (fig. 1). Wings more strongly infumated than in typical race.

Paratypes. Twenty-two males and two females as follows: Two males; Lake Placid; July 13, 1948 (R. H. Beamer). Two males; Cocoa, Brevard Co.; July 1944 (G. E. Bohart). One male; Orlando, Orange Co.; March 1944 (R. & G. Bohart). Nine males; Inverness, Citrus Co.; 1891, 1892 (C. Robertson nos. 10285, 10419, 10506, 10507, 10564, 12653, 12737, 12738, 12871). Two males; Daytona Beach, Volusia Co.; September 9, 1940 (H. T. Fernald). One male, one female; Welaka, Putnam Co.; April 18-20, 1955 and May 11-12, 1955 respectively (H. E. and M. A. Evans). Two males; Alachua Co.; April 15, 1955 (R. A. Morse; on flowers of *Melilotus alba*) and August 27, 1954 (H. V. Weems; on flowers of *Rhus glabra*). One male; St. Johns Co.; September 3, 1955 (H. V. Weems). One male; Orange Park, Clay Co.; March 25, 1952 (O. Peck). One female; Hilliard, Nassua Co.; August 19, 1930 (R. H. Beamer). One male; Suwanee Springs, Suwanee Co.; August 2-3, 1939 (R. H. Beamer). Paratypes are in the collections of the U. S. National Museum, American Museum of Natural History, Illinois Natural History Survey, University of Kansas, Florida State Plant Board, Division of Entomology (Ottawa, Canada), R. M. Bohart, H. E. Evans and the author. Male paratypes range in length (head to apex of second tergum) from 8.5 to 10.5 mm.; about half of them lack apical yellow bands on the third to fifth terga; three have a black blotch on middle of disk of first tergum; and one has some reddish markings on scutum and more extensive red markings on mesopleuron and propodeum. The female paratypes are 11.3-12.0 mm. from head to apex of second tergum; one agrees in coloration with the allotype, while the other has a black blotch on center of clypeus and middle of disk of first tergum.

Intergrades. Three females from Alachua Co. and Cedar Keys, Levy Co., and six males from Crescent City, Putnam Co., Orlando, Orange Co., and Tallahassee, Leon Co., are typical *molestum* with regard to the development of the propodeum; they have reduced areas of reddish integument on parts of pronotum, propodeum and first tergum. A similar slight suffusion with red occurs in some specimens of otherwise typical *molestum* at Kill Devil Hills, North Carolina, and at several localities in Georgia.

Biology. The specimens from Lake Placid were collected in the Highlands Ridge sand-scrub area of the Archbold Biological Station. At least the males appear to be attracted to nectar of various flowers. I assume that *m. boharti* probably nests in cavities in wood and preys on small lepidopterous larvae. Females of typical *molestum* will nest in borings in wooden traps at Kill Devil Hills and prey on small lepidopterous larvae belonging to several species of Pyraustidae and Epipaschiidae. As in typical *molestum*, there are probably two generations a year judging from the dates of collection.

Rygchium molestum molestum (Saussure), new status

Odynerus turpis Saussure, 1870. Rev. Mag. Zool. (2) 22: 60. ♀; Amer. bor.; type series in Geneva Museum.—Saussure, 1875. Smithson. Misc. Coll. 254: 281. NEW SYNONYMY.

Odynerus molestus Saussure, 1870. Rev. Mag. Zool. (2) 22: 61. ♂; Amer. bor.; type series in Geneva Museum. -Saussure, 1875. Smithson. Misc. Coll. 254: 290.

Odynerus manifestus Cresson, 1872. Trans. Amer. Ent. Soc. 4: 240. ♂, ♀; type in Academy of Natural Sciences of Philadelphia. Preoccupied.

Odynerus primus Dalla Torre, 1889. Wien. Ent. Ztg. 8: 125. New name.

Several years ago Dr. Jos. Bequaert suggested *(in litt.)* that *molestus* and *turpis* were opposite sexes of the same species, a possibility recognized by Saussure in 1875. Recently Dr. Ch. Ferrière of the Natural History Museum, Geneva, Switzerland, was kind enough to lend me the two available male syntypes of *molestus* and the two available female syntypes of *turpis*. These specimens are dirty and faded, and the two females have been attacked by museum pests. However, they are clearly conspecific, and agree with Bohart's and my interpretation of typical *Rygchium molestum*. Bohart and I have consistently used *molestum* for the taxon under discussion here, both in our identification work and in publications. I am exercising the first reviser's privilege and I am placing *turpis* as a synonym although it has page priority.

Lectotypes have not been designated previously for these two species and it seems desirable to take such action at this time. The two males of *molestus* bear the following labels: a small square of gold-coated paper; a label, "Etats Unis/Cn de Saussure."; and another label, "Odynerus/molestus Sss./Mus. Genève"; in addition, one of them bears a red label with the word "Typus" written on it (Dr. Ferrière does not know who placed this label on the specimen—it is not in Saussures' handwriting and does not constitute a valid lectotype designation). Both specimens agree with the original description except that one has apical yellow bands on the first five abdominal terga; the other has such bands on only the first four terga, as specified in the description. Therefore, I am selecting the latter specimen as lectotype and have so labeled it; it is the specimen which does not bear the red label, "Typus."

The two females of *turpis* bear the following labels: a small square of silver-coated paper; a label, "Etats Unis/Cn de Saussure."; and another label, "Odynerus/turpis Sauss./Mus. Genève." Both specimens agree with the original description. In one specimen the propodeum is scarcely produced above, and in the other the propodeum is produced above into a pair of low, blunt tubercles. I have selected the former specimen as lectotype. It is evident that the description is based on both specimens for Saussure describes the metanotum (*i.e.*, the propodeum) as occasionally bearing a strong tooth above.

Saussure redescribed *molestus* and *turpis* in 1875, possibly based on the same material discussed above. He mentioned that the two males of *molestus* were from Tennesse, and that the two females of *turpis* were from Tennessee, sent by E. Fr. Falconnet.

In Florida typical *molestum* occurs in Santa Rosa County in western Florida, at Gainesville and Lochloosa in Alachua County, and Tallahassee in Leon County.

Stenodynerus (Stenodynerus) pulvinatus surrufus, new subspecies

This race differs from typical *pulvinatus* Bohart in the extensive reddish to orange markings, the somewhat coarser and closer punctation of head and thorax, darker wings, and the narrower apical reflex of second abdominal tergum. In Bohart's key to the red *Stenodynerus* of Florida (Fla. Entomologist 31: 71-74, 1948) *pulvinatus surrufus* runs to *beameri* Bohart, couplet 8. It may be separated readily from *beameri* by having very large, smooth interocellar tubercles, humeral angles not prominent, mid femur of male not flattened beneath, and base of second tergum with a transverse row of foveolae.

Typical *pulvinatus* ranges from Massachusetts south to northern Florida (Suwanee Springs in Suwanee County and Gold Head Branch State Park in Clay County) and west to Michigan, Kansas and Missouri. The new race is known only from Lake Placid and Levy County, Florida.

Type. Male: Lake Placid, Highlands County, Florida; July 16, 1957 (K. V. Krombein; reared at Washington, D. C., from nest M 287, cell 3 or 4) [U. S. National Museum, Type No. 64317].

Length 11 mm. (head to apex of second tergum 9 mm.), forewing including tegula 7.5 mm. Black, the following light reddish—scape, flagellum beneath except apically, V-shaped supra-antennal spot, large spot anterolaterally on pronotum, tegula, parategula, lateral blotch on dorsum of propodeum extending downward along the edge posteriorly, legs except coxae in part, first abdominal segment except declivous anterior aspect of tergum, middle of tergum above and apex narrowly, round anterolateral spot and narrow apical band on both second tergum and sternum; the following are orange—mandible except apex, clypeus, inner eye orbit to ocular sinus, spot behind eye above, round spot on mesopleuron above, postscutellum, and narrow band at apex of first tergum. Wings strongly infumated and with violaceous reflections. Punctation of head and thorax as in typical *pulvinatus* though correspondingly slightly coarser and closer; thin reflexed edge of second tergum only slightly wider than diameter of anterior ocellus.

Allotype. Female: Lake Placid, Fla.; July 16, 1957 (reared from nest M 287, cell 2) [USNM].

Length 13 mm. (head to apex of second tergum 11.5 mm.), forewing including tegula 9 mm. Markings as in type but clypeus black except base, flagellum black except beneath at base, disk of first tergum without median black blotch, and fourth tergum with a very narrow orange band at apex. Wings colored as in type. Apex of second tergum scarcely reflexed.

Paratypes. Two males, Lake Placid, Fla. (K. V. Krombein); one male, July 14, 1957 (from nest M 286, cell 2); one male, July 16, 1957 (from nest M 287, cell 3 or 4). One female; Levy Co., Fla.; July 7, 1955 (R. A. Morse; on *Eriogonum tomentosum*). Paratypes are in the collections of the U. S. National Museum, American Museum of Natural History and the author. The male paratypes are a little smaller than the type, but are otherwise very similar except the one from nest M 286 was injured during the pupal state and the left mesopleuron is deformed and almost smooth, and the second tergum lacks the reflexed apex. The female paratype is a little smaller than the allotype, has the facial markings lemon yellow rather than orange, has the femora infuscated basally, and lacks the pair of anterolateral spots on second sternum.

Biology. The Lake Placid specimens were reared from two wooden traps containing 4.8 mm. borings which had been set out in the Highlands Ridge sand-scrub area of the Station in April 1957. The nests were provisioned with lepidopterous larvae by the mother wasp during June and were sent to me about June 24. When I opened them on July 1, there was a newly transformed wasp pupa in the second cell of nest M 286, and prepupae almost ready to transform to pupae in the second to fourth cells of nest M 287. The single male in M 286 left the nest on July 14, and the two males and one female in M 287 left the nest in that sequence on July 16.

The first cell in each nest contained a small bombyliid larva feeding on the wasp prepupa on July 1. These parasitic larvae completed feeding on July 5, transformed to pupae on July 9, and the adults emerged on July 22. Both were females of *Anthrax argyropyga* Wied. [det. W. W. Wirth].

Family Sphecidae

Trypoxylon (Trypargilum) tridentatum archboldi[2], new subspecies

This race is known from a short series of specimens all but one of which was reared from wooden trap nests from Lake Placid, Florida. It is distinguished at once from typical *tridentatum* Packard by having the basal segments of antennae, pronotal disk and tubercle, legs and basal two abdominal segments reddish, the propodeum dorsally suffused to some extent with reddish, and the forewings entirely and deeply infuscate; in typical *tridentatum* the red is confined to the two basal abdominal segments or is occasionally entirely lacking, and

[2] Named for Mr. Richard Archbold in recognition of his courtesy in making available the facilities of the Archbold Biological Station during several all-too-brief visits in 1953, 1954 and 1956, and of his continued interest manifested by sending me periodically the wooden trap nests from which this and many other species of wasps and bees have emerged. The information obtained from such nests has increased substantially our knowledge of the life history, prey preferences, and nesting habits of these insects.

the wings are very slightly infumated with somewhat darker apices. Typical *tridentatum* is known from Florida, but unfortunately only from a single specimen bearing the label "Fla".

Type. Female: Lake Placid, Highlands County, Florida; January 31, 1958 (K. V. Krombein; reared at Washington, D. C., from nest M 164, cell 3) [U. S. National Museum, Type No. 64278].

Length 13 mm., forewing including tegula 9 mm. Black, the following reddish: mandible except apical third, apex of clypeus in middle, five basal antennal segments, pronotal disk and tubercle, tegula, propodeum suffused along the pair of low oblique ridges on dorsum, legs except extreme bases of coxae and first two abdominal segments except apex of second narrowly. Forewing strongly infuscated, the margin a little darker, and with coppery to violaceous reflections; hind wing not so infuscated but darker than in typical race. Suberect vestiture as dense as in typical race but yellowish to light tan instead of silvery to cinereous; fine, short appressed vestiture similar in both races. Sculpture identical in the two races.

Allotype. Male: Lake Placid, Fla.; February 25, 1958 (reared from nest M 124, cell 1) [USNM].

Length 13.5 mm., forewing including tegula 9.5 mm. Color and vestiture as in female; sculpture also similar, but as in male of typical race, somewhat coarser on propodeum; genitalia as in typical race.

Paratypes. Three females, one male; Lake Placid, Fla. (K. V. Krombein); one female, February 11, 1958 (from nest M 249, cell 2); one female, February 14, 1958 (from nest M 124, cell 5); one female, February 18, 1958 (from nest M 124, cell 4); one male, February 23, 1958 (from nest M 124, cell 3). One male, Lake Placid, Fla., July 13, 1948 (E. L. Todd). Paratypes are in the collections of the U. S. National Museum, American Museum of Natural History, and the author. Females range in length from 11 to 13 mm., males from 12 to 13.5 mm. There is very little variation in color in the reared series, but the July 13 male has the pronotum and first two abdominal segments entirely red and a large red patch on declivous surface of propodeum above abdominal insertion. The sculpture also is quite similar except for a little variation in development of the paired projections on propodeum and median frontal prominence; however, this is not as marked as the variation in these features in the typical race.

Biology. The nests from which the reared specimens emerged had been set out in the Highlands Ridge sand-scrub area of the Station. Details of the biology are reserved for publication in a separate contribution reporting the results from trap nest studies made in the Atlantic Coast States from New York to Florida. In brief, females of *tridentatum archboldi* can be induced to nest in a wooden block containing a boring 4.8 to 6.4 mm. in diameter. Presumably the wasp normally would nest in abandoned beetle borings in wood, deserted clay cells of *Sceliphron* and other wasps, or similar cavities. The mother places from 9 to 17 small, paralyzed spiders belonging to several species of Araneidae and Theridiidae in the inner end of the boring and lays an egg on the abdomen of one of the last spiders brought in. Next she constructs a hard, non-friable partition 1.5 to 2.5 mm. in thickness from sand grains agglutinated probably with salivary secretion. Then she begins to provision a second cell adjacent to the first in the same manner, continuing thus until there is a linear series of cells ranging from 13 to 30 mm. in length (average length of 16 stored cells in three 6.4 mm. borings is 18 mm., and of 7 cells in one 4.8 mm. boring is 20 mm.).

Inhabitants of the nests sent to me were all in the prepupal state in cocoons when received in Washington; so I have no information on the earlier stages. However, the sequence is probably about as follows (based on observation of closely allied species): the egg hatches in from 1 to 2 days; the young larvae begins to feed by sucking fluids from the abdomen of the spider through a small puncture in the body wall; as the larva increases in size it feeds more voraciously, consuming the flesh as well as the body fluids; the store of spiders is entirely consumed in from 5 to 7 days; the larva then proceeds to spin a cocoon from silk secreted by the salivary glands.

The cocoon of *tridentatum archboldi* is identical in appearance to that of the typical race. It is cylindrical with rounded ends, from 4.6 to 6.0 mm. in diameter, and from 10 to 15 mm. in length. Grains of sand from the partition closing the cell are incorporated in the cocoon so that the very thin wall is extremely hard though brittle. Emergence from the cells is in reverse order, the inhabitant of the outermost cell emerging first and of the innermost cell last, as will be evident from the data given above for nest M 124. There appear to be two generations a year, the overwintering generation presumably emerging as adults during February and March and constructing nests from which the second generation emerges in June or July.

Related Species. Two other members of the subgenus *Trypargilum* occurring in Florida are superficially very similar to *tridentatum archboldi* in the extensive reddish markings. I have also reared both of them from borings in wooden trap nests from Lake Placid. These three forms may be separated by the following key:

Appressed vestiture on clypeus and lower half of front silvery with a slight yellowish cast; front with a strong median projection as broad as a posterior ocellus; hind ocellus separated from eye margin by about the diameter of the ocellus; scutum shining, punctures small and separated in middle of disk by more than the width of a puncture; metapleuron above with a narrow reflexed lamella; dorsum of propodeum with a depressed triangular area with transverse rugulae, the area bounded by rather well defined low ridges which usually terminate posteriorly in a pair of blunt tubercles or teeth; inner keel on dorsum of hind coxa weaker, evanescent opposite emargination for reception of trochanter; hind trochanter of male unarmed; larger, females 11-13 mm. long, males 12-13.5 mm. .... **tridentatum archboldi,** new subspecies

Appressed vestiture on clypeus and lower half of front silvery; front with a weaker median projection, narrower than a posterior ocellus; hind ocellus almost touching eye margin; scutum shining, punctures small and separated in middle by more than the width of a puncture; metapleuron not lamellate above; dorsum of propodeum flat, anteriorly with oblique rugulae, posteriorly with transverse ones; inner keel on dorsum of hind coxa weaker, evanescent opposite emargination for reception of trochanter; hind trochanter of male unarmed; smaller, females 9-12 mm. long, males 8-10 mm. .... **collinum collinum** Smith

Dense appressed vestiture on clypeus and lower half of front golden; front with a weaker median projection, narrower than a posterior ocellus; hind ocellus separated from eye margin by more than half the diameter of the ocellus; scutum rather dull, the punctures coarser, subcontiguous in middle; metapleuron above with a wide reflexed lamella; dorsum of propodeum with a depressed triangular area, anteriorly with oblique rugulae, posteriorly with transverse ones, sides of depressed area not ridged; inner keel on dorsum of hind coxa complete to apex, higher opposite emargination for reception of trochanter; hind trochanter of male beneath with an acute subapical tooth on inner margin; larger, females 12-14.5 mm. long, males 10-13 mm. .... **johannis** Richards

Trypoxylon (Trypargilum) collinum collinum Smith, new status

This was recognized as a discrete species by both Richards and Sandhouse in their recent revisions. I consider it as only subspecifically distinct from the wide-ranging *collinum rubrocinctum* Packard (new status). The chief differences are the darker wings, extensive reddish markings and slightly coarser propodeal sculpture of the Floridian race, and two minor differences in aedeagus and eighth sternum of the males. The cocoons of the two races are identical in shape and texture. I have no records of *collinum rubrocinctum* from Florida, and *c. collinum* is not known to occur north of the Okefenokee Swamp in southeastern Georgia.

Trypoxylon (Trypargilum) johannis Richards

This species is very closely related to the wide-ranging *clavatum* Say, and perhaps should be placed as a race of that species. However, the differences between *johannis* and *clavatum* in sculpture and in male genitalia are more numerous and of such a degree that it seems preferable to accord them specific rank. Furthermore, the cocoons of the two species exhibit constant though minor differences in shape and texture. It is not known whether there is a zone of overlap of these two species. I have seen one specimen of *clavatum* from Quincy, Florida, a part of the State from which I have no *johannis*. The only specimen of *johannis* from outside Florida bears only the label "Ga".

ANNOUNCEMENTS

Two events of entomological interest have occurred since the appearance of the last edition of the *Proceedings* and are hereby called to the attention of the readers of these pages.

One is the appearance of *Studies in Insect Morphology,* Volume 137 of the Smithsonian Miscellaneous Collections. It was published in honor of Dr. R. E. Snodgrass, Honorary President of the *Society,* on the occasion of his 84th birthday, July 5, 1959. The presentation was made by Leonard Carmichael, Secretary of the Smithsonian Institution, in June during a ceremony attended by a number of Smithsonian and Department of Agriculture friends of Dr. Snodgrass. The main body of the volume consists of papers by 17 world-known morphologists—in subject these contributions range from external anatomy to metachemogenesis, but all of them pertain to Dr. Snodgrass's principal field of specialization. To non-morphologists and non-physiologists, the volume is justified alone by the first chapter, a word portrait of Dr. Snodgrass written by Dr. Ernestine B. Thurman. This is an accurate and sympathetic picture of the life of the world's greatest morphologist, relating the history of a continuing work that has already spanned more than 62 productive years. It is of interest to note that, to date, he has written slightly over 6,000 published pages, an average of 97.7 pages per year from 1896 to 1958, or an average of almost 77 printed pages per publication.

The other event concerns a gift to the *Society.* Mr. Lewis H. Weld, a long-time member of the *Society* and widely known as a cynipid authority, has privately published a 160-page volume entitled *Cynipid Galls of the Eastern United States.* In making this gift he stipulates that as long as he lives, $1.00 from the sale of each copy go to the publication fund of the *Society,* and after his death the *Society* shall promote the sale of the work and receive the entire amount of $2.00 per copy. Mr. Weld is to be deeply and warmly thanked for his generosity. The book contains a section on morphology, keys to the subfamilies and to the genera in each subfamily, and a synoptic list of all the 489 species described from the eastern United States as far west as central Texas. For the first time for this area a host index containing a list of the known galls, with short descriptions, occurring on each of the 30 kinds of native oak is provided. 163 described galls (18 root galls, 4 flower galls, 14 acorn galls, 25 bud galls, 36 stem galls and 66 leaf galls) are figured. This book may be purchased for $2.00 and ordered either directly from the author, *Mr. Lewis H. Weld, 6613 Washington Boulevard, Arlington 13, Virginia,* or from the *Custodian, Entomological Society of Washington, c/o Division of Insects, U. S. National Museum, Washington 25, D. C.*—ED.

THE PRONUNCIATION AND DERIVATION OF THE NAMES OF THE GENERA AND SUBGENERA OF THE FAMILY ICHNEUMONIDAE FOUND IN NORTH AMERICA NORTH OF MEXICO

(HYMENOPTERA)

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This paper has been undertaken at the suggestion of Dr. Henry K. Townes of the University of Michigan, inspired by my interest as an amateur in the family Ichneumonidae and as a professional in linguistic matters. Helpful suggestions have been received from Dr. Townes, Miss Luella M. Walkley of the Entomology Research Branch, United States Department of Agriculture, and Mr. David Spiegel, Arlington, Virginia.

The names included are taken from Hymenoptera of America North of Mexico: Synoptic Catalog, by C. F. W. Muesebeck, K. V. Krombein, and H. K. Townes, U. S. Department of Agriculture, Agriculture Monograph No. 2, 1951, with the addition of some names subsequently added to our fauna, two names of interest to those who prefer to follow the International Commission on Zoological Nomenclature rather than the bibliographic principles employed in this portion of the catalog, and some names that I have been informed will be included in the forthcoming supplement to the catalog.[1] Some tribe names have been included, either because based on genera not recorded from our fauna or because of orthographical errors due to faulty derivation.

The pronunciations given are based exclusively on the derivation and general usage, since I feel that this is the only logical principle and that there is no consistent traditional usage among entomologists justifying any departure from this basis (which is that of the pronunciation of all Latin and Latinized-Greek words and names—including taxonomic names of all kinds—found in unabridged dictionaries and botanical works). The general rules on which these pronunciations are based will be found stated in Webster's New International Dictionary, 2d Edition, sec. 269, p. liv, "Rules for the English pronunciation of Latin." These rules, of course, apply also to names of Greek origin, since these are transliterated according to the Roman method (as specified in the International Rules) and pronounced as if Latin.

For the benefit of those who may not find it convenient to refer to the place cited, a brief statement of the principles follows, together with a discussion of some points that have been found to cause difficulty (some of them not there mentioned or not clearly brought out, but all verifiable from dictionary entries—all examples here given marked "cp." will be found in Webster). The basic rule is that the position of the stress accent in Latin and Latinized-Greek words is on the penult (next-to-last syllable) if this contains a long vowel (this can only be determined from a Latin or Greek dictionary, since any of

[1]This supplement has been issued while this paper was in press. It contains eight additional names which unfortunately could not be inserted.

the simple vowels, including *y*, may be either long or short) or a Latin or Greek diphthong or ends in a consonant according to Latin rules (by these rules, a combination of another single consonant with a following *r* or *l*, such as *br*, *cl*, *thl*, etc., is treated as if a single consonant and does not cause the preceding syllable to end in a consonant, whereas *x* and *z* following the penult do cause the accent to fall there: cp. *Pericles*, *Tanagra*, *Melanoplus*), otherwise on the antepenult (third syllable from the end of the word). The Latin or Greek vowel quantity has no other effect on the English pronunciation, which is determined by the relation of the vowel to the primary and secondary accent and by whether the syllable ends in a consonant or not in the English pronunciation. In the case of a word accented on the penult, the decision as to whether it ends in a consonant in determining vowel pronunciation is according to the Latin rule (cp. *macron*) except in the case of *z*, which is regularly preceded by a "long" vowel (cp. *Erethizon*, *Melospiza*, *coryza—amazon* has an "Anglicized" pronunciation as an isolated exception to the rules: see comment on *anemone* and *Anemone* in an unabridged dictionary). If the accent is on the antepenult, *i* and *y* have the "short" sound (cp. *Polybius;* but there are some special exceptions), *u* has the "long" sound unless followed by a consonant in the same syllable; and *a*, *e*, and *o* have the short sound if followed by more than one consonant by Latin rules (*dactylus*) or if the penult is separated from the last syllable by a consonant (*Africa*, *Acropolis*), but the long sound otherwise (*Anatolia*, *Demetrius*). The pronunciation of vowels bearing a secondary accent fluctuates, but tends to follow the rules for the accented antepenult and to favor the "short" sounds.

Special attention is called to the following: *ae* and *oe* are treated as if they were merely *e*, both in their own pronunciation and their effect on preceding *c* and *g* (which are always pronounced as *s* and *j* before *e*, *i*, and *y*). The group *ch* is always pronounced as *k* (cp. *architect*, *school*). The letter *s* is pronounced as in *sit*, never as in *rose*, except in the ending *-es*, before certain consonants, and in certain cases determined by general English usage (commoner in species names, e.g., *miser*, than in genus names). Word endings in *-si-* plus vowel (e.g., *-sia*; also *-ci-*, *-zi-* plus vowel) may be pronounced either according to the basic rules or with various modifications (cp., *Aspasia*, *Elysium*, etc.) and *-ti-* in the penult when followed by a vowel is almost always pronounced *-shi-* or even *-sh-* if unaccented. The suffix *-oides* would be pronounced *-o-ī′dēz* according to the basic principles, but the pronunciation *-oi′dēz* is definitely established by usage (cp. *hyoides*, *Nymphoides*). Names derived from modern proper names are given with a pronunciation that represents a compromise between the Latin rules and the normal English pronunciation of the proper names in question.

It is my opinion that the "Roman" pronunciation of Latin and Latinized words and phrases is out of place in any English context except a discussion of the Latin language and literature, and should therefore be eschewed by entomologists (I refer especially to pronouncing *c* as *k* before *e* and *i*, etc.—my opinion is based on general usage, including that of most Latin scholars).

Justifiable variations in the interpretation of the rules are noted in many cases below (but not exhaustively).

The symbols used in indicating the pronunciation are a simplification of those used in Webster's dictionary, and are as follows: *ā, ē, ī, ō, ū* as in *ate, eke, ice, ode, use*; *ă, ĕ, ĭ, ŏ, ŭ* as in *hat, set, sit, hot, but*; *ä, â, ô, oo, û* as in *art, bare, short, moon, burn*; *a, e, i, o, u* indicating obscure vowels varying between any of the sounds given above and the sound of *a* in *sofa*, according to their surroundings in the word and individual preferences; *oi, ou* as in *oil, out*; *g, s, th* always as in *get, sit, thin*; *zh* as *z* in *azure*. All other letters have their common sounds. The sign ′ indicates that the main stress falls on the preceding syllable and ˋ indicates secondary stress.

The original descriptions have been consulted in determining the derivation, but unfortunately the majority of authors give no information on the derivation of their names. The derivation of names for which no information was furnished by the describers has been worked out from Liddell and Scott's Greek dictionary (2d and 9th editions of the large dictionary). The derivations obtained from the descriptions have also been checked with the same source. In some of the latter category of cases, the derivation is not given precisely as indicated by the author, an intermediate form more closely reflected by the taxonomic name being given (or more basic forms added) or an error of form or translation corrected. The derivations given may be considered definitive unless otherwise indicated. Most names for which the authors have given no origin are nevertheless perfectly clear. In some cases, however, names whose derivation has not been given by the authors are so obscure (because of distortion in most instances, but in *Gelis* and one or two others, inability to rule out alternatives) that I have been unable to reach a satisfactory conclusion; this and any resultant uncertainty as to the pronunciation are indicated by question marks and comments as appropriate. In addition to the published descriptions, I have consulted the Förster notebooks in the U. S. National Museum, which give the derivation of nearly all his names for which this information does not appear in the published descriptions. Also Dr. Townes and Miss Walkley have furnished information on the names established by them. In the list below, comments on the application of the derivation to the insect when in parentheses are due to the describers and when in brackets are from other sources.

While on the subject of derivations in general, I should like to point out that the terms *notauli* and *sternauli* are *perfectly correct*, and the emendations *notaulices* and *sternaulices*, far from being in any way preferable, are themselves incorrect.

The gender of the names in the list below is indicated by the abbreviations m., f., nt. (masculine, feminine, neuter). This has been determined from the dictionary in the case of all words that are nouns according to Greek grammar; but a large proportion of the compounds of Greek nouns are adjectives by Greek grammar and may be either masculine or feminine (only the neuter having a distinct form, and in a few cases this is not distinct in transliteration), and in such cases the gender must be considered to be determined by the first species included whose name is of definite gender. I have accordingly consulted Dalla Torre and all sources indicated in Viereck's "Type species" and the Synoptic Catalog in addition to the original descriptions in all such cases, but have not had time to search the Zoological Record and so on. Whenever I have indicated the gender of a name without qualification, it is either the only grammatically correct one or has been established as indicated above. A special problem is posed by Förster's names in *-is* (but not *-tis*), when the source word ends in *-ης*. It is my conviction (supported by the limited evidence from his species names in such cases and some other evidence) that Förster intended this as a feminine ending on the analogy of the noun suffix *-tis* — especially since nearly all Greek nouns in *-is* are feminine; but the question remains whether this is sufficient evidence to consider that the masculine species names used with a few of these genera are actually wrong, or whether we must abide by these as in the cases in which either gender is unquestionably etymologically acceptable.

The proper combining form is given abbreviated in transliteration in parentheses following the last part of the name in the explanation of the derivation if this is formed otherwise than by dropping final *-a, -as, -e, -es, -is, -on, -s* (after *y*), *-um, -us* before the appropriate supergeneric suffix. In the case of a genus name derived from another, if the latter is cited without explanation, it will be found explained in its proper alphabetical order.

Supergeneric names should be pronounced according to the following models (variations in the position of the secondary accent are illustrated): Ichneumonidae (ĭk`nū-mŏn′i-dē), Tryphoninae (trī`fo-nī′nē), Anomalini (a-nŏm`a-lī′nī), Perilissina (pĕr`i-lĭ-sī′na).

List of Names with Their Pronunciation and Derivation

Absyrtus (ăb-sûr′tus), m., Ἄψυρτος, proper name (brother of Medea).

Acanthojoppini (a-kăn`tho-jŏ-pī′nī), from *Acanthojoppa* (a-kăn`tho-jŏp′a), f., ἄκανθα, thorn + *Joppa* (proper name—probably the city, modern Jaffa).

Acaenitini (a-sē`ni-tī′nī, a-sĕn`i-), from *Acaenites* (ăs`e-nī′tēz [there is only very slight possibility of another position of the accent, since the suffix *-ites* is virtually always accented on the penult, as in *Simeon Stylites*], m., probably from ἄκαινα, thorn + -ιτης, inhabitant of ["dweller among thorns"]. A derivation from ἄκοινος, 'uncommon,' as apparently assumed by those who emend the name to *Acoenites*, seems very improbable.

Acerastes (ăs`e-răs′tēz,, ā`se-), m., ἀ-, un-, not + κεράστης, horned (κέρας, horn). (Refers to the lack of frontal horn.)

Acrodactyla (ăk`ro-dăk′ti-la), f., ἄκρος, extreme, topmost + δάκτυλος, finger.

Acrolyta (a-krŏl′i-ta), f., ἄκρον, at the extremity + λυτός, released, loosened.

Acroricnus (ăk'ro-rĭk'nus), m., ἄκρον, end (for propodeum) + ῥίκνος, wrinkled.

Acrotomus (a-krŏt'o-mus), m., ἀκρότομος, cut off sharp, abrupt (ἄκρον, extreme + τέμνω, cut).

Adelognathus (ăd'e-lŏg'na-thus), m., ἄδηλος, unseen, obscure + γνάθος, jaw.

Aderaeon (ăd'e-rē'on), nt., ἀ-, without + δέραιον, collar, necklace [epomia].

Agathilla (ăg'a-thĭl'a), f., probably from ἀγαθίς, ball of thread [elongate mouth parts] + *-illa* (Latin feminine diminutive ending).

Agonocryptus (a-gŏn'o-krĭp'tus), m., ἄγωνος, without an angle [ἀγονία, cited with this meaning in the description, means 'unfruitfulness'!] + *Cryptus.*

Agrothereutes (ăg'ro-the-roo'tēz), m., ἀγρός, field + θηρευτής, hunter.

Agrypon (a-grī'pon), nt., ἀ-, not + γρυπός, bent, crooked.

Alegina (ăl'e-jī'na), f., ἀλεγεινός, painful.

Allomacrus (ă-lŏm'a-krus), m., ἀλλός, the other + μακρός, long (third joint of hind tarsi).

Alomyini (a-lō'mi-ī'nī), from *Alomya* (a-lō'mi-a), f., ἄλη, wandering, distraction [this seems more reasonable, since it gives the existing form, than Dalla Torre's suggestion, ἀλλός, other, different] + μύα, fly.

Alophosternum (a-lŏf'o-stûr'num), nt., ἄλοφος, without crest + στέρνον, breast, chest.

Amblyjoppa (ăm'bli-jŏp'a), f., ἀμβλύς, blunt + *Joppa* (proper name).

Amblyteles (ăm-blĭt'e-lēz), m., ἀμβλύς, blunt + -τελης, -ended (τέλος, end, extremity).

Amersibia (ăm'er-sĭb'i-a), f., ἀμερσι- (from ἀμέρδω), depriving, robbing + βίος, life.

Amydraulax (ăm'i-drô'laks), f., ἀμυδρός, indistinct + αὖλαξ (-ac-), furrow.

Anarthronota (ăn-är'thro-nō'ta), f., ἄναρθρος, unjointed + νῶτος, back.

Aniseres (ăn'ī-sē'rēz), m., ἀ(ν)-, un- + ἰσήρης, like.

Anisobas (ăn-ĭs'o-bas, ăn-ī'so-), m., ἄνισος, uneven, unequal + βάς, going, gone (-bant-; a participle of βαίνω, go).

Anisopygus (ăn-ī'so-pī'gus, ăn-ĭs'o-), m., ἄνισος, unequal + πυγή (adjective form -πυγος), rump.

Anisotacrus (ăn'ī-sŏt'a-krus), m., ἀνισότης, inequality + ἄκρος, extreme.

Anomalon (a-nŏm'a-lon), nt. [?—see note], ἀνώμαλος, irregular [Note: The obvious derivation is the neuter of this adjective, as generally accepted by more recent authors (as shown by their treating the name as neuter); but doubt is cast on this by Panzer's use of the masculine species name *cruentatus*, suggesting either a present participle (meaning either 'equalizing' or 'being irregular'), which would admit of masculine gender (combining form *Anomalont-*), or possibly an unorthodox use of the suffix -ων (combining form *-on-;* chiefly restricted to proper names and therefore much less probable). I am unable to find linguistic or bibliographic evidence to give a definite answer to this problem, although I am inclined toward the participle in view of the name of the genotype].

Anurotropus (ăn'ū-rŏt'ro-pus), m., ἀν-, without, -less + οὐρά, tail + τρόπος, turn, appearance.

Aoplus (ā'o-plus), m., ἄοπλος, unarmed (ἀ + ὅπλον, weapon).

Apaeleticus (ăp'e-lĕt'i-kus), m., ἀπαιόλησις, cheating, deception (the suffix -ητικος forms adjectives from nouns in -ησις) [probable derivation].

Aperileptus (a-pĕr`i-lĕp′tus), m., ἀπερίληπτος (περιλαμβάνω), uncircumscribed (referring to the propodeum).

Aphanistes (ăf`a-nĭs′tēz), m., ἀφανιστής, destroyer (ἀφανίζω, obliterate).

Aplomerus (ăp`lo-mē′rus), m., ἁπλόος (properly *Haplo-*), simple + μηρός, femur.

Apotemnus (ăp`o-tĕm′nus), m., ἀποτέμνω, cut off.

Apsilops (ăp′si-lŏps), f., ἀ-, not + ψιλός, bald, smooth + ὤψ, face (-op-).

Aptesis (ăp-tē′sis), f., ἀ-, without + πτῆσις, flight, flying.

Arachnoleter (ăr`ak-nŏl′e-ter), m., ἀράχνη, spider + ὀλετήρ (ὄλλυμι, kill), destroyer, murderer.

Arenetra (ăr`e-nē′tra), f., ἀρήν, sheepskin + ἦτρον, belly [first element certain, since new name for *Lasiops* (λάσιος, woolly: genotype *pilosella*), second probable].

Areolopristomerus (a-rē`o-lo-prĭs`to-mē′rus), m., *areola* (Latin, diminutive of *area*) + *Pristomerus*.

Arotes (ăr′o-tēz), m., ἀρότης, plowman (referring to the hypopygium).

Asphragis (ăs-frā`jis), f., (established by inclusion of *defectiva* by Schmiedeknecht), ἀ-, without + σφραγίς (-gid-), seal, impression (lack of areola).

Astiphromma (ăs`ti-frŏm′a), nt., ἀ-, not + στιφρός, pushed together + ὄμμα, eye (*-mat-*).

Asymmictus (ăs`ĭ-mĭk′tus, ā`sĭ-), m., ἀσύμμικτος, unmixed.

Atopotrophos (ăt`o-pŏt′ro-fus, ā`to-), m., ἄτοπος, out of place, strange + τροφός (-ph-), feeder [cp. "trophi"].

Atractodes (ăt`rak-tō′dēz, ā`trak-), m., ἀτρακτώδης, spindle-shaped (ἄτρακτος, spindle + εἶδος, shape, form).

Atrometus (ăt`ro-mē′tus, ā`tro-), m., ἀτρόμητος, fearless.

Banchus (băng′kus), m., proper name?

Barycnemis (băr`ik-nē′mis), f., βαρύς, heavy + -κνήμις, -legged, -shanked (*-id-;* from κνήμη, tibia).

Barylypa (băr`i-lī′pa), f., βαρυλῦπος, gravely afflicting.

Bathyplectes (băth`i-plĕk′tez), m., βαθύς, deep + πλήκτης, striker.

Bathythrix (băth′i-thrĭks), f., βαθύθριξ (*-ytrich-*), with thick, long hair (θρίξ, hair).

Benjaminia (bĕn`ja-mĭn′i-a), f., proper name.

Biolysia (bī`o-lĭs′i a, -lĭsh′[i]-, -lĭz′i-), f., βίος, life + λύσιος, releasing, doing away with.

Blapticus (blăp′ti-kus), m., βλαπτικός, hurtful, mischievous.

Boëthoneura (boē`tho-nū′ra, -ĕth`o-), f., *Boëthus* + νευρά, cord, bowstring, nerve.

Boëthus (bo-ē′thus), m., βοηθός, helper.

Brachycyrtus (brăk`i-sûr′tus), m., βραχύς, (short, small), a little + κυρτός, curved, bent, arched.

Caenomeris (se-nŏm′e-ris), f., καινός, strange + μερίς (*-id-*), part (referring to the unusual length of second abscissa of radius).

Callidiotes (kăl`i-dī′o-tēz), m., κάλλος, beauty + ἰδιότης, quality, peculiarity [properly the noun ending *-otes* has the combining form *-otet-*, but since the construction is somewhat ungrammatical at best, having an adjective sense, we may follow the lead of Schmiedeknecht's *Anisotacrus*, which see, and retain Callidiotini].

Calliephialtes (kăl`i-ĕf`i-ăl′tēz), m., καλλι- (κάλλος, beauty, from καλός, beautiful) + *Ephialtes*.

Campoctonus (kăm-pŏk′to-nus), m., κάμπη, caterpillar + κτόνος, killer (κτείνω, kill).

Campoletis (kăm-pŏl′e-tis), f., κάμπη, caterpillar + -ὀλέτις (*-tid-*), she who kills or destroys.

Campoplex (kăm′po-plĕks), m., κάμπη, caterpillar + -πλήξ (*-pleg-*, from πλήσσω), striking.

Campothreptus (kăm`po-thrĕp′tus), m., κάμπη, caterpillar + θρεπτός, fed, reared (from τρέφω) ["fed on caterpillars"].

Casinaria (kăs`i-nā′ri-a), f., proper name?: 'inhabitant of Casinum or Casina'?

Catadelphus (kăt`a-dĕl′fus), m., κατά (intensive: 'downright, very) + ἀδελφός, brother, kinsman.

Catastenus (ka-tăs′te-nus), m., κατάστενος, very narrow (κατά, down [as prefix cp. "downright"] + στενός, narrow).

Centeterus (sĕn`te-tē′rus), m., κεντητήριος, fitted for piercing [probable derivation].

Ceratogastra (se-răt`o-găs′tra), f., κέρας, horn + γάστρα, belly of a jar (γαστήρ, belly).

Charops (kā′rŏps), f., χάροψ (*-op-*), bright-eyed.

Charopsimorpha (ka-rŏp`si-môr′fa, kā`rŏp-), f., *Charops* + μορφή, form [should have been *Charopomorpha*].

Chasmias (kăz′mi-as), m., χάσμη, gape + -ίας, suffix indicating person characterized by . . . [hence combination equivalent to χασμώδης, always yawning, whence *Chasmodes*, for which it is a new name].

Chilophion (kī`lo-fī′on, kĭl`o-), m., χεῖλος, lip + *Ophion*.

Chorinaeus (kŏr`i-nē′us), m., proper name? (cp. *Chorineus/Corynaeus* in Virgil).

Christolia (krĭs-tō′li-a), f., proper name (de Christol).

Chromocryptus (krō`mo-krĭp′tus), m., χρῶμα, color + *Cryptus*.

Cidaphus (sĭd′a-fus), m., κίδαφος, sly, clever.

Clemontia (kle-mŏn′shi-a, -ti-a, klā-), f., proper name (Clément).

Clistopyga (klĭs`to-pī′ga), f., κλειστός, closed + πυγή, rump.

Clistorapha (klĭs-tŏr′a-fa), f., κλειστός, closed + ῥαφή, seam, suture.

Cnemischys (ne-mĭs′kis), m. [subject to contrary publication], κνήμη, shinbone + ἰσχύς, strength, thickness (hind tibia).

Coccygomimus (kŏk`si-go-mī′mus), m., κόκκυξ, cuckoo, coccyx + μῖμος, imitator.

Coelichneumon (sē`lik-nū′mon, sĕl`ik-), m., κοῖλος, hollow + *Ichneumon*.

Coleocentrus (kō`le-o-sĕn′trus), m., κολεός, sheath, scabbard + κέντρον, sting.

Collyria (kŏ-lĭr′i-a), f., κολλύρα, roll of bread [probable derivation, presumably referring to the incrassate femora, especially since it is a new name for *Pachymerus*; the *-i-* may be from *collyrium*, 'eyewash'].

Colpognathus (kŏl-pŏg′na-thus), m., κόλπος, bosom, hollow + γνάθος, jaw.

Colpomeria (kŏl`po-mē′ri-a), f., κόλπος, bosom, hollow, fold + μηρία, thighbone.

Colpotrochia (kŏl`po-trō′ki-a), f., κόλπος, hollow, fold + τροχιά, track, round of a wheel.

Compsocryptus (kŏmp`so-krĭp′tus), m., κομψός, elegant + *Cryptus*.

Conocalama (kō`no-kăl′a-ma, kŏn`o-), f., κῶνος, cone + καλάμη, stalk (shape of postpetiole).

Cophenchus (ko-fĕng′kus), m., κωφός, blunt + ἔγχος, spear, lance.

Cosmoconus (kŏz`mo-kō′nus), m., κόσμος, order, ornament + κῶνος, cone.

Cratichneumon (krăt`ik-nū′mon), m., κράτος, strength + *Ichneumon.*

Cratophion (krăt`o-fī′on), m., κράτος, strength + *Ophion.*

Cremastus (kre-măs′tus), m., κρεμαστός, suspended.

Cryptanura (krĭp`ta-nū′ra), f., *Cryptus* + ἀν-, without + οὐρά, tail, hinder parts.

Cryptohelcostizus (krĭp`to-hĕl`ko-stī′zus), m., *Cryptus* + *Helcostizus.*

Cryptopimpla (krĭp`to-pĭm′pla), f., *Cryptus* + *Pimpla.*

Cryptus (krĭp′tus), m., κρυπτός, hidden [probably has no real significance in Ichneumonidae, having been lifted from Jurine, probably as a mere proper name as so many of Fabricius's names seem to be].

Ctenichneumon (tĕn`ik-nū′mon), m., κτείς, comb + *Ichneumon.*

Cteniscus (te-nĭs′kus), m., κτείς, comb + -ισκος (diminutive suffix).

Ctenochira (tĕn`o-kī′ra), f., κτείς, comb + χείρ, hand.

Ctenopelma (tĕn`o-pĕl′ma), nt., κτείς, comb + πέλμα (*-mat-*), sole.

Cubocephalus (kū`bo-sĕf′a-lus), m., *cubus* (Latin, from κύβος), cube + κεφαλή, head (-κέφαλος, -headed).

Cultrarius (kŭl-trā′ri-us), m., *culter* (Latin), plowshare + *-arius* (adjective suffix).

Cyclolabus (sī-klŏl′a-bus) m., κύκλος, round + λαβή (-λαβος), handle [''*Platylabus*'' with round propodeal spiracles].

Cylloceria (sĭl`o-sē′ri-a, -se-rī′a), f., κυλλός, mutilated + κεραία, antenna [the faulty transliteration renders the pronunciation uncertain].

Cymodusa (sĭm`o-dū′sa, sī`mo-), f., κῦμα, wave, anything swollen + [probably] δ(έ)οῦσα, lacking [presumably referring to form of propodeum].

Cymodusopsis (sĭm`o-du-sŏp′sis, sī`mo-), f., *Cymodusa* + ὄψις, sight, form, appearance.

Cyphanza (si-făn′za), f., [probably arbitrary, as many of Cameron's names are, although first part suggests κῦφος, hump, stoop].

Cyrtobasis (sûr-tŏb′a-sis), f., κυρτός, curved, bent, round, humped + βάσις, step, foot, base, going.

Dallatorrea (dăl`a-tŏr′e-a, däl`ä-tôr′e-a), f., proper name.

Delomerista (dĕl`o-me-rĭs′ta, dē`lo-), f., δῆλος, evident + μεριστός, divided (referring to the propodeum).

Demopheles (de-mŏf′e-lēz), m., δημωφελής, generally useful (δῆμος, people + ὄφελος, help, advantage).

Diacritus (dī-ăk′ri-tus), m., διάκριτος, separated, excellent.

Diadromus (dī-ăd′ro-mus), m., διάδρομος, running through or about, wandering.

Diaglyptidea (dī`a-glĭp-tĭd′e-a), f., *Diaglypta* (διάγλυπτος, carved, engraved) + ἰδέα, form, appearance, kind, idea.

Dialges (dī-ăl′jēz), m., διαλγής, causing great pain.

Diapetimorpha (dī-ăp`e-ti-môr′fa), f., *Diapetus* (dī-ăp′e-tus), m., διαπετής, spread out, unfolded + μορφή, form.

Dicaelotus (dī-sē′lo-tus?), m., etymology dubious [perhaps: δι-, two or δεῖ, it lacks + κοιλότης, hollowness (''it lacks'' + ''hollowness'' seems most likely in view of lack of gastrocoeli) or δίκαιος, right, proper + λωτός, lotus (this would give pronunciation dī`se-lō′tus; it does not, however, seem to have any appropriateness)].

Dimophora (dī-mŏf′o-ra, di-), f., δειμός, fear + -φορος, -bringing (φέρω, bring).

Diplazon (dĭ-plā′zon), m., διπλάζων (-ont-), doubling, twofold.
Diplazontinae (dĭ-plā′zon-tī′nē), [proper form].
Diradops (dĭr′a-dŏps), f., δειράς, ridge, neck ('hill'—author in litt.) + ὤψ (-op-), face.
Dolichopselephus (dŏl′i-kop-sĕl′e-fus), m., δολιχός, long + ? [ὤψ, face (proper combining form -*op*-) + ἐλέφας, elephant, ivory; or ψηλαφάω, feel, grope + suffix -*os* — since the description mentions long palpi, it seems probable that the derivation is from ''feel'' with misspelling under influence of ''elephant''].
Dusona (dū-sō′na), f., ? δύσωνος, hard to buy [more likely arbitrary: published in same paper with *Fhogra*].
Dyspetus (dĭs′pe-tus), m., δυσπετής, bringing misfortune.
Earobia (ē′a-rō′bi-a), f., ἔαρ, spring + βίος, life.
Echthrus (ĕk′thrus) m., ἐχθρός, hostile.
Eclytus (ĕk′li-tus), m., ἔκλυτος, let loose, loose, unrestrained.
Ecphoropsis (ĕk′fo-rŏp′sis), f., ἐκφορά, projection (referring to the petiolar spiracles) + ὄψις, appearance.
Ectopimorpha (ĕk-tŏp′i-môr′fa, ĕk-tō′pi-), f., *Ectopius* + μορφή, form.
Ectopius (ĕk-tō′pi-us), m., ἐκτόπιος, foreign, strange [literally 'out of place'].
Eiphosoma (ī′fo-sō′ma), nt., ξίφος, sword [Ξ confused with E] + σῶμα (-*m*- or -*mat*-), body.
Endasys (ĕn′da-sis), m., ἔνδασυς, somewhat hairy (referring to the eyes).
Enicospilus (ĕn′i-kŏs′pi-lus), m., ἑνικός [properly *henico*-], single + σπίλος, spot, stain [older dictionaries have σπῖλος, but this has been shown to be incorrect].
Enizemum (ĕn′i-zē′mum), nt., ἐνίζημα, the seat in it, the sitter in it [Förster; dictionary gives merely 'seat'].
Ephialtes (ĕf′i-ăl′tēz), m., ἐφιάλτης, nightmare [literally, 'one who leaps upon'].
Eriplanus (e-rĭp′la-nus), m., ἐρι-, very + πλάνος, wandering.
Erromenus (ĕ-rŏm′e-nus) m., ἐρρωμένος (from ῥώννυμι), active, stout.
Ethelurgus (ĕth′e-lûr′gus), m., ἐθελουργός, untroubled, indefatigable.
(Euceratini): should be **Eucerotini.** The element -*ceros* is not a corruption of κέρας, but a combining form of the latter: -κέρως as in *Rhinoceros* (compare Rhinocerotidae).
Euceros (ū′se-ros), m., εὐκέρως (-*rot*-), with beautiful horns.
Eudiaborus (ū′dī-ăb′o-rus), m., εὖ, well + *Diaborus* (διαβόρος, eating through, piercing).
Eurylabini (ū-rĭl′a-bī′nī), from *Eurylabus* (ū-rĭl′a-bus), m., εὐρύς, broad + λαβή (-λαβος), handle.
Euryproctus (ū′ri-prŏk′tus), m., εὐρύπρωκτος, wide-, loose-breeched (-tailed), (εὐρύς, wide + πρωκτός, anus, hinder parts, tail).
Eusterinx (ū-stē′rĭngks), f., εὖ, good + στήριγξ (-*ing*-), support.
Eutanyacra (ū′ta-nī′a-kra), f., εὖ, well + τανύω, extend (τανυ-, long, extended) + ἄκρα, end, point.
Exenterus (ĕks-ĕn′te-rus), m., ἐκ, ἐξ, out of, dis- + ἔντερον, bowel [disembowled].
Exephanes (ĕks-ĕf′a-nēz), m., ? ἐξεφάνης, you were brought to light (ἐκφαίνω) or (less likely) ἐξωφανής, convex.
Exetastes (ĕk′se-tăs′tēz), m., ἐξεταστής, examiner.
Exochus (ĕk′so-kus), m., ἔξοχος, prominent (referring to the face).

Exyston (ĕks-ĭs′ton), nt., [probably] ἐκ, out of, deprived of + ξυστόν, spear shaft, spear; [less likely] ἐκ, thoroughly + ξυστός, polished.

Gambrus (găm′brus), m., γαμβρός, relative (referring to similarity to *Aschistus* auct.).

Gelis (jē′lis), m., ?γῆ, earth + λῖς (li-), lion [most probable; others less likely: γῆ + ἀλεείς (*alent-*), crouching; γέλοιος, absurd; Γελίας, Γελλίας (proper names); the subfamily and tribe names should be Geliinae, Geliini if "earth-lion" or the proper names are taken as the basis, Gelentinae, Gelentini if "earth-crouching" is taken—note that the recorded form would result from either of the "earth-" compounds by normal rules of compounding, whereas for derivation from the proper names we must assume an error on the part of either Thunberg or his sources, which is of course not impossible].

Genophion (jĕn′o-fī′on), m., *gena* (Latin), cheek + *Ophion*.

Giraudia (zhē-rō′di-a), f., proper name.

Glyphicnemis (glĭf′ik-nē′mis), m., γλυφίς, notch + -κνήμις (*-mid-*, from κνήμη, shinbone), -legged, -shanked.

Glypta (glĭp′ta), f., γλυπτός, carved.

Gnamptopelta (nămp′to-pĕl′ta), f., γναμπτός, curved + πέλτη, shield (concave anterior margin of clypeus).

Gnesia (nē′si-a, -shi-a), f., γνήσιος, genuine, belonging to the race.

Gnypetomorpha (ni-pĕt′o-môr′fa, nĭp′e-to-), f., γνυπετός, weak in the leg + μορφή, form.

Gravenhorstia (grä′ven-hôrst′i-a, grăv′en-), f., proper name.

Grotea (grō′te-a), f., proper name (A. R. Grote, lepidopterist).

Grypocentrus (grĭp′o-sĕn′trus, grī′po-), m., γρυπός, curved + κέντρον, sting.

Hadrodactylus (hăd′ro-dăk′ti-lus), m., ἁδρός, stout, strong + δάκτυλος, finger.

Haplaspis (hăp-lăs′pis), m., ἁπλόος, simple + ἀσπίς (*-pid-*), shield.

Hedylus (hĕd′i-lus), m., ἡδύλος, charming.

Helcostizus (hĕl′ko-stī′zus), m., ἕλκος, wound + στίζω, prick, stab.

Helictes (he-lĭk′tēz), m., [ἑλικτής, roller, etc., not in dictionary, but normal formation from] ἑλίσσω, roll, twist, wind.

Hemiteles (he-mĭt′e-lēz), m., ἡμιτελής, half-finished (author: "imperfect—because of the imperfectly pentagonal areolet").

Heterocola (hĕt′e-ro-kō′la), f., ἕτερος, the other, different, strange + κῶλον, member (referring to the very long labial palpi).

Heteropelma (hĕt′e-ro-pĕl′ma), nt., ἕτερος, other, different + πέλμα (*-mat-*), sole.

Hidryta (hi-drī′ta), f., ἱδρυτός, fixed, established.

Himerta (hi-mûr′ta), f., ἱμερτός, delightfully pleasant or gracious, lovely.

Homaspis (ho-măs′pis), m., ὁμασπις (*-pid-*), comrade of the shield, fellow fighter.

Hoplismenus (hŏp-lĭs′me-nus), m., ὡπλισμένος, armed.

Hoplocryptus (hŏp′lo-krĭp′tus), m., ὅπλον, weapon + *Cryptus*.

Horogenes (ho-rŏj′e-nēz), m., ὁρογενής, "born on the border, i.e., in the middle of closely related genera" (Förster).

Hybophanes (hi-bŏf′a-nēz), m., ὑβός, hump-backed + -φανής, -appearing (φαίνω, appear).

Hymenoepimecis (hī′me-no-ĕp′i-mē′sis), f., ὑμήν, membrane [for Hymenoptera] + ἐπιμήκης, long, longish, oblong.

Hypamblys (hi-păm′blis), m., ὑπαμβλύς, somewhat blunt.

Hyperacmus (hī'per-ăk'mus), m., ὑπέρακμος, 'beyond the bloom of youth' (New Testament—probably not the meaning here; from ὑπέρ, above, beyond + ἀκμή, edge, point, apex).

Hyperallus (hī'per-ăl'us), m., ὑπέραλλος, surpassing others.

Hypomecus (hī'po-mē'kus, hĭp'o-), m., ὑπομήκης, longish.

Hyposoter (hī'po-sō'ter, hĭp'o-), m., ὑποσώζω, save somewhat or to some extent (agent noun σωτήρ [*-ter-*]).

Hypsicera (hĭp-sĭs'e-ra), f., ὑψίκερως, high-horned (ὕψι, high + κεραός, horned).

Ichneumon (ĭk-nū'mon), m., ἰχνεύμων (*-on-*), (a tracker), the Egyptian ichneumon, a wasp that hunts spiders (*Pelopaeus spirifex* [= *Sceliphron aegyptium*]).

Idechthis (i-dĕk'this), m. [by included species, but see introduction], εἰδεχθής, hated, of hateful look (εἶδος, form, manner + ἔχθος, hate).

Idemum (i-dē'mum), nt., εἰδήμων, skillful, dexterous (οἶδα, εἰδέναι, know).

Idiogramma (ĭd'i-o-grăm'a), f., ἴδιος, own, peculiar + γραμμή, line, outline [Dalla Torre's "something written with one's own hand" seems unlikely, especially since the dictionary word for this meaning is ἰδιόγραφος; I believe "peculiar outline" is the probable intention].

Idiolispa (ĭd'i-o-lĭs'pa), f., ἴδιος, peculiar + λίσπος, smooth, polished.

Ipoctoninus (i-pŏk'to-nī'nus), m., ἴψ, worm, larva + *-κτονος* (κτείνω), -killer + *-īnus* (Latin suffix indicating 'pertaining to, little').

Ischnojoppini (ĭsk'no-jŏ-pī'nī), from *Ischnojoppa* (ĭsk'no-jŏp'a), f., ἰσχνός, thin, lean + *Joppa* (proper name: see Acanthojoppini).

Ischnus (ĭsk'nus), m., ἰσχνός, "slender, from the slender abdomen" (Gravenhorst).

Isdromas (ĭs'dro-mas, ĭz'-), m., εἰς, into, within + δρομάς (*-ad-*), running.

Iselix (ī-sē'liks), m., ἰσῆλιξ (*-ic-*), of the same age or size.

Iseropus (ī-sĕr'o-pus), m., ἰσήρης, similarly made + πούς (*-pod-*), foot, leg.

Itoplectis (ī'to-plĕk'tis, ĭt'o-), f., ἴτης, eager, bold + f. of πλήκτης, striker.

Joppidium (jŏ-pĭd'i-um), nt., *Joppa* (proper name, see Acanthojoppini) + *-ίδιον*, diminutive suffix.

Labena (la-bē'na), f., derivation obscure, perhaps λαβή, handle + ἀνά, up [cp. insertion of petiole].

Labroctonus (la-brŏk'to-nus), m., λάβρος, violent, furious + *-κτονος*, killer.

Labrorychus (la-brŏr'i-kus), m., λάβρος, violent, furious + *-ορύχος*, -digging (ὀρύσσω, dig).

Labrossyta (la-brŏs'i-ta), f., λαβρόσσυτος, rushing furiously.

Lamachus (lăm'a-kus), m., λάμαχος, very warlike.

Lampronota (lăm'pro-nō'ta), f., λαμπρός, bright + νῶτος, back.

Laphyroscopus (lăf'i-rŏs'ko-pus), m., λάφυρα, spoils + σκοπός, seeker for.

Lathrolestes (lăth'ro-lĕs'tēz), m., λάθρος, secret + λῃστής, robber.

Laufeia (lou'fe-ya), f., [presumably a proper name].

Leipaulus (lī-pô'lus), m., λείπω, leave behind + αὐλός, groove.

Leptopygus (lĕp'to-pī'gus), m., λεπτόπυγος, with slender abdomen (Förster; dictionary meaning: 'with small buttocks').

Leurus (lū'rus), m., λευρός, flat (author in litt.), smooth, level.

Limonethe (lĭm'o-nē'thē, lī'mo-), f., λειμών, meadow + ἤθη (plural of ἦθος), haunts.

Lissonota (lĭs\`o-nō′ta), f., λισσός, smooth + νῶτος, back.
Listrodromini (lĭs-trŏd\`ro-mī′nī), from *Listrodromus* (lĭs-trŏd′ro-mus), m., λίστρον, spade, shovel, hoe + δρόμος, race, running.
Listrognathus (lĭs-trŏg′na-thus), m., λίστρον, spade, etc. + γνάθος, jaw.
Lobaegis (lo-bē′jis), f., λοβός, lobe + αἰγίς (-gid-), shield.
Luchatema (lū\`ka-tē′ma), f., anagram of *Temelucha*, τημελοῦχος, anxious, full of care.
(Lycorini, incorrect form for) **Lycorinini** (lĭk\`o-ri-nī′nī, li-kŏr\`i-), from *Lycorina* (lĭk\`o-rī′na, lī\`ko-), f., derivation uncertain, most likely: λύκος, wolf, hook + ῥινή, file, or second element may be -ρινος, -nosed (ῥίς, nose) or ῥινός, hide, leather shield, or possibly the whole is a diminutive of the proper name *Lycoris* (all these give the same pronunciation and combining form).
Lymeon (lĭm′e-on), m., λυμεών (-on-), destroyer.
Macrojoppa (măk\`ro-jŏp′a), f., μακρός, long + *Joppa* (see Acanthojoppini).
Mallochia (ma-lŏk′i-a, -lō′ki-a), f., proper name.
Mastrus (măs′trus), m., μαστρός, seeker.
Megaplectes (mĕg\`a-plĕk′tēz), m., μέγας, great + πλήκτης, striker.
Megarhyssa (mĕg\`a-rĭs′a), f., μέγας, large + *Rhyssa*.
Megastylus (mĕg\`a-stī′lus), m., μέγας, large + στῦλος [erroneously marked with the acute by Schiødte], pillar (author: "scape").
Melanichneumon (mĕl\`a-nik-nū′mon, me-lăn\`ik), m., μέλας, black + *Ichneumon*.
Mengersenia (mĕng\`er-sē′ni-a, -sĕn′i-a), f., proper name.
Mesochorus (mĕs\`o-kō′rus), m., μέσος, middle + χῶρος, space ("'having a space in the middle'—because of the broad areolet").
Mesoclistus (mĕs\`o-klĭs′tus), m., μέσος, middle + κλειστός, closed.
Mesoleius (mĕs\`o-lī′us), m., μέσος, middle + λεῖος, smooth, level, polished.
Mesoleptidea (mĕs\`o-lĕp-tĭd′e-a), f., *Mesoleptus* + ἰδέα, form, appearance.
Mesoleptus (mĕs\`o-lĕp′tus), m., μέσος, middle + λεπτός, slender ("'slender in the middle': because of the slender petiole").
Mesostenus (mĕ-sŏs′te-nus), m., μεσόστενος, narrow in the middle ("because of the very narrow areolet").
Messatoporus (mĕs\`a-tŏp′o-rus), m., μέσσατος, quite in the middle + πόρος, opening [petiolar spiracles].
Metopius (me-tō′pi-us), m., μετωπίας, having a broad or high forehead.
Microleptes (mī\`kro-lĕp′tēz), m., μικρολέπτης [*sic!* Gravenhorst lapsus for μικροκλέπτης], petty thief.
Mnesidacus (ne-sĭd′a-kus), m., μνῆσις, recollection + δάκος, bite, sting.
Mnioës (nī′o-ēz), m., μνιόεις (*-oënt-*), mossy.
Monoblastus (mŏn\`o-blăs′tus), m., μόνος, single + βλαστός, bud [referring to the number of eggs carried on the ovipositor].
Myersia (mī-ûr′zi-a), f., proper name.
Narthecura (när\`the-kū′ra), f., νάρθηξ, wand, rod + οὐρά, tail, hinder parts.
Nasutocryptus (na-sū\`to-krĭp′tus), m., *nasutus* (Latin, species name of the genotype), large-nosed + *Cryptus*.
Neliopisthus (ne-lī\`o-pĭs′thus, nē\`li-), m., νη-, not + λεῖος, smooth + ὄπισθε, behind + -ος (adjective suffix) [the derivation proposed by Dalla Torre is quite improbable, especially in view of the parallel *Nemioblastus*].
Nemeritis (nĕm\`e-rī′tis?), f., derivation obscure [? νέμος glade + ἀερῖτις, sky-blue (but by derivation could be taken as 'air-dweller') or νη-, not + f. of μερίτης,

partaker (in which case: ne-mĕr′i-tis) or form intended as feminine of *νημερτής*, unerring; or *νέμος*, glade + *αἱρέτις*, she who chooses. Feminine gender and combining form *-tid-* would result from any of these].

Neogreeneia (nē`o-grē′ni-a), f., *νέος*, new + proper name.

Neorhacodes (nē`o-ra-kō′dēz), m., *νέος*, new + *ῥακώδης*, ragged, wrinkled (*ῥάκος*, ragged garment + *εἶδος*, form, kind).

Neotypus (nē-ŏt′i-pus), m., *νέος*, new + *τύπος*, form.

Neoxorides (nē`ok-sŏr′i-dēz, -o-zŏr′-, nē-ŏk`so-rī′dēz, nē`o-zo-), m., *νέος*, new + *Xorides*.

Nepiera (nĕp`i-ē′ra, nē`pi-), f., *νη-*, not + *ἐπίηρος*, agreeable.

Netelia (nĕt`e-lī′a), f., *νη-*, not + *τέλειος*, perfect, entire [probable derivation: referring to hamuli].

Neurateles (nū-răt′e-lēz), m., *νευρά*, sinew, string, nerve + *τέλος* (*-τελης*), end.

Noëmon (no-ē′mon), m., *νοήμων* (*-on-*), thoughtful, wise.

Notopygus (nō`to-pī′gus), m., *νῶτος*, back + *πυγή* (*-πυγος*), rump.

Nythobia (nĭ-thō′bi-a), f., *νυθός*, secret + *βιόω*, I live (*-βια*, one who lives).

Odontocolon (o-dŏn`to-kō′lon), nt., *ὀδούς*, tooth + *κῶλον*, leg.

Oetophorus (e-tŏf′o-rus), m., *οἶτος*, fate, doom + *φορός*, bearer, bearing (*φέρω*).

Olesicampe (o-lĕs`i-kăm′pē), f., *ὀλεσι-* (*ὄλλυμι*), destroying + *κάμπη*, caterpillar.

Oocenteter (ō`o-sen-tē′ter), m., *ᾠόν*, egg + *κεντητήρ* (*-ter-*), piercer.

Opheltes (o-fĕl′tēz), m., *Ὀφέλτης* (proper name: ?increaser, helper).

Ophion (o-fī′on), m., *Ὀφίων* (*-on-*), name of a Titan [with small initial, also the name of a mythical animal; a less likely origin in view of Fabricius's evident predilection for proper names, and one that makes no difference in pronunciation].

Ophionellus (o-fī`o-nĕl′us), m., *Ophion* + *-ellus* (Latin diminutive suffix).

Ophiopterus (ō`fi-ŏp′te-rus), m., *Ophion* + *πτερόν*, wing (*-πτερος*, -winged).

Opidnus (o-pĭd′nus), m., *ὀπιδνός*, dreaded, awful.

Orthocentrus (ôr`tho-sĕn′trus), m., *ὀρθός*, upright + *κέντρον* (*-κεντρος*), sting.

Orthomiscus (ôr`tho-mĭs′kus), m., *ὀρθός*, straight + *μισκός*, stem, stalk.

Orthopelma (ôr`tho-pĕl′ma), nt., *ὀρθός*, straight + *πέλμα* (*-mat-*), sole.

Otacustes (ŏt`a-kŭs′tēz, ō`ta-), m., *ὠτακουστής*, listener, spy.

Oxyrrhexis (ŏk`si-rĕk′sis), f., *ὀξύς*, fierce + *ῥῆξις*, piercing.

Pammicra (pă-mī′kra), f., *πάμμικρος*, quite small (*πᾶς*, all + *μικρός*, small).

Pantisarthrus (păn`ti-sär′thrus), m., *πᾶς*, all + *ἴσος*, equal + *ἄρθρον*, joint ("entirely equal-jointed—referring to the first and second joints of flagellum").

Parabates (pa-răb′a-tēz), m., *παραβάτης*, one who stands beside, transgressor (*παρά*, beside + *βαίνω*, go).

Parabatus (pa-răb′a-tus), m., *παραβατός*, that is to be gone beyond, to be overcome [or more likely derived from *Parabates* by change of ending].

Paropheltes (păr`o-fĕl′tēz), m., *παρά* beside + *Opheltes*.

Patroclus (pa-trō′klus, -trŏk′lus, păt′ro-klus), m., *Πάτροκλος*, proper name [by the derivation, the first syllable should bear the accent—the order of the three pronunciations given is that indicated in the unabridged Webster for the usage relating to the name in its original force as that of a prominent personage in the Iliad].

Perilissus (pĕr`i-lĭs′us), m., *περί*, around + *λισσός*, smooth [smooth all round or very smooth].

Periope (pĕr'i-ō'pē), f., περιωπή, circumspection, caution.

Perithous (pe-rĭth'o-us), m., Περίθοος, proper name (probably 'very swift,' περί + θοός).

Phaeogenes (fē-ŏj'e-nēz), m., φαιός, dusky, gray, dun (in biological usage usually has last sense) + γενεά (-γενής), birth.

Phobetes (fo-bē'tēz), m., φοβητής, one who frightens.

Phobocampe (fō'bo-kăm'pē), f., φοβεῖν, frighten + κάμπη, caterpillar.

Phrudus (froo'dus), m., φροῦδος, away, fled, gone.

Phthorima (thŏr'i-ma), f., φθόριμος, destructive.

Phygadeuon (fĭg'a-dū'on, fī'ga-), m., φυγαδεύω, banish [the generic name best answers to the present participle of this verb, combining form *-ont-*; the form φυγαδευός given by Gravenhorst is ungrammatical, and the meaning he gives, 'dispatching, putting an end to' goes very well with a participle, although this is not in itself conclusive (the precise meaning he gives is not in Liddell and Scott). Another argument against a form in -ος as original is that this would make the name neuter, whereas all authors, including Gravenhorst, have treated it as masculine.]

Phytodietus (fī'to-di-ē'tus), m., φυτόν, plant + δίαιτα, way of life ("one who lives in plants").

Picrostigeus (pĭk'ro-stĭj'e-us, pi-krŏs'ti-joos), m., πικρός, sharp + στιγεύς, awl, pricker.

Pimpla (pĭm'pla), f., Πίμπλα, place name.

Pimplopterus (pĭm-plŏp'te-rus), m., *Pimpla* + πτερόν, wing.

Pion (pī'on), m., πίων (-on-), fat, plump.

Plagiotrypes (plā'ji-o-trī'pēz, plăj'i-), m., πλάγιος, sidewise, crooked, slanting + τρυπάω, bore + -ης (adjective suffix of compounds from verbs).

Platylabus (pla-tĭl'a-bus), m., πλατύς, flat, broad + λαβή, handle.

Plectiscidea (plĕk'ti-sĭd'e-a), f., *Plectiscus* (plĕk-tĭs'kus, m., πλήκτης, striker + -ισκος, diminutive suffix—"little striker," Gravenhorst) + ἰδέα, form, appearance.

Poemenia (pe-mē'ni-a), f., ποιμένιος, of a shepherd.

Polistiphaga (pŏl'is-tĭf'a-ga), f., πολιστής, builder of a city [the wasp] + φάγος, eating, eater.

Polyblastus (pŏl'i-blăs'tus), m., πολύς, many + βλαστός, bud [referring to the number of eggs carried on the ovipositor].

Polycinetis (pŏl'i-si-nē'tis), f., πολύς, much, violently + feminine form (*-id-*) of κινητής, arouser ("arousing alarm").

Polycyrtidea (pŏl'i-sûr-tĭd'e-a), f., *Polycyrtus* + ἰδέα, form, appearance.

Polycyrtus (pŏl'i-sûr'tus), m., πολύς, much + κυρτός, curved, bent.

Polysphincta (pŏl'i-sfĭngk'ta), f., πολύς, much + σφιγκτός, constricted.

Polyterus (pŏl'i-tē'rus), m., πολύς, many + τηρός, watching, guarding.

Polytribax (po-lĭt'ri-băks), m., πολύς, much + τρίβαξ (*-bac-*), crafty, worn.

(**Porizonini**—incorrect for) **Porizontini** (po-rī'zon-tī'nī), from *Porizon* (po-rī'zon), m., πορίζων (*-ont-*), present participle of πορίζω, conduct, bring in, provide, devise.

(**Pristiceratini**: should be) **Pristicerotini** (prĭs-tĭs'e-ro-tī'nī)—for explanation, see "Euceratini."

Pristiceros (prĭs-tĭs'e-ros), m., πρίστις, "saw" (Gravenhorst—according to the dictionary, a kind of fish) + κέρας (-κερως), horn (from the serrate antennae).

Pristomerus (prĭs\`-to-mē′rus), m., πριστός, saw-toothed + μηρός, thigh.

Probolus (prŏb′o-lus), m., πρόβολος, projecting (πρό, forward + βάλλω, throw).

Proclitus (prŏk′li-tus), m., πρό, forward + κλίτος, leaning (κλίνω).

Promethes (pro-mē′thēz), m., προμηθής, provident, foresighted, wary.

Prosthodocis (prŏs-thŏd′o-sis), f., πρόσθεν, before, in front + δοκίς, stick, rod, bar, beam [doubtless referring to the antefurcal nervulus of the genotype] (*-id*).

Protarchus (pro-tär′kus), m., πρώταρχος, leading first (πρῶτος, first + ἀρχός, leader).

Protichneumon (prō\`tik-nū′mon, prŏt\`ik-), m., πρῶτος, first, foremost + *Ichneumon.*

Pseudamblyteles (sū\`dăm-blĭt′e-lēz), m., ψευδής, false + *Amblyteles.*

Pseuderipternus (sū-dĕr\`ip-tûr′nus, sū\`de-rip-), m., ψευδής, false + ἐρι-, very + πτέρνα, heel.

Pseudischnus (sū-dĭsk′nus), m., ψευδής, false + *Ischnus.*

Pseudometopius (sū\`do-me-tō′pi-us), m., ψευδής, false + *Metopius.*

Pseudoplatylabus (sū\`do-pla-tĭl′a-bus), m., ψευδής, false + *Platylabus.*

Pseudorhyssa (sū\`do-rĭs′a), f., ψευδής, false + *Rhyssa.*

Pterocormus (tĕr\`o-kôr′mus), m., πτερόν, wing + κορμός, stump, trunk.

Pycnocryptus (pĭk\`no-krĭp′tus), m., πυκνός, solid, strong + *Cryptus.*

Pyracmon (pi-răk′mon), m., proper name (πῦρ, fire + ἄκμων [*-on-*], anvil).

Rhembobius (rĕm-bō′bi-us), m., ῥεμβός, roaming + βίος, life.

Rhexidermus (rĕk\`si-dûr′mus), m., ῥῆξις, piercing + δέρμα (-δερμος), skin.

Rhorus (rō′rus), m., ῥωρός, strong, mighty.

Rhynchophion (rĭng\`ko-fī′on), m., ῥύγχος, snout, beak + *Ophion.*

Rhyssa (rĭs′a), f., ῥυσός (ῥυσσός), shriveled, wrinkled ("rugose," Gravenhorst).

Rhyssella (rĭ-sĕl′a), f., *Rhyssa* + *-ella* (Latin diminutive suffix).

Saotis (sā-ō′tis), f., σαῶτις (*-tid-*), she who saves.

Scambus (skăm′bus), m., σκαμβός, crooked, bent, bow-legged.

Schenkia (shĕng′ki-a), f., proper name (Dalla Torre emends to *Schenckia*).

Schizopyga (skĭz\`o-pī′ga), f., σχίζω, split, divide + πυγή, rump.

Scolobates (sko-lŏb′a-tēz), m., σκωλοβατίζω, walk on stilts ("because of the long hind legs," Gravenhorst—σκωλοβάτης, 'weevil' is recorded by a grammatical writer, doubtless so named for a similar reason).

Simophion (sĭm\`o-fī′on, sī\`mo-), m., σιμός, snub-nosed + *Ophion.*

Smicroplectrus (smĭk\`ro-plĕk′trus, smī\`kro-), m., σμικρός (dialect form of μικρός), small + πλῆκτρον, spur.

Sphecophaga (sfe-kŏf′a-ga), f., σφήξ, wasp + φάγος, eater.

Spilichneumon (spĭl\`ik-nū′mon, spī\`lik-), m., σπίλος, spot, stain + *Ichneumon.*

Spudaeus (spū-dē′us), m., σπουδαῖος, industrious, active.

Spudastica (spū-dăs′ti-ka), f., σπουδαστικός, assiduous, powerful.

Stenodontus (stĕn\`o-dŏn′tus), m., στενός, narrow + ὀδούς, tooth.

Stenomacrus (ste-nŏm′a-krus), m., στενόμακρος, narrow and long (referring to the stigma).

Sternocryptus (stûr\`no-krĭp′tus), m., στέρνον, breast, chest + *Cryptus.*

Stiboscopus (sti-bŏs′ko-pus), m., στίβος, track + σκοπός, one that watches (σκοπέω).

Stilbops (stĭl′bŏps), f., στίλβη, sheen, mirror + ὤψ (-op-), face.

Stilpnus (stĭlp′nus), m., στιλπνός, glistening, glittering ("shining—because of the polished abdomen").

Symboëthus (sĭm`bo-ē'thus), m., συμβοηθός, jointly aiding or assisting.

Symplecis (sĭm'ple-sis), f. (-cid-), συμπληκής, entwined, entangled (Förster: "plaited, joined").

Syndipnus (sĭn-dĭp'nus), m., σύνδειπνος, table-fellow.

Synoecetes (sĭn`e-sē'tēz), m., συνοικητής, living together.

Synomelix (sĭn`o-mē'lĭks), f., συνομῆλιξ, comrade, companion (σύν, with, together + ὁμός, same, common + ἧλιξ, equal).

Syrphoctonus (sûr-fŏk'to-nus), m., *Syrphus* (Diptera: σύρφος = σέρφος, gnat) + κτείνω, kill (-κτονος, killer).

Syzeuctus (sĭ-zūk'tus), m., συζεύγνυμι, yoke together, couple.

Tersilochus (tûr-sĭl'o-kus), m., Θερσίλοχος, proper name [probably "bold in ambush". I consider the retention of the above spelling an indefensible application of the principle of nonemendation, since the lack of any possible derivation, plus the emendation by Holmgren himself (Handl. Sv. Vet. Akad., 2:135; (1858) 1860) to my mind constitutes prima facie evidence of a *lapsus*].

Thaumatoteles (thô`ma-tŏt'e-lēz), m., θαῦμα, wonder + τέλος (-τελης), end.

Thaumatotypidea (thô`ma-tŏt`i-pĭd'e-a), f., *Thaumatotypus* (thô`ma-tŏt'i-pus, θαῦμα, wonder + τύπος, form) + ἰδέα, appearance, form.

Therion (thē'ri-on), nt., θηρίον, wild animal, little animal [other derivations calling for a different pronunciation are possible, e.g., θέρειον, of summer, θερείων, burning, but these seem less likely—"animal" and "of summer" call for the form *Theriina* for the subtribe name and "burning" would give *Theriontina;* I cannot find any derivation that would give the form usually used].

Theronia (the-rō'ni-a), f., θήρ, animal + ὀνία = ἀνία, bane [or, less likely, θήρ + ὀνεία, useful (in which case: thĕr`o-nī'a)].

Thibetoides (thĭb`e-toi'dēz), m., ?Thibet (old spelling of the country Tibet) + connecting vowel -*o*- + εἶδος (-ειδης), shape, form.

Thymaris (thi-mā'ris), [m., authors—see introduction], θυμάρης, pleasant, agreeable.

Thyreodon (thi-rē'o-don), m. [by genotype!], θυρεός, shield (shaped like a door: θύρα) + ὀδών (Ionic form of ὀδούς), tooth.

Tmetogaster (mĕt`o-găs'ter), m., τμητός, cut + γαστήρ, venter (referring to the depressed abdominal sutures).

Toxochilus (tŏk`so-kī'lus), m., τόξον, bow + χεῖλος, lip ("arched, bristly clypeus").

Toxophoroides (tŏks-ŏf`o-roi'dēz), m., τοξοφόρος, bow-bearing, archer + εἶδος (-ειδης), form, kind.

Trachysphyrus (tra-kĭs'fi-rus), m., τραχύς, rough + σφυρόν, ankle.

Trematopygus (tre-măt`o-pī'gus, trĕm`a-to-), m., τρῆμα, hole + πυγή, rump.

Trevoria (tre-vō'ri-a), f., proper name (Trevor Kincaid).

Tricholabus (tri-kŏl'a-bus), m., θρίξ (*tricho*-), hair + λαβή, handle [probably meant not for "hairy petiole," but "hairy *Platylabus*," having been originally described as a subgenus of the latter].

Trichomma (trī-kŏm'a), nt., θρίξ, hair + ὄμμα (-*mat*-), eye.

Triclistus (trī-klĭs'tus, tri-), m., τρεῖς (τρι-), three, thrice + κλειστός, closed, shut.

Tricyphus (trī-sī'fus, tri-), m., τρεῖς, three + κυφός, humpbacked.

Trieces (trī-ē'sēz), m., τρεῖς, three + ἡκής, sharp (referring to the three carinae on abdomen).

Trogomorpha (trō`go-môr'fa, trŏg`o-), f., *Trogus* + μορφή, form.

Trogus (trō′gus), m., [probably proper name, compare *Trogus Pompeius*, Roman historian; perhaps from τρώγω, gnaw, nibble, eat].

Tromatobia (trŏm′a-tō′bi-a), f., τρῶμα (variant of τραῦμα), a hurt + βίος, life.

Trophophion (trŏf′o-fī′on), m., τροφός, feeder + *Ophion*.

Trychosis (tri-kō′sis), f., τρύχωσις, destruction (Förster), exhaustion.

Tryphon (trī′fon), m., Τρύφων, proper name ("luxurious," from θρέπτω, break, crush, be proud).

Xenoschesis (ze-nŏs′ke-sis), m., ξένος, strange + σχέσις, state, condition [according to Förster's notebook, it is evidently intended to mean "strange habitus"].

Xorides (zŏr′i-dēz, zo-rī′dēz), m., [derivation obscure; some possibilities are: ξηρώδης, dry-looking; ξυρόν, razor + εἶδος, shape, form; χορίτης, dancer; χωρίτης, countryman, rustic. My reason for preferring to accent the antepenult is that the word suggests the patronymic suffix *-ides*, which has a short penult].

Xylophrurus (zī′lo-froo′rus, zĭl′o-), m., ξύλον, wood + φρουρός, watcher.

Zabrachypus (za-brăk′i-pus), m., ζα-, very + βραχύς, short + πούς (*pod-*), foot.

Zaglyptus (za-glĭp′tus), m., ζα-, very + γλυπτός, carved.

Zaleptopygus (za-lĕp′to-pī′gus), m., ζα-, very + *Leptopygus*.

Zatypota (zăt′i-pō′ta), f., ζα-, very + τυπωτός, shaped, impressed (referring to the abdomen).

Zootrephus (zo-ŏt′re-fus), m., ζῶον, animal + τρέφω, feed, nourish ("nourished on animals").

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The following materials deal with subjects similar to that of the present paper:

Miller, W. "Scientific names of Latin and Greek derivation." Proceedings of the California Academy of Sciences, 3d series, Zoology, 1:115-42.

Brown, R. W., 1954. Composition of scientific words. Published by the author.

Wheeler, G. C., 1956., Myrmecological orthoepy and onomatology. University of North Dakota Press.

ANNOUNCEMENT

A new entomological journal, *Pacific Insects*, commences publication in 1959. Under auspices of the Entomology Department, Bernice P. Bishop Museum, it is advertised as the organ for the program "Zoogeography and Evolution of Pacific Insects," and will be devoted primarily to monographs and zoogeographical papers on insects and other terrestrial arthropods from the Pacific area, including eastern Asia, Australia, and Antarctica. Manuscripts should not be submitted without prior arrangement with the editors.—ED.

A NEW SUBGENUS AND SPECIES OF DINOGAMASUS MITE FOUND ASSOCIATED WITH APHIDS IN ANGOLA, AFRICA

(ACARINA, LAELAPTIDAE)

FREDERICK CUNLIFFE, *Castleton Teachers College, Castleton, Vermont.*

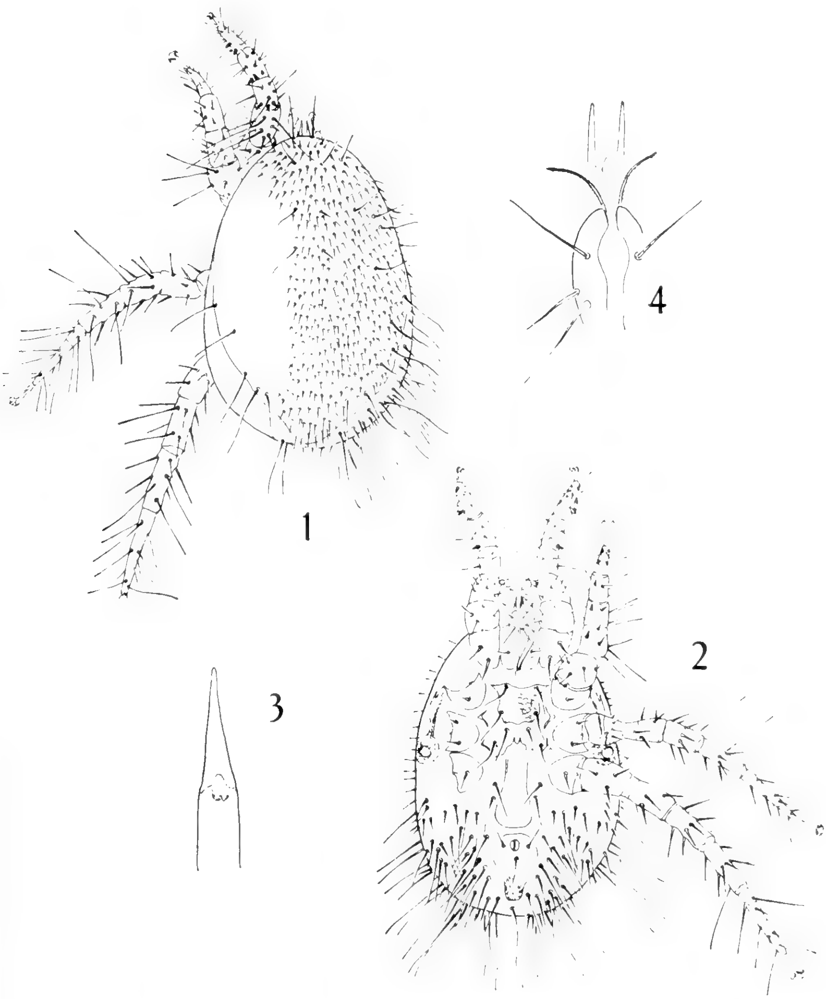
An interesting mite belonging to the family Laelaptidae, subfamily Hypoaspidinae, was sent to the U. S. National Museum for determination by Arturo Medina of Angola, Africa. Although the only information with the mite stated that it was associated with aphids, the structure of the mouth parts indicates that this species is a parasite of insects, although not necessarily of aphids. Grossly, it appears similar to *Coleolaelaps* Berlese, 1914 (Laelaptidae), and *Megalolaelaps* Berlese, 1908 (Pachylaelaptidae) in possessing numerous body setae. The mouth parts of this new mite are very interesting in that they resemble those of an undescribed species of Laelaptonyssidae in that the fixed chela is completely lost. The laelaptid mites associated with insects appear to have various characters in common, even though they may not be closely related. At present, their phylogenetic relationship is not clear, but it is hoped that as new species are found these relationships can be better understood.

Dinogamasus (Allophilaelaps), new subgenus

This genus is characterized in having many short body setae, giving the mite a hairy appearance, in that the chelicerae are without the fixed chelae, in that the sternal plate has only two pairs of setae, and in that the genital plate is without setae. As far as is known, no other laelaptid mite possesses this combination of characters. The type of the genus is *D.* (*A.*) *medini*, new species.

Dinogamasus (Allophilaelaps) medini, new species

Only the female is known. Dorsally, the shield is covered with many short setae, giving the mite a hairy appearance; a few setae are very long, and those on the posterior of the shield are about twice as long as the shorter ones elsewhere on the shield. The setae on the non-sclerotized areas of the dorsum are long, whiplike. The gnathosoma is barely visible from above; it is situated beneath the propodosoma, and is characterized in that the corniculi are absent; as far as can be seen on the only specimen there are no teeth in the deutosternal groove; the hypostomal setae are as figured. The chelicerae lack the fixed chelae, and the movable chelae lack teeth. The tritosternum is bifid. The sternal plate is small, squarish, reticulate, and possesses only two pairs of long setae; the third pair of sternal setae are off the plate. The metasternal plates are missing, although the setae and pores are present. The genital plate is long, drop shaped, with few longitudinal striations anteriorly, and without setae; the genital setae arise from the non-sclerotic area laterad of the plate; another pair of long setae arise just behind these setae. The anal plate is longer than wide, with setae as figured. The venter of the body is densely clothed with setae, most of which are long and whiplike; the metapodal plates are missing. The stigmata are large, circular, the peritreme is short, not extending past coxae III; the peritrematal plate is wide, broadening anteriorly, and reaching coxae II. The legs are distinctive in that both legs I and II possess short strong spinelike setae; the other setae are slender and whiplike. Tarsus I has a distal, hooked spinelike seta and three proximal outer spinelike setae, the anterior one being bifid; tibia I possesses three short proximal spinelike setae; genu I has three short stout spinelike proximal setae and one long dorsal whiplike seta; femur I possesses several long dorsal whiplike setae and a small ventral spinelike seta; the long whiplike setae of femur I are reminiscent of those setae found in the genus *Laelaps*. Tarsus II has an anterior and a medial pair of short



Dinogamasus (*Allophilaelaps*) *medini*, new species. Fig. 1, dorsum of female; fig. 2, center of female; fig. 3, chelicera; fig. 4, venter of rostrum.

spinelike setae ventrally, but none dorsally; tibia II has one short strong seta ventrally, the others being normal; genu II has two short strong spinelike setae ventrally, the others being normal; femur II has one strong short spinelike seta ventrally and three long whiplike setae dorsally, much as on femur I. Legs III and IV possess a combination of long whiplike setae and spinelike setae of medium length as figured. Length of female 1730 μ; width 1090 μ.

The only specimen, a female, holotype U. S. National Museum No. 2547, was collected by Arturo Medina in Portuguese Angola, Africa, at Inga-Zanga, with aphids (no other data available).

NEW SYNONYMY IN THE DERMANYSSINAE KOLENATI, 1859, WITH A DESCRIPTION OF A NEW SPECIES OF DERMANYSSUS

(ACARINA, DERMANYSSIDAE)

G. W. KRANTZ, *Oregon State College, Corvallis*

In his review of North American dermanyssid mites, Ewing (1922) erected the genus *Allodermanyssus*, designating *Dermanyssus sanguineus* Hirst as the type species. *Allodermanyssus* was characterized as having, in the female, a divided dorsal shield and the anus situated centrally in the anal plate. In all other respects, the genus was considered to be similar to *Dermanyssus*.

In 1956, Keegan placed *Dermanyssus aegyptius* Hirst, 1913, in the genus *Allodermanyssus* when the presence of a minute posterior dorsal shield on the female type material was confirmed. To date, therefore, there are two described species of *Allodermanyssus*.

Whether the presence or absence of a divided dorsal plate is sufficiently strong to merit generic differentiation in this group is open to debate. Examination of nymphs in both *Dermanyssus* and *Allodermanyssus* reveals that the dorsal sclerotization is usually fragmented. For example, the protonymph of *D. muris* Hirst (1914) possesses a posterior dorsal plate similar to that of *A. sanguineus*, as well as four pairs of mediolateral platelets. The two above-mentioned protonymphs show a striking similarity in overall dorsal sclerotization (figs. 6, 7). The protonymph of *D. gallinae* (Degeer) has a posteriorly fragmented dorsal plate consisting of three pairs of posteromedian and a pair of posterior platelets (fig. 5). Coalescence of platelets occurs at the deutonymphal molt in both these genera, with the consolidation resulting in sclerotization resembling that of the subsequently emerging adult. Platelet coalescence in males of *A. sanguineus* results in a single dorsal plate of a type similar to that of males of the genus *Dermanyssus*.

The variation in anal plate morphology of *Dermanyssus* and *Allodermanyssus* seems too minor to be considered a major generic character. Further, the position of the anal opening of *A. sanguineus* may vary considerably from that of *A. aegyptius,* with that of the latter showing a definite posterior orientation on the anal plate (Hirst, 1914). Thus the only character separating these genera is based on the degree of plate and platelet coalescence occurring initially in the female deutonymph.

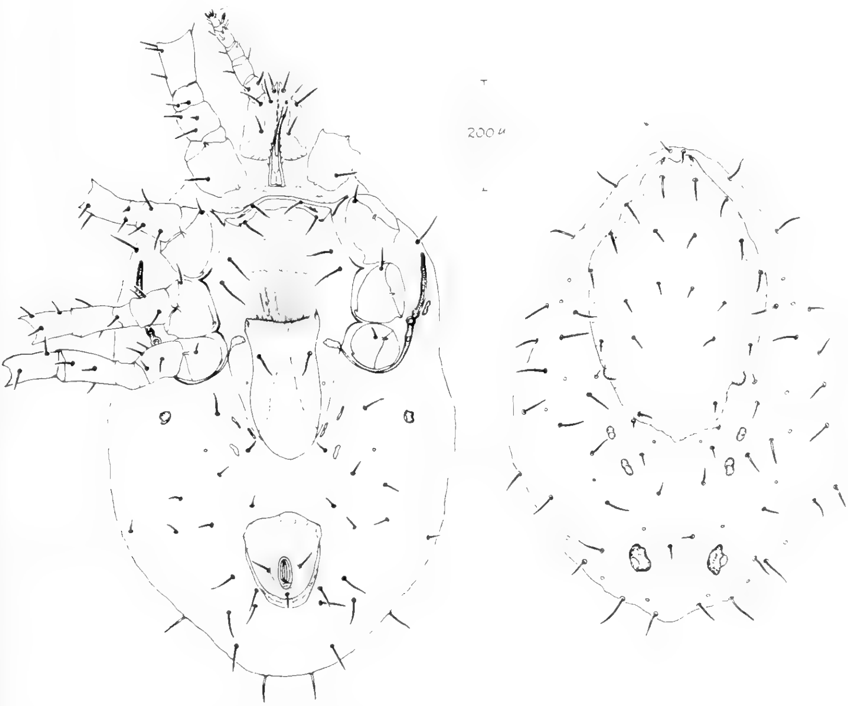
Recently, a series of specimens representing an undescribed species of the subfamily Dermanyssinae was received from Alaska, the females of which possess three primary dorsal plates. On the basis of the discussion above, and because of the apparent variations in platelet coalescence as illustrated in the accompanying description, the genus *Allodermanyssus* Ewing is herein placed in synonymy with *Dermanyssus.*

Genus **Dermanyssus** Dugés

Dermanyssus Dugés, 1934, Ann. Sci. Nat. Zool., I, 18.
Allodermanyssus Ewing, 1922, Proc. U. S. Nat. Mus. 62(13): 2. *New synonymy.*

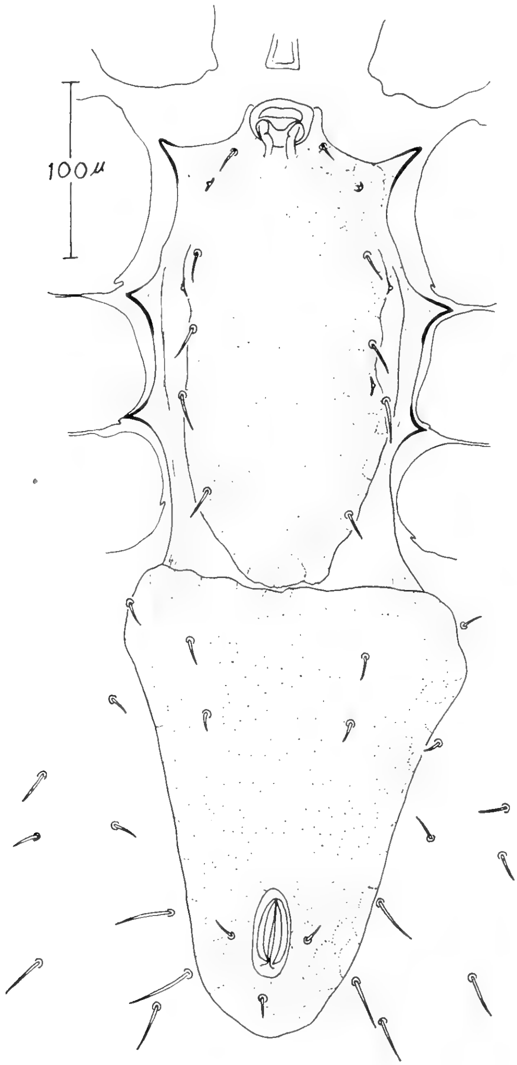
Type.—Acarus gallinae Degeer, 1778.

Generic description.—Chelicerae of female long and needle-like; chelae minute. Dorsal plate undivided, or divided posteriorly into one or more small primary



Dermanyssus triscutatus, female. Fig. 1, dorsal aspect; fig. 2, ventral aspect.

platelets. Genitoventral plate of female pointed or rounded posteriorly and bearing one pair of setae. Peritreme joined posteriorly with fovea of coxa IV. Coxae without spurs. Ventral plate of male undivided or provided with a suture at the level of coxae IV. Anal plate rounded or peltate, with the anus situated centrally or posteriorly in the plate. Parasites of birds and small mammals.



Dermanyssus triscutatus, male. Fig. 3, ventral aspect.

Dermanyssus triscuatus, n. sp.

Female (Figs. 1 & 2).—Average length of idiosoma (60 engorged specimens)—914μ, with a range of 840-1022μ; average width at insertions of coxae IV—536μ, with a range of 490-602μ. Ventrally, similar to *D. gallinae,* except for the following: Peritreme extending anteriorly to a point just behind the midline of coxae II. Sternal plate abbreviated and forked anterolaterally to form a spine-like protuberance on either side. Dorsally, with a short weakly reticulated anterior plate extending little more than half the length of the idiosoma and pointed posteriorly; with ten pairs of simple setae, the more anterior pairs far exceeding the others in length; usually with a pair of small rounded lateral protuberances at a point posterior to the insertion of coxae IV. Vertical setae short, inserted in the integument just above the anterior plate. With a pair of small primary platelets situated near the posterior end of the dorsum, and two pairs of smaller platelets flanking the posterior edge of the anterior plate. Platelets without setae.

Male (Fig. 3).—Length of idiosoma—660μ. Width at insertions of coxae IV—422μ. Ventrally, similar to male of *D. gallinae*, except for the following: Genito-sternal plate with five pairs of simple setae. Peritreme of variable length, but never extending forward to the anterior edge of the insertion of coxae II. Dorsally, with an undivided, weakly reticulated dorsal plate which extends anteriorly and anterolaterally to the margins of the idiosoma, tapering posteriorly from the level of coxae II and extending nearly to the posterior margin of the body. With approximately 16 pairs of setae inserted on the dorsal plate, the more anterior pairs exceeding the others in length. Unfortunately, the dorsum of the one male specimen available to the writer was somewhat obscure.

Immature stages.—Similar to *D. gallinae*, except that the vertical setae often are inserted anterior to, rather than on, the anterodorsal plate (Fig. 4).

Type specimens.—Holotype female and allotype male on slides No. 58-16631H and 58-16631A respectively, deposited in the collection of the U. S. National Museum, Washington, D. C. Collecting data are as follows: Holikachuk, Alaska; August, 1958; Coll. John Pettit; collected on and in school buildings.

Type host.—Unknown. Several northern cliff swallows were found to be nesting in the infested buildings and may have acted as the natural host for *D. triscutatus*. It was reported that the mites were biting school children and causing dermal irritation.

Type locality.—Holikachuk, Alaska.

Optical equipment.—Drawings were made and morphological data were collected with the aid of a Spencer phase contrast microscope equipped with dark medium contrast objectives and illuminated by a Spencer Ortho-illuminator.

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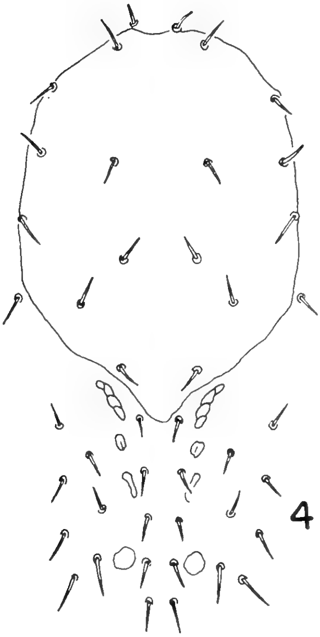

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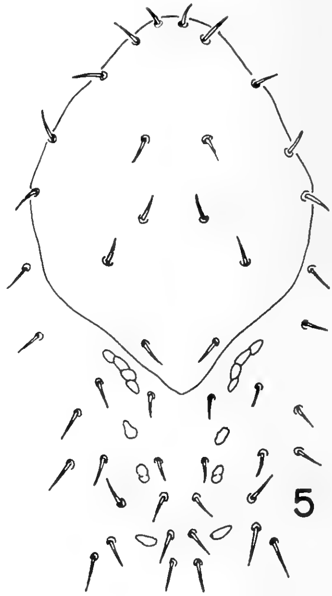

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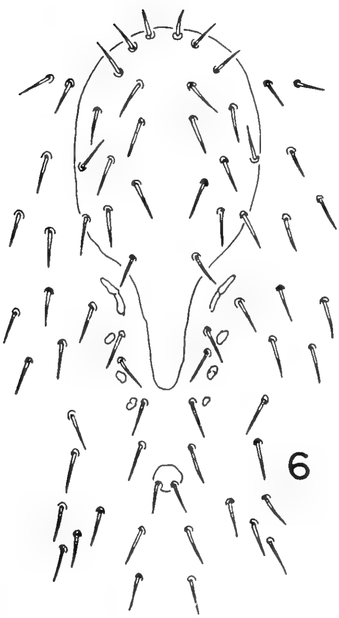

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Dorsal aspects of dermanyssine protonymphs. Fig. 4, *D. triscutatus;* fig. 5, *D. gallinae;* fig. 6, *D. sanguineus;* fig. 7, *D. muris.*

A NEW PALMACORIXA FROM WESTERN CANADA

(HEMIPTERA, CORIXIDAE)[1]

A. R. BROOKS, *Canada Agricultural Research Laboratory, Saskatoon, Saskatchewan*

The genus *Palmacorixa* Abbott contains three described North American species distributed chiefly in Eastern Canada and United States (Hungerford, 1948). None has heretofore been recorded from Western Canada.

During the regular insect faunal survey in 1958 two species of *Palmacorixa* were collected in Saskatchewan and Manitoba. One of these proved to be an undescribed, lake-dwelling species. The other species, *P. gillettei* Abbott, was found rather abundant in Saskatchewan in a weedy pool of the Pipestone Creek south of Whitewood; and in Manitoba in the La Salle river at St. Norbert, in the Assiniboine river north of Holland, and in Lake Manitoba east of Langruth.

The new species is named for my daughter Jane, who was responsible for collecting the original series.

Palmacorixa janeae, n. sp.

(Figs. 1, 2, 3, 4)

Size.—Length 4.5 to 5.5 mm.; width of head 1.2 to 1.4 mm.

Color.—General appearance pale, with paler area on clavus just behind scutellum. Vertex and face pale, translucent yellow, the vertex usually with faint, brown, median line. Pronotum crossed by about eight, narrow, more or less split, brown bands. Hemelytral pattern reticulate, quite variable, the brown lines usually narrow and scattered, and the inner basal area of clavus with reduced markings; brown lines usually somewhat heavier and partly fused each side of claval suture, and immediately behind claval suture-commissure junction; pattern of membrane continuous with corium; underside and legs entirely pale.

Structural characteristics (male).—Frontal depression very shallow and oval, the upper margin extending just above the lower border of eye; a slight depression beneath inner corner of eye. Synthlipsis 0.8 times as wide as eye at posterior margin. Pronotum 2.15 times as wide as long, its surface sparsely punctate. Hemelytral surface rugulose with sparse hairs. Mesoepimeron a little narrower than lateral lobe of prothorax, the osteole just laterad of the tip. Metaxyphus short, flat, and triangular, one-third wider than long, and the apex about 80 degrees. Front femur with large, circular, stridular field of pegs (12-13 rows); pala a thin, triangular plate with upper margin nearly straight, the outer third covered with appressed, white, spine-like hairs with some stouter peg-like hairs forming a triangular patch at the centre toward base, and a short, curved row of pegs at base below; lower palmar bristles 12; middle femur without a row of pegs on ventral surface; upper surface of hind femur (posterior) with long row of pegs, the lower surface bare. Hemelytron pointed at apex; hind wing reduced to very small, short membrane. Fourth abdominal tergite with large, hair-margined

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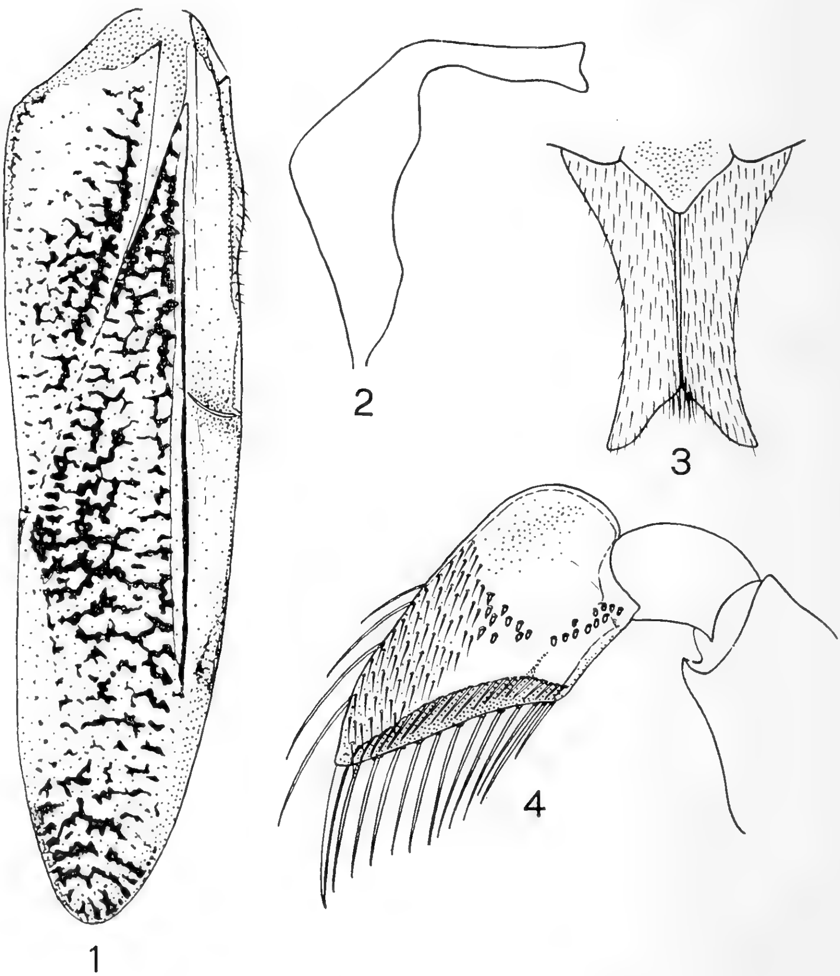
[1]Contribution No. 14, Canada Department of Agriculture Research Laboratory, Saskatoon, Saskatchewan.

lobes; seventh tergite with pencil of long hairs and a small, curved, dextral, sclerotized hook; strigil small, with 5 combs; right clasper as illustrated.

The female is similar in color and general structure to the male; last ventral abdominal segment not plainly incised at the tip.

Comparative notes.—*P. janeae* is closely related to the genotype *P. gillettei* Abbott, differing from that species by the less depressed front of the male; the shorter, more obtuse metaxyphus; the narrower mesoepimeron; and the structure of the male pala. It is a noticeably smaller



Palmacorixa janeae n. sp. Fig. 1, right hemelytron, male; fig. 2, right genital clasper, male; fig. 3, metaxyphus; fig. 4, right pala, male.

species on the average than *gillettei*, with more pointed hemelytra, and the hemelytral pattern is made up of smaller and more scattered figures than average *gillettei* from the Prairie Region.

The Saskatchewan specimens are a little larger than the Manitoban and decidedly paler, with the lighter area of the clavus more conspicuous.

Habitat and distribution.—The type series was collected near the north shore line in clear, sandy-bottomed Lake Katepwa which is part of the Qu'Appelle River system. No conspicuous vegetation was present.

The Manitoban series was collected at Moon Lake in Riding Mountain National Park. This lake is in a spruce forest association and is much smaller than Katepwa. It is stony-bottomed, lacks conspicuous vegetation, and is not on a river course.

As the species lacks functional hind wings and presumably does not migrate as readily as other species, the distribution cannot be explained at present.

Holotype male, allotype female.—Lake Katepwa, Lebret, Saskatchewan, 13.vii.1958 (A. R. & J. E. Brooks) : No. 6777 in the Canadian National Collection, Ottawa.

Paratypes.—20 males, 46 females, Lebret, Sask., 13.vii.1958 (A. R. & J. E. Brooks) ; 9 males, 23 females, Moon Lake, Wasagaming, Manitoba, 14.viii.1958 (A. R. & J. E. Brooks). Paratypes in Ottawa, in the United States National Museum, Washington, and in the University of Kansas, Lawrence.

REFERENCE

Hungerford, H. B. 1948. The Corixidae of the Western Hemisphere (Hemiptera). Univ. Kansas Sci. Bull. 32: 1-827.

BOOK REVIEW

A REVIEW OF THE CRABHOLE MOSQUITOES OF THE GENUS DEINOCERITES (DIPTERA, CULICIDAE), by John N. Belkin and Charles L. Hogue, Univ. Calif. Publ. in Ent. 14: 411-458, illus. 1959.

The genus *Deinocerites* is distributed in the Caribbean area and along that part of the Pacific Coast of the Western Hemisphere opposite the Caribbean. It is one of the most interesting genera of mosquitoes because of its association with crabholes and its uncertain position in the Culicidae. This work is a splendid revision of the genus, dealing with 11 species, 6 of them previously described, 4 described as new, and 1 unnamed. The work was based on the study of more than 1,500 specimens. The paper summarizes the biological information and goes into the taxonomy, zoögeography and phylogeny in detail. The illustrations consist of a distribution map by species and species group, a phylogenetic tree, and many fine taxonomic drawings by the junior author. Complete keys are given to the females, males, and male terminalia, and preliminary keys to some of the larvae and pupae.

ALAN STONE, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

A BURROWING WEBWORM, ACROLOPHUS SP., GIRDLING EVERGREEN SEEDLINGS

(Lepidoptera, Acrolophidae)

For the past several years seedling evergreen stands growing in the Maryland State Forest Nursery at Jessup have been subject to repeated attacks by a girdling insect. Spruce, balsam, and white pine are attacked. Typical damage occurs from ground level to about one-half inch up the trunk. The bark is completely removed from the seedling.

Detection of the pest is difficult. The girdling symptom, browning of the foliage, does not appear for several days after attack by the insect. In order to locate the pest several hundred seedlings were examined in beds in areas where browning was found and girdling had occurred. Fresh droppings were finally located near several seedlings which had recently been damaged. When the earth from around the base of these plants was removed a large caterpillar was unearthed about one foot in the ground. Droppings from this larva were similar to those found at the base of damaged plants.

Mr. H. W. Capps of the Entomology Research Division, Insect Identification and Parasite Introduction Laboratories, U. S. Department of Agriculture, identified the larva as *Acrolophus sp.*, family Acrolophidae.

Charles W. McComb and John A. Davidson, *Department of Entomology, University of Maryland, College Park.*

BOOK NOTICE

THE WORLD OF INSECTS, by Paul Pesson. 204 pp., profusely illustrated. McGraw-Hill Book Co., New York, N. Y. Price $15.00.

A companion volume to *The World of Butterflies and Moths,* reviewed in Vol. 60, No. 6, of the *Proceedings,* this book provides a wonderful introduction to some of the more unusual insects. It offers many hours of informative reading. Included in its pages are some of the best insect photographs, both in color and black-and-white, that this reviewer has ever seen.—Ed.

NEW DISTRIBUTION RECORDS FOR ZOROTYPUS HUBBARDI CAUDELL

(ZORAPTERA)

Since my 1938 synopsis of the Zoraptera appeared (Proc. Ent. Soc. Wash. *40:* 57-87), numerous additional records for *Zorotypus hubbardi* have been published. Riegel (Trans. Ill. State Acad. Sci. *50:* 265-266, 1957) has cited the relevant papers and suggested that the "pattern of distribution that is emerging for *Z. hubbardi* seems to coincide with the deciduous forest region almost to the 39th parallel." The present note is for the purpose of making available various records which have accumulated, based mainly on collecting opportunities incidental to trips outside of the Washington, D. C., area. Specimens are preserved in the U. S. National Museum.

First state records are included for Pennsylvania, Delaware, and West Virginia, that for Pennsylvania being at a latitude of about 39° 50′, slightly farther north than any previously published record. Several sawdust piles in more boreal parts of Pennsylvania have been examined, but they yielded no Zoraptera. The Camp Crowder, Missouri, collection is the most westerly record except for Texas ones and the recent record from McCurtain Co., Okla. (Coop. Econ. Insect Report, U. S. Dept. Agric. *9:* 22, 1959). It may be noted that none of the localities for *hubbardi* occurs above the Upper Austral Zone, as mapped by Merriam and his associates in 1910, except the West Virginia locality which barely is included in Transition Zone limits. So far as adding further state records near the Atlantic Coast is concerned, southern New Jersey deserves investigation.

The following records are listed in north to south order, and from east to west. The initials ABG indicate my collecting.

Pennsylvania: About 2 miles n. w. of Fairfield, Adams Co., along road from Fairfield to South Mountain, in sawdust pile in woods, about 1000 ft. alt., July 13, 1958 (ABG).

Maryland: Tridelphia, near Clarksville, in sawdust, Dec. 7, 1941 (ABG); Blackwater Migratory Bird Refuge, about 10 miles s. of Cambridge, in sawdust pile, Nov. 22, 1958 (P. J. Spangler); Callaway, 8 miles n. of Piney Point, St. Mary's Co., Aug. 26, 1946 (E. A. Chapin, R. I. Sailer).

Virginia: Frederick Co., on Route 55 just e. of W. Va. line, about 14 miles n. w. of Strasburg, about 1700 ft. alt., sawdust pile, Sept. 14, 1958 (ABG); Shenandoah Co., at base of Short Mountain, near town of Mount Jackson, under slabs in mixed pine and oak sawdust, acidity, pH 4.5, about 1200 ft. alt., June 6, 1941 (ABG); New Church, on Route 13, about 2 miles s. of Md. line, in sawdust pile, Oct. 19, 1958 (ABG); Princess Ann Co., North Landing, near Princess Ann, in sawdust pile, Aug. 29, 1938 (ABG).

West Virginia: About 6 miles s. of Augusta, Hampshire Co., about 1300 ft. alt., in sawdust pile, Aug. 4, 1956 (ABG).

Delaware: About 2 miles e. of Md. line on Route 24 between Laurel, Del., and Sharptown, Md., in sawdust pile, Oct. 18, 1958 (ABG).

South Carolina: Florence, under bark of logs, May 3, 1941 (M. R. Smith).

Florida: Newman's Lake, Gainesville, in rotting log in hammock, Oct. 8, 1941 (T. H. Hubbell, J. J. Friauf, ABG); Plant City, in pile of cypress sawdust, Oct. 2, 1941 (ABG); Sarasota, under bark of pine log, Feb. 6, 1958 (H. V. Weems, Jr.); Fort Myers, in sawdust pile, Oct. 2, 1941 (ABG); Marco Island, under pine log bark, Dec. 1, 1955 (H. V. Weems, Jr.).

Missouri: 10 miles w. of Columbia, in sawdust pile, Oct. 23, 1956 (P. J. Spangler); Knob Noster, Johnson Co., in rotten log, April 19, 1957 (P. J. Spangler); Camp Crowder, Neosho, in sawdust pile, Oct. 25, 1942 (ABG).

ASHLEY B. GURNEY, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

BOOK REVIEW

MANUAL OF INSECT MORPHOLOGY, by E. Melville DuPorte, Macdonald College, McGill University, Quebec, Canada. Reinhold Publishing Corporation, New York, 224 pages, 14 figures. $5.00.

This *Manual of Insect Morphology* is a student's guide to the study of insect anatomy. The author says it is a product of forty years of teaching. Morphological discussions are reduced to a minimum, and there is no indoctrination of any particular morphological theory. The facts of insect structure are clearly stated, and the student is specifically instructed how to see them with his own eyes. The illustrations are all diagrammatic, as they should be in a text of this kind; none can be copied as a picture of any particular insect.

The subject matter is divided into 19 sections. The first three treat briefly of sclerites, segmentation, and the general external structure of an insect. The others are devoted to the major anatomical parts of the insect, the appendages, and the internal organ systems. Each section begins with a general description of the part to be examined, and then proceeds to a study of individual species, with instructions for the student on how to make dissections, and specification of the drawing which the student is expected to make from his own observation. The sections do not follow the usual anatomical order, but apparently according to the relative ease with which the parts can be studied. The abdomen thus comes first, then the thorax, wings, legs, and external genitalia, followed by the more difficult subjects of the head and types of mouth parts, the integument, and finally the internal organs, and a brief section on the sense organs.

The insects selected for study are in general species easily procured, or that have close relatives found most anywhere. The cricket *Acheta* plays a major role in most of the sections; others described for comparison include a grasshopper, a stonefly, a neuropteron, an hemipteron, a beetle, a lepidopteron, a fly, and the honey bee, or various other forms for special features. At least 40 species are listed in the index that receive mention somewhere in the text.

Certainly the student who completes the course outlined in this text will be thoroughly grounded in the elements of insect anatomy. Few of us have had such a start.—R. E. SNODGRASS, *Washington, D. C.*

NEW NAME COMBINATIONS IN A LIST OF THE SPECIES OF DIALEUROPORA QUAINTANCE AND BAKER

(HOMOPTERA, ALEYRODIDAE)

LOUISE M. RUSSELL, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

This paper is presented primarily for the purpose of making available seven new name combinations. Since only 14 described species are assignable to *Dialeuropora*, however, and since their original descriptions are scattered and some are not readily accessible, it is deemed desirable to list each name with its original citation, and to give the first citation linking the specific name with the generic name *Dialeuropora* in the seven cases in which such action had already been taken. The name of the plant and the major political division from which each species was originally described is also included.

Dialeuropora, with *decempuncta* designated as its type species, was established by Quaintance and Baker as a subgenus of *Dialeurodes* (1917, U. S. Nat. Mus. Proc. 51: 406, 434), and was elevated to generic rank by Takahashi (1934, Formosa Govt. Res. Inst. Dept. Agr. Rpt. 63: 46).

SPECIES OF DIALEUROPORA

Dialeuropora brideliae (Takahashi), 1934, Formosa Govt. Res. Inst. Dept. Agr. Rpt. 63: 46.

Dialeurodes (*Dialeuropora*) *brideliae* Takahashi, 1932, Formosa Govt. Res. Inst. Dept. Agr. Rpt. 59: 15-16, illus. On *Bridelia ovata, Machilus* sp.; Formosa.

Dialeuropora centrosemae (Corbett), new combination.

Dialeurodes centrosemae Corbett, 1935, Fed. Malay States Mus. Jour. 17: 750, illus. On *Centrosema plumieri;* Selangor, Malaya.

Dialeuropora cumiugum (Singh), new combination.

Dialeurodes cumiugum Singh, 1932, Indian Mus. Rec. 34: 85, illus. On undetermined shrub; Burma.

Dialeuropora decempuncta (Quaintance and Baker), Takahashi, 1934, Formosa Govt. Res. Inst. Dept. Agr. Rpt. 63: 46.

Dialeurodes (*Dialeuropora*) *decempuncta* Quaintance and Baker, 1917, U. S. Nat. Mus. Proc. 51: 434-435, illus. On cinnamon, mulberry; Ceylon, India.

Dialeuropora hassensanensis Takahashi, 1934, Formosa Govt. Res. Inst. Dept. Agr. Rpt. 63: 45-46, illus. On a plant of the Lauraceae; Formosa.

Dialeuropora holboelliae Young, 1944, Sinensia 15: 132, illus. On *Holboellia* sp.; Szechwan, China.

Dialeuropora jendera (Corbett), new combination.

Dialeurodes jenderus Corbett, 1935, Fed. Malay States Mus. Jour. 17: 750-751, illus. On *Adinobotrys atropurpureus;* Selangor, Malaya.

Dialeuropora langsat (Corbett), new combination.

Dialeurodes langsat Corbett, 1935, Fed. Malay States Mus. Jour. 17: 752-753, illus. On *Lansium domesticum;* Selangor, Malaya.

Dialeuropora mangiferae (Corbett), new combination.

Dialeurodes mangiferae Corbett, 1935, Fed. Malay States Mus. Jour. 17: 751-752, illus. On *Mangifera indica;* Selangor, Malaya.

Dialeuropora murrayae (Takahashi), new combination.

Dialeurodes (*Dialeuropora*) *murrayae* Takahashi, 1931, Nat. Hist. Soc. Formosa. Trans. 21: 262-264, illus. On *Murraya* spp.; Formosa.

Dialeuropora perseae (Corbett), Young, 1944, Sinensia 15: 131.

Dialeurodes perseae Corbett, 1935, Fed. Malay States Mus. Jour. 17: 749-750, illus. On *Conocephalus subtrinervius, Cyamopsis psoralioides, Musa sapientum, Persea gratissima;* Selangor, Malaya.

Dialeuropora setigera (Takahashi), 1934, Formosa Govt. Res. Inst. Dept. Agr. Rpt. 63: 46.

Dialeurodes (*Dialeuropora*) *setigerus* Takahashi, 1932, Formosa Govt. Res. Inst. Dept. Agr. Rpt. 59: 14-15, illus. In *Machilus* sp.; Formosa.

Dialeuropora urticata Young, 1944, Sinensia, 15: 131. On *Urtica* sp.; Szechwan, China.

Dialeuropora viburni (Takahashi), new combination.

Dialeurodes (*Dialeuropora*) *virburni* Takahashi, 1933. Formosa Govt. Res. Inst. Dept. Agr. Rpt. 60: 8-9, illus. On *Viburnum awabucki;* Formosa.

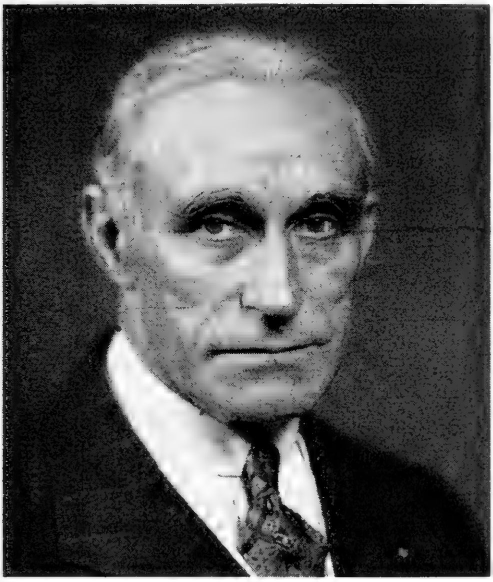
A FIRST HOST RECORD AND NEW DISTRIBUTION RECORDS FOR PHILOCALIA TENUIROSTRIS REINHARD

(DIPTERA, TACHINIDAE)

Philocalia tenuirostris Reinhard was described in 1939 (Bull. Brooklyn Ent. Soc. 34 (2) :70-72) on the basis of the holotype female collected at Bozeman, Montana. Dr. E. H. Strickland in 1946 (Canadian Jour. Res., D, 24:173) has shown that *Evanalia medicinensis* Strickland (Canadian Ent. 73(4) :64-66, figs. 1 & 2, 1941), which was described from Medicine Hat and Tilley, Alberta, is a synonym. This remarkable fly may be distinguished from all other known genera of Tachinidae, at least in our Nearctic fauna, by the combination of the two following characteristics: (1) the four vein evanescent beyond the bend, (2) the elongate slender proboscis nearly equaling the combined length of the thorax and abdomen.

One female specimen of this tachinid was reared by P. C. Stone from *Amydria effrenatella* Clemens (Lepidoptera: Tineidae), merely from the recorded locality "Illinois" on 18-V-39. Data as to whether the parasite emerged from the host larva or pupa are unavailable. One male specimen of *tenuirostris* was also collected at Terra Haute, Indiana, on 14-VII-43, by Fred C. Harmston. These two specimens are in the collection of Professor H. J. Reinhard, who has kindly made the material available for study.

P. H. ARNAUD, JR., *Bureau of Entomology, California Department of Agriculture, Sacramento.*



CHARLES TULL GREENE, 1879-1958

Charles Tull Green, born March 27, 1879, was the son of Joseph Sawyer and Mary Ann Greene of Philadelphia. He attended eight consecutive years of public school in that city and at the age of 17 entered the Franklin Institute to study the art of illustration. During 1898, 1899, and 1900 he continued to develop in that direction at the School of Industrial Arts of the Pennsylvania Museum, spent another year at the Franklin Institute in 1903 and 1904, then attended the Drexel Institute from 1906 to 1908 as a special student with an interest in mathematics. For four years following the completion of these studies he was employed as a draftsman with the Philadelphia Maritime Exchange, the Baldwin Locomotive Works, the Tabor Machine Co., and the Walker Electric Co., all located in the city of his birth.

Greene's interest in entomology was awakened by a membership in the Feldman Collecting Social. His liking for C. W. Johnson, then associated with the Academy of Natural Sciences of Philadelphia, fostered his love for insects—this love apparently deepened as his schooling progressed, for in the spring of 1912 it bore fruit when he sought and was appointed to a position as "Agent" with U. S. Department of Agriculture Forest Insect Investigations. His first duties were ". . . to investigate insect enemies of living forest trees, especially chestnut." He became deeply interested in life histories of insects and their immature stages—it was an interest he was to express by further study and publication for the rest of his professional career. In 1913 he arrived in the Forest Insects Investigations Laboratory in Falls Church, Virginia, and worked there under A. D. Hopkins until that organization was disbanded in 1918. By this time his flair for illustration and his general knowledge of Diptera qualified him for a taxonomic position—he was accordingly appointed on Department of Agriculture funds as a "Specialist in Diptera" to work under J. M. Aldrich on the collections of insects in the U. S. National Museum.

By the time that appointment had become a reality on July 1, 1919, Greene had already published papers on various species in the dipterous families Tipulidae, Tabanidae, Agromyzidae, Syrphidae, and Muscidae, much of which involved descriptions and illustrations of immature stages. Although his fundamental interest in life histories and immature stages was expressed throughout his writings, he now turned to more comprehensive problems with the descriptions of new genera, some work on the phylogeny of the muscoid flies, and the complete revisions of several rather difficult groups, all made possible by his access to the National Collection and constant association with Aldrich.

During March, April and May of 1926, Greene traveled to Panama and the Canal Zone to rear and study fruit flies, a project that gave rise to the first important revision of the difficult tephritid genus *Anastrepha* ever attempted by a North American entomologist. In connection with this trip he was appointed Honorary Assistant Custodian of Diptera in the U. S. National Museum.

Greene had a penchant for outside study during his entire working life. His interest in illustration kept him in art schools at night during his early years in Philadelphia. For a time in 1916 he studied French under a private tutor. Soon after he assumed his duties at the National Museum he initiated studies at George Washington University, and six years of evening classes and at-home study was rewarded with two full years of university credit. He spent the next five years in the same type of activity at American University in Washington and was awarded his Bachelor of Science degree by that institution in the spring of 1933.

During three years between 1917 and 1921 he served in the "Colonial Rifles," a company of Virginia Home Guards which substituted for the Virginia State Militia during World War I.

His retirement on March 31, 1949, at the age of 70 ended an association with the Department of Agriculture that had lasted for almost 37 continuous years.

By the time he had completed his series of publications he had performed taxonomic work in at least 17 families of Diptera and had written biological accounts of various species in many more. He was especially well known for his ability to illustrate the insects with which he worked. The American literature on Diptera has been greatly enriched by the presence of a very large number of his drawings.

On October 9, 1912, he married Ida May Parkinson. They resided in Falls Church, Virginia, until about 1920, when they moved to

College Park, Maryland. Mrs. Greene died on June 15, 1942. He was very much interested in classical music, and both he and Mrs. Greene sang in the choir of the Falls Church Methodist Church, of which they were both members. In addition to his interest in insects, he indulged in a hobby of collecting stamps and seals. As a small boy he devoted himself to these collections.

Greene became a member of the Entomological Society of Washington in 1912. He acted as Recording Secretary from 1922 to 1928, served as Vice President in 1931 and 1932, and was elected to the presidency of the Society for the year 1933. Throughout his entomological career he was also a member of the Biological Society of Washington, Cambridge Entomological Club, and the Academy of Natural Sciences of Philadelphia.

He died of cancer in December, 1958, having bequeathed an unrestricted sum of $500.00 for the advancement of Entomological Society of Washington objectives.

W. S. Fisher
D. G. Hall
Richard H. Foote, *Chairman*

Publications of Charles T. Greene

1909. Description of larva and pupa of *Tipula trivittata* Say. Ent. News 20: 289-290, illus.

——. Male of *Chrysops brimleyi* Hine. *Ibid.:* 302, illus.

——. Female of *Aeschnasoma rivertonensis* Johnson. *Ibid.:* 327.

1914. The cambium miner in river birch. Jour. Agric. Res. 1: 471-474, illus.

1915. Capture of *Callicera johnsoni* Hunter. Proc. Ent. Soc. Wash. 17: 1.

1916. District of Columbia Diptera: Syrphidae. Proc. Biol. Soc. Wash. 29: 173-203, illus. (with N. Banks, W. L. McAtee, and R. C. Shannon).

1917. Two new cambium miners. Jour. Agric. Res. 10: 313-317, illus.

——. A contribution to the biology of N. A. Diptera. Proc. Ent. Soc. Wash. 19: 146-161, illus.

1918. Three new species of Diptera. *Ibid.* 20: 69-71.

——. A note on the habit of *Pegomyia affinis* Stein and other anthomyid genera. *Ibid.:* 160.

1919. A new genus in Scatophagidae (Diptera). *Ibid.* 21: 126-129, illus.

1921. A new genus of Bombyliidae (Diptera). *Ibid.* 23: 23-24, illus.

——. Dipterous parasites of sawflies. *Ibid.:* 41-43.

——. Further notes on *Ambopogon hyperboreus* Greene (Diptera). *Ibid.:* 107-109.

——. Two new species of Diptera. *Ibid.:* 125-127, illus.

——. An illustrated synopsis of the puparia of 100 muscoid flies. Proc. U. S. Nat. Mus. 60(10): 1-39, illus.

1922. Synopsis of the North American flies of the genus *Tachytrechus*. *Ibid.* 60(17): 1-21, illus.

1923. The immature stages of *Hydrophorus agalma* Wheeler. Proc. Ent. Soc. Wash. 25: 66-69, illus.

1923. A contribution to the biology of North American Diptera. *Ibid.:* 82-89, illus.

——. The larva and pupa of *Microdon megalogaster* Snow (Diptera). *Ibid.:* 140-141, illus.

——. A new species of *Volucella*. *Ibid.:* 165-168, illus.

1924. New species of *Mythicomyia* and its relationship with a new genus (*Pachyneres*) (Diptera). *Ibid.* 26: 60-64, illus.

——. Synopsis of the North American flies of the genus *Scellus*. Proc. U. S. Nat. Mus. 65(16): 1-18, illus.

1925. The puparia and larvae of sarcophagid flies. *Ibid.* 66(29): 1-26, illus.

——. A tentative arrangement of the muscoid flies based on the puparia. Proc. Ent. Soc. Wash. 27: 157-162, illus.

1926. Descriptions of larvae and pupae of two-winged flies belonging to the family Leptidae. Proc. U. S. Nat. Mus. 70(2): 1-20, illus.

1927. The larva and puparium of *Oedematocera dampfi* Aldrich (Diptera). Proc. Ent. Soc. Wash. 29: 18-19, illus.

1929. Characters of the larvae and pupae of certain fruit flies. Jour. Agric. Res. 38: 489-504, illus.

1931. District of Columbia Diptera: Rhagionidae. Proc. Ent. Soc. Wash. 33: 213-220 (with J. R. Malloch and W. L. McAtee).

——. The immature stages of *Pantophthalmus tabaninus* Thunberg. Trans. Ent. Soc. London 79: 277-282, illus. (with F. W. Urich).

1934. Tachinid flies with an evanescent fourth vein, including a new genus and five new species (Diptera). Proc. Ent. Soc. Wash. 36: 27-40, illus.

——. A revision of the genus *Anastrepha* based on a study of the wings and on the length of the ovipositor sheath. *Ibid.:* 127-179, illus.

1937. The pupa of *Myocera tabanivora* Hall (Diptera). Proc. U. S. Nat. Mus. 84: 217-218, illus.

1938. A new genus and two new species of the dipterous family Phoridae. *Ibid.* 85: 181-185, illus.

1940. Two new species of the genus *Hermetia* (Diptera, Stratiomyiidae). Proc. Ent. Soc. Wash. 42: 150-155, illus.

1941. Two new species of cecidomyiid flies from phlox. Proc. U. S. Nat. Mus. 90: 547-551.

——. A remarkable new species of the genus *Pseudacteon* (Diptera: Phoridae). Proc. Ent. Soc. Wash. 43: 183-184, illus.

1949. Five new species of *Graptomyza* (Diptera, Syrphidae). *Ibid.* 51: 77-80.

1954. Larva and pupa of *Thrypticus fraterculus* (Wheeler) with new original notes on the habits of the family Dolichopodidae. Ent. News 65: 89-92, illus.

1955. Larvae and pupae of the genera *Microdon* and *Mixogaster* (Diptera, Syrphidae). Trans. Amer. Ent. Soc. 81: 1-20, illus.

1956. Dipterous larvae parasitic on animals and man and some dipterous larvae causing myiasis in man. *Ibid.* 82: 1-34, illus.

SOCIETY MEETING

Held in the U. S. National Museum

680th Meeting, Apr. 2, 1959

George E. Cantwell's name was proposed for membership in the Society.

One of our members of long standing, Mr. Charles T. Greene, was kind enough to bequeath an amount of $500.00 to our Society. According to the lawyers who are handling his estate, this sum should be available in about 6 months. According to President Nelson, the amount will be deposited in our Special Publications Fund along with previous bequests.

Mr. Nelson also reported the death of Herbert Matsumora on March 19, 1959, at the Kaiser Hospital in Honolulu. Mr. J. H. Fales and Mrs. O. F. Bodenstein were selected by President Nelson to prepare an obituary for the Proceedings.

Mr. Curtis Sabrosky presented the only note and only exhibition of specimens during the meeting. First, he reported upon his attendance as a delegate of our Society at the centennial celebration of the American Entomological Society in Philadelphia on March 26. The day's program included open house in the insect collection at the Academy of Natural Sciences, luncheon in the reading room of the library, and a panel discussion in the afternoon on "The Role of Smaller Entomological Societies." Especial recognition was given at the luncheon to the oldest members. Dr. P. P. Calvert had been a member of the American Entomological Society since 1893.

Second, Mr. Sabrosky exhibited specimens of *Musca domestica* and the recently introduced European species, *A. autumnalis.* The latter was first noted in North America in 1952. Its progress in the Northeast was recounted, and the recent records from the Leesburg, Virginia, area were noted as a major extension of the known range.

The feature of the evening was a symposium entitled "Radiological and Biochemical Methods of Interfering with Insect Growth and Reproduction," by Dr. E. F. Knipling, Dr. John N. Kaplanis and Mr. Norman Mitlin. A lively discussion followed in which literally a wealth of information was obtained.

Several visitors were introduced: *Mr. W. Sellers, Dr. Clarence A. Sooter, Miss Anne Baroody, Mr. John Gallagher* and *Mr. Paul H. Schwartz.*—

HELEN SOLLERS, *Recording Secretary.*

PUBLICATION DATES

The date of publication of Vol. 61, No. 3, of the *Proceedings* was 29 June 1959. Date of publication of Vol. 61, No. 4, will be found in Vol. 61, No. 5.

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Pears – from 3 days to 1 day with malathion 57% Emulsifiable Liquid.

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Extended interval: – The label for leaf lettuce has been extended from 10 days to 14 days. The label for head lettuce remains the same: 7 days.

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Vol. 61 OCTOBER, 1959 No. 5

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of **WASHINGTON**

U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

PUBLISHED BIMONTHLY

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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

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BIOLOGICAL NOTES ON SOME GROUND-NESTING WASPS AT KILL DEVIL HILLS, NORTH CAROLINA, 1958, AND ADDITIONS TO THE FAUNAL LIST

(HYMENOPTERA, ACULEATA)

KARL V. KROMBEIN, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

The observations reported below were made during two visits to Kill Devil Hills on the Outer Banks of coastal North Carolina, May 30 to June 1 and July 27 to August 10, 1958. I am indebted to the following specialists for determinations of prey or wasps as noted: P. D. Ashlock (Pentatomidae), R. M. Bohart (*Stenodynerus*), H. E. Evans *(Anoplius, Aporinellus)*, A. B. Gurney (Gryllidae), B. J. Kaston (Araneae), J. P. Kramer (Cicadellidae, Fulgoridae), L. M. Russell (Membracidae), C. W. Sabrosky (Muscoidea), A. Stone (Tabanidae), and G. B. Vogt (Chrysomelidae).

BIOLOGICAL NOTES

Family POMPILIDAE

Sericopompilus apicalis (Say)

I captured a worn female (73058 C) 12 mm. long on the barrens at 1108 on July 30 as she crawled up my leg dragging a paralyzed spider. The latter was an adult female araneid, *Acanthepeira stellata* (Walck.), 8 mm. long. This wasp frequently climbs up bushes or trees with its prey, as it apparently cannot fly from the ground carrying the spider.

A recently emerged female (73158 B) 12 mm. long was captured at 1500 on July 31 in the woods just after leaving her spider prey on the leaf of a plant 15 cm. above the ground. The spider was an adult female salticid, *Phidippus* species, 10 mm. long.

I collected a third worn female (8858 F) 13 mm. long with her prey at 1415 on August 8. The wasp was walking backward up the trunk of a low sweetgum tree. The spider was an adult female salticid, *Phidippus whitmanii* Peckham, 10.5 mm. long.

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Episyron posterus (Fox)

A newly emerged female (73158 A) 9.5 mm. long was taken at 1430 on July 31 as she dug her burrow in the sand along a road through the woods. The paralyzed spider prey was lying on the sand about 30 cm. from the burrow entrance. It was an adult female araneid, *Neosconella pegnia* (Walck.), 5.5 mm. long.

I captured a worn female (8158 A) 7 mm. long just as she flew back to about a meter from her burrow entrance with a small paralyzed spider at 0915 on August 1. The spider was an adult female araneid, *Eustala anastera* (Walck.), 4.5 mm. long. The burrow was on a slight slope and went in for 38 mm. at an angle of 35°. Then it turned and continued downward for another 18 mm., terminating in a cell 45 mm. below the surface.

Anoplius (Lophopompilus) atrox (Dahlbom)

A worn female (8958 B) 18 mm. long was captured on pine needle litter on the ground in the woods near a pond at 1135 on August 9. She was struggling to drag her bulky paralyzed spider prey over the needles. The spider was an adult female pisaurid, *Dolomedes urinator* Hentz, 22 mm. long.

Anoplius (Arachnophroctonus) apiculatus pretiosus (Banks)

A female (6158 A) 12.3 mm. long was captured with her paralyzed prey on the barrens at 1015 on June 1. The spider was a female lycosid in the penultimate instar, *Arctosa littoralis* (Hentz), 10.8 mm. long.

Anoplius (Arachnophroctonus) semirufus (Cresson)

A recently emerged female (8158 B) 7.5 mm. long was found digging her burrow on a sandy slope along the woods road at 0950 on August 1. Her paralyzed prey, an adult female lycosid, *Schizocosa saltatrix* (Hentz), 6.5 mm. long, was lying on the sand 7.5 cm. below the burrow entrance.

Anoplius (Pompilinus) marginatus (Say)

I captured a female (53058 A) 9.0 mm. long on the barrens at 1100 on May 30 dragging her paralyzed prey toward the burrow entrance. The latter was a thomisid female in the penultimate instar of *Tibellus duttoni* (Hentz), 10.8 mm. long.

Anoplius (Pompilinus) splendens (Dreisbach)

A female (6158 B) 9.8 mm. long was captured on the barrens at 1135 on June 1. She was transporting her paralyzed spider prey, an adult female salticid, *Habronattus viridipes* (Hentz), 5.6 mm. long.

Aporinellus apicatus (Banks)

I found a worn female (72858 A) 7.5 mm. long just completing a burrow on the barrens beneath a stunted live oak at 0845 on July 28. Her paralyzed prey was lying on the sand several centimeters from the burrow entrance. It was a young female thomisid, a species of *Xysticus*, 4 mm. long.

Aporinellus fasciatus (Smith)

A recently emerged female (8358 D) 6 mm. long was discovered at 1153 on August 3 digging a burrow on the barrens in level sand. At this time the burrow was already deep enough so that the wasp was out of sight when working at the bottom. She continued excavating sand until 1225. During the period of digging she paused twice, at 1200 and at 1208, to visit her paralyzed prey. She had placed the spider, venter down, on the leaf of a tiny live oak about 1.5 cm. above the ground and 10 cm. from the burrow entrance. Every few minutes she left the burrow to spread the excavated sand behind the entrance for a distance of 3 cm. At 1225 she removed the spider from the leaf and began to drag it toward the burrow, walking backwards. She held the spider by the mouthparts during transport. When she had gone half way, she left the spider for a few seconds in order to inspect the burrow. At 1227 she left it at the burrow entrance, went into the burrow head first, and immediately came to the surface head first. Grasping the spider by the mouthparts, she flipped it over lengthwise so that the abdomen was toward the entrance, and then pulled it into the burrow by the spinnerets. I captured her when she returned to the surface 2 minutes later to begin filling in the burrow. I found upon excavation that the burrow was about 6 mm. wide and went in toward the south at an angle of 45°. The burrow turned toward the east at the same downward angle about 3.5 cm. below the surface and terminated in an ovoidal cell about 5.7 cm. below the surface. The slightly curved egg was 1.7 mm. long and 0.5 mm. wide, and was laid transversely on the spider's abdomen on the right side of the venter about a third of the distance from the base. The spider was an adult female thomisid, *Tibellus duttoni* (Hentz), 9.5 mm. long.

Family **SPHECIDAE**

Chlorion (Chlorion) aerarium Patton

Two newly emerged females (8558 A, 8958 A) 22 and 25 mm. long were captured while flying in the woods with their paralyzed cricket prey on August 5 and 9. One of them had a nymph of a species of *Acheta* 13 mm. long, and the other had a female *Anurogryllus muticus* (DeG.) 13 mm. long.

Ammatomus (Tanyoprymnus) moneduloides (Packard)

This species begins its nests in the vertical surface of sand banks. One female (8758 E) 10 mm. long was caught while she hovered in front of her burrow entrance at 1545 on August 7. She was carrying a paralyzed adult fulgorid, *Rhynchomitra microrhina* (Wlkr.), 13 mm. long.

A second female (8858 B) 11 mm. long was captured at 1325 on the following day as she flew toward her burrow entrance with a paralyzed fulgorid nymph 8.5 mm. long. It was a fifth (?)-instar nymph of the same species used by 8758 E. The wasp was released so that she could continue storing her nest. At 1351 she returned with an adult fulgorid, carried it into the burrow, and left a minute and a half later. I excavated the burrow at 1330 on August 9. It had a diameter of about 8 mm., went into the bank at a slight downward angle for 6.5 cm. and then curved slightly downward for another 7.5 cm. I found no cell at the bottom of this burrow, but there was one 5 cm. to the left at the same level containing four fifth (?)-instar nymphs, *Rhynchomitra microrhina*, 8-10 mm. long. Presumably this cell was not fully stored, for there was no wasp egg. The wasp was captured at 1410, when she returned with another *Rhynchomitra* nymph.

Psammaecius (Hoplisoides) costalis (Cresson)

I found a female (73158 C) 10.5 mm. long in the woods plugging the entrance to her burrow with sand at 1505 on July 31. The burrow was in rather loose sand with a slope of 45° and went inward at an angle of about 30°. It was open for about 5 cm. and then was plugged with sand for another 2.5 cm. Beyond this sand plug was a cell containing nine adult membracids about 7 mm. long and a wasp egg on the first one brought into the cell. About 2.5 cm. to the left of this burrow and at a slightly lower level was a second ovoidal cell about 13 mm. long. It contained five adult membracids, and again the wasp egg was on the membracid that had been brought in first. The wasp egg was attached to the left side of the thorax just above the legs, and the anterior end extended a little beyond the head of the membracid. The egg was 3 mm. long and about 0.75 mm. wide. The egg in cell 1 hatched between 2000 and 2130 on July 31 and that in cell 2 at 1600 on August 1. The larva in cell 2 died on August 2. The larva in cell 1 was nearly full grown by 0800 on August 4 and had begun to spin its cocoon by 1700 when I preserved it for taxonomic study. The wasp larva hollows out the membracids, leaving the chitinized exoskeleton more or less intact. The membracids were a species of *Stictocephala* near *borealis* (Fairm.).

Psammaecius (Hoplisoides) denticulatus (Packard)

A female (73058 A) 7.5 mm. long was captured at 1015 on July 30 as she flew over the barrens with her paralyzed cicadellid prey. The latter was a deltocephaline nymph 5.5 mm. long probably in the fifth instar.

Psammaecius (Hoplisoides) nebulosus (Packard)

I captured a female (73058 D) 9 mm. long as she hovered over a sand road through the woods at 1455 on July 30. She was carrying a paralyzed membracid nymph of a species of *Microcentrus*, 6.5 mm. long.

Bicyrtes quadrifasciata (Say)

I caught a female (8358 C) 18 mm. long as she started to open her burrow on the barrens at 1040 on August 3. She was carrying a paralyzed pentatomid nymph 8.5 mm. long of a species of *Brochymena*, probably *cariosa* Stål. The burrow went in toward the south at an angle of 30°; it was 12.7 cm. long and terminated in an empty cell about 7.5 cm. below the surface.

Stictia carolina (Fabricius)

I found two nesting females of this species. The first (8358 A), 24 mm. long, entered her closed burrow on the barrens at 0930 on August 3. She was captured a minute later as she began to make a temporary closure prior to flight. The burrow went in toward the east on a slight slope at an angle of 35°. It was straight, about 32 cm. long, and terminated about 22 cm. below the surface in a horizontal ovoidal cell about 30 mm. long and 20 mm. wide. The lowest 2½ cm. of the burrow were plugged with sand. The cell contained a half-grown larva and a number of fragmentary and whole flies consisting of several specimens of a small species of *Tabanus*, 21 specimens of the calliphorid *Callitroga macellaria* (F.), and one each of the muscid *Musca domestica* L. and of a species of *Sarcophaga*. The wasp larva was fed on decapitated dragon flies and was spinning its cocoon by 0800 on August 4. The cocoon is fusiform, composed of sand grains interwoven with silk, and is 30 mm. long and 12 mm. in diameter. There are about a dozen small pores scattered irregularly around the middle.

The second female (8558 B), 25 mm. long, was noted entering her burrow at the edge of a wheel rut on the sand road through the woods at 1045 on August 5. She left her prey, a large tabanid 23.5 mm. long, *Tabanus americanus* Forst., at the burrow entrance while she went inside the burrow. Upon excavation I found that the burrow went in toward the southwest at an angle of 30° and was 36 cm. long. It terminated in a cell containing a large larva which was injured during my excavation. The cell also contained flies which were identified as one specimen of *Tabanus atratus* F., two specimens of *atratus* var. *nantuckensis* Hine, and fragments of several smaller species of *Tabanus*. The larger tabanids were about 22 mm. long and the smaller ones from 10 to 12 mm.

Cerceris flavofasciata H. S. Smith

I found a colony of about a dozen females nesting in a section of vertical sand bank about 75 cm. wide on August 3. Several females were captured on August 3 and 4, but none of them was carrying prey. On August 4 I dug up one of the burrows and found no prey in it, and probably it had not been completed. It went downward from the vertical surface at an angle of about 20° and was about 33 cm. long. I did not visit this colony again until the afternoon of August 7. On that date I took four adult chrysomelid beetles (8758 A-D) belonging to the Cryptocephalinae from *Cerceris* females between 1500 and 1630. The beetles were very lightly paralyzed and were identified as two females and one male of *Chlamisus* sp., probably *plicata* (F.), and one specimen of *Cryptocephalus mutabilis* Melsh. I also captured five males of *Cerceris flavofasciata* flying about the vegetation above the sand bank where the females were nesting. I did not observe any mating activity.

On August 8 I took eight lightly paralyzed chrysomelid beetles (8858 A, C-E, G-J) from *Cerceris* females between 1320 and 1525. These were identified as three females and three males of *Chlamisus* sp., probably *plicata*, one specimen of *Cryptocephalus guttulatus* Oliv., and one specimen of *Bassareus clathratus* Melsh. I was able to time several provisioning flights during this period. One female entered her burrow with prey at 1334, left the burrow half a minute later, returned with another beetle at 1337, left again in half a minute, and returned with a third beetle at 1354, and again left half a minute later. Later in the afternoon she brought in another beetle at 1456 and left in 20 seconds. The female leaves the burrow entrance open during provisioning flights, but pushes up a plug of loose sand about 5 mm. thick with her pygidium when she intends to remain inside for a considerable period. The burrows have a diameter of 8 to 10 mm. Four burrows had been dug into the vertical and overhanging faces of the excavation that I made on August 4.

I took six lightly paralyzed beetles (8958 C, G-K) from *Cerceris* females between 1400 and 1630 on August 9. These were three females and two males of *Chlamisus* sp., probably *plicatus*, and one specimen of *Cryptocephalus mutabilis*. I also dug up several burrows. Most of them were 50 to 75 cm. long, sloped slightly downward, and had one or more angulations. One (8958 E) was a downward curving shaft about 60 cm. long; at the bottom were three beetles more deeply paralyzed than those taken from the wasps. These were specimens of *Cryptocephalus mutabilis.* A second burrow (8958 F) had a 15° downward slope, several angulations, and a total length of 75 cm. It contained seven more deeply paralyzed beetles, three specimens of *Cryptocephalus mutabilis,* and four females of *Chlamisus* sp., probably *plicata.* Most of the burrows did not contain any beetles. In one of the excavations I found a *Cerceris* cocoon, probably of the same generation as the females that were nesting at this time. There were some beetle elytra surrounding the cocoon, which was about 35 cm. from the bank surface. These fragments were identified as belonging to one specimen of *Cryptocephalus guttulatus,* one specimen of *Cryptocephalus* sp., probably *quadrimaculatus* Say, and five specimens of *Bassareus* sp., probably *sellatus* Suff. The cocoon was silken, fusiform, tan, opaque, 18 mm. long, and 6 mm. in diameter at the upper fourth. It enclosed a smaller, similarly shaped tan silken cocoon about 13 mm. long. Inside this second cocoon a mutillid pupa was starting to darken. On August 12 a female *Dasymutilla nigripes* (F.) emerged from the cocoon. I macerated the larval meconial plug of the mutillid in alcohol, but could find no recognizable host remains. I did find the exuvia of a small wasp larva attached to the lower outer end of the mutillid cocoon. H. E. Evans has studied this specimen and states that it may be the cast skin of an early instar of the mutillid or of the *Cerceris* larva.

The *Cerceris* females are 11.5 to 14.5 mm. long. Of their prey, *Chlamisus* sp., probably *plicatus,* is 3 to 4 mm. long, *Cryptocephalus guttulatus* 4.5 to 5.5 mm. and *C. mutabilis* 5.5 to 7.5 mm.

Wasps New to the Kill Devil Hills List

The following nine species, except *Cerceris compacta* Cr., were not collected in previous years. The faunal list from this limited but rich area now stands at 230 species and subspecies including the Chrysididae, which have been reported in a recent separate article (Krombein 1958). Those species preceded by an asterisk were not recorded in the North Carolina State list or supplements thereto (Brimley 1938, 1942; Wray 1950).

Family TIPHIIDAE

Tiphia micropunctata Allen. 1 ♀; July 31; in woods.

Family VESPIDAE

Rygchium hidalgo boreoorientalis (Bequaert). 1 ♀; August 4; on barrens; also reared from wooden trap nests set out on barrens. Recorded as *Odynerus hidalgi* (!) Sauss. in State list.

**Ancistrocerus spinolae* (Saussure). 7 ♀♀; May 30-June 1; gathering damp sand along road through woods.

Stenodynerus (*Stenodynerus*) *oculeus illinoiensis* (Robertson). 1 ♀; August 4; on barrens. Recorded in Second Supplement of State list as *Odynerus oculeus* Robtsn.

**Stenodynerus* (*Stenodynerus*) *pulvinatus* Bohart. 1 ♀; August 8; on barrens.

Family POMPILIDAE

**Aporinellus apicatus* (Banks). 1 ♀; July 28; on barrens.

Family **SPHECIDAE**

**Solierella inermis* (Cresson). 1 ♀; July 30; on barrens.

Trypoxylon (*Trypoxylon*) *johnsoni* Fox. 1 ♀; August 9; gathering damp sand along road through woods.

Cerceris compacta Cresson. 4 ♀♀; June 30, 1954 and August 1-3, 1952; in woods and on barrens, some on foliage of *Quercus virginiana.*

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"TROGUS" ATROCOERULEUS CRESSON, A REDISCOVERY AND REDESCRIPTION

(HYMENOPTERA, ICHNEUMONIDAE)

GERD H. HEINRICH, *Dryden, Maine*

The type of *Trogus atrocoeruleus* Cresson (Trans. Amer. Ent. Soc. ii, p. 62, 1868) has never been found, and in Townes' Catalog (1951, U. S. Dept. Agr. Monog. No. 2: 184-409) as well as in Hopper's monograph of the Trogini (1939, Trans. Amer. Ent. Soc. 65:343) the name is listed only as an unplaced species. Checking the unarranged material in the collections of the U. S. National Museum I was struck by the sight of an extraordinarily big, bluish-black species of the tribe Ichneumonini. The unusual size of the species as well as its colour triggered in my imagination the connection with Cresson's mysterious, unexplained *Trogus atrocoeruleus.* Was it possible that he had placed a species so obviously belonging to the Ichneumonini in the genus *Trogus?* Cresson's key for the genera as published in 1877 (Trans. Amer. Ent. Soc. VI, p. 186) seems to answer this question:

"*Ichneumonides amblypygi*

Scutellum flat or convex .... *Amblyteles*

Scutellum strongly elevated, subpyramidal .... *Trogus*"

Cresson thus distinguished *Amblyteles* and *Trogus* by no other character than the shape of the scutellum. This was indeed the concept of his time. The present generally accepted use of the morphology of the propodeum as a distinctive tribal character was probably introduced into common practice not earlier than 1934 (Heinrich, Mitt. Zool. Mus. 20(1):1-263). Considering these facts it seems not in the least surprising that the species under discussion, distinguished by its extraordinarily high elevated scutellum, was placed by Cresson in the genus *Trogus*, especially since its general appearance, size, and colour reminds one strongly of a *Tricyphus* or *Catadelphus.*

The description of the propodeal characters, particularly of the heart-shaped area superomedia as given in the original diagnosis of *Trogus atrocoeruleus*, matches the species under discussion so perfectly that the identity seems to be established beyond doubt. In the following I give a redescription of the species *atrocoeruleus* Cress. based on a series of reared females and males, designate a neotype and neallotype, and correct its generic position by erection of a new genus.

Protopelmus, gen. nov.

Type.—*Trogus atrocoeruleus* Cress.

Related to *Hepiopelmus* Wesm. in the shape of gastrocoeli with rather distinct thyridia, the tendency of forming an elevated scutellum, the punctured, non-striated postpetiole, and biologically, by parasitism on Arctiidae. It differs from *Hepiopelmus* mainly in the stronger chitinization of sternites, which are not partially membraneous, in the more abbreviated propodeum, the area superomedia, which is distinctly raised above the level of the surrounding horizontal part of the propodeum, in the much more highly elevated scutellum, and in the presence of distinct notauli in the anterior third of the mesonotum.

Protopelmus atrocoeruleus (Cress.) ♀ ♂

Neotype.—♀, Ft. Pierce, Florida, ex *Ecpantheria deflorata* (F.), May 20, 1957, leg. A. G. Sellime. In U. S. National Museum.

Neallotype.—♂, Victoria, Texas, ex *Ecpantheria muzina* Oberth., leg. J. D. Mitchell. In U. S. National Museum.

Female.—Uniformly bluish black, including wings. Pleura and propodeum brighter metallic blue than the rest. Flagellum black, without annulus. Length, 23 mm. Flagellum slender, strongly attenuated towards the apex, not at all widened beyond the middle, with 45 joints, the first joint about four times longer than its apical width, seen from the side the 11th as wide as long. Temples strongly narrowed, sloping backward from the hind margin of eyes immediately and almost vertically. Frons distinctly concave. Mesonotum densely punctured and alutaceous, opaque, with distinct notauli in the anterior part. Scutellum very highly elevated above postscutellum, rather short, the apex truncate with rounded border and sloping vertically, the upper surface slightly convex, densely punctured all over. Propodeum short, the area superomedia wider than long, distinctly narrowed toward the apex, which is slightly emarginated, the anterior margin somewhat curved backward in the middle, the outline of the area superomedia thus shaped like a heart with truncated apex. Postpetiole densely punctured all over, with distinct median area. Gastrocoeli with distinct thyridia, approximately as wide as the interval, of medium depth. Tergites very densely and finely punctured and alutaceous, opaque. Apex of abdomen amblypygous.

Male.—Bluish black with pale yellow pattern. Yellow area as follows: Face, clypeus, squamulae, tegulae, scutellum, postscutellum, spot at the end of areae spiraculiferae, tibiae I and II and the basal four joints of tarsi I and II (all except the narrow black apex), outer side of tibiae III (except apex), large spots on each side of the apex of postpetiole, the second tergite (except the gastrocoeli, their interval, the narrow apical margin of the tergite and a stripe along the middle, which is narrowed or interrupted at the base), large spots at the sides of the third tergite and small spots at the sides of the fourth. Length: 20 mm.

THE NEARCTIC SPECIES OF LOPHEPYRIS, A NEW SUBGENUS OF RHABDEPYRIS

(HYMENOPTERA, BETHYLIDAE)

HOWARD E. EVANS, *Cornell University, Ithaca, N. Y.*

It has not generally been appreciated that the bethylid genera *Rhabdepyris* and *Anisepyris* are closely related and that certain species are, in fact, somewhat annectant between the two groups. These annectant species are, so far as I have been able to determine, all undescribed, and I wish to take this opportunity to describe those which occur in our fauna. It seems to me best to consider these forms as constituting a distinct subgenus and to assign this subgenus to *Rhabdepyris* rather than to *Anisepyris*. The latter group has apparently diverged strongly from certain elements in *Rhabdepyris* in two or three major characters. On the other hand, *Rhabdepyris* exhibits considerably more variation in structure. The species in question appear to have evolved in the direction of *Anisepyris*, but they still remain within the usual conception of the genus *Rhabdepyris*. The groups in question may be separated by the table which follows.

A. Pronotal disc not margined laterally by carinae; third antennal segment of male small, but at least half as long as the second segment and usually not completely consolidated with the fourth segment; male genitalia elongate, the aedoeagus slender, the parameres slender and considerably longer than the distance from their base to the base of the parameral plates.

B. Pronotal disc without carinae, more or less rounded anteriorly and laterally; third antennal segment of male seldom much shorter than the second, always distinct and clearly evident.

Rhabdepyris, subgenus **Rhabdepyris** Kieffer

BB. Pronotal disc with a transverse carina anteriorly, the sides rather sharp although not actually carinate; third antennal segment of male 0.5 to 0.8 times the length of the second, closely consolidated with the fourth.

Rhabdepyris, subgenus **Lophepyris**, new subgenus

AA. Pronotal disc margined anteriorly and laterally by carinae; third antennal segment of male not readily visible, less than half the length of the second and forming a mere annulus at the base of the fourth; elements of male genitalia shorter and broader, the parameres not much more than twice as long as their greatest width and not longer than the distance from their base to the base of the parameral plates.

Anisepyris Kieffer

Lophepyris, new subgenus

Type.—Rhabdepyris (Lophepyris) bridwelli, new species

Subgeneric characters.—Mandibles with four or five apical teeth. Clypeus short, with a median carina which is arched in profile. Eyes hairy. Male antennae relatively elongate, segment three 0.5 to 0.8 times the length of the second, not separated from the fourth by a constriction. Pronotal disc margined in front by a strong transverse carina; sides rather sharp, but not actually carinate; posterior margin with or without a transverse preapical groove. Notauli strong, diverging anteriorly and nearly or quite reaching the anterior margin of the mesoscutum. Scutellum with a strong basal groove which is expanded into a pit on each side. Propodeum with five or seven discal carinae. Middle tibiae with or without spines above. Wings fully developed in both sexes, the venation not differing notably from that of *Rhabdepyris* s. str.

Included species.—I have seen five species assignable to this subgenus, and all of them were used in making the preceding generalizations. Three of these species are Central American and known to me from only a few specimens each. For the present I wish to describe only the two species of this group which occur in the United States (both in Texas). The male of only one of these species, *bridwelli*, is known. The females may be separated by the following couplet:

Head and thorax black, with a weak coppery-green luster; legs blackish, paler beyond the femora; head relatively narrow, the middle interocular line 1.3 to 1.5 times the eye height .... **bridwelli**, n. sp.

Head and thorax bright bluish-green dorsally; legs beyond the coxae bright ferruginous; head broad, the middle interocular line 1.8 to 1.9 times the eye height .... **bradleyi**, n. sp.

Rhabdepyris (Lophepyris) bridwelli, new species

Female.—Length 5.0-5.3 mm.; length of fore wing 2.8-3.0 mm. Color black, head and thorax with a weak coppery-green luster, propodeum with a weak bluish cast; palpi light brown; mandibles and antennae reddish-brown; trochanters, tibiae, and tarsi light reddish-brown, the femora varying from brown to nearly black, the coxae black; abdomen shining black, the apical two segments suffused with reddish-brown. Wings hyaline, the veins and stigma light brown. Mandibles with five simple teeth in an oblique series. Clypeus triangularly produced, the carina weakly arched. Front strongly shining, weakly alutaceous, with small, strong punctures which are separated from one another by from 1.5 to 2.5 times their own diameters. Middle interocular line .66 times the transfacial line, 1.3 to 1.5 times the eye height; vertex more or less squared off far above the eye-tops; ocello-ocular line from 1.35 to 1.45 times the width of the ocellar triangle. Antennal scrobes not margined above by a carina. Pronotal disc shining, the punctures widely separated; no evidence of a groove paralleling the posterior margin. Mesoscutum and scutellum moderately shining, distinctly alutaceous, the punctures small and sparse; groove at base of scutellum constricted to a thin line medially. Propodeum with five distinct discal carinae, between which it is somewhat rugose; area between the lateral and discal carinae weakly striate in front, nearly smooth behind; posterior face of propodeum with ridges which are directed upward medially. Middle tibiae strongly spinose above.

Male.—Length 4-5 mm.; length of fore wing 2.6-3.1 mm. Color black, head and thorax often with a faint coppery-green luster; palpi light brown; mandibles ferruginous apically; antennal flagellum brownish-ferruginous; tegulae brown; coxae black, femora dark brown, trochanters, tibiae, and tarsi light yellowish-brown; tip of abdomen often suffused with brownish. Wings hyaline, the veins and stigma brown. Mandibles with five teeth. Antennae elongate, the first five segments in a ratio of about 20:5:3:17:15, segment four about twice as long as its greatest thickness, segment twelve about three times as long as its greatest thickness. Front shining, distinctly alutaceous, punctures strong, separated from one another by from 0.5 to 1.5 times their own diameters. Middle interocular line .65 to .68 times transfacial line, 1.3 to 1.5 times eye height; ocello-ocular line 1.1 to 1.3 times width of ocellar triangle. Antennal scrobes not margined above by a carina. Pronotal disc alutaceous, somewhat shining, with large, widely separated punctures; anterior transverse carina strong; sides of disc sharply margined, not carinate; posterior margin closely paralleled by a shallow groove. Mesoscutum alutaceous, weakly punctate; groove at base of scutellum rather long and slender. Propodeum with five discal carinae between which there are some weak and irregular transverse rugae. Subgenital plate strongly, arcuately concave apically. Genitalia with the parameres elongate, strongly setose; volsellae with two small setae at the base of the digitus, the cuspis consisting of very slender dorsal and ventral arms; aedoeagus simple, slender.

Types.—Holotype ♀, Brownsville, Texas, 1921 (J. C. Bridwell) [U.S. Nat. Mus. no. 64398]. Allotype ♂, same data as type [U.S. Nat. Mus.]. Paratypes: 1♀, 20♂♂, same data as type; 1♂, Brownsville, no further data; 1♂, Brownsville, in plane cabin, Sept. 1949; 1♂, Laredo, Dec. 1920 (J. C. Bridwell); 1♀, 10 mi. S. of Nuevo Laredo, Mexico, Dec. 22, 1940 (G. E. Bohart); 1♂, Vera Cruz, Mexico, summer of 1896 (H. Heyde) [U. S. Nat. Mus., Calif. Acad. Sci., Cornell Univ.]. A male from San Salvador in the National Museum may also belong to this species.

Rhabdepyris (Lophepyris) bradleyi, new species

Female.—Length 6.2-8.0 mm.; length of fore wing 3.8-4.3 mm. Head and thorax dark green or bluish-green; propodeum black; gaster brownish, grading in to rufous on the apical one or two segments; mandibles, antennae, and legs beyond the coxae, bright ferruginous; tegulae testaceous. Wing veins light brown, the membrane hyaline except faintly tinged with brown near the veins. Mandibles broad, with five teeth, the basal three of which are quite blunt. Clypeus very short, its median carina strongly arched. Antennal scrobes not margined above by a carina. Front strongly shining, very weakly alutaceous, the punctures strong, separated from one another by from 1 to 2 times their own diameters. Middle interocular line .70 to .73 times the transfacial line, 1.8 to 1.9 times the eye height, the front thus extremely broad; vertex extending far above the eye-tops, somewhat squared off; ocello-ocular line 1.1 to 1.3 times the width of the ocellar triangle. Pronotal disc shining, sparsely punctate, without a groove paralleling the posterior margin. Propodeum with seven discal carinae, but the two carinae close beside the median carina weaker than the others; space between the median carinae and the lateral carinae more or less smooth and shining; posterior face with the transverse ridges turned upward strongly along the midline, mostly obsolete on the upper part of the sides. Middle tibiae strongly spinose above.

Types.—Holotype ♀, Wharton, Texas, June 24, 1917 (J. C. Bradley) [Cornell Univ. no. 3491]. Paratypes: 4 ♀♀, same data as type [Cornell Univ., U. S. Nat. Mus.].

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THE FIRST INSTAR LARVAE OF SOME NORTH AMERICAN SPECIES OF MELOIDAE

(COLEOPTERA)

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Largely as the result of a long series of descriptive papers by Auguste Cros which appeared from 1910 to 1944 and, more recently, the publication of J. W. MacSwain's (1956) monograph of the first instar larvae of the Meloidae, it is probably safe to say that this family is as well known taxonomically in the larval stage as any sizable family of beetles. Yet our knowledge of meloid first instar larvae is limited primarily to the faunas of the temperate regions of the world. In the New World MacSwain has given us a fairly comprehensive treatment at the generic level and has described a great many of the species that occur in the United States, but all except a few of the species of the rich faunas of México, Central America, and South America still await description and incorporation into the taxonomic framework which he has provided.

In the present paper the first instar larvae of five species of Meloidae are described from material obtained in México in 1957 and 1958. Four of these species are confined to México; one *(Lytta eucera)* ranges south into Central America. The descriptions given follow MacSwain's format and terminology rather closely, which should facilitate their use with his monograph. Short series of larvae of the species described will be deposited in the collections of the British Museum (Natural History), University of California at Berkeley, U. S. National Museum, W. R. Enns, and F. G. Werner. The remainder of the larval material as well as the adults from which the larvae were reared will remain in my collection.

About two years ago Dr. MacSwain gave me series of larvae of many of the species described in his monograph. This material has been of great assistance to me in the present study and in others, and I am happy to take this opportunity to express my appreciation of Dr. MacSwain's generosity publicly. I am also happy to acknowledge the assistance I have received from the Society of the Sigma Xi in the form of a Sigma Xi-RESA Research Fund grant supporting field work in Mexico in 1957.

Lytta eucera (Chevrolat)

(Figures 1, 2)

Brownish yellow; head somewhat darker, the area around each ocellus brown; basal two-thirds of pronotum and entire surface of second to sixth abdominal terga brown. Dorsal setae of head behind level of antennae, all setae of thoracic nota, all posterior marginal setae of first to sixth abdominal terga, large posterior marginal seta on each side of seventh tergum, basalmost seta on coxae, and (often) seta on abdominal pleurites split at apex to form two or more spicules. Head with lateral margins irregular, weakly narrowed at base; epicranial suture with lateral extensions reaching antennal foramina; 16

setae on frontal area; gula considerably longer than wide, expanded and broadly rounded apically. Eyes small, as in *mutilata*, one-third transverse diameter of mesothoracic spiracle. Antennae with segment I short, transverse; II elongate, twice as long as I, nearly one-tenth longer than and twice as wide as III; sensory organ with diameter a little narrower than diameter of base of segment III, about four-fifths as long as segment III and reaching about that distance from base to apex of segment; segment III apically with a short seta dorsally at base of sensory organ and subapically with two long setae and a sensory papilla dorsally and a shorter seta ventrally; terminal seta 10

Lytta eucera (Chevrolat), first instar larva; fig. 1, ventral view of head; fig. 2, dorsal (left) and ventral (right) views of sixth to ninth abdominal segments.

times as long its its segment. Mandibles with outer margin sinuate near middle, not evenly convex; inner margin entire; form more elongate than in *mutilata;* mandibular setae subequal. Maxillae with lateralmost seta of stipes fully as long as median seta of stipes; other setae of stipes much shorter. Maxillary palpi with first two segments moderately sclerotized, transverse; second segment with a single seta on anterior lateral margin, this seta extending beyond apex of third segment; third segment twice as long as wide, dorso-ventrally flattened, parallel-sided, obliquely rounded on anterior margin; sensory area sparsely set with setiform papillae, with two-segmented sensory appendix slender, inserted at middle. Labial palpi with outer margin of first segment longer than inner margin; second segment more than one-half longer than wide, with inner margin subequal in length to outer margin, parallel-sided, rounded (but not obliquely so) at apex. Thorax with notal setae subequal to one another to posterior marginal setae of first to sixth abdominal terga; line of dehiscence complete on pro- and mesonotum, incomplete and rather weak on metanotum; mesothoracic spiracles transversely oval, one-third wider than long, more strongly curved on posterior side than on anterior side. Abdomen with spiracles circular; first to sixth spiracles subequal in diameter (second and third spiracles slightly smaller than rest), about one-half transverse diameter of mesothoracic spiracle; seventh and eighth spiracles one-half larger in diameter than sixth, asymmetrical, with atrium slanting strongly forward, meeting trachea well before anterior lip of spiracle; seventh spiracles in posterior half of tergum; eighth spiracles extending half their diameter beyond posterior margin of tergum; all spiracles with a well-developed lip; sculpturing of spiracular atria as in *mutilata*; first to sixth terga each with 10 setae in posterior marginal row, these subequal in length except lateralmost seta on each side decidedly longer than rest; first tergum with median posterior margin setae two-thirds as long as tergum; setae of second to sixth terga like those of first tergum; pair of median setae on first to sixth terga very small in comparison with posterior marginal setae; seventh and eighth terga with posterior marginal setae much different than on preceding terga; on the seventh tergum the median pair of posterior marginal setae are very small and not split at apex, the next two setae on each side are progressively longer (and not split), the fourth seta (located behind spiracle) from the middle on each side is as large as the posterior marginal setae of the preceding terga and is split, the seta accompanying the fourth seta is longer than its homolog on the preceding terga, and the lateralmost seta is absent on each side; on the eighth tergum there is a moderately long, entire seta on the posterior margin just mesad of the spiracle and eight to ten tiny setae on or near the margin between these; no line of dehiscence on first abdominal tergum. Legs with hind tibia about eight times its greatest width. Body length, about 2.9 mm.

The larva of this species is of special interest in that the second antennal segment is elongate, as in such non-lyttine genera as *Epicauta* and *Pyrota*. In all other Lyttini previously described the second segment is short and transverse (like the first), a condition which MacSwain correctly, I think, regards as specialized. Because of its departure from the normal for the Lyttini in this character, the larva of *eucera* runs to the tribe Pyrotini (*Pyrota*) rather than to the Lyttini in MacSwain's key to the tribes of Meloidae. However, the question of its forming a connecting link between the Pyrotini and Lyttini cannot be seriously entertained, for the species agrees with MacSwain's diagnosis of the Lyttini in all characters except that of the antennae, while showing no special similarity to the Pyrotini (or any of the other tribes of Meloidae) except in this character. The obvious conclusion, it seems to me, is that *eucera* is a true lyttine which has undergone secondary elongation of the second antennal segment of the larva. It differs from MacSwain's diagnosis of the genus *Lytta* only in that the line of dehiscence is incomplete on the metanotum and the seventh and eighth abdominal spiracles are enlarged.

On the basis of adult morphology *eucera*, *peninsularis* (Fall), *erebea* (Champion), *sanguinea* Haag-Rutenberg, *erythrothorax* (Herrera and Mendoza), *mutilata* (Horn), and *cardinalis* Chevrolat form a distinct subgenus of *Lytta* which I will formally describe in my forthcoming revision of the genus. These species fall naturally into three groups, *peninsularis* forming one, *erebea* and *eucera* another, and the remaining species a third. Among them the only species besides *eucera* known from the larval stage is *mutilata*.

Although there are numerous differences between them, the larva of *eucera* is basically more similar to the larva of *mutilata* than to any other known larva of *Lytta*, as would be expected from the evidence of relationship provided by adult morphology. As a tentative diagnosis of the larval characters of the subgenus to which these species belong I propose the following: color yellow, the head darker yellow or brown; frontal area with 16 setae, pronotum with 26; mandibles with inner margin entire; maxillary palpi with first two segments subequal, narrowly transverse; a single seta on anterior lateral margin of second segment; third segment parallel-sided or with sides slightly divergent; setae of thoracic nota large, subequal in length; first abdominal tergum with two tiny setae in median transverse row and with median eight setae of posterior marginal row subequal to one another and to those of thoracic nota, the lateralmost seta on each side of tergum longer; second to sixth or eighth terga with setae similar in size and arrangement to those of first tergum (except that lateralmost seta may increase in size posteriorly); first abdominal spiracles slightly larger than second spiracles; spiracular atria set with numerous fine, evenly spaced sclerotized areas; hind tibia eight to ten times as long as its greatest width.

Many of the larvae of *eucera* studied exhibit abnormalities in the formation of the dorsal sclerites of the body. Most of these involve one or more of the abdominal terga, although the meso- and metanotum may be affected also. The most common abnormality is a simple division of one or more of the nota or terga. When the sclerites of two or more adjacent segments are divided one half of a sclerite may be fused more or less solidly with the opposite half of another segment. In some cases one half of a sclerite is fused with a following normal sclerite.

During the incubation period the eggs from which the larvae were obtained were carried several hundred miles daily in an automobile. In the course of time a large percentage of the eggs were either crushed or dented, and relatively few of the larvae that developed succeeded in hatching. This makes it seem likely that the abnormalities described above were produced by injury to the developing embryos.

Material studied.—Several hundred specimens, adults from Puebla, Puebla, México, July 13, 1957, on squash, R. B. and J. M. Selander (eggs July 18, 1957; larvae August 3 to 5, 1957).

Lytta quadrimaculata (Chevrolat)

Brown. Head wider than long; lateral margins almost evenly rounded to base; frontal area with 16 setae, eight of these on boundary between frons and clypeus; epicranial suture with lateral extensions reaching antennal foramina; three largest setae on each side of epicranium split at apex into two or three spicules.

Eyes about one-half diameter of mesothoracic spiracle. Antennae with anterior lateral margin of segment II only slightly longer than anterior lateral margin of I; II one-half as long as III; sensory organ with diameter twice diameter of base of segment III, nearly nine-tenths as long as III, reaching nearly three-fourths distance from base to apex of III; terminal seta more than four times as long as its segment. Mandibles with outer margin evenly convex in portion anterior to apical seta, feebly serrate on inner margin; mandibular setae subequal. Maxillae with lateralmost seta of stipes fully as long as median seta of stipes. Maxillary palpi with first two segments subequal, moderately sclerotized, narrowly transverse; second segment with two setae, one seta on anterior lateral margin, not reaching apex of third segment, and the other near mesal margin; third segment nearly twice as long as wide, dorso-ventrally flattened, parallel-sided, with apical margin obliquely rounded; two-segmented sensory appendix inserted nearer inner margin than outer, short, not longer than papillae. Labial palpi with outer margin of first segment twice as long as inner margin; second segment two-fifths longer than wide, subparallel-sided, obliquely subtruncate, with outer margin longer than inner margin; sensory appendix large, robust. Thorax with all setae of nota small (= minute); pronotum with 32 to 34 setae; line of dehiscence complete on pro- and mesonotum, not reaching hind margin on metanotum; mesothoracic spiracles circular. Abdomen with first spiracles only slightly smaller in diameter than mesothoracic spiracles; second spiracles three-fourths diameter of first spiracles; third to eighth spiracles progressively slightly smaller than second, the eighth two-thirds diameter of second; spiracular atria with a number of small, rather regularly spaced sclerotized areas; first to eighth terga with setae of posterior marginal row, except lateralmost seta on each side, small, subequal to one another and those of thoracic nota; lateralmost seta on each side of terga longer, heavier; first to eighth terga with four small setae in transverse median row, these like median eight setae of posterior marginal row; no line of dehiscence on first abdominal tergum. Legs with hind tibia a little more than seven times as long as its greatest width. Body length, about 2.75 mm.

Adult characters intimately associate *quadrimaculata* with a large group of species of the southwestern United States and México, including such forms as *puberula* LeConte, *biguttata* LeConte, and *variabilis* (Dugès). Unfortunately, none of the species of this group except *quadrimaculata* is known in the larval stage. Of the species of *Lytta* whose larvae are known the closest relative of *quadrimaculata* on the basis of adult characters is *reticulata* Say. Less closely related species are *nitidicollis* (LeConte) and the members of the Magister Group as defined by MacSwain. The latter are quite distinctive in both the adult and larval stages and need not be considered further here. *Nitidicollis* shows a number of similarities with *quadrimaculata* not shared by *reticulata*, but there is an even greater number of characters by which *quadrimaculata* and *reticulata* differ from *nitidicollis*. These latter include head shape, details of antennal structure, the serrate inner mandibular margin, the proportions of third maxillary palpal segment, the form of the mesothoracic spiracles, and the relatively large size of the first abdominal spiracles.

In MacSwain's larval key to the species of *Lytta* the present species runs to couplet 9, where it is easily distinguished from *nitidicollis* by the characters mentioned above and from *vesicatoria* (Linnaeus) by, among other things, its complete epicranial suture and the small size of the posterior marginal setae of the abdominal terga.

Material studied.—150 specimens, adults from Amozoc, Puebla, México, July 14, 1957, on *Argemone mexicana*, R. B. and J. M. Selander (eggs about July 18, 1957; larvae about July 30, 1957).

Epicauta rufipedes (Dugès)

Yellow, the thorax slightly darker; head light brown. Body surface finely, strongly reticulate; cells in posterior five to six rows on first to sixth abdominal terga and posterior one to three rows on seventh and eighth terga each with a small toothlike evagination on posterior margin. Head as long as pro- and mesothorax combined; shape much as in *pennsylvanica* (DeGeer) but with lateral margins even more deeply emarginate; gula about one-half as long as greatest width of head; gular setae normal (relatively long). Antennae with segment I about as long as III; II twice as long as either; two long and one short setae on apex of segment II; sensory organ wider than and as long as segment III but not reaching its apex; terminal seta less than one-half longer than segment II. Mandibles moderately slender, bearing 16 "teeth," nine to eleven visible in outline; "teeth" truncate; apical mandibular seta longer than basal seta. Maxillary palpi with third segment about three-fifths longer than wide, the lateral margin not evenly convex, more strongly convex basally than elsewhere; sensory area a little more than half the length of third segment; papillae of sensory area long, about 80 in number, not obscuring one another in dorsal view; two-segmented sensory appendix long, its length about equal to four-fifths width of second segment of labial palpi. Labial palpi with first segment one-half as long as second; second more than twice as long as wide; single seta of second segment extending slightly beyond apex of segment. Thorax fully one-third length of body; prothorax slightly longer than meso- and metathorax combined; line of dehiscence extending full length of pro- and mesonotum, very weakly or not at all indicated on metanotum. Abdomen with 10 setae in posterior marginal row on first to eighth terga; spine-like evaginations well developed at base of marginal setae on second to sixth terga, rather poorly developed on first, seventh, and eighth terga; poorly developed evaginations present also at base of setae in posterior row on meso- and metanotum; no teeth at base of median transverse row of setae on abdominal terga; fifth tergum about three times as wide as long; posterior marginal setae one-half as long as their terga; setae of median transverse row two-thirds as long as posterior marginal setae; pleurites ventral, wider than long, with posterior marginal seta of each on second to eighth segments nearly as long as its pleurite; first abdominal spiracles two-thirds diameter of mesothoracic spiracles, a little larger than second abdominal spiracles; remaining spiracles subequal to second; first to seventh abdominal sterna with median sclerotized areas each including two setae; eighth and ninth sterna well sclerotized; all sterna with median anterior setae (two pairs on each sternum) very small. Legs with distance from articulation to apex of fore coxa slightly more than twice greatest width of coxa; coxae each with two, trochanters with three, and femora each with seven lanceolate setae, the anterior basal femoral seta much smaller than the others; fore tarsal claws with longer seta reaching a point four-fifths distance from base to apex of claw. Body length, about 1.75 mm.

Adult morphology would place *rufipedes* in the DD Group of Werner's (1945) classification of the genus *Epicauta* (corresponding to Group G of MacSwain's). Within this group there are four other species known from the larval stage: *maculata* (Say), *pardalis* LeConte, *ocellata* (Dugès) (see below), and *nigritarsis* (LeConte). Among these *rufipedes* is most similar to *nigritarsis* in both adult and larval characters. Adults of *rufipedes* and *nigritarsis* are predominantly tan in color, show at least a tendency for development of a median vitta of dense pubescence on each elytron, and have no denuded areas; those of *maculata, pardalis,* and *ocellata* are black, lack elytral vittae, and have numerous small denuded spots scattered over the body and elytra. In the larval stage of *rufipedes* and *nigritarsis* the abdomen is uniformly colored, while in the other species the fifth or sixth to ninth abdominal segments are darker than the rest.

In MacSwain's larval key to the species of *Epicauta* no difficulty is encountered in running *rufipedes* to *nigritarsis*, from which it is separable by its darker head, with the lateral margins (presumably) more strongly emarginate; by the greater number of mandibular teeth; by its more robust third segment of the maxillary palpi, with a considerably longer sensory appendix; and by differences in the development of the evaginations at the base of the posterior marginal setae of the abdominal terga. The small toothlike evaginations of the reticulations of the abdominal terga characteristic of *rufipedes* are not mentioned in MacSwain's description of *nigritarsis* and presumably offer an additional means of separating the two species.

Material studied.—111 specimens, adults from 16 miles south of Cuernavaca, Morelos, México, August 22, 1958, on *Kallstroemia maxima*, R. B. Selander (eggs August 25, 1958; larvae September 13, 1958).

Epicauta ocellata (Dugès)

Similar to *maculata* except as noted below.

Dark yellow; metathorax and fifth to ninth abdominal segments dark brown; first abdominal segment usually darkened also. Antennae with segment II about two and one-half times as long as III; sensory organ reaching apical one-third of segment III. Mandibles bearing 14 "teeth," 10 visible in outline; apical mandibular seta conspicuously longer than basal one. Maxillary palpi with two-segmented sensory appendix as long as two-thirds width of second segment of labial palpi. Labial palpi with first segment two-fifths as long as second; second segment two and three-fourths times as long as greatest width. Line of dehiscence incomplete or absent on metanotum. Abdomen with spine-like evaginations at base of setae poorly developed on first and seventh segments; seventh sternum with median sclerotized areas usually including only two setae each. Body length, about 2.50 mm.

This species runs to couplet 23 (*pardalis* and *maculata*) in MacSwain's larval key to the species of *Epicauta*. The most obvious character separating it from both *pardalis* and *maculata* is the dark color of the metathorax. Other useful differences are as follows:. mandibular setae unequal; labial palpi with second segment more than twice greatest width; maxillary palpi with two-segmented sensory appendix as long as two thirds (not one-half) width of second segment of labial palpi. All three species are very similar in the larval stage, with perhaps a greater resemblance evident between *ocellata* and *maculata* than between either of these species and *pardalis*.

Material studied.—128 specimens, adults from 13 miles southeast of Nochixtlán, Oaxaca, México, July 18, 1957, on *Solanum amazonum*, R. B. and J. M. Selander (eggs July 18, 1957; larvae August 3, 1957); 325 specimens, adults from 21 miles west-northwest of Apizaco, Tlaxcala, México, August 20, 1958, on Leguminosae, R. B. Selander (eggs August 23 to 25, 1958; larvae September 15, 1958).

Zonitis nemognathoides Enns

Pale brown. Body surface finely reticulate. Head broadly triangular, slightly less than one-tenth longer than wide, 25:23, five-eighths as long as thorax; apex moderately acute; chaetotaxy as in *bilineata* (see MacSwain, 1956, pl. 23). Antennae one-third as long as head; segment II twice as long as I; III three-fourths as long as II; terminal seta nearly ten times as long as its segment. Mandibles with three transverse ridges; basal ridge well developed. Maxillary palpi as long as antennae; second segment one-half longer than first; third segment considerably longer than first two segments combined. Thorax with line of dehiscence absent on pronotum; mesonotum two and four-fifths times as wide as long; posterior paired setae on meso- and metasternum separated from each other by a distance as great as or greater than length of a single seta. Abdomen with spiracles of first segment about two-thirds diameter of mesothoracic spiracles, twice diameter of second abdominal spiracles; distance between spiracle-bearing processes of eighth segment one-half greater than distance from base to apex of one process; a row of four setae between bases of processes. Legs with a long seta on each fore trochanter which is longer than corresponding femora; middle and hind trochanters with all setae shorter than corresponding femora (no longer than trochanters themselves); hind tarsi half as long as tibiae; longer tarsal seta reaching midpoint between base and apex of tarsal claw. Body length, 0.59 - 0.61 mm.

The larva of this species most closely resembles that of *bilineata* Say. It runs to couplet 4 in MacSwain's key to the species of *Zonitis*, which may be modified for its reception as follows:

4. Second trochanter with all setae shorter than corresponding femora 4a
   Second trochanter with a long seta which is considerably longer than corresponding femora 5

4a. Color pale yellowish brown; body length 0.75-0.80 mm.; posterior dorsal margin of head evenly arcuate .... *bilineata*
   Color pale brown; body length 0.59-0.61 mm.; posterior dorsal margin of head not evenly arcuate .... *nemognathoides*

Material studied.—58 specimens, adults from El Refugio, San Luis Potosí, México, September 2, 1958, on Compositae, R. B. Selander (eggs September 2, 1958; larvae September 13, 1958). The larval specimens hatched from an egg mass deposited on the under side of a composite flowerhead by a female beetle under observation in the field. This same female was designated as the allotype of *nemognathoides* by Enns (1959).

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OBSERVATIONS ON A PRAYING MANTID—WEIGHT AND RESPIRATION

(ORTHOPTERA, MANTIDAE)

A female European mantid, *Mantis religiosa* Linnaeus, collected near Egg Harbor, New Jersey in September, 1958,[1] was observed intermittently during the succeeding weeks. The insect was maintained at room temperature in a glass aquarium covered with wire screening. The leaf litter was sprinkled periodically to provide water, and numerous houseflies, which were frequently placed in the aquarium, provided the diet of this carnivorous insect.

The insect was weighed at irregular intervals in connection with studies of its respiratory rate. Table I shows several significant weights of the animal. On November 1, the mantid oviposited on twigs and leaves in the litter; the three egg masses weighing 1.31 grams. It is interesting to note that the eggs and their encasing oöthecae at this time accounted for more than one-half of the total body weight of the female.

The respiratory rate (oxygen consumption) of the insect was measured on several occasions, using a simple respirometer. The apparatus consists of a small bore capillary tube, containing a column of manometric fluid, connected to a bottle which serves as the animal chamber. During respiration, any CO_2 produced by the insect is absorbed by KOH, thus reducing the pressure in the chamber and allowing accurate measurement on the manometer tube. The oxygen-

[1] Collector: Dr. Lester E. Eyer.

DATE	WEIGHT	COMMENT
October 16	2.1 gm.	before oviposition
November 5	1.1	after oviposition
Nov. 15	1.25	before feeding
Nov. 15	1.43	after feeding
Nov. 16	1.34	
Nov. 17	1.34	
Nov. 18	1.27	
Nov. 26	0.85	dead

TABLE I: WEIGHT RECORD

DATE	TEMP.	O_2 mm^3/ gm./ hr.
Nov. 15	25° C	16.45
Nov. 16	23° C	13.75
Nov. 17	22° C	7.40
Nov. 18	25.5° C	10.35

TABLE II: OXYGEN CONSUMPTION

consumption rate, taken under similar conditions on four consecutive days, is reported in Table II.

The general decrease in respiratory rate during the period is attributed to the approach of death, although temperature variations probably modified the respiratory rate.

The rate of oxygen consumption in the mantid, which is reported here, is considerably lower than the rate in most insects (Spector, (ed.), 1956, Handbook of Biological Data, W. B. Saunders, Phila.), but it has been reported that, among insects, the metabolic rate generally decreases with increasing size (Zeuthen, 1947, Comp. Rend. Lab. Carlsberg, Ser. Chim. 26: 17-161). It seems reasonable that this large and rather sedentary insect should have a low rate of respiration. A decrease in respiratory rate appears to accompany the symptoms of approaching death, and might provide an interesting topic for research.

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FURTHER EARLY REFERENCES TO MEIGEN (1800)
(DIPTERA)

The much-disputed "Nouvelle classification" of Diptera by Meigen (1800), long neglected by taxonomists until after its so-called "rediscovery" by Hendel (1908), is known to have been mentioned in print fourteen times before 1908 (Smart, 1944, Ann. Mag. Nat. Hist., ser. 11, 11: 261-272; Sabrosky, 1952, Proc. Ent. Soc. Wash. 54: 144-145).

For the historical record of this vexing question, I can record five additional references prior to 1908. Three of these have little significance, because they appeared in 1907 and are thus approximately contemporaneous with the "rediscovery." However, two are by contemporaries of Meigen, in the early years of the 19th century, and these, together with the known references by such prominent authors as Latreille (1802), Cuvier (1817), and Duméril (1823), further highlight the curious fate of Meigen's 1800 paper in slipping into oblivion for a century. No doubt Meigen's own adoption, in his later and major contributions, of a different set of names, with not a single mention of his 1800 paper, was honored and followed by his contemporaries and immediately succeeding workers.

1802. Walckenaer, C. A. "Fauna Parisienne. Insectes." 2 vols.

In volume 2, p. 417, after noting the works of early authors, he wrote that there had recently appeared two "plans de travail" on the Diptera, one an "Exposition" by Duméril, and "l'autre est de J. G. Meigen, et est intitulé: *Nouvelle classification des Mouches à deux ailes.* Paris 1800. in 8°". He remarked that although the methods of the two authors were different, they resembled each other in that all the characters were taken from the antennae and the form of the body.

1819. Leach, W. E. Article on "Entomology," in "Supplement to the 4th, 5th and 6th Editions of the Encyclopaedia Britannica," 6 vols., 1815-1824.

In vol. 4, pp. 164-165, in a chronological review of the history and literature of entomology, he wrote as follows under the year 1800:

"'Nouvelle Classification des Mouches à deux ailes, &c. par J. G. Meigen. Paris.' 8vo. This is the first production of a man who has enriched the classification of Diptera, not only by describing new species, but by laying the groundwork for their classification. He has in this work characterized eighty-eight genera, and, at the end of each, has enumerated the species. Many of the names proposed have been since changed by Illiger." In contrast to this statement, it is interesting to note that Meigen's "Versuch" (1803) rated only a mention by title, on p. 167.

1907. "Diptera. Hierin die Bibliothek des Herrn. Barons C. R. v. Osten-Sacken, Heidelberg." Antiquariats-Katalog 105, Max Weg, Buchhandlung und Antiquariat, Leipzig.

Meigen's "Nouvelle classification" was listed for eight marks, as "très rare," in this sale catalogue of Osten-Sacken's library.

1907. Bezzi, M. Wien. Ent. Ztg. 26: 296.

Attention was called to the note on the 1800 paper by Walckenaer (1802), noted above.

1907. Kertész, K. Ein neuer Dipteren-Gattungsname. Ann. Mus. Nat. Hung. 5: 499.

Attention was called to *Potamida* Meigen (Nouvelle classification, 1800) as the senior synonym of *Clitellaria* Meigen (1803).

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CULEX (CULEX) SCIMITAR, A NEW SPECIES OF MOSQUITO FROM THE BAHAMA ISLANDS[1]

(DIPTERA, CULICIDAE)

NINA BRANCH[2] and EDWIN L. SEABROOK[3]

The northernmost islands of the Bahamas, British West Indies, lie some one hundred miles off the southeast coast of Florida on the northern limits of the Neotropical realm. On two of these, Andros and Hog Island, a new species of *Culex*, here proposed as *scimitar*, has recently been observed. The terminalia of three male specimens of this form taken by light trap on Andros Island were sent by the authors to Dr. Alan Stone of the Entomology Research Division, U. S. Department of Agriculture, who verified its undescribed status. According to Dr. Stone (personal communication) a series of this species from New Providence Island, Bahamas, was determined by Dyar along with *Culex nigripalpus* Theobald as *Culex similis* Theobald. Dyar later considered *similis* to be a synonym of *nigripalpus*, probably correctly, and it does not seem likely that this or any of the other supposed synonyms of *nigripalpus* can be applied to the form we describe here. Dr. Stone also has in his possession a single male of the species from Havana, Cuba.

Andros Island, the Bahamas' largest, extends southward from latitude 25 North. Hog Island, near the same latitude some forty miles to the east of Andros, is a small strip of land situated less than a mile across a salt-water channel from the city of Nassau on the northeast coast of New Providence Island. In the present study, a total of fifty males and seventy females from these two localities has been examined. Light traps on Andros, operated by Seabrook and F. W. Harden during the summer of 1958, captured seven males, while larvae taken by them from Hog Island, and reared to adults by Branch in October of 1958, accounted for an additional forty-three males and the seventy females. These larvae were collected in two lots: (1) from land-crab holes and from ground pools among fallen cattail and palm fronds on the perimeter of a swamp in an area flooded by rains; (2) from land-crab holes in the same locality fifteen days later after the flood waters had receded. Larvae of *C. scimitar* were found in association with *Deinocerites cancer* Theobald and *C. nigripalpus;* the adults, in light-trap collections, in association with *Anopheles albimanus* Wiedemann, *Anopheles crucians* Wiedemann, *Aedes tortilis* (Theobald), *Aedes condolescens* Dyar and Knab, *Aedes taeniorhynchus* (Wiedemann), *Culex bahamensis* Dyar and Knab, *C. nigripalpus, Culex pipiens quinquefasciatus* Say, *Culex atratus* Theobald and *Culex pilosus* (Dyar and Knab).

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The type specimens were selected from the series of adults reared from larvae collected on Hog Island. The holotype, male, the allotype, female, and a series of paratypes have been deposited in the U. S. National Museum, Washington, D. C. Paratypes will be sent to the British Museum, London. The remainder will be placed in the Research Center collection.

The authors are especially grateful to Dr. Stone and to Dr. Maurice W. Provost, Director, Entomological Research Center, Vero Beach, for counsel and encouragement, to Mr. Frederick W. Harden of St. Lucie County, Florida, for his assistance as a collector on the islands, and to Mr. Willem Janse of the Research Center for preparing the plate.

The male and female of *C. scimitar* are herein described. At the present writing no definitive characters have been found to separate the larvae of *C. scimitar* from those of *C. nigripalpus*.

Culex (Culex) scimitar, new species

(Fig. 1, A and B)

Female.—Medium sized species. **Head:** Proboscis long, dark, with median pale scaling ventrally. Palpi short, dark. Occiput clothed dorsally with dark erect forked scales, and with pale narrow recumbent scales occasionally white along the eye margins; lateral regions with patches of broad flat white scales. Tori dark, bare. **Thorax:** Integument of scutum brown with scattered long dark bristles and many narrow bronzy-gold curved scales which are paler in the prescutellar area (coarser than in *C. nigripalpus*). Scutellum bears some long dark bristles and pale golden curved scales on each lobe. Pleura pale greenish-grey, sternopleuron and mesepimeron with conspicuous patches of flat white spatulate scales, often as many as twenty scales in each patch. Halteres with pale scaling on the knobs. Wing scales dark. **Abdomen:** Dorsally with flat dark-brown scales showing iridescent shadings. All tergites except the first with lateral white spots and other white scaling basally. Tergite I with a small patch of brown scales medially; II usually with a patch of white scales medially, occasionally with a narrow band; III, IV, V and VI usually with white bands, III and VI sometimes with only a median patch of white; VII usually unbanded, the lateral white spots lengthening along the margins of the tergite to form prominent triangles; VIII broadly white basally, apically dark. Venter predominately pale scaled, the sternites usually with some apical brown scaling. **Legs:** Dark except for pale scaling on the posterior surfaces of the femora and prominent patches of white scales at the apices of the tibiae. The tibiae also often show indefinite posterior pale scaling which may involve the first tarsal segment. The first coxae are white-capped on the outer surface.

Male.—Coloration similar to that of the female. Terminalia (fig. 1, A and B). **Dististyle** (Ds) about two thirds as long as basistyle; thick at base, widening along the inner margin to near center where it narrows abruptly scimitar-like in an unsclerotized area bordering the ragged fringe of the sclerotized integument; the distal third slender to the apex, bearing two setae within its margins and a series of small transverse reflexed ridges along its crest. The terminal claw (C) inserted before the apex, prominent, flattened, blunt at tip. **Basistyle** (Bs) about twice as long as wide, broadly rounded at base, narrower above the subapical lobe; a long slender seta inserted near the base of the dististyle; many long curved setae on the outer aspect, inner aspect with scattered short setae and a vestiture of fine hairs. **Subapical lobe** (SL) prominent, undivided, with five appendages; three rods, a leaf, a seta; the first rod short, slender, tapering uniformly to tip, the second rod a fourth again as long, thick, flattened at apex, the third rod similar, still longer, gently recurved in its apical half toward the broad obovate leaf and the long slender seta. **Phallosome** (fig. 1, B) composed of two heavily sclerotized plates, each plate with a long curved dorsal arm (DA); a thick sharply pointed ventral arm (VA) bearing a series of small transverse ridges along its outer surface; a long broadly spatulate basal process (BP); and three or four stout dark teeth (T) arising along a depressed ridge between the ventral arm and the basal process. The **lobes of the ninth tergite** prominent, each with numerous setae, and separated by a profound emargination about as wide as deep. The **tenth sternite** crowned with numerous stout spines, those on the apex pointed, the outer ones blunt; the basal arm stout, curved, heavily sclerotized. **Claspette** absent.

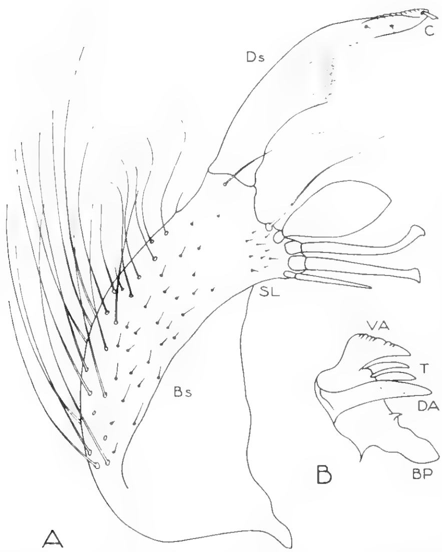

Fig. 1. *Culex (Culex) scimitar*, new species, male terminalia. A: Ds, dististyle; C, claw of dististyle; Bs, basistyle; SL, subapical lobe of basistyle. B: Plate of phallosome. VA, ventral arm; T, teeth; DA, dorsal arm; BP, basal process.

The female of *C. scimitar* may be differentiated from *C. nigripalpus,* which it most resembles, by the increased scaling on the pleura, the pale recumbent scales of the dorsum of the occiput, the lighter coloring and coarser appearance of the bronzy scales of the scutum, and the usually quite evident white basal banding of the abdominal tergites. The male of *C. scimitar* is readily differentiated from other *Culex* (*Culex*) species by the excessively enlarged and bulbous appearance of the terminal segments of the abdomen and the large characteristic dististyles which are often identifiable with a dissecting microscope (x 75) in unmounted terminalia.

DIAPAUSE AND FAT BODY FORMATION BY CULEX RESTUANS THEOBALD

(Diptera, Culicidae)

Robert C. Wallis, *The Connecticut Agricultural Experiment Station, New Haven*

The problem of the diapause and fat body formation by *Culex restuans* became of special interest when observations of the ecology of this species led to the conclusion that the majority of the over-wintering adult population consisted of young females which had not taken a blood meal. This was contrary to the popular theory that, with the exception of the species reported by Frohne in 1953 (1), most mosquitoes which hibernate as adults utilize nutritional reserves in their fat body derived from a late fall season blood meal. Consequently, special study of the ecology of *C. restuans* was initiated during 1956.

Procedure

Year-around sampling of the mosquito population was conducted during 1956, 1957 and 1958. Collections were taken from winter hibernation sites in two study areas each month from November through February. Beginning in March, weekly collections were taken from known diurnal resting places and weekly sampling of established aquatic sites for larval activity was continued from then until the water was frozen solid in the following winter. Adult females were collected from diurnal resting places by hand aspirator and transported to the laboratory in cardboard cartons. All blood-engorged *Culex* were then sorted from the collection and maintained in cages until oviposition occurred. Since adult female *C. restuans* were difficult to distinguish from *Culex pipiens* and *Culex salinarius*, egg rafts were isolated and allowed to hatch so that identification of specimens was confirmed by examination of the larvae. The number of engorged females in each collection was noted throughout the mosquito breeding season.

Larvae were obtained for laboratory study from egg rafts oviposited by adults collected in the field. In August 1956, 300 laboratory-reared adult females were divided into six groups and each group placed in a lantern chimney cage. These were provided with water, wet filter paper around the sides and cotton pads soaked in 5 per cent sucrose solution for feeding. In a similar cage, a group was maintained consisting of 50 females which had previously taken a blood meal and oviposited an egg raft. All seven cages were placed in cool storage hibernation conditions (at 40° F.) early in September. They were inspected each week thereafter during the next four months and the incidence of fat body formation and mortality noted.

In September 1957, a similar series of cages were set up. However, in these, each of three cages contained 100 females obtained from field collections in hibernating sites. These females all appeared to possess fat bodies or to have engorged with clear fluid. Each of three other cages contained 100 laboratory-reared females which had fed from one to five weeks on 5 per cent sucrose solution.

Results

Adult female *C. restuans* left hibernation places late in March and April, depending upon the onset of warm weather. Shortly thereafter, during April, May and June, increasing numbers of blood-engorged specimens appeared in diurnal resting places. This continued until mid-July when up to 75 per cent of the females in collections contained blood. From August through October the incidence of blooded females declined and there was an increase in the number of young adults in collections. Very large numbers of these were encountered in diurnal and hiberation places during the fall season and by October, the majority of the females were engorged with clear fluid or contained fat bodies.

The development of larvae in aquatic sites was not detected until late in the spring. However, by June 1, all stages of larvae were collected. Larval populations continued to increase throughout the summer and into the fall, when large populations of fourth instar larvae were observed.

During summer months laboratory populations of *C. restuans* were reared from egg rafts oviposited by wild females late in June. From these, adults were obtained and maintained in one-cubic-foot cages for study. They took blood meals readily during the early summer period and fed from a variety of hosts (man, rat, mouse, chicken and egg embryo). However, late in the summer and during the fall season increasing difficulty was encountered in inducing blood feeding. There appeared a decided preference for engorging with sucrose solution, and fat bodies developed in females which had not previously taken a blood feeding.

During the fall of 1956, in six groups of laboratory-reared females which were fed only on sucrose solution and then placed in experimental hibernation conditions, the incidence of fat body formation was again noted. All of these females developed fat bodies and survived the first few weeks of hibernation. However, the group of blood-fed females sustained high mortality. This continued, until January 1, only one of the 50 survived. At this time 68 per cent of the 300 sucrose-fed females still survived, and the experiment was terminated at this time.

During the fall and winter of 1957-1958, in a similar series of tests to compare survival and fat body formation among wild and laboratory reared females, little difference was observed in survival rates. The majority of the females in both groups developed fat bodies and survived well during the first four months. However, late in January 1958, heavy mortality occurred in both groups when accidental desiccation occurred in the cages.

Discussion

The problem of diapause and fat body formation by *C. restuans* became of interest during study of potential mosquito vectors of eastern equine encephalitis in Connecticut. Of the four species of *Culex* commonly found hibernating in Connecticut, *C. restuans* was selected for study for a number of reasons. It was the only one of the four species known to be a good host and laboratory vector of the eastern equine encephalitis virus (Chamberlain *et al.* (2)). It enters houses and feeds upon man and takes blood from a wide variety of other hosts. In addition, it was one of the few species which was found abundantly in all areas where encephalitis virus activity occurred in Connecticut (Wallis, *et al.* (3)). However, following study of hibernating mosquitoes in areas of known virus activity, it was suggested (Wallis, *et al.* (4)) that since as far as it is known, it is necessary that a blood meal from an infected host be taken by the mosquito in order for it to become infected, it was highly improbable that the eastern equine encephalitis virus was harbored by hibernating *Culex* if they entered diapause without blood feeding. Therefore, it was considered important to determine experimentally if blood feeding was necessary for fat body formation and hibernation. Numerous observations of the ecology of *C. restuans* indicated that blood feeding was not necessary, and did not generally occur in nature. Huge larval populations built up late in the fall and adults from this late season breeding had little time in which to find a host and obtain a blood feeding before hard frosts drove the populations into hibernation sites for the winter. Furthermore, the incidence of blooded females steadily declined in late summer and adults were no longer taken in fall biting collections. This was similar to the situation in the laboratory where the females could no longer be induced to take blood late in the summer, and instead, exhibited a decided preference for feeding upon sucrose solutions. When under experimental conditions the sucrose-fed females repeatedly formed fat bodies and successfully went into diapause in hibernation conditions, whereas blood-fed females did not survive, it was concluded that blood was not necessary for fat body formation and winter survival. Thus, the observations and experiments here support the hypothesis that species of hibernating *Culex* which enter diapause without blood feeding were unlikely to serve as overwintering hosts of the eastern equine encephalitis virus.

Since this study was initiated, results have been reported of work on the hibernation of another species, *Culex tarsalis*, which are very similar to results in this study, and which led the authors to the conclusion that *C. tarsalis* was not a likely host for harboring the western equine encephalitis virus (Rush *et al.* (5), Bennington *et al.* (6)). This, and the report of Tate and Vincent (7) that *Culex pipiens* females did not take blood before entering hibernation, and Frohne's (1) observations on *Culex territans*, leads to the speculation that perhaps more *Culex* mosquitoes exhibit similarities to Frohne's Type V life cycle. At least those species with more northern distribution, even though they do not specifically fit his definition in that more than one generation a season occurs, may, during the late fall generation, undergo diapause before blood feeding and egg deposition, as he describes in the *Culiseta impatiens* life cycle.

SUMMARY

The diapause and fat body formation by *Culex restuans* was studied from 1956 to 1959. In the field, the incidence of blooded females was high in the spring and summer, but declined rapidly in the fall, when hibernation places were filled with large populations of young adults. These females, instead of containing blood, were filled with a clear fluid and developed fat bodies. Laboratory colonies reared during the summer became reluctant to take blood in the fall and developed a preference for engorgement on sucrose solution. Sucrose-fed females, when placed in experimental hibernation conditions, developed fat bodies without previously having taken blood. The good survival of these females was contrasted with poor survival and unsuccessful hibernation of blood-fed females.

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BOOK NOTICES

LABORATORY MANUAL FOR INTRODUCTORY ENTOMOLOGY, by Clifford J. Dennis (East Central State College, Ada, Okla.). 65 pp., illus. Wm. C. Brown Co., Dubuque, Iowa. Price, $2.00.

MITES, OR THE ACARI, by T. E. Hughes. 225 pp., illus. Essential Books, 16-00 Pollitt Drive, Fair Lawn, N. J. Price, $6.75.

A NEW STIGMAEID MITE FROM ARIZONA

(TROMBIDIFORMES, STIGMAEIDAE)

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In 1935, the author collected a mite from Bermuda grass at Phoenix, Ariz. In 1946, it was referred to E. W. Baker who replied that it seemed to be a new genus in the Stigmaeidae.

Recently, the author re-studied the drawings of this mite, and furnished Baker with a copy of the drawings. He consulted the original slide and gave the mite additional attention. Baker confirmed his earlier diagnosis that the mite is in the family Stigmaeidae, and probably a new species in the genus *Macrostigmaeus*. The description of the species follows.

Macrostigmaeus bakeri, new species

Body two and one-third times as long as wide. Dorsum without actual shields, but with a sutural constriction between propodosoma and hysterosoma, and two faintly defined sutures near caudal end, thus dividing the body into four sections. The arrangement of the striae on the propodosoma gives an erroneous appearance of the presence of two shields. Striae occur generally on the dorsal integument, these being mostly longitudinal. Three pairs of setae laterally on the propodosoma, that over each coxa I much the longest, and with an eye behind its base; in addition, a pair of setae laterally, even with the main body suture; four pairs of dorso-median setae on the main hysterosomal area, and a lateral seta over each coxa III; six setae borne on the pre-anal section, and four setae on the anal section, as illustrated.

Legs stout, of moderate length; tarsi bearing a pair of strong, hooked claws and, between them, a pulvillus bearing two pectinate series of 3 tenent hairs each. Tarsi I and II bearing mid-dorsally a fingerlike sensilla, and dorso-terminally a hair longer than the tibia and tarsus together.

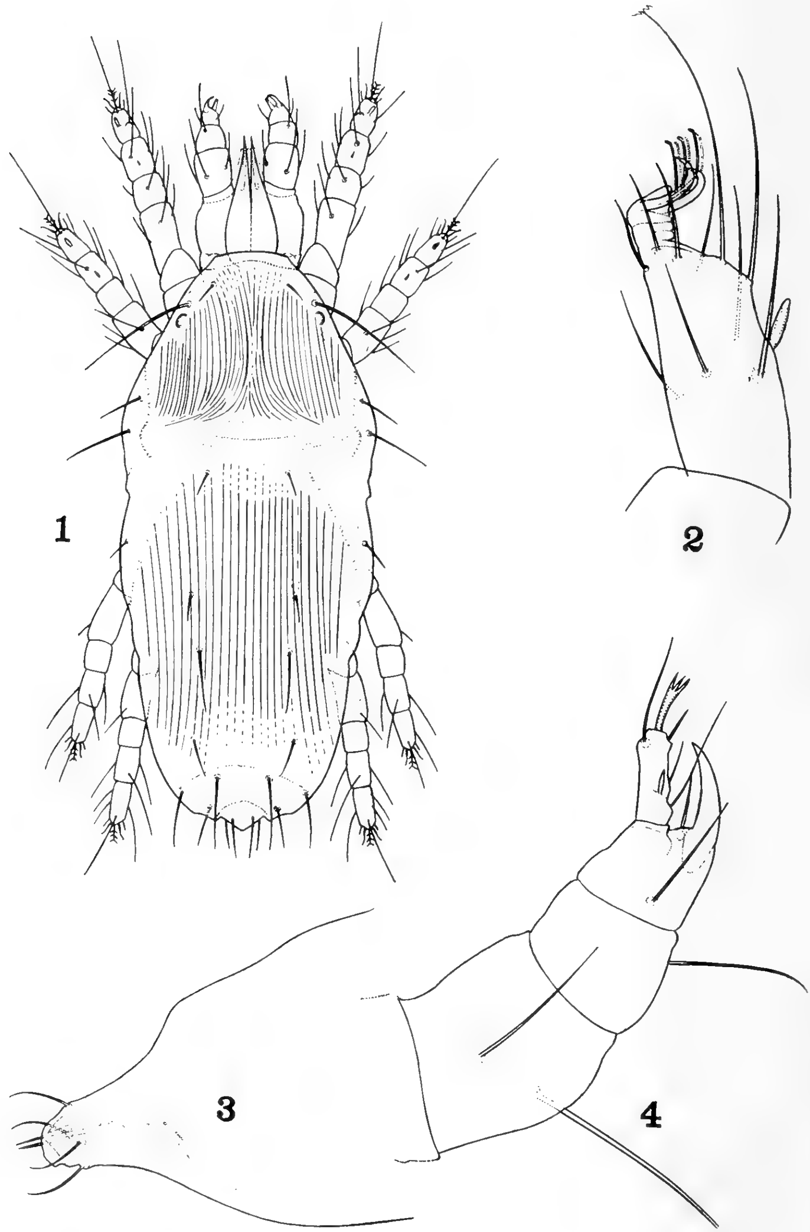
Palpus evidently 6-segmented, the palp-tarsus subtended from the tibia, the latter with a strong claw about equalling the palp-tarsus; the latter bearing terminally a thick seta that is 3-cleft apically; subbasally the palp-tarsus bears a fusiform, sensory seta.

The hypostome terminally with a pair of rodlike stylets.

Type material.—McG. No. 1438, deposited in U. S. Nat. Museum.

Type locality.—Phoenix, Ariz., Sept. 17, 1935.

Food plant.—Bermuda grass (*Cynodon dactylon*).



Macrostigmaeus bakeri, n. sp. Fig. 1, dorsal view of mite; fig. 2, tarsus I, lateral; fig. 3, hypostome, lateral; fig. 4, palpus, lateral.

FURTHER NOTES ON ICHORONYSSUS QUADRIDENTATUS STRANDTMANN AND HUNT, WITH A DESCRIPTION OF THE FEMALE (Acarina; Dermanyssidae, Macronyssinae)[1]

Edward W. Baker[2] and R. W. Strandtmann[3]

In 1951 Strandtmann and Hunt described a new mite, *Ichoronyssus quadridentatus*, based on only two male specimens. Because the outstanding characteristics of the two specimens was the presence of four prominent spurs on the posterior margin of the dorsal plate, the name *quadridentatus* was proposed.

Recently a collection of nine females and two males of this species has come to our attention. (These mites were collected on the bat, *Myotis austroriparius*, in Alachua Co., Florida, March 13, 1954, by Dale W. Rice). One of the two males has two posterior spines and the other has six, but in all other respects they are referable to *I. quadridentatus* Strandtmann and Hunt. Obviously the name *quadridentatus* was an unfortunate choice.

Since the two males do not differ appreciably from the original description, except in the number of posterior dorsal spines, they will not be redescribed here. The original description gave the length of the mite as 535 μ; the two males now before us measure 525 μ and 550 μ for the six-spined and the two-spined individuals, respectively (figs. 1 and 2).

It is assumed that the nine females are *I. quadridentatus* because they were found in company with the two males and they differ from other described females in several respects. They are described below.

Female (figs. 3-8).—Eight of the nine specimens were measured. Dimensions given are the averages, followed in parentheses by the ranges. Total length excluding gnathosoma, 630 μ (615-650); total width, 340 μ (310-370).

Dorsal side (fig. 8).—The dorsal plate is parallel-sided and narrows gradually anteriorly and abruptly posteriorly. In the ovigerous female it covers about two-thirds of the dorsum. The peripheral setae on the anterior one-third of the plate are prominent. All other setae are small and slender, especially in the central area. Length of dorsal plate, 546 μ (515-560). The soft portion of the dorsum has from 60 to 80 setae, uniformly distributed and of uniform length. They are as long as or slightly longer than the anterior peripheral setae of the plate.

Ventral side (fig. 3.—The sternal plate is more than twice as wide as long, bears three pairs of setae of equal length, two pairs of pores, and an inconspicuous stigma-like spot in each anterior corner; the margin is slightly convex anteriorly and deeply concave posteriorly. The medial length is 45 μ (no variation in 8 specimens); the width between bases of sternal setae II is 108 μ (100-115). There is a clearly defined presternal sclerotization reaching the base

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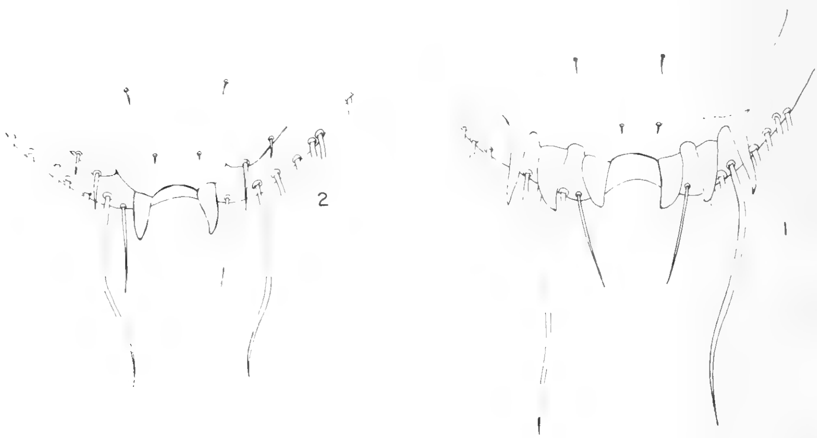
[1] Supported in part by a grant from the National Institutes of Health.
[2] Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.
[3] Department of Biology, Texas Technological College, Lubbock.

of the tritosternum. The epigynial shield is bluntly pointed with obvious scalelike lines. It bears one pair of genital setae on the lower third. There is always one seta just below the tip and one on each side near the tip; the last two sometimes appear to be on the plate, and their bases average a setal length anterior of the tip of the plate. The metasternal seta is present, but the metasternal plate and pore are lacking. There are no metapodal plates. The anal plate is roundly triangular, the paired setae are shorter than the odd seta, and the odd seta is borne on a slight protuberance. The soft portion of the venter bears 38 to 42 pairs of setae, all of about equal length.

Legs.—The legs are not unusual in any way. The chaetotaxy is not unusual.



Ichoronyssus quadridentatus Strandtmann and Hunt, male. Figs. 1 and 2, posterior dorsal margins of dorsal plate and body.

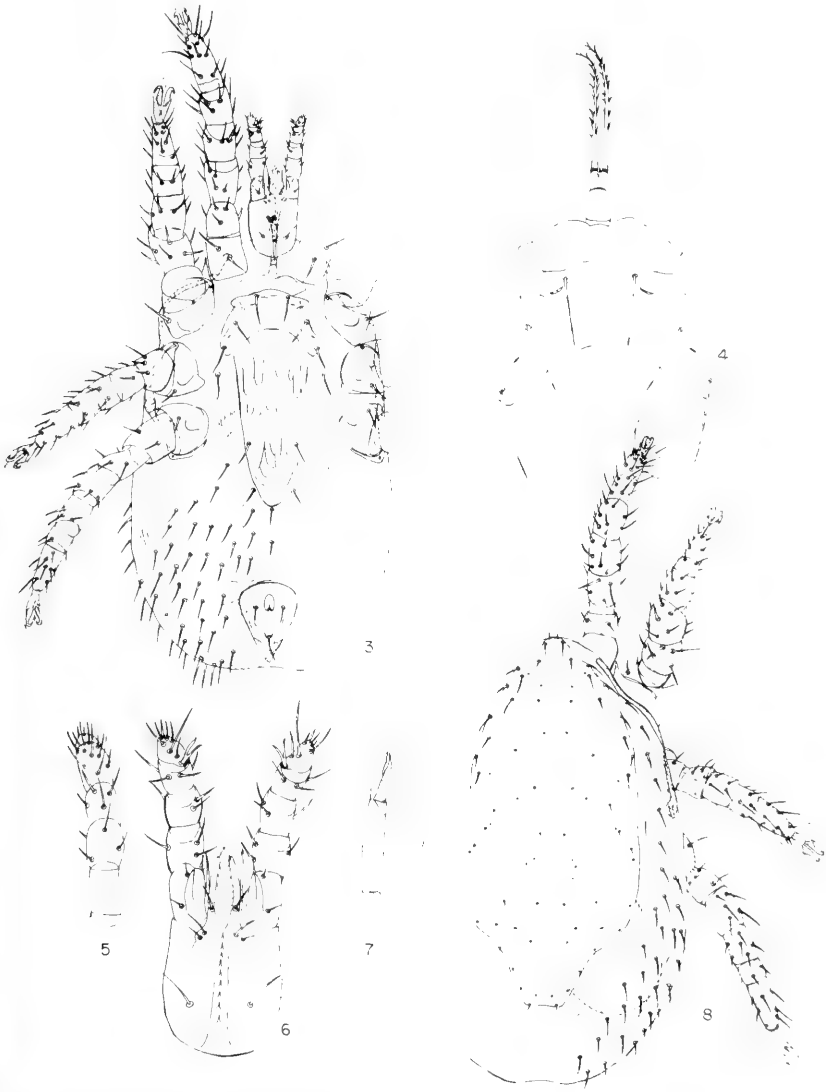
Femora I and II bear more prominent setae dorsally than do other segments. The coxal setae are slender and fairly long. Coxal II, III, and IV each bears a slight, half-moon-shaped protuberance.

The peritreme runs ventrally to midway between legs III and II, then dorsally to midway of coxa I. The peritrematalia embraces coxa IV as a narrow band and has a pore opposite the posterior edge of coxa IV.

The tritosternum (fig. 4) apparently has no hyaline, lateral margin. The laciniae branch near the base, are sparsely pilose, and have a crownlet of inconspicuous denticles near the base.

The gnathosoma (figs. 5 and 6) has average chaetotaxy; each palp trochanter has a prominent ventral spur; there are nine deutosternal teeth; the corniculae are long, slender, and flacid. The chelae (fig. 7) are large and apparently devoid of teeth or setae.

Remarks. The female is much like *I. longisetosus* Furman (1950: 479). However, in Furman's species the second pair of epigynial setae are much nearer the tip of the plate, the anterior coxal setae II and III are decidedly heavier, and the posterior body setae are longer and heavier. In *I. hasei* Vitzthum (1932: 23) the dorsal plate does not narrow abruptly posteriorly and there are more ventral setae. In *I. brittanicus* (Radford) (1941: 311) the epigynial plate is rounded posteriorly and there are seventy or more pairs of ventral setae. In *I. kochi* Fonseca (1948: 278) the dorsal plate has setae of about uniform length over all. *I. nyctinomi* (Zumpt and Patterson)



Ichoronyssus quadridentatus Strandtmann and Hunt, female. Fig. 3, venter; fig. 4, tritosternum, presternal area and sternal plate; fig. 5, dorsal view of pedipalp; fig. 6, ventral view of gnathosoma; fig. 7, chelicerae; fig. 8, dorsum.

(1951: 89), *I. forsythi* (Zumpt) (1950: 169), *I. venezolanus* Vitzthum (1932: 9) all have spatulate, or flattened, body setae.

This mite has now been recovered from three species of bats: *Eptesicus fuscus*, Thomas County, Georgia (H. B. Morlan), 1♂; *Myotis lucifugus*, Thomas County, Georgia (H. B. Morlan), 1♂; *Myotis austroriparius*, Alachua County, Florida (Dale W. Rice), 9♀♀, 2♂♂.

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ANNOUNCEMENT

CYNIPID GALLS OF THE EASTERN UNITED STATES, by Lewis H. Weld. 124 pp., 354 figs. Privately published. Price, $2.00.

Mr. Weld's gift to the Society, announced in Vol. 61, No. 4, of the *Proceedings*, is a splendid contribution to our knowledge of the cynipids and their galls. Copies may be ordered either directly from the author, *Mr. Lewis H. Weld, 6613 Washington Blvd., Arlington 13, Virginia*, or from the *Custodian, Entomological Society of Washington, c/o Division of Insects, U. S. National Museum, Washington 25, D. C.*—Ed.

THE STATUS OF LEPTODESMUS ORTONEDAE SILVESTRI, A POORLY KNOWN ECUADORIAN DIPLOPOD

(POLYDESMIDA, CHELODESMIDAE)

RICHARD L. HOFFMAN, *Department of Biology, Virginia Polytechnic Institute, Blacksburg*

The literature relating to the Diplopoda has always been quite top-heavy with respect to poorly described or otherwise enigmatic species, and it is gratifying to be able to reduce the number whenever possible. I deal at this time with an interesting neotropical polydesmoid which was originally described without illustrations and promptly dropped into obscurity, and subsequently redescribed—in a different genus—as a new species which shortly afterward was made the type of a new monotypic genus. The gonopods of this species have never been adequately illustrated in spite of all these transactions, and naturally its systematic position could not be correctly determined.

A few months ago Dr. Ralph Crabill transmitted to me some tropical millipeds intercepted by quarantine inspectors and sent to the U. S. National Museum for identification. Several collections from bananas originating in Ecuador contained specimens of the species mentioned above, first described over fifty years ago from Guayaquil by Silvestri. The identification of the quarantine material was made possible because of a paratype exchange between Silvestri and O. F. Cook many years ago, as a result of which typical material of *Leptodesmus ortonedae* is represented in the National Museum collections.

Family **CHELODESMIDAE** Cook

The correct name for the group of genera to which *Guayapeltis* belongs is yet to be determined. Contrary to the view of the Count von Attems and his followers, who have advocated the single family "Leptodesmidae," there seems to me to be in South America at least three or four very distinct groups of genera which are certainly worthy of recognition as families. Until this can be worked out and the families defined, we must fall back on the existing arrangement, that of Attems as published in Das Tierreich in 1938. Here, Attems extended the name Leptodesmidae (defined in a negative way by the absence of such modifications as set off the Platyrhachidae, Oxydesmidae, and other families) to include most of the larger American polydesmoids which he had previously (1926) divided between the families Leptodesmidae and Fontariidae. The result was an extremely heterogenous ensemble, which has been going by several different names.

The earliest family name based on any of the genera is Cook's Chelodesmidae (1895). It was proposed for a small group including *Leptodesmus, Odontopeltis, Odontotropis, Priodesmus,* and *Rhacodesmus*, and took the name of the new genus *Chelodesmus*, which was diagnosed at the same time. Since the diagnosis was very brief and without illustrations, no one subsequently was able to deduce what the characters of the genus might be, and it became a sort of *nomen* *inquirendum* (although in a later paper, published in 1899, Cook himself stated "... I now strongly suspect that it is in reality not widely different from *Chelodesmus*," in discussing the genus *Eurydesmus*). Some workers retained Cook's family name, probably because it represented some better known genera; others dropped it altogether and took up the name Leptodesmidae, dating from its introduction as a subfamily in 1898 by Attems. More recent workers have followed one usage or the other, chiefly on the basis of tradition.

In 1950, following the demise of Dr. Cook, some material in his possession was returned to the National Museum, including the type specimen of *Chelodesmus marxi*. This was found (Hoffman, 1950) to be congeneric with *Eurydesmus angulatus*, the type of an older generic name—*Eurydesmus* Saussure, 1859—and the status of the name Chelodesmidae was thereupon thrown open to question. At the time, anticipating a decision on such matters by the International Commission, I suggested retention of the name Chelodesmidae, a course which I still prefer, particularly since the synonymy is entirely subjective and thus liable to subsequent dispute.

Dr. R. V. Chamberlin, however, believing that family names should be altered when their type genera are found to be junior synonyms, introduced the alternative name Eurydesmidae in 1950, and this has been carried over into the recently published "Checklist of the Millipeds of North America" (U. S. Nat. Mus. Bull. 212, 1958) compiled by Dr. Chamberlin and me. I have not gone into the question of whether Eurydesmidae Chamberlin in 1950 is preoccupied by the usage of the family-group name Eurydesminae, proposed by Attems in 1899 for an African genus which he incorrectly identified as *Eurydesmus;* but the matter does not end with a simple question of preference for family names, or whether they are synonymous. On the basis of preliminary studies now under way, I have come to believe that actually several family-groups may be recognized in the South American genera included by Attems in the "Leptodesmidae," and indeed, even within his one genus "Leptodesmus." Until these groups are worked out and defined, application of a single name to replace Leptodesmidae seems a somewhat academic matter. My preference is for Cook's Chelodesmidae, older by three years than the next available name—Leptodesminae Attems—for the same general ensemble of genera.

Genus **Guayapeltis** Verhoeff

Guayapeltis Verhoeff, 1938, Zool. Jahrb., Abt. Syst., vol., 71, p. 4. Haplotype: *Alocodesmus nitidus* Attems, 1931.

Guayapeltis is revived as the generic name for the following species with some diffidence, but it is at least more nearly correct than *Alocodesmus*, of which it was considered a junior synonym by Attems in 1940. There is actually some reason to believe that *Alocodesmus* in its strict sense—not as treated by Attems in 1938—belongs to a different subfamily from *Guayapeltis*, a matter to be discussed more fully in a longer paper now in preparation. For the present, with generic limits in the American chelodesmoids still totally undefined for the most part, *Guayapeltis* is convenient and certainly valid as long as the group remains monotypic or severely limited. Whether *ortonedae* correctly belongs with a group of species for which an earlier name is available is something which only future studies can settle, but it is not out of place to note that most of the existing Neotropical genera, such as *Leptodesmus*, are already far too inclusive and heterogeneous, and their applicability to Andean species such as the one under discussion seems entirely unlikely. It is only when the generic limits of the older names have been established in a restricted sense can the validity and extent of *Guayapeltis* be evaluated. For the present the name rests upon the characters of *ortonedae* and the closely related *G. witti* (Attems).

Guayapeltis ortonedae (Silvestri), new combination
(Figures 1, 2)

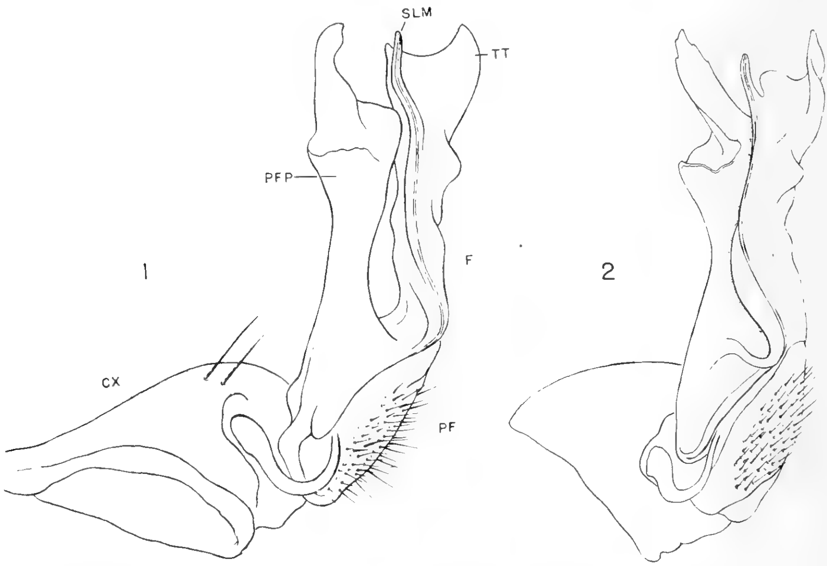
Leptodesmus ortonedae Silvestri, 1898, An. Mus. Buenos Aires, vol. 6. p. 66 (Guayaquil, Ecuador).
Alocodesmus nitidus Attems, 1931, Zoologica, vol. 30, lief. 3-4 (Heft 79), p. 58, figs. 81, 82 (Guayaquil, Ecuador). NEW SYNONYMY.
Guayapeltis nitidus Verhoeff, 1938, Zool. Jahrb., Abt. Syst., vol. 71, p. 4.
Alocodesmus nitidus Attems, 1938, Das Tierreich, lief. 69, p. 134, figs. 157, 158; 1940, idem., lief. 70, p. 551.

Material examined.—Two male paratypes, U. S. Nat. Mus., Myriapod type no. 2519, from Guayaquil, received from Silvestri; several male and female specimens intercepted by quarantine inspectors at Philadelphia from banana shipments originating in Ecuador (no further locality given).

A moderate sized, slender species, males up to 35 mm. in length and 4.5 mm. in width, females up to 5 mm. longer and more massive in body-size. Dorsal coloration chestnut to dark brown, antennae, legs, and paranota yellowish, median area of metatergites lighter brown or with a poorly defined yellowish median spot.

Head smooth, invested with numerous short setae; antennae very long and slender. Paranota of segments 2-5 set high on body, subrectangular, and well-developed, those of following segments much smaller, hardly more than lateral swellings, the peritremata conspicuously set off as pyriform callosities. Surface of tergites convex and smooth, no transverse groove present. Ventrolateral carinae not present; sternite 5 of males with four low rounded knobs. Sternites of abdominal flat and glabrous, without spines at bases of legs; latter quite long and slender, increasingly setose distally, the tarsal joint much longer than tibia. Tibial pads not present.

Gonopod socket relatively large, suboval, its margins conspicuously produced on the lateral and caudal sides. Gonopods as figured (figs. 1, 2); the coxae, in situ, are in contact with no distinct sternal remnant between them. Coxal joints large, subovoid, with two macrosetae on the upper side, telopodite set on its distal end forming an angle of about 110 degrees. Prefemur rather short, moderately setose, with a long stout prefemoral process, this expanding abruptly at the distal third, thereupon tapering apically into a thin subtriangular lamina. Femur a narrow stalk, its margins undulate, nearly in line with the prefemur, tibiotarsus forming a broad, concave, trilobed lamella, one of its lobes functioning as a solenomerite.



Guayapeltis ortonedae (Silvestri), left gonopod of male paratype: fig. 1, in mesial aspect; fig. 2, a more ventromesial aspect. Abbreviations: CX, coxa; F, femur; PF, prefemur; PFP, prefemoral process; SLM, solenomerite; TT, tibiotarsus.

Remarks.—This species should not be confused with the possibly related form described by Silvestri (1897) as *Odontopeltis Ortonedae*, likewise from Guayaquil. The gonopods appear, from Silvestri's drawing, to be somewhat like those of *Guayapeltis*, but the species differs in having fully developed paranota, a granulated head, and several transverse rows of tubercules on the tergites. The only recent reference to the species known to me is in Attems' 1938 manual, wherein he incorrectly refers it to *Trienchodesmus*, a genus of the family Sphaerotrichopidae. *O. ortonedae* may turn out to be a member of the *Alocodesmus* Group of genera.

Guayapeltis witti (Attems), new combination

Leptodesmus (Leptodesmus) witti Attems, 1901, Mitt. Naturh. Mus. Hamburg, vol. 18, p. 90, figs. 17, 18 (Loja, Ecuador).

Leptodesmus (Pseudoleptodesmus) witti Attems, 1938, Das Tierreich, lief. 69, p. 42, fig. 46.

The male gonopods of this species are virtually identical with those of *ortonedae*, as seen by a comparison of figure 18 in the original description with figure 1 of this paper. The only difference involves the distal end of the prefemoral process and may be due either to an individual variation or to an inaccuracy of illustration. Despite this, however, *witti* differs considerably in that the paranota of the mid-body segments are not reduced as in *ortonedae*, a departure which assures specific distinction between the two. The two species may prove to be allopatric as well; *witti* known only from the high Loja Valley in southern Ecuador, *ortonedae* inhabiting the coastal lowlands around Guayaquil.

It is a matter of interest that Attems, who had studied material of both of these closely related species, would have placed them in widely separated genera in his treatment in Das Tierreich. The reason, of course, is that his gonopod drawings, four in all, were made from as many different aspects, making subsequent comparisons almost impossible. This sort of thing has caused almost as much trouble in diplopod systematics as the failure to publish *any* drawings.

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ANNOUNCEMENT

Short scientific articles, not illustrated, two double-spaced typewritten pages or less in length, are welcome and will usually receive prompt publication. References to literature should be included in the text, and the author's name should appear at the end of the article.

THE REPORTED BITING AND FILTH FREQUENTING ARTHROPODS OF THE BERMUDA ISLANDS EXCLUSIVE OF THE IXODOIDAE AND ARANEIDA[1]

ROGER W. WILLIAMS, *School of Public Health and Administrative Medicine, Columbia University, New York, N. Y.*

At the annual meeting of the Entomological Society of America in December of 1956, Dr. B. V. Travis (1957) commented, "Experience during the past two decades has brought rather forcefully to our attention the need for a better understanding of the world wide distribution of arthropods of medical importance. Numerous unfortunate experiences in the past could have been either avoided or minimized had everyone been more aware of the local pest and disease problems in various areas of the world. These well documented catastrophies are ample proof of the need for more adequate data."

Although the Bermuda Islands, 600 miles off the coast of North Carolina, served as a strategically located U. S. air and naval base during World War II and will undoubtedly continue to serve as the location for such bases for years to come, no extensive effort had been made to ascertain the local pest and potential disease vectors among the arthropods until the author conducted such studies in 1955 and 1957. Johnson (1913) published on the dipteran fauna of the Bermudas, Ogilvie (1928) published a list of insects of these islands, and Waterston (1940) put out a supplementary list of Bermuda insects. These lists were probably somewhat incomplete and there may have been a considerable introduction of arthropods into the Bermudas in recent years. Air traffic into these islands continues to increase every year and planes come in daily from many distant parts of the globe. Interior spraying of civilian planes does not take place until all passengers have disembarked and very possibly any arthropods also. Here insects have been seen to fly from luggage when opened for the first time. As in most port areas there has been some rat exodus from ships for among the rodent ectoparasites was found a mite, *Marquesania expansa* (Ferris), known previously only from the Marquesas Islands.

Since the results of the 1955 and 1957 studies, which have been reported in a series of 7 papers (see References), are somewhat scattered and since it is most difficult to obtain Ogilvie's paper the intent of this paper is to bring together under one title a list of the reported biting and filth frequenting arthropods, exclusive of the Ixodoidea and Araneida, of the Bermuda Islands as found by the earlier investigators and by the present author in an attempt to fill the need for more adequate and accessible data of this nature. The

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[1] Contribution No. 253 of the Bermuda Biological Station. The 1955 investigations of the author was the result of a National Science Foundation grant-in-aid and a Childs Frick Fellowship from the Bermuda Biological Station. The 1957 investigations were sponsored by the Public Health Service, National Institutes of Health, research grant E-1350 and from the Childs Frick Fund of the Bermuda Biological Station.

Ixodoidae have been omitted because nothing is known about them other than the fact that some species of Ixodoidae have been noted on cattle and dogs by the local veterinarians. Since the Araneidae lie outside of the field of study of the author this group has likewise been omitted. The biting louse, *Linognathus setosus* (von Olfers), from a dog, is herewith reported from these islands for the first time in this paper. Biological information on many of the species may be obtained by consulting the original papers. The listing given here is alphabetically arranged and those species which have been shown to be a part of the Bermuda fauna by the author are preceded by an asterisk. Those species which are followed by † have been confirmed by the local Health Department and local doctors, through Dr. W. H. Sutcliffe, Jr., Director of the Bermuda Biological Station, as occurring in the Bermudas. It is doubtful if they have previously been reported from these islands. The information on the Myriapoda was supplied by Mr. I. W. Hughes, Assistant Director of the Bermuda Botanical Gardens of the Bermuda Department of Agriculture.

CLASS ARACHNIDA

Order ACARINA[2]

Family **LAELAPTIDAE**

**Androlaelaps* sp.

**Echinolaelaps echidninus* (Berlese)

**Laelaps nuttalli* Hirst

Family **LISTOPHORIDAE**

**Marquesania expansa* (Ferris)

Family **SARCOPTIDAE**

Sarcoptes scabiei (DeGeer) †

CLASS INSECTA

Order ANOPLURA

Family **HOPLOPLEURIDAE**

**Polyplax spinulosa* (Burmeister)

Family **LINOGNATHIDAE**

**Linognathus setosus* (von Olfers)

Family **PEDICULIDAE**

Pediculus humanus humanus (capitis) L.†

Pediculus humanus corporis (DeGeer) †

Phthirus pubis (L.) † (Thought not to be indigenous but occasionally broug in by visitors.)

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[2] Mite ectoparasites of rodents and man only.

Order Diptera[3]

Family CALLIPHORIDAE

Calliphora vomitoria (L.) (None captured in 1957.)
**Callitroga macellaria* (Fab.) (Most common filth fly on the islands in 1957.)
Lucilia caesar (L.) (It is not known whether this species as reported by Ogilvie as found by Verrill in 1902 and by himself in 1923-28 is the true *caesar,* which apparently does not occur elsewhere in North America, or *L. illustris,* which is the *L. caesar* of many North America workers, or *Phaenicia caeruleiviridis* or *P. mexicana* which have been identified as *L. caesar* by some workers. None were trapped in 1957.)
Phaenicia problematica (Johnson) (None captured in 1957.)
Phaenicia sericata (Meig.)
Stomorhina (Idia) lunata (Fab.) (None captured in 1957.)

Family CULICIDAE

Aedes aegypti (L.)
Aedes sollicitans (Walk.)
Aedes taeniorhynchus (Wied.)
Culex pipiens quinquefasciatus Say
**Culex salinarius* Coq.

Family HELEIDAE

**Bezzia atlantica* Wirth and Williams
**Culicoides bermudensis* Williams
**Culicoides crepuscularis* Malloch
**Culicoides floridensis* Beck
**Dasyhelea atlantis* Wirth and Williams
**Dasyhelea bermudae* Wirth and Williams
**Dasyhelea cincta* (Coq.)
**Dasyhelea grisea* (Coq.)
**Dasyhelea luteogrisea* Wirth and Williams
**Dasyhelea scissurae* Macfie
**Forcipomyia ingrami* Carter
**Forcipomyia raleighi* Macfie
**Forcipomyia varipennis* Wirth and Williams
Pterobosca fusicornis (Coq.) = (*Ceratopogon fur* Johnson. None captured in 1955 or 1957.)

Family MUSCIDAE

**Atherigona orientalis* Schin.
Fannia pusio (Wied.)
Musca domestica L.
Ophyra aenescens (Wied.)
Stomoxys calcitrans (L.)
Synthesiomyia nudiseta (Wulp.) = *S. brasiliana* B. & B.

Family ORTALIDAE

Euxesta sp.

---

[3] Only biting forms and species attracted to decomposing organic matter are reported here. See Ogilvie and Johnson for other families, genera and species.

Family **CHLOROPIDAE**

Hippelates plebejus Loew
Hippelates pusio Loew

Family **SARCOPHAGIDAE**

Sarcophaga assidua Walk. (Probably *ventricosa.*)
Sarcophaga georgina Wied. (Not collected in 1957.)
Sarcophaga helicis (Towns.) (Probably either *morionella* or *rapax.*)
**Sarcophaga lherminieri* (R.-D.)
**Sarcophaga morionella* Ald.
**Sarcophaga rapax* Walk.
**Sarcophaga ventricosa* Wulp.
Sarcophagula sp. (Not collected in 1957.)

Family **TABANIDAE**

Stenotabanus atlanticus (Johnson)
Tabanus nigrovittatus Macq.
Tabanus sp. close to *costalis* (According to Ogilvie, reported only by H. H. Whetzel in "Annual Reports of the Board and Department of Agriculture, Bermuda," and Bda. Dept. Agr., Agr. Bulln. for 1921, 1922, 1923. This species has apparently not been seen in recent years.)

Order HEMIPTERA

Family **CIMICIDAE**

Cimex lectularius L.

Order ORTHOPTERA

Family **BLATTIDAE**

Blatella germanica (L.)
Blatta orientalis L.
Ceratinoptera diaphana Fab.
Leucophaea maderae (Fab.)
Periplaneta americana L.
Periplaneta australasiae (Fab.)
Pycnoscelus surinamensis (L.)

Order SIPHONAPTERA

Family **PULICIDAE**

Ctenocephalides canis (Curtis) (Not found in 1957.)
**Ctenocephalides felis* (Bouche) (May have been *canis* reported by Ogilvie.)
Pulex irritans (L.)
**Xenopsylla cheopis* (Roth.)

Family **SARCOPSYLLIDAE**

Echidnophaga gallinacea (Westw.)
Tunga penetrans (L.) (Ogilvie thought that this species may no longer be present on the Islands. None were found in 1957.)

CLASS MYRIAPODA

Order CHILOPODA

Family **LITHOBIIDAE**

Lithobius lapidicola Mein.

Family **MECISTOCEPHALIDAE**

Mecistocephalus guilingii Newport

Family **SCOLOPENDRIDAE**

Scolopendra subspinipes Leach

Family **SCUTIGERIDAE**

Scutigera forceps Raf.

Order Diplopoda

Family **JULIDAE**

Julus moreleti Lucas
Julus spp.

Family **SPIROBOLIDAE**

Spirobolus heilprini Bollman.

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Wirth, W. W. and Williams, R. W., 1957. The biting midges of the Bermuda Islands, with descriptions of five new species. (Diptera, Heleidae). Proc. Ent. Soc. Wash. 59(1): 5-14.

PUBLICATION DATES

The date of publication of Vol. 61, No. 4, of the *Proceedings* was 11 September 1959. The date of publication of Vol. 61, No. 5, will be found in Vol. 61, No. 6.

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of **WASHINGTON**

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1884

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 61 DECEMBER, 1959 No. 6

TEN NEW FLEA-BEETLES FROM CUBA

(COLEOPTERA, CHRYSOMELIDAE)

DORIS H. BLAKE, *Washington, D. C.*

The material from which these ten new species of Alticinae are described was obtained by Fernando de Zayas of Habana, Cuba. He has been actively collecting specimens of all groups of insects in Cuba for many years until he now has a collection of over 400 boxes of mounted material. In time this may become the nucleus of a Cuban national collection.

Oedionychus orientensis, new species

(Figure 1)

About 6 mm in length, oblong oval, shiny, very finely punctate, deep yellow brown with the body beneath a little deeper in coloring, the five terminal antennal joints dark, the elytra with small dark spots, one on the humerus, one in the middle of each elytron below the scutellum, another below middle, and another near apex, sometimes one in middle at side, all these spots except the humeral one very small and sometimes absent in part or entirely.

Head with interocular space about one-third width of head, occiput shiny and smooth except for a row of punctures near eye running down to frontal tubercles, and ending in a large fovea near eye; interantennal area knob-like, lower front short and sharply declivate, mouthparts small. Antennae filiform, not extending much below humeri, pale with joints 7 to 10 and sometimes 11 dark. Prothorax more than twice as broad as long, somewhat alutaceous and very finely punctate, dark yellowish brown with faint traces of two spots in middle anteriorly in some specimens. Scutellum deep brown. Elytra smooth, polished, very indistinctly but moderately densely punctate; humeral prominences marked by a short intrahumeral sulcus; deep yellow-brown with a piceous spot on humeri, and on each elytron three or four small and usually inconspicious dark spots, one below scutellum, one at middle on the side, another in line with the basal one, and another near apex. In one specimen the spot at the side lacking, in another there are no spots except on the humerus. Body beneath a little deeper in color. Tibiae and tarsi pale. Length 5.5 to 6.2 mm.; with 2.8 to 3 mm.

Types.—Type female, U.S.N.M. Type No. 64661 and 5 paratypes, two in collection of F. de Zayas, collected at El Johnson, Moa, Oriente Province, Cuba, in June 1954, by F. de Zayas and Pastor Alayo.

Remarks.—This differs from *Oe. complanata* Suffrian in having usually more spots, in having punctate elytra, and in being somewhat larger. Suffrian described *Oe. complanata* as having only one spot near the middle of the elytra, and no mention is made of a dark covering of the humerus. In these half dozen specimens of *Oe. orientensis* that I have examined, the spotting is somewhat variable; the spots near the base may be small or entirely lacking, one specimen is pale except for the humeral spot which appears in all the specimens. Unfortunately no male has been examined.

Oedionychus zayasi, new species

(Figure 2)

About 5 mm. in length, elongate oblong, not shiny, dull strawcolored, the 8th and 9th antennal joints and sometimes the 10th, dark, the terminal joint usually pale; scutellum deeper brown.

Head with interocular space less than half width of head, occiput smooth, a row of punctures extending from a fovea on inner margin of eye to frontal tubercles, the frontal tubercles distinctly marked, interantennal area produced in a tiny knob, lower front sharply declivate from antennal sockets. Antennae extending below humeri, slender, becoming slightly thicker distally, pale with joints 8 to 10 deeper in color, often the terminal joint pale. Prothorax more than twice as wide as long at base, not very convex, alutaceous, very indistinctly punctate, entirely pale yellow brown. Scutellum deep brown. Elytra smooth, alutaceous, with a short intrahumeral sulcus, surface very finely punctate, entirely pale yellow brown. Body beneath and legs yellow brown with breast a little deeper brown. Length 4.6 to 5.7 mm.; width 2.3 to 2.8 mm.

Types.—Type male, U.S.N.M. Type No. 64662, and 3 paratypes, two in Zayas' collection, all from the Peninsula Guanacahabibes, Pinar del Rio Province, Cuba, collected in July 1955 by Fernando de Zayas.

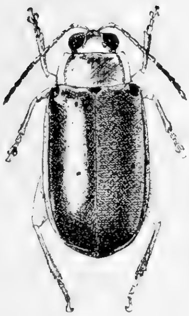
Remarks.—There is no other Cuban species of *Oedionychus* yet described with this dull pale yellow-brown color.

Oedionychus cristalensis, new species

(Figure 3)

About 5 mm. in length, oblong oval, finely alutaceous although somewhat shiny, very finely punctate, yellow-brown, the antennae with the two basal and five apical joints dark, prothorax deeper brown with two dark areas in the middle anteriorly, elytra with a wide, sinuous, dark reddish brown, sutural vitta not extending to apex, breast darker than rest of undersurface.

Head with interocular space about one-fourth the width of the head, occiput smooth except for a row of punctures extending from a fovea on inner side of eye down to frontal tubercles, frontal tubercles distinctly marked, a knob between antennal sockets, lower front sharply declivate, mouthparts small, upper part of head yellow brown, lower gradually deepening in color. Antennae filiform, not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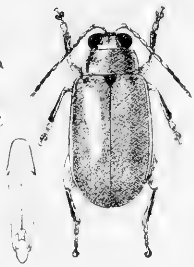
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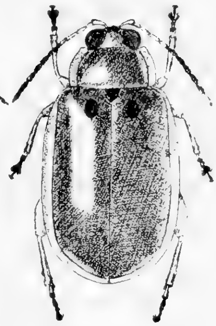
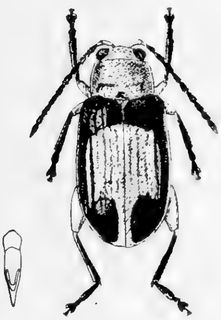

4 Oedionychus amplilimbatus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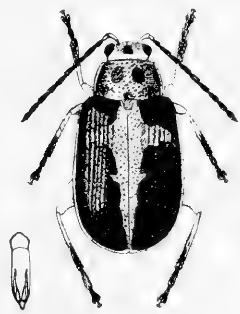
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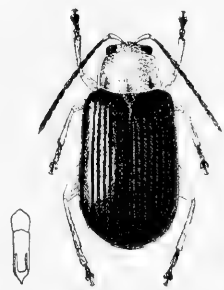
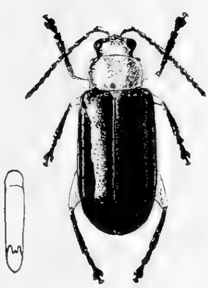

7. Hemilactica stomachosa (Suffrian)?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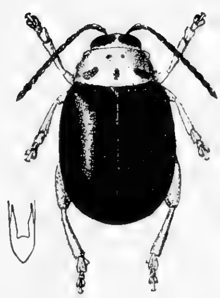
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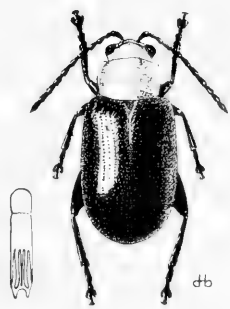

10. Cyrsylus cubensis

extending to middle of elytra, the two basal and five distal joints darker than joints three to six. Prothorax about twice as wide as long at base, narrowed in a straight line anteriorly, dull dark yellowish brown with two darker areas in middle near anterior edge; surface alutaceous and finely punctate. Scutellum dark. Elytra moderately shiny although finely alutaceous, very finely punctate, yellow brown with a wide dark reddish brown sutural vitta narrowing near middle and then widening again, not extending below apical curve. Body beneath pale yellow brown with the breast darker brown, legs entirely pale. Length 4.8 mm.; width 2.5 mm.

Type.—Male, in collection of F. de Zayas, from Sierra del Cristal, Oriente Province, Cuba, collected in June 1956 by Fernando de Zayas.

Remarks.—The sinuate sutural vitta on the elytra distinguishes this species from any yet described from Cuba.

Oedionychus amplilimbatus, new species
(Figure 4)

About 6 mm. in length, elongate oblong oval, somewhat shiny although finely alutaceous, dirty dark yellow brown, the elytra with two dark brown spots near base, the last six antennal joints and tarsal joints deep brown; explanate margin unusually wide.

Head with interocular space about one-third width of head, head smooth and alutaceous over occiput, a row of depressed punctures from inner margin of eyes down to frontal tubercles; frontal tubercles well marked, a knob-like prominence between antennal sockets, lower front sharply declivate and short, whole head dirty dark yellow brown. Antennae not extending much below humeri, filiform with the outer joints a little broader; the last six joints deeper brown. Prothorax approximately twice as broad as long, not very convex with wide explanate margin, surface alutaceous, very faintly punctate, dirty yellow brown. Scutellum deeper brown. Elytra rather flat, humeri not very prominent, explanate margin wide, surface alutaceous, very faintly and finely punctate, dirty yellow brown with a large dark brown spot near suture and below scutellum, on each elytron. Body beneath entirely yellow brown, the legs yellow brown with the tarsal joints deeper brown. Length 6.3 mm.; width 3.4 mm.

Type.—Female, in collection of F. de Zayas, from Peninsular Guanacahabibes, Pinar del Rio Province, Cuba, collected in July 1955 by Fernando de Zayas.

Remarks.—The unusually wide explanate margin and the two elytral spots distinguish this from other Cuban species.

Hemilactica clara, new species
(Figure 5)

About 3.5 mm. in length, oblong oval, shining, distinctly punctate, the prothorax with traces of basal transverse sulcus, the elytra with irregular costae and a submarginal fold; pale reddish brown, the elytra with a basal and apical metallic blue or green spot connected along the side with a dark metallic band; antennae, tibiae and tarsi dark.

Head with interocular space half its width, strongly punctate, except on frontal tubercles, carina somewhat blunt and rounded, not sharply defined. Antennae extending well below humeri, 3rd joint shorter than 4th, the two basal joints pale, the remainder dark piceous. Prothorax somewhat narrowed apically with slightly curved sides, traces of a basal sulcus in the form of a depression on each side and one in the middle, surface distinctly and densely punctate, a little bumpy, entirely pale reddish brown. Scutellum pale. Elytra with a strong lateral submarginal fold and numerous costae, the interspaces with obsolete punctures; shining, pale reddish brown, with a broad basal metallic blue or green band connected broadly along the sides with a large apical spot. Body beneath pale reddish brown, femora reddish brown, tibiae and tarsi piceous. Length 3 to 4.5 mm.; width 1.5 to 2 mm.

Types.—Type male, U.S.N.M. No. 64663, from La Breña, Moa, Oriente Province, Cuba, and 10 paratypes, 2 in collection of F. Zayas; also one specimen collected at Piloto, Moa, Oriente Province, Cuba, all collected by F. de Zayas and Pastor Alayo in June and July 1954.

Remarks.—As in *H. stomachosa* (Suffrian) there is a strong lateral fold on the elytra. The aedeagus is similar in shape to that of *H. rugosa* Blake in having a long pointed tip. This species is entirely different from any of the others in its elytral pattern.

Hemilactica crucifera, new species

(Figure 6)

About 3 mm. in length, oblong oval, shining, distinctly punctate, the prothorax with traces of basal sulcus at sides and middle, the elytra with several more or less distinct costae, pale reddish brown with a median occipital piceous spot on head, four large dark spots having a bluish lustre across anterior half of prothorax, and the elytra dark violaceous except the pale margin and a median cross-shaped pale marking; legs and undersurface pale with the tibiae at apex, and tarsi darker brown, antennae mostly dark brown.

Head with interocular space about half width of head, except in the middle of the lower front head densely and coarsely punctate; a broad rounded keel from between antennal sockets downward; pale reddish brown with an oblong piceous spot on occiput. Antennae extending well below humeri, 3rd joint half as long as 4th, 4th and 5th slightly longer than remainder; the two basal joints pale, remainder deep brown. Prothorax wider at base, narrowed straightly to apex; traces of a basal sulcus in the limiting ends and depression in the middle of base; surface shining and coarsely and irregularly punctate; pale reddish brown with four elongate piceous spots having a faint bluish lustre across anterior half of prothorax, the outer ones extending to but not covering explanate margin. Scutellum pale. Elytra shining, rather coarsely and irregularly punctate in the pale area, and between costae, and punctures becoming obsolete after the middle; humeri well marked, several short costae down middle of the elytra; a median cross-shaped pale reddish area down suture, and the elytral margin also pale, rest of elytra deep blue. Body beneath pale reddish brown, legs pale with the posterior half of tibiae and tarsi deeper brown; posterior femora enlarged, spur at tip of hind tibiae. Length 3.2 mm.; width 1.8 mm.

Type.—Male, in collection of F. de Zayas, from Sierra del Cristal, Oriente Province, Cuba, collected in June 1956 by F. de Zayas.

Remarks.—The spotting of the prothorax is similar to that of

H. pulchella Blake, but the markings of the elytra as well as the shape of the aedeagus are different.

Hemilactica stomachosa (Suffrian)?
(Figure 7)

Haltica stomachosa Suffrian, Archiv. f. Naturg., vol. 34, pt. 1, 1868, p. 204.

About 3.5 mm. in length, oblong oval, shining, the elytra with numerous costae; reddish brown, the elytra violaceous blue, the breast and abdomen deep brown.

Head with interocular space approximately half width of head, strongly and densely punctate, except on tubercles, the carina broad, entirely reddish brown. Antennae extending well below humeri, 3rd joint shorter than 4th, the two basal joints paler than the deep brown remainder. Prothorax not twice as broad as long with sides somewhat narrowed apically, traces of a basal sulcus in the limiting depressions on each side and a median basal depression; surface shiny, finely punctate, pale reddish brown. Scutellum pale reddish brown. Elytra with seven distinct costae in the female, the costa from humerus down side developed more than in male into a lateral fold; shining, indistinctly punctate, entirely deep violaceous blue. Body beneath and legs pale reddish brown with the breast and abdomen deeper brown. Hind femora enlarged, a tiny spur at apex of hind tibiae. Length 2.8 to 3.8 mm.; width 1.4 to 1.8 mm.

Remarks.—F. de Zayas has collected five specimens of what may be Suffrian's *Haltica stomachosa*, four at Pan de Guajaibon and the other at Suajaibon, Pinar del Rio Province, Cuba, although they do not entirely correspond to the Suffrian description. Suffrian described the elytra as having a ferrugineous margin and the underside as having the breast and abdomen blue-black. In these specimens the margin is not ferrugineous but dark as the rest of the elytra, and the underside is simply a deeper brown. Since I have never seen *H. stomachosa* in any collection, and since I have already illustrated the rest of the genus, I include this species.

Systena plicata, new species
(Figure 8)

Between 5 and 6 mm. in length, elongate oblong, shining, the prothorax and elytra thickly punctate, the elytra with a strong lateral fold running down the side from the humerus; reddish brown with deeper brown antennae, tibiae, tarsi and abdomen, elytra shining dark blue or bluish green.

Head with interocular space a little more than half width of head, well rounded over occiput, vertex finely and densely punctate, a line running across over tubercles between eyes, carina between antennal sockets short and somewhat produced; entirely pale reddish brown. Antennae deep brown, third joint a little shorter than fourth or fifth, remainder subequal to third. Prothorax not quite twice as broad as long, with rounded sides, obtuse anterior angles and a tooth at basal angles; surface shining, densely and finely punctate, entirely pale reddish brown. Scutellum reddish brown. Elytra rather flat, with a distinct lateral fold, more developed in the male, from humerus nearly to apex; intrahumeral sulcus short but well marked; surface shining, and densely and strongly punctate, a slightly depressed line parallel to and near suture; dark blue or bluish green. Body beneath with anterior coxal cavities closed, reddish brown, the abdomen deeper brown, femora reddish, tibiae and tarsi brown; tibiae with a sulcate line, a spur on hind tibiae and tiny spine on anterior tibiae, claws appendiculate. Length 4.4 to 5.5 mm.; width 1.7 to 2 mm.

Types.—Type male, U.S.N.M. Type No. 64664, and 2 paratypes, both female, one in the collection of F. de Zayas, taken by him in the Sierra del Cristal, Oriente Province, Cuba, in June 1956; also two specimens taken at Morrillo, Matanzas, near Rio San Juan, in June 1949, by F. de Zayas.

Remarks.—The strong lateral fold on the elytra distinguishes this species. It does not correspond with Suffrian's description of *S. coeruleipennis* in this regard, and the color pattern is a little different. The aedeagus is typical of *Systena.*

Megistops coeruleipennis, new species

(Figure 9)

About 3 mm. in length, oval, alutaceous, feebly shining, pale reddish brown with dark brown antennae, the pronotum having indistinct spotting, the elytra shining deep blue.

Head with the large eyes nearly meeting on vertex, frontal tubercles squeezed between eyes and a narrow carina down lower front; entirely pale reddish brown. Antennae deep reddish brown, 3rd joint shorter than 4th, 4th and 5th joints long, remainder a little shorter and subequal. Prothorax widening from apex to base, broadly truncate at apical angles, disk reddish brown with two faint darker brown areas, one on either side near anterior middle, and a larger area on either side near base and margin, and a less well defined one in middle of base. Scutellum deep brown. Elytra broad and more convex, deep blue, faintly shiny, finely alutaceous and very finely punctate. Body beneath entirely pale reddish brown, shining. Posterior femora much enlarged, posterior tibiae with the usual broad double-tipped spur. Length 3.2 mm.; width 1.8 mm.

Type.—Male, U.S.N.M. Type No. 64665, taken at Cumanayagua, Las Villas Province, Cuba, in January 1954, by F. de Zayas. One other specimen, taken at Corralillo, near Guao, Las Villas Province, June 1954, by F. de Zayas, is in his collection.

Remarks.—This is the second species of *Megistops* with blue elytra to be described from the West Indies. The first, *M. dissita* Blake. (Bull. Brook. Ent. Soc., vol. 26, 1931, p. 81) was described from Haiti, and is similar in color but the eyes are placed farther apart and the antennae and scutellum are pale instead of deep brown.

The gender of the word *Megistops* is feminine and, contrary to the *Catalogus Coleoptorum* which lists all the species with masculine endings, the specific endings should be feminine.

Cyrsylus cubensis, new species

(Figure 10)

About 4.5 mm. in length, oblong-oval, shining, elytra striately punctate, head and prothorax pale reddish or yellowish brown, antennae, legs and undersurface black, elytra shining deep blue or bluish green.

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Head with interocular space more than half its width, occiput shining, smooth, well rounded, impunctate, a line runing across front above antennal sockets to margin of eye, carina between antennal sockets rounded, not much produced; head entirely pale. Antennae entirely shining black, 3rd joint shorter than 4th, 5th a bit longer than 4th, remainder subequal. Prothorax about twice as wide as long with rounded sides and with obtusely cut apical angles and smooth sharp tooth at basal angles, disk smooth, convex, surface shining, very finely punctate and entirely pale yellowish or reddish brown. Scutellum deep chestnut brown. Elytra with the striate punctures strong in basal half but becoming much reduced towards apex; between these rows of coarser punctures are finer ones; the lateral margin not wide, in fact scarcely discernible, epipleura wide along side but disappearing near apex. Body beneath with prosternum and area about front of middle coxae pale, remainder shining black or piceous, legs entirely dark; anterior coxal cavities closed, hind femora enlarged, a spur at end of hind tibiae, tibiae not channelled. Length 4 to 5.3 mm.; width 1.8 to 2.4 mm.

Types.—Type male, U.S.N.M. Type No. 64666, and 6 paratypes, two in the collection of F. de Zayas who collected them in the Sierra del Cristal, Oriente Province, Cuba, in June 1958.

Remarks.—Three species closely resembling each other have been described from the West Indies—*C. cyanipennis* (Weise), from the Virgin Islands, *C. hispaniolae* Blake from Haiti, and *C. montserrati* Blake. Only *C. hispaniolae* is as large as *C. cubensis.* All of them except *C. cubensis* have pale legs and undersurface and paler antennae, whereas in *C. cubensis* the legs, undersurface, and antennae are shining black. The aedeagus in all is strikingly similar and unusual in having a double tip.

INSECTS ASSOCIATED WITH MILKWEED

There appears to be very little published information about milkweed insects except for scattered references to the well-known: *Oncopeltus fasciatus* (Dall.), *Lygaeus kalmii* Stal., *Tetraopes tetraophthalmus* Foster, and *Chrysochus auratus* Fab. Intensive observations of insects visiting milkweed plants, *Asclepias syriaca*, at College Park, Maryland, were made in June, July, and August, 1958. Some fifty plants in various stages of growth were selected and observed for the most part at weekly intervals. Repeated observations were made on most of the plants. Population estimates were made, and information on the feeding activity of the insects was recorded. A large number of insects land on milkweed plants for unexplained reasons.

Altogether 67 species belonging to 47 families in 9 orders were observed. Lists of the species are available on request from the second author.

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THE SPECIES OF THE GENUS HERBERTIA HOWARD

(Hymenoptera, Pteromalidae)

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The genus *Herbertia*, having the gaster sessile, the parapsidal furrows complete, the antennae inserted very low on the frons, the head non-menisciform, and the prepectus large, is referable to the tribe Pirenini of the subfamily Pteromalinae. All the species of *Herbertia* are small, the largest known species being only 2.5 mm. long. These species, as for as is known, parasitize leaf-mining Diptera belonging to the family Agromyzidae.

The first described species of *Herbertia* was from the island of St. Vincent, B. W. I. Ashmead soon added 2 more species from Brazil. This paper describes 3 additional species, one each from Japan, India, and the United States.

Genus **Herbertia** Howard

Herbertia Howard, 1894, Linn. Soc. London Jour.-Zool., 25: 98; Dalla Torre, 1898, Cat. Hym., v. 5, p. 216; Ashmead, 1904, Carnegie Mus. Mem., 1: 272, 377; Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 270, 271; Gahan and Fagan, 1923, U. S. Natl. Mus. Bul. 124, p. 70; Ferrière, 1934, Schweiz. Ent. Ges. Mitt., 16: 84, 86, 88.

Type: *Herbertia lucens* Howard; monotypic.

This genus was named for Herbert H. Smith, the collector of the type species.

Generic description.—Head as broad as or slightly broader than pronotum, from dorsal aspect head approximately half as long as wide, occiput deeply concave, its margin broadly rounded; eyes large, densely hairy; malar space narrow, malar suture absent; ventral margin of gena projecting as a narrow shelf which extends over base of forecoxa; clypeus a distinct, transverse sclerite; antennae inserted very low, near the clypeal margin; antennal scape short, its apex never exceeding a point half-way between mouth border and anterior ocellus; pedicel stout, almost as long as club; one ring segment present; funicle with 6 segments, all broader than long and usually increasing in width toward apex of funicle; club with 3 segments, club at least half as long as funicle; ocelli large; scrobe cavity with margin non-acute, scrobe occupying more than half the space on frons between the compound eyes. Thorax compact, flattened dorsally, mesopraescutum and scutellum with dorsal surfaces almost on the same plane; pronotum semi-rectangular, transverse, its posterior margin almost straight; parapsidal furrows complete, distinctly impressed throughout; mesoscutellum slightly longer on meson than praescutum; forewing with marginal and submarginal veins subequal in length, postmarginal vein from ⅓ to ½ as long as marginal, stigmal vein short, its apex bearing a minute spur which usually is directed obliquely anteriorly; hind tibia with 2 apical spurs, one much longer than the other; ventral side of hind tarsus bearing 2 rows of short, relatively weak spines. Propodeum with a median, longitudinal carina and a pair of sublateral, longitudinal carinae, transverse carinae usually also present between median and sublateral ones; median carina usually bearing a minute papilla near its middle; apex of propodeum usually produced on meson as a small neck, dorsal surface of this neck flattened; gaster sessile, first tergum occupying approximately ½ dorsal length of gaster; first tergum smooth and shining, posterior terga sculptured, dull; apices of ovipositor sheaths usually slightly exserted.

Head, dorsum of thorax, legs, wings, lateral and apical areas of propodeum, base of first gastral tergum, and apical gastral terga conspicuously hairy, the hair on propodeum and base of first gastral tergum woolly. All tibiae and basal 4 segments of all tarsi in all species white; head, body, and legs otherwise black or metallic green, blue, or blue-green.

Antigeny in this genus slight, but males have gaster slightly smaller than females, male first gastral tergum relatively shorter, and apex of gaster produced on meson as a minute point.

Key to Species of Herbertia

1. Surface of propodeum between carinae shagreened, dull **howardi** Ashmead
   Surface of propodeum between carinae smooth, shining 2

2. First gastral tergum with a median, transverse, basal lamina 3
   First gastral tergum without a median, basal lamina 4

3. Median area of scutellum smooth, shining; height of compound eye 5 times as great as width of malar space; longer spur of hind tibia almost as long as basal hind tarsal segment; overall length more than 2 mm. .... **nipponica,** new species
   Median area of scutellum reticulated, dull; height of compound eye 6 times as great as width of malar space; longer spur of hind tibia ½ as long as basal hind tarsal segment; overall length less than 2 mm. .... **indica,** new species

4. Head, entire thorax, and basal gastral tergum metallic brassy-green, apical gastral terga metallic blue .... **lucens** Howard
   Head black, or black with frons metallic blue; mesoscutum metallic blue or dark blue-green, scutellum black 5

5. Fronto-vertex of head bright metallic blue; dorsal margin of clypeus almost touching ventral margin of scrobe cavity; femoral furrow in mesopleuron sculptured .... **brasiliensis** Ashmead
   Fronto-vertex black or very faintly tinted with metallic blue; dorsal margin of clypeus separated from margin of scrobe cavity by a space greater than length of clypeus; entire mesopleuron smooth .... **wallacei,** new species

Herbertia howardi Ashmead

Herbertia howardi Ashmead, 1904, Carnegie Mus. Mem., 1: 474; Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 271; Ferrière, 1934, Schweiz. Ent. Ges. Mitt., 16: 88.

Female.—Length 2.5 mm. Head with frons metallic blue, vertex and occiput black; antennae brown, faintly washed with metallic blue sheen; pronotum black, narrow transverse band at posterior margin metallic blue; mesopraescutum, parapsides, and axillae metallic blue-green; scutellum metallic blue-green laterally, shading to black on meson; thorax on pleura and venter shining black, faintly tinged with metallic blue from some angles; coxae black, femora metallic blue-green; wing veins tan; propodeum black, tinged with blue-green near spiracles; first gastral tergum metallic green at base, shading to back at apex, posterior gastral terga black.

Compound eye extremely large, width of malar space only 1/12 as great as height of eye; antennae inserted at level of ventral margins of eyes; antennal club as long as 3 apical funicle segments, pedicel as long as 3 basal funicle segments; ventral margin of scrobe cavity almost in contact with clypeus; scrobe cavity extending to a point slightly below half the eye height; width of frons at level of apex of scrobe cavity 1½ times as great as width of compound eye; width of anterior ocellus 1/6 as great as interocular distance at this point.

Entire dorsum of thorax with minute but strong alveolate sculpture, nowhere smooth; prepectus with surface anteriorly roughened, mat, posteriorly smooth and shining; mesopleuron mostly smooth, but with a large, diamond-shaped, sculptured area at antero-ventral angle and a smaller, depressed, sculptured area near base of hindwing; forewing with marginal vein twice as long as postmarginal, stigmal 1/3 as long as postmarginal.

Surface of propodeum between carinae dull, shagreened; median propodeal carina with a papilla, a pair of transverse carinae arising from median one just posterior to papilla, lateral carinae stout and strongly elevated; spiracle oval, margins elevated, touching anterior propodeal margin; basal margin of first gastral tergum without a transverse lamina; first gastral tergum occupying slightly less than ½ dorsal length of gaster; ovipositor sheaths not exserted.

Male.—Unknown.

Type locality.—Rio de Janeiro, Brazil.

Type.—U. S. N. M. no. 60515 (formerly in the Carnegie Museum, Pittsburgh, Pa.).

Distribution.—Brazil.

Host.—Unknown.

Herbertia nipponica, new species

Female.—Length 1.5 mm. Shining, jet black, with frons, antennae, posterior margin of pronotum, tegulae, coxae, and femora faintly metallic blue; wing veins tan.

Width of malar space 1/5 as great as height of compound eye; dorsal margin of clypeus well separated from ventral margin of scrobe cavity; antennae inserted at level of ventral margins of compound eyes; antennal club as long as apical 3 funicle segments; pedicel as long as 2 apical funicle segments; scrobe cavity extending to ½ the eye-height; width of frons at level of apex of scrobe cavity twice as great as width of one compound eye.

Entire mesopleuron smooth and shining; forewing with postmarginal vein 2/5 as long as marginal, stigmal slightly less than ½ as long as postmarginal; surface of scutellum reticulated at base, surface smooth in middle and apical part; longer apical spur of hind tibia almost as long as basal segment of hind tarsus.

Surface of propodeum smooth, shining; median carina without a papilla, transverse carinae lacking; spiracles oval, touching anterior margin of propodeum; anterior margin of basal gastral tergum with a short, median, transverse lamina; laterally at base this tergum with dense, wolly hairs; first gastral tergum occupying 5/8 dorsal surface of gaster; apices of ovipositor sheaths slightly projecting.

Male.—Unknown.

Type locality.—Japan.

Type.—U. S. N. M. no. 64494.

Described from 1 female specimen reared at the Seattle, Washington, Port of Entry, Feb. 29, 1934, from *Euonymus* sp. leaf from Japan infested with an undetermined agromyzid leaf miner, J. P. Young, Seattle no. 3641.

Herbertia indica, new species

Female.—Length 1.2—1.5 mm. Head, thorax, and abdomen usually entirely black; antennae and wing veins tan; tegulae, coxae, femora, and propodeum faintly metallic blue or blue-green; posterior margin of pronotum sometimes metallic blue; vertex and entire dorsum of body sometimes with a very faint metallic blue sheen.

Width of malar space 1/6 as great as height of compound eye; dorsal margin of clypeus almost touching ventral margin of scrobe cavity; antennae inserted slightly above level of ventral margins of compound eyes; antennal club pointed at apex, as long as apical 3 funicle segments, pedicel 5/8 as long as club; scrobe cavity extending to 3/4 the eye height; width of frons at level of apex of scrobe cavity twice as great as width of a compound eye.

Entire mesopleuron smooth, shining; apex of scutellum smooth, rest of thoracic notum sculptured; forewing with marginal vein slightly greater than twice as long as postmarginal, stigmal vein ½ as long as postmarginal; longer spur of hind tibia ½ as long as basal hind tarsal segment.

Surface of propodeum between carinae smooth; papilla present on median propodeal carina, located very near base of propodeum; transverse carinae absent; spiracles oval, almost touching anterior propodeal margin; basal gastral tergum with median, transverse lamina at base; first tergum making up 3/5 dorsal length of gaster; apices of ovipositor sheaths projecting a distance equal to dorsal length of third gastral tergum.

Male.—Length 1.1—1.4 mm. Thoracic notum more strongly flattened than in female; first gastral tergum comprising 2/3 to ¾ dorsal length of gaster.

Type locality.—Gwalior, India.

Types.—U. S. N. M. no. 64495.

Described from 5 female and 5 male specimens, as follows: Holotype ♀, allotype ♂, and 2 ♀ and ♂ paratypes, Gwalior, Madhya Pradesh, India, 1958, reared from dipterous leaf miner on *Withania seminifera*, O. S. Bindra; 2 ♂ paratypes, same data, but from *Liriomyza* sp. leaf miner on undetermined herbaceous weed; 2 ♀ and 1 ♂ paratypes, Paradeniya, Ceylon, May 3, 1914, reared from dipterous leaf miner, A. Rutherford.

Herbertia lucens Howard

Herbertia lucens Howard, 1894, Linn. Soc. London Jour.-Zool., 25: 98; Dalla Torre, 1898, Cat. Hym., v. 5, p. 216; Ashmead, 1900, Ent. Soc. London Trans., [48]: 255; Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 271; Ferrière, 1934, Schweiz. Ent. Ges. Mitt., 16: 88, 93.

Female.—Length 1.8 mm. Head, thorax, coxae, trochanters, femora, and basal gastral tergum shining, metallic green; propodeum black with metallic blue highlights; antennae, tegulae, and apical gastral segments metallic blue; wing veins tan.

Width of malar space 1/6 as great as height of compound eye; antennae inserted slightly below level of ventral margins of compound eyes; margin of clypeus almost in contact with ventral margin of scrobe cavity; antennal club as long as apical 3 funicle segments, pedicel as long as 3 basal funicle segments; apex of scrobe cavity located at a point ½ the eye height; width of frons at level of apex of scrobe cavity 1 ½ times as great as width of a compound eye; width of anterior ocellus 1/5 as great as interocular distance at this point.

Prepectus and entire mesopleuron smooth and shining; forewing with marginal vein twice as long as postmarginal, stigmal vein 2/5 as long as postmarginal; entire surface of scutellum reticulated; longer hind tibial spur ⅓ as long as basal segment of hind tarsus.

Surface of propodeum between carinae smooth, shining, median carina with a papilla at base, no transverse carinae arising at this point; spiracles oval, touching anterior margin of propodeum; first gastral tergum without a transverse lamina at base; ½ dorsal length of gaster occupied by first tergum; ovipositor sheaths projecting a distance equal to length of terga 2-4.

Male.—Length 1.25 mm. First gastral tergum occupying slightly less than ½ dorsal length of gaster; seventh tergum produced at apex as a minute point.

Type locality.—St. Vincent, B. W. I.

Types.—Originally described from 14 cotypes; there are now 4 in the U. S. National Museum (no. 2727), and 8 in the British Museum (Natural History); 2 specimens presumably are lost.

Distribution.—St. Vincent. B. W. I.

Host.—Unknown.

Herbertia brasiliensis Ashmead

Herbertia brasiliensis Ashmead, 1904, Carnegie Mus. Mem., 1: 474; Schmiedeknecht, 1909, Gen. Ins., fasc. 97, p. 271; Ferrière, 1934, Schweiz. Ent. Ges. Mitt., 16: 88.

Female.—Length 1.75 mm. Head with fronto-vertex intense metallic blue, occiput black; antennae brown, washed with metallic blue-green; pronotum black, posterior margin metallic blue; mesoscutum metallic blue, scutellum black; coxae black, femora metallic blue-green; wing veins brown; propodeum black on meson, blue-green laterally; dorsal surface of first gastral tergum metallic blue, apical terga black.

Width of malar space 1/5 as great as height of compound eye; clypeus bearing a row of 4 bristles along its anterior margin, clypeal margin almost in contact with ventral margin of scrobe cavity; antennae inserted at level of ventral margins of compound eyes; antennal club as long as apical 3 funicle segments, pedicel as long as apical 2 funicles; scrobe cavity extending to 2/3 the eye height; width of frons at level of apex of scrobe 1 1/3 times as wide as eye.

Prepectus smooth; femoral depression of mesopleuron sculptured, mesopleuron otherwise smooth; dorsum of thorax reticulated, scutellum uniformly more strongly sculptured than mesoscutum; forewing with marginal vein slightly more than twice as long as postmarginal, stigmal vein ½ as long as postmarginal; longer spur of hind tibia ½ as long as basal hind tarsal segment.

Surface of propodeum between carinae smooth; papilla present on median carina, propodeal spiracles oval, almost touching anterior margin; first gastral tergum making up ½ dorsal length of gaster; transverse, dorsal lamina wanting at base of first gastral tergum; apex of ovipositor sheaths slightly produced.

Male.—Unknown.

Type locality.—Chapada, Brazil.

Type.—U. S. N. M. no. 60516 (formerly in the Carnegie Museum, Pittsburgh, Pa.).

Host.—Unknown.

Herbertia wallacei, new species

Female.—Length 1.25—1.75 mm. Head black, fronto-vertex sometimes with very faint blue luster, antennae dark brown or black, tinged with metallic blue or green; posterior margin of pronotum and most or all of mesoscutum metallic blue or dark blue-green, thorax otherwise black; wing veins brown; tegulae, coxae, and femora metallic blue or blue-green; lateral areas of propodeum with metallic blue or blue-green tint, abdomen otherwise black, although dorsum of first gastral tergum sometimes faintly metallic blue.

Width of malar space 1/5 as great as height of compound eye; clypeus well separated from ventral margin of scrobe cavity; antennae inserted slightly below level of ventral margins of compound eyes; antennal club as long as apical 3 funicle segments, pedicel as long as apical 2 funicles; scrobe cavity extending to 2/3 the eye height; width of frons at level of apex of scrobe cavity twice as great as width of compound eye.

Prepectus and mesopleuron smooth, shining; dorsum of thorax reticulated except for lateral and apical margins of scutellum, which are smooth; forewing with marginal vein twice as long as postmarginal, stigmal ½ as long as postmarginal; longer apical spur of hind tibia ½ as long as basal hind tarsal segment.

Surface of propodeum between carinae smooth; papilla present on median propodeal carina, transverse carinae extending laterally from median carina but not reaching lateral carinae; spiracles oval, almost touching anterior propodeal margin; median, transverse lamina absent at base of first gastral tergum; two rows of woolly hair present on either side at base of first tergum, this tergum making up ½ dorsal length of gaster; tips of ovipositor sheaths projecting slightly past end of gaster.

Male.—Length 1.0-1.25 mm. Antennae, vertex, posterior margin of pronotum, tegulae, coxae, and femora faintly metallic blue, otherwise black.

Type locality.—Norfolk, Va.

Types.—U. S. N. M. no. 64496.

Described from 7 female and 2 male specimens, as follows: Holotype ♀, Norfolk, Va., 1926, reared from *Phytomyza ilicicola* Loew, F. W. Poos; allotype ♂ and 1 ♀, 1 ♂ paratypes, Pittsburgh, Pa., South Park, Aug. 11-18, 1939, G. E. Wallace; 1 ♀ paratype, Patuxent Refuge, Md., Aug. 31, 1953, H. Owens; 1 ♀ paratype, Waco, Texas, July 6, 1949, P. A. Glick; 1 ♀ paratype, Waco, Texas, July 13, 1949, on cotton, W. B. Lattimore; 1 ♀ paratype, Brownsville, Texas, July 21, 1945, on cotton; 1 ♀ paratype, Wellston, Ohio, May 25, 1953, W. E. Miller. One ♂ and 1 ♀ paratypes deposited in the Carnegie Museum, Pittsburgh, Pa.; the other specimens are in the U. S. National Museum.

A NEW SPECIES OF NOMADOPSIS AND NOTES ON SOME PREVIOUSLY DESCRIBED ONES

(HYMENOPTERA, ANDRENIDAE)

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This paper is based upon collections generously loaned by the California Insect Survey, University of California, Berkeley [CIS], Cornell University [CU], Snow Entomological Museum, University of Kansas [KU], U. S. National Museum [NM], and University of Idaho [UI]. Only records that alter previously existing concepts of the distribution of a species or that greatly extend the known range of a species are listed. Unless indicated otherwise, citations of previous work refer to my revisionary study of the genus (Rozen, 1958).

Nomadopsis (Nomadopsis) puellae (Cockerell)

1 male, Murphy, Owyhee Co., Ida., VI-16-57 (W. F. Barr). 2 males, same except 13 mi. S.E. of Murphy, V-27-58 [All UI]

After the revision of the genus was completed, the distribution of *puellae* north of southern Nevada still remained in doubt. However, the above records suggest that the species inhabits most of the Great Basin region. Accordingly *puellae* will probably be collected in southern Oregon and western Nevada.

Nomadopsis (Macronomadopsis) barri Rozen, new species
(Figs. 1, 4)

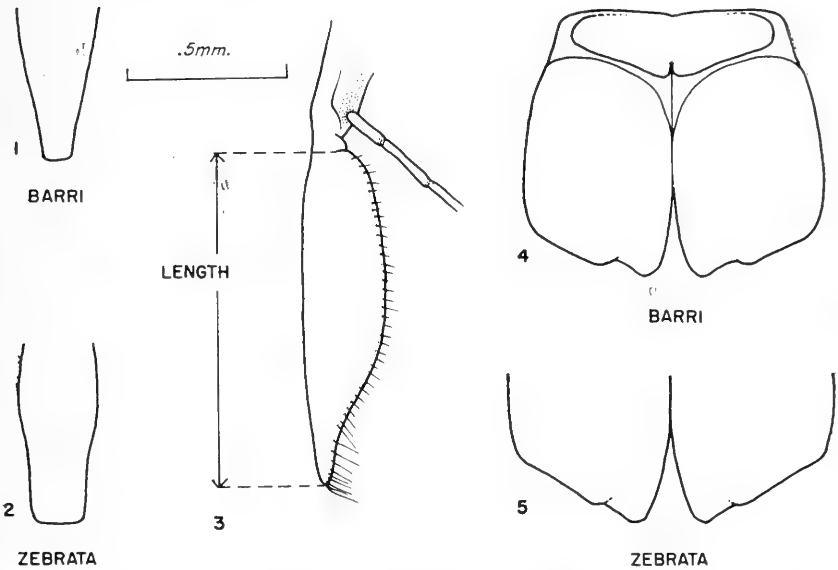
Both the males and females of this species run to *zebrata* in the key to species of *Nomadopsis*. They differ from those of *zebrata* by their smaller size, lower vertex, and shorter clypeus, as described below. In *barri* the mouthparts relative to head size are shorter than those of *zebrata*, whereas the length of eye relative to head size is greater in *barri*. A comparison of the length of the galea as measured in figure 3 with the maximum length of the eye reveals that the galea is approximately one-half the length of the eye in *barri* and at least two-thirds in *zebrata*. However, the yellow genal maculation posteriad of the mandibular condyle is the easiest means of recognizing the males of *barri*. The only diagnostic feature of the male genitalia is the posterior margins of the gonocoxites.

Male.—Length approximately 8.5 mm.

Head: As described for *zebrata* (Rozen, 1958) except for following. Clypeal length shorter than in *zebrata* but longer than in *micheneri;* clypeal protuberance about same as in *micheneri* and less than in *zebrata;* supraclypeal area approximately one-half as long as broad; vertex extending even less above upper margins of eyes than in *zebrata,* approximately as in *micheneri;* gena, unlike in other *Nomadopsis,* with yellow maculation immediately behind mandibular condyle. Antennal scape light except for elongate dark maculation on dorsal surface; pedical light below.

Mesosoma: As described for *zebrata* except for following. Pronotum with lateral angles and lateral lobes light. Mesoscutum with anterior part having punctures between one-half and one puncture width apart, somewhat sparser than in *zebrata;* posteromedial part with punctures about two to three puncture-widths apart; integumental sculpturing absent; color entirely dark except in two specimens, one having two longitudinal paramedian yellow stripes about one half mm. long, the other (the holotype) with two inconspicuous paramedian elongate flecks of yellow mesad of tegulae. Tegulae opaque yellow at base, transparent brown to light brown at apex. Mesoscutellum of one specimen (the holotype) with conspicuous yellow flecks on discal area. Fore legs with coxa and usually trochanter bearing light maculations; femur light apically, maculation extending at least nearly to base on anterior, ventral and part of posterior surfaces; femur light; tarsus light. Middle legs with coxa and trochanter usually bearing small light maculations; femur light apically, with light maculation actually or nearly reaching base of segment on anterodorsal surface; tibia light except sometimes for small diffused dark maculation on posteroventral surface; tarsus light, becoming tawny toward apex. Hind legs with coxa and trochanter bearing small light maculation; femur light apically, with light maculation extending nearly to base of ventral surface; tarsus light, becoming tawny toward apex.

Metasoma: As described for *zebrata* except for following. Metasomal terga 1-6 with light bands uniform in width, moderately broad (more so than in *micheneri* and slightly more so than in *zebrata zebrata*) and but slightly narrowing medially; first, fifth, and sixth bands occasionally very shallowly excavated from behind by sublateral dark spots; seventh metasomal tergum with diffused



EXPLANTION OF FIGURES

Genus *Nomadopsis*. Fig. 1: *N. barri*, pygidial plate, posterior view. Fig. 2: *N. zebrata*, same. Fig. 3: Galea, lateral view, depicting method of measuring length. Fig. 4: *N. barri*, gonocoxites of male, dorsal view. Fig. 5: *N. zebrata*, posterior margin of gonocoxites of male, dorsal view. Scale refers to figures 1, 2, 4, and 5.

median light maculation anterior to pygidial plate. Pygidial plate (fig. 1) usually somewhat narrower at apex than in *zebrata* (fig. 2) and with sides more divergent anteriorly. Sterna and genitalia as illustrated for *zebrata* (Rozen, 1958, figs. 114-8) except median part of posterior margin of gonocoxites not as greatly produced posteriorly (figs. 4, 5).

Female.—Length 9 mm.

Head: As described for *zebrata* (Rozen, 1958) except for following. Clypeal length shorter than in *zebrata,* same as in *micheneri;* color light except for two elongate dark maculations extending part way from supraclypeal area toward labrum; compared with that of male, each paraocular area with light maculation reduced from above; subantennal areas light; supraclypeal area light and measured at greatest distances three-fifths as long as broad; vertex produced even less above upper margins of eyes than in *zebrata* and *micheneri*. Antennal scape dark except for small diffused light maculation at base.

Mesosoma: As described for *zebrata* except for following. Pronotum with lateral angles light and with small light fleck on each lateral lobe. Tegulae each with small opaque light spot at base and translucent brown at apex. Fore legs with femur bearing small apical light maculation; tibia with anterior and dorsal surfaces light, becoming tawny toward apex; tarsus tawny. Middle legs with femur bearing very small apical light maculations; tibia with dorsal surface light except for extreme apex; tarsus dark except for elongate light maculation on anterior surface of basitarsus. Hind legs with femur bearing small apical light maculation; basitibial plate dark; tibia with anterior surface light at least at base; rest of segment covered with pollen; tarsus dark except for diffused light maculation on anterior surface of basitarsus. Wings with humeral plate mostly light.

Metasoma: As described for *zebrata* except for following. Metasomal bands 1-4 uniform in width, moderately broad (more so than in *micheneria* and *anthidia*), and but slightly narrowing medially (less so than in *zebrata zebrata, micheneri,* and *anthidia*); bands not excavated from behind by sublateral dark spots; fifth metasomal tergum with band broader than preceding and shallowly excavated from behind by sublateral dark spots; median part of band notched anteriorly.

Type Material.—Holotype male, allotype, four male paratypes: Rexburg, Ida., VII-17-56, alt. 4861 ft. *Melilotus* (W. F. Barr).

The holotype and allotype have been returned to the University of Idaho. This species is named in honor of William F. Barr, the collector of the type series.

Discussion and Distribution.—This species appears so similar to *zebrata* that its specific status might be questioned. However, in view of the characters presented in the diagnosis and of the fact that no intermediates are known, these two forms must be considered distinct species, though in all probability recently evolved from a common ancestor.

The distribution of *barri* is allopatric with that of *zebrata. N. barri* is known only by the type series and a single male bearing the following data: Sisters, Crook Co. [now Deschutes Co.], Ore., VII-1909 (J. C. Bridwell) [NM]. This specimen agrees in all salient features with those of the type series except the light markings on the scape, gena, and legs are somewhat reduced, the sublateral dark spots on the scape, gena, and legs are somewhat reduced, the sublateral dark spots on the abdomen are slightly more pronounced and the posterior femora bear elongate dark maculations on the middle of the anterior surfaces.

Flower Data.—The fact that all specimens of the type series, including the pollen bearing female, were taken on *Melilotus* suggests that the subgenus as a whole feeds upon legume pollen.

Nomadopsis (Macronomadopsis) anthidia (Fowler)

In a recent letter, P. H. Timberlake points out that in all probability Fowler named this species *Calliopsis anthidius* because of the color pattern resemblance to the bees in the genus *Anthidium.* Consequently, "*anthidius*" must be regarded as a declinable adjective. Therefore, the name now should be *anthidia,* in agreement with the feminine generic name, and not *anthidius*, as cited in the revision and in Michener (1951).

Nomadopsis (Micronomadopsis) phaceliae Timberlake

1 male, 5 mi. S. Lancaster, Los Angeles Co., Calif., IV-II-58 (J. W. MacSwain). 3 males, Apple Valley, San Bernardino Co., Calif.,

V-8-58, *Nama demissum* (P. D. Hurd). 1 male same except *Euphorbia albomarginata*. [All CIS]

These records reflect a wider distribution for *phaceliae* than predicted in the revision and suggest that the species range encompasses at least the Mojave Desert.

Nomadopsis (Micronomadopsis) meliloti (Cockerell)

2 males, Willcox, Cochise Co., Ariz., VIII-18-58 (P. D. Hurd), [CIS]

The first collection of the species both from Arizona and from west of the Continental Divide, this record indicates that *meliloti* extends west into the desert regions of Arizona, Mexico, and possibly California and Baja California.

Nomadopsis (Micronomadopsis) callosa Timberlake

I have now examined the type of this species [CU] and find that the specimens treated in the revision are virtually identical to it.

Nomadopsis (Micronomadopsis) australior (Cockerell)

13 females, Villa Ahumada, Chih., Mex., VI-28-47, D. Rockefeller Exp., *Lepidium alyssoides* most with pollen on legs. (C. D. Michener) [KU]

Although the species was predicted to occur in Mexico, this record is the first for that country.

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A NEW PERMIAN INSECT HORIZON

Many members of the fauna of the Oklahoma Wellington Formation from the Midco insect bed are well-known. Dr. Paul Tasch of the University of Wichita reports discovery of a new horizon, several feet stratigraphically above the bed that yielded the insects described by Dr. F. M. Carpenter of Harvard University. The new horizon, Tasch reports, was traceable in Kay ounty, Oklahoma (which is immediately north of Noble County where the above insect bed was located) and in Sumner County, Kansas. Geological details will be published elsewhere. Here, I wish to indicate that the following orders of insects have been recognized in the fossils from this new horizon: Protoperlaria, Ephemeroptera, Protodonata, Megasecoptera, Protorthoptera, and Ephemeroptera. A wing with a piece of the abdomen is readily placed in Protozygoptera of Odonata.—J. R. Zimmerman, *Indiana Central College, Indianapolis.*

THE ECTOPSOCUS BRIGGSI COMPLEX IN THE AMERICAS

(PSOCOPTERA, PERIPSOCIDAE)

EDWARD L. MOCKFORD, *Illinois Natural History Survey, Urbana.*

The group of species here designated the *Ectopsocus briggsi* complex is characterized by having the wings unmarked except for a fuscous spot on the margin at the end of each vein and at the radio-medial confluence in the forewing, and in bearing a pair of slender lobes posteriorly on the margin of the female subgenital plate. The species are very much alike in body color and in structure of the genitalia.

It is the purpose of this paper to present the view that three species are present in this group in North America, to show how they may be distinguished, to show the approximate ranges of the three species in North America, to discuss the literature concerning the group in North America, and to present the first South American records of the group.

The material examined is chiefly from my own collection and that of the Illinois Natural History Survey. Also, material from the California Academy of Sciences, and the Chicago Natural History Museum was studied. The South American material is entirely from the California Academy of Sciences.

The three species in North America are *Ectopsocus briggsi* McLachlan, *E. meridionalis* Ribaga, and *E. californicus* (Banks). They may be distinguished as adults by the following key:

1. Two transverse combs present dorsally on the terminal abdominal segments .... males 2
   No transverse combs present dorsally on the terminal abdominal segments .... females 3
2. Phallic apparatus bearing a pair of thumb-like structures at its apex (fig. 249 in Badonnel, 1943); spine of paraproct margin double, the two prongs nearly equal. Clypeus straw-colored, not contrasting with vertex; spots on forewing very indistinct or absent .... **E. briggsi** McL.
   Phallic apparatus (fig. 3) lacking a pair of thumb-like structures at its apex; spine of paraproct margin simple. Clypeus brown, contrasting markedly with the pale vertex and frons. Spots on forewing distinct on non-teneral specimens .... **E. californicus** (Banks)
3. Spine of the paraproct margin simple. Gonapophyses with a clear basal articulation (fig. 1) .... **E. californicus** (Banks)
   Spine of the paraproct margin double. Gonapophyses without a clear basal articulation (fig. 5) 4
4. Apical lobes of subgenital plate long, rather straight, with a definite line extending forward from the inner base of each lobe (fig. 7). The two prongs of the double paraproctal spine markedly uneven in length (fig. 6) .... **E. meridionalis** Rib.
   Apical lobes of subgenital plate relatively shorter than in fig. 7, decidedly curved inward, and each ending in a decided smooth-margined process between the inner two setae (fig. 7 in Jentsch, 1939). The two prongs of the double paraproctal spine nearly equal in length (fig. 8 of ♂, same in ♀) .... **E. briggsi** McL.

Ectopsocus briggsi McLachlan

This species was first described from England (McLachlan, 1899) and has since been found in Continental Europe (Jentsch, 1939; Söfner, 1941; Badonnel, 1943) and the Belgian Congo (Ball, 1943). In the Americas, it is now known from California, the Mexican Plateau, and Chile. The female was adequately described and figured by Jentsch (1939), and the male genitalia were figured by Badonnel (1943).

Records.—UNITED STATES. **California,** Marin Co., Inverness, Oct. 30, 1946, E. S. Ross, 3 ♂, 8 ♀; Marin Co., Taylor State Park, May 18, 1952, beating dead leaves (Madrone?), H. S. Dybas, 6 ♂, 8 ♀, 2 nymphs; Marin Co., Mt. Tamalpais (east slope), May 14, 1952, dead leaf of Manzanita?, H. S. Dybas, 4 ♂, 4 ♀; Alameda Co., Niles Canyon nr. Pleasanton, Aug. 30, 1953, beating rhododendron, E. L. Mockford, 3 ♂, 2 ♀; Mendocino Co., 8 miles south of Piercy on U. S. Highway 101, Sept. 1, 1953, beating redwoods and broadleaf trees, E. L. Mockford, 2 ♀, 1 nymph.

MÉXICO. **México,** Chapingo near Texcoco, Aug. 29, 1958, E. L. Mockford, 5 ♂, 3 ♀; **Morelos,** Mountains above Cuernavaca, el. 5000′, Aug. 27 and 28, 1958, E. L. Mockford, 2 ♀; Puebla, 5 to 6 miles southwest of Teziutlan, el. 7000′, Aug. 16 and 19, 1958, E. L. Mockford, 5 ♂, 3 ♀.

CHILE. Zapullar, Ancon, Nov. 27, 1950, Ross and Michelbacher, 2 ♂, 9 ♀.

Ectopsocus californicus (Banks)

Peripsocus californicus Banks, 1903:237.

Although Banks' description of this species is very brief, it contains several features which I hold to be diagnostic. The description of the wing spotting places the species in the *E. briggsi* group. The type locality at Berkeley, California, restricts the species to two possibilities. The statement "Head pale, nasus brown . . . legs pale" cannot apply to *E. briggsi*, but applies readily to the other species occurring on coastal California. In the latter species the brown clypeus contrasts markedly with the pale vertex and frons, and the pale legs contrast with the brown thoracic pleurae. These characters are readily visible at low magnification (10X) in this species, whereas at the same magnification *E. briggsi* appears uniformly straw-colored on the head, thorax, and legs. Also, Banks' statement "Easily known by the ten dots on wings" cannot apply to *E. briggsi* in which the dots are very pale and sometimes absent, whereas in this species the dots are very prominent.

A morphological diagnosis of this species is obtainable from my key and from the accompanying genitalic figures. The large sac-like structure shown in fig. 1, which lies between the gonapophyses of the two sides is apparently associated with the opening of the spermathecal duct and is absent in *E. briggsi* and *E. meridionalis.*

The species is restricted to the Pacific Coast of North America from Central California to southern British Columbia (see map).

Records.—**California.** Marin Co., Mt. Tamalpais, east slope, May 14, 1952, H. S. Dybas, 1 ♂, 5 ♀; Alameda Co., Niles Canyon near Pleasanton, Aug. 29 and 30, 1953, E. L. Mockford, 2 ♂, 2 ♀; Humbolt Co., Willow Creek, Sept. 2, 1953, beating dry bay leaves, E. L. Mockford, 2 ♀.

Oregon. Corvallis, Aug. 23, 1944, elm and maple, 1 ♂, 1 ♀, G. F. Knowlton.

Washington. Port Townsend, June 29 and July 5, 1948, E. L. Mockford, 1 ♂, 9 ♀.

British Columbia. Bowen Island, June 23, 1940, H. H. Ross, 6 ♀; Vancouver, June 30 and July 1, 1940, H. H. and J. A. Ross, 1 ♂, 1 ♀.

Discussion.—It may be seen from the distribution records and map that the range of this species overlaps that of *E. briggsi* in California. In one instance I have collected both species on the same plants (rhododendron) at the same locality. The way is now open for investigation of biological and ecological relationships between the two species in their area of overlap. There can be little doubt that the two species are very closely related, hence investigation of their niches and of their isolating mechanisms should produce results of considerable significance.

Ectopsocus meridionalis Ribaga

This species was first described from Italy (Ribaga, 1904), and has since been reported in Germany (Jentsch, 1939; Söfner, 1941) and France (Badonnel, 1943; figure of female called *E. briggsi* is this species). It also occurs in the Belgian Congo (Ball, 1943) and in French Cameroons (Badonnel, 1943a). In North America it occurs in the eastern United States from central Illinois, central Indiana and Connecticut south to Peninsular Florida, with its western limit probably in the Ozark Region. It is known from several localities in the Mexican plateau (see map). It is also known from Colombia in South America.

Records.—Those of Chapman (1930) for *E. californicus* from eastern United States, also the following:

EASTERN UNITED STATES. **Alabama**, Cleburne Co., Mt. Cheaha summit house, Aug. 19, 1951, *ex* dry leaves on branch, E. L. Mockford, 1 ♀, 2 nymphs; Pike Co., Paucassins, Aug. 20, 1951, E. L. Mockford, 1 ♀. **Arkansas**, Benton Co., Rogers, June 1 to 12, 1946, M. W. Sanderson, 15 ♀, 1 nymph; Rogers, July 7 to 14, 1949, Sanderson and Stannard, 8 ♀; 9 miles east of Rogers, July 9 and 11, 1949, Sanderson and Stannard, 7 ♀. **Connecticut**, Mt. Carmel, Oct. 7, 1943, dried leaves, K. M. and A. H. Sommerman, 1 ♀. **Florida** (all collections by E. L. Mockford), Alachua Co., Newnan's Lake, Feb. 29, 1952, 1 ♀; same locality, March 28, 1952, 2 ♀; 1 mile east of Gainesville, Dec. 5, 1953, 2 ♀; Levy Co.,

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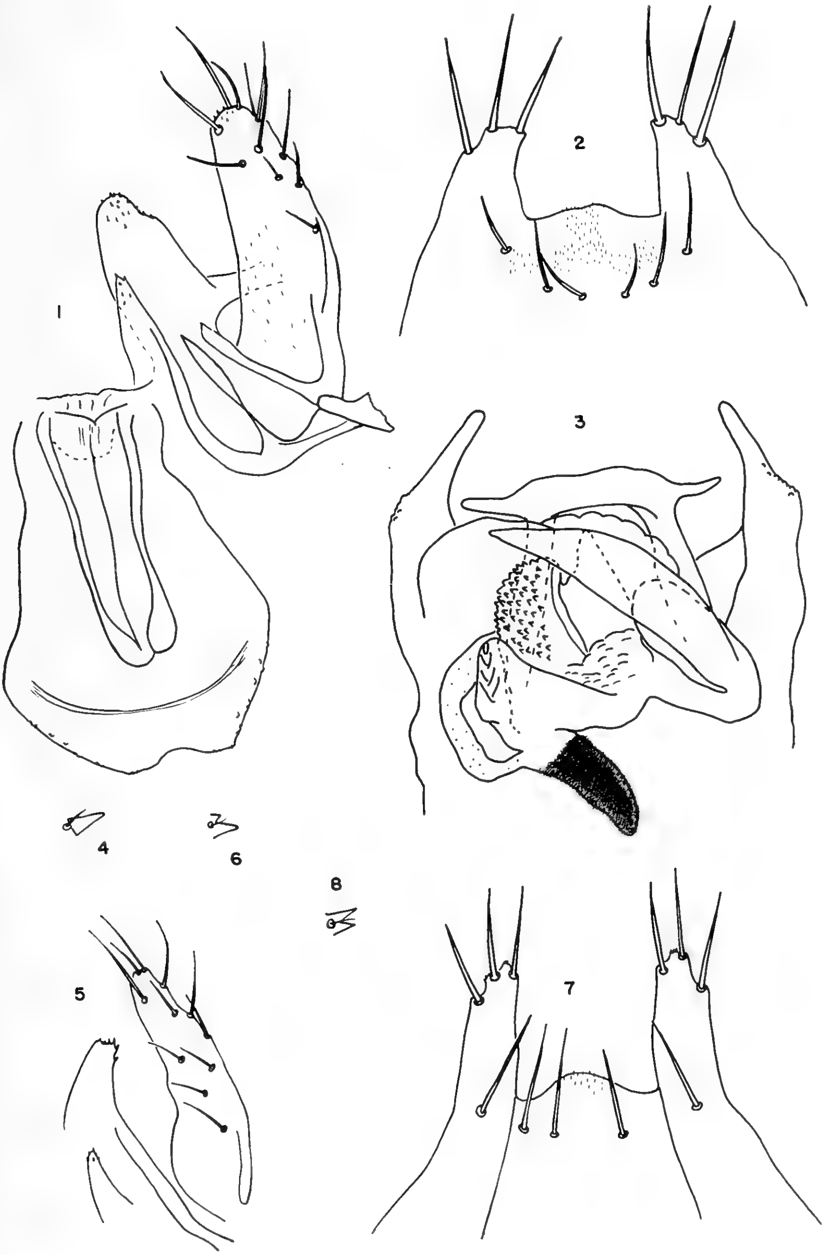
Ectopsocus californicus (Banks). Fig. 1, gonapophyses and associated structures (♀), x440; fig. 2, subgenital plate (♀), x440; fig. 3, phallic sclerites (♂), x440; fig. 4, spine on median margin of paraproct (♀; essentially same in ♂), x700. *Ectopsocus meridionalis* Ribaga ♀. Fig. 5, gonapophyses, x440; fig. 6, spine on median margin of paraproct, x700; fig. 7, subgenital plate, x440. *Ectopsocus briggsi* McLachlan, ♂. Fig. 8, spine on median margin of paraproct, x700.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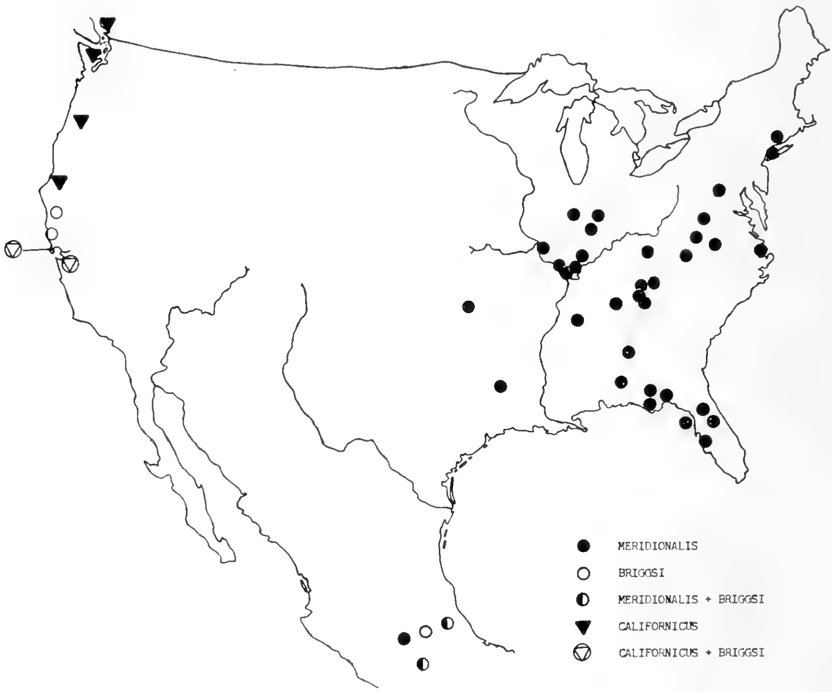
Seahorse Key, June 28, 1953, 2 ♀, 1 nymph; Liberty Co., Torreya State Park, June 3-4, 1952, 4 ♀; same locality, June 4, 1953, 1 ♀; same locality, March 27, 1954, 1 ♀; Sarasota Co., Myakka River State Park, April 12, 1952, 1 ♀. **Georgia**, DeKalb Co., Fort McPherson, June 12 to Aug. 20, 1943, light trap, H. Hoogstraal, 3 ♀; Morgan Co., Hard Labor Creek State Park, Sept. 1, 1951, E. L. Mockford, 3 ♀, 2 nymphs; Decatur Co., Woodruff Dam Site, June 2, 1953, E. L. Mockford, 15 ♀, 14 nymphs. **Illinois**, Pope Co., Bell Smith Springs, July 16, 1947, L. J. Stannard, 1 ♀; Pope Co.,



North American distribution of the *Ectopsocus briggsi* complex.

Dixon Springs, Aug. 22, 1944, Sanderson and Leighton, 1 ♀, 1 nymph; Monroe Co., Burksville, June 29, 1949, Smith and Stannard, 1 ♀; Union Co., Union County State Forest, July 18, 1947, L. J. Stannard, 1 ♀; Union Co., Jonesboro, July 26, 1951, Sanderson and Richards, 1 ♀; Union Co., LaRue, Oct. 26, 1944, Ross and Sommerman, 7 ♀; Pulaski Co., Karnak, June 23, 1932, Ross *et al.*, 1 ♀; Gallatin Co., Pounds Hollow Lake, July 19, 1944, Ross and Leighton, 1 ♀; Urbana, Jan. 23, 1941, U. of I. Floriculture greenhouse, K. M. Sommerman, 11 ♀; same locality but outdoor station, Oct. 14, 1944, K. M. Sommerman, 1 ♀; same locality, Oct. 21, 1944, K. M. Sommerman, 3 ♀. **Indiana** (all collections by E. L. Mockford), Bloomington, May 26, 1949, 1 ♀; same locality, Oct. 22, 1949, 1 ♀ ; same locality, Sept. 18, 1950, 3 ♀ , 3 nymphs; same locality, Oct. 13, 1950, 1 ♀ ; same locality, July 11, 1951, 16 ♀ , 1 nymph; same locality, Aug. 10, 1951, 9 ♀ ; Indianapolis, Oct. 8, 1954, E. L. Mockford, 3 ♀ ; 1 nymph. **Louisiana**, Grant Parish, Dry Prong, May 7-8, 1954, H. S. Dybas, 9 ♀ . **Maryland**, Frederick Co., Catoctin Mt. Park, Aug. 28, 1955, E. L. Mockford, 1 ♀ , 1 nymph. **Tennessee**, Great Smoky Mountains National Park, Sept. 1, 1948, Ross and Stannard, 8 ♀ ; same locality, July 10, 1949, E. L. Mockford, 3 ♀ ; Rock City, Lookout Mt., June 9, 1955, H. S. Dybas, 1 ♀ . **Virginia**, Newport News, Aug. 15, 1944, Ruth Stone, 1 ♀ ; Cumberland Co., Cumberland State Forest, Sept. 10, 1955, M. Byrd, 1 ♀ ; same locality, Oct. 16, 1955, M. Byrd, 5 ♀ .

MÉXICO. **México**, 15 miles east of Lerna, Aug. 30, 1958, E. L. Mockford, 1 ♀ ; **Morelos**, mountains above Cuernavaca, el. 5000′, Aug. 28, 1958, E. L. Mockford, 18 ♀ ; Puebla, 5 to 6 miles southwest of Teziutlan, el. 7000′, Aug. 16 and 19, 1958, E. L. Mockford, 22 ♀ .

COLOMBIA. No locality or date, *ex* orchids, 18 ♀ , 2 nymphs.

Discussion.—In Mexico the range of this species coincides with that of *E. briggsi*, and the two species may be found in exactly the same areas. This situation offers another opportunity for the study of niche relationships between closely related species. The question of isolating mechanisms does not arise in this case, however, as *E. meridionalis* is completely isolated by its parthenogenesis.

North American literature.—It is now necessary to try to determine which species was meant in each of the literature references to this group in North America.

Banks described *Peripsocus californicus* in 1903 with its type locality at Berkeley, California. I have shown above which one of the two California species Banks had before him.

Chapman (1930) apparently looked at Banks' type but did not study it closely. He placed the species in the genus *Ectopsocus* and treated all U. S. specimens of the *E. briggsi* group under the name *E. californicus*. His material consisted largely of females from the eastern states. That the latter were *E. meridionalis* there can be little doubt, for his figure of the female genitalia is of this species. The details of the genitalia of *E. meridionalis* are known through a publication by Jentsch (1939) which also contains what I believe to be a convincing argument that the name is properly applied. Accordingly, I have cited Chapman's eastern records in my records of *E. meridionalis* without having examined the specimens. Chapman's figure of male genitalia shows the true *E. californicus* and is an accurate drawing, though small.

McClure (1936) and Sommerman (1943) have reared material which they called *E. californicus* from the University of Illinois greenhouses and have shown parthenogenesis, with complete absence of males for this form. I have examined a preserved sample of the material reared by Sommerman, and I find it to be *E. meridionalis*. This species is parthenogenetic in Europe (Ribaga, 1904; Weber, 1931) and males are unknown.

Söfner (1941) has already pointed out that the material studied by McClure (1936), and the female genitalic figure of Chapman (1930) represent *E. meridionalis.* She followed Badonnel (1932) in placing *E. californicus* in the synonymy of *E. briggsi,* a conclusion which is erroneous.

Mockford (1950, 1952) published records under the name *E. californicus* from Indiana. These records are all for *E. meridionalis.*

Summary.—The *Ectopsocus briggsi* complex in the Americas consists of three species. *E. briggsi* occurs in California, parts of Mexico, and Chile. *E. meridionalis* occurs in the Eastern United States, parts of Mexico, and Colombia. *E. californicus* occurs on the Pacific Coast from California to British Columbia.

North American authors have generally referred to any members of this group as *E. californicus.* I have attempted to determine which species is meant in each case.

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JAPYGIDAE OF NORTH AMERICA, 4. NEW SPECIES OF EVALLJAPYX WITH TWENTY-FOUR ANTENNAL SEGMENTS

(DIPLURA)

LESLIE M. SMITH, *University of California, Davis*

The genus *Evalljapyx* has been found in the western part of the United States, Mexico, Guatemala, Costa Rica and the West Indies. Twenty-one species have been described of which four are from the United States. These four species are: *Evalljapyx dispar* Silvestri (1947) with 27 segments in the antennae, *E. diversiplura* Silv. (1911) with 24 segments in the antennae, *E. sonoranus* Silv. (1911) with 30 segments in the antenna, and *E. propinquus* silv. (1911) with 28 segments in the antenna.

Members of the genus *Evalljapyx* are abundant in California and our collections indicate that they outnumber all other genera of Japygids combined. The genus can be recognized by the following characters: plumose body setae, apical lamina of lacinia pectinate, stylus with two setae, forceps asymmetrical, sexual dimorphism in forceps, no frontal sinuses on the head.

The species discussed in this paper can be distinguished by the 24-segmented antenna. I have examined several hundred specimens and found no deviants from this number. Additional characters which will separate them from some of the other members of the genus are: dorsal apex of the femur of each leg with a row of three setae, close together, with the anterior two of these setae plumose and the third or posterior seta simple, length of body 5 to 10 mm.

Preliminary measurements of many specimens of *Evalljapyx helferi* Smith, collected in a single area, indicate that there may be five instars in the adult female and at least two instars in the adult male. The first two nymphal instars are non-motile, or at least do not leave the nest cavity. The third nymphal instar is motile and leaves the nest. This instar is probably truly nymphal since the spermathecae are not developed. After the third moult, female specimens show well developed spermathecae and may be considered adult. A number of workers have attempted to rear japygids in captivity to study the life cycle, but with little success. Consequently, the life cycle can only be inferred from field collections, as is done above.

As adult females pass through a series of instars they become larger and the number of setae, especially on abdominal sternite I increases. Males are easily separable into two stages. In stage I the seventh pleura resemble those of the female, but in stage II the pleura (in *E. helferi*) are projected to the rear, enlarged into rounded knobs, and heavily sclerotized. Likewise the posterior lateral margins of tergite seven are rugose and heavily sclerotized. For all species described in this paper, male stages I and II have been collected and studied with the exception of *E. raneyi*. This species differs markedly from the others and it is not known whether stage II occurs. Moreover, in some populations of the other species male stage II has been absent. This may be due to the time of year that the collections were made, or to an unfavorable environment which did not allow males to survive long enough to reach stage II, or strains may exist in which stage II is omitted.

Sclerotization of the pleura and tergum of segment seven of older males is common in the genus *Evalljapyx*, but the posterior projection of the pleurae into knobs occurs mainly in species with a small number of antennal segments, e.g. 23 to 25. Such knobs are rare or absent in species with a larger number of antennal segments, e.g. 29 to 31.

In his description of *E. diversipleura*, Silvestri (1911) described a stage II male although he did not indicate the sex. No females were available at the time, and have not since been described. This paper emends the description of *E. diversipleura* and adds a description of the female.

Evalljapyx helferi, n. sp.

Female.—Head with about 17+17 M[1] mostly plumose, one pair large M between bases of antennae, antennae with 24 segments, segments 7 to 18 with two irregular whorls of setae consisting of long straight setae alternating with shorter curved setae, segments 19 to 24 with more than two whorls of setae composed mostly of short curved setae, terminal segment with one dorsal and two ventral placoid sensillae, trichobothria typical, subequal to longest seta on same segment, antennal segments 1 and 2 with 5 plumose setae each and some simple setae, antennal segment 3 with 2 plumose setae, all other antennal segments without plumose setae, width of sixth antennal segment 0.11 mm., length of longest seta on sixth antennal segment 0.08 mm., terminal segment of antenna hemispherical. Labrum emarginate with 5 large sensory cones at lower edge, 5 long setae and 14 shorter setae, none plumose, maxillary palpus with 13 setae, external edge of galea with one simple seta, thumb of galea sclerotized retractile, with 5 sensory cones at tip, galea with one stout lateral seta, distal lamina of lacinia pectinate throughout its distal half with about 10 teeth, other 4 laminae pectinate throughout. Mandible typical. Labium with typical protrusible sacs. Labial palpus with 3 or 4 long and one short simple setae, sides parallel, length 0.064 mm., width 0.026 mm. Thorax: pronotum with 6+6 M all plumose and 9+9 m of various sizes, all simple, mesonotum prescutum 1+1 M plumose and 1+1 m, scutum 14+14 M plumose, metanotum prescutum 2+2 M plumose (in some 1+2 M) and 2+2 m, scutum 14+14 M. Legs, coxa 3 M, trochanter 4 M, setae at dorsal apex of femur 2 plumose and one simple with middle seta shorter, first and third subequal, setae per ventral row on tarsus 3 or 4, tarsal claw typical.

Abdominal tergite I prescutum 2+2 M and 2+2 m, scutum 5+5 M bilaterally pinnate with 6±2 pinnulae per seta, and 12+12 m; tergites II-VI 11+11 M and

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[1]Abbreviations: M, macrosetae, plumose; m, submacrosetae, simple unless stated otherwise; LI, L2, L3, first, second, and third pair of legs; I-X, abdominal segments; st_1-st_7, length of styli on abdominal segments I-VII; s_1-s_7, length of longer seta on styli on abdominal segments I-VII; pleurite = the anterior sclerotized portion of the pleura, pleuron = the posterior sclerotized area of the pleura.

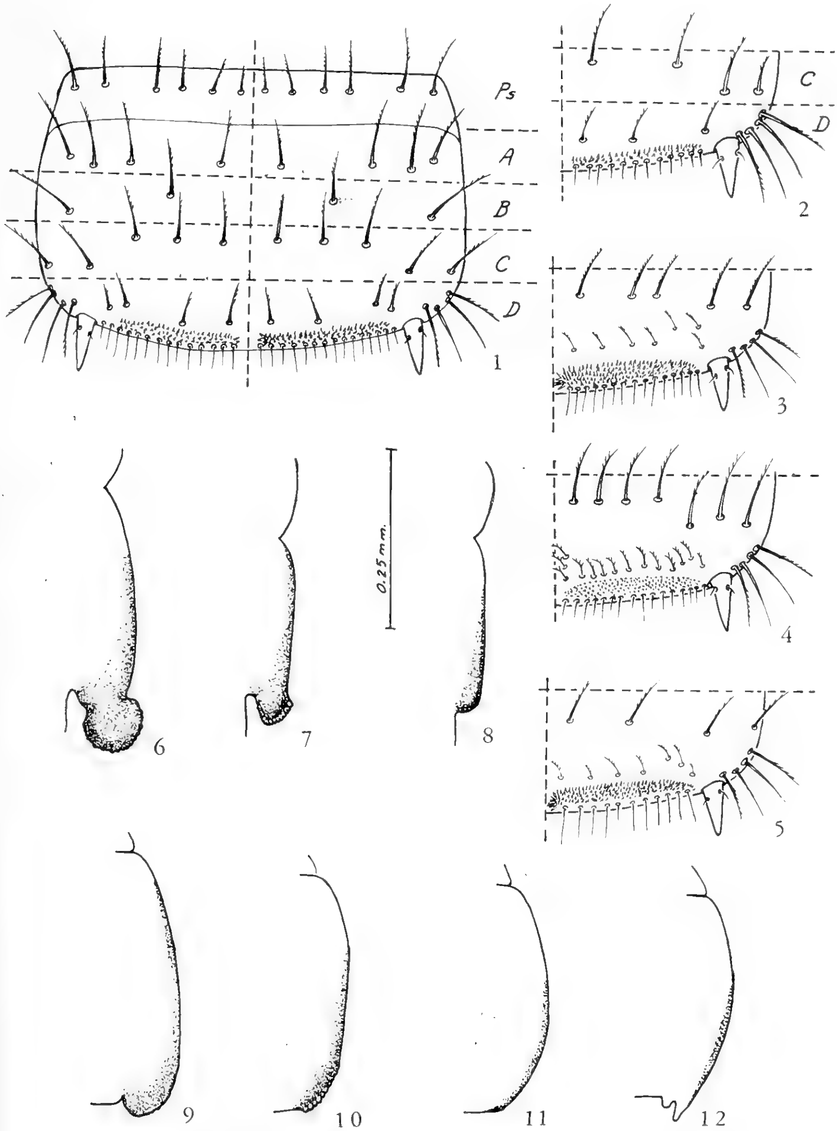


Fig. 1: Abdominal sternite I of *E. helferi* ♂, Ps=prescutum, A, B, C, D=rows of M, m omitted. Fig. 2: Postero-lateral quadrant of abdominal sternite I of *E. helferi* ♀. Fig. 3: *E. raneyi* ♂. Fig. 4: *E. facetus* ♂. Fig. 5: *E. diversipleura* ♂. Figs. 6, 7 and 8: Dorsal view of pleura VII of stage II ♂, setae omitted; fig. 6, *E. helferi;* fig. 7, *E. facetus;* fig. 8, *E. diversipleura.* Figs. 9-12: Dorsal view of lateral margin of tergite VII, of stage II ♂, setae omitted; fig. 9, *E. helferi;* fig. 10, *E. facetus;* fig. 11, *E. diversipleura;* fig. 12, *E. raneyi.*

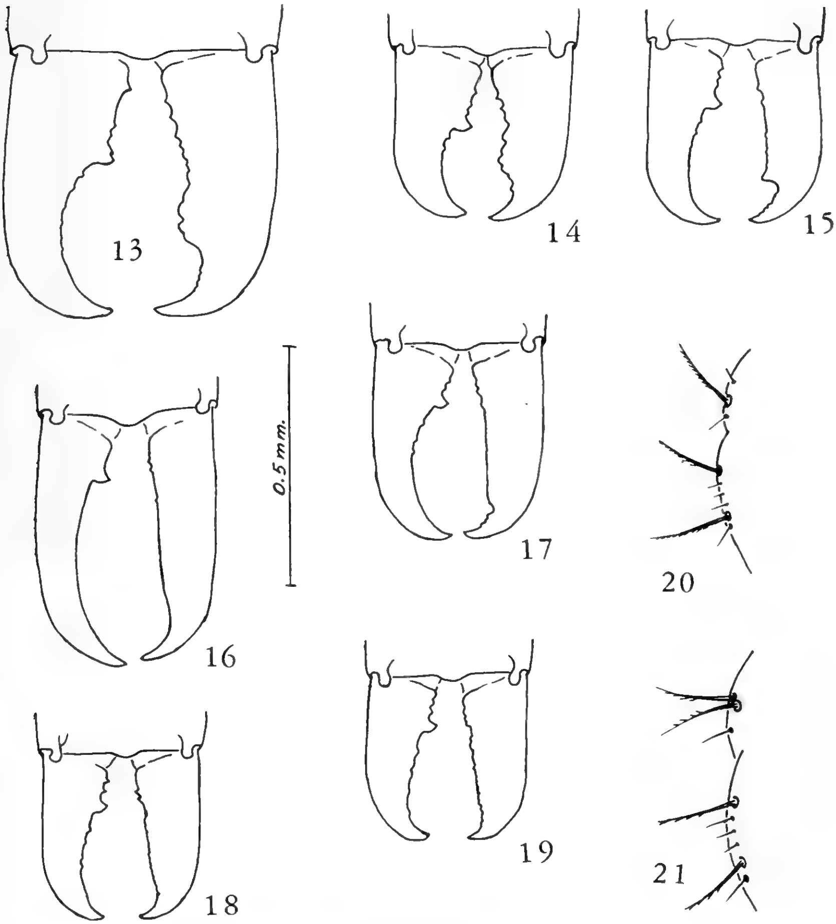
more numerous m; tergite VII lateral margins straight, tapered slightly to rear, 12+12 M; tergite VIII 10+10 M; tergite IX 3+3 M; tergite X between carinae 7+7 M of which posterior median pair simple; tergites VIII to X with numerous pores, acropygidium small and flat; no setae in rectum; sternite I prescutum 5+5 and 1+1 m, in old females 6+6 M, scutum 12+12 M or 13+13 M and 12+12 m of which postero-lateral ones well developed, and an irregular row of 3+3 plumose setae just anterior to lateral subcoxal organs and within the limits of the styli; lateral subcoxal organs occupying five-sixths of distance between styli; one uniform row of sensory setae, about 14+14, minutely bilaterally pinnate, slightly shorter than stylus, three rows of minute glandular setae, no median subcoxal organ, stylus tapered with one lateral seta, one mesad seta half as long as lateral seta, and one basal pore; sternites II-VI prescutum 6-7 + 6-7 M, scutum 19+19 M with 6±2 pinnulae, sternite VII prescutum 5+5 M, scutum 18+18 M, sternite VIII 8+1 or 2+8 M, genital orifice oval surrounded by an inner ring of about 24 small simple setae and an outer ring of about 28 larger simple setae, laterad of orifice a cluster of 5-6 short sense-setae, genital papillae absent, sternite X 10+10 M, pleura I pleurite no setae, pleuron 1 M and 1 simple seta larger than M, pleura II-VI pleurite 2 M and 1 or 2 m, pleuron 2 M and 4 m, pleura VII pleurite 1 M and 1 m, pleuron 2 M and 3 or 4 m. Forceps asymmetrical, numerous pores, left forcep with one large rounded premedial tooth, predental tubercles 3, postdental tubercles 10 becoming crenulations apically, right forcep with postmedian dilation of inner edge pre-dilation denticles ¼, one large latero-basal seta on each forceps plumose, others simple. $st_1/st_7=0.67$; $s_1/s_7=0.90$; $s_7/st_7—0.22$. Length of body including forceps 6.0-10.0 mm.

Male.—Similar to female except large conspicuous sac opening on scutum of third abdominal sternite, containing 100+ bilaterally plumose setae, tip of sac extended anteriorly to hind margin of segment II, setae throughout the sac, abdominal pleura I, pleurite[1] no setae, pleuron one plumose seta and one equally long simple seta, pleuron II-VI pleurite 2 M one above the other + 1 large m, pleuron 2 M + 3 m in a line, posterior m large, pleura VII of stage II males pleurite 1 M + 1 m, pleuron 2 M + 1 large m, heavily sclerotized and projected to rear as a spherical rugose knob, tergite VII with postero-lateral angles projected to the rear heavily sclerotized along lateral margins, tips of projections slightly rugose, genital orifice (evaginated) oval ringed by 26 small simple setae, anterior to orifice 28 larger simple setae, posterior to orifice about 50 small simple setae, no papillae or clusters of special sense-setae. Length of body including forceps 6.0-9.0 mm.

Type.—Holotype ♀ in Calif. Acad. Sciences, paratypes USNM, Calif. Ins. Survey Berkeley. and Univ. of Calif., Davis.

Habitat.—Type ♀ and 36 ♂ and ♀ paratypes collected by Mr. J. Helfer, Mendocino Co., Calif., Oct. 19, 1957, in redwood humus. I have also seen about 1,500 other specimens collected by Mr. Helfer near Mendocino. I have examined good series of this species collected by various collectors in Sonoma, Marin, San Mateo and Santa Cruz Counties, California. Gut contents show nothing suggestive of animal parts.

This species is variable throughout its known geographic range, although specimens collected at any one station are remarkably



Figs. 13-19: Dorsal view of forceps, setae and pores omitted; fig. 13, *E. helferi* ♂; fig. 14, *E. helferi* ♀; fig. 15, *E. raneyi* ♂; fig. 16, *E. facetus* ♂; fig. 17, *E. facetus* ♀; fig. 18, *E. diversipleura* ♂; fig. 19, *E. diversipleura* ♀. Figs. 20 and 21: Dorsal view of pleurite and pleuron; fig. 20, *E. raneyi*; fig. 21, *E. helferi.*

uniform. In general, the size of the postmedian dilation of the right forcep becomes progressively smaller southward from Mendocino and the setae between styli I increase in number. In the same geographic direction the setae, M, on the prescuta of the metathorax and of abdominal tergite I tend to reduce to 1+2 M.

I take pleasure in naming the species for Mr. Jacques Helfer who has made extensive collections.

Evalljapyx facetus, n. sp.

Female.—Similar to *E. helferi* except antennal segments 1, 2, and 3 without plumose setae, labial palpus with 2 long and 2 short simple setae, mesothorax prescutum with 1+1 M and 1+1 m, scutum with 10+10 M, metanotum prescutum 1+2 M and 1+1 m, scutum 10+10 M, abdominal tergite I prescutum 1+2 M and 1+2 m, scutum 6+6 M bilaterally pinnate with 3±2 pinnulae per seta, tergites II-VI with 13+13 M and more numerous m, tergite VIII with 11+11 M, tergites VII-X with numerous minute pores similar to pores on the forceps, sternite prescutum 6+6 M longer laterad, scutum 15+15 M and an irregular row of 10+10 short plumose setae just anterior to the lateral subcoxal organs and within the limits of the styli; subcoxal organ sensory setae 12+13 minutely bilaterally pinnate subequal in length to the styli, 5 to 6 rows of minute glandular setae, sternites II-VI prescutum with 5+5 M longer laterad, scutum with 18+18 M with 3±1 pinnulae, sternite VII prescutum with 4+4 M, scutum 17+17 M, sternite VIII 6+2+6 M, left forcep with 2 predental tubercles and about 10 postdental tubercles becoming crenulations apically, right forcep without postmedian dilation of inner edge, denticles at base 1/3, remainder of edge crenulated. Length of body including forceps 6-8 mm.

Male.—Similar to *E. helferi* except setae only in basal half of male sac, abdominal pleura I pleurite without setae, pleuron 1 M and 1 longer simple seta, pleuron VII of stage II male heavily sclerotized and projected to rear as a squarish rugose knob, tergite VII with postero-lateral angles slightly projected to rear, heavily sclerotized along lateral margins, tips of projections with rounded denticle-like protruberances. Forceps as illustrated. Length of body including forceps 6-8 mm.

Type.—Holotype ♀ and paratype ♂ Calif. Acad. Sci., paratypes in U.S.N.M., Calif. Ins. Survey, Berkeley, and Univ. of Calif., Davis.

Habitat.—Type ♀ and 55 paratype males and females collected 4 miles west of Newcastle, Placer County, California, in the spring of 1958 and 1959 by L. M. Smith and R. O. Schuster, in damp humus and surface soil under oaks. I have examined good series of this species collected by various persons in Napa, Sonoma, Lake, Yolo and Santa Clara Counties, California. The species is variable in the dentition of the left forceps of the male in that pre- and postdental tubercles may be present or absent, and in the number of pores on the forceps and posterior abdominal tergites. The greatest development of these pores is found in Placer County and the number of pores becomes less southerly until they are present in numbers only on tergites VIII and IX in Santa Clara County.

Evalljapyx raneyi, n. sp.

Male.—Similar to *E. helferi* except maxillary palpus with 10 setae, labial palpus with 2 long and 3 short setae, mesonotum prescutum with 1+1 M and 2+1 m, scutum 6+6 M, metanotum prescutum with 1+1 M and 2+1 m, scutum 6+6 M, abdominal tergite I prescutum 1+1 M and 2+2 m, scutum 5+5 M bilaterally pinnate with 12±2 pinnulae per seta, and 8+8, tergites II-VI 10+10 M and more numerous m, tergite VII 13+13 M, tergite VIII 4+4 M, tergite IX

2+2 M, tergite X between carinae 3+3 M of which postero-median pair simple, a few pores on terga VIII and IX, very few on X and forceps, sternite I with irregular row of 7+7 short plumose setae just anterior to subcoxal organ and within the limits of the styli, subcoxal organ with 17+17 sensory setae minutely bilaterally pinnate, two-thirds length of styli I, eight rows of glandular setae, one-third length of sensory setae, large setae on sternite I with 12±2 pinnulae, sternite VII prescutum 4+4 M, scutum 14+14 M, sternite VIII 7+7 and 15+15 m, sternite IX 4+4 M, sternite X 6+6 M, setae throughout male sac, abdominal pleura I pleurite with no setae, pleuron one M and one longer simple seta, pleura II-VII pleurite 1 M and 2 m, pleuron 2 M and 4 m with posterior m large, pleura VII slightly sclerotized otherwise similar to preceding pleura, tergite VII lateral margins curved not tapered to rear, widest at mid-transverse line, postero-lateral angles distinctly projected to rear. Forceps: left forcep similar to *E. helferi*, right forcep with one distinct basal tooth, straight crenulated edge ending in a prominence resembling a tooth, followed by sharply crescentic terminal hook.

Female.—Unknown.

Types: Holotype ♂ in Calif. Acad. Sciences, paratype ♂ Univ. Calif., Davis.

Habitat.—Two males collected by Mr. F. Raney at Monte Vela Jamul, San Diego County, Calif., XII-30-1958, 4-8 cm. deep under *Quercus agrifolia.*

I take pleasure in naming this species after Mr. Franklin C. Raney.

Evalljapyx diversipleura Silvestri, emend. L. M. Smith

Female.—Similar to *E. helferi*, except meso- and metanotum presuctum 1+1 M, and scutum 8+8 M, abdominal tergite I prescutum 1+1 M and 1+1 m, setae on tergite I with 10±2 pinnulae, tergites II-VI with 9+9 M, tergite VII 10+10 M, tergite VIII 8+8 M, tergite X between carinae 6+6 M of which posterior pair simple, segment X without pores, sternite 1 scutum with 10+10 M and an irreglar row of small plumose setae just anterior to lateral subcoxal organs and within the limits of the styli 7-9+7-9, one row 7-12+7-12 sensory setae and 3-4 rows of glandular setae each ⅓ as long as sensory setae, sternite II-VI prescutum 4+4 M, scutum 16+16 M with 10±2 pinnulae, sternite VII presutum 4+4 M, scutum 14+14 M, sternite VIII 7+1+7 M sternite X 6+6 M. Left forcep with one prominent recurved tooth, predental tubercles 2, postdental tubercles 7, right forcep without postmedian dilation. Length of body 5-7 mm.

Male.—Similar to female except setose sac in third abdominal segment with setae only in the basal one-half of the sac, postero-lateral edges of tergite VII sclerotized, pleura VII sclerotized, slightly projected to the rear, but without posterior knob, a few pores on tergite X. Length of body 5-8 mm.

Habitat.—Prairie Creek State Park, Humboldt County, California, in redwood humus, Sept. 9, 1958, by L. M. Smith; 13 paratype males and females same locality and time; 6 paratype males and females, 2 miles northeast of Patrick Creek Post Office, Del Norte County, California, in fir and elm humus July 10, 1958, by Mr. J. Powell.

KEY FOR SEPARATING SPECIES OF EVALLJAPYX WITH 24 ANTENNAL SEGMENTS

1. Pleurites II-VI with 1 M, tergite X 3+3 M between carinae, lateral margins of tergite VII rounded, right forcep as illustrated .... **raneyi**, n. sp.
   Pleurites II-VI with 2 M, tergite X with 6-7+6-7 M between carinae, lateral margins of tergite VII straight and slightly tapered to the rear, or slightly rounded in diversipleura, right forceps as illustrated 2
2. Prescuta of tergites of metathorax and abdominal segment I with 2+2 M (rarely 2+1 M), sternite I with 3-4+3-4 M plumose setae between styli (rarely 5+5), right forcep with post-median dilation of inner edge, pleuron VII of stage II ♂ with large spherical knob .... **helferi**, n. sp.
   Prescuta of tergites of metathorax and abdominal segment I with 1+1 M (rarely 2+1 M), sternite I with 6-19+6-19 plumose setae between styli; right forcep without post-median dilation, pleuron VII of stage II ♂ with small squarish knob or no knob 3
3. Pleuron VII with squarish knob as illustrated, sternite I with 10-19+10-19 plumose setae between styli, forceps as illustrated .... **facetus**, n. sp.
   Pleuron VII without knob as illustrated, sternite I with 6-8+6-8 plumose setae between styli (rarely more), forceps as illustrated .... **diversipleura** Silv.

In general the distribution of the four species discussed in this paper is as follows: *E. diversipleura* Silv. occurs in the mountains in the extreme northern part of California; *E. helferi* L. M. Smith occurs on the coastal side of the Coast Ranges from Mendocino County through Santa Cruz County; *E. facetus* L. M. Smith occurs in the Sacramento and San Joaquin, and Santa Clara Valleys and the foothills on either side, from Napa County on the north to Santa Clara County on the south; *E. raneyi* L. M. Smith occurs in the mountains in the extreme southern part of California.

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ANNOUNCEMENT

Short scientific articles, not illustrated, two double-spaced typewritten pages or less in length, are welcome and will usually receive prompt publication. References to literature should be included in the text, and the author's name should appear at the end of the article.

LAELAPTONYSSUS PHYTOSEIOIDES, A NEW SPECIES OF LAELAPTONYSSID MITE FROM HEMIPTERA

(Acarina, Mesostigmata)

Edward W. Baker[1] and Donald E. Johnston[2]

In 1956 Womersley erected the genus *Laelaptonyssus* and the family Laelaptonyssidae for some mites found in a house fly culture in Western Australia. As with many of the laelaptoid mites that are associated with insects, the placement of *Laelaptonyssus* is problematical. The discovery of a second species strengthens Womersley's family but contributes little to our knowledge of the affinities of these mites. This family shows similaries to the Phytoseiidae as regards ventral armature and hypostomal modifications, but differs from all known phytoseiids in the presence of two subequal dorsal shields. The chelicerae differ from those of the phytoseiids, the modifications perhaps being due to a parasitic mode of life. The absence of the fixed digit in *L. phytoseioides*, new species, resembles the condition in *Otopheidomenis zalelestes* Treat, 1955 (Otopheidomenidae), a parasite of moths. Femora I and II of *phytoseioides* bear enlarged dorsal setae as in the laelaptine genera. Because of the anomalous characters of *Laelaptonyssus*, it seems best to keep the genus as representative of a separate family until enough specimens, species and knowledge accumulate to enable it to be properly placed.

Laelaptonyssus mitis Womersley and *L. phytoseioides*, new species. differ in a number of ways and the separation of the species into two genera might be justifiable on the bases of present knowledge. For the present, however, *phytoseioides* is included in *Laelaptonyssus*. The differences between *mitis* and *phytoseioides* may be summarized as follows:

Laelaptonyssus mitis Womersley. Female with scissorslike chelae; with 2 pairs of sternal setae; and with 28 pairs of dorsal shield setae.

Laelaptonyssus phytoseioides, new species. Female with chelicerae lacking fixed digit; with 3 pairs of sternal setae; and with 15 pairs of dorsal setae.

The family Laelaptonyssidae was inadvertently omitted from the Guide to the Families of Mites, Baker, et al., 1958.

Laelaptonyssus phytoseioides, new species
(Figs. 1-8)

Diagnostic characters.—The female is a laelaptoid mite, with a two forked palpal claw with a small spur on one tine, with three pairs of sternal setae, with elongate and strongly fimbriate epigynial plate, with ventrianal plate, with stigmata and short peritremes, with two dorsal shields, the two possessing a total of

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[2] Department of Zoology, University of Maryland, College Park.

15 pairs of setae, with the dorsal femoral setae of legs I and II strong, projecting posteriorly as in *Laelaps*, and all legs with caruncles and reduced claws.

Female.—The gnathosoma is relatively small; the tectum is simple, arched, without teeth; the fixed chelae are lost, the movable chelae are present, strong, with only two weak teeth; the palps have two strong dorsal femoral setae, one much larger than the other; the palpal claw is two pronged, with one prong possessing a minute third tooth; venter of rostrum difficult to see because of mounting, but with usual setae and deutosternal teeth, and with small, slender, weakly curved hypostomal processes. Dorsal shields divided into two subequal sections, the anterior somewhat larger, with 11 pairs of setae, the posterior with 4 pairs of setae, both plates with elongate reticulate pattern laterally, and with less elongate ones medially; only two pairs of dorsal setae off shields, one pair behind level of coxae IV and the other on the posterior median portion of body. Tritosternum with basal and distal sections, the distal section dividing about one-half its length from base. Apparently no presternal sclerotization present although a few striae are present: sternal plate elongate, deeply indented posteriorly, with 3 pairs of setae, and apparently without striae. No metasternal plates present although there are metasternal setae. Epigynial plate elongate, fimbriate with longitudinal striae, without setae, and blunt posteriorly. Ventrianal plate with two pairs of preanal setae and only one anal seta (one is missing); postanal seta long; ventrianal plate strongly vase shaped, lightly striated, with true anal plate indicated by suture as figured. Three pairs of setae laterad of ventrianal plate (one seta missing). Metapodal plate present. Peritreme present, relatively short, extending to a point between coxae I and III; peritremalia extending posteriorly behind coxae IV. Leg setation simple ventrally, dorsally femora I and II each has a pair of large strong setae pointing posteriorly as in the genus *Laelaps;* a large seta is found on both femora III and IV; other leg setae short, simple, slightly expanded basally in most cases. All legs with caruncles and reduced claws. Setation of tarsus I simple, as figured. Length of female, 813 u. Length of anterior dorsal shield 439 u; width 520 u; length of posterior shield 333 u, with 466 u.

A single female, the holotype, U. S. National Museum no. 2528, was collected on "Hemiptera," Oakland, Florida, September 8, 1958, by R. J. Griffith.

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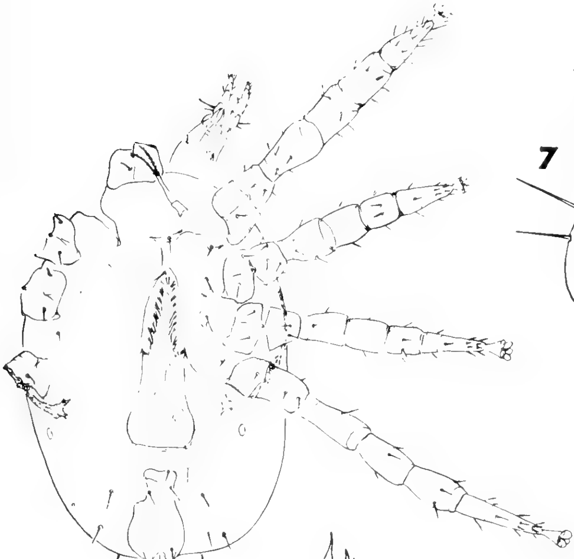
Laetaptonyssus phytoseioides, new species, female. Fig. 1, dorsal view of gnathosoma. Fig. 2, chelicera. Fig. 3, palpal tine. Fig. 4, ventral view of rostrum. Fig. 5, dorsal view. Fig 6, ventral view. Fig. 7, dorsal view of tarsus I. Fig. 8, details of caruncle.



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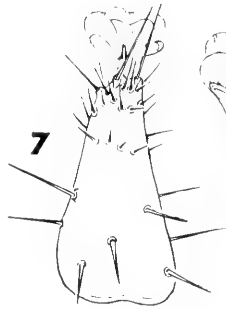

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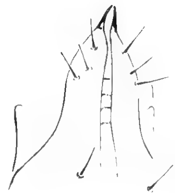

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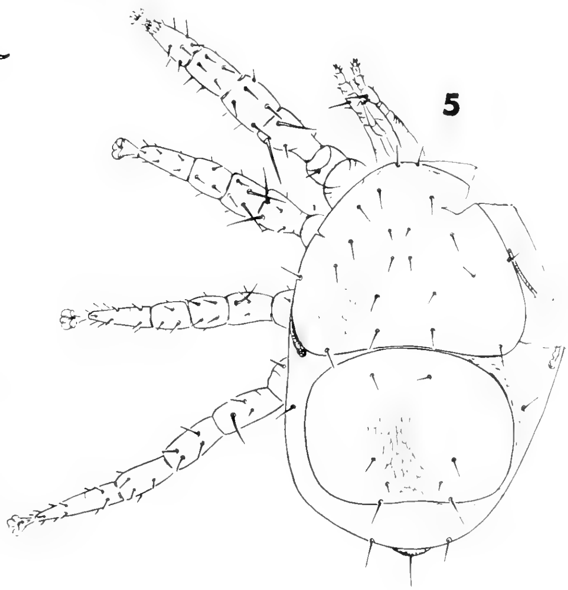

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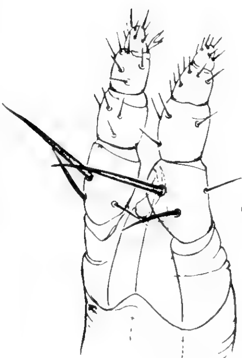

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A NOTE ON ACRONICTA RAPIDAN (DYAR)

(Lepidoptera, Noctuidae)

Four specimens of *Acronicta rapidan* (Dyar), a species not previously reported from the United States, were collected by Paul T. Riherd at Mercedes, Texas, in March and May 1955, and in September 1956. Nine other specimens, from Brownsville and Houston, Texas, all collected 30 or more years ago, have been located in the collection of the United States National Museum. One of the specimens from Brownsville was figured by Barnes and McDunnough in 1913 (Contribubtions to the Natural History of the Lepidoptera of North America, 2(1): pl. 2, fig. 5), but as "*Acronycta connecta Grote.*" They were aware that it did not agree in maculation with *connecta,* as they stated in the explanation to the figure, "We suppose our specimen to be this species, although it is less suffused with blackish than most of those in our series." Dyar's original description (Proc. U. S. Nat. Mus., 1912, 42: 62) was based on a single female specimen from Misantla, México. The type, No. 14240, is in the United States National Museum.

The only other reference to *Acronicta rapidan* (Dyar)is that of Draudt (Seitz, 1924, Die Gross-schmetterlinge der Erde, 7:24), but the specimen figured (pl. 3, row c) is not that species if the illustration is an accurate reproduction. The coloration of the hindwing is different, and several important details in the maculation of the forewing do not agree with the pattern in *rapidan.* Draudt believed *rapidan,* based on the specimen he illustrated, to be closely related to *Acronicta furcifera* Guénée, a member of the *lobeliae* species group. It seems likely that the specimen figured does belong to that group, but it is not *rapidan.*

In general habitus *rapidan* resembles small specimens of *Acronicta hasta* Guénée or other species of the *hasta* complex, but the forewing differs in that the pale orbicular spot is margined with black outwardly only, the apical dash is obsolescent, and there are short black terminal dashes in cells M_3 and Cu_1. The short terminal dashes in cells M_3 and Cu_1, which extend about half the distance toward the postmedial band, are not clearly indicated in the photograph of the specimen figured by Barnes and McDunnough, as that area of the forewings is somewhat rubbed.

The male and female genitalia are indistinguishable from those of *Acronicta connecta* Grote. It is quite possible, therefore, that *rapidan* is but a slightly smaller, paler, subtropical race of that species. *A. connecta* is known from Colorado and South Dakota east to New Hampshire and New York and South to Texas and Florida, but appears to be more abundant in the northern part of its range. Four typical females from Victoria, Kemper's Bluff, and Harris County, Texas, are in the United States National Museum. The only specimen from Florida in this collection is a female from Royal Palm Park. It is very pale in coloration and approaches the specimens of *rapidan* in that regard. In consideration of the apparent overlap of ranges—i.e., *connecta* from Victoria, Texas and *rapidan* from Houston, Texas, and the absence from the area of overlap of known intermediate specimens—it seems best for the present to maintain *rapidan* and *connecta* as distinct species. A good colored illustration of *connecta* may be found in Holland's Moth Book (1937, pl. 18, fig. 19). The genitalia of the male of *connecta* (left valve) was figured by Smith (Proc. U. S. Nat. Mus., 1898, 21: pl. 21 fig. 4).—E. L. Todd, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

BOOK REVIEW

A SYNOPTIC CATALOG OF THE MOSQUITOES OF THE WORLD, by Alan Stone, Kenneth L. Knight, and Helle Starcke. Thomas Say Foundation, Vol. VI, 358 pp., 1959. Published by the Entomological Society of America, Washington, D. C. Prices: $6.50 to ESA members, $7.25 to non-members.

An up-to-date version of Edwards' mosquito catalog published in 1932 as Fascicle 194 of *Genera Insectorum*, this work was supported in part by a transfer of funds from the Office of Naval Research to the Smithsonian Institution. It includes all generic, subgeneric, and trivial names applicable to mosquitoes published prior to 1959, including citations to the original descriptions. In the first two categories, the genotype and the method by which it achieved this status is cited. Each specific and infraspecific name is accompanied by information on the location and life history stages of the holotype or of syntypes and the type locality. For each valid trivial name those references are cited that most adequately present information on life history stages, biology, or vector relationships not available in the original citation. References to nomenclatorial matters are given in some cases, and distribution in broad terms appears for each valid species, subspecies, or variety.

This reviewer, having had a brief association in the past with mosquito systematics, and a first-hand knowledge of this catelog as editor, can attest to the care with which this thorough going work was prepared. It is indispensable for everyone who concerns himself with mosquitoes in any way.—RICHARD H. FOOTE, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington.*

SOCIETY MEETINGS

Held in U. S. National Museum

681st Meeting, May 7, 1959

Following the second reading of *George E. Cantwell's* name, he was welcomed as a member of the Society. The names of *Lawrence W. Smith, Jr.* and *Cyril J. Hodapp* were proposed for membership.

President Nelson announced that a forthcoming book by Lewis Weld entitled "Cynipid Galls of the Eastern United States, an Aid to their Identification," 160 pp., is being privately printed and will be on sale by the author for $2.00. The author has proposed that the book also be sold by our Society. By this means, $1.00 from each copy sold is to be given Mr. Weld as long as he lives and the balance (minus expense of advertising and mailing) is to go to the Special Publication Fund of the Society. He further requests that the entire proceeds of the sale go to the Fund upon his death. Mr. Nelson pointed out that this fine gesture on the part of Mr. Weld has been accepted by the Executive Committee.

The date of the annual picnic was set for June 6.

We again had the pleasure of having the winners of the 5 science fairs in the area to show us their exhibits and talk about them. *Joseph Hickman*, Fairfax County, exhibited the life cycle of Lepidoptera; *Edward Hueske*, Northern Virginia, a collection of butterflies; *Carol Zocchi*, Prince Georges County, the effect of humidity on metamorphosis; *David Chen*, Montgomery County, experiments of hormonal control of insect metamorphosis; and *Charles Renfro, Jr.*, District of

Columbia, a stream survey of where and how insects live. The Society presented each of the five winners with R.V. Swaine's ''Insect Guide.''

The principal speaker of the evening, *George Vogt,* presented a noteworthy paper on the ''Occurrence of Sex Ratios, Parthenogenesis and Host-plant Range Patterns within a Species Complex.''

A number of visitors were introduced; *Harvey O. Haggard, Elsie L. Barber, Velma Barber Palmer, the Rev. John Ostdick, Edward E. Hueske, Dr. and Mrs. William Y. Chen, Col. and Mrs. C. G. Renfro, Mr. and Mrs. Paul D. Hickman, Mr. and Mrs. D. C. Zocchi,* and *Lewis C. Roache.*

682nd Meeting, June 6, 1959

A joint picnic of our Society with the Insecticide Society of Washington took place at the Log Lodge. Co-Chairmen were *Paul W. Oman* and *Milton S. Schechter.* Other committee members were *Paul E. Hubanks, Edgar A. Taylor,* and *Helen Sollers.*

683rd Meeting, October 1, 1959

Lawrence W. Smith, Jr. and *Cyril J. Hodapp* were elected to membership and the following names were proposed for election to the Society: *Charles C. Compton, William R. Kellen,* and *Myron L. Wolbarsht.*

President Nelson requested the nominating committee to report at the November meeting of the Society. He announced the deaths of James Zetek, who worked for many years on Barro Colorado Island, and of A. C. Baker of Mexico City. A committee consisting of *Lyman Henderson, Doyle Reed,* and *R. T. Cotton* was named to prepare an obituary for E. A. Back.

Under the section on notes and exhibition of specimens, *Frank L. Campbell* called attention to a new book entitled ''Physiology of Insect Development'' by a number of authors but edited by him; *Alan Stone* gave a brief review of a new publication by Richard H. Foote and D. R. Cook, entitled ''Mosquitoes of Medical Importance,'' U. S. Department of Agriculture Handbook No. 152. *T. L. Bissell* discussed the cowpea curculio, *Chalcodermus aeneus* Boh. Cowpeas are grown to a limited extent in Maryland for table use. This year a light infestation of the cowpea curculio was found in blackeyed cowpeas picked at Lexington Park, St. Mary's County, on August 30. The pods were in a filled green stage ready for cooking. This is the first recorded instance of the rearing of this notorious cowpea pest in Maryland although the author secured one larva from cowpeas at the same locality in 1958.

Dr. Henry Fuller presented a highly interesting paper, ''Lice as hosts and vectors of the organism causing trench fever.''

The following visitors were introduced: *H. I. Scudder, Clyde S. Barnhart, Louis Locke, Norman F. Baker,* and *C. A. Sooter.*—HELEN SOLLERS, *Recording Secretary.*

ACTUAL DATES OF PUBLICATION, VOLUME 61

No. 1, pp. 1-48, March 6, 1959; No. 2, pp. 49-96, April 30, 1959; No. 3, pp. 97-144, June 29, 1959; No. 4, pp. 145-192, September 11, 1959; No. 5, pp. 193-240, November 10, 1959; No. 6, pp. 241-288, December 31, 1959.

Note: The dates of publication of Nos. 5 and 6, Vol. 59, of the *Proceedings* is hereby established as November 18, 1957, and January 28, 1958, respectively.—Ed.

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OF

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PUBLISHED BY THE SOCIETY
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PROCEEDINGS

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The Society does not exchange its publications for those of other societies.

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PROCEEDINGS OF THE

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Vol. 62 MARCH, 1960 No. 1

SUPPLEMENTARY STUDIES ON THE LARVAE OF THE MYRMICINAE

(HYMENOPTERA: FORMICIDAE)

GEORGE C. WHEELER and JEANETTE WHEELER, *Department of Biology, University of North Dakota, Grand Forks*

Subsequent to the publication of our several articles on the larvae of the tribes of the subfamily Myrmicinae we have collected or received from other myrmecologists so much additional material that it has become necessary to publish a supplement.

The purpose of this supplement is (1) to characterize the genera acquired since previous publication; (2) to describe species in such genera; (3) to describe additional species in previously studied genera; (4) to revise our published characterizations as required by new material; (5) to cite recent references in the literature; (6) to cite older references previously overlooked.

Tribe **Myrmicini** F. Smith

Our previous characterization of this tribe (1952*b*, p. 106) should be replaced by the following:

Stout; diameter greatest at the fourth or fifth abdominal somite; slightly attenuated anteriorly; thorax very stout (when mature) and arched or bent ventrally, but not differentiated into a neck; posterior end broadly rounded. Antennae with three (rarely two or four) sensilla, each of which bears a spinule. Head hairs short to long; mostly denticulate. Labrum small or moderate-sized, short, breadth 1.5-2 X length; bilobed; anterior surface of each lobe with 4-10 sensilla and/or minute hairs; posterior surface spinulose and bearing 8-20 sensilla. Mandibles rather small or moderate-sized (ratio of head width to mandible length 2.1-2.9, average 2.5); stout (ratio of length to width at base 1.8-2.4, average 2.1); heavily sclerotized. Apex of maxilla usually spinulose; palp paxilliform and bearing five or six sensilla; galea paxilliform or digitiform; palp slightly shorter than or equal to galea. Anterior surface of labium usually spinulose; palp a short projection bearing 4-8 sensilla. Opening of sericteries a short transverse slit. Hypopharynx usually sparsely spinulose, the spinules minute and generally in transverse rows.

SMITHSONIAN INSTITUTION APR 2 8

Genus **Pogonomyrmex** Mayr

To include *badius,* our characterization of *Pogonomyrmex* (1952*b*, p. 106) should be amended as follows: . . . Head hairs short to long, simple or sparsely denticulate on the distal half. Labrum small and short; breadth 2-3 X the length; . . .

Subgenus **Pogonomyrmex** Mayr

Medial mandibular teeth conspicuous, long, robust and round-pointed.

Pogonomyrmex badius (Latreille)

Major Worker Larva.—Length (through spiracles) about 8.8 mm. Stout; with the thorax curved ventrally and tapering to a little larger than the head-size; abdomen widest at the fifth abdominal somite. Anus postero-ventral. Leg, wing and gonopod vestiges present. About nine differentiated somites. Integument sparsely spinulose, the spinules minute and in very short rows. Body hairs sparse. Of two types: (1) short (0.058-0.156 mm), slightly curved, with the distal half denticulate, on every somite; (2) long (0.156-0.369 mm), slightly curved to sinuous, without denticles, longest on the thorax, becoming very short posteriorly. Cranium subcircular in anterior view. Antennae small, each with three sensilla, each of which bears a spinule. Head hairs few, simple, slightly curved, 0.039-0.156 mm long. Labrum small, short (breadth 3X length), somewhat narrowed ventrally, bilobed, with a median furrow extending dorsally on the anterior surface; anterior surface of each lobe with seven sensilla; ventral half of anterior surface spinulose, the spinules longer and more numerous ventrally; ventral border spinulose and with two or three sensilla on each lobe; posterior surface spinulose, the spinules smaller and in longer rows dorsally; posterior surface of each lobe with two or three isolated sensilla and two pairs of contiguous sensilla. Mandibles robust, heavily sclerotized; apical tooth long, tapering only slightly to a rounded point; the two medial teeth are shorter but still quite long, subequal and round-pointed. Maxillae with apex subconical and bearing a few large isolated spinules; palp a skewed peg with four apical (three bearing a spinule each and one encapsulated) and one lateral (bearing a spinule) sensilla; galea digitiform with two apical sensilla. Labium with the anterior surface spinulose, the spinules minute and in numerous short transverse rows; palp a short peg with five sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit on the anterior surface.

Minor Worker Larva.—Length (through spiracles) about 6.7 mm. Similar to the major worker larva except in the following details: Diameter more nearly uniform throughout. Body hairs shorter (0.019-0.027 mm). Head hairs fewer. Mandibles slenderer.

(Material studied: numerous larvae from Georgia, courtesy of Dr. P. B. Kannowski.)

Pogonomyrmex barbatus (F. Smith)

Correction, Wheeler and Wheeler, 1952*b*, p. 107: the two medial teeth of the mandibles are *long.*

Barnes and Nerney, 1953: ''The larvae . . . remain in the chambers of the colony. They are cream colored and are shaped like crook-necked squashes, the smaller, crooked portion ending in a very small head. The full-grown larvae are about ¼ inch long'' (p. 4). Fig. 2D, larva [semipupa?].

Wheeler, 1907, p. 189: ''I had previously found that this species does not feed its larvae by regurgitation but with pieces of seeds or insects.''

Pogonomyrmex marcusi Kusnezov

Marcus, 1953: "Of the larvae in nest D, 41 were 5-6 mm long, 30 were 4 mm and 11 were 2-2.4 mm. (The measurement was taken from the cervical curvature to the posterior end.) Eggs with embryos in various stages measure 1.5-2 mm. The largest larvae (6 mm) had rudiments of testes. From these data we may presume that there are four larval stages, each molt with a larva one millimeter longer. The larva of 5-6 mm belong to the worker and sexual castes, the latter having one more molt than the former.

"Certain larvae attract attention because of their broad flat shape. This rare and surprising shape is not the result of poor preservation, because it was observed while collecting. It seems that immediately after the molt the larvae are flat and after feeding acquire the normal rounded body shape.

"Figure 33 shows one of these flat larvae, which measures 3.6 mm long and 3.25 mm broad. To be noted are 12 spiracles for primordial tracheal respiration. The second segment bears two. In sagittal section the midgut is empty and consists of a simple epithelium. All the interior of the larva is composed of uniform histiogenic cells. When a rounded larva is examined one finds differentiated organs, an intestine with muscles, Malpighian tubules and especially beautiful thick tubes of salivary (or labial) glands. . . .

"Each form has its physical cause. At the molt the hard chitinous exoskeleton is ruptured, the contents of the intestine are eliminated and certain larval organs degenerate. The larva remains without the support of the exterior chitin and with an interior of rounded undifferentiated cells, actually liquid. The lack of solid tissues for support causes the larva to lie on its back on the soil like a jellyfish stranded on the beach. Thus results, I believe, the flattened form of the larva shown in figure 33. When it regenerates the intestine, new larval organs and new supporting tissues develop and the larva recovers its rounded form around the regenerated intestine, which is filled with food." (Translated from the Spanish, pp. 46 and 48.) Fig. 33*a*. shows a flat larva in ventral view; Fig. 33*b*, a normal larva in profile. Internal anatomy, pp. 48-54 and figs. 33*c*, 34, 35, 36, 37 and 40. Summary in German, p. 67.

Genus **Hylomyrma** Forel

Body hairs sparse, rather long. Of two types: (1) denticulate and slightly curved; (2) sinuous, with the apical portion hooked, simple or with a few denticles on the apical third, a few around the middle of each somite. Anchor-tipped hairs lacking. Antennae small, each with three sensilla each of which bears a rather long spinule. Head hairs few, short to long, minutely denticulate. Labrum with the breadth 1½ X length; bilobed; each lobe without spinules or hairs but with seven sensilla on and near the ventral border; posterior surface sparsely spinulose. Mandibles with the apical tooth curved medially and posteriorly; with a medial blade which has an erose border and bears one or two subapical teeth; anterior surface of the blade with a few spinules. Maxillae with the galea digitiform and bent.

Hylomyrma has been regarded as the least specialized genus in the tribe Myrmicini. It has also been considered as a subgenus of *Pogonomyrmex*. Larval characters do not support either viewpoint. It is certainly generically distinct from *Pogonomyrmex* because of its mandibular shape and spinules and because of its hooked body hairs. It is perhaps less specialized than *Pogonomyrmex* in mandibular shape and spinules but it is more specialized in having fewer spinules on the other mouth parts and in the hooked body hairs.

Hylomyrma columbica Forel

(Pl. I, figs. 16-21)

Sexual Semipupa.—Length (through spiracles) about 3.5 mm. Leg, wing and gonopod vestiges present. Integument spinulose. Body hairs sparse, rather long and denticulate. Of two types: (1) 0.036-0.08 mm slightly curved, without alveolus and articular membrane, on every somite; (2) a few around the middle of each somite, 0.18-0.22 mm long, sinuous, with the apical portion hooked, the hooks (in preserved material) curled anteriorly, simple or with a few denticles on the apical third. Cranium subtrapezoidal in anterior view, narrowed ventrally, with the occipital corners broadly rounded. Antennae small, each with three sensilla each of which bears a rather long spinule. Head hairs few, short to long (0.054-0.09 mm), slightly curved, with very minute denticles. Labrum with the breadth 1½ X length; bilobed, with a furrow extending dorsally on the anterior surface; each lobe with seven sensilla on the anterior surface and ventral border; posterior surface of each lobe with about seven sensilla near the center; posterior surface sparsely spinulose, the spinules minute and in very short rows. Mandibles subtriangular in anterior view; apical tooth heavily sclerotized, curved medially and posteriorly; with a medial blade which has an erose border and bears one or two subapical teeth; anterior surface of the blade with a few spinules. Maxillae with the apex paraboloidal and sparsely spinulose, the spinules isolated or in short rows; palp a tall frustum with two apical (bearing a spinule each), two subapical (large and encapsulated) and one lateral (bearing a spinule) sensilla; galea digitiform, the apical half bent outward at a 25° angle, with two apical sensilla bearing a spinule each. Labium spinulose, the spinules in short transverse rows; palp a low knob with five sensilla (three bearing a spinule each and two encapsulated); an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit in a depression. No spinules seen on hypopharynx. (Material studied: two sexual semipupae from Mexico, collected by E. O. Wilson.)

Dr. Wilson has informed us (by letter) that "in captivity workers of this species captured *Drosophila* spp., *Isotoma viridis* Bourlet, and a few other small insects offered them in the food chamber, and fed them directly to the larvae."

Genus **Myrmica** Latreille

Myrmica laevinodis Nylander

Brian (1951 *a*) referred to this species, but changed the identification to *M. rubra* in 1957*b* (see below).

Myrmica rubra (Linnaeus)

Brian (1951*a*) reported that there were two batches of brood, each in a separate cycle (referred to as *M. laevinodis*, but changed to *M. rubra*, 1957*b*) and (1957*b*) he considered factors affecting these cycles. He reported (1956*b* and 1956*c*) the effects of larva-piling, "test-servicing" and the sizes of larvae in a group on larval feeding. In

1957*a* he reported that food was distributed equally to larvae of equal size, but that in larvae of mixed sizes larger larvae were fed and smaller larvae neglected.

Brian (1951*b*) reported that female larvae had to reach a certain size by the time they started hibernation in order to become queens and he suggested that "vernalisation" might also be necessary. He reported (1954) "normal" ontogenies for larvae which develop into queens and males and suggested criteria for measuring "queenness." In 1955 *a* and *b* he concluded that: (1) season at which eggs were laid, (2) the ratio of growth to development, (3) temperature during development and (4) age of attendant workers determine whether workers or queens would be produced. In 1956*a* he reported that protein food was essential through the critical third instar period for normal queen-larval growth. A summary of factors producing queens and males was given in 1957*c*.

Morley, 1953, p. 21, fig. 2c: a small crude drawing of a larva in side view. Weir, 1957: internal anatomy (referred to as subspecies *microgyna*).

Genus **Manica** Jurine

Stout; ventral profile angulate, with the apex at abdominal somite II; dorsal profile curved; diameter greatest at abdominal somite V, decreasing gradually to the anterior end (or slightly constricted at abdominal somites I and II) and more rapidly to the posterior end, which is broadly rounded. Anus posteroventral. Body hairs sparse to numerous, short to moderately long. Two types in each species; one type whip-like, the other either denticulate toward the apex or with appressed branches; anchor-tipped hairs lacking. Antennae minute, slightly elevated, each with three (rarely four) sensilla. Head hairs few to moderately numerous, short to long, mostly denticulate. Labrum short, more or less bilobed; anterior surface of each lobe with 5-10 sensilla but without hairs; ventral border of each lobe spinulose and bearing three or four sensilla; posterior surface densely spinulose and with 7-10 sensilla on each lobe. Mandibles with the apex forming a long tooth which is curved medially and slightly posteriorly; anterior surface produced mesally into a blade which bears two subapical teeth; basal half of anterior surface with numerous spinules in short rows. Maxillary and labial palps with six or seven sensilla each.

Manica mutica (Emery)

(Pl. I, figs. 1-5)

Worker Larva.—Length (through spiracles) about 5 mm. Stout; ventral profile angulate, with the apex at abdominal somite II; dorsal profile curved, diameter greatest at abdominal somite V, decreasing gradually to the anterior end (or slightly constricted at abdominal somites I and II) and more rapidly to the posterior end, which is broadly rounded. Anus posteroventral. Leg, wing and gonopod vestiges present. Segmentation indistinct. Integument with minute spinules in moderately long transverse rows on the ventral surface of the thorax and abdominal somite I. Body hairs sparse and short to moderately long. Of two types: (1) 0.078-0.19 mm long, evenly attenuated, with the base straight or slightly curved and the remainder flexible, on all somites except the prothorax and abdominal somite X; (2) 0.027-0.198 mm, slightly curved, with a few denticles toward the apex, on the prothorax and the last abdominal somite. Cranium subhexagonal in anterior view, with the corners rounded. Antennae minute, slightly elevated, each with three sensilla, each of which bears a minute spinule. Head hairs few, short to long (0.027-0.14 mm), slightly curved, with a few denticles near the apex. Labrum short (breadth 1.8 X length); ventral border feebly concave; each half of anterior surface with five sensilla; each half of ventral border with four sensilla; ventral border spinulose, the spinules minute and in short rows; posterior surface densely spinulose, the spinules minute and in numerous short arcuate rows; posterior surface of each half with five isolated and two contiguous sensilla. Mandibles heavily sclerotized; subtriangular in anterior view; apex forming a long tooth which is curved medially and slightly posteriorly; anterior surface produced medially into a blade which bears two subapical teeth; basal half of anterior surface with numerous spinules in short oblique rows. Maxillae with the apex conoidal and spinulose, the spinules minute and in short arcuate rows; palp a skewed peg with two apical (with a spinule each), two subapical (one encapsulated and one bearing a spinule) and three lateral (each bearing a spinule) sensilla; galea digitiform, with two apical sensilla. Labium with the anterior surface sparsely spinulose, the spinules minute and in numerous short arcuate rows, the rows grouped into longer subtransverse rows; palp a low knob with six sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit. Hypopharynx spinulose, the spinules minute and in subtransverse rows.

Sexual Larva.—Length (through spiracles) about 7.2 mm. Similar to the worker larva except in the following details: A small concavity on the mid-ventral surface of the last abdominal somite, but no gonopod vestiges seen. Entire integument spinulose. Head transversely subelliptical. Labrum with 6-8 sensilla on each half of the anterior surface; palp a tall skewed peg with four apical and four lateral sensilla.

(Material studied: numerous larvae from Roosevelt National Memorial Park, North Dakota.)

Manica bradleyi (Wheeler)

(Pl. I, figs. 6-8)

Worker Larva.—Length (through spiracles) about 7.4 mm. Similar to *M. mutica* except as follows: No spinules seen on the integument. Body hairs numerous and moderately long. Of two types: (1) on the dorsal surface, 0.144-0.288 mm long, simple, whip-like, with long slender shaft and very fine lash; (2) on the ventral and lateral surfaces, 0.072-0.306 mm long, with heavy base and minute to long branches, the branches closely appressed so that at low magnification the hairs appear stout and simple. Anterior surface of each lobe of labrum with 10 sensilla; posterior surface with 8-10 sensilla in the center of each lobe.

Sexual Larva.—Length (through spiracles) about 8.4 mm. Similar to worker larva except in the following details: A small concavity on the midventral surface at the posterior border of abdominal somite IX, but no gonopod vestiges seen. Body hairs shorter. Ventral border of labrum with two isolated and two contiguous sensilla on each lobe. Maxillary palp with four apical and four lateral sensilla. Labial palp with a low knob with six sensilla.

(Material studied: 16 larvae from Yosemite National Park, California, collected by Dr. E. O. Wilson.)

Tribe **Pheidolini** Emery

Genus **Stenamma** Westwood

Stenamma diecki Emery

Smith, 1957, p. 134: ''Brown and Wilson (unpublished observations) found the larvae of *diecki* feeding on a small dipterous larva determined by W. W. Wirth as probably an empidid, and also on what they though might be a springtail.'' See also p. 163.

Stenamma impar Forel

Smith, 1957, p. 153: ''Miss Talbot found that it is common for the larvae to overwinter in the nest.''

Genus **Aphaenogaster** Mayr

Aphaenogaster (Attomyrma) floridana M. R. Smith

Length through spiracles about 4.3 mm. Similar to *A. rudis* (Wheeler and Wheeler, 1953*b*, p. 56) except in the following details: Body hairs of only one type, short (0.036-0.072 mm), with long base and short dichotomizing tip. Cranium somewhat broader than long. Anterior surface of basal half of mandibles spinulose. (Material studied: numerous larvae from Gretna, Florida, and from Georgia, collected by Dr. P. B. Kannowski.)

Aphaenogaster (Deromyrma) sp.

Length (through spiracles) about 4.8 mm. Apparently similar to *A.* (*D.*) *inermis* (Wheeler and Wheeler, 1953*b*, p. 64). (Material studied two larvae and two semipupae, with most of the hairs lacking, collected by J. W. Chapman, 1942, Horn of Negros, Dumaguete, Philippine Islands.)

Genus **Messor** Forel

Messor barbarus aegyptiacus (Emery)

Bernard (1951*a*, pp. 93-94) mentioned this species as adapted to the dry soil of the Sahara.

Bernard (1953, p. 13) discussed the xerophilous adaptations of larvae:

''La forme externe larvaire ne paraît pas offrir de traits spéciaux aux Fourmis xérophiles, mais l'anatomie interne a souvent, sinon toujours, quelques particularités. D'après les recherches récentes de C. Athias-Henriot (1945) [1947] et de S. Valentini (1951), faites à mon laboratoire, on connaît déjà *Messor aegyptiaca, Monomorium Salomonis, Acantholepis Frauenfeldi.* Leurs larves sont relativement riches en corps gras, de nature à faciliter la rétention d'eau par les tissus. Les glandes labiales sont petites et à cellules réduites: peut-être y a-t-il économie de salive. La vésicule rectale . . . est très grande et reployée autour de l'intestin, suggérant une récupération possible de l'eau des excreta. Ces premières indications montrent l'intérêt de travaux biologiques plus poussés sur ces larves, dont la croissance en volume semble aussi modifiée.''

Messor barbarus minor (E. André)

Valentini, 1951: internal anatomy.

Genus **Novomessor** Emery

When we prepared our characterization of *Novomessor* (1953*b*, p. 70) we had only damaged integuments of one species. Since we now have adequate material of this species and of two additional species, a complete revision of the generic treatment is necessary:

Body moderately stout, slightly constricted at abdominal somites I and II; diameter greatest at abdominal somites IV and V. No neck. Body hairs short, rather sparse or moderately numerous; of two or three types, shapes diverse. Cranium subhexagonal in anterior view but with the angles indistinct; as broad as long. Antennae very small. Head hairs sparse, rather short, with denticulate tip. Labrum short, bilobed; posterior surface spinulose, the spinules minute and in short arcuate rows which tend to form a reticulate pattern. Mandibles with the apex forming a long slender tooth; with two subapical teeth on the medial border. Maxillae with the apex spinulose.

Novomessor albisetosus (Mayr)

(Pl. II, fig. 1)

Length (through spiracles) about 6.6 mm. Body moderately stout; slightly constricted at the first and second abdominal somites; diameter greatest at abdominal somites IV and V; no neck. Anus posteroventral. Leg, wing and gonopod vestiges present. Spiracles small, the mesothoracic slightly larger. No spinules seen on the integument. Body hairs short and rather sparse. Of two types: (1) 0.034-0.1 mm long, slightly curved, with bifid tip, generally distributed; (2) 0.05-0.1 mm long, bifid with the tips recurved, 12-24 on each abdominal somite. Cranium subhexagonal in anterior view, as broad as long. Antennae very small, each with three sensilla each of which bears a minute spinule. Head hairs sparse, rather short (0.024-0.053 mm long), slightly curved with the tip denticulate. Labrum short, breadth twice the length; bilobed; anterior surface of each lobe with seven sensilla; ventral border of each lobe with three sensilla and a few minute spinules; posterior surface of each lobe with two isolated and a cluster of three sensilla; posterior surface spinulose, the spinules minute and in short arcuate rows, the rows forming a reticulate pattern, with a transverse trend dorsally and a longitudinal trend on and near the ventral border. Mandibles heavily sclerotized; subtriangular in anterior view; apex forming a long slender tooth which is slightly curved medially; with two conspicuous acute subapical teeth on the medial border. Maxillae small, with the apex moderately spinulose, the spinules minute and in

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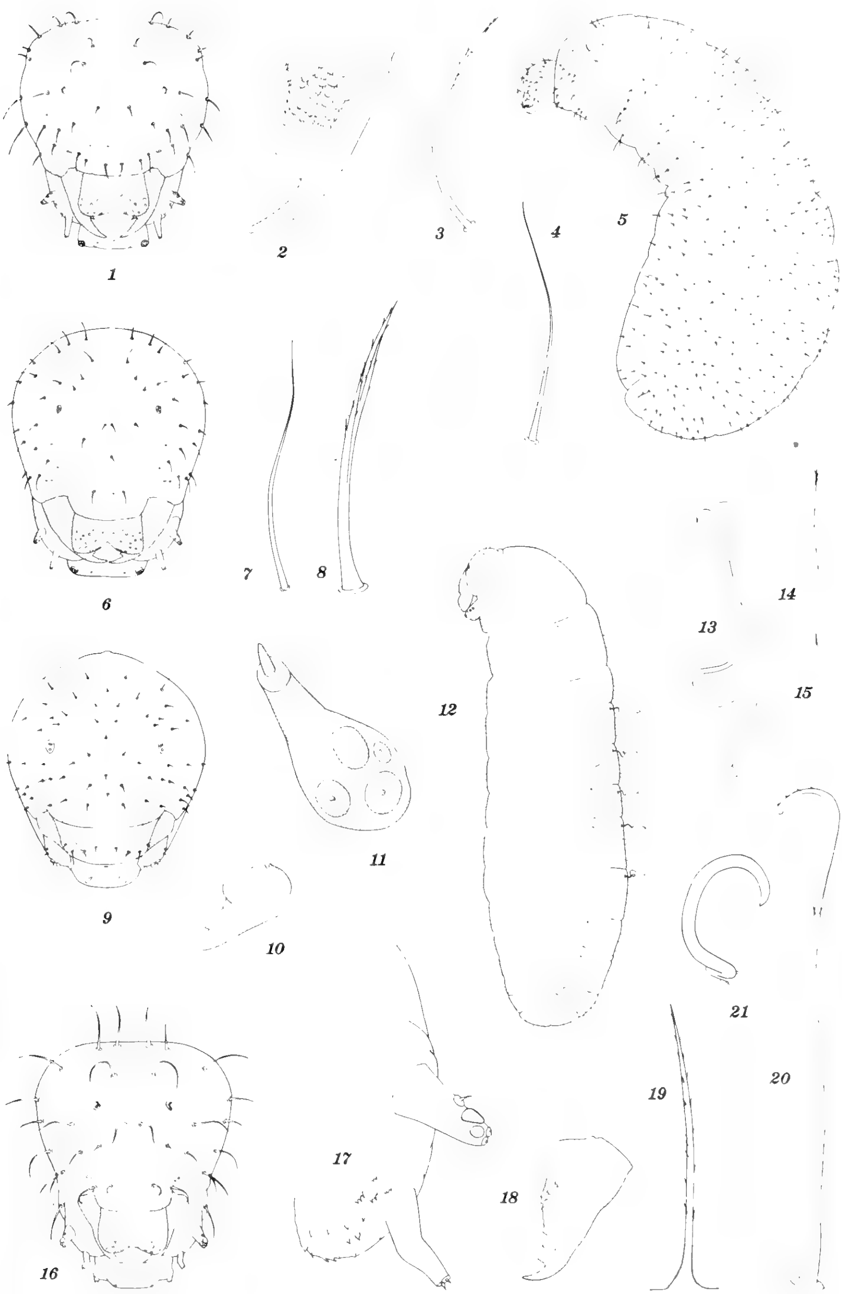
EXPLANATION OF PLATE I

Manica mutica: fig. 1, head in anterior view, X65; fig. 2, left mandible in anterior view, X214; figs. 3 and 4, two body hairs, X185; fig. 5, larva in side view, X19. *Manica bradleyi:* fig. 6, head in anterior view, X60; figs. 7 and 8, two body hairs, X176. *Xenomyrmex stolli mexicanus:* fig. 9, head in anterior view, X111; fig. 10, left mandible in anterior view, X212; fig. 11, left labial palp in anterior view, X1700; fig. 12, larva in side view, X38; figs. 13-15, three body hairs, X333. *Hylomyrma columbica:* fig. 16, head in anterior view, X96; fig. 17, left maxilla in anterior view, X427; fig. 18, left mandible in anterior view, X185; fig. 19, type 1 body hair, X432; fig. 20, type 2 body hair in side view, X432; fig. 21, type 2 body hair in end view. X432.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very short rows; palp paxilliform and bearing four apical (two encapsulated and two bearing a spinule each) and one lateral (with a spinule) sensilla; galea digitiform with two apical sensilla. Labium with the anterior surface spinulose, the spinules minute and in short arcuate rows; palp a low knob with five sensilla; opening of sericteries a short transverse slit in a depression on the ventral surface. Hypopharynx spinulose, the spinules minute and in transverse rows. (Material studied: 14 larvae from Texas, courtesy of Dr. P. B. Kannowski.)

Novomessor cockerelli (E. André)

Length (through spiracles) about 7.8 mm. Similar to *N. albisetosus* except in the following details: Body hairs of three types: (1) generally distributed, 0.02-0.078 mm long, with multifid tip, all branches in one plane; (2) 0.078-0.156 mm long, with short-bifid tip, the branches sometimes denticulate, 36 on the prothorax, 16 each on mesothorax, metathorax and abdominal somite I, six on the ventral surface of abdominal somite II, ten on X; (3) 0.078-0.117 mm long, with the tip bifid, the branches short and more or less coiled, some on all surfaces of each abdominal somite I-IX. Labrum with the anterior surface of each lobe bearing ten sensilla; posterior surface of each lobe with five isolated and a cluster of three sensilla. (Material studied: 19 larvae from Texas, courtesy of Dr. P. B. Kannowski.)

Novomessor manni Wheeler and Creighton

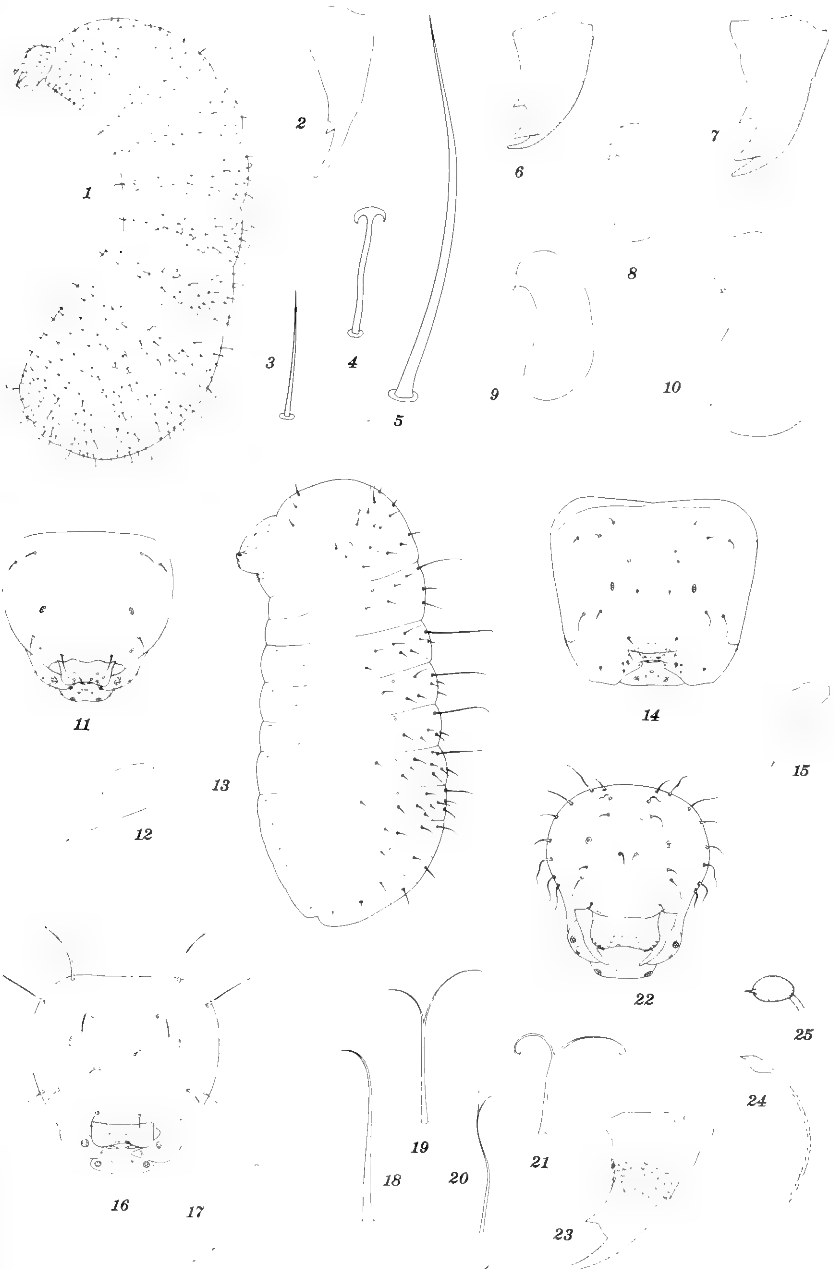
(Pl. II, figs. 2-5)

Semipupa.—Length (through spiracles) about 8 mm. Apparently similar to *N. albisetosus* except as follows: Body hairs moderately numerous. Of two types: (1) 0.078-0.27 mm long, usually simple (rarely with short-bifid tip), on all somites; (2) 0.05-0.176 mm long, stout, anchor-tipped with nearly straight shaft, four in a row across the dorsum and in a patch of 24-36 on each lateral surface of abdominal somites III-VII. Labrum with the spinules on the posterior surface much longer and in longer rows. Mandibles with the apical tooth longer and straighter, medial teeth much smaller. (Material studied: numerous semipupae from Mexico, collected by P. B. Kannowski.)

Kannowski, 1954, p. 4: "Larvae and pupae were usually found unsorted in the uppermost galleries. A peculiar feature of the larvae was noted in several nests.

EXPLANATION OF PLATE II

Novomessor albisetosus: fig. 1, larva in side view, X15. *Novomessor manni:* fig. 2, left mandible in anterior view, X116; figs. 3 and 5, simple body hairs, X217; fig. 4, anchor-tipped body hair, X217. *Monomorium (Notomyrmex) tambourinensis:* fig. 6, left mandible in anterior view, X278. *Monomorium (Notomyrmex) antarcticum:* fig. 7, left mandible in anterior view, X278; fig. 8, profile of worker larva, X7; fig. 9, profile of male larva, X7; fig. 10, profile of queen larva, X7. *Crematogaster (Orthocrema) minutissima:* fig. 11, head in anterior view, X102; fig. 12, left mandible in anterior view, X278; fig. 13, larva in side view, X38. *Crematogaster (Acrocoelia) coarctata vermiculata:* fig. 14, head in anterior view, X93; fig. 15, left mandible in anterior view, X333. *Crematogaster (Apterocrema) atitlanica:* fig. 16, head in anterior view, X118; fig. 17, left mandible in anterior view, X333. *Huberia striata:* fig. 18, type 2 body hair, X233; figs. 19-21, type 1 body hairs, X233; fig. 22, head in anterior view, X63; fig. 23, left mandible in anterior view, X214. *Rhopalothrix amoena:* fig. 24, type 3 body hair, X185; fig. 25, type 3 hair tip enlarged, X370.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Some of them were joined together side by side by hooked hairs which are present on the sides of the larvae, and were so joined that they resembled a small, open-ended, hollow sphere. Such an arrangement is probably an advantage to the workers in moving the larvae about and in keeping them together in a group.''

Genus **Pheidole** Westwood

Trabert, 1957, p. 299: brief reference to Wheeler and Wheeler, 1953*b*.

Pheidole dentigula M. R. Smith

Worker Larva.—Length (through spiracles) about 1.5 mm. Similar to *P. dentata* (Wheeler and Wheeler, 1953*b*, p. 71) except in the following details: Body hairs somewhat shorter; only two anchor-tipped hairs on the dorsum of each abdominal somite I-V. Head hairs with bifid or multifid tip. Maxillary palp with four apical and one lateral sensilla. Opening of sericteries not in a depression.

Sexual Larva.—Length (through spiracles) about 3 mm; straight length about 2.6 mm. Body subcylindrical; ventral profile straight, dorsal profile slightly curved. No body hairs or hair bases seen. Head hairs minute (about 0.005 mm). Mandibles with no denticles in the medial cavity. Maxillae without spinules. Otherwise similar to the male larvae of *P. dentata*.

(Material studied: numerous larvae from Georgia, collected by P. B. Kannowski.)

Pheidole metallescens Emery

Worker Larva.—Length (through spiracles) about 3.5 mm. Similar to *P. dentata* (Wheeler and Wheeler, 1953*b*, p. 71) except in the following details: Anchor-tipped body hairs somewhat shorter (about 0.187 mm), only two on the dorsal surface of each abdominal somite I-V. Each lobe of the labrum with three or four sensilla on the anterior surface, two on the ventral border and three on the posterior surface.

Sexual Larva.—Length (through spiracles) about 7.2 mm. Very similar to male larva of *P. dentata*. [All hairs have been broken off of our specimens.]

(Material studied: numerous larvae from Florida, collected by P. B. Kannowski.)

Pheidole morrisi Forel

Length (through spiracles) about 2.1 mm. Only two anchor-tipped hairs on the dorsum of each abdominal somite I-V. Otherwise similar to *P. dentata* (Wheeler and Wheeler, 1953*b*, p. 71). (Material studied: numerous larvae from Florida, collected by P. B. Kannowski.)

Pheidole pallidula (Nylander)

Goetsch, 1957, Fig. 5a, p. 22: a small sketch of a few larvae.
Valentini, 1951: internal anatomy.

Pheidole punctulata Mayr

Michener and Michener, 1951, p. 136, referred to feeding. (After Weber.)

Tribe **Crematogastrini** Forel

Genus **Crematogaster** Lund

Crematogaster (Acrocoelia) coarctata vermiculata Emery

(Pl. II, figs. 14 and 15)

Length (straight) about 2 mm; length through spiracles about 2.2 mm. Similar to *C.* (*A.*) *lineolata* (Wheeler and Wheeler, 1952*a*, p. 250) except in the following details: Slenderer; ends more broadly rounded. Some larvae have lateral welts smaller than and similar to *C. lineolata subopaca* type B (Wheeler and Wheeler, 1952a, p. 252). A minute midventral pocket near the posterior border of abdominal somite IX. Integument with a few minute spinules on the prothorax and abdominal somites IX and X. Head trapezoidal, narrowed ventrally. Head hairs longer (0.007-0.098 mm). Mandibles with the apex longer and slenderer. (Material studied: numerous larvae from Georgia, collected by P. B. Kannowski.)

Crematogaster (Acrocelia) rivai luctuosa Menozzi

Bernard, 1951*b*, p. 1064: "Les larves sont immobiles; celles de quelques espèces très évoluées possèdent des appendices latéraux et ventraux qui sont probablement des exsudatoires au même titre que ceux des *Pachysima*." Fig. 965, p. 1064, third stage larva, in ventrolateral view, after Menozzi, 1930.

Crematogaster (Apterocrema) atitlanica Wheeler

(Pl. II, figs. 16 and 17)

Male Larva.—Estimated length (through spiracles) about 2 mm. Spiracles unequal in diameter; the first the largest, the remainder decreasing gradually. Integument without spinules. Body hairs of at least two types: (1) simple, 0.018-0.027 mm long, a few on the ventral surface of each somite, shorter posteriorly; (2) 0.018-0.126 mm long, with short-bifid tip, on the dorsal and lateral surfaces. Cranium subrectangular, a third broader than long; occipital border straight; occipital corners rounded. A slender sclerotized bar extends along the sides of the head just inside the genae; somewhat below the antennal level it passes out and enters the prothorax. Antennae moderately large, with two or three sensilla, each of which bears a minute spinule. Head hairs short to long (0.029-0.09 mm), with short-bifid or denticulate tip. Labrum small; short (breadth about 3 times length); bilobed due to the concavity of the ventral border; anterior surface of each lobe with three or four sensilla; ventral border of each lobe with two or three contiguous sensilla; ventral border with a few minute spinules in short arcuate rows; posterior surface of each lobe with two or three sensilla; posterior surface with a few minute spinules in short arcuate rows. Mandibles feebly sclerotized; small; apical two-thirds rather stout, sharp-pointed and slightly curved medially, sometimes with a suggestion of a medial tooth. Maxillae small, with the apex conoidal and directed medially; palp a cluster of four sensilla; galea two agglomerated sensilla. Labium small; palp a cluster of four sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit. (Material studied: One damaged integument from Tsanjuyo, Guatemala, 19-III-1935, collected by W. M. Wheeler.)

Crematogaster (Orthocrema) minutissima Mayr

(Pl. II, figs. 11-13)

Length (straight) about 1.5 mm; length through spiracles about 1.9 mm. Plump, chunky and turgid; subelliptical; diameter nearly uniform, greatest at abdominal somite IV; anterior end broadly rounded, posterior end narrowly rounded. Anus subterminal. Leg, wing and gonopod vestiges present. Spiracles unequal in size, the first the largest, the remainder decreasing gradually. Integument on the dorsa of abdominal somites VI-X with a few minute spinules in very short rows. Body hairs sparse. Of three types: (1) simple, minute (0.008-0.023 mm), most numerous on the ventral surface of the prothorax; (2) moderately long (0.047-0.102 mm), slightly curved, with short-bifid tip, on all somites, the most abundant type; (3) long (0.156-0.254 mm), anchor-tipped, with slightly curved shaft, four in a row across the dorsum of each abdominal somite I-IV. Cranium subpentagonal, a fourth broader than long, occipital border nearly straight. A slender sclerotized bar extends just inside each gena from the level of the antennae to the maxillae; at its ventral end a stouter branch passes out and enters the prothorax. Antennae minute, each with three sensilla, each of which bears a spinule. Head hairs very few, short (0.027-0.045 mm), simple or with a few minute denticles at the tip. Labrum small; short, width 2.5 times length; bilobed due to concavity of the ventral border; anterior surface of each lobe with three sensilla; ventral and ventrolateral borders with a few minute spinules; ventral border with three sensilla on each lobe; posterior surface with a few spinules in short transverse rows and with four sensilla on each lobe. Mandibles small and moderately sclerotized; subtriangular, the apex very acute. Maxillae with the apex paraboloidal; palp a low knob with five sensilla; galea represented by two agglomerated sensilla. Labium small, without spinules; palp a cluster of five sensilla; a minute sensillum between each palp and the opening of the sericteries; the latter a short transverse slit on the anterior surface. Hypopharynx without spinules. (Material studied: numerous larvae from Georgia, collected by P. B. Kannowski.)

Tribe **Myrmicariini** Forel

Genus **Myrmicaria** Saunders

Myrmicaria eumenoides opaciventris Emery

Wheeler and Wheeler, 1953*a*, fig. 12, p. 187: the mesothoracic spiracle was omitted from the drawing.

Tribe **Solenopsidini** Forel

Genus **Huberia** Forel

Body hairs sparse and short. Of two types: (1) bifid, with the branches short to long, simple or recurved, generally distributed; (2) simple and slightly curved, a few on the ventral surface. No anchor-tipped hairs. Antennae minute. Head hairs few, moderately long, simple and flexible. Labrum short, broad and bilobed. Mandibles subtriangular in anterior view; of two parts, a stout sickle-shaped body and a narrow medial blade; apex forming a long slender curved tooth; blade bearing a single conspicuous medial tooth; anterior surface with a band of spinules across the middle. Maxillary palp a low irregular elevation; galea a frustum. Labial palp represented by a cluster of five sensilla. Spinules on the posterior surface of the labrum, the anterior surface of the mandibles and on the maxillae, and hypopharynx.

Huberia striata (F. Smith)

(Pl. II, figs. 18-23)

Worker Semipupa.—Length (through spiracles) about 4.6 mm. Spiracles small. Integument without spinules. Body hairs sparse and short. Of two types (1) 0.050-0.114 mm long, bifid, the branches short to long and simple or recurved, on all somites; (2) 0.05-0.11 mm long, simple and slightly curved, a few on the ventral surface of each thoracic somite and abdominal somites I-III. Cranium transversely subelliptical in anterior view, a fourth broader than long. Antennae minute, each with three sensilla, each of which bears a spinule. Head hairs few, moderately long (0.045-0.09 mm), simple and flexible. Labrum bilobed; short (breadth 2.3 X length); anterior surface of each lobe with five or six sensilla; ventral border of each lobe with four isolated and two contiguous sensilla; posterior surface of each lobe with three or four isolated and three contiguous sensilla; posterior surface spinulose, the spinules in moderately long subtransverse rows. Mandibles with the apical half heavily sclerotized; subtriangular in anterior view; of two parts—a stout sickle-shaped body and a narrow medial blade; apex forming a long slender curved tooth; blade bearing a single conspicuous medial tooth; anterior surface spinulose in a band across the middle, the spinules coarse and isolated or fine and in short rows. Maxillae with the apex paraboloidal and spinulose, the spinules minute and in short arcuate rows; palp a low irregular elevation with five sensilla (two encapsulated and three bearing a spinule each); galea a frustum bearing two apical sensilla. Labium with the anterior surface spinulose, the spinules minute and in short arcuate subtransverse rows; each palp represented by a cluster of five sensilla (two encapsulated and three bearing a spinule each); an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit on the anterior surface. Hypopharynx densely spinulose, the spinules minute and in short subtransverse rows; near the pharynx the rows are sublongitudinal.

Male (?) *Larva.*—Length (through spiracles) about 7.25 mm. Stout; thorax slightly attenuated and curved ventrally but not differentiated into a neck; abdomen inflated, diameter greatest at abdominal somite VI. Leg, wing and gonopod vestiges present. Similar to worker semipupa except as follows: Integument sparsely spinulose, the spinules minute and in arcuate rows. Body hairs longer. Posterior surface of labrum with a median dorsal patch of minute spinules, the spinules in short arcuate rows, the rows forming a reticulate pattern. Mandible with two subapical teeth and with spinules on the anterior, medial and posterior surfaces. Maxillae without spinules.

(Material studied: two worker semipupae and six male (?) larvae and semipupae from New Zealand, collected by E. A. Plank, courtesy of Dr. W. L. Brown.)

Genus **Monomorium** Mayr

Monomorium (Equestrimessor) n. sp.

Bernard (1951*a*, p. 93) mentioned this species as adapted to the dry soil of the Sahara.

Monomorium (Monomorium) minimum (Buckley)

The United States Department of Agriculture Bulletin No. 28 (Anon., 1953) has repeated the time-honored figure used by Back, *et al.*, which includes a larva in side view.

Monomorium (Monomorium) pharaonis (Linnaeus)

Hall and Smith (1953, p. 133) stated that the worker-larvae period is 17 days; sexual 21 days. Their discussion (pp. 133-134) of caste determination is summarized (p. 135) as follows: "There is a nutritional difference between larvae destined to be workers and those destined to be sexuals. This is apparent by a darkening of the gut contents, this darkening commencing when the worker larva is 9-11 days old and when the sexual larva is 14-17 days old. Explanations of this darkening phenomenon are discussed. In *M. pharaonis* (L.) it seems probable that caste determination is trophogenic—the difference between worker and sexual seems to be due to generous feeding of the sexual larvae for a further period of 6-10 days."

Subgenus Notomyrmex Emery

The following revises our treatment of the subgenus, 1955*b*, p. 122: Stout; prothorax (or prothorax and mesothorax) bent ventrally at right angles to form a very short stout neck; rest of body straight. Body hairs mostly bifid (in *M. antarcticum* a few anchor-tipped and a few with the tip denticulate). Antennae minute. Head hairs bifid or with bifid tip. Posterior surface of labrum sparsely spinulose, the spinules isolated. Mandibles of two parts, a slender sickle-shaped body and a blade projecting medially; medial border of blade with two sharp teeth. Maxillae with the apex spinulose; palp a short peg; galea a low elevation or a short peg.

Monomorium (Notomyrmex) antarcticum (F. Smith)

(Pl. II, figs. 7-10)

Worker Larva.—Length (through spiracles) about 3.3 mm; straight length about 2.5 mm. Stout; prothorax and mesothorax bent ventrally to form a very short stout neck; remainder of body straight; ends rounded; diameter greatest at the fourth and fifth abdominal somites; dorsal profile C-shaped; ventral profile sinuate. Anus posteroventral. Segmentation indistinct. Spiracles small, the first larger than the others. Integument sparsely spinulose, the spinules minute and widely spaced. Body hairs rather short and moderately numerous. Of three types: (1) short (0.054-0.13 mm), bifid, with flexible shaft and long flexible branches, the tip of each branch with a single or double hook, the most abundant type; (2) moderately long (about 0.13 mm), anchor-tipped with tortuous shaft, a few on the dorsal surface; (3) short to moderately long (0.027-0.13 mm), nearly straight, with frayed tip, a few on the ventral surface of the thorax and abdominal somites I-IV. Head subcordate. Antennae minute, each with three sensilla, each of which bears a minute spinule. Head hairs few, rather short to rather long (0.03-0.06 mm), curved, with short-bifid tip. Labrum distinctly bilobed; breadth twice the length; anterior surface of each lobe with five or six sensilla; ventral border of each lobe spinulose and with one isolated and two contiguous sensilla; posterior surface of each lobe with three or four isolated and a cluster of three contiguous sensilla; posterior surface spinulose, the spinules rather coarse and isolated. Mandibles heavily sclerotized; subtriangular in anterior view; of two parts—a slender sickle-shaped body and a medial blade bearing two large subapical teeth. Maxillae with the apex paraboloidal and spinulose; the spinules small and isolated apically, minute and in short transverse rows dorsally; palp a short frustum with one subapical and four apical sensilla; galea a short peg with two apical sensilla. Labium with the anterior surface spinulose, the spinules minute and in short arcuate rows; each palp a low elevation with five sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a short transverse slit. No spinules on hypopharynx.

Mature Queen Larva.—Length (through spiracles) about 5.5 mm; straight length about 3.8 mm. Body much stouter and head relatively much smaller; no neck. Otherwise similar to worker larva.

Mature Male Larva.—Length (through spiracles) about 3.7 mm. Very similar to worker larva.

Immature Queen Larva.—See first paragraph of our description, 1955*b*, p. 123 and Pl. I, figs. 16-19 and 21.

Young Sexual Larva.—See second paragraph of our description, 1955*b*, p. 123 and Pl. I, fig. 20.

Revision based on numerous larvae from New Zealand, courtesy of Dr. W. L. Brown.

Monomorium (Notomyrmex) tambourinensis Forel

(Pl. II, fig. 6)

Length (through spiracles) about 1.9 mm; straight length about 1.6 mm. Stout; thorax bent ventrally at right angles to form a very short stout neck; remainder of body straight; ends rounded; diameter greatest at the fourth abdominal somite; dorsal profile C-shaped; ventral profile nearly straight. Anus ventral. Leg and gonopod vestiges present. Segmentation indistinct. Spiracles small, the first larger than the others. Integument of the ventral surface with minute spinules in short subtransverse rows. Body hairs short and numerous. Of two types: (1) about 0.03 mm long, bifid with long branches, without alveolus and articular membrane, on every somite, the most numerous type; (2) about 0.036 mm long, bifid, with the branches long and attenuated, a few on each somite but most numerous on the ventral surface of the prothorax, with alveolus and articular membrane. Head moderately large; cranium subhexagonal, length equal to breadth; the occipital border broadly rounded. Antennae minute, each with three sensila, each of which bears a spinule. Head hairs moderately numerous and moderately long (0.036-0.048 mm), bifid, the branches long and extremely attenuated. Labrum small and short (breadth twice the length); bilobed; anterior surface of each lobe with six sensilla; ventral border of each lobe with one isolated and two contiguous sensilla; ventral border spinulose, the spinules minute and isolated; posterior surface of each lobe with three isolated and three contiguous sensilla; posterior surface sparsely spinulose, the spinules minute and isolated. Mandibles heavily sclerotized; of two parts—a sickle-shaped body with the apex curved posteriorly and a blade arising from the anterior surface, extending medially and bearing two subapical teeth. Maxillae with the apex paraboloidal and bearing a few minute spinules in arcuate rows; palp a short peg with one lateral and four apical sensilla; galea paxilliform, with two apical sensilla. Labium with the anterior surface sparsely spinulose, the spinules minute and isolated or in short arcuate rows;

each palp a low knob with five sensilla; an isolated sensillum between each palp and the opening of the sericteries; the latter a moderately wide slit on the ventral border. Hypopharynx without spinules. (Material studied: eight larvae from Queensland, collected by W. L. Brown.)

Although this species has been placed in the subgenus *Notomyrmex*, its larvae are subgenerically distinct from *Monomorium*, *Notomyrmex* and *Xeromyrmex*.

Monomorium (Parholcomyrmex) gracillimum (F. Smith)

Bernard, 1951*a*, p. 94: ''Deux formes plus steppiques que sahariennes, *Cataglyphis albicans* et *Monomorium gracillimum*, toutes deux probablement originaires d'Asie centrale, sont curieuses par la forte taille des larves néonates issues de l'oeuf. Il en résulte une croissance totale en volume très faible: les larves au 5e stade sont à peine 7 ou 8 fois plus grosses qu'à leur naissance, tandis que celles des, autres Fourmis ont de 21 à 330 pour le même rapport. C'est une adaptation à la sécheresse, une grosse larve néonate ayant une surface plus faible par rapport à son volume, d'où moindre évaporation.''

Monomorium (Xeromyrmex) ajjer Bernard

Valentini, 1951, p. 266: ''Les larves [des *Monomorium salomonis* et *M. ajjer*], quoique très semblables par leur adaptation à la sécheresse, présentent quelques faibles différences. Toutes sont arrondies, courtes, massives.'' Internal anatomy, pp. 266-268.

Monomorium (Xeromyrmex) salomonis (Linnaeus)

Bernard (1951*a*, p. 93) mentioned this species as adapted to the dry soil of the Sahara.

Bernard, 1953, p. 13: see above under *Messor aegyptiacus*.

Valentini, 1951, pp. 266-268: see above under *Monomorium ajjer*.

Genus **Epixenus** Emery

Epixenus algericus Bernard

Bernard, 1955, p. 277-279: ''Je dispose jusqu'à présent de deux séries de larves d'*Epixenus*, prises en mai 1955 dans les nids de la forêt de Baïnem: 3 grosses larves de 1 mm, 7 à 1 mm, 9; 12 larves de 1 mm, 15 à 1 mm, 30. Par comparaison avec *Monomorium salomonis*, qui a cinq stades larvaires comme la plupart des Fourmis, il est probable que les petites larves représentent le stade 2 et les grosses le stade 3. A part la taille, leurs morphologies sont très semblables: Tête bien différenciée, au moins autant que chez une larve de *Monomorium*, avec mandibules jaunes très visibles. Corps blanc au stade 2, jaunâtre ou brunâtre au stade 3. Les 3 segments thoraciques ont leur limites peu distinctes sur la face dorsale et très difficiles à voir ventralement. Les dix segments abdominaux ont leurs séparations bien nettes dorsalement et ventralement, mais non prolongées sur les côtés, sauf à la bordure du pygidium. Tous les segments et la tête portent de nombreux poils courts, dressés et plus ou moins incurvés. Seule la région des pièces buccales est peu poilue, avec quelques poils isolés rectilignes trois fois plus courts que les autres. Presque tous les poils du corps et du dessus de la tête sont courts, bifurqués, à branches de la fourche incurvées. Cela rappelle beaucoup *M. salomonis*, mais, chez ce dernier, il y a en plus un cercle de grands poils, rectilignes, en avant du prothorax. Ainsi faites, ces larves diffèrent notablement de celles des *Monomorium* déjà connus (*M. salomonis* (L.) et *gracillimum* Sm.) par leur corps moins cylindrique, bien plus poilu, les limites des segments beaucoup mieux indiquées, surtout pour les segments abdominaux 4 à 10. Le bord antérieur du prothorax ne porte pas de couronne de grands poils comme chez *Monomorium*. Les types larvaires les plus voisins seraient ceux de *Leptothorax acervorum* Nyl. . . . et de *Pheidole dentata* Mayr. . . . Encore ce *Pheidole* et ce *Leptothorax* ont-ils des poils larvaires plus longs et plus variés que notre *Epixenus*. En somme, la larve *d'E. algiricus* est moins évoluée, moins simplifiée extérieurement que celles des *Monomorium*, ce qui correspond aux caractères des adultes, où la reine surtout est moins comprimée et moins différente des ouvrières que chez *Monomorium*. Le genre *Epixenus* est donc, à divers égards, plus primitif que son proche parent *Monomorium*. Si les ouvrières amènent à le rapprocher étroitement de *Monomorium*, les larves s'éloignent de la tribu des *Solenopsidini* et peuvent être comparées à celles des *Leptothoracini*, sauf pour la pilosité.'' Fig. 2, p. 278, an immature larva in side view; mouth parts and body hairs enlarged.

We can not agree, however, that the larva of *Epixenus* differs notably from the larvae of *Monomorium* which we have studied (*M. pharaonis*, *floricola*, *antarcticum*, *tambourinensis* and two undetermined species near *minimum;* we have not seen *M. salomonis* or *gracillimum*.) *Epixenus* lacks the anchor-tipped hairs found in *Pheidole* and *Leptothorax* and has hairs similar to *Monomorium* (except *M.* (*Notomyrmex*) *antarcticum*). *Epixenus* apparently lacks the distinct teeth and denticles found on the mandibles of *Pheidole dentata*. In fact, Bernard's figures suggest that the larva of *Epixenus* is quite similar to the larva of *Monomorium*.

Genus **Xenomyrmex** Forel

Straight and subcylindrical. Head anteroventral. Body hairs short and moderately numerous. Of two types: (1) short, simple or with a few denticles, on all somites; (2) moderately long, anchor-tipped with sinuous shaft, four in a row across the dorsum of each abdominal somite I-V. Cranium subcircular in anterior view. Antennae small. Head hairs moderately numerous, short and simple. Labrum with the ventral border convex. Mandibles small; apical third of two parts—a curved body ending in a short apical tooth and a small blade arising from the anterior surface, directed medially and produced into two teeth. Maxillae rather small, appearing adnate; palp and galea very small, the former bearing only three sensilla. Labial palp a very small projection, which is pear-shaped in anterior view. No spinules on mouth parts.

''There seems to be little doubt . . . that they form their small colonies in the cavities of twigs. The structure of the female shows a marked adaptation to such a type of habitat. The slender thorax and long, narrow abdomen of the Xenomyrmex female are strikingly similar to those of the females of certain twig-dwelling species of Solenopsis (*picta* etc.). To a lesser extent, these modifications are shown by the worker and male'' (Creighton, 1950, Bull. Mus. Comp. Zool. Harvard Coll. 104: 224). The larva of *Xenomyrmex* also shows a striking convergent similarity to the larvae of other ants which inhabit plant cavities. The body is elongate, straight and subcylindrical and the hairs are short. ''Both of these characters are possibly adaptations to life in plant cavities, particularly tubular cavities of small bore. A long larva parked parallel and close to the wall would be less of a traffic hazard than a shorter larva parked crosswise or obliquely. These same characters are to be found also in the larvae of other ants which inhabit plant cavities, notably *Azteca, Camponotus, Crematogaster, Leptothorax,* and the Pseudomyrmecinae.'' (Wheeler and Wheeler, 1954*b*, p. 149.)

Xenomyrmex floridanus skwarrae Wheeler

Creighton, 1957, p. 13: ''When termites were fed to them the *skwarrae* workers not only lapped up the body fluids of the termites but cut their tissues into small pieces which they thrust into the mouths of the larvae. This was followed by extensive chewing and salivation on the part of the larvae. As a rule the copious salivary secretion of the larva formed a bubbly mass above its jaws. When this happened the worker would often take away the piece of termite and give it to another larva.''

Xenomyrmex stolli mexicanus Wheeler

(Pl. I, figs. 9-15)

Length (through spiracles) about 1.8 mm; straight length about 1.7 mm. Elongate, straight, subcylindrical; diameter greatest at abdominal somites IV and V; decreasing slightly to the anterior end and more rapidly to the posterior end, which is narrowly rounded; anterior end formed from the dorsum of the prothorax. Head anteroventral. Anus posteroventral. Leg, wing and gonopod vestiges present. Spiracles small, decreasing slightly posteriorly. Integument of the dorsal surface of abdominal somites VIII-X spinulose, the spinules isolated or in short rows. Body hairs short and moderately numerous. Of two types: (1) short (0.01-0.033 mm), simple or with a few denticles, on all somites, a few of the longest with alveolus and articular membrance; (2) moderately long (about 0.15 mm), anchor-tipped, with sinuous shaft, four in a row across the dorsum of each abdominal somite I-V. Head moderately large; cranium subcircular in anterior view. Antennae small, each with three sensilla each of which bears a minute spinule. Head hairs moderately numerous, short (0.01-0.02 mm), simple and nearly straight. Labrum short, breadth 2.5 times the length; anterior surface with eight minute hairs; ventral border convex and bearing one isolated and three contiguous sensilla on each half; posterior surface with four or five sensilla on each half; without spinules. Mandibles small, with the apical third heavily sclerotized and composed of two parts—a curved body ending in a short apical tooth and a small blade arising from the anterior surface, directed medially and produced into two teeth. Maxillae rather small, appearing adnate; palp a very small peg with three sensilla; galea a very small peg with two sensilla. Labial palp a very small projection, which is pear-shaped in anterior view, with one apical (bearing a spinule) and four basal (one encapsulated and three bearing a spinule each) sensilla; opening of sericteries a very small slit on the anterior surface. Hypopharynx without spinules. (Material studied: four larvae from a colony in an orchid pseudobulb from San Luis Potosí, Mexico, courtesy of Dr. W. S. Creighton.)

Genus **Allomerus** Mayr

Allomerus decemarticulatus octoarticulatus Mayr

Bernard, 1951*b*, p. 1019: ''Il est difficile de reconnaître les larves de futurs sexués autrement que par leur taille. Cependant, certain genres ont, après la 3e mue, de remarquables différenciations morphologiques, séparant nettement les reproducteurs des autres castes. Tel est le Myrmicide tropical *Allomerus octoarticulatus,* d'après G. C. Wheeler (fig. 936 [= Wheeler, 1935, pl. VIII, figs. 4 and 6]): les larves banales ont des segments convexes, à poils flexueux courts, et cela se maintient jusqu'à la nymphose chez l'ouvrière. Les larves sexuées acquièrent, après une mue critique, des segments plus cylindriques et sans poils, sauf des soies géantes sur la face ventrale de l'abdomen. Semblables changements existent certainement ailleurs . . . et présentent un grand intérêt pour l'origine des castes.''

Trabert, 1957, pp. 299 and 300: brief reference to G. C. Wheeler, 1935.

Genus **Solenopsis** Westwood

Michener and Michener (1951, p. 234): ''One species [of *Microdon*] is reported to eat the larvae of its host, *Solenopsis*, the fire ant.''

Solenopsis (Solenopsis) saevissima (F. Smith)

Wilson, 1958, p. 40: a photograph of sexual [queen?] larvae. Repeated by Wilson and Brown, 1958, p. 214.

Anonymous, 1954, p. 3: ''In 8 to 12 days the eggs hatch into larvae. When the larvae appear, they are ready to start feeding. They are helpless, dirty-white grubs, and can hardly move. They depend on the queen and the workers. The queen feeds her first larvae food that is stored in her own body. Workers feed larvae of subsequent broods.'' Life cycle: egg 8-12 days; worker larvae 6-12 days; pupa 9-16 days. Photograph of larva in side view, on page 4. This is referred to subspecies *richteri*. The above information is used in Anonymous, 1958.

Solenopsis (Diplorhoptrum) fugax (Latreille)

According to Trabert (1957, pp. 300-301) both sexes have 22-27 head hairs. Those of the queen are somewhat the longer. In the queen only the tips of the hairs are branched (2 to 4 fine branches). In the male on the dorsal half of the head the hairs are similar to body hairs—deeply bifid with the branches strongly divergent; sometimes the branches are bifid. The hairs on the ventral half of the head are also bifid but with the shaft longer and the branches relatively shorter. Both clypeal hairs have multifid tip. The mandible of the queen has an apical and two medial teeth. The mandible of the male has a sharp apex and a vestigial medial tooth. Fig. 1, p. 300, head hairs of queen and male compared; Fig. 2, p. 301, mandibles of queen and male.

Solenopsis (Diplorhoptrum) pergandei Forel

Worker Larva.—Length (through spiracles) 1.7 mm; straight length about 1.35 mm. Similar to *S. geminata* (Fabricius) (Wheeler and Wheeler, 1955*b*, p. 132) except in the following details: Integument of ventral surface of thorax and dorsum of posterior somites sparsely spinulose. Body hairs of two types: (1) 0.024-0.03 mm long, with nearly straight bifid tip, a few on the ventral surface of each thoracic somite; (2) elsewhere the hairs are bifid, 0.03-0.04 mm long, with the base about half the length, the branches more or less perpendicular to the base, the tips recurved; hairs on ventral surface with alveolus and articular membrane. Genae bulging. Head hairs much shorter (0.02-0.04 mm long). Maxillary and labial palps each with five sensilla (two encapsulated and three bearing a spinule each).

Sexual Larva.—Similar to those of *S. molesta* (Say) (Wheeler and Wheeler, 1955*b*, p. 134) except as follows: Body hairs of one type, 0.048-0.096 mm, bifid, with very short base and long straight branches; no hairs on the dorsum of prothorax and mesothorax and none on the entire ventral surface. No head hairs.

(Material studied: numerous larvae from Georgia, collected by P. B. Kannowski.)

Solenopsis (Diplorhoptrum) picta Emery

Length (through spiracles) about 1.5 mm; straight length 1.2 mm. Similar to *S. geminata* (Wheeler and Wheeler, 1955*b*, p. 132) except as follows: Ventral surface of thorax sparsely spinulose. Body hairs of three types: (1) 0.01-0.015 mm long, simple, mostly with alveolus and articular membrane, about 12 on the ventral surface of each thoracic somite and abdominal somite I; (2) 0.008-0.015 mm, with bifid tip, without alveolus and articular membrane, on all somites; (3) 0.02-0.03 mm long, with slightly curved shaft and single hook, on the dorsum of the thorax. Each lobe of the labrum with four sensilla on the anterior surface, three on the ventral border and five on the posterior surface; no spinules. Maxillary palp a slight elevation with four sensilla. Labium without spinules; palp a cluster of four sensilla. (Material studied: numerous larvae from Florida, collected by P. B. Kannowski.)

Solenopsis (Euophthalma) globularia littoralis Creighton

Length (through spiracles) about 2.0 mm; straight length about 1.6 mm. Generally similar to *S. geminata* (Wheeler and Wheeler, 1955*b*, p. 132) except in the following details: Integument of ventral surface of thorax with minute spinules in subtransverse rows. Body hairs of type (1) 0.015-0.03 mm long, with simple or denticulate tip, about ten on the ventral surface of each thoracic somite and abdominal somites I and II; (2) elsewhere the hairs are 0.015-0.025 mm long, the base about half the length, the branches more or less perpendicular to the base. Maxillary and labial palps each with five sensilla (two encapsulated and three bearing a spinule each). (Material studied: numerous larvae from Florida, collected by P. B. Kannowski.)

Tribe **Pheidologetini** Emery

Genus **Paedalgus** Forel

Paedalgus termitolestes Wheeler

Bernard, 1951*b*, p. 1065: "Les ouvrières, aveugles ou presque, pillent la termitière et nourrissent d'énormes larves de femelles. Par exemple, la larve femelle âgée . . . est obèse, à pièces buccales réduites, mais à glandes salivaires labiales hypertrophiées: comme les nymphes sont nues, le rôle de ces glandes dans la trophallaxie n'est guère douteux. Les poils crochus maintiennent les larves accrochées entre elles par paquets." Fig. 966, larva in side view, after W. M. Wheeler.

Tribe **Myrmecinini** Ashmead

Genus **Podomyrma** F. Smith

Podomyrma sp.

Immature Larva.—Length (through spiracles) about 3 mm. Generally similar to *P. adelaidae* (F. Smith) (Wheeler and Wheeler, 1954*d*, p. 127) but differing in the following details: Body hairs: (1) moderately long (about 0.24 mm), anchor-tipped, with tortuous shaft, 2-10 in a row across the dorsum of the metathorax and each abdominal somite I-VIII (two may be present on each abdominal somite IX and X); (2) all other hairs very short (0.012-0.06 mm) with short-bifid to multifid tip, on all somites, mostly without alveolus and articular membrane. Antennae small. Head hairs half as numerous and shorter (0.01-0.036 mm long), with bifid or multifid tip. Labrum without spinules except a few on the lateral borders; anterior surface of each lobe of labrum with eight sensilla. Mandibles stouter, with several denticles near the middle of the medial surface. Maxillary palp a slight elevation with five sensilla. Labium without spinules. (Material studied: numerous larvae from Sherbrooke For., Dandenong Ra., Victoria, Australia, 8-IX-1951, collected by W. L. Brown).

Genus **Atopula** Emery

Atopula hortensis Bernard

Valentini, 1951, pp. 269-271; internal anatomy.

Tribe **Leptothoracini** Emery

Genus **Leptothorax** Mayr

Subgenus **Dichothorax** Emery

Like *Myrafant* as amended below.

Leptothorax (Dichothorax) pergandei Emery

Length (through spiracles) about 3.6 mm. Similar to *L.* (*M.*) *ambiguus* Emery (Wheeler and Wheeler, 1955*a*, p. 22) except in the following characters: Body hairs of two types: (1) short (0.02-0.13 mm), longest dorsally, with short-bifid or short-multifid tip; (2) long (about 0.26 mm), anchor-tipped, with tortuous shaft, four in a row across the dorsum of each abdominal somite I-IV, two on V. Head hairs short (0.032-0.057 mm), with short-bifid or denticulate tip. Anterior surface of labrum with six minute hairs. Mandibles with two sharp-pointed subapical teeth. Maxillary palp a cluster of five sensilla. Labial palp a cluster of four or five sensilla. (Material studied: numerous larvae from New Jersey, courtesy of Dr. W. L. Brown).

Subgenus **Myrafant** M. R. Smith

Our previous characterization of this subgenus (1955*a*, p. 22) must now be amended to accommodate two additional species: Body hairs sparse. Of two or three types, including anchor-tipped.

Leptothorax (Myrafant) schaumi Roger

Length (through spiracles) about 1.7 mm. Similar to *L.* (*M.*) *ambiguus* (Wheeler and Wheeler, 1955*a*, p. 22) except in the following details: Integument without spinules. Body hairs sparse. Of two types: (1) short (0.009-0.117 mm), slightly curved, with denticulate tip, on every somite; (2) moderately long (about 0.144 mm), anchor-tipped, with tortuous shaft, four in a row across the dorsum of each abdominal somite I-V, two on VI. Head hairs short (0.005-0.012 mm), with multifid tip. Labial palp represented by a cluster of five sensilla. (Material studied: a dozen larvae from Georgia, collected by P. B. Kannowski.)

Leptothorax (Myrafant) texanus Wheeler

Mature Larva.—Length (through spiracles) about 3 mm. Similar to *L.* (*M.*) *ambiguus* (Wheeler and Wheeler, 1955*a*, p. 22) except in the following characters: Integument without spinules. Body hairs of two types. (1) short (0.024-0.168 mm), longest dorsally, with short-bifid tip, on every somite; (2) long (about 0.24 mm), four in a row across the dorsum of each abdominal somite I-III, anchor-tipped, with tortuous shaft. Head hairs short (0.009-0.024 mm), with short-bifid tip. Anterior surface of labrum with seven minute hairs; posterior surface with eight sensilla. Mandibles with two large subapical teeth on medial blade. Maxillary palp with four or five sensilla. Labial palp with five sensilla.

Just-Hatched Larva.—Similar to *L.* (*M.*) *ambiguus* (Wheeler and Wheeler, 1955*a*, p. 23).

Material studied: numerous larvae from Georgia, collected by P. B. Kannowski.

Leptothorax (Temnothorax) arenarius Santschi

Bernard, 1951*a*, pp. 93-94: "La forme externe et la pilosité ne sont pas sensiblement modifiées par rapport aux espèces hygrophiles des mêmes genres. Il n'y a pas lieu de retenir les déductions de Santschi (1908), basées sur *Leptothorax arenarius* des oueds tunisiens, selon lesquelles des poils crochus aideraient les larves à se maintenir dans le sable croulant. D'une part, *Cataglyphis bombycina*, éminemment sabulicole, a des poils simples et courts; d'autre part, une foule de *Leptothorax* et de *Crematogaster* habitant les roches lisses ont des poils crochus."

Genus **Macromischa** Roger

Our previous characterization of this genus (1955*a*, p. 17) needs revision as to hairs: Body hairs sparse to moderately numerous; of two or three types including short and spike-like, short to moderately long with multifid or denticulate tip and anchor-tipped. Head hairs few or moderately numerous and short or long.

Marcomischa manni Wheeler

Length (through spiracles) about 3.7 mm. Similar to *M. wheeleri* Mann (Wheeler and Wheeler, 1955*a*, p. 18) except in the following details: First spiracle not much larger than the others. Apparently without spinules on the integument. Body hairs moderately numerous. Of two types: (1) short to moderately long (0.018-0.19 mm), with multifid tip, generally distributed; (2) long (about 0.4 mm), anchor-tipped, with tortuous shaft, four in a row across the dorsum of the metathorax and each abdominal somite I-VI. Head small. Head hairs moderately numerous, longer (0.018-0.084 mm). Anterior surface of labrum with 12 short hairs; posterior surface with 10 isolated and two clusters of three sensilla each. Maxillary palp a cluster of five sensilla. (Material studied: nine larvae from Cuba, collected by E. O. Wilson, courtesy of Dr. W. L. Brown.)

Tribe **Tetramoriini** Emery

Genus **Tetramorium** Mayr

Tetramorium caespitum (Linnaeus)

According to Trabert (1957, pp. 301-303) the body hairs of the male are dendritic with the branches only slightly divergent. The queen body hairs have strongly divergent branches. Each sex has a few hairs intermediate between these two types. There are usually 24 hairs on the head. The head hairs of the queen are notably longer than those of the male and are bifid or multifid at the tip. Those of the male have the tip frayed into many more branches. In the male the maxillary palp and galea are stout and the galea is the shorter; in the queen they are more slender and the galea is longer than the palp. Fig. 3, p. 302, body hairs of male and queen; Fig. 4, p. 302, head hairs of male and queen compared; Fig. 5, p. 303, maxillary palps and galeae of male and queen.

Tribe **Basicerotini** Brown

Genus **Rhopalothrix** Mayr

Rhopalothrix amoena Mann

(Pl. II, figs. 24 and 25)

Immature Larva.—Length about 1.6 mm. Generally similar to *R. gravis* Mann (Wheeler and Wheeler, 1954*a*, p. 117) except in the following details: Body hairs of two types: (1) slender, flexible, denticulate, short to moderately long (0.048-0.192 mm), on all surfaces of all somites; (2) stout, of nearly uniform diameter, sinuous, long (about 0.17 mm), with denticulate shaft and a minute apical hook arising from a spoonshaped or subfusiform knob. Cranium subcircular. Head hairs moderately numerous, long (0.024-0.096 mm). Labrum wider (breadth three times the length); posterior surface of each lobe with two contiguous sensilla. (Material studied: two immature larvae from the Chiriqui Mts., Panama, collected by F. M. Gaige, determined by W. L. Brown.)

Rhopalothrix biroi Szabó

Wilson, 1956, p. 22-23: ''If any generalization is to be made about food preference, it is probably safest to say that this species of *Rhopalothrix* accepts a wide variety of soft-bodied arthropods and rejects other animals that are either hard-bodied or possess repugnant odors . . . Captured animals were either left on the brood chamber apart from the larvae, or else placed immediately among the larvae, which fed on it directly, ponerine fashion. The adults fed separately or simultaneously with the larvae on the same animal . . . The workers were very solicitous of the brood, washing it and moving it about constantly. They were in fact more attentive in this way than any dacetine genera I have studied.''

Tribe **Dacetini** Forel

Genus **Epopostruma** Forel

Epopostruma sp.

Length (through spiracles) about 3.5 mm. Indistinguishable from *E.* sp. which we have described, 1954*a*, p. 128. (Material studied: four larvae from Ferntree Gully, Dandenong Ra., Victoria, Australia, 8-X-1951, W. L. Brown coll. et det.)

Genus **Strumigenys** F. Smith

Our previous description (1954*a*, p. 135) should be amended to read as follows: Short and stout; prothorax directed ventrally; dorsal profile C-shaped, ventral feebly sinuate; diameter of body increasing gradually from anterior end to abdominal somite V, then decreasing to posterior end. Segmentation indistinct. Body hairs moderately numerous and short to moderately long. Of three types: (1) on the ventral surface, few, denticulate, flexible; (2) bifid, with the branches denticulate; (3) anchor-tipped, with tortuous shaft, two or four in a row across the dorsum of each abdominal somite I-IV or I-V. Antennae small to moderately large, with only two sensilla each. Head hairs short to moderately long, flexible and denticulate. Maxillary palp a low elevation bearing four sensilla. Labium with a pair of mammiform ventrolateral lobes, each bearing a palp which is a low elevation with four or five sensilla.

Strumigenys biolleyi Forel

Length (through spiracles) about 2.7 mm. Similar to *S. louisianae* Roger (Wheeler and Wheeler, 1954*a*, p. 136) except in the following details: Anchor-tipped hairs longer (about 0.26 mm long), on abdominal somites I-IV. Middle of occipital border straight. Antennae moderately large. Labrum narrower (breadth 1.8 times length); anterior surface of each lobe with four sensilla; posterior surface of each lobe with three isolated and three contiguous sensilla. Labial palp with five sensilla. (Material studied: four larvae from Panama, collected by F. M. Gaige, det. W. L. Brown.)

Strumigenys godmani Forel

Worker Larva.—Length (through spiracles) about 3.6 mm. Similar to *S. louisianae* (Wheeler and Wheeler, 1954*a*, p. 136) except in the following details: Body hairs longer: (1) 0.072-0.144 mm long; (2) 0.11-0.2 mm long; (3) about 0.3 mm long, two on the dorsum of each abdominal somite I-IV. Antennae moderately large. Subapical tooth of mandible smaller.

Just-Hatched Larva.—Length (through spiracles) about 0.8 mm. Body shape very similar to very young larva of *Smithistruma nigrescens* (Wheeler) (Wheeler and Wheeler, 1954*a*, p. 144). Otherwise similar to mature larva of *godmani* except in the following details: Body hairs sparse; (1) 0.051-0.15 mm long; (2) shorter (0.012-0.036 mm long), very few on lateral surfaces only; (3) shorter (about 0.2 mm long). Head hairs much longer (0.018-0.072 mm long). Mandibular teeth shorter and with sharper points.

(Material studied: 12 larvae from Panama, coll. F. M. Gaige, det. W. L. Brown.)

Strumigenys loriae Emery

Wilson and Brown, 1956, p. 451: In mixed nests, the larvae of *Strumigenys loriae* were mixed with the brood of *Kyidris yaleogyna* Wilson and Brown or *K. media* Wilson and Brown. Both species of workers fed and cared for the mixed brood but the *Kyidris* workers were reported to be "ineffectual."

Strumigenys n. sp.

Worker Larva.—Length (through spiracles) about 2.4 mm. Similar to *S. louisianae* (Wheeler and Wheeler, 1954*a*, p. 136) except in the following details: Body hairs of type 2 shorter (0.048-0.072 mm); type 3 about 0.15 mm long, two on the dorsum of each abdominal somite I-V. Head hairs shorter (0.014-0.096 mm long). Antennae moderately large. Mandible with the medial teeth larger, the proximal tooth directed medially. Labium not bilobed; palp with five sensilla.

Male Larva.—Length (through spiracles) about 3.3 mm. Similar to the worker larva except in the following details: A minute midventral pocket on the ninth abdominal somite. Body hairs sparse; longer: (1) 0.1-0.2 mm long; (2) 0.065-0.15 mm long; (3) about 0.23 mm long, four in a row across the dorsum of each abdominal somite I-V. Labium bilobed.

(Material studied: numerous worker larvae and male semipupae, from Progresso, Chiriqui Mts., Panama, 15-IV-1923, F. M. Gaige, #332; det. W. L. Brown.)

Strumigenys sp. (**szalayi** group)

Mature Larva.—Length (through spiracles) about 2.3 mm. Similar to *S. louisianae* (Wheeler and Wheeler, 1954*a*, p. 136) except in the following details: Anterior end more swollen dorsally; posterior end slenderer. Head relatively larger. Body hairs (1) 0.042-0.12 mm long, on the ventral surface of the thorax and abdominal somites I-VIII; (2) 0.072-0.096 mm long; (3) about 0.23 mm long. Head hairs shorter (0.012-0.072 mm long). Antennae moderately large. Medial teeth of mandible directed anteromedially. Labial palp with five sensilla.

Very Young Larva.—Shape similar to that of *Smithistruma nigrescens* (Wheeler); otherwise similar to the mature larva.

(Material studied: a dozen larvae from Baliem, Dutch New Guinea, 14-XII-1938, 1600 m, L. J. Toxopeus; det. W. L. Brown.)

Strumigenys sp.

Length (through spiracles) about 3.2 mm. Similar to *S. louisianae* (Wheeler and Wheeler, 1954*a*, p. 136) except in the following details: Body hairs sparse; (1) longer (0.054-0.144 mm long); (2) 0.084-0.12 mm long; (3) longer (about 0.2 mm long). Head hairs shorter (0.024-0.1 mm long). All mandibular teeth round-pointed and blunt. (Material studied: numerous larvae from Chiriqui Mts., Panama, 19-V-1923, F. M. Gaige, #497; det. W. L. Brown.)

Genus **Smithistruma** Brown

Smithistruma alberti (Forel)

Similar to *S. talpa* (Weber) (Wheeler and Wheeler, 1954*a*, p. 141) except in the following details: Body hairs: (1) 0.036-0.072 mm long; (2) 0.06-0.12 mm long; (3) about 0.18 mm long, four in a row across the dorsum of each abdominal somite I-V. Each labial palp with five sensilla. (Material studied: two damaged larvae from Panama, coll. F. M. Gaige; det. W. L. Brown.)

Tribe **Attini** F. Smith

Bischoff, 1927, p. 384: ''Bei den pilzzüchtenden Attinen bilden die kultivierten Pilzkohlrabi die wichtigste Brutnahrung.''

Weber, 1956*b*, p. 605: Ant saliva may possibly promote the growth of mycelia. ''This would account for the covering of mycelium that a well-licked larva may develop.''

Weber, 1958, p. 463: ''The care of the brood is similar among the attines. The brood is kept in the cells of the gardens, except in *Cyphomyrmex rimosus* where the brood is roughly segregated from the garden and in piles according to size.

''It is significant and striking that the brood in all genera known is commonly coated with the mycelium of the fungus. In *Cyphomyrmex rimosus*, where the fungus is cultivated in the form of masses of yeast-like cells, the brood is covered with filamentous hyphae as in the other attines. This mycelial covering may be so dense as to completely obscure the larvae and pupae. The eggs may bear less numerous tufts of the mycelium. The mycelium is planted by the ants on the brood integument as they similarly plant the substrate. For this reason, and apparently because of changing luxuriantness of the fungus in the garden and feeding habits, the brood within a colony may vary in the completeness of its mycelial coat from day to day. The hairy larvae of *Acromyrmex octospinosus* may lack a fungus coat. All stages of brood among attines are frequently licked by the workers. The saliva as added may be nutritive for the fungus and of course the latter may be food for the adults.

''Larvae are fed by the worker bringing in masses of the fungus and placing them on the mouthparts, where the larva takes over and manipulates the fungus so that it can imbibe the contents of the rasped or punctured cells. It usually rests on its dorsal or lateral surfaces with mouthparts directed outward and frequently embedded in the garden as so much substrate, being held in place by its hairs or by a mesh of mycelium.''

Genus **Cyphomyrmex** Mayr

Cyphomyrmex rimosus Spinola

Weber, 1958, p. 463: See above under tribe Attini.

Cyphomyrmex rimosus minutus Mayr

Weber, 1955: ''The brood is kept separate from the garden and is segregated according to size; large larvae may be mingled with pupae. The brood is usually enveloped in a mycelium that differs from that in other attines in being almost granular in superficial appearance, consisting of dense masses or tufts that are always connected by ordinary hyphal strands. Under a 32X binocular the tufts show as a more concentrated form of bromatia than in other attine species . . . Eggs and the smallest larvae as well as larger brood may be covered with the mycelium. The position and frequency of the tufts indicate that they sometimes may be planted by the workers. Larvae are fed as in other attines by placing the fungus on the mouthparts. In this species the fungus fed to the larvae seems to consist only of the cheese-like bromatia. As the larva feeds, the mouthparts go in and out like pistons while the bromatium is rasped and the juices imbibed'' (p. 277-278). Fig. 1, photograph of nest in Petri dish, showing larvae.

Genus **Sericomyrmex** Mayr

See *Trachymyrmex wheeleri* (below).

Genus **Trachymyrmex** Forel

Trachymyrmex septentrionalis (McCook)

Weber (1956*a*, p. 156) described two young larvae (1.5 and 1.0 mm long) as ''smooth and shiny.'' Two days later the smaller larva had a scanty covering of hyphae.

Trachymyrmex wheeleri (Weber)

G. C. Wheeler described (1948, 670-671, Pl. II, figs. 9-13) the larva of this species as *Sericomyrmex wheeleri*. Weber has transferred the species to *Trachymyrmex* (*Entom. News* 69: 54. 1958).

Trachymyrmex sp.

Michener and Michener (1951, Fig. 90, opposite p. 208): photograph of larvae on a fungus garden.

Genus **Acromyrmex** Mayr

Morley (1953, p. 21, fig. 2a) reproduced G. C. Wheeler's 1943 figure of *Eciton* (*E.*) *hamatum* head in anterior view erroneously under this genus.

Acromyrmex octospinosus (Reich)

Weber, 1958, p. 463: ''The hairy larvae . . . may lack a fungus coat.''

Genus **Atta** Fabricius

Brun (1924, p. 95) made a brief mention of sex determination in *Atta*.

Steinhaus (1949, p. 96): ''The larvae hatching from the eggs eat the fungus'' in the nest of a colony-founding queen. This is contrary to the observations of Huber (1905, translation 1907), W. M. Wheeler (1907 and later), Forel (1923), etc. (See references: G. C. Wheeler, 1948, pp. 676-683). See also Michener and Michener, 1951, p. 166.

Atta insularis Guérin

Bruner and Barry (1949, p. 140) reported that in an incipient colony the life cycle was: egg 15 to 16 days; larva 9 to 22 days (average 17; pupa 11 to 15 days (average 14). (English summary, p. 151.)

Atta sexdens (Linnaeus)

Brun (1924, p. 90) reviewed Huber's (1905) account of colony-founding. Also he referred (p. 37) to Goeldi's conclusions on caste determination: ''Ein weiteres Argument für die trophogene Theorie hat neuerdings Göldi durch eine interessante Beobachtung bei der südamerikanischen Pilzzüchterin *Atta sexdens* geliefert. Er fand nämlich in den Brutkammern der Nester dieser Ameisen eigentümliche Knäuel, die sich bei näherer Untersuchung aus etwa einem Dutzend kleinster Arbeiter zusammengesetzt erwiesen, welche je eine grosse männliche oder weibliche Larvae vollständing bedeckten. Diese 'Ammen' schienen in eine Art lethargischen Schlaf versunken und hafteten so fest an ihrer Unterlage, dass sie sich sogar in Spiritus nicht von derselben loslösten. Göldi glaubt, in diesen Brutknäueln 'das biologische Äquivalent der verbesserten Aufzuchtbedingungen (Raum, Futter in qualitativer und quantitativer Hinsicht) erblicken zu dürfen, welche im Bienenhaushalte von den Arbeitsbienen den Geschlechtsindividuen (Weisel and Drohnen) geboten werden (Göldi 1916).'' We have been unable to find any article by Goeldi dated 1916, nor any other reference to such an article.

Eidmann, 1935: ''Die kleine Larve verlässt durch ein seitlich genagtes Loch die Eischale'' (p. 197). ''Die Larve von *A. sexdens* ist wie alle Ameisenlarven eine bein- und augenlose Made. Am Abdomen lassen sich 10 Segmente unterscheiden, die besonders bei den Junglarven gut ausgeprägt sind, so dass die Larve insgesamt 13 Segmente zählt. Die Larven sind holopneustisch, d. h. sie haben die normale Zahl von 10 Stigmen, von denen 2 dem Thorax (Meso- und Metathorax), der Rest den ersten 8 Abdominalsegmenten angehört. Die Junglarve ist ziemlich gleichmässig ventral eingekrümmt und von gelblicher Färbung. Der Kopf ist relativ gross und beborstet, die Kopfkapsel schwach chitinisiert. Die Antennen sind angedeutet durch warzenförmige Erhebungen, auf welchen sich 2 Sinneshöcker erkennen lassen. Die Mandibeln sind relativ gross und auf ihrer Aussenseite dicht bedornt. Sie haben einen schwach gezähnten Kaurand. Der Körper der Junglarve ist mit äusserst feinen, teilweise gruppenartig beieinander stehenden Dörnchen bedeckt. Behaart ist ausser dem Kopf nur das letzte Segment in der Umgebung des Afters, sowie die Ventralseite des Pro- und Mesothorax, die eine dichte bürstenartige Beborstung aufweist, welche wohl mit der Nahrungsaufnahme in Zusammenhang stehen dürfte. Von der Verpuppung gehen an der Larve eine Reihe von Veränderungen vor sich, und diese wird zur Präpuppe. An ihr fällt der relativ sehr kleine Kopf auf, welcher wie ein kleines Anhängsel vorn an dem buckelförmig aufgetriebenen Prothorax sitzt. Letzterer enthält in diesem Stadium die Anlage des mächtigen Puppenkopfes, der die Auftreibung verursacht. Die Haut ist in diesem Stadium prall ausgedehnt, die Segmentierung daher besonders in der Abdominalregion kaum kenntlich. Die Behaarung ist spärlich und kurz und beschränkt sich auf den Kopf, den Prothorax und die letzten Abdominalsegmente'' (p. 198-199). Figure 6, p. 198, young larva and semipupa in side view. At the end of September eggs, young larvae and mature larvae were in the nest but middle-sized larvae and the larvae and pupae of the sexual forms were absent (p. 195).

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NEW NORTH AND CENTRAL AMERICAN SPECIES OF SCIOMYZIDAE

(DIPTERA: ACALYPTRATAE)[1]

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The following descriptions are presented at this time mainly because several of the species are subjects of biological investigations and are therefore in need of names. All of the species are referable to the subfamily Tetanocerinae.

Guatemalia, new genus

Vallar bristles absent; ocellar bristles well developed; hind tibiae with one strong dorsal preapical bristle; mid-frontal stripe broad and long; second antennal segment more than half as long as third segment, arista black-haired; lunule narrowly exposed; mesopleura and sternopleura covered with short hairs, without bristles; pteropleura bare; one fronto-orbital bristle; wings with well developed pattern of bars and spots; male postabdomen very similar to that of *Tetanocera,* almost symmetrical, only aedeagus and tergites 6 and 7 strongly asymmetrical. Closely allied to *Tetanocera* and in general appearance much like *T. valida* Loew, which has two fronto-orbitals and entirely bare mesopleura. No species of *Tetanocera* has been recorded from so far south as is the type species of this genus.

Generitype.—Guatemalia hubbelli, new species. Gender feminine. The only other species that may be included in this genus is *Tetanocera straminata* Van der Wulp, from Guerrero, Mexico, but its description is inadequate.

Guatemalia hubbelli Steyskal, new species

(Figures 1 to 4)

Male.—Length of wing, 5.9 to 6.2 mm. Color tawny, except as noted below. All bristles and hairs, including those of arista, black. Squamal fringe pale yellow.

Head: Black spots behind *pvt* bristles, at either side of ocellar triangle, at anterior end of mid-frontal stripe, and laterad of antennal bases; a slender parafrontal black stripe extends from *fo* halfway to anterior margin of front. Mid-frontal stripe broad and concave, extending almost to frontal margin; shining parafrontal stripes very narrow, extending from *vt* to *fo;* front otherwise dull. Face yellowish pruinose. Chaetotaxy: one each of long and strong *vte, vti, pvt,* and *oc;* one pair of *fo* half as long as *vt.* Hairs of front sparse, a few close to eyes and some in middle of front anterad of end of parafrontal black stripes; hairs of cheeks scarcely extending onto parafacials, very few above level of lower margin of eyes. Antennae with second segment laterally compressed, 0.32 mm. wide by 0.41 mm. long; third segment strongly tapering, slightly concave on upper margin, 0.6 mm. long; arista with dense long hairs. Palpi slender, yellow.

Thorax dull; a broad central brown stripe extends from anterior margin, where it is trifid for a short distance, to tip of scutellum; a pair of sublateral brown

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[1]Most of the species descriptions included herein are based, wholly or in part, upon specimens collected by Mr. Stuart E. Neff, of Cornell University, in an investigation supported by a research grant (E-743) from the National Institute of Allergy and Infectious Diseases, of the National Institutes of Health, Public Health Service.

stripes extend from mesad of humeri to postalar callus; the dorsal humeral groove is also brown, and the broad upper part of the pleura is brown from anterior face of humeri to hypopleural callus, but a small wedge of yellow is left in upper hind corner of mesopleura. Chaetotaxy: 1 *h*, 1 *sl*, 2 *n*, 1 *sa*, 2 *pa*, all long and strong; 1 long and 1 weak *dc;* 1 weak *acr*. Scattered hairs present over most of mesopleura and sternopleura; prosternum bare. Scutellum flattened above, covered with short hairs and with 2 subequal pairs of marginal bristles.

Legs: All femora and tibiae with black tips; apical tarsal segments blackish. Fore coxae with 3 bristles in apical half; hind coxae with a well developed group of hairs at upper apex. Fore femora with only short and weak bristles below, dorsally with a row of about 6 strong bristles; middle femora with 1 mid-anterior bristle and 1 posterior bristle in apical fifth, with many antero- and posteroventral bristles. Claws and pulvilli a little longer than last tarsal segment.

Wings yellow, with dark brown pterostigma, about 8 spots each in marginal and submarginal cells, both crossveins broadly seamed, 1st posterior cell with 5 or 6 crossbars and a median longitudinal stripe in apical ¾, discal cell with 3 or 4 rather fain crooked or bifid bars that extend somewhat posterad of 5th vein. *Ta* at middle of discal cell; *tp* buckled outward in middle to approximately 135°.

Abdomen with broad, subshining brown stripe medially and a pair of rather narrow complete lateral stripes only slightly within lateral margins of tergites. All bristles rather short, those of last segment longest, but still only ⅔ length of segment. Postabdomen as in figs. 1 to 4; surstyli strongly curved forward, with claw-like tips; cerci and anus well removed from posteroventral margin of epandrium.

Female.—Length of wing, 7.2 mm. Similar to male. Face subshining, a little pitchy at middle of lower margin.

Types.—Holotype and 3 paratypes (males), *Guatemala:* Panajachel, Sololá, 1560 m., April 28, 1956 (T. H. Hubbell), notebook no. 208 ("in low herbage and grass in sunny open part of coffeegrove"); 2 male paratypes, same locality, January 20, 1956 (I. J. Cantrall), notebook no. 4 ("fallow farming plot, including moist areas with *Juncus*, *Cyperus*, and *Tradescantia*"). Allotype, *Guatemala:* Patzún, Chimaltenango, Ruta Nac. 1, km. 90, 6300 ft., August 3, 1958 (Neff and Matthews). All in University of Michigan Museum of Zoology, except 2 male paratypes in my collection and 1 in that of Cornell University.

The name of this species is appreciatively dedicated to one of its collectors, my friend Theodore H. Hubbell, director of the University of Michigan Museum of Zoology.

Genus **Dictya** Meigen

In my recent revision of the American species of this genus (Steyskal, 1954, Ann. Ent. Soc. Am., 47: 511-539), 17 species were assigned

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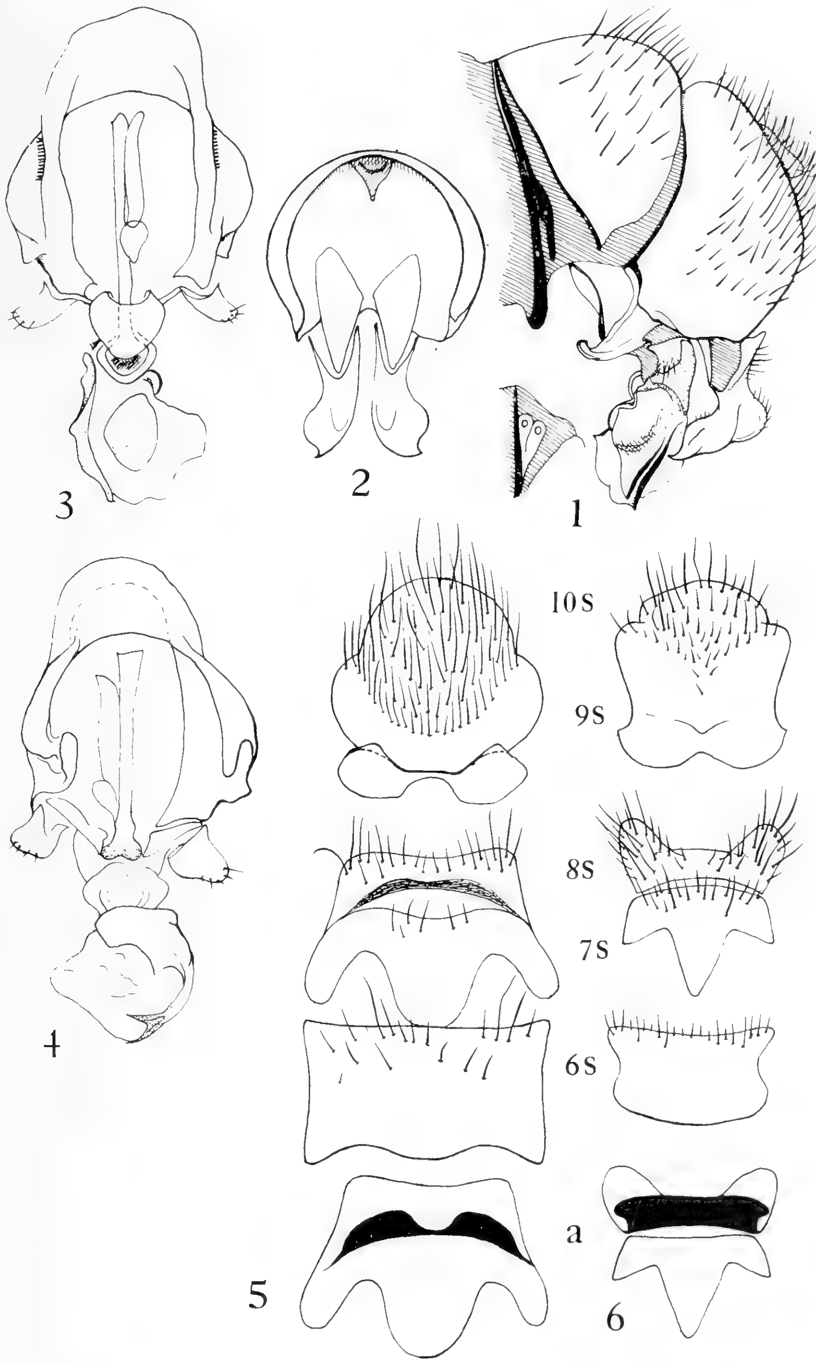
Guatemalia hubbelli, new species, male postabdomen: fig. 1, left profile, extended, with tip of right side of fused 6th and 7th sternites; fig. 2, anterior view of epandrium with hypandrial structures removed, showing surstyli and divided 10th sternite; fig. 3, posterior view of hypandrium, aedeagus and associated parts; fig. 4, same, anterior view; *Dictya matthewsi*, new species, fig. 5, sixth to tenth sternites of female; *D. abnormis* Stey., fig. 6, sixth to tenth sternites. a—internal view of seventh and eighth sternites, with apodemes in black.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to the typical group, differing from each other in scarcely more than details of the postabdomen. Two additional species of that group are now described, as well as another of the "abnormis group." I have found that it is necessary to disassociate the parts of the female postabdomen sufficiently to obtain a view of the ninth tergite perpendicular to its surface in order to make proper comparisons between species and, by cutting the lateral membrane of one side, to examine the apodemes on the internal side of the eighth sternite. These apodemes are highly characteristic, permitting easy differentiation of species that are otherwise difficult to separate in the female sex. The sixth sternite has also proved useful, its shape and proportions also helping to distinguish closely similar forms.

The "abnormis group" is not sharply differentiated from the more typical forms. The new species *Dictya matthewsi*, as will be seen from its description below, is but little different from several members of the typical group in the male postabdomen, while the head shows the characters of *abnormis* in a somewhat reduced degree.

Dictya abnormis Steyskal

(Figure 6)

Dictya abnormis Steyskal, 1954, Ann. Ent. Soc. Am., 47: 518 (one male, Head of Piedras Verdes River, Sierra Madre, Chihuahua, Mexico).

Material brought back from Mexico by Stuart E. Neff and Eric G. Matthews and reared in the laboratory included several specimens of *Dictya abnormis*, among which were 3 of the hitherto undescribed females. I am here describing those females and designating one of them as allotype.

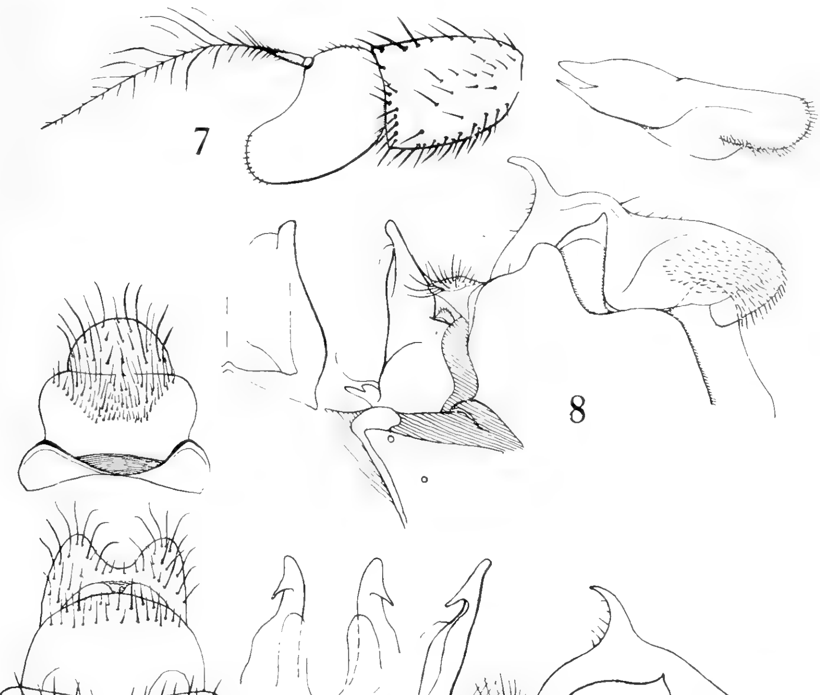
Female.—Length of wing, 4.0 to 5.0 mm. Postabdomen as in figure 6; 6th sternite nearly twice as wide as long, with distinct emarginations laterally, nearly straight posteriorly, and convex anteriorly; 7th sternite with an acute median anterior lobe; the anterolateral angles separated from the median lobe by 90° sinuses, the posterior margin gently arcuate and not fused with the 8th sternite; 8th sternite with a pair of widely separated tongue-like lobes, the apodemes fused across meson to form a single lamina with sharp lateral corners; 9th sternite with basal shelf consisting of a pair of contiguous, roundingly arcuate lobes.

Type.—Allotype (female), *Mexico:* 6 miles north of Oaxaca, August 10, 1958 (Neff and Matthews), in United States National Museum.

Dictya matthewsi Steyskal, new species

(Figures 5, 7, 8)

Male.—Length of wing, 4.15 to 4.7 mm. (average of 15 specimens, 4.41 mm.). Prosternum bare. Antennae as in figure 7, with upper outer half of second segment shining. Dull black parafrontal spots extending ⅓ of distance from orbits to middle of front. Mid-facial spot 1/5 the width of medifacies. Presutural bristle approximately ⅔ as long as notopleurals. Middle femora posteroventrally with 10-12 short and rather stout bristles in apical half. Postabdomen as in figure 8; surstyli not very different from those of species of the typical group, but in



Dictya matthewsi, new species, male: fig. 7, antenna; fig. 8, postabdomen, with ventral view of surstylus and anterior view of half of hypapandrium; *D. iron*, new species: fig. 9, postabdomen of male, with anterior view of pregonites; fig. 10, sixth and succeeding sternites of female (a—internal view of seventh and eighth sternites, with apodemes in black; b—oblique posteroventral view of ninth sternite); *D. neffi*, new species, male: fig. 11, postabdomen, with anterior view of hypandrium.

ventral view with lateral bulge and blunt tip; pregonite short and straight, with obliquely truncate tip extending but little beyond the membranous flange; ventral process of epandrium with short broad lobe.

Female.—Length of wing, 5.05 to 5.55 mm. (average of 11 specimens, 5.23 mm.). Antennae with second segment slightly longer than in the male. Middle femora without specialized shorter or stouter bristles. Postabdomen as in figure 5; 6th sternite rectangular, nearly twice as broad as long, posterior margin nearly straight, lateral margins slightly concave, anterior margin bisinuate; 7th sternite fused with 8th sternite, the 7th deeply biemarginate and with median lobe wide and tongue-like, the 8th sternite without distinct lobes, apodemes short, somewhat sloping laterally and disjunct mesally by a rounded sinus; 9th sternite short and broad, without shelf, but with 2 large polygonal lobes, each of which has mere rudiments of posterolateral teeth.

Type.—Holotype (male, No. 3518), allotype, and 14 male and 10 female paratypes, *Mexico, Chiapas:* Las Cruces (near Cintalapa), July 16, 1958 (Neff and Matthews), in Cornell University collections, except 2 pairs retained in my collection.

This species is apparently related to *Dictya abnormis,* but quite different in many details of the postabdomen in both sexes. I am happy to dedicate it to one of its collectors, Eric G. Matthews.

Dictya iron Steyskal, new species

(Figures 9 and 10)

Male.—Length of wing, 4.6 mm. Prosternum bare. Postabdomen as in figure 9; surstyli very broad dorsoventrally, dorsal tip almost rounded and projecting but little, lateral line very steep; pregonite with long slender process pointed apically and with retrorse preterminal lobe, in anterior view with mesal margin curving outward, the preterminal lobe directed outward; ventral process of epandrium bilobate.

Female.—Length of wing, 5.2 to 5.4 mm. Postabdomen as in figure 10; 6th sternite rectangular, nearly twice as broad as long, anterior corners broadly rounded; 7th sternite with rather shallow anterior emarginations, posterior margin semicircular and broadly fused to 8th sternite; 8th sternite with deep emargination, apodemes large, subrectangular and narrowly connected mesally; 9th sternite with but slight shelf and teeth, but with basal lobes projecting well laterad of main body of sternite.

Types.—Holotype (male), *Mississippi:* Horn Island, Sept. 13, 1944; allotype, same locality, Sept. 11, 1944; one female paratype, same locality, Sept. 1, 1944 (collector not cited on label); all returned to C. P. Alexander, Massachusetts State College.

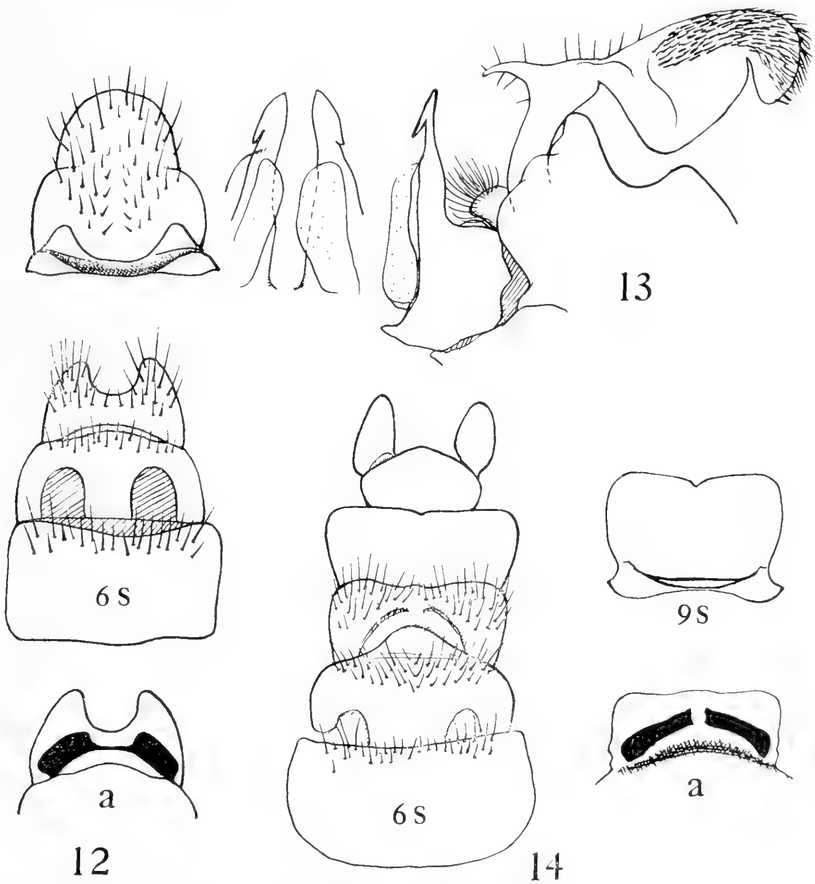
The name of this species is from Greek *eírōn,* "dissembler." This species is a member of the typical group and is closely related to *Dictya neffi, Dictya oxybeles* (v.i.), and the species to which the latter is compared.

Dictya neffi Steyskal, new species

(Figures 11 and 12)

Male.—Length of wing, 4.3 to 4.95 mm. (average of 8 specimens, 4.62 mm.). Prosternum bare. Postabdomen as in figure 11; surstyli moderately broad, dorsal tip rounded and projecting a little, lateral line steep; pregonite with long, bluntly tipped process with retrorse preterminal lobe, in anterior view curved outward and then back inward, the preterminal lobe ending in line with lateral margin; ventral process of epandrium with small short lobe.

Female.—Length of wing, 5.2 to 5.3 mm. Postabodmen as in figure 12; 6th sternite rectangular, nearly twice as wide as long, all sides nearly straight; 7th and 8th tergites fused, the 7th deeply biemarginate anteriorly, the 8th with posterior margin rounded, with large rounded emargination that is as wide as deep; apodemes rather short, disjunct mesally by a space as wide as posterior emargination of sternite; 9th sternite broad and short, the anterior margin with a narrow shelf, a pair of widely separated and very short lobes, and a pair of well developed but short and blunt teeth.



Dictya neffi, new species, female: fig. 12, sixth and succeeding sternites; *D. oxybeles*, new species: fig. 13, male postabdomen, with anterior view of pregonites; fig. 14, female sixth and succeeding sternites. a—internal view of eighth sternite, showing apodemes in black.

Type.—Holotype (male, no. 3519), allotype, and 1 male paratype, *Guatemala:* Patzún, Chimaltenango, Ruta Nac. 1, km. 90, August 3, 1958 (Neff and Matthews); 6 male and 2 female paratypes, Guatemala City, July 21, 1958 (Neff and Matthews), in Cornell University collections, except 2 male and 1 female paratypes retained in my collection.

I am pleased to dedicate this species to one of its collectors, Stuart E. Neff. The species is a member of the closely related group including *Dictya iron, D. oxybeles* (v.i.), and the species with which the latter is compared.

Dictya oxybeles Steyskal, new species

(Figures 13 and 14)

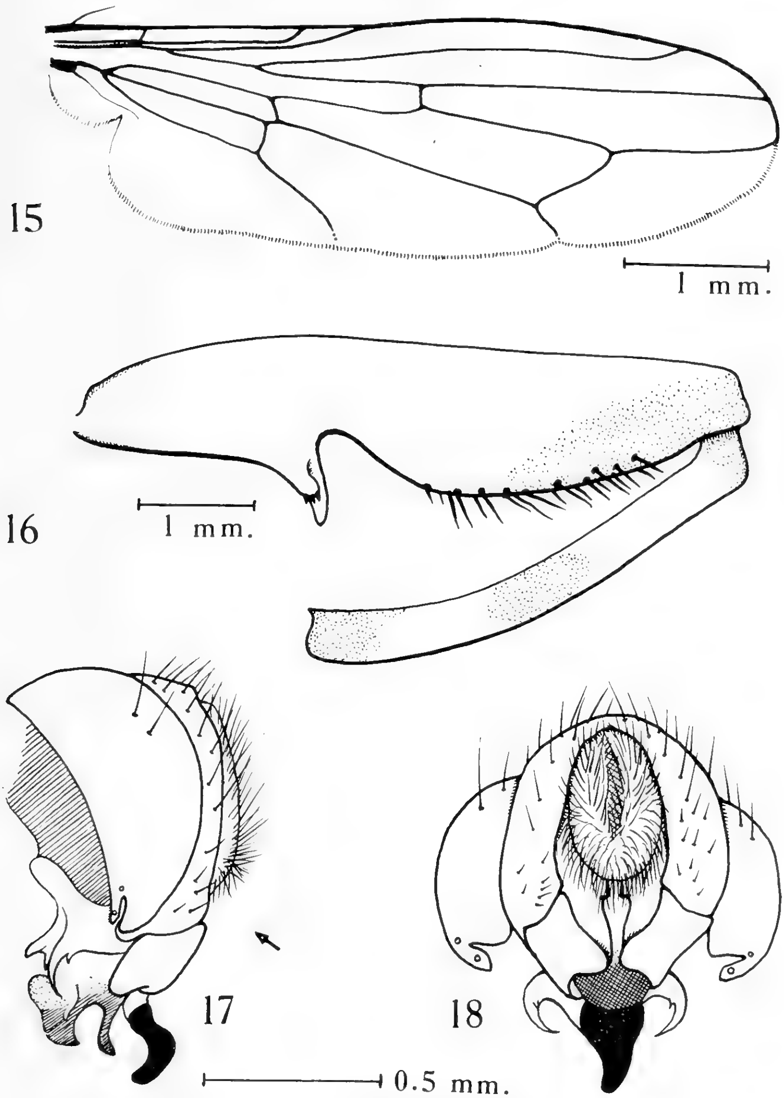
Male.—Length of wing, 5.1 to 7.0 mm. Prosternum bare. Postabdomen as in figure 13; surstyli very broad dorsoventrally, dorsal tip angulate and projecting but little, lateral line very steep; pregonite with long slender process sharply pointed apically and with acutely reflexed preterminal lobe, in anterior view with mesal margin roughly parallel to opposite pregonite and with bullet-shaped tip, the preterminal lobe on lateral margin; ventral process of epandrium with crenate, sloping margin.

Female.—Length of wing, 5.1 to 6.2 mm. Postabdomen as in figure 14; 6th sternite nearly twice as long as wide, with square posterior corners, anterior corners broadly rounded; 7th sternite with deep anterior emarginations, lateral lobes much shorter than median lobe, posterior margin nearly straight except at fusion with 8th sternite; 8th sternite with posterior margin slightly sinuate, apodemes low, narrowly separated at meson; 9th sternite almost without shelf and with only minute posteriorly directed teeth.

Types.—Holotype (male), allotype, and 10 male and 4 female paratypes, *South Carolina:* Isle of Palms, Charleston County, June 23, 1957 (Geo. Steyskal); 5 male and 4 female paratypes, *Florida:* Levy County, March 14, 1958, in salt marsh (H. V. Weems, Jr.); 1 male paratype, *Mississippi:* Saucier, Harrison County, Sept., 1954 (M. R. Wheeler); one male paratype, *New Jersey:* Leeds Point, June 18, 1953, salt marsh (E. Homan); 7 male and 4 female paratypes, *Massachusetts:* mouth of Bass River, near West Dennis, Cape Cod, Sept. 4, 1957 (S. E. Neff); one pair of paratypes, *Nova Scotia:* Smiths Cove, July 24, 1955 (Geo. Steyskal). The holotype, allotype, and a number of paratypes are in my collection; paratypes are deposited in the collections of the United States National Museum, University of Michigan Museum of Zoology, Cornell University, Florida State Plant Board, and Marshall R. Wheeler.

This is a species of the typical group, running in my key to *Dictya atlantica* and *D. mexicana,* differing from those species and from *D. neffi* and *D. iron* (v.s.) in details of the postabdomen. It also resembles *D. lobifera* and *D. stricta*, but those species have the apex of the pregonite in anterior view quite narrow. The name is from Greek *oxybelēs*, "sharp-pointed."

The Isle of Palms material was taken in a shallow channel cut in sand, connecting with the ocean, and filled with a little sea-water, much vegetation, small crabs, and snails; the Florida and Massachusetts specimens were taken in "salt marsh"; and the Nova Scotian specimens were taken on the broad tidal flats for which that region is famous. Apparently *D. oxybeles* is restricted to a saline habitat.



Sepedon haplobasis, new species, male: fig. 15, wing; fig. 16, hind femur and tibia; fig. 17, postabdomen, lateral view; g. 18, same, view in direction of arrow in fig. 17.

Sepedon haplobasis Steyskal, new species

(Figures 15 to 18)

Male.—Length of wing 4.6 to 5.5 mm. (average of 7 specimens, 5.1 mm.). Color in general tawny.

Head: Parafrontal dull spots scarcely darker than remainder of front; orbito-antennal spots black; V-shaped yellowish-pruinose area extending downward 0.8 of distance from antennal sockets to oral margin; most of front shining; antennae with 1st segment very small, 2d segment 0.20 mm. high by 0.48 mm. long, 3d segment obovoid, 0.24 mm. wide by 0.40 mm. long; arista inserted at middle of 3d segment.

Thorax pale gray-pruinose on sides, on dorsum yellowish-pruinose, broadly brown laterally (except humeri) and with 6 more or less complete longitudinal brownish stripes.

Legs brownish; fore tibiae blackish in apical ¼; fore femora shining, dark brown; hind femora and tibiae as in figure 16, femora with a median constriction and a bifid process, of which the anterior branch bears 2 or 3 short stout spinules, and with piceous area in apical ⅓, tibiae gently curved and with base, apical ⅙, and median band dark brown to blackish; fore and hind basitarsi and apical 2 tarsal segments of all legs blackish.

Wings brown, yellowish anterobasally, with smoky areas about *ta* and *tp*, with more or less distinct dark longitudinal streaks in apices of marginal and 1st posterior cells, and with anterior half of submarginal cell beyond *tp* somewhat darker; venation and shape as in figure 15, *tp* strongly oblique, 4th vein slightly curved anterad at tip. Halteres with blackish knob. Squamae with black ciliae.

Abdomen rounded apically, dorsum brown centrally and laterally, with pair of broad yellowish sublateral stripes and with rather narrow yellow-pruinose lateral margin. Postabdomen as in figures 17 and 18, processes of hypandrium strongly curved mesad, sharply pointed, with bimucronate anterior branch and with two small subsidiary teeth.

Female.—Length of wing 5.1 to 5.9 mm. Similar to male, except for sexual characters; hind femora simple; abdomen unicolorous brown.

Types.—Holotype (male, no. 3520), allotype, and 2 female paratypes, *Mexico:* D.F., Mexico, route no. 190, km. 15, August 12, 1958; 9 male and 7 female paratypes, all reared from material collected on same date and in same locality (Neff and Matthews), in Cornell University collections, except one pair retained in my collection.

This species is closely related to *Sepedon bifida* Steyskal (1950, Wasmann Jour. Biol., 8: 28), differing therefrom in the male most obviously in the lack of a subbasal prong on the lower side of the hind femora (whence its specific name) and in both sexes in the median blackish band on the hind tibiae and the strongly oblique hind cross-vein of the wings.

Genus **Teutoniomyia** Hennig

Hennig, 1952, Beiträge z. Ent., Deut. Ent. Inst., 2 (3): 609.

The type, and until now, only, species of *Teutoniomyia* was described as *T. plaumanni* from a single pair (of which the male at least was poorly preserved) from Nova Teutonia, Santa Catarina, Brasil. The genus appears to be related to *Dictyacium*. I have in my collection 4 topotypical specimens, also poorly preserved, from which I can add only the following to Hennig's excellent description: Wings 1.18 to 1.2 mm. wide by 2.2 to 2.4 mm. long; halteres (1 spm.) dark brown; prosternum bare; hind coxae bare above; mesonotal central gray stripe at least as wide as the brownish stripes on either side of it. I have also a single specimen of a closely related species from Costa Rica:

Teutoniomyia costaricensis Steyskal, new species

Female.—Wing 1.3 mm. wide by 2.6 mm. long, the hyaline spots somewhat larger than in *T. plaumanni*, a few of them confluent. Tibiae uniformly dark brown, without paler bands. Mesonotum with central gray stripe very narrow, much narrower than brown stripes on either side of it; only one posterior dorsocentral bristle.

Male.—Unknown.

Type.—Holotype (female), *Costa Rica:* Farm La Caja, 8 km. west of San Jose, August 5, 1945 (H. Schmidt), in my collection.

I wish to especially thank my friend Stuart E. Neff, who, although qualified to describe the material he collected, has graciously allowed me to do so.

THE APPLICATION OF THE NAME SYENE
(Hymenopteras Ichneumonidae)

The name *Syene* is an available generic name in the Ichneumonidae, but has not yet had any species referred to it. The purpose of this paper is to give it a genotype and to assign it to synonymy.

Syene was proposed by Vollenhoven in 1878 (Tijdschr. voor Ent. 21: LXXVI) for a genus near "*Pimpla*," distinguished by having a deep transverse groove in front of the hind margin of the abdominal tergites. No further characters were given and no species specifically mentioned, but the paper in which the name appeared dealt principally with the Javanese Ichneumonidae in the Leiden Museum. In 1958 I saw the ichneumonid material in the Leiden Museum but did not find any specimens labeled *Syene*. In 1959, Dr. J. van der Vecht made a second search for specimens of *Syene* in Leiden, and he also could find none. This leaves only the original description for identification of the genus involved. Several Javanese genera of Ephialtinae, particularly of the tribe Ephialtini, will fit Vollenhoven's description. Of these, it is nomenclaturally most convenient to consider that *Syene* should be the same as *Echthromorpha*. *Cryptus notulatorius* Fabricius, 1804 is hereby designated the type of *Syene*, and *Syene* Vollenhoven is synonymized with *Echthromorpha* Holmgren 1868.—Henry Townes, *Museum of Zoology, University of Michigan, Ann Arbor.*

THE CORRECT STATUS OF COTOCRIPUS CARIDEI BRETHES, A SOUTH AMERICAN BITING MIDGE

(DIPTERA: CERATOPOGONIDAE)

Culicoides caridei (Brèthes)

Cotocripus caridei Brèthes, 1912, An. Mus. Nac. Buenos Aires 22: 451 (female; Argentine, biting man; fig.).

Culicoides caridei, Lane, 1945, Rev. Ent. 16: 366 (redescr., Brazil; syn.: *Centrorhynchus setifer* Lutz, *Culicoides hirtipes* Kieffer); Barbosa, 1947, An. Soc. Biol. Pernambuco 7: 13 (syn.; rec. Uruguay); Macfie, 1947, Ann. Trop. Med. Parasit. 42: 69 (*hirtipes* not a syn., is a *Dasyhelea*).

Centrorhynchus setifer Lutz, 1913, Mem. Inst. Osw. Cruz 5: 64 (female; Brazil, Uruguay, Argentina; bloodsucker; fig. wing).

As pointed out by Macfie (1947), Lane erred in 1945 in sinking *Culicoides hirtipes* Kieffer from Peru under *Culicoides caridei* (Brèthes). Kieffer's species, described from a male, actually belongs in *Dasyhelea*. *C. caridei* and its synonym *setifer* (Lutz) are true *Culicoides* of the subgenus *Oecacta*, as I have determined by comparing the specimens listed below with the original descriptions of Brèthes and Lutz and the excellent redescription by Lane. Therefore Forattini's (1957) assignment of *Cotocripus* to the synonymy of *Dasyhelea* and the placement of *caridei* in that genus is incorrect. The monobasic genus *Cotocripus* Brèthes 1912 is a synonym of the subgenus *Oecacta* Poey 1853.

Specimens examined.—URUGUAY: Le Merin, 16 Nov. 1942, Arrozal Treinta y Tres, hematofagos, 7 females. ARGENTINA: Bariloche, Rio Negro, Nov. 1926, R. & E. Shannon, 1 female.

The following descriptive notes are taken from the Uruguay specimens, adding characters not previously described: Wing 1.1 mm. long. Eyes very broadly separated, by the breadth of the antennal pedicel, without interfacetal hairs. Antenna with lengths of flagellar segments in proportion of 25-21-20-20-21-21-22-22-25-26-28-32-46, antennal ratio thus 1.19; distal sensory tufts present on segments 3, 8-10, 13-15, occasionally also on 7 and 12. Palpal segments with lengths in proportion of 15-35-42-20-20, third segment short and moderately swollen, 2.0 times as long as greatest breadth, with a broad, shallow, subapical sensory pit. Proboscis moderately long, about as long as height of a compound eye; mandible with about 15 minute teeth. Thorax moderately dark brown; legs uniformly pale brown, without pale bands; hind tibial comb with 5 spines, the third from the spur longest. Wing uniformly pale gray, veins yellowish brown; costa to 0.61 of wing length; macrotrichia moderately dense, scattered on distal half of wing and extending along posterior margin including posterior half of anal cell. Halter pale brown. Spermathecae two, pyriform with short tapered neck, each measuring 0.046 mm. by 0.033 mm.—WILLIS W. WIRTH, *Entomology Research Division, A.R.S., U.S. Department of Agriculture, Washington, D. C.*

A NEW SPECIES OF KOHLSIA FROM CENTRAL AMERICA

(SIPHONAPTERA: CERATOPHYLLIDAE)

EUSTORGIO MENDEZ[1] *and* ROBERT M. ALTMAN[2]

Our information on the flea genus *Kohlsia* is recent. Traub (1950) described the genus and five new forms: *K. osgoodi, K. cora, K. gammonsi, K. uniseta* and *K. graphis erana*. He included in this group *K. graphis* (Rothschild, 1915) and *K. campaniger* (Jordan, 1931) which were considered before in other genera. Since the above-mentioned work the following species have been described: *K. fournieri* Vargas, 1951; *K. whartoni* Traub and Johnson, 1952; *K. pelaezi* Barrera, 1954; and *K. felteni* Smit, 1958. With the description given below there are now eleven known members of this genus.

Mr. F. G. A. M. Smit, of the British Museum, confirmed the status of the species which is the subject of this paper. He has been also responsible for valuable comments and the loan of a male specimen (Rothschild collection) from Costa Rica.[3] Lt. Col. Robert Traub has kindly compared our drawings with an undescribed Panamanian *Kohlsia* in his possession and found two species were represented. To these workers we express our gratitude. Our thanks are also due to Dr. Phyllis T. Johnson and Capt. V. J. Tipton for critical review of the manuscript and helpful suggestions.

Kohlsia tiptoni, new species

(Figures 1-11)

Types.—Holotype male, from Cerro Azul, Panama, ex *Didelphis marsupialis,* 29, I, 1958, Coll. No. 4034 (U. S. National Museum Type No. 64877). Allotype female, same data as holotype but ex *Tylomys panamensis,* Coll. No. 4031, both to be deposited in the U. S. National Museum. One paratype male from San Geronimo, Pirris, Costa Rica, ex rat, 17, IV, 1931, collected by C. F. Underwood, deposited in the British Museum collection.

Diagnosis.—The following characters readily will distinguish this species from all the other described members of the genus: The presence of a large number of subspiniform bristles in the distal arm of ninth sternum (this form possesses more than twelve subspiniforms, about twice as many as occur in any other known *Kohlsia*). This arm also bears a conspicuous apical bristle directed cephalad which seems to be absent in the other species. Another important diagnostic feature is the presence of a tibial comb on each leg. This last character suggests the related genus *Jellisonia* Traub on which the tibial comb is typical.

MALE.—*Head* (Fig. 1): Anterior margin of head evenly rounded except for

[1]Gorgas Memorial Laboratory, Panama City.

[2]Major, M. S. C., U. S. Army Caribbean, Canal Zone. Present address: Department of Entomology, University of Maryland.

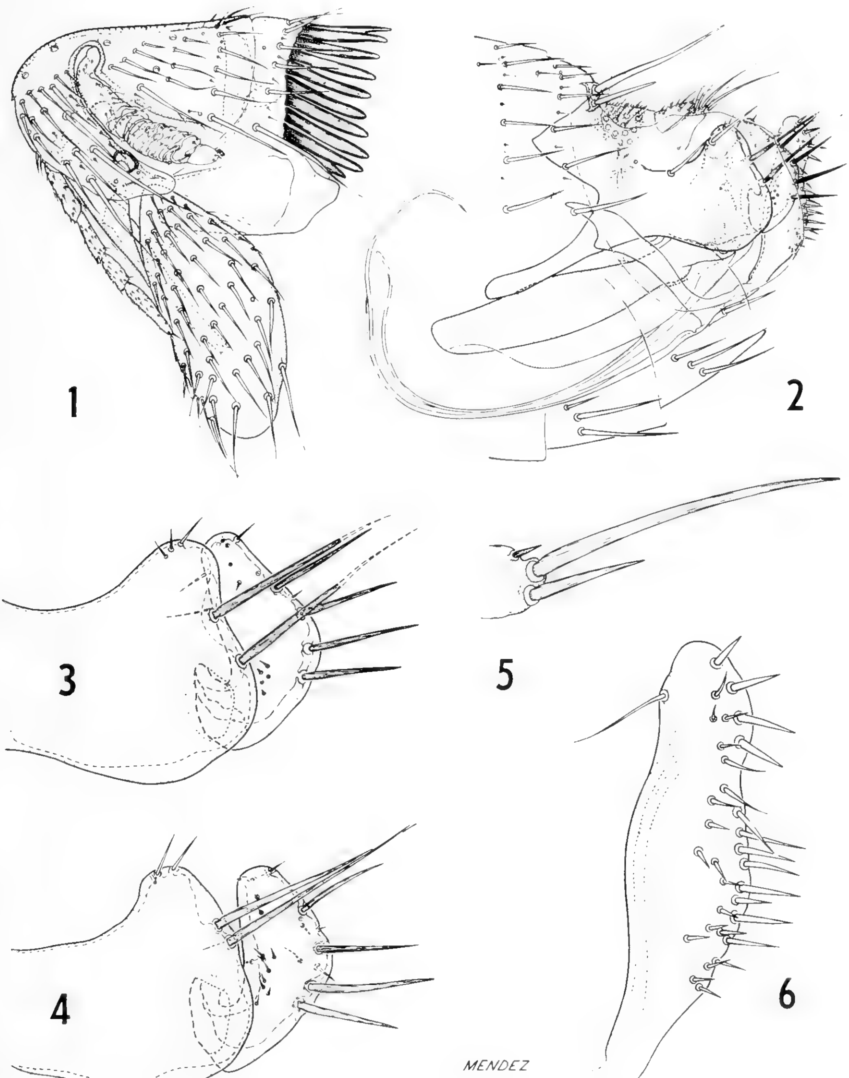
[3]This specimen unfortunately is in poor condition. The head, prothorax and mesothorax are missing, though the metathorax and abdomen are in perfect condition. It constitutes our only paratype.

acute median tubercle; micropores distributed along pre- and postantennal areas preceding rows of bristles. Subgenal region with three very fine bristles: one mesad and two proximad to eye. Eye suboval, well developed, not highly pigmented. Genal process broad at base, suddenly tapering to become subacuminate. Maxillary lobe acute, reaching first third of fore coxa. Maxillary palpus four-segmented, extended just beyond middle of fore coxa. Labial palpus five-segmented, reaching about four-fifths length of fore coxa. Anterior border of antennal fossa with line of six fine bristles. Antenna as illustrated (Fig. 1). Postantennal region with three irregular rows of bristles consisting of four, five and six bristles respectively; several scattered fine bristles.

Thorax: Pronotum with one row of six bristles per side, basal one longer, reaching middle of mesepisternum, with row of intercalary hairs. Mesonotum with two or three rows of bristles per side, posterior one with intercalary hairs. Flange of mesonotum with three pseudosetae on each side. Metanotum with apparently three rows of bristles per side, of which last row has intercalary hairs. Mesepisternum with two bristles. Mesepimere with seven to eight bristles arranged in three rows. Metepisternum with single submedian bristle which reaches apex of hind coxa. Metepimere with seven to eight bristles distributed in three rows. Lateral metanotal area with two bristles; postero-lateral margin dilated, ending at level with middle of dilated pleural arch.

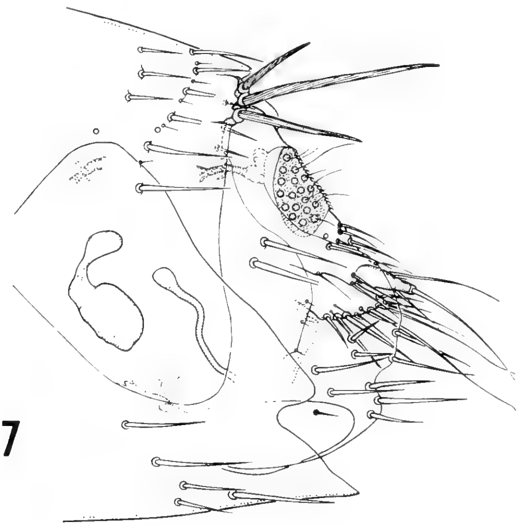
Legs: Precoxa with numerous well pigmented bristles distributed along entire surface and few lightly pigmented ones on anterior region. Trochanter with two bristles on anterior margin and three minute subapical hairs. Prefemur with anterior margin provided with one subbasal bristle and one subapical one; with about three median bristles; posterior margin having several marginal and submarginal bristles besides long apical one. Mesocoxa with several marginal, submarginal bristles on anterior margin and patch of minute hairs on basal area close to this margin; posterior region with only two dorso-caudal bristles. Mesofemur with line of dorso-marginal bristles, apical bristle long, strong; anterior margin with two bristles. Metacoxa having ventral margin with several marginal and submarginal bristles; with about three median basal minute hairs on anterior region; three emarginal minute hairs on anterior half of dorsal margin and two submedian caudal bistles. Metafemur only differs from mesofemur in size. Each tibia with dorsal region provided with line of stout, subequal marginal bristles forming typical comb, apart from three larger ones; submedian row of bristles along entire length; ventral region with one apical, conspicuous stout bristle, few marginals and submarginals. First segment of hind tarsus with row of lateral bristles on each margin, those of posterior margin being more stout, subequal in size and forming comb. Fifth segment of all tarsi with six pairs of plantar bristles, of which four pairs are laterals and two pairs are displaced medially on basal and apical region respectively.

Abdomen: Tergum I with three rows of bristles; anterior row has three bristles, shorter than those of remaining rows; middle row represented by four bristles; posterior row with four long bristles and intercalaries. Terga II to VII with two rows of bristles, posterior one having long bristles plus intercalaries. Terga I through V with one or two spinelets per side. Basal sternum with row of two or three ventral bristles. Sterna II to VI with row of two or three ventral bristles. Antesensilial bristles three in number; uppermost being reduced; median one long, more than two times length of lowermost.



Kohlsia tiptoni, new species (Figs. 1 to 3, 5 and 6 of Holotype Male, Fig. 4 of Paratype Male). Fig. 1, head, prothorax and fore coxa; Fig. 2, modified abdominal segments; Fig. 3, movable and immovable process of clasper; Fig. 5, antesensilial bristles; Fig. 6, distal arm of ninth sternum.

Modified abdominal segments (Fig. 2): Tergum VIII large, ensheathing most of genitialia, with anterior margin convex and posterior margin sinuate; with two or three outstanding bristles on superior region. Sternum VIII reduced, having single apical bristle. Distal arm of sternum IX longer than proximal arm, with both dosal and ventral margins sinuate; narrow on basal portion, becoming subsequently



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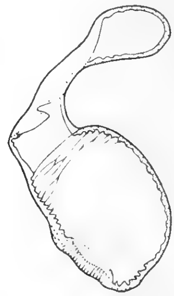

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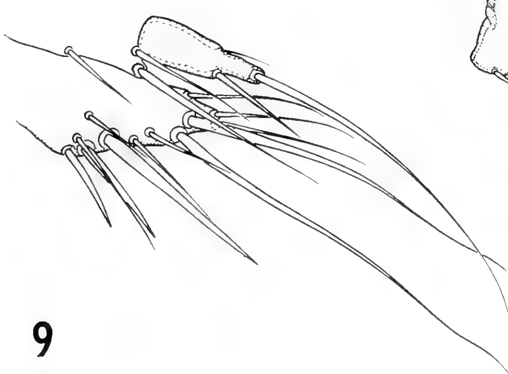

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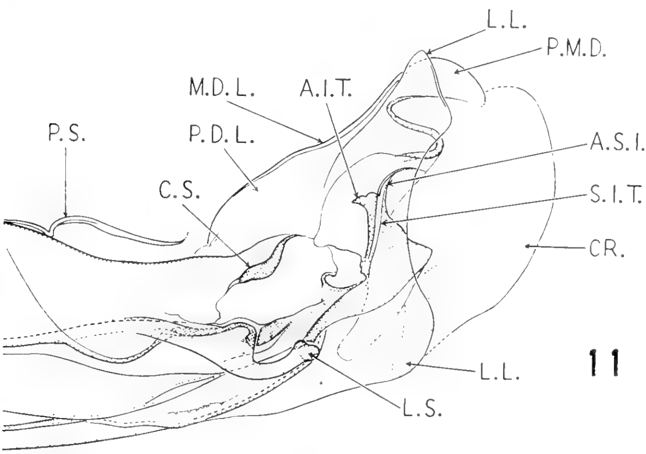
Kohlsia tiptoni, new species, Allotype Female. Fig. 7, modified abdominal segments; Fig. 8, spermatheca; Fig. 9, anal stylet and ventral anal lobe; Fig. 10, femur and tibia of hind leg.

broad and then slightly constricted before apex which is rounded. This arm bears multiple short marginal and submarginal subspiniforms and bristles distributed along the first two-thirds of dorsal area and ventral, distinct subapical bristle directed cephalad. Immovable process of clasper (Figs. 3, 4) about as long as broad, becoming gradually dilated from base and projected apically into subrounded lobe, thus forming concave superior margin and convex, dorsocaudal one; this margin bears two median acetabular bristles located close to each other above margin of acetabulum, as appears in male paratype specimen[4] (Fig. 4); apex with three apical bristles. Movable process of clasper subtriangular, more than twice as long as broad, with convex posterior margin having four stout subequal bristles located medially; anterior margin almost straight on superior half and concave on basal area. This process bearing additional marginal, submarginal and median short bristles.



Kohlsia tiptoni, new species, Holotype Male. Fig. 11, endchamber of aedeagus.

Aedeagus[5] (Figs. 2, 11): Aedeagal apodeme long, about twice length of aedeagus proper, lacking apical appendage. Aedeagus proper longer than broad. Proximal spur (P. S.) well developed, curved backward. Median dorsal lobe (M. D. L.) slightly sinuate, distally divided apically by distinct, sinuate ridge which forms primary median dorsal lobe (P. M. D.) with margin evenly rounded and secondary paradorsal lobe (P. D. L.) slightly convex. Lateral lobes well developed; apical lobe truncate, with anterior projection slightly extended beyond margin of primary median dorsal lobe; basal lobe sinuate. Crochet (CR) not heavily sclerotized, expanded, twice as long as broad, with convex margin. Sclero-

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[4]Mr. F. G. A. M. Smit has called our attention to the fact that our male holotype is somewhat abnormal. It has the acetabular bristles widely separated and not close together as is normal in the genus. A further abnormality is the presence of two antesensilial bristles on one side and three on the other side.

[5]Terminology followed is that of Traub (1950).

tized inner tube (S. I. T.) compact, with apex (A. S. I.) slender, curved, extended backward; armature (A. I. T.) ending apically in short, claw-like projection. Crescent sclerite (C. S.) distinct, curved, well sclerotized. Lateral sclerite (L. S. curved upward, with dilated apex.

Female.—Closely agrees in morphology with the male, except for following features: head more regularly rounded, details of last abdominal segments and larger size.

Modified abdominal segments (Fig. 7): Sternum VII with ventral margin provided with well defined sinus, dorso-caudal margin acuminate; subapical region with six bristles distributed in two rows with following arrangement: one side with four bristles on anterior row, two bristles on caudal row; other side with three bristles on each row. Tergum VIII with two long median bristles below sensilium; posterior margin with five marginal, three submarginal bristles. Sternum IX with three postero-marginal bristles. Dorsal lobe of proctiger with several marginal, submarginal and latero-median bristles preceding anal stylet, three bristles below this structure. Anal stylet (Fig. 9) about three times as long as width of its base; with long apical bristle about three times length of stylet, shorter ventro-marginal bristle, fine dorso-marginal bristle. Ventral anal lobe (Fig. 9) angulate, clothed with several marginal and submarginal bristles of variable length and strength, caudal one stouter. Spermatheca (Fig. 8) with semiglobular body; ventral margin convex; dorsal margin sinuate; tail (unfortunately collapsed in our specimen) longer than body, turned upward.

Remarks.—It is our pleasure to dedicate this species to Capt. V. J. Tipton in recognition of his work on taxonomy of ectoparasites.

References

Traub, R. 1950. Siphonaptera from Central America and Mexico. A Morphological Study of the Aedeagus, with Descriptions of New Genera and Species. Fieldiana, Zoological Memoirs of the Chicago Natural History Museum *1* (1): 1-127, 54 pls.

ANNOUNCEMENT

Beginning with Volume 62, the *Proceedings* will appear four times a year instead of six, and concurrently, the price of reprints will be increased. It is our belief that these steps, taken to offset recent increases in printing costs, will affect little, if at all, the services previously rendered to entomology by our publication . Each issue will contain more pages than formerly, and each page will be produced more efficiently financially and, we hope, editorially.

Contributors of articles reporting work done under grants-in-aid can contribute immeasurably to the *Proceedings* by voluntarily supporting, at $14.00 per page, the cost of publication. Members and friends of the Society are strongly urged to consider this means of assuring that their periodical remain strong and effective.—Ed.

MITES OF THE GENUS LONGOLAELAPS

(Acarina: Laelaptidae)[1]

R. O. Drummond and Edward W. Baker[2]

The genus *Longolaelaps* was erected in 1926 by Vitzthum for a mite collected from *Rattus whiteheadi* in Sumatra. It was differentiated from *Laelaps* by its elongate body shape. There has been some doubt as to the validity of this genus, but the discovery of two undescribed species from the same general area strengthens the concept of *Longolaelaps* as being a distinct unit. Aside from the body shape, all three known species have a peculiar transverse striated presternal area, apparently unique for these mites.

Strandtmann and Wharton (1958) have discussed the taxonomic position of *Longolaelaps* and have given a bibliography to the genus.

Key to the species of Longolaelaps

1. No strong spinelike setae ventrally on trochanter I 2
   Two strong spinelike setae ventrally on trochanter I .... **longulus** Vitzhum
2. Anal plate truncate anteriorly, separated from epigynial plate by less than length of anal opening .... **whartoni,** new species
   Anal plate convex anteriorly, separated from epigynial plate by more than length of anal opening .... **traubi,** new species

Longolaelaps longulus Vitzthum

Longolaelaps longulus Vitzthum, 1926, Treubia 8 (1-2): 74-79.

Female.—Medium sized, elongate mite, measuring 620μ long, exclusive of gnathosoma, by 300μ wide at region of coxa III. Dorsum: Dorsal plate entire, covering most of idiosoma, about 550μ long by 290μ wide, with a small heavily sclerotized ridge extending along edge of anterior third, with 38-40 pairs of setae and 7 pairs of pores; lateral setae increase in length from anterior to posterior; most of median setae extending slightly past bases of setae of next row. Gnathosoma: Six rows of 2-4 teeth on deutosternum; chelicerae with each arm of chelae containing two teeth and a terminal tooth; pilus dentatus straight, ending in a small recurved hook. Venter: Tritosternum with well serrated lacinae arising above attachment to basal segment; sternal plate with concave anterior margin and convex posterior margin with protruding center, about 100μ long at midline by 120μ wide at maximum width, with the usual 3 pairs of setae and 2 pairs of pores; anterior pair of sternal setate about half as long as the two equal-length posterior pairs; area of presternal transverse striations about half as long as sternal plate; metasternal plates with metasternal setae which extend to bases of first pair of epigynial setae; epigynial plate with 4 pairs of setae, the most

[1]The material for this study was taken from collections made by Lt. Col. Robert Traub and associates. The initial work was done while the senior author was on duty at the U. S. National Museum, Washington, D. C. Acknowledgement is made to Tom Evans, Clearwater, Florida, who made the drawings for figures 1-6.

[2]Entomology Research Division, ARS, U. S. Department of Agriculture, Kerrvills, Texas, and Washington, D. C., respectively.

posterior pair only three-fourths as long as anterior 3 pairs; epigynial plate removed from anal plate by more than length of anal opening; anal plate egg-shaped with adanal setae arising posterior to anal opening, post-anal seta slightly stronger than adanals; with small serrations at posterior end of plate; stigmata located between coxae III and IV, peritremes extending anteriorad and dorsad ending at level of middle of coxa II; 6 pairs of setae on nonsclerotized portion of venter. Legs: Coxa I with two heavy spinelike setae, anterior one blunted, posterior one finger-like; venter of trochanter I with 1 strong, long, pointed and 1 strong, short, blunted spinelike seta, dorsum with 1 long, pointed spinelike seta; femur I expanded, venter with 1 strong, pointed spinelike seta, dorsum with 2 long, sharp setae and 1 long dorsal spinelike seta, and laterad with 1 strong, short seta; genu I and tibia I each with 1 small lateral spinelike seta; coxa II with a long, sharp, anterior seta and with a strong, pointed posterior spinelike seta; trochanter II with 2 small spinelike setae; femur II enlarged, with 3 short ventral spinelike setae and with 2 long dorsal spinelike setae; coxa III with a strong, sharp anterior spinelike seta, and with a small, pointed posterior spinelike seta; trochanter III with 1 weak, elongate anterior spinelike seta; coxa IV with a single small seta; trochanter IV with an anterior and posterior weak, elongate spinelike seta; other setae of legs not strongly spinelike.

This species can be easily separated from the two others by the two strong spinelike setae on the venter of trochanter I, the three small spinelike setae on the venter of femur II, and the egg-shaped anal plate.

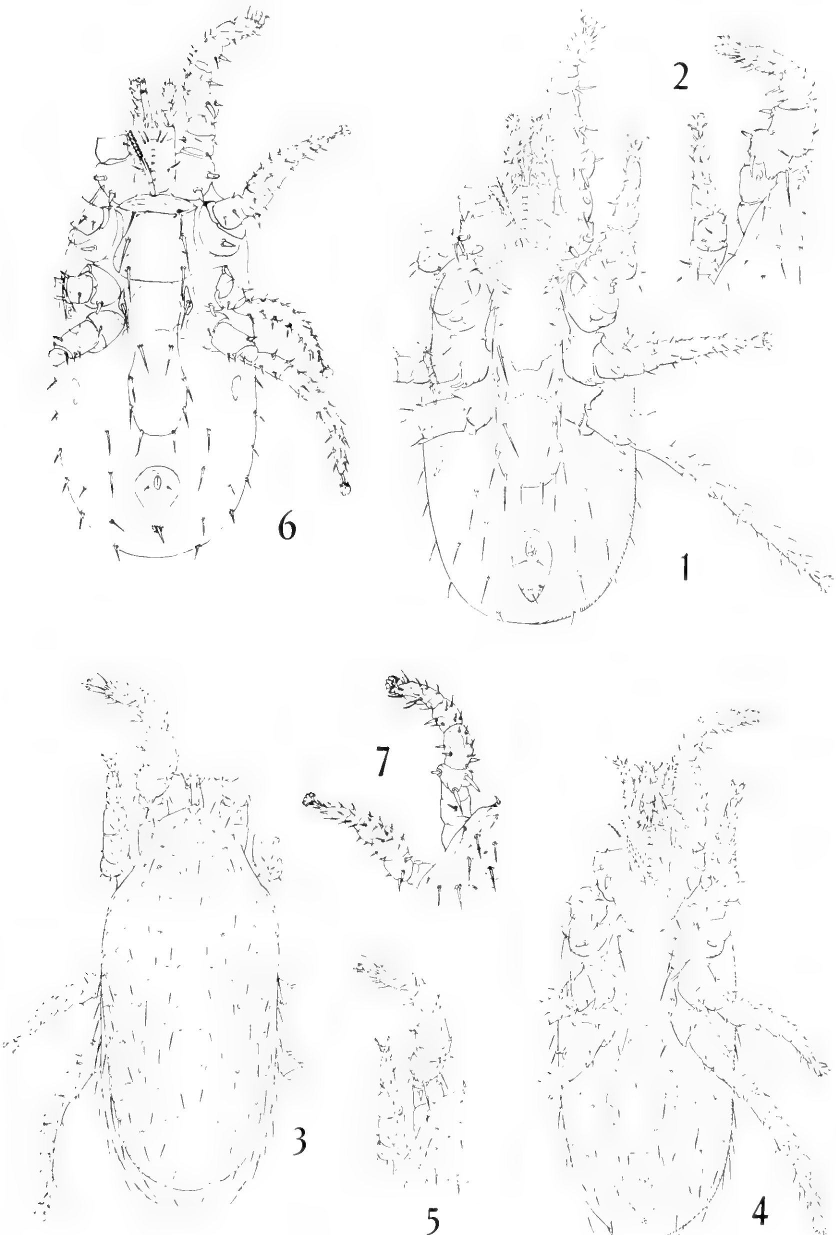
The type is in Vitzthum's private collection. It was collected from *Rattus whiteheadi* by Karry and Siebers, November 29, 1921, at Urwald, Wai Lima, Lampong, South Sumatra. Specimens examined were collected as follows (all collections were made by Robert Traub unless otherwise stated):

Rattus whiteheadi whiteheadi: North Borneo, Mt. Kinabalu, Paring, July 14, 19, 20, and October 9, 1953; North Borneo, Ranau, July 12, and August 1, 1953; Malaya, Selangor, Subang, March 19 and 25, 1948 (R. Traub and C. B. Philip); Malaya, Pahang Road, 16 miles N. Kuala Lumpur, July 27, 1948. *Rattus cremoriventer:* North Borneo, Ranau, July 11, 1953. *Rattus rajah* group: North Borneo, Ranau, July 13, 1953. *Rattus* sp. (*fulvescens* or *alticola*)*:* Malaya, Cameron Highlands, Brinchong Hill, July 20, 1948 (R. Traub and B. Insoll, colrs.). *Hylomys suillus:* North Borneo, Mt. Kinabalu, Tenompak, August 17, 1953. *Dremomys everetti:* North Borneo, Mt. Kinabalu, Tenompak, August 17, 1953. *Callosciurus notatus:* Malaya, Selanger, Pahang Road, 16 miles N. Kuala Lumpur, June 25, 1948.

Longolaelaps whartoni, new species

(Figs. 3-5)

Female.—Medium sized, elongate mite, measuring 600μ long, exclusive of gnathosoma, by 275μ wide at region of coxa III. Dorsum: Dorsal plate entire, covering most of idiosoma, about 570μ long by 250μ wide, with a small heavily sclerotized ridge extending along edge of anterior fifth, with 38-40 pairs of setae and 11 pairs of pores; anterior-lateral setae very short, most other setae extending past bases of next row of setae. Gnathosoma: Six rows of 3-5 teeth on deutoster-



Longolaelaps longulus Vitzthum: Fig. 1, ventral view; fig. 2, dorsal view of legs I and II. *L. whartoni*, n. sp.: fig. 3, dorsal view; fig. 4, ventral view; fig. 5, dorsal view of legs I and II. *L. traubi*, n. sp.: fig. 6, ventral view; fig. 7, dorsal view of legs I and II.

num; chelicerae with each arm of chelae containing 2 teeth and a terminal tooth; pilus dentatus fingerlike, ending in small recurved hook. Venter: Tritosternum with well serrated lacinae arising above attachment to basal segment; sternal plate with concave anterior border and slightly convex posterior border, about 80μ long at midline by 115μ wide at maximum width, with the usual 3 pairs of setae and 2 pairs of pores; anterior pair very short, not exceeding bases of second pair of setae; area of presternal transverse striations almost as long as stenal plate; metasternal plates with very long metasternal setae which extend well past bases of first pair of epigynial setae; the epigynial plate swollen posteriorly and removed from anal plate by less than length of anal opening, with 4 pairs of setae, the most posterior pair the shortest; anal plate truncate anteriorly with adanal setae arising posterior to anal opening, the post-anal seta minute, much shorter than adanals, with the usual serrations at posterior end of plate; stigma located at posterior edge of coxa III, peritremes extending anteriorad and dorsad and ending at level of anterior edge of coxa II; 6 pairs of long setae on non-sclerotized portion of venter. Legs: Coxa I with 2 strong spinelike setae, the anterior blunted, the posterior dully pointed; trachanter I with 1 pointed dorsal spinelike seta; femur I expanded, with 2 long and 1 short, pointed dorsal spinelike seta; genu I and tibia I each with 1 small lateral spinelike seta; coxa II with a long, sharp, anterior seta, and a strong, pointed, posterior spinelike seta; femur II extended laterally with 1 small dorsal spinelike seta; coxa III with a heavy pointed anterior spinelike and a small posterior seta; coxa IV with 1 small seta; other setae of legs not strongly spinelike.

This species is easily separated from the others in that there are no strong spinelike setae on the venter of femur I, coxa III has a small posterior seta, the epigynial plate nearly touches the anal plate, the anal plate is truncate anteriorly, and the post-anal seta is minute.

This species is named for G. W. Wharton, of the Department of Zoology, University of Maryland, in recognition of the time, energy, and inspiration he freely gives to his students.

Holotype.—Female, U. S. National Museum No. 2484, collected from *Rattus rajah* group, Malaya, Selangor, Pahang Road, 16 miles N. Kuala Lumpur, July 2, 1948.

Other specimens examined are as follows: ex *Rattus rattus argentiventer*: Seven females, Malaya, Selangor, Subang, August 18, 1948 (R. Traub and B. Insoll).

Longolaelaps traubi, new species

(Figs. 6, 7)

Female.—Medium sized, elongate mite, measuring 680μ long, exclusive of gnathosoma, by 320μ wide at region of coxa III. Dorsum: Dorsal plate entire, covering most of idiosoma, about 580μ long by 300μ wide, with a small heavily sclerotized ridge extending along anterior third, with 38-40 pairs of setae and 9 pairs of pores; most lateral setae short, most medial setae not extending past bases of next row of setae. Gnathosoma: Six rows of 3-5 teeth on deutosternum; chelicerae with each arm of chelae containing 2 teeth and a terminal tooth; pilus dentatus fingerlike, ending in a small recurved hook. Venter: Tritosternum with well serrated lacinae arising above attachment to basal segment; sternal plate with very slightly concave anterior margin and a slightly convex posterior margin, about 120μ long at midline by 130μ wide at maximum width, with the usual three pairs of setae and two pairs of pores; anterior pair of sternal setae slightly shorter than posterior pairs; area of presternal striations much less than half as long as sternal plate; metasternal plates with metasternal setae which do not extend to bases of first pair of epigynial setae; epigynial plate removed from anal plate by more than length of anal opening, with 4 pairs of short equal-length setae; anal plate roughly kite-shaped with small adanal setae arising slightly ahead of posterior edge of anal opening, the post-anal seta stronger than adanals, and with a small series of serrations at posterior end of plate; stigma located between coxae III and IV, peritremes extending anteriorad and dorsal, ending at middle of coxa I; 6 pairs of setae on non-sclerotized portion of venter. Legs: Coxa I with 2 strong spinelike setae, the anterior blunted, the posterior dully pointed; trochanter I with 1 small dorsal spinelike seta; femur I expanded, with 1 strong ventral spinelike seta, with 2 long, sharp dorsal setae and 1 small dorsal spinelike seta; genu I and tibia I each with 1 small lateral spinelike seta; coxa II with a small anterior seta and a strong pointed posterior spinelike seta; femur II enlarged, with 1 ventral and 3 short dorsal spinelike setae; coxa III with a strong, sharp anterior spinelike seta, and a strong posterior spinelike seta; coxa IV with a single small seta; other setae of legs not strongly spinelike.

This species can be easily separated from the other two in that there is a strong spinelike seta on the venter of femur I, the metasternal setae do not extend beyond the bases of the first pair of epigynial setae, the adanal setae arise anterior to the posterior edge of the anal opening, and the post-anal seta is spinelike, stronger than the adanals.

This species is named for Lt. Col. Robert Traub, Medical Service Corps., U. S. Army.

Holotype.—Female, U. S. National Museum No. 2485, collected from *Rattus alticola*, North Borneo, Mt. Kinabalu, Tenompak, August 12, 1953.

The following specimens have been examined: ex *Rattus alticola:* One female, North Borneo, Mt. Kinabalu, Paring, July 13, 1953. ex *Rattus whiteheadi whiteheadi:* Six females, North Borneo, Mt. Kinabalu, Tenompak, August 18, 1953. ex *Rattus sabanus:* One female, North Borneo, Mt. Kinabalu, Tenompak, August 13, 1953.

References

Strandtmann, R. W., and G. W. Wharton. 1958. A manual of mesostigmatid mites parasitic on vertebrates. Institute of Acarology, Contrib. no. 4, p. 71.

Vitzthum, H. G. 1926. Malayische Acari. Treubia 8 (1-2): 74-79.

OVIPARAE OF METOPOLOPHIUM DIRHODUM (WALKER) ON A SECONDARY (SUMMER) HOST

(Homoptera: Aphididae)

Migratory aphids alternate in their life cycle between different plant species. *Metopolophium* (=*Macrosiphum*) *dirhodum* (Walker) migrates from grasses and grains to *Rosa* spp. True migratory aphids are characterized by the production of oviparous females and eggs on the primary (winter) host and the production of males only on the secondary (summer) host.

M. dirhodum collected in 1957 from *Phalaris* sp. was colonized on barley in a greenhouse. During the fall of 1958 somewhat smaller and pinkish or buff colored oviparae appeared in the colonies. The oviparae deposited yellowish eggs on barley leaves. Eggs were collected from barley and placed on the leaves of *Agropyron repens* (L.) in an outdoor screenhouse. Eggs of *Rhopalosiphum fitchii* (Sanderson) and *Sipha agropyrella* Lambers were collected from their respective primary host plants and placed similarly on *A. repens* for comparison. Unfortunately, forms of *M. dirhodum* on roses which could have been used for comparative studies were unavailable. The eggs of *M. dirhodum* failed to hatch (probably being infertile) whereas eggs of the other species hatched in the spring.

The above observation indicated that under certain circumstances the oviparae of a migratory aphid can appear on the secondary host. Although this may occur rarely in nature and the eggs may fail to survive the winter on a secondary host plant, it suggests how migrating species could become non-migrating. To make this change complete, however, fundatrices which have a strict taxonomic and physiological host preference must also be able to adapt to the secondary host. In other studies, fundatrices of *R. fitchii* collected in the spring from *Malus* sp. did not feed while caged in barley leaves. Sexuparae and sexuales collected from *Crataegus* sp. in the fall were maintained for eight days while caged on barley, and eggs were deposited.

According to Hille Ris Lambers (Proc. 8th Intern. Congr. Ent. 1948: 141, 1950), many migrating species have morphologically similar non-migrating species on the secondary host plants. Thus *Metopolophium dirhodum* migrates from roses to grain and grasses, but the related species, *M. tenerum* H. R. L., *M. albidum* H. R. L., *M. festucae* (Theob.) and *M. frisicum* H. R. L. complete their life cycle on Graminae. He suggested that the related species, which live permanently on the secondary hosts, are derived from the migrating species.

Additional speculation is possible in the light of the present observation. In North America, *M. dirhodum* may be evolving a complex of subspecies or species which are comparable to those described in Europe. Or it is possible that the specificity between primary host and *M. dirhodum* is not pronounced, and under certain conditions the aphid tends to complete its life cycle as a non-migrating species.

G. Orlob and J. T. Medler, *Department of Entomology, University of Wisconsin, Madison 6.*

ON THE PTINID GENUS MEZIUM CURTIS[1]

(COLEOPTERA: PTINIDAE)

CHARLES S. PAPP, *Department of Entomology, University of California, Riverside*

The genus *Mezium* was established by Curtis (1828: British Entomology, 5:f.232) for *sulcatum* Curtis (*op. cit.*) which is *M. affine* (Boield.) today. Curtis' *sulcatum* is a homonym of *sulcatum* Fabricius (1781: Spec. Ins., 1:73) as recognized earlier by Boieldieu (1856: Monogr. p. 647).

The general characteristics of this genus may be summarized as follows; elytra not punctured, polished, shining, widely embracing the abdomen at the sides; ventral surface about one-third the width of the elytra; head and thorax densely covered with small scales or scale-like hairs. Thorax tuberculate; ventral segments five. They are easily differentiated from the very closely related genus *Gibbium*, which is also shiny, has no scales covering the thorax, with subfrontal eyes and only four ventral segments.

Most authors mention *M. americanum* Castelnau (1840: Hist. Nat. 1:279) from North America. Previous study by Brown (1944: Canad. Ent. 76:9) found *M. affine* Boieldieu (1856: Ann. Ent. Soc. Fr. 4:674) as a common ptinid beetle in the United States and in eastern Canada. I have several specimens from New York State and Pennsylvania in my collection, collected by myself (1951-53 in Rochester, N. Y.) and received recently (as *M. americanum*) from Pennsylvania.

Hinton (1941: Bull. Ent. Res. 31:335) discussed the characteristics of both *americanum* and *affine* but, except for Brown's paper (*op. cit.*) and the Fifth Supplement to the Leng Catalogue (by Blackwelder), nothing has been done to adopt *affine*. In some cases there are questionable reports on *M. americanum*, which upon close investigation may turn out to be *M. affine*, bound more to the northeastern part of the United States and to the southeastern portion of Canada. *M. americanum* has a more southern distribution. For future study the writer would appreciate receiving 5 to 10 specimens of *Mezium* from different parts of the United States, Canada and Mexico.

Mezium americanum Castelnau

Confusingly similar to *affine* except as follows: Median sulcus of pronotum deeper and broadening posteriorly instead of subparallel-sided. Pronotum with sublateral gibbosity, formed by hairs, on each side more prominent. Basal collar of elytra partly interrupted on each side. Elytra usually without hairs except for a few stout, long, erect ones on each side of suture near base. Unrubbed specimens with similar hairs sparsely distributed over elytra except the sides, these hairs shorter posteriorly. Length 1.5-3.5 mm., width: 0.98-1.8 mm.

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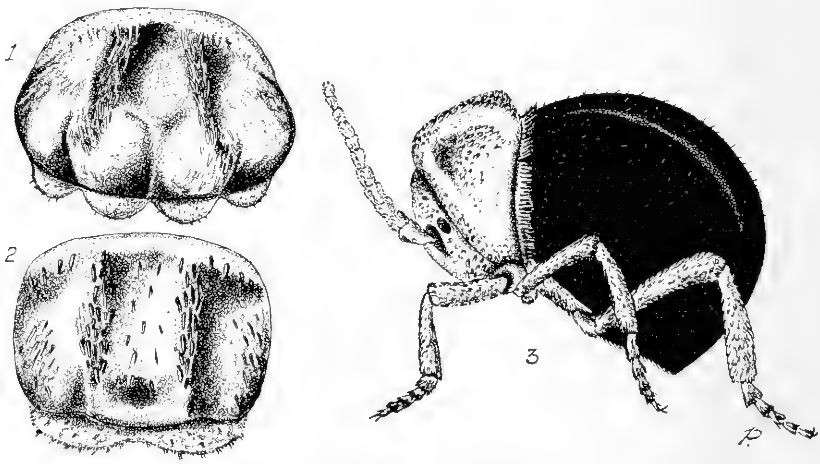
[1] Notes on North American Coleptera, No. 11.

A cosmopolitan species, found mostly in the southern and western parts of the United States.

Mezium affine Boieldieu

Head and antennae very densely clothed with recumbent to suberect, golden-testaceous scales and hairs. Eyes strongly convex, nearly round, and about half as broad as second antennal segment. Ground surface of front of head densely, often confluently, granulate and rugose, the granules about twice as coarse as facets of eyes. Pronotum densely clothed like head but with hairs usually longer and nearly parallel, occasionally scale-like, ground surface similar to head. Elytra with a narrow basal collar clothed like head; on each side of suture near collar with a few stout, erect hairs, which are about as long as second antennal segment; numerous short, stout, erect hairs on extreme apical region; surface of elytra otherwise polished and nearly impunctate. Legs and sternites clothed like antennae with numerous stout, moderately long, erect hairs. Body oval with elytra very strongly convex and inflated posteriorly; shining, dark reddish-brown to nearly black. Length: 2.3-3.5 mm; width: 1.3-1.9 mm.

Distributed in Europe and North Africa, introduced into the United States and commonly found in the northeastern part of the country and in the southeastern portion of Canada.



Dorsal view of pronotum with base of elytra: Fig. 1, *Mezium americanum;* Fig. 2, *M. affine;* Fig. 3, *Mezium americanum.*

SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1959

CORRESPONDING SECRETARY

Membership on January 1, 1959			491
Resigned	2		
Deceased	5		
Total		7	
Elected to membership	5		
Reinstated	0		
Total		5	
Net loss in membership		2	
Membership on October 31, 1959			489

Classes of Membership:

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Retired	9
Honorary	4

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Circulation of the *Proceedings* (October 1959 issue):

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District of Columbia	96		
U. S. Possessions	9		
Total		561	
Stamped, to foreign countries		200	
Total			761

Distribution of the *Proceedings* (October 1959 issue):

To members	476	
To subscribers	285	
Total		761

The *Proceedings* goes to members and subscribers in 50 states, the District of Columbia, 2 territories, and 47 foreign countries.

Respectfully submitted. PAUL A. WOKE, *Corresponding Secretary.*

TREASURER

General Fund

Cash on Hand—January 1, 1959	29.14	
Receipts to Oct. 31, 1959	3,108.00	
Total		3,137.14

Cash on Hand—October 31, 1959	85.88	
Expenditures—January 1, 1959, to October 31, 1959	3,051.26	
Total		3,137.14

Publication Fund

Cash and Deposits on Hand—January 1, 1959	5,378.27	
Receipts to Oct. 31, 1959	921.26	
Total		6,299.53
Cash and Deposits on Hand—October 31, 1959	6,299.53	
Expenditures—1959	none	
Total		6,299.53

(Exclusive of $252.23 loans to General Fund)

Copies of the complete Treasurer's report, approved by the Auditing Committee, are on file with the Corresponding Secretary and Treasurer.

Respectfully submitted. PRICE G. PIQUETT, *Teasurer.*

CUSTODIAN

From January 1 to October 31, 1959, the value of items sold by the Custodian's office amounted to $569.08, of which $172.00 was for 25 copies of the Memoirs, $394.08 for copies and one complete set of the *Proceedings*, and $3.00 for miscellaneous papers and reprints.

Sales of the most recently published Memoir, No. 5, have been very slow, amounting to a total of only 10 during the year.

A copy of the complete, detailed report for the first 10 months of 1959 is on file with the Recording Secretary.

Respectfully submitted. H. J. CONKLE, *Custodian.*

EDITOR

Six numbers of Volume 61 of the *Proceedings* have been published in 1959. Of the 288 published pages, 7 were devoted to advertising and 281 to scientific papers, notes, book reviews, obituaries, minutes of meetings, and announcements. The size of Volume 61 is 16 pages shorter than that of Volume 60; the reduction in size is accounted for by the increase in printing costs initiated by the printer on Oct. 1, 1959. This is the third year in which the *Proceedings* has remained the same size or has been reduced in size. Volume 61 contains 61 reports of original work, averaging about 4.5 pages, contrasted with 48 reports averaging 5.5 pages for 1958.

Respectfully submitted. RICHARD H. FOOTE, *Editor.*

COMMITTEE APPOINTMENTS FOR 1960

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Representing the Society on the Board of Managers of the Washington Academy of Sciences as a Vice-President of the Academy: *Harold H. Shepard.*

SOCIETY MEETINGS

Held in the U. S. National Museum

684th Meeting, November 5, 1959

As of November 5, *Charles C. Compton, William R. Kellen* and *Myron L.Wolbarsht* became members of the Society. *Maj. Robert M. Altman* was proposed for election.

Alan Stone, chairman of the nominating committee, presented the slate of officers for election at the December meeting of the Society. (See front cover.)

T. E. Snyder introduced the exceptionally interesting color film entitled *The Intruder,* in which he played a prominent role; it was designed for use in Science Fair activities. ''An Entomologist Looks at Agriculture in the Soviet Union,'' by P. W. Oman, was extremely topical. This address and the colored movie were the highlights of the evening.

Dr. C. A. Weigel, a long-time member of the Society, and Mrs. Weigel were welcomed to the meeting after a long absence. Visitors were as follows: *Arnold Rosenbaum, Herbert Meyer, R. L. Walker, Daisy P. Liu, R. M. Altman, F. de Zayas, L. B. Savage,* and *B. J. Hayes.*—Helen Sollers, *Recording Secretary.*

685th Meeting, December 10, 1959

President R. H. Nelson presented summary reports of the Corresponding Secretary, Membership and Advertising Committees, Treasurer, Custodian, and Special Publication Fund. He also reported that the Auditing Committee had examined the Treasurer's books and found them correct.

Maj. R. M. Altman was elected to membership. Five names proposed for membership were: *C. S. Barnhart, Herbert Ruckes, Paul M. Marsh, W. W. McIntyre, Jr.,* and *Cdr. John M. Hirst.*

Names of officers proposed by the Nominating Committee for 1960 were presented by President Nelson. A. B. Gurney moved that the nominations be closed and that the secretary be instructed to cast a unanimous ballot. W. E. Bickley seconded the motion, which was carried.

P. W. Oman reported some recent observations made by J. K. Holloway on the effects of heavy gorse weevil (*Apion ulicis*) attack on gorse plants in California. His remarks were supplemented by photographs by Mr. Holloway. Dr. Oman also exhibited color slides of the Governing Board of the Entomological Society of America taken Nov. 30-Dec. 4, 1959.

A California visitor, J. W. MacSwain, showed specimens and a short, interesting movie on black bees, *Andrena* spp. A. B. Gurney briefly discussed the Orthoptera which are established adventives in the United States and Canada. Curtis Sabrosky cited records of the introduction and spread of *Musca autumnalis* in the United States.

The speaker of the evening, Dr. Philip Lunginbill, Jr., gave a valuable talk entitled, ''Resistant wheat varieties and sawfly control.'' An animated discussion followed.

Visitors introduced were: *Cdr. John M. Hirst, W. W. McIntyre, Jr., E. Gordon Linsley, J. W. MacSwain, Charles Osgood,* and *Douglas S. Kettle.*—HELEN SOLLERS, *Recording Secretary.* Corrected and revised, ERNESTINE B. THURMAN, *Recording Secretary.*

686th Meeting, January 7, 1960

President Paul W. Oman announced standing committee appointments. He reported that greetings from the Society had been sent to Glenn W. Herrick, Professor Emeritus, Cornell University, on the occasion of his 90th birthday, on January 5th. Dr. Oman, in his discussion of the need for increased advertising in the *Proceedings*, cited its distribution as worldwide, noting that 760 copies are distributed to 50 states, the District of Columbia, 2 territories, and 47 countries.

Five candidates were elected to membership: *C. S. Barnhart, Herbert Ruckes, Paul M. Marsh, W. W. McIntyre, Jr.,* and *Cdr. John M. Hirst.* Names of two candidates for membership were announced: *Robert P. Harrison* of Dow Chemical Co., and *Robert L. Walker* of ARS, USDA.

R. I. Sailer reviewed a publication by T. R. E. Southwood and Dennis Leston (1959), *Land and Water Bugs of the British Isles.* K. V. Krombein showed excellent kodachromes of traps simulating longitudinal sections of plant stems containing nests of megachilid leaf cutting bees.

LC Robert Traub presented an interesting and well-illustrated account of entomological investigations of the U. S. Army Medical Research Unit in Malaya, 1955-1959. The Unit is concerned mainly with investigations of viral diseases, particularly those presumed to be transmitted by arthropods.

Visitors introduced were: *William F. Barr, Col. Joseph E. Webb, Jr., Samuel C. Dews, Miss Leta Jane Holman,* and *Miss E. Van Tassell.*—ERNESTINE B. THURMAN, *Recording Secretary.*

PUBLICATION DATE

The date of publication of Vol. 62, No. 1, of the *Proceedings* will be found in Vol. 62, No. 2.

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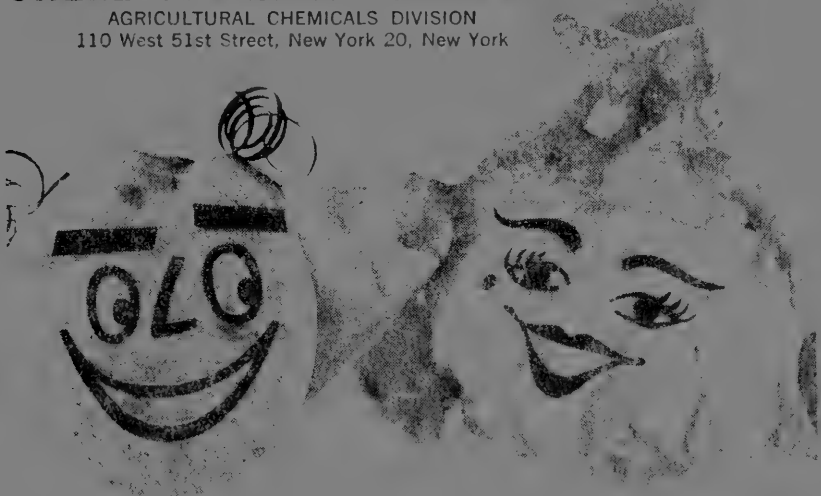

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Vol. 62 JUNE, 1960 No. 2

PROCEEDINGS
of the
ENTOMOLOGICAL SOCIETY
of **WASHINGTON**

U. S. NATIONAL MUSEUM
WASHINGTON 25, D. C.

PUBLISHED QUARTERLY

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(Continued on Back Cover)

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ORGANIZED MARCH 12, 1884

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MEETINGS

Regular meetings of the Society are held in Room 43 of the U. S. National Museum on the first Thursday of each month from October to June, inclusive, at 8 P.M. Minutes of meetings are published regularly in the *Proceedings*.

MEMBERSHIP

Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are $5.00; initiation fee is $1.00 (U. S. currency).

PROCEEDINGS

[illegible] beginning with March by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of [illegible] subscriptions are $6.00 per year, both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

The Society does not exchange its publications for those of other societies.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about $14.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines should indicate present mailing address of the author and his organizational affiliation, if possible. Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding references in which author, year, title, name of publication, volume and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

Proportions of full-page illustrations should closely approximate 4-5/16 x 6" (26 x 36 picas); this usually allows explanatory matter to appear on the same page. Cost of illustrations in excess of that for one full-page line cut will be borne by the author.

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

Vol. 62 JUNE, 1960 No. 2

CASES OF PARASITISM OF THE BASILICA SPIDER, ALLEPEIRA LEMNISCATA (WALCKENAER), BY THE DIPTERAN ENDOPARASITE, OGCODES DISPAR (MACQUART)

(ARANEIDA: ARGIOPIDAE *and* DIPTERA: ACROCERIDAE)

DONALD H. LAMORE, *Cottey College, Nevada, Missouri.*[1]

Between August 4th and 19th, 1959, inclusive, I came upon eleven cases of parasitism of the basilica spider, *Allepeira lemniscata* (Walckenaer), by an endoparasitic, dipteran acrocerid larva at Greenbelt, Prince George's County, Maryland. Several of these larvae developed into adult *Ogcodes dispar* (Macquart). The discovery of the first case was accidental while pursuing the last stages of a five-year biological field study of the basilica spider. This initial discovery spurred me to search for more parasites in the field among populations of numbered spiders that were under daily observation and among other populations under observation. Altogether, I estimate that these populations totalled about 300 spiders.

In the first part, I present chronologically the discovery of the 11 cases of parasitism. This includes a description of the emergence of the parasite from the host and the parasite's subsequent behavior in the web of the host, morphological observations on the parasite and dead host, and information on the rearing of the parasite from larva to adult. In a second part there is an analysis of notes from my diary of field observations on two parasitized spiders prior to the date of emergence of the parasite from the host. Illustrations accompany this. In the last part I discuss my data against the background of literature on the subject and delineate any original contributions that my study may bring.

[1]Bache Fund Grant number 458 provided financial assistance while I worked on this subject. I thank those who helped me. Dr. William E. Bickley, under whom I did my study of the basilica spider, gave me helpful advice. Dr. Herbert W. Levi and Mr. Curtis W. Sabrosky identified specimens for me. Dr. Evert I. Schlinger suggested references to consult and answered questions regarding the biology of *Ogcodes*. My wife assisted in the preparation of the paper and did all of the illustrations.

Discovery of the Parasites

Larva No. 1.—At dusk, 8:30 p.m., August 4, 1959, a large female spider apparently mating with a male drew my attention to a web bearing my number 132 on the crown of a privet hedge, *Ligustrum vulgare* L. However, closer examination revealed both spiders to be in their habitual inverted watching position facing west under the web dome. The male was aligned behind the female and was feeding on the posterior end of her abdomen which appeared quite shriveled. A glossy, creamy white, maggot-like larva clung by one end to the anterior ventral surface of the female's abdomen. The body of the larva hung vertically from the web at right angles to the spider's abdomen as shown in Fig. 1. The larva tapered noticeably at the end attached to the spider. Decreasing light prevented further field observations, and I took the two spiders, parasite, and web inside for further inspection. To do this, I introduced a lidless jar under the web dome and moved the jar upward so that the top of the dome adhered to and spread out flat over the jar opening with the two spiders and the parasite hanging into the jar. I found a small specimen of *Conopistha trigona* Hentz in the web also. This spider is a common commensal spider of the basilica spider at Greenbelt (Lamore, 1957).

Examination under the binocular scope showed that the parasite was attached to the left anterior ventral portion of the female's abdomen which was obviously collapsed dorso-ventrally. The parasite's escape from the host left a hole just behind the left epigastrium as shown in Fig. 4. Before leaving its host, it clung to it by one end, later identified as the anterior end, and stretched out and contracted its body several times, earthworm fashion. After leaving the host, the tapering, anterior end of the parasite extended and withdrew repeatedly. Despite its constant efforts, the parasite made no progress when placed in a drop of water on a piece of paper.

No clear distinction marked the head, thorax and abdomen at this time. Segmentation was indistinct, as described by Clausen (1940), though a number of body segments were discernible on this slimy-appearing animal. There was no visible suggestion of a cuticle except for the posterior, transparent end. Most of its body was creamy white, the color of old ivory. Five rectangular, darker, olive green-brown areas appeared deeper in the segments across the longitudinal midline as illustrated in Fig. 2. Two short, jaw-like extensions were in view, one on each side of the tapering, active front end. At the blunt-appearing rear end, there was a bell-shaped, transparent segment with a terminal opening (Figs. 2 and 3). The last segments extended and withdrew spasmodically. Two tube-like, dorsal caudal spiracles were visible when the larva extended itself. There was no attempt to rear this larva. I placed it in 70% alcohol, and the soft interior was forced out through a rupture in the cuticle during considerable manipulation in attempts to identify it. Only the cuticle and the hard parts remain.

This nearly empty integument, flattened dorso-ventrally, measures 8 mm. in length and 3 mm. in width at the widest point. The first segment has a width of 0.75 mm. at its base. The ventral surface is provided with bulging plaques of setae accentuated by folds in the nearby surrounding cuticle (Fig. 8). One anterior segment possesses a single median plaque while each of the 7 succeeding segments carries a pair of plaques arranged symmetrically on each side of a longitudinal, mid-ventral line. The distance between the two plaques of each segment increases from one segment to the succeeding one, giving an over-all effect of a V whose point faces the front of the larva and corresponds to the anterior, unpaired plaque as indicated in Fig. 7. Under the microscope, the setae appear to be articulated (Fig. 11).

Larva No. 2.—Finding the first parasite spurred a search for additional examples, with the hope that some might be reared to the adult stage for precise identification. I checked carefully as many basilica spiders as possible around the City of Greenbelt, including all populations known to me within approximately a three mile radius of the Greenbelt shopping center. The afternoon of August 8th marked the collection of a second glossy, creamy white larva. It was recognizable as the same type as the first although it had begun to turn slightly brownish.

As I removed it from where it was suspended under the hub of a basilica spider's web, it extended and withdrew its body in the same manner as the first larva had done, indicating that pupation had not set in. A search for the host's body was fruitless. The larva was placed on a thin film of sand in a low form stender dish for rearing. With pupation, the animal became smaller, browner, and dryer in appearance. Sometime during the night of the 12th and the early morning of the 13th of August, the imago emerged. Mr. Curtis W. Sabrosky identified this adult and all the other adults of the series as *Ogcodes dispar* (Macq.).

Larva No. 3.—On August 5th, I began to suspect that spider number 54 of my backyard hedge population was parasitized. For one thing, it had had a large abdomen for some time but had no cocoons to its credit as yet. Besides, I had seen it mating earlier in July. In addition, it was surrounded by contemporaries which had made cocoons. Of the 23 other females of this same population seen copulating in July, 19 had at least one cocoon. Specifically, six had 1 cocoon; seven had 2; four had 3; one had 4; and one had 5. Four had disappeared before making any cocoons.

My suspicion that individual number 54 was parasitized was fully confirmed at 10:05 a.m. on August 9th when I saw a glistening white parasitic larva protruding from the anterior ventral surface of this spider's abdomen at the level of the lung slits (see Fig. 5). Two dark, tapering, bristle-like projecting caudal spiracles conspicuously flanked the larva's posterior end which was attached to the web above it. Some of the body segments of the larva showed at this time. The corpse of the spider was motionless with the abdomen collapsed completely. Also, the host now lacked its second right leg. However, nothing of the external morphology of the spider betrayed the presence of the parasite when I examined the spider carefully on the 7th and 8th of August.

At 12:55 p.m., the larva was coming further out of the spider as drawn in Fig. 6. Just before it dropped the integument of its host, the larva swung it like a pendulum but hung vertically from the web when it finally released the victim, as shown in Fig. 6, *a* through *c*. It dropped the host at 1:00 p.m. Once it had abandoned its host, the larva still hung headfirst from the web dome but moved its tapering anterior end up and about as if exploring, as in Fig. 6*d*. The parasite soon fastened itself in a horizontal position under the web and was this way when I collected it at 1:07 p.m.. (See Fig. 6*e*). This larva measured ten millimeters in length when it stretched out. It was reared and an imago emerged on the 14th of August.

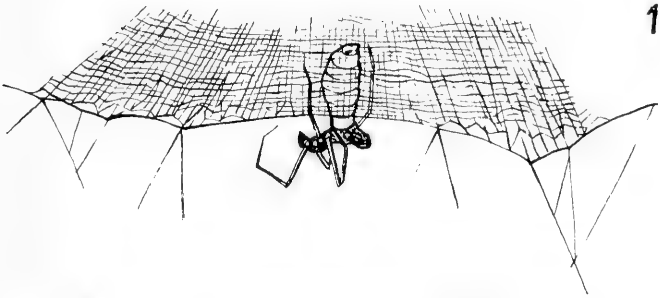
Continuing my intensive survey for parasites of the nearby basilica spider populations resulted in finding two more larvae on August 9th. Each was in a basilica spider's web in small Scot's pines, *Pinus sylvestris* L., near Greenbelt Lake. I numbered the first of these larvae number 4 and the second number 5.

Larva No. 4.—This was a shiny, creamy white individual that held on to a strand of the dorsal labyrinth of a perfect web. The spider host was gone, but the ventral labyrinth still held some old, discarded prey. For rearing, the larva was placed in a stender dish covered with a gauze. On the 14th of August, the adult emerged, escaped from its jar, and was on top of the gauze at 4:35 p.m. There was no difficulty in capturing this sluggish specimen.

Larva No. 5.—This one came from a somewhat damaged snare in a smaller pine tree than for the preceding specimen but in the same vicinity. The larva was slimy in appearance and had already begun to turn brownish. Also, it held its host whose abdomen was much shriveled. That evening, the larva left its host, moving about two millimeters away on a leaf where parasite and host had been placed in a stender dish. To escape from its host, the parasite had perforated the host's abdomen in the same region as in the preceding cases. The larva was turning brown at one end, involving half of the animal's body as signs of pupation appeared. It no longer appeared glistening or wet at this time and moved no more. At 9:15 a.m., August 12th, the adult was emerging from the pupal skin.

Larva No. 6.—This larva had fastened itself under the northern part of the dome of a basilica spider's web in the dead branches of a willow oak, *Quercus phellos* L., in a mixed group of Scot's pines and willow oaks at Greenbelt Lake on August 10th. I collected a living male basilica spider from the dorsal labyrinth of this web on the same occasion. The dead female basilica spider host with a shrunken, wrinkled abdomen hung on a strand of the ventral labyrinth of the web at 5:00 p.m. This host is mutilated, lacking all but the femur and patella of the first right leg as well as the entire right pedipalp. The sternum caves in, and the parasite's exit hole is in the region of the lung slits in this case too. I placed the parasite on a privet leaf that was on a thin layer of sand on the bottom of a gauze-covered stender dish. The larva pupated and gave rise to an adult which emerged on the 14th of August at about 4:00 p.m. In hopes that they might mate, I placed this adult together with others in a quart jar which contained "mimosa" blossoms, *Abizzia lebbeck*, goldenrod blossoms, *Solidago* sp. L., and a water-soaked slice of raisin.

Host spider, *Allepeira lemniscata* (Walckenaer), and larva of its insect dipteran endoparasite, *Ogcodes dispar* (Macquart), Greenbelt, Prince George's County, Maryland. Fig. 1: Larval parasite hanging vertically from its host's web and still clinging by one end to the anterior, ventral, epigastrial region of the host, a female basilica spider. Fig. 2: Maggot-like larval parasite with the bell-shaped, transparent, posterior end. Fig. 3: Details of the last segments of the larval parasite with the dorsal, caudal spiracles showing. Fig. 4: Body of the dead female host spider, showing the collapsed and shriveled, empty abdomen with the ventral escape hole behind the left epigastrium.



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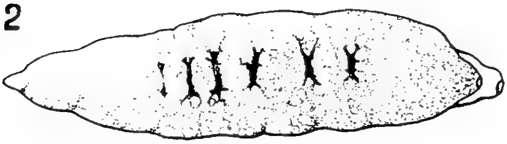

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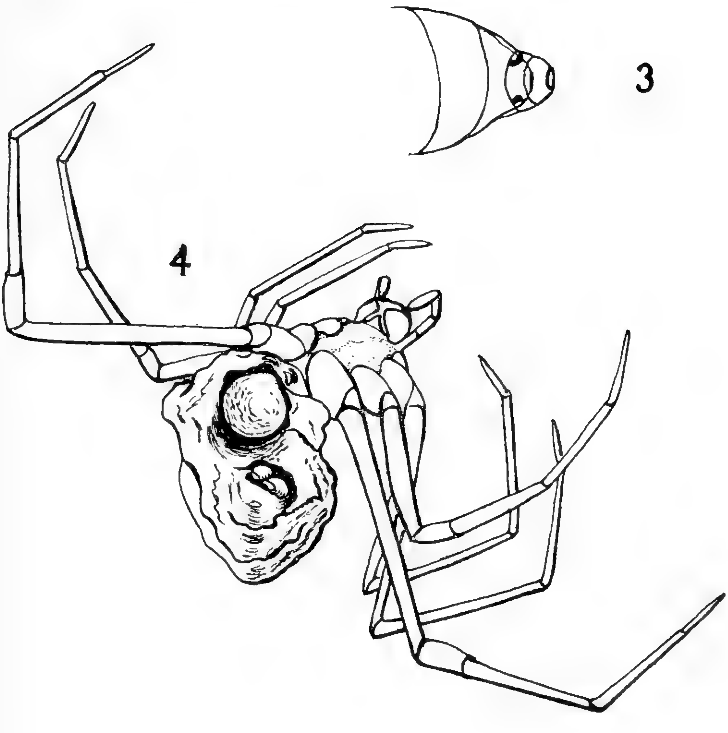

Larva No. 7.—This individual was under the dome of a deserted basilica spider's web in the branches of a small willow oak near Greenbelt Lake when I collected it on the 10th of August. The adult emerged on the 12th of August in the morning and was placed with the other adults. On the 14th of August, at 10:40 a.m., the adult was on its back with its legs thrashing the air. It died later the same day.

Larva No. 8.—I saw this specimen on the 11th of August but did not take it until the 12th. This pupa was attached to some strands under the dome of a basilica spider's web in some greenbriar, *Similax rotundifolia* L., at the edge of a lawn bordering a stand of pines about 100 yards north of the Greenbelt shopping center. Presumably dead, the animal was placed in Bouin's solution August 23rd. The prothoracic spiracle and those of the first four abdominal segments are distinct on the left side. Abdominal spiracles one through four are distinct on the right side. This specimen is 5½ mm. in length, has a thoracic width of 2 mm. at the widest point, and a greatest abdominal width of 3 mm.

Larva No. 9.—I took this larva on the 13th of August from where it had attached itself to a basilica spider's web in a small Scot's pine. The tree grew in a bushy area bordering a pine woods. The soil was sandy-clay, slightly eroded, at the western limit of the athletic field of the Greenbelt Junior High School. A drainage ditch that held some stagnant water ran along the field's edge at this point. Sphagnum and other mosses as well as some grasses were growing in and around the ditch. This lustrous white maggot hung under the web dome and appeared as if it had just emerged from the spider's integument, which was not to be found. Pupation appeared to be starting 17 hours later when I fixed this parasite in Bouin's solution. The two dorsal caudal larval spiracles hold some red pigment and are visible with the setae-bearing pseudopods on the puparium. The four abdominal spiracles of the pupa are clearly seen through the puparium (Figs. 12 and 13). This specimen is 5 mm. long and 2 mm. wide.

Larva No. 10.—From a basilica spider's web in a low Scot's pine in the same locality as for number 9, I removed this larva on the 14th of August. A bowl and doily spider, *Frontinella communis* Hentz, occupied a web about 1 foot away at the same branch level and on the same tree. One *Conopistha trigona* Hentz, a commensal spider, was in the ventral labyrinth of the basilica's web. This larva had turned brown when collected. As in the case of the other larvae, I placed it in a

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Close views of a larval insect dipteran endoparasite, *Ogcodes dispar* (Macquart), clinging to its female spider host, *Allepeira lemniscata* (Walckenaer), prior to discarding its host, while preparing to discard its host, and after discarding its host, in Greenbelt, Prince George's County, Maryland. Fig. 5: Close view of the larval parasite protruding from the anterior, ventral surface of the spider's abdomen at the level of the lung slits. Fig. 6: Larval insect parasite holds its host and stretches while hanging vertically from the web of its host. *a* and *b*, sketches soon afterward to indicate the pendulum-like swinging motion of the same parasitic larva as its anterior end still clings to body of its spider host. *c*, subsequent sketch of the same parasitic larva in a vertical position just after it dropped is host. *d*, later sketch of the same larva showing the anterior, tapering end of the animal moving up and about in exploring fashion. *e*, parasite sketched just afterward when it had fastened itself to the web of the host in a horizontal position.

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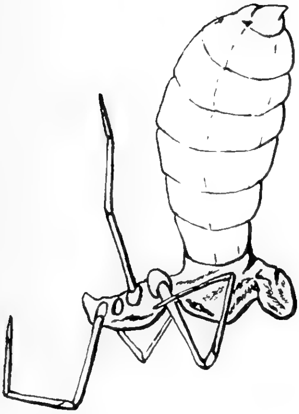

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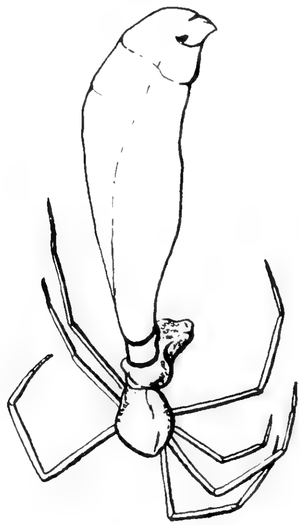

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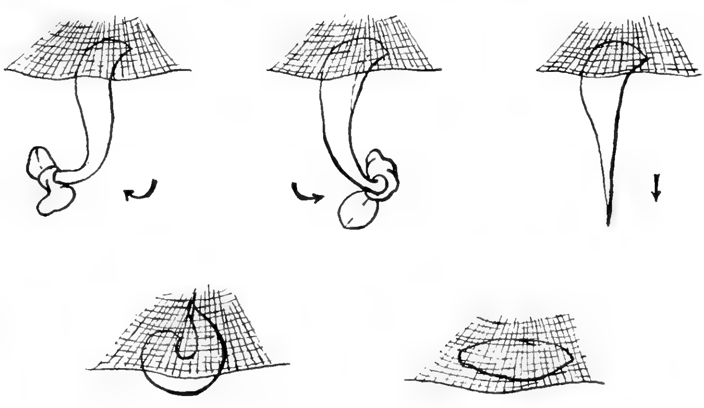

d e

stender dish for rearing. The imago emerged between 8:00 p.m. on the 15th and 10:30 a.m. on the 16th of August.

Larva No. 11.—On Saturday, August 16th, I took a large female basilica spider from its web in a Scot's pine near Greenbelt Lake. I had noted it on the 31st of July and decided to collect it because I suspected that it was parasitized. In the first place, it had had a large abdomen over a period of time. Also, it had no cocoons as yet. Lastly, it was surrounded by many other basilica spiders which had made cocoons.

To facilitate observations, the spider was placed in a small jar with pieces of goldenrod in it and a gauze spread over the top to prevent escape. A wet cotton wad placed on top of the gauze provided moisture. The spider soon suspended itself from silk strands attached to the top of the gauze and hung about ½ inch below the gauze. When I took the bottle in my hand and turned it around, the spider would move. It received no food. Daily close scrutiny revealed no external sign of a parasite. A final close check just before leaving the house at 12:45 p.m., August 19th, gave no external clue that the spider was parasitized and about to be killed. Upon returning that night at 7:15 p.m., a larval parasite was hanging in the web just under the gauze. The husk of the dead, abandoned host was lying about ½ inch below it. I placed both larva and host in Bouin's solution at 9:18 p.m., August 19th.

This larva measures 8 mm. in length and 3¾ mm. in thickness from the dorsal to the ventral surface at the thickest point. The setae-bearing bulges of the ventral surface are clearly defined in profile.

In all cases except number 11, these parasites were either seen in the field emerging from a basilica spider or found where they had attached themselves in the web of their basilica spider host.

Of the eleven cases of parasitism, two parasites, numbers 1 and 3, came from numbered hosts, numbers 54 and 132, of my backyard hedge population. These spiders were under almost daily observation for some time before the emergence of the parasite.

Prior to the date when the parasite emerged from female 54, I recorded observations on this web on 28 different days. My records began June 26th. The inhabitant was estimated to be 3 mm. in length at this time, less than ½ the length of many adult females. I observed it twice in June, the 26th and the 28th. I took notes on it on the 2nd, 4th, 8th, 10th, 14th, 15th, 16th, 17th, 20th, 22nd, 23rd, 24th of July and on every day from the 27th of July through the 9th of August when the parasite killed it. I have seventeen recorded consecutive daily observations on host 132 prior to its death on the 4th of August when the parasite emerged. I omitted only the second of August. Observations recorded relate to different biological phases which I studied during 5 breeding seasons. They may be grouped conveniently under the following headings: the web and the spider's position in the web, courting and copulation, cocoon construction, and feeding.

Details of larval and pupal dipteran endoparasites, presumably *Ogcodes dispar* (Macquart), of the basilica spider, *Allepeira lemniscata* (Walckenaer) of Greenbelt, Prince George's County, Maryland. Fig. 7: Ventral surface of larva showing the V-like disposition of the bulging plaques of setae on seven succeeding

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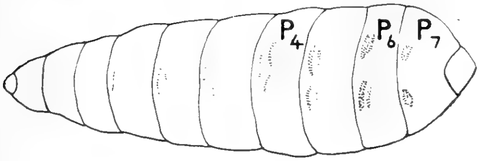

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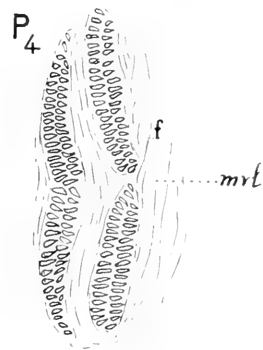

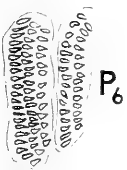

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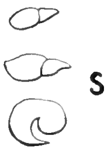

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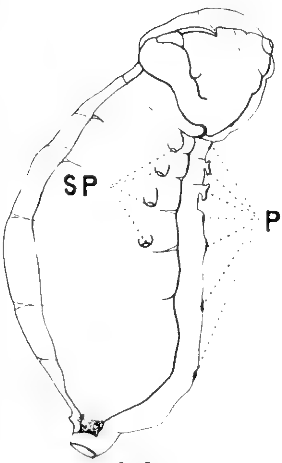

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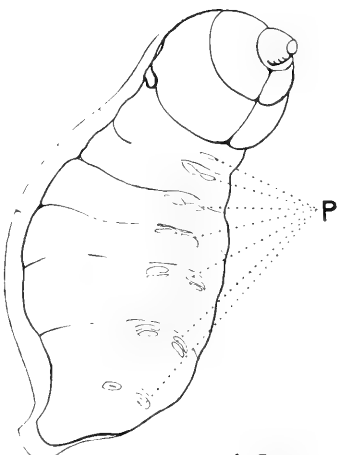

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segments. Only the fourth, sixth, and seventh plaques are numbered as P4, P6, and P7. Figs. 8-10: Details of the setae-bearing plaques P4, P6, and P7 respectively; f, folds of the cuticle. mvl, mid-ventral line. Fg. 11: S. Details of the setae under the microscope. Figs. 12 and 13: Profile and three-quarter view of a pupa through the transparent puparium skin; P, the plaques of seta on puparium skin; SP, spiracles on the abdominal region of the pupa.

Diary

The web and the spider's position in the web.—The webs of both 54 and 132 were in good condition at the time of the emergence of the parasite. Both webs were in good repair after an afternoon storm on the 23rd of July. The spider from which parasite 11 emerged during captivity of the host also had a good web when I captured it. Of the other 8 specimens of parasites collected, number 5 was the only one that came from a web which appeared damaged and slack.

Spider number 54 had molted, leaving its cast skin hanging in the ventral labyrinth when I observed on the 2nd of July. I did not find the spider in its web on the 4th. From the 8th of July onward, I described the web inhabitant as a large female, and I referred to it as a large-abdomened female as of July 12th. It molted between observations on the 14th, when its legs were blackish green, and the 15th, when they were pale green and a cast skin hung in the ventral labyrinth. Males were observed several times in her web. Except when the female mated on the 17th and 27th of July, she alone occupied the web owner's habitual position underneath the dome hub.

From the very first, I characterized number 132 as being large and referred to it as a large-abdomened female beginning July 24th. Only one noteworthy incident occurred before the spider was killed, and that involved its position in the web as web tenant in relation to the position of a male suitor present also in the web. Until August 3rd, the female remained under the hub. Meanwhile, the male present was observed in the dorsal labyrinth on 5 occasions, in the ventral labyrinth once, and beneath the dome edge on 4 later instances. However, on the 3rd of August, I noted that the male had usurped her position under the web hub. The female was about 1½ inches from the male and still under the dome. On the 4th of August, a large male was still under the hub of the dome at 3:15 p.m.

However, I place no special interpretation on this incident, for I have noted other cases where males of the same size as the female tenant or larger than she took over the central post under the dome hub which is usually held by the web owner. Also, in the case of 54, the female did not yield her position under the hub to a male during any of my observations.

Courting and copulation.—On 10 out of 17 recorded observations a male spider was living with the female in web number 132. On one of these occasions, two male spiders were present in the web. The female retreated nimbly when the male present on the 4th of August tweaked the web in a courting effort. She skirted around the hub where he was hanging. The male present on the 26th of August was busy filling its palps from a sperm web. I did not see these spiders copulate in this case.

A large male was present in the web with female 54 from the 14th through the 17th of July and copulated with her on the 17th at 4:40 p.m. The same male, presumably, was in the dorsal labyrinth of her web forty minutes later. When I inspected on the 20th, 22nd, and 23rd the female was alone. The web inhabitant mated again between 10:36 a.m. and 10:49 a.m. on the 27th, thirteen days before the parasite struck its lethal blow. Copulation occurred three separate times as I watched, with the behavior of both sexes quite typical of what I had recorded for many other copulating pairs of this species. At one point, the male lost his grip on the female and dropped to safety on a silken escape line. He returned soon and mated again, however.

Cocoon construction.—Although all of these parasites upon which I report left the host in the full cocoon-making season, none of the host spiders had produced any cocoons among the eleven cases. The sturdily made, unmistakable cocoons of this spider hang like a string of beads over the hub of the web from a tough horizontal bar of silk. The string of cocoons and its silken support bar remain through the winter while the web itself deteriorates and disappears soon after the death of the adult.

The basilica spider host carrying larva number 11 was a large, cocoon-less adult, conspicuous among other adults which had cocoons. Parasitized spiders number 132 and 54 which had no cocoons when their parasites killed them on the 4th and 9th of August respectively belonged to a numbered population. At this point, figures from the diary bring the following precision: thirty-one numbered spiders were fully comparable to 54 and 132. Out of these 33 contemporaneous individuals, 26 had cocoons by the 9th of August and 7 had none. Of these 7, two were parasitized; four deserted late in July; and one was found dead in the web.

Feeding activity.—A rough indication of the relative feeding activity of the individuals of the population was obtained by scoring any feedings witnessed at the time of the daily rounds. After July 23rd, neither parasitized spider 54 nor 132 was seen feeding. The feeding of 24 numbered spiders of my backyard hedge was scored together with the feeding of parasitized spiders number 54 and 132. For that sample, my tally shows that the frequency of occurrence of the total number of feedings witnessed for one individual reads as follows:

TABLE 1

Number of feedings witnessed after the 23rd of July up to August 9th for different individuals of the same population	Frequency of individuals feeding that number of times.
0	3*
1	4
2	6
3	7
4	3
5	1
6	1
7	0
8	1
	26

* This includes parasitized individuals 54 and 132.

Spiders inhabiting webs number 54, 89, and 141 respectively had considerable debris in the form of fallen tree leaves in their snares. Fallen leaves and flower parts of an overhanging "mimosa" tree, *Abizzia lebbeck,* began to clutter the webs dorsal and ventral labyrinths according to my notation of July 16th. It is possible that the leaf and flower-encumbered web reduced the food-getting capacities of number 54 in some way. However, 89 fed 3 times from July 23rd to August 9th, and 141 fed twice as compared to no observed feedings for 54 during the same period.

Two incidents show that spider 54 probably had not lost its food-getting instinct as yet as of August 1st. At 3:00 p.m., July 30th, the spider was alert and shook its web vigorously under the southern dome perimeter just below a privet leaf that had just lodged in the dorsal labyrinth. It moved agily about under the southwestern part of its dome and palped another fallen privet leaf which stuck there on the 1st of August at 5:15 p.m. This behavior is common among basilica spiders whose webs trap fallen leaves and seems identical to the web-tweaking practiced to further secure partially ensnared prey.

Discussion

The information available permits certain remarks about the biology of the host spiders and the parasite.

A. The Host

The web.—All hosts except one were able to maintain relatively good webs. This contrasts with Johnson's (1915) statement that Montgomery, in dealing with Lycosids and their parasitic *Acrocera fasciata* Wied., says that he could distinguish parasitized spiders "long before there was any other indication" because their webs were weaker and not as well made as those of normal spiders.

The literature has accounts of host spiders spinning silk aimlessly just prior to the escape of their acrocerid parasites. If the basilica spider does this too, it does not enclose itself in a cocoon of silk. In any case, such spinning by the basilica spider did not produce anything conspicuous that I could offer as evidence as to whether or not they spin silk just prior to the escape of the parasite. On the contrary, the wolf spider from which an *Ogcodes eugonatus* Loew emerged on June 9, 1959, at Nevada, Missouri had spun a distinct mat of webbing just under the glass plate covering the culture dish in which the spider lived. The parasite gripped this web from below, and the discarded host fell to the sand on the bottom of the dish. The host had made no previous web.

Mating.—Carrying a parasite within its body did not destroy the mating instinct or capacity to copulate of host number 54. It may well have been parasitized when it molted on July 15th. It is worth noting that Bristowe (1941) records certain captive spiders carrying ectoparasitic ichneumon larvae as able to "spin webs, catch flies, mate" and even lay eggs in one instance.

So far as the biology of the basilica spiders goes, the preceding remarks are in harmony with Clausen's (1940) statement that "The host spider usually shows no evidence of parasitism, either by modifications in body form or change in activities, until a few hours before death."

On the other hand, the following observations do not agree with his statement:

Cocoons.—Being parasitized had a decided suppressive effect upon the cocoon-making capabilities of all of the host basilica spiders under consideration here. In fact, it was possible to single out two parasitized spiders during the cocoon-making season because their lack of cocoons made them conspicuous among their cocoon-possessing neighbors. Thus, while it cannot be said that all cocoonless individuals are parasitized, it may be said that one earmark of these parasitized spiders was their lack of cocoons.

B. The Parasite

Data gathered on the parasite invite comment too:

Region of emergence of parasite from host.—In five out of the eleven cases reported upon, I was able to observe the region of emergence of *O. dispar* from its host basilica spider. In all five cases the spider escaped through a hole cut just behind the epigastria on the anterior, ventral abdomen of the spider. The *O. eugonatus* that escaped from its wolf spider host on June 9, 1959, left through the same region of the spider's body. Millot (1938) reports cases where larvae emerged through the ventral abdomen, other cases where it left through the lateral abdomen, and still others where it left through the dorsal abdomen of the host. From this, he concludes that there is no specific region of emergence of the parasite from its host. However, Clausen (1940) states that "emergence is effected through a hole cut in the ventral abdominal wall." Millot (1938) reports that the 3rd stage parasitic larva more often establishes respiratory communication with the exterior by penetrating the host's pulmonary cavity with its posterior spiracle-bearing extremity. At the time of emergence, it seems to me that the route offering the least resistance to the exit of the parasite from its host would be through this pulmonary opening previously established for respiration. Consequently, we would find evidence more often of the escape of the parasite from the ventral side of the host's abdomen near the lung slit openings just behind the equigastria, as in the cases which I observed.

Time needed for parasite to leave host.—I can offer only approximate figures on two cases as to the length of time required for *O. dispar* to leave basilica spider hosts. In the case of larva number 1, from host number 132, there was no sign of the parasite emerging at 3:15 p.m., August 4, 1958, and the host was still lively at that time. However, at 8:30 p.m. of the same day, the larva had completely emerged except for its anterior tip with which it still held its host. The larva left the host at 8:50 p.m. while I was looking at it under the binocular-scope. Thus, it required less than 5 hours and 35 minutes for it to emerge from and abandon its host. Of course, bringing the web with host and parasite inside and examining these animals under the binocularscope may have hastened the parasite's act of leaving its host. Although I did not see the beginning of the escape of parasite number 3 from host spider 54, I saw the parasite continue to hold and use its host between 10:05 a.m. and 1:00 p.m., a period of 2 hours and 55 minutes. From larva number 11, the parasite emerged from and discarded the remains of the host between 12:45 p.m., August 19, 1958, when I left the house, and 7:15 p.m. that same day, when I returned. It thus required less than 7½ hours.

The specimen of *O. eugonatus* escaped from the captive wolf spider host between 11:40 a.m. and 1:50 p.m. on June 9, 1959, requiring less than two hours and ten minutes. My data agree with similar records in the literature. Millot (1938) sums up in a general fashion by saying that at times it takes less than six hours from the first symptoms of parasitism by the victim until the larval parasite has emerged and discarded its host. Starting with the first sign of emergence of *Opsebius diligens* Osten Sacken from its host spider, *Hololena curta* (McCook), Schlinger (1952) watched and recorded for 4 hours and 49 minutes but discontinued his watch before the parasite discarded its host. He judged that the parasite probably devoted over five hours to external feeding before leaving its host. Eight minutes were necessary for the larva to emerge and attach itself to the host's web.

Extent of feeding by parasite upon host.—The amount of feeding on their respective hosts varied among the different larvae of *O. dispar* concerned here. In the cases of two out of five hosts available, the parasite removed all flesh from the cephalothorax, coxae, and femora of the legs and pedipalps and stripped the chelicerae as well. In another instance, the flesh was missing from all coxae, trochanters, and all but the distal tips of the collapsed femora. In this instance, the sternum was caved in toward the dorsal surface of the cephalothorax, but a film of flesh remained in the dorsal cephalothorax. The chelicerae appear to have gone untouched by the parasite. Appendages and cephalothorax were opaque in two other hosts where little or no external feeding occurred. In the case of one of these last two, host 132, the male spider which was in the female's web had begun to feed on the posterior tip of her abdomen while the parasite still held its victim. This may have disturbed the parasite somewhat. Also, preserved host 132 had its abdominal contents less completely consumed than in the cases of the other hosts. These observations show that *O. dispar* may neglect using the flesh of the cephalothorax and appendages at times, may strip them almost completely in other cases, and clean them completely in yet other cases except for the distal femoral tips, tibiae, tarsi, and metatarsi. *O. eugonatus* removed all of the flesh from the cephalothorax, coxae, trochanters, and femora of its wolf spider host. The additional information makes it clear that skeletonizing the host to a certain degree before discarding it is a common trait among acrocerids.

However, the literature concerning the relative amount of feeding on the host by the parasite does not show as much variation as I observed. King (1916), in speaking of the spider host *Epeira sericata* Clerk for the acrocerid parasite *Pterodontia flavipes* Gray, stated, "The cephalothorax and legs were also eaten out so that the remains resembled a cast skin, except for the fact that the cephalothorax was not broken." Kaston (1937) wrote of his observations that *O. pallidipennis* Loew ate out the cephalothorax and coxae before it abandoned the host. Schlinger (1952) reports that *Opsebius diligens* Osten Sacken fed on abdominal, cephalothoracic and leg tissues down to and including the tibiae of the host involved. It consumed most of the tibial flesh and nearly all of the flesh in the more proximal segments. Flesh of the pedipalps and chelicerae was eaten too.

Time of day when parasite emerges from host.—My study also permits comment about the time of day when the parasites emerge from their hosts. Millot (1938) states that in 4 out of 5 cases which he observed involving one *Acrocera golbutus* Panz, one *Ogcodes zonatus* Erichson, and three *Ogcodes pallipes* Latreille, the maggot left its host during the night. He concluded tentatively that this is a general rule. Schlinger (1952) saw the emergence and feeding of *Opsebius diligens* Osten Sacken from its spider host, an immature female *Hololena curta* (McCook) between 10:44 p.m., March 20th, and 3:36 a.m., March 21st, 1950. The larva had "separated from the host at 8:00 a.m." when he inspected it on the 21st of March. For three of the 11 cases of *O. dispar* upon which I report, I have definite information as to the time of emergence of the parasite from its host. The parasite began or completed its emergence during the day in each of these three cases. Sometime between 3:15 p.m. and 8:30 p.m., August 4, 1958, larva number 1 emerged from its host which it discarded at 8:50 p.m. At 10:15 a.m., August 9, 1958, parasite number 3 had emerged from its host but still clung to the victim by the anterior tip of its body. It finally dropped its host at 1:00 p.m. Larval parasite number 11 escaped from its host between 12:45 p.m. and 7:30 p.m., August 19, 1958. More recently, the larva of *O. eugonatus* liberated itself from the captive wolf spider host between 11:40 a.m. and 1:50 p.m., June 9, 1959. From the evidence, it appears that it is not uncommon for larval *Ogcodes* to leave their hosts during daylight hours.

Time required from larval emergence to imago.—From my study some information is available on the length of time required after the emergence of the parasite, *O. dispar,* from its basilica spider host until the imago appears. I have precise information in two cases as follows. Parasitic larva number 3, which liberated itself from its host August 9, 1958 in the afternoon, gave rise to an imago which was present on the morning of August 14th, requiring slightly less than 5 days. In the second case, larva number 5, the larva left the host's abdomen on the 9th of August in the afternoon also, and the imago was present at

9:15 a.m., August 12th, slightly less than three days being required. This shows a variation for the period where the same host species is used and the larval parasites are kept under the same conditions. The other parasites upon which I report do not give us exact data on the length of time which elapsed between the exit of the larva from its host and the appearance of the adult fly. Number 2, taken August 8th in the afternoon, produced an imago that was present the morning of August 13th, requiring almost 5 days from the date of collection. I took larva number 7 in the afternoon of August 10th, and the imago was present on the morning of the 12th, slightly under two days later. It is likely that pupation had begun in this individual when it was collected. Number 10, acquired as a pupa on the afternoon of August 14th, gave rise to an imago that was present on the morning of the 16th, slightly less than two days later. All specimens developed under the same conditions: in stender dishes placed side by side on the sill of an open window, during August, 1958, when the average monthly temperature was 72.7 degrees Fahrenheit.

It is worth noting in Table 2 below the average monthly Fahrenheit temperatures for April through November, 1958, covering the life span of the basilica spiders once they leave their cocoons in Prince George's County, Maryland. The figures are from the U. S. Weather Bureau's Annual Summary 1958, Volume LXII, No. 13, from the Greenbelt Station, Prince George's County, Maryland.

TABLE 2

April	May	June	July	August	September	October	November
53.7	61.4	67.9	76.4	72.7	66.2	55.9	47.5

The larva of *O. eugonatus* also gave rise to an imago in slightly less than 4 days. This larva emerged from a captive wolf spider between 11:40 a.m. and 1:50 p.m. on June 9, 1959, and the imago had already emerged at 9:00 a.m. on June 13th. Mr. Curtis W. Sabrosky identified this fly.

Kaston (1937) indicated that the pupal period was 5 to 6 days for the *O. pallidipennis* Loew which he observed. Millot (1938) interprets the acrocerid pupal period to be scarcely a week in length, with variations according to the changing temperature. He judges the larval period from the time of escape from the host until pupation to be 36 hours at the longest.

Fecal discharge.—Nielsen (1932), Kaston (1937), Millot (1938), and Schlinger (1952) call attention to the black, stringy, often coiled fecal discharge of larval and pupal acrocerids. My observations of the larvae on which I report further substantiate this as being typical.

Measurements of larvae.—Some of the measurements which I took from the larvae, presumably *O. dispar*, are as follows: larva number 1, integument only, and flattened dorso-ventrally, is 8 mm. long and 3 mm. wide at the widest point. Larva number 3, a living larva, once stretched to a length of 10 mm. Larva 11, preserved in Bouin's solution, is 8 mm. in length and 3¾ mm. from dorsal to ventral surfaces at the thickest point.

The larvae that I measured are relatively large. Nielsen (1932) lists 6.5 mm. as the length of the larva of *O. gibbosus* (Linnaeus) which he examined. For his specimen of *O. costatus* Loew, Kaston (1937) gives 9.35 mm. as the length. Millot (1938) gives the length of *O. pallipes* Latreille as between 6 and 7 mm., based on measurements of his three specimens. The larvae which I measured are longer than those reported upon by Nielsen (1932) and Millot (1938). The longest example, measured when alive and stretching, exceeded the length given by Kaston (1932) for *O. costatus.*

At this point, it is interesting to note that the abdomen of a large female basilica spider that is not parasitized by an acrocerid may attain a size approximating that of a full term acrocerid larvae after discarding the basilica spider host. A large basilica spider taken at Greenbelt, Maryland in the summer of 1958 had an abdomen that was 7.8 mm. in length, 3.5 mm. as a greatest width, and a greatest dorsoventral thickness anteriorly of 4 mm., and tapered to a thickness of 3 mm. posteriorly.

Pupa.—I was able to make some observations on the pupae. As described by Millot (1938) for the family Acroceridae in general, *O. dispar* larvae turned brown progressively as pupation advanced. Some of the larvae acquired brown pigment much more swiftly than others. Number 9 had not turned brown at all when I fixed it after it had become motionless and had a distinct head, thorax, and abdomen. On the other hand, half of the body of number 5 was brown while the larva still clung to its host and wiggled actively. Two cast pupal skins preserved in alcohol are orange-brown in color, viewed in transparency, matching with shade 220, orange, of Séguy (1936). The pupa of *O. eugonatus* remained light in color, undergoing only slight change from the color of the larva.

Specimen number eight, a pupa preserved in alcohol, has 5 distinct spiracles on the left side: the prothoracic and those of the first four abdominal segments. Abdominal spiracles one through four are distinct on the right side. This specimen is 5½ mm. in length, has a thoracic width of 2 mm. at the widest point, and a greatest abdominal width of 3 mm. Specimen number 9, preserved in Bouin's solution, is 5 mm. long and 2 mm. in width at the widest point. Abdominal spiracles and some pseudopods are visible on this pupa (see Fig. 12).

Imago: I have little to add about the longevity of the imagos that I raised as I placed them all together, unmarked, as soon as they emerged from the pupal stage in hopes that they would reproduce. None survived more than 5 days. Mr. Sabrosky sexed the adults as 2 males and 5 females.

Life cycle.—There is reason for comment about the number of generations of *O. dispar* per year in respect to those individuals which parasitize Maryland basilica spiders. Clausen (1940), relying heavily on the reports of King (1916) and Millot (1938), and admittedly on the basis of scant available data, concluded tentatively that acrocerid flies propagate but one generation per year with nine months allotted to the endoparasitic larval development in "an active or hibernating host." This line of thinking eliminates the basilica spider as a possible winter host for *O. dispar*, for the adult basilica spider populations all die at the conclusion of the breeding season, leaving the eggs and developing young within the cocoon to tide the spiders over the winter. Next, we may turn to the possibility that the larval flies just out of their own eggs invade the cocoons of the basilica spiders there to penetrate the spider eggs or embryos and thus spend the winter in this host. However, there is little to support this thesis. Little credence is given now to early reports that acrocerids parasitize spider eggs. Kaston and Jenks (1937) point out that "so far as is known, dipterous 'parasites' of spider egg sacs are actually egg predators, the maggots not completing their development within a single egg but lying free in the sac among the eggs." Furthermore, in Millot's (1938) experiment, he observed complete failure of fly larvae to penetrate available spider eggs and embryos of host spider species.

My own dissections of 30 individual basilica spider cocoon strings, comprising 134 separate cocoons in all, gave conclusive evidence of cocoon predation in one case only, and the insect predators involved were not acrocerids. Four other cocoons were completely empty with large holes in them as an apparent result of predation.

At present, then, we do not know how *O. dispar,* which parasitizes the basilica spider, passes the winter. Bristowe (1941) cautiously states that, "Often, and perhaps always, it spends the winter inside its host," when he speaks of acrocerids. So far as I know, the literature holds no record of overwintering adults or eggs for this fly. The possibility is open also for more than one generation of this fly per year, the generation which uses the basilica spiders being followed by a generation which overwinters parasitically within another spider species unidentified as yet as the alternate host. The adults of the alternate fly generation would reproduce in the spring or early summer, providing larvae which would infest the basilica spider. Millot (1938) calls attention to the lack of host specificity on the part of these parasites.

Basilica spider as a host.—All available basilica spider hosts were females. However, Millot's (1938) records show that acrocerids parasitize male and female spiders in other species of spiders. Certain things help to account for the lack of examples of male basilica spider hosts from my search in the field. First of all, male basilica spiders were less numerous than females at that part of the season when I discovered the examples of parasitism. In addition, those of the male spiders still living at this time that wander through the foliage to seek females expose themselves to predation by insect and spider hunters more than do the females which stick to their webs. In this way some parasitized males may be consumed by predators. Moreover, the parasite may kill its male host as it travels through the branches and thus hide the scene from the observer. Also, since female basilica spiders do eat their mates at times (Lamore, 1959), it is possible that parasitized males fall prey to the female occasionally. Besides, a more extensive survey over a greater period of time might have resulted in finding some examples of male basilica spiders parasitized by *O. dispar.*

It is not surprising to find this kind of parasite using the basilica spider as host. Millot (1938) points out and Bristowe (1941) agrees that because acrocerids are apt to lay their eggs on bushes and trees, with many larvae probably falling to the soil after hatching, that spiders which travel on plants habitually and those which walk usually on the ground would be the most common victims. Although the female basilica spider hangs usually under the hub of its web dome, it walks on the nearby leaves and branches at times. It goes on the leaves and branches to repair its web and to escape from its enemies. To escape, it drops to the lower branches and soil occasionally, just as the males do. In addition, mature males travel along plants in search of females. Also, I have seen instances where both sexes went out short distances on the foliage as the female chases her male suitor from the web. Finally, the spider is of a suitable size for this type of parasite.

Frequency of cases of parasitism.—All examples of parasitism of the basilica spider by *O. dispar* occurred within a one-mile radius of the Greenbelt shopping center. The two examples from my backyard hedge were about 10 feet apart. Among the pines at the Greenbelt Junior High School, I found two that were about 50 feet from each other and about ½ mile from the nearest of the others. Three out of the four discovered at Greenbelt Lake were within 100 feet of each other. The fourth one was about 200 feet from the closest of the other three of this group. All four were about ½ mile from any of the others. Two other cases were separated by about ½ mile from each other and by at least ¼ mile from any of the other groups. I checked approximately three hundred webs during this search. I could not check all of them every day due to other urgent matters. Also, I would have missed any cases where the parasite left its host before or after my period of search.

Some information is available on the frequency of parasitism of spiders by acrocerids. Montgomery (1903) found that "one male and six females of *Lycosa stonei* Montgomery" out of some twenty spiders taken from a region in Pennsylvania were parasitized by acrocerids. Kaston (1937) found five spiders parasitized by acrocerids out of about a thousand captive spiders of different kinds used in the laboratory over a four-year period. Millot (1938) came across five such cases of parasitism out of 1,100 different kinds of spiders "captured young and raised in the laboratory." Out of about 50 captive spiders of various kinds which I observed at Nevada, Vernon County, Missouri during the summer of 1959, one wolf spider was parasitized by *O. eugonatus.* But the present report is on a field study of a single species, the basilica spider, and its endoparasite, *O. dispar.* Accordingly, my information is not comparable to that given by Montgomery (1903), Kaston (1937), or Millot (1938).

The basilica spider at Greenbelt, Maryland was an especially suitable species for a rapid survey for examples of parasitism by acrocerids. For one thing, the web of this spider is conspicuous. Also, these spiders tend to congregate on hedges and trees, forming colonies where individual webs touch each other in some cases. Besides, lack of the typically conspicuous cocoon string for some females during the cocoon-making season helps to identify parasitized spiders.

It is possible to foresee the accumulation of more information on the subject. For instance, dissection of a series of cocoonless females at the height of the breeding season may disclose the parasite inside of its host in some cases and give us information about the parasite in its host during this important period. Also, the collection of several maggots at the time of emergence may lead to a breeding stock of adult of *O. dispar* and eventually to a supply of newly hatched larvae, marking a further step toward the clarification of the life cycle of these flies.

Summary

Between August 4th and 19th, 1958, during a field study of the basilica spiders at Greenbelt, Prince George's County, Maryland, I came across 11 cases involving parasitism of these spiders by endoparasitic acrocerid fly larvae. I reared 7 of these larvae to adults which Mr. Curtis W. Sabrosky identified as *O. dispar.* I checked about 300 webs in my search for these parasites.

There was nothing that I could see about the external anatomy of living spiders suspected of being parasitized to indicate that they were parasitized. All but one of the 11 hosts maintained relatively good webs. One parasitized spider mated twice, the last time being only 13 days before the parasite killed it. However, none of the eleven spider hosts made any cocoon whereas their neighbors that were not parasitized by acrocerids did.

In each of the five cases where the host's body was available, the parasite's escape hole was just behind the epigastria on the anterior, ventral abdomen of the spider. In some cases, the larval parasites ate more of their host's flesh than in other cases. Three of the eleven parasites began or completed emergence from the host during daylight hours. I do not know at what time of day the others emerged.

The present study at Greenbelt, Maryland establishes the basilica spider as a host of *O. dispar* and opens the question of how and where the parasite passes the winter season. The study also shows that the

basilica spider is an especially suitable species for a rapid survey for examples of parasitism by this kind of parasite.

I also report an example of an acrocerid, *O. eugonatus,* escaping from a captive, immature wolf spider host, family Lycosidae, during the day of June 9, 1959, at Nevada, Missouri. Dr. Herbert W. Levi identified the spider host.

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ANNOUNCEMENT

Helminthological Society of Washington Observes Fiftieth Anniversary.

Saturday, October 8, 1960, the Helminthological Society of Washington will observe its Fiftieth Anniversary. A scientific program will be held at the University of Maryland, College Park, Maryland, and a banquet will be held during the evening at the Naval Officers Club at Bethesda, Maryland. Dr. Chauncey D. Leake, President of the American Association for the Advancement of Science, will be speaker of the evening.

NEW HOSTS OF THE FOXGLOVE APHID

(Homoptera: Aphidae)

Two plants not formerly recorded as hosts of the foxglove aphid (*Myzus solani* (Kltb.)) were observed to be serving in this capacity on Aroostook Farm near Presque Isle, Maine, in 1958. These plants are yellow goatsbeard (*Tragopogon pratensis* L.) and alder-leaved buckthorn (*Rhamnus alnifolia* L'Her.)

Large numbers of aphids bred on yellow goatsbeard that came up in a cage covering several hawkweed plants after they had been infested earlier with a single stem mother nymph. Progeny of the aphid continued to breed throughout the remainder of the season on both plants. Observations by E. L. Tuttle (resigned Aug., 1959) at the same place in 1959 corroborated this finding. Yellow goatsbeard should probably be considered as a secondary host of the aphid. It is a perennial plant but apparently dies to the ground before oviparae of the aphid mature in the field.

Early in June 1958 a naturally occurring colony of the foxglove aphid was found and caged on alder-leaved buckthorn. Alatae matured in the colony from June 9 to 16. (Our identification of these alatae was verified by Louise M. Russell, Entomology Research Division, who also examined first- and second-generation adult progeny that developed in the greenhouse on caged plants of potato, *Solanum tuberosum* L., and hemp nettle, *Galeopsis tetrahit* L.). These were apparently spring migrants, because similar forms, known to be spring migrants, began to mature on June 12 in colonies developing from single stem mothers on caged plants of the primary host, hawkweed (*Hieracium* sp.), growing nearby. It appears that alder-leaved buckthorn served as a primary host. This plant is the most important primary host of the buckhorn aphid (*Aphis nasturtii* Kltb.).

Although our observations indicate that both these plants are now of little importance as hosts of the foxglove aphid, they could, under some conditions, serve in this capacity. Both plants are generally present in northeastern Maine.—W. A. Shands *and* H. E. Wave (resigned Aug., 1958), *Entomology Research Division, ARS, U. S. Department of Agriculture, Orono, Maine* (*In cooperation with the Maine Agricultural Experiment Station*).

BOOK NOTICES

THE COMMON SALT-MARSH TABANIDAE OF LONG ISLAND, NEW YORK, by Hugo Jamnback and William Wall. New York State Museum and Science Service Bulletin No. 375, Albany, New York. 72 pages, 27 figs.

THE ANATOMICAL LIFE OF THE MOSQUITO, by R. E. Snodgrass. Smithsonian Miscellaneous Collections, vol. 139, no. 8, 87 pp., 30 figs., 1959. Smithsonian Institution, Washington, D. C.

THE TAXONOMY OF PSILOTHRIPS HOOD

(THYSANOPTERA: THRIPIDAE)

KELLIE O'NEILL, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

Psilothrips is a little-known deserticolous genus, remarkable in its distribution. Of its three species, *pardalotus* and *priesneri* inhabit arid regions of the United States, and *bimaculatus* is found in the Eastern Desert of Egypt and the Jordan Valley. The appearance of *bimaculatus* so far from its congeners is hard to account for. Part of the explanation may lie in the fact that its known localities are divided by the Suez, passageway for centuries of traffic. There may also be a relationship between the distribution of this genus and that of the plant genus *Lycium*, on which all the species of *Psilothrips* have been found; but since at least the American species are found on other desert plants, especially *Atriplex*, it seems likely that *Psilothrips* is associated with desert areas more than with *Lycium*.

Each of the three species of *Psilothrips* was originally assigned to a separate genus, and was therefore not compared with the others. The rarity of specimens—there is still no collection from which more than two of the species are available—has since deterred a study of them, even when it was realized they belong to the same genus. With the addition of *priesneri* (Moulton) to the national collection, through a short series collected by F. F. Bibby, Phoenix, Ariz., came the opportunity to compare the North American species, and data on the Egyptian *bimaculatus* (Priesner), furnished by its describer, permit it to be included in this paper.

The three species were described within a fairly short period. Moulton described *priesneri* in 1926, but placed it in *Anaphothrips*. In 1927 Hood recognized the genus as new, naming it *Psilothrips*, with the type his new species *pardalotus*. In 1932 Priesner, then unaware of Hood's description, provided a new generic name, *Thamnothrips*, for the species he described, *bimaculatus*. Subsequently Priesner recognized *Thamnothrips* as a synonym of *Psilothrips*, but, not yet having seen *pardalotus*, did not show whether *bimaculatus* was identical or only congeneric with it.

The most distinctive characteristics of these small, spotted thrips are in the wings, which are comparatively wide for Thripidae. The fore wing has no fringe on the fore margin, and the fringe hairs present on both wings are virtually straight, rather than wavy, as in most of the family. The maxillary palpi are two-segmented, but the antennae (figs. 3 and 4) and legs are typically thripine, and accessory sternal setae are present in the female. The development of the pterothorax for jumping and the broadly spindle-shaped abdomen are reminiscent of *Sericothrips*, but where *Sericothrips* has microtrichia covering most of the abdomen, *Psilothrips* has only a few projections from the lines of the latero-dorsal sculpture, and lacks even the usual comb on the posterior margin of the 8th tergum.

My thanks are due to F. F. Bibby, Arizona Fertilizers, Inc., Phoenix, Ariz., for specimens of the American species and to H. Priesner, Linz, Austria, for data on the Near Eastern species. I am also grateful to E. S. Ross and the California Academy of Sciences and S. F. Bailey, of the University of California at Davis, who lent material including types of both American species; to Floyd Andre, of Iowa State College, who lent series of *pardalotus* from several localities, mostly new; and to R. S. Cowan, of the U. S. National Museum, who checked plant names.

Genus **Psilothrips** Hood

Psilothrips Hood, 1927, Wash. Biol. Soc. Proc. 40:198; Bailey, 1957, Calif. Insect Surv. Bul. 4(5):190. Type by original designation and monotypy *P. pardalotus* Hood.

Thamnothrips Priesner, 1932, Soc. Roy. Ent. d'Egypte 16(1-2):2 (= *Psilothrips*, Priesner, 1949, Soc. Fouad 1er d'Ent. 33:150. Type by original designation and monotypy *T. bimaculatus* Priesner).

Female small, not over 1.3 mm. long when fully distended; pale, maculate. Setae of body and wing mostly clear, longitudinally grooved or fluted (figs. 11c and d), slightly thicker, less acutely pointed, and moderately to decidedly shorter than usual in Thripinae. Head (fig. 6) transverse, widest through eyes; eyes slightly bulging, one-half to two-thirds the length of head, separated by more than their width; cheeks slightly rounded or evenly converging to base; frontal costa shallow, a little wider than in typical thripines; ocelli on rounded hump. Sculpture of head, at base distinct, transverse, anastomosing; elsewhere weakly rugose; all setae minor. Antennae (figs. 3 and 4) thripine, 8-segmented; segments III with dorsal, IV with ventral subapical forked sense cone; IV lacking simple sense cone Mouth cone usually moderate to long, maxillary palpi 2-segmented.

Pronotum (figs. 1 and 2) transverse, scarcely wider than head; surface more or less rugose; posterior angles with or without a major seta; other setae minor. Pterothorax stout but not wider than abdomen; sculpture of mesonotum about as usual in thripines; of metanotum varying with the species. Legs delicate, unarmed; tarsi subsegmented. Wings (fig. 8) wider than usual in Thripinae; width nearly 1/10 length; veins distinct in untreated specimens; fore wing without fore marginal fringe, with hind marginal fringe hairs straight (fig. 11e); row of setae interrupted on anterior longitudinal vein, irregular but not distinctly interrupted on posterior one. Abdomen broad at segments III and IV, tapering decidedly to X; segments except X transverse, I-VII decidedly so. Sculpture of terga reticulate, reticles about equilateral on I, transverse on II to base of IX, indistinct elsewhere; the more prominent lines of sculpture aculeate-dentate (fig. 11b). Posterior margin of tergum I more or less sinuate. Median pair of tergal setae prominent, approximate on II-VIII, attached to apodeme on III-VII; pair 2 prominent, somewhat medially directed on V-VII; position and development of setae not otherwise peculiar; total number of dorsal and lateral pairs 6 on segment V. Tergum VIII with no trace of posterior marginal comb; IX with 1 pair of pores; X entire. Structure and position of sternal setae normal for subfamily; sterna II and VII lacking primary pair 3; accessory setae forming irregular median transverse row on sterna III-VII, a few present on II.

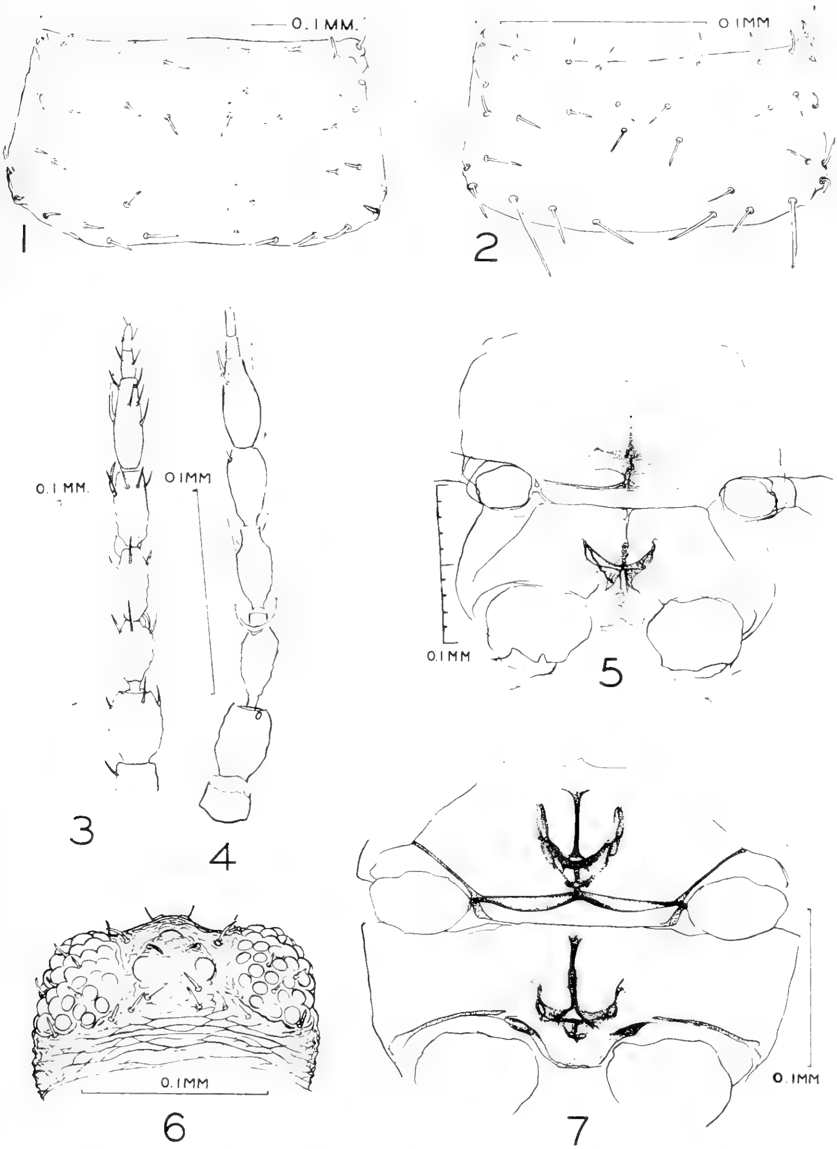


Fig. 1, *P. priesneri*, pronotum (most of sculpture omitted); fig. 2, *P. pardalotus*, pronotum (sculpture omitted); fig. 3, *P. bimaculatus*, antenna (after Priesner, with permission); fig. 4, *Psilothrips priesneri*, antenna (setae omitted); fig. 5, *P. pardalotus*, meso- and metasternum; fig. 6, *P. priesneri*, head; fig. 7, *P. priesneri*, meso- and metasternum.

Male small, slender, with only the usual differences from the female, except accessory sternal setae are lacking. Glandular areas present on sterna III-IV or III-V of species known. Nymph with principal dorsal setae brush-like (fig. 11a) similar to those in *Sericothrips*; other characteristics not visible in specimens available.

The second couplet of the key to species was furnished by Priesner in personal correspondence. His figures for *priesneri* are from 3 paratypes; figures in brackets are from the series before me.

KEY TO SPECIES OF PSILOTHRIPS

1. Ocellar pigment gray or gray-brown; posterior angles of pronotum with a major seta (usually the 3rd from the meson) (fig. 2); reticulation of metanotum forming whorled pattern (fig. 10); Ariz., Calif., Nev., N. Mex., Texas, Utah .... *pardalotus* Hood
   Ocellar pigment orange or orange-red; pronotum with only minor setae; (sculpture of metanotum in *priesneri* reticulate and rugose within reticles (fig. 9)) 2
2. Costal setae near apex of wing 28-30 [23-36] microns long; antennal segment III 40-45 microns long, with sides less convex (fig. 4); segment VI 40 microns long; Ariz., Calif., Texas........ *priesneri* (Moulton)
   Costal setae near apex of wing 45 microns long; antennal segment III 36 microns long, with sides convex (fig. 3); segment VI 44-47 microns long; Egypt, Palestine .... *bimaculatus* (Priesner)

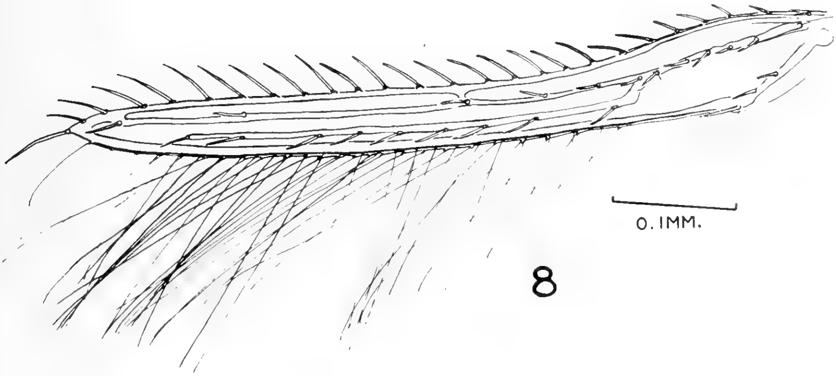
Psilothrips paradalotus Hood

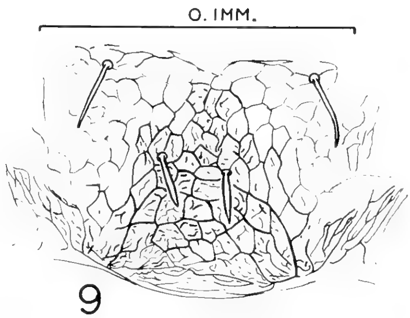
(Figs. 2, 5, 8, 10)

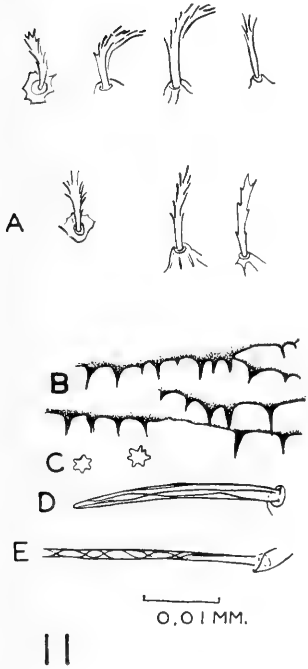
Psilothrips pardalotus Hood, 1927, Wash. Biol. Soc. Proc. 40:198; Bailey, 1957, Calif. Insect Surv. Bul 4(5):190.

Female.—Occasionally colored like *priesneri* except for the absence of red in the ocellar pigment, but usually much paler, as in the following description. Pale, very lightly marked with brown; markings obscured in untreated specimens by dull light yellow internal pigment; ocellar pigment gray-brown. Areas shaded with brown: antennal segments II-VIII very light, intermediate segments slightly darker at either end; head between eyes, slightly darker in occipital region; occipital apodeme distinct; blotches on thorax, of which dorsal ones are difficult to distinguish from ventral; middle of each femur and tibia; fringe hairs of wings; indistinct spot near base of fore wing; distinct spot at fork between longitudinal veins; abdominal terga I, VIII, IX, and X uniformly; IX just perceptibly; X scarcely darker; II-VII with paler areas posteriolaterally; III-VII darkest at apodeme.

Mouth cone slender, long; length more than twice dorsal length of head; maxillary palpi long, segments I and II averaging 0.017 mm. (0.009-0.024 mm.) and 0.027 mm. (0.024-0.037 mm.) respectively. Pronotum scarcely rugose, with a short but distinct major seta at each posterior angle; these averaging 0.030 mm. (0.021-0.040 mm.); total number of posterior marginal setae between first laterally-directed pair (fig. 2) numbering 4, occasionally 3; the major pair no. 3 (or 2).







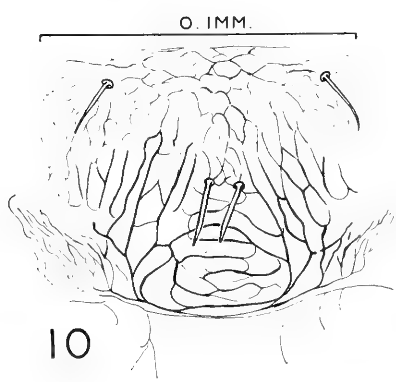


Fig. 8, *P. pardalotus*, fore wing (syntype); fig. 9, *P. priesneri*, metanotum; fig. 10, *P. pardalotus*, metanotum. Fig. 11, *P. priesneri*: a, nymphal setae; b, costal seta; c, same, cross section; d, abdominal tergum VII, aculeate-dentate sculpture; e, fore wing, basal portion of fringe hair.

Metanotum with sculpture reticulate, forming a whorled pattern posteriorly; reticles simple, not rugose within (fig. 10). Average width of fore wing (fig. 8) at middle 0.056 mm. (0.049-0.070 mm.); costal margin with average number of setae 27 (23-33); average length of seta near middle 0.037 mm. (0.028-0.047 mm.), of 4th seta from apex 0.044 mm. (0.036-0.057 mm.). Anterior longitudinal vein with average number of setae 11 (8-15), mostly near base; average length of seta near middle of wing 0.020 mm. (0.012-0.025 mm.). Posterior longitudinal vein with average number of setae 10 (5-14); setae about evenly spaced; average length of seta near middle of wing 0.027 mm. (0.016-0.033 mm.). Lines of sculpture on abdominal terga scarcely aculeate-dentate, with teeth virtually absent on IX and X.

Male.—Smaller and paler than female; setae shorter and, on wings, less numerous. Abdominal sterna III-V only with glandular areas; these transverse, elongate, punctate in appearance.

Redescribed from 2 syntypes, Ysleta, Tex., Sept. 4, 1927, *Atriplex canescens* (Pursh) Nutt., J. D. Hood; and other specimens as follows: Avondale, Ariz., *Atriplex* sp., Feb. 21, 1954, F. F. Bibby (no. 323), 2 ♀; nr. Maricopa, Pinal Co., Ariz., *Lycium* sp., May 4, 1958, F. F. Bibby (no. 1477), 5♀; Parma, Idaho, greasewood [probably *Sarcobatus vermiculatus* (Hook.) Torr.] Aug. 13, 1932, Lancaster, 4♀; Fernley, Nev., *Atriplex* sp., May 29, 1945, Floyd Andre, 8♀; Las Cruces, New Mexico, leaf of *Bassia hyssopifolia* (Pall.) Kuntze, June 27, 1951, Floyd Andre, 6♀, 1♂; Presidio, Tex., *Atriplex canescens,* July 2, 1942, U. S. N. M. accession no. 42 8283, 1♀; S. W. Cedar Mts., Utah, under *Chrysotham[n]us,* Aug. 25, 1953, Bill Thomas, U. C. Div. E. & P. no 1916, 2♀, under shadscale [*A. confertifolia* (Torr. & Frem.) S. Wats., or incorrectly, *A. canescens*], no. 1915, 1♀; Dog Area, Utah, "sand dune," July 6, 1953, R. L. Gering, U. C. Div. E. & P. no. 1893, 1♂; Simpson Buttes, Utah, Sept. 23, 1953, Bill Thomas, U. C. Div. E. & P. no. 2044, 1♀, "under droppings," Sept. 10, 1953, no. 1995, 3♀, 3♂, Sept. 11, 1♀; Joseph, Utah, *Sarcobatus,* Sept. 11, 1954, G. F. Knowlton, 1♀; Arlington, Calif., July 30, 1956, D. L. Brawner, 1♀. Localities given in original description California, Arizona, and Texas.

In spite of the overlap in the range of length of the setae of the posterior angles of the pronotum and of the costa, *pardalotus* is most quickly distinguished from its congeners by its longer setae. In properly mounted specimens the pattern of the metanotal sculpture and the number of posterior pronotal setae furnish unequivocal differences from *priesneri,* but the nature of these characteristics is not known in *bimaculatus.*

Psilothrips priesneri (Moulton)

(Figs. 1, 4, 6, 7, 9, 11)

Anaphothrips priesneri Moulton, 1926, Trans. Amer. Ent. Soc. 52(891):123-124, pl. 6, fig. 9.

Psilothrips priesneri (Moulton), Bailey, 1935, Pan-Pac Ent. 11(4):166; Bailey, 1957, Calif. Insect Surv. Bul. 4(5):190, pl. 23, fig. 50.

Female.—Light brown, irregularly marked; pale areas much obscured by internal pigment, which is dull orange in pterothorax and abdomen X and ochraceous elsewhere; ocellar pigment reddish orange. Brown areas: Antennae except segment I, light; frons, occiput, and cheeks; spots on pronotum and mesonotum; entire pleura and venter of thorax; legs, with tarsi, bases of tibiae and femora, and apices of femora very light; wing fringe hairs; light basal and subbasal spots on fore wing; fore wing between longitudinal veins, sometimes entire fore wing distad of fork between longitudinal veins; very light subbasal spot on hind wing; abdomen, with lighter sublateral areas forming longitudinal stripes dorsally and ventrally, with terga IX at middle and X at base lighter than elsewhere.

Mouth cone moderately long, but shorter and stouter than in *pardalotus;* length less than twice dorsal length of head. Maxillary palpi shorter than in *pardalotus;* segments I and II averaging 0.014 mm. and 0.025 mm. respectively. Pronotum mostly rugose, without major setae; minor posterior marginal setae between first laterally-directed pair (fig. 1) usually numbering 5, occasionally 4 or 6; average length of seta 4 (from meson), 0.018 mm. (0.011-0.024 mm.). Metanotum (fig. 9) reticulate; reticles rugose within, not elongate, not forming a pattern. Average width of fore wing at middle 0.070 mm. (0.062-0.076 mm.); costal margin with an average of 32 setae (24-35); average length of seta near middle 0.027 mm. (0.022-0.032 mm.), of 4th seta from apex 0.031 mm. (0.023-0.036 mm.). Anterior longitudinal vein with average number of setae 12 (10-16), mostly before cross vein; average length of seta near middle 0.017 mm. (0.012-0.021 mm.). Posterior longitudinal vein with average number of setae 12 (9-15); setae more or less evenly spaced; average length of seta near middle of wing 0.017 mm. (0.012-0.022 mm.). Tergal abdominal lines of sculpture distinctly aculeate-dentate (fig. 11b) lateral on terga II-VIII, median on IX and X.

Male.—Not known.

Redescribed from 4 paratypes, Modesto, Calif., weeds, Aug. 1 and Aug. 17, 1910, A. L. Rutherford (Moulton nos. 340 and 343); and other specimens as follows: near Casa Grande, Pinal Co., Ariz., *Lycium* sp. Apr. 1, 1958, F. F. Bibby (nos. 1447 and 1448), 13 ♀; Winter Haven, Tex., flowers of *Amaranthus retroflexus* L., Oct. 31, 1948, K. Sakimura (no. 3553), 1 ♀. Mr. Bibby thinks it likely that the species of *Lycium* on which he collected *pardalotus* is different from that on which he collected *priesneri*. Type locality Modesto, California.

Ordinarily *priesneri* is most readily distinguished from *pardalotus* by its darker color, although occasional specimens of *pardalotus* are dark enough to be mistaken for it. As noted under *pardalotus*, however, the most positive means of distinguishing the two is by the differences in the number of posterior pronotal setae and the character of the metanotal sculpture. Both *priesneri* and *bimaculatus* lack major setae on the pronotum, but *priesneri* has relatively short costal setae whereas those of *bimaculatus* are longer, comparable with the costal setae in *pardalotus*. Priesner gives additional differences between *bimaculatus* and *priesneri* (in correspondence): Width of head across eyes 0.152-0.162 mm. in *bimaculatus*, 0.140-0.145 mm. in *priesneri* (3 *paratypes*); width of pterothorax 0.260-0.270 mm. in *bimaculatus*, 0.216-0.224 mm. in *priesneri;* length of fore tibiae 0.112-0.120 mm. in *bimaculatus,* 0.096-0.100 mm. in *priesneri.* "Strangely enough," he writes, "the most obvious character lies in the length of the endothoracic spinulae. The spinula on the metasternum is long and reaches almost [to the] fore margin in *bimaculatus,* while it is only half as long (reaching only [the] middle of [the] metasternum) in *priesneri;* the spinula of the mesosternum is stout and complete in *bimaculatus,* but weak and partly (near base) interrupted in *priesneri.*" (See figs. 5 and 7.) He states that the wings are practically the same in the two species, but that the legs of *bimaculatus* are longer and more slender.

Psilothrips bimaculatus (Priesner)

(Fig. 3)

Thamnothrips bimaculatus Priesner, 1932, Soc. Roy. Ent. d'Egypte 16(1-2):3-5, figs. 1-2.

Psilothrips bimaculatus (Priesner), 1949, Soc. Fouad 1er d'Ent. 33:150.

Female.—Varying greatly in color, but usually pale, with internal pigment dull orange in pterothorax and dull yellow elsewhere, and with gray or brown markings or shaded areas as follows: Antennae except segment I and base III; frons, underside of labium, and basal apodeme of head; irregular spots on pronotum; margins of mesonotum; markings on metascutum and pleura; median ring on all femora and fore tibiae; inner margin of mid and hind tibiae except at base; light spot on wing at fork between longitudinal veins, attaining costa but not posterior margin; abdominal segments I-VIII except pale posterior marginal border, which is widened laterally into pale spots; basal half of IX; all of X very light. Ocellar pigment orange.

Head 0.152-0.156 mm. wide across eyes; maxillary palpi with segment I less than half as long of II. Pronotum without major setae; minor setae small; sculpture indistinct. Length of fore tibia 0.112-0.120 mm. Width of pterothorax 0.260-0.270. Width of fore wing across middle 0.076-0.078 mm.; costal margin with 29 setae; length of seta near apex 0.045 mm. Anterior longitudinal vein with 12 setae, posterior with 11.

Male.—Similar to female in color. Length (width) in millimeters of antennal segment I, 0.016 (0.021-0.022); II, 0.032 (0.022); III, 0.036 (0.015); IV, 0.034 (0.013); V, 0.037 (0.014); VI, 0.046 (0.013); VII, 0.011 (0.006); VIII, 0.014 (0.004). Abdomen with small glandular areas on sterna III and IV only; areas transversely elliptical, 0.015 mm. on III, 0.020 on IV. Tergum IX with only normal setae, those of a transverse row of 4 each 0.040-0.045 mm. long.

No specimens were seen. The description of the female was paraphrased from the original, with additional data furnished by Priesner in correspondence; the description of the male is entirely from data furnished by Priesner. The original description was of a single female swept from desert shrub, Wadi Digla, near Cairo, Egypt, Mar. 28. 1930. Priesner states, "*P. bimaculatus* is a common desert species which I collected in numbers in the Wadis of the Eastern desert of Egypt, and also in the Elba mountains (latitude of Wadi Halfa). I also collected it in Palestine (Jordan Valley, Jan. 1935, on *Lycium* sp.). In Egypt I always found it on the leaves of *Lycium arabicum*." Type locality Wadi Digla, near Cairo, Egypt.

The differences between *bimaculatus* and *priesneri* are given under *priesneri*. The major seta at each posterior angle of the pronotum in *pardalotus* distinguishes it from both these species.

References

Priesner, H. 1957. Zur vergleichenden Morphologie des Endothorax der Thysanopteren, Zoologischer Anzeiger 159 (7/8):159-167, figs. 1-6.

MECONEMA THALASSINUM, A EUROPEAN KATYDID NEW TO THE UNITED STATES

(Orthoptera: Tettigoniidae)

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Two specimens of a small European katydid, *Meconema thalassinum*[1] (De Geer), have been found on Long Island, N. Y., and probably the species is established there. This is the first record of *thalassinum* in America. Likewise, the subfamily Meconematinae is not native to the Western Hemisphere. The specimens were collected by John K. Terres, editor of Audubon Magazine, and generously deposited in the National Museum. On July 12, 1959, he took a living female on the terrace of his yard in Little Neck, on the north shore of Long Island near the line between Queens and Nassau Counties, and on July 14 he found a dead male on the floor in his home. The recorded distribution of *thalassinum*, including its synonym *varium* (F.), is from southern Sweden, Ireland, England, and Spain, east to the regions of the Adriatic Sea and the Caucasus.

This katydid is about 11 to 15 mm. in body length, exclusive of appendages, and the tegmina and wings extend 3 to 4 mm. beyond the apex of abdomen. The legs are moderately slender, the hind femur slightly shorter than the tegmen. The tympanum on each side of the front tibia is open. In *Conocephalus* and *Orchelimum*, two native genera comprising small katydids which in a superficial way resemble *Meconema*, each tympanum is covered except for a slitlike opening. Compound eyes are globose and prominent, and the acute, conelike fastigial vertex extends slightly in advance of the eyes. The male cerci are each about 4 mm. long, strongly curved, the apices scarcely specialized. The ovipositor is about 8 to 10 mm. long, usually extends about 3 mm. beyond the tegminal apices, and has no serrations. The color of *thalassinum* is a nearly uniform pale green except for a yellow longitudinal median stripe on the pronotum, often bordered on the

[1] As Roberts (Trans. Amer. Ent. Soc. *67*: 28, 1941) has pointed out, the name *Meconema* is neuter, so that the corresponding spelling of the specific name, as well as the subfamily name Meconematinae—based on the stem *Meconemat*—is correct. This clarification is applicable because many references to *thalassina* and Meconeminae are in the literature.

metanotal disc with a dark spot on each side. Preserved specimens often fade to a straw color. Most guides to British and European Orthoptera refer to this katydid, and the accounts of Chopard (Faune de France, *56:* 98-101, 1951), Hartz (Die Geradflügler Mitteleuropas: 173-176, 1957), and Lucas (Monograph Brit. Orth.: 189-193, 1920) are rather full and well illustrated.

Unlike most Tettigoniidae, the tegmina of male and female *thalassinum* are almost identical, though Petrunkewitsch and Guaita (Zool. Jahrb., Syst., 14: pl. 17, fig. 25, 1901) show slight differences. In both sexes microscopic denticles of special interest are borne on the dorsal surface of the tegmen. These denticles, best seen at magnifications of 60 or more, are about two to three dozen in number and are located along the raised veins near the posterior margin about 3 to 4 mm. from the base of the tegmen. I have seen no ventral denticles, though Petrunkewitsch and Guaita (l. c., p. 301) referred to their presence along the ventral side of some lengthwise veins. This katydid is sometimes regarded as silent, and Burr (Brit. Grasshoppers and their Allies, p. 130, 1936) considered it as the only group of Tettigoniidae that lacks male stridulatory apparatus. However, Ander (Opusc. Ent., Suppl., p. 54, 1939) reported a lack in the Phyllophorinae also.

Several authors have discussed the sound-producing behavior of *thalassinum*, and Kevan (Special Papers Univ. Nottingham Sch. Agric. Zool. Sect. *2:* 3, 5, 1954), pointed out that several observers thought that sound was produced by the abdomen striking a leaf or other substratum. This was not confirmed by Currie (Ent. Record *65:* 93-94, 1953), however. Cappe de Baillon (Ann. Soc. Ent. France *90:* 69-80, 1921) thought that the tiny tegminal denticles serve as stridulatory organs, but neither has this view been confirmed. Currie referred to the sound produced by *thalassinum* as a faint ''drumming'' audible up to 12 feet away. Sound was not of more than ½ second duration, repeated at 2- to 3-second intervals. He stated that when ''drumming'' the tegmina and wings were closely appressed and raised perpendicular to the long axis of the body, and the tip of the abdomen was vibrated very rapidly. It is evident that *thalassinum* is a species of more than ordinary interest, and that the patient observer may be well repaid for his efforts.

M. thalassinum is reported to occur especially on oaks, as well as various other deciduous trees. Currie (l. c.) stated that a specimen in captivity fed readily on leaves of oak, rose, and birch, and that in the field he observed the species feeding on sawfly larvae. Lucas (l. c.) also reported it as occasionally carnivorous. Eggs are inserted into ridges or cracks on the bark. Lucas (Entomologist *45:* 114-117, 1912) described oviposition on oaks in England, and Chopard (Biol de Orth., Encyclopedie Ent. *20:* 186, 1938) said that oviposition occurs most often among lichens on the west side of tree trunks. Mr. Terres has reported that the garden of his Long Island home is well supplied with native and exotic trees and shrubs, so that an introduction by means of eggs may have occurred.

SEVEN NEW SPECIES OF WEST INDIAN CHRYSOMELIDAE

(COLEOPTERA)

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This paper consists of the descriptions of seven new species of Chrysomelidae from the West Indies, four of which were collected by Fernando de Zayas. Mr. Zayas has been most actively collecting insects in Cuba for many years.

Metachroma elachistum, new species

(Figure 6)

About 2.5 mm in length, broadly oblong-oval, shining, deep reddish brown, the pronotum moderately densely and distinctly punctate, the elytral striate punctures distinct throughout.

Head shining brown, covered with punctures, finer and not so dense over upper half, denser and coarser in lower half, the groove about inner margin of eyes curving down and across and not quite meeting across the front. Antennae long and slender, extending well below humeri, the outer joints longer and darker brown. Prothorax smoothly convex except for a slight semicircular depression over the occiput; surface very shiny, strongly and densely punctate, deep reddish brown. Scutellum shining brown. Elytra with humeral prominences, short intrahumeral sulcus and a small basal callosity near scutellum; striate punctures enlarged in the depression below callosity, dense and distinct otherwise to the apex. Body beneath and legs reddish or yellowish brown; middle and hind tibiae emarginate near apex. Length 2.3 to 2.8 mm.; width 2.4 to 2.6 mm.

Types.—Holotype male and 3 paratypes, U.S.N.M. Type No. 64670; 1 paratype in collection of F. de Zayas. All collected by him along the shore near Havana, Cuba, in September 1951.

Remarks.—The structure of the aedeagus in the single male collected is most unusual.

Metachroma cavicolle, new species

(Figure 5)

About 6 mm. in length, elongate oblong, alutaceous, only feebly shining, the head and prothorax densely and coarsely punctate, prothorax with lateral depression on each side; the elytra with striate punctures closely set and a lateral fold in female (no males seen); entirely dirty yellowish brown.

Head densely and coarsely punctate, alutaceous, a median vertical line ending in a rounded median depression, below this on either side a group of large punctures, these punctures near the end of the groove about the inner margin of eye; head yellowish brown with the jaws deeper brown or piceous. Antennae not extending much below humeri, 2nd and 3rd joints about equal in length, 4th and remaining joints longer and gradually wider; entirely yellowish brown. Prothorax with an anterior and a basal ridge on either side, the resulting depression between being almost a transverse depression, the lateral margin sinuate with a large basal and apical tooth; surface alutaceous, densely and strongly punctured, and entirely dirty yellowish brown. Scutellum punctate, alutaceous and yellowish brown. Elytra flattish, with a slight basal callosity and short intrahumeral sulcus; along side from humerus to apex a distinct lateral fold, possibly only in the female, no male examined; elytra narrowed towards the apex; elytral striae made up of dense strong punctures, and in the intervals, scattered fine punctures, yellowish brown. Body beneath shining yellowish brown, the coxae a little darker, femora robust, anterior ones strongly toothed, middle and posterior tibiae emarginate near apex, claws with short basal tooth. Length 6 to 6.2 mm.; width 2.7 mm.

Types.—Holotype female, U.S.N.M. Type No. 64671; one paratype in collection of F. de Zayas. All collected by F. de Zayas in Sierra Cajalbana, Pinar del Rio Province, Cuba, June 1956.

Remarks.—The two distinguishing characters of this species are the ridges and depressions on the prothorax and the lateral fold on the elytra. Possibly this last character is more developed in the females; no males are known. This species belongs to that group of *Metachroma* with the elongate and apically narrowed elytra. There are two other species similarly shaped, *M. oteroi* Blake from near Havana, Cuba, in which species the front femora are also toothed, and *M. gracile* Blake also from near Havana, in which both anterior and posterior femora are toothed. *M. gracile* also has a lateral fold or costa, not so distinct, on the elytra. In neither species nor in any other I have seen of that genus is the surface of the thorax so uneven.

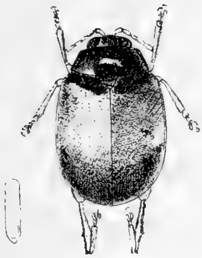
Phaedon cubensis, new species

(Figure 7)

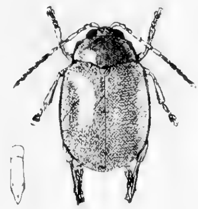
About 6.5 mm. in length, broadly ovate, moderately convex, the elytra more or less distinctly striate punctate, the punctation very fine, reddish brown, with dark piceous scutellum, antennae and legs, except the basal part of femora which are pale brown.

Head with interocular space more than half width of head, occiput with a fine median line connecting with a V-line running down on either side to antennal sockets; finely punctate, especially near eyes, reddish brown with deeper brown mouthparts, Antennae scarcely reaching beyond humeri, first joint stout, joints two to five short with the second longest, and almost as broad as long but only half as broad as joints six to eleven, which are longer and broader and all deep piceous, the last six joints heavily pubescent. Prothorax over twice as broad as long at base, narrowed anteriorly, smoothly convex, with fine, moderately dense punctation, shining reddish brown. Scutellum deep brown or piceous. Elytra smoothly convex, with fine punctation tending to be striate, a row of punctures depressed in some specimens and extending from humerus to apex and producing a rounded fold near margin. Body beneath shining, reddish brown, not at all piceous, femora in basal half pale, in apical half becoming piceous, tibiae and tarsi piceous and sometimes with a bluish lustre. Length 6.2 to 6.8 mm.; width 4.5 to 4.6 mm.

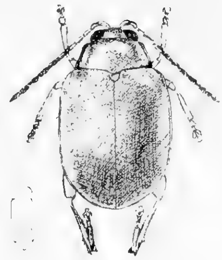
Types.—Holotype male, and 2 paratypes, U.S.N.M. Type No. 64676; one paratype in collection of F. de Zayas. All collected at Cuidad Mar, Santiago, Oriente Province, Cuba, in July 1945 by F. de Zayas.



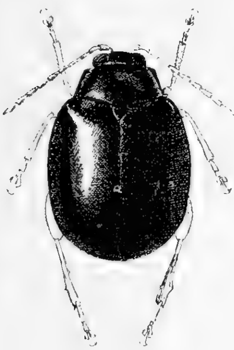
1 Heikertingerella fusca



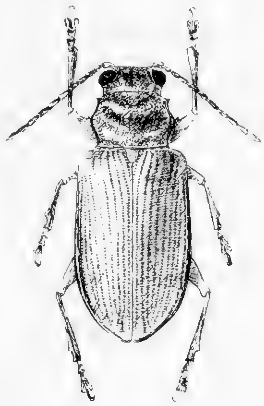
2. Heikertingerella minima (Suffrian)?



3. Heikertingerella dominicae



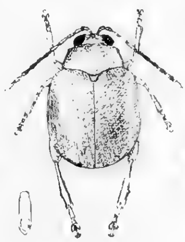
4. Heikertingerella guadeloupensis



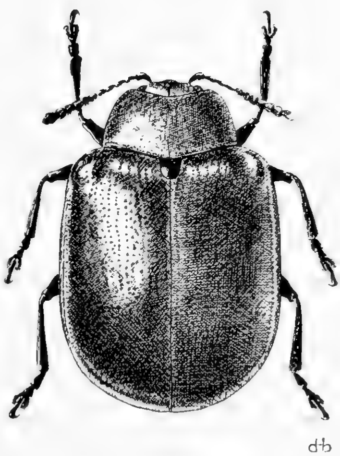
5. Metachroma cavicolle

6. Metachroma elachistum

7. Phaedon cubensis



8. Heikertingerella Krugi (Weise)



9. Phaedon zayasi

Remarks.—This species closely resembles *Phaedon barberi* Blake from Puerto Rico in being reddish brown above and in having similar sculpture. But the Puerto Rican species has a shorter prothorax and the body beneath is piceous, not pale brown.

Phaedon zayasi, new species

About 7.5 mm. in length, broadly ovate, not very shiny, the prothorax with scattered groups of punctures, the elytra more coarsely punctate with a tendency to striation, a depressed row of punctures from humerus to apex forming a roll near margin; deep reddish brown, almost chocolate brown, the scutellum, legs, undersurface and antennae a shining black with a faint greenish or bronzy lustre.

Head finely and rather densely punctate, a median line down occiput to join with a V-shaped line running to base of antennal sockets, entirely dark reddish brown. Antennae with the five basal joints dark with a faint greenish lustre, 2nd joint long, 3rd to 5th gradually diminishing, joints 6 to 11 gradually increasing in breadth and pubescence. Prothorax more than twice as broad as long at base, more widely curved behind eyes than in *Phaedon cubensis;* surface a little uneven due to scattered groups of punctures, a line of punctures along basal margin; entirely deep reddish brown. Scutellum black with faint greenish lustre. Elytra moderately convex, with strong humeral prominences, and rather coarse punctures from humerus to apex forming a roll near margin; surface rather dull and deep reddish brown, almost chocolate colored. Body beneath and legs entirely dark, shining with a faint greenish or bronzy lustre. Length 7.5 mm.; width 5.5 mm.

Type.—Holotype female in Zayas collection, collected at Gran Piedra, Caney, Oriente Province, Cuba, in January 1954 by F. de Zayas and Pastor Alayo.

Remarks.—This is larger than *P. cubensis* and darker in coloring, the prothorax is differently shaped, not being so closely wrapped about the eyes anteriorly, and the punctation is coarser and deeper. The basal joints of the antennae are not so short and wide as in *P. cubensis.*

Genus **Heikertingerella** Csiki

Homophyla Harold, Deut. Ent. Zeit., xxi, 1877, p. 138; *Euplectroscelis* Jacoby, Biol. Centr. Amer. Coleoptera, 1885, p. 392; *Heikertingerella* Csiki, Coleopterorum Catalogus, vol. 25, 1940, p. 350.

The species of *Heikertingerella* are all very much alike in outer appearance, being tiny roundish brown beetles. The male aedeagus in these, however, is quite distinctive, and that coupled with the slight differences in shape, some being more elongate, others broadly oval, constitutes the best character in determining the species. From the West Indies at least two species have been described, *H. unicolor* (Jacoby) from St. Vincent and Grenada, and *H. krugi* (Weise) from Puerto Rico. Suffrian has described from Cuba under *Haltica minima* what may very well be another species. There are at least two species of *Heikertingerella* from Cuba, one of which is represented by a single male taken at light on "shipboard" at "Cuba." The other species, of which we have more material, is probably identical with specimens taken in Haiti by W. A. Hoffmann on *Tecoma stans.* This second species corresponds pretty well with Suffrian's description of *minima.* In the National Museum there are also specimens of a larger species from Dominica, which is quite distinct from the rest, and another dark piceous one from Guadeloupe, still larger. One can only deplore the bad taste that led to attaching the monstrous name *Heikertingerella* to these tiny beetles.

Heikertingerella minima (Suffrian) ?

(Figure 2)

Haltica minima Suffrian, Archiv. f. Naturg., vol. 34, pt. 1, 1868, p. 184.

About 2.5 mm. in length, ovate, shining, the head and pronotum finely and densely punctate, the elytra less densely punctate: yellow brown, the last five or six antennal joints deeper in color, sometimes the head, prothorax and base of elytra and hind femora deeper brown to piceous.

Head with interocular space about half its width, eyes large, a groove running from a fovea near inner margin of eye down to antennal socket on each side, no trace of frontal tubercles, carina between antennal sockets narrow and running down the front; head usually pale but in some darker specimens deep brown to piceous above. Antennae with the two basal joints robust, 3rd short and thin, 4th and 5th joints gradually lengthening, usually the five basal joints pale, the remainder dark. Prothorax nearly twice as wide as long at base, narrowed straightly to apical angles which are broadly truncate, disk somewhat convex, basal margin sinuate over scutellum, surface shinning, densely and distinctly punctate; usually yellow-brown, but in darker specimens, deep brown to piceous. Scutellum reddish brown. Elytra broad and convex, with distinct humeral umbone, shiny and rather sparsely punctate, the punctures becoming fine and indistinct after the middle; yellowish brown except in some darker specimens which are deep brown to piceous near the base. Body beneath usually entirely pale, but in dark specimens deep brown, the legs also in this case being darker. Length 2.2 to 3mm.; width 1.5 to 1.8 mm.

Distribution.—**Cuba**: Buenas Aires, Las Villas Province, in June 1953, by F. de Zayas, Playa Ingles, Las Villas Province, in May 1954, F. de Zayas; Sierra Rangel, A. R. Otero and S. C. Bruner in April 1953. **Haiti**: Rio Froide, 1300 ft., on *Tecoma stans*, W. A. Hoffman, Oct. 14, 1924; St. Roe, Nov. 1923; Port-au-Prince, G. N. Wolcott, May 1925.

Remarks.—There are also two specimens taken by W. A. Hoffman on Feb. 12, 1925 at Cour Bizoton, Haiti, that I hesitate to put with this species, as they are smaller, rounder, and of a uniform deep brown color. Unfortunately both are females.

Heikertingerella dominicae, new species

(Figure 3)

Between 2.5 and 3 mm. in length, ovate, shining, the pronotum finely and densely punctate, the elytra finely and sparsely and after the middle indistinctly punctate, yellow-brown with the last six or seven antennal joints and hind tarsal joints a little darker.

Head with interocular space about half its width, smooth, shiny and very indistinctly punctate over occiput, a groove running down from a fovea on inner margin of eye to antennal socket, no trace of frontal tubercles, carina between antennal sockets well developed and running down lower front. Antennae as in the other species, the basal four joints paler than the rest. Prothorax nearly twice as wide as long at base, narrowed in a straight line anteriorly with broad truncate front angles, disk convex, shiny, densely and distinctly punctate, entirely yellow-brown. Scutellum brown. Elytra shiny, very finely punctate, the punctures fading away before the middle, pale yellow brown. Body beneath yellow-brown, in one of the two specimens collected by Fennah, the posterior legs deeper brown. Length 2.5 to 3 mm.; width 1.7 to 2 mm.

Types.—Holotype male, U.S.N.M. Type No. 64672; one paratype, female, from the Greenhill Estate, 800 ft., Dominica, B.W.I., collected July 3-12, 1941, by R. G. Fennah. Two other specimens were collected by H. W. Foote, Yale Expedition, in June and July 1913, both females.

Remarks.—This species is larger and rounder than the Cuban beetles and has a most distinctive aedeagus. The two specimens collected by Foote are more distinctly punctate.

Heikertingerella fusca, new species

(Figure 1)

About 2.5 mm. in length, broadly ovate, shining, the pronotum rather densely and very finely punctate, the elytra less densely and more distinctly punctate, yellow-brown with a deeper reddish brown head, prothorax and base and apex of elytra.

Head with interocular space barely half width of head, smoothly rounded over occiput, eyes large and with a groove of punctures from inner margin extending to antennal sockets, no trace of frontal tubercles, interantennal area flat, but below, a short narrow keel down lower front; lower front somewhat declivate, upper head deep reddish brown, lower front paler. Antennae present only in part, the two basal joints robust and wider than the following three, which gradually increase in length from the 3rd which is shortest. Prothorax considerably wider at base, narrowed straightly to apical angles which are oblique, basal margin sinuate over scutellum, disk moderately convex, shining, very finely and densely punctate, reddish brown. Scutellum shining, deep reddish brown. Elytra broad and convex, with humeral umbone, surface shining, finely, and not very densely punctate, the punctures having a faintly striate arrangement; reddish brown over base and below the middle, the rest yellow brown. Body beneath entirely yellow brown, anterior coxal cavities open, hind legs with femora much enlarged, and tibiae becoming wider towards apex, grooved and with an outer tooth and emargination before apex, and another short tooth at apex, first tarsal joint very long and narrow. Length 2.4 mm.; width 1.6 mm.

Type.—Holotype male, U.S.N.M. Type No. 64673, taken at light on shipboard, at Cuba.

Remarks.—This is a slightly larger and rounder species than *H. minima* (Suffrian) and with darker coloring, especially of the apex of the elytra. The aedeagus, too, is different.

Heikertingerella guadeloupensis, new species

(Figure 4)

About 3 mm. in length, ovate, shining, the elytra distinctly punctate, deep brown, almost piceous, the antennae and legs pale yellow brown, the undersurface deeper yellow brown.

Head with interocular space less than half width of head, eyes large, occiput smooth and shining, a fovea on each side near margin of eyes, frontal tubercles faintly marked, a wide rounded carina between antennal sockets running down lower front. Antennae not reaching much below humeri, the two basal joints swollen, third about length of second but much narrower, pale yellow brown, deepening in color in distal joints. Prothorax shining piceous, very finely punctate, convex with the sides narrowed straightly to rounded apical angles, basal margin sinuate over scutellum. Scutellum shining piceous. Elytra convex, the humeral umbones prominent, shining piceous, the apex a little paler, possibly due to the light shining through; punctures dense and distinct, with a tendency to being striate. Body beneath and hind femora shining deep yellowish brown, the rest of the legs paler yellow brown. Length 3 mm.; width 2 mm.

Type.—Holotype female, U.S.N.M. Type No. 64674, collected by A. Busck on Guadeloupe, at 3000 ft. altitude, West Indies, July 30.

Remarks.—The much deeper brown, almost piceous, coloring marks this species as unlike any of the rest from the West Indies yet described. It is also larger.

PTINUS VARIEGATUS ROSSI, NEW TO THE UNITED STATES

(Coleoptera: Ptinidae)

A species of *Ptinus* not recorded heretofore from the United States was collected recently in Vienna, Virginia. Previously collected specimens from the U.S.A., Europe, and North Africa were then found in the U. S. National Museum, but all were misidentified or unidentified. Accurate identification was finally obtained from R. D. Pope, of the Commonwealth Institute of Entomology in England. The species is *Ptinus variegatus* Rossi, 1794 (Mantissa Insectorum, Vol. 1, p. 20), previously known from Europe and northern Africa. It is possible that this species was reported as *Ptinus fur* (L.) and *Ptinus bimaculatus* Melsh. in lists of beetles of North America, for I have seen specimens from Raleigh, N. C., so identified. (However, *fur* and *bimaculatus* should not be stricken from the North Carolina list; I have seen specimens of them collected in the State.) A survey of a few collections in the States involved produced 13 specimens from the following localities, the year in parenthesis being the earliest capture at that locality: North Carolina, Raleigh (1905) and Southern Pines (1905); South Carolina, Greenville (1927) and Florence (1929); Virginia, Vienna (1958). It may be that *variegatus* is native to this country, but if it is introduced, some indication of its spread can be gotten from the dates given above. The species is not considered to be of economic importance in the Old World, and the only collecting data on the American specimens is "at light" and "in house." One individual in the U. S. National Museum was intercepted coming into this country from Germany "with poplar seeds." Of the 13 specimens from the United States, 1 was collected in December, 2 in March, and the others in April and May.

Ptinus variegatus is rather stout, resembling *Ptinus ocellus* Brown in general stature. The length of the pronotum plus elytra is 3.3 to 4.4 mm., and the maximum width of the elytra is 1.6 to 2.2 mm. The background color is black or brownish black. Pronotum with four distinct callosities made more pronounced by vestiture; elytra subparallel-sided, with distinct humeri; antenna of moderate length and width. Vestiture of pronotum unlike that of any other North American *Ptinus;* composed of long, spatulate, usually depressed, golden setae on most of surface, these more vertical on callosities, and with broader, more scalelike, depressed, white setae along posterior half of mid-line. Elytra shiny, the intervals with a single row of long, semi-recumbent, spatulate setae, these setae sparse, each subequal in length to the distance between it and the seta in front of or behind it; strial punctures coarse, subquadrate, each with a single recumbent, spatulate seta emanating from its anterior margin, this seta shorter than setae of intervals and subequal in length to distance between it and the seta in front of or behind it; with a transverse band of scalelike, white setae extending from the lateral border in the humeral area to the elytral suture, this band becoming narrow toward the suture; and with a posterior transverse band of scalelike, white setae in the area where elytra narrow, this band becoming wider toward the elytral suture. Head with intermixed white and gold spatulate setae of intermediate density. Ventral surfaces of thorax and abdomen, all legs, and the basal antennal segments with very dense, intermixed white and gold setae. The sexes similar.

In addition to thanking Mr. Pope, I would like to thank the following for specimens or information: R. W. Howe, Slough, England; David A. Young and D. L. Wray, Raleigh, N. C.; Frances McAlister, Clemson, S. C.; and Vernon M. Kirk, Florence, S. C.—T. J. SPILMAN, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

BOOK NOTICE

A REVISION OF THE APION SUBGENUS TRICHAPION WAGNER IN THE NEW WORLD (Coleoptera: Curculionidae), by David G. Kissinger. Proceedings of the U. S. National Museum, vol. 110, no. 3418, 1959, pp. 247-389; 16 figs. U. S. Government Printing Office, Washington, D. C.

A PECULIAR NEW HALICTINE BEE FROM CALIFORNIA

(Hymenoptera: Apoidea)

P. H. Timberlake, *Citrus Experiment Station, University of California, Riverside.*

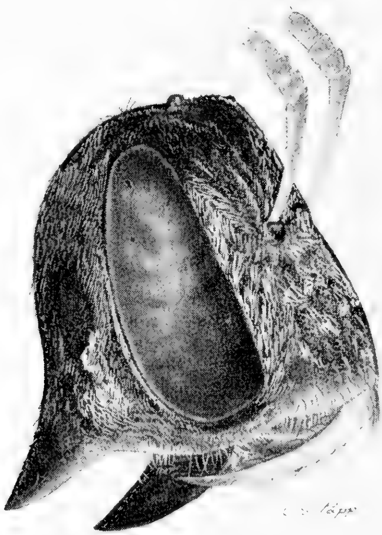
The new bee described below is so striking in its structural characters that it deserves separate notice in the hope that additional material may be looked for and discovered. The accompanying figure was kindly prepared for me by my esteemed colleague, Charles S. Papp.

Halictus (Evylaeus) adsurdiceps, new species

In the male genital characters *adsurdiceps* is close to *H. chionocephalus* Cockerell and Sandhouse, which is presumably the male of *H. vanduzeei* Cockerell and Sandhouse. The latter name has been synonymized with *H. arizonensis* Crawford, although fully adequate material might show that more than one species is involved. *H. chionocephalus,* however, has none of the cephalic peculiarities of *adsurdiceps.*

Male.—Head and thorax black, the anterior border of clypeus and the tubercles creamy white. Mandibles except dark red apical third and the labrum yellowish white. Abdomen ferruginous red, the disk of the first tergite suffused with fuscous. Legs brown at base, the apex of femora, tibiae and tarsi rather pale testaceous, with the middle and hind tibiae suffused with brown especially on the anterior side and the middle and hind basitarsi whitish. Antennae uniformly ferruginous. Tegulae testaceous hyaline, with a white spot at base. Wings whitish hyaline, the nervures pale testaceous, the stigma pale honey yellow, the subcosta and metacarpus somewhat brownish.

Head large, slightly broader than long and broader than thorax. Cheeks very broad, widest opposite middle of eyes and produced anteriorly into an enormous conical process. Mandibles extremely long, slender, tapering and reaching beyond the base of each other (the underneath one when closed almost reaching base of genal process). Antennae moderately long and reaching base of scutellum, with the pedicel and first joint of flagellum equal and broader than long, and the following joints of flagellum about one and one-half times longer than thick. Venation that of *Evylaeus,* with the second submarginal cell shorter than usual and the first recurrent nervure received by the third submarginal cell near its base. Head, thorax and abdomen polished, shining and minutely punctured; punctures of nude part of face one to two or three puncture-widths apart, those on the hairy parts of face and cheeks probably of about the same density, and those on vertex much sparser. Punctures of mesoscutum numerous but rather widely separated and those of scutellum remote. Mesopleural region weakly and rather closely punctured. Basal area of propodeum plane and with irregular wrinkles on basal half; truncation well defined but without lateral carinae. Basal tergites of abdomen with very minute and moderately close punctures except on the apical depression. Pubescence white, that on the face and cheeks very dense, plumose and appressed, but upper half of frons, anterior part of vertex and the genal processes almost nude, and the posterior part of vertex thinly hairy. Notum of thorax thinly hairy, but pleural region with rather dense white tomentum, although much damaged in type. Abdomen without hair bands, the pubescence thin but becoming longer and more abundant toward apex and the hair of venter moderately long and rather sparse. Genitalia in general much as in *chionocephalus*, but the parameral process almost vestigial, the ventral wings of caulis narrow and acute, and the sagittal rods long, slender, very acute at apex, bent downward near base and then evenly curved inward. Length about 4 mm., with the form robust; anterior wing, 3.7 mm.



Halictus adsurdiceps, n. sp.: Fig. 1, semilateral view of head of male.

One male (holotype), 8 miles southwest of Merced, Merced Co., California, on *Solidago*, Sept. 5, 1956 (R. R. Snelling). Type at present in collection of the Citrus Experiment Station but eventually will go to the California Academy of Sciences, San Francisco.

NOTES ON ARADIDAE FROM THE EASTERN HEMISPHERE XVI

(HEMIPTERA)

When several entomologists are working on the same group independently, the same genera and species are often described under different names. To avoid confusion, several cases of this kind are clarified below.

The following three publications are involved:

1. Aradoidea (Heteroptera) of Madagascar and adjacent islands, Ac. Ent. Mus. Pragae; Suppl. 4, pp. 1-109, 125 figs., by Hoberlandt. It was printed March 1, 1957.

2. Classification of the Aradidae (Hemiptera-Heteroptera), London, pp. vii + 410, 102 figs., by Usinger and Matsuda. According to a letter from Dr. Usinger the official day of issue was January 29, 1959.
3. New and little-known Brachyrhynchidae (Hemiptera-Heteroptera), Rev. d'Ent. de l'URSS, vol. 38, fasc. 1, pp. 179-195, 11 figs. (in Russian), by Kiritshenko. According to a letter from Dr. V. B. Popov, Head of the Department of Entomology, Zoological Institute, Academy of Science, USSR, the volume in question was sent to press February 25, 1959, and distributed at the beginning of March, 1959.

Consequently, the names proposed by Hoberlandt, Usinger and Matsuda have priority over those of Kiritshenko, as discussed below. Excellent illustrations in all these publications greatly aided the identification of the following genera and species.

1. *Mezira patruelis* Kiritshenko, 1959, p. 181, fig. 2. is identical with *Mezira madagascariensis* Hoberlandt, 1957, p. 66, fig. 67-70; hence is a synonym of the latter name.

2. *Mezira castanea* Jakovlev, 1878, belongs to the genus *Neuroctenus* Fieber, 1861, as first stated by Hasegawa (1954, Rep. Sci. Exp. Ozegahara Moor (Tokyo), p. 750; and later confirmed by the author (1955, Quart. Jour. Taiwan Mus., vol. 8, fasc. 3, p. 189).

3. *Mezira* (*Mezirella*) *infantulus* Kiritshenko, 1959, p. 186, belongs to the genus *Pictinellus* Usinger & Matsuda, 1959, p. 288; hence, *Pictinellus infantulus* (Kiritshenko), **nov. comb.**

4. *Oroessa* Kiritshenko, 1959, p. 186, is identical with *Oroessa* Usinger & Matsuda, 1959, p. 320, as both are based on the same type-species, *Mezira lujae* Schouteden, 1919. The genus is properly attributed to Usinger & Matsuda. This genus was established under the same name by Bergroth not long before his death, but was never published and remains "Nomen museorum."

5. *Pandinocoris* Kiritshenko, 1959, p. 188, fig. 7, is identical with *Chlonocoris* Usinger & Matsuda, 1959, p. 209, fig. 60, so the first goes into the synonymy of the latter. Whether *Pandinocoris milleri* Kiritshenko, 1959, p. 189, is identical with *Chlonocoris multispinosus* Usinger & Matsuda, 1959, p. 211, is not possible to determine without comparing types; at any rate, they are very closely allied, if not identical. Hence *Chlonocoris milleri* (Kiritshenko), **nov. comb.**

6. *Evaldius* Kiritshenko, 1959, p. 190, is identical with *Jarmilaia* Hoberlandt, 1957, p. 15, hence is a synonym of the latter, and we have *Jarmilaia annulipes* (Kiritshenko), **nov. comb.**

7. *Coloborhynomorpha* Kiritshenko, 1959, p. 192, is identical with the genus *Carventus* Stål, 1865, belonging to the Ethiopian group within the genus previously separated as subgenus *Burgeonia* Schouteden, 1919, and as such goes into synonymy of *Carventus* Stål. Hence, *Carventus chinai* (Kiritschenko), **nov. comb.**, and *C. parvus* (Kiritshenko), **nov. comb.**—NICHOLAS A. KORMILEV, *Brooklyn, N. Y.*

VISCERAL MYIASIS CAUSED BY PHAENICIA SERICATA IN THE HOUSE MOUSE

(Diptera: Calliphoridae)

A live house mouse, *Mus musculus L.*, was brought to the laboratory by Yvonne Schaelchlin on May 30, 1959. It was wandering outside a local building and appeared tame. The next day she noticed vaginal bleeding and on June 1 it was killed and brought to me. Upon immediate dissection maggots were found crawling in the uterus and lower intestine. The mouse was then placed in a jar on clean sand and the top covered with gauze. A larva was seen tunnelling in the sand on June 7 and white puparia noted on June 9. There were no imagoes by June 12 (temperatures 24-32° C. since the 1st) but during the summer vacation three flies matured. Through P. W. Oman and C. W. Sabrosky of the U. S. Department of Agriculture these were determined as *Phaenicia sericata* (Meigen).

This common blowfly is not recorded by D. G. Hall (Blowflies of North America, 1948) as causing internal myiasis in any animal, although frequently as the agent in sheep cutaneous myiasis. In this case it would appear that a fly had oviposted on the perineal region and that the larvae had made their way into the lower abdomen from here. James (1947, The flies that cause myiasis in man, U. S. Dept. Agr. Misc. Publ. 631) notes that older larvae may burrow deeply into human wounds.

While not myiasis, another instance of fly larvae infestation was of *Piophila casei* L. (det. U.S.D.A.) which I found inside the apparently intact pericardial sac of a male human cadaver being dissected in the University of North Dakota Medical School in the summer of 1944. Other larvae were in the mediastinum. The high summer temperatures and open windows of the laboratory may have given the flies access to the cadaver but it is curious that the larvae concentrated in embalmed tissue of this type rather than in more accessible sites.—Neal A. Weber, *Swarthmore College, Swarthmore, Pennsylvana.*

BOOK NOTICES

A TAXONOMIC REVIEW OF THE BRITISH SPECIES OF CULICOIDES LATREILLE (DIPTERA, CERATOPOGONIDAE), by J. Allen Campbell and E. C. Pelham-Clinton. Proceedings (Sec. B), Royal Society of Edinburgh. About 120 pp., 291 text figures. To be published in late spring or early summer of 1960. Price $4.00. (May be ordered in advance from Royal Society of Edinburgh, 22, George St., Edinburgh 2.)

STUDIES OF 12 SPECIES OF MOSQUITOES AS POTENTIAL VECTORS OF FILARIAE AFFECTING SKUNKS, SQUIRRELS AND RACCOONS IN MARYLAND, by B. R. Evans, W. G. Phillips and W. E. Bickley. University of Maryland Agricultural Experiment Station Bulletin A-99. June, 1959.

A NEW SUBGENUS AND SPECIES OF STEGANA MEIGEN

(Diptera: Drosophilidae)

Marshall R. Wheeler, *Department of Zoology, The University of Texas, Austin*[1]

The genus *Stegana* was established by Meigen (1830:79) for the two new European species, *hypoleuca* and *nigra*. Neither of these species was designated as the type of the genus, and each of them was later shown to be synonymous, *hypoleuca* being a later name for *Musca coleoptrata* Scopoli 1763, and *nigra* being a synonym of *Drosophila curvipennis* Fallén 1823.

All recent literature gives the type species of *Stegana* as *coleoptrata* Scopoli, the type selection being credited to Westwood (1840:153) who, in his *Synopsis of the Genera of British Insects*, vol. 2, listed the single species, *S. annulata* Haliday, which is a synonym of *hypoleuca* Meigen and of *coleoptrata* Scopoli.

It seems clear, however, that Westwood did not, in fact, designate the type species, writing only: "STEGANA *Meig.* Drosophila p. *Fall.* 1 sp. *annulata* Hal. Meig. pl. 58, f. 22." This was followed by a brief description. *Stegana annulata* Haliday was not an originally included nominal species, and Westwood made no reference to either of Meigen's species, the plate and figure reference being to a generalized figure of an antenna and arista which is not identified with either *hypoleuca* or *nigra*.

On the assumption that *coleoptrata* was the type of *Stegana*, Hendel (1920) restricted the genus to those species with horizontally elongated eyes and broad cheeks, and erected the new genus *Protostegana*, with *Drosophila curvipennis* Fallén as the type, for those species with vertically elongated eyes and narrower cheeks. Separation along these lines has been followed by later authors, sometimes treating *Protostegana* as a genus, sometimes as a subgenus.

The first unequivocal reference to a type species of *Stegana* is that of Zetterstedt (1874: 2577) who wrote: "*Typus* generis: *St. nigra*." This was clearly a valid selection of the type and, due to the synonymy mentioned above, *Drosophila curvipennis* Fallén becomes the currently valid name of the type species of *Stegana*. *Protostegana* is therefore a synonym of *Stegana* since both have the same type species. This has the unfortunate, but unavoidable, effect of placing in *Stegana s.s.* all of those species which were formerly considered to belong to *Protostegana*, while there is now no applicable group name for those species formerly classed as *Stegana*. I am therefore proposing the name *Steganina* for this group of species, and since I do not feel that the two groups are generically distinct, I am proposing it as a subgenus.

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[1] I wish to thank Mr. Curtis Sabrosky for his assistance in determining the first valid citation of the type species of *Stegana*, Dr. Willis Wirth who arranged the loan of the specimens, and Mrs. Linda Kuich who prepared the figures.

Stegana, subgenus **Steganina**, new subgenus

The type species of this subgenus is the Holarctic species, *Musca coleoptrata* Scopoli 1763. In addition, the following species are known to belong to this subgenus: *antica* Curran, *atrifrons* Malloch, *dorsolineata* Duda, *magnifica* Hendel, *mehadiae* Duda, *minor* Duda, *nigrifrons* de Meijere, *nigrolimbata* Duda, *nigromarginata* Duda, *planifacies* Malloch, *schildi* Malloch, *scutellata* de Meijere, *strobli* Mik, *uniformis* Malloch, and the new species described below.

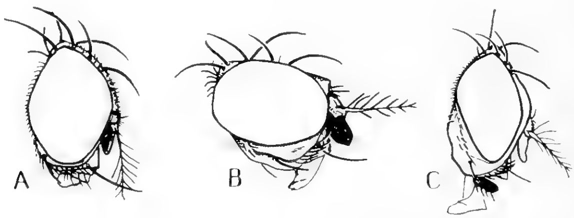

Fig. 1: Profile views of the heads of three species of *Stegana*, representing three subgenera. A, *S.* (*Orthostegana*) *acutangula* Hendel; B, *S.* (*Steganina*) *coleoptrata* Scopoli; C, *S.* (*Stegana*) *vittata* Coquillett.

The characteristics of the subgenus *Steganina* are those formerly associated with the name *Stegana* (as contrasted with *Protostegana*). The most distinctive feature is the shape of the head; this is shown in Figure 1, for *S.* (*Steganina*) *coleoptrata*, with similar views of *S.* (*Stegana*) *vittata* and *S.* (*Orthostegana*) *acutangula* for comparison. In *Steganina* the eye is elongated, the horizontal axis being noticeably greater than the vertical axis. The cheeks are quite broad and elongated, and are typically whitish pruinose. The front is relatively broader than in the other subgenera, is usually shiny, and has a fairly evident transverse depression behind the postlunular hump. The anterior margin of the front is usually straight except at the extreme corners. Many species have two stout humeral bristles. As far as is known, the front tarsi of males are never greatly flattened and modified in shape.

Of the three known Nearctic species of *Stegana*, one (*vittata*) belongs to the subgenus *Stegana* while the other two belong to *Steganina*; they are: *coleoptrata* Scopoli and the following new species.

Stegana (Steganina) antigua, new species

Male and female.—Front subshining, tan, a little darker around ocelli. Second antennal segment tan, third blackish and rather long; arista pale at base, darker apically, with 8-10 dorsal and 5-6 ventral branches in addition to the poorly-defined apical fork. Proboscis, palpi, clypeus and lower half of face pale yellow; upper face, including the low carina, brown to black. Cheek broad, pale whitish.

Mesonotum and scutellum tan with a slight reddish cast, with poorly-defined yellow longitudinal stripes, variable in intensity; narrow yellow stripe of midline continued over disc of scutellum as a distinct stripe. Pleura with a strong brown to black longitudinal stripe from anterior spiracle to base of haltere, below this stripe wholly pale yellowish. Halteres pale. Legs mostly pale, the middle femora and tibiae sometimes faintly discolored on the apical and basal halves, respectively.

Abdomen dark chestnut brown, subshining. Wings brown, more intensely so over anterior half.

Body length, ♂, about 3.0 mm.; ♀ about 4.0 mm.

Types.—Known only from five specimens in the U. S. National Museum collection. Holotype male, Dead Run, Va., July 15, 1915, R. C. Shannon collector. Allotype, Plummers Island, Md., June 20, 1912, H. Barber; three paratypes: Plummers Island, Md., June 1912; Dead Run, Va., June 1916; and S. Wales, N. Y., September 1911.

There is a strong possibility that this species is now extinct; it will be noted that all five specimens were collected between 1911 and 1916. In view of the large amount of collecting that has been done in the environs of the District of Columbia, it is certainly remarkable that not a single specimen is known to have been captured since 1916.

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Zetterstedt, J. W. 1847. Diptera Scandinaviae 6:2163-2580.

A NEW SPECIES OF HOPLOPLEURA FROM AUSTRALIA

(Anoplura: Hoplopleuridae)

Phyllis T. Johnson, *Gorgas Memorial Laboratory, Panama, R. P.*

Through the kindness of Dr. Theresa Clay of British Museum (Natural History) I have had the opportunity to examine specimens of a louse collected from *Pseudomys higginsi*, which is one of the murine rodents native to Australia and adjacent islands. The specimens were collected in Tasmania by Mr. John H. Calaby, Wildlife Survey Section, Commonwealth Scientific and Industrial Research Organization, Canberra.

It gives me pleasure to dedicate the new species to Mr. Calaby, whose interest has made available to us this unusual Australian anopluran.

Hoplopleura calabyi, new species

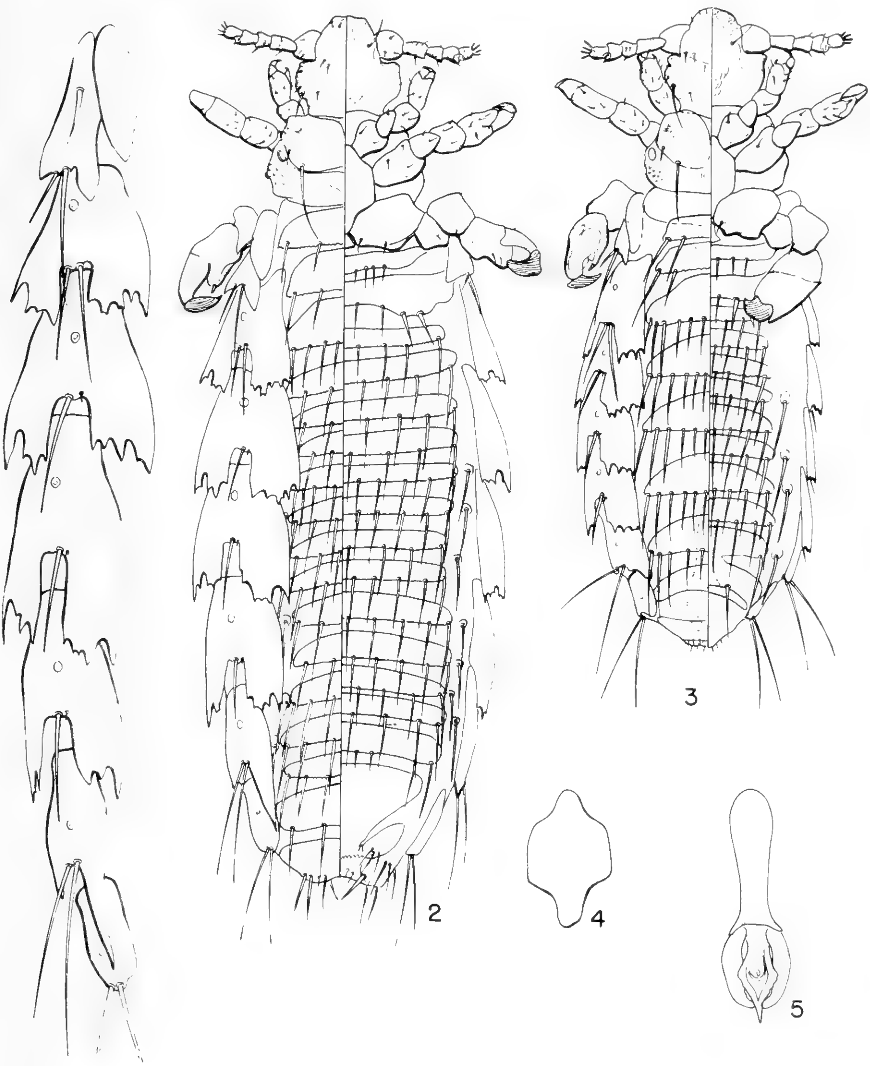
Type data.—Holotype female, allotype male, three male and two female paratypes from *Pseudomys higginsi*, Dawson Settlement, Tasmania, 19 June 1959, J. H. Calaby collector. Holotype and allotype deposited in the Division of Entomology Museum, Commonwealth Scientific and Industrial Research Organization, Canberra, Australia. One pair of paratypes deposited in the collections of the U. S. National Museum, Washington, D. C., the remaining paratypes deposited in the collections of the British Museum (Natural History), London.

Diagnosis.—A member of the *hesperomydis-affinis* group of *Hoplopleura* species. Like its related species, *calabyi* has a pair of long setae on the thoracic dorsum, the majority of the paratergal plates are divided into two more-or-less truncate lobes, typical abdominal segments have three ventral plates in the female and two such plates in the male, the first ventral plate of the third abdominal segment has two enlarged setae in each of the two lateral groups, and the thoracic sternal plate is elongate. *H. calabyi* is similar to *H. apomydis* Ferris, 1921 (from *Apomys insignis*, Philippines) in that paratergal plate VII has a long dorsal apical lobe in the female and plates IV-VI normally have only one long apical seta, the second seta being minute. In both sexes, *calabyi* is easily distinguished from *apomydis* by having the two apical lobes of paratergal plates III-IV deeply scalloped and in having two long apical setae on paratergal plate III rather than only one seta in this position.

Description.—FEMALE (fig. 2): **Head:** Postantennal region almost as broad as entire head is long; lateral postantennal margins unevenly rounded and heavily sclerotized. **Thorax:** Large seta present mesad to spiracle on both sides; thorax broader than long; dorsum laterally rugose. Thoracic sternal plate (fig. 4) elongate, with anterior and posterior apices abruptly narrowed to form sharply rounded to angulate lobes. **Legs:** As in genus. **Abdomen:** Typical segments with three sternal and three tergal plates bearing on the posterior margin six to eight long, thin unmodified setae. Both dorsally and ventrally some segments have one seta occurring laterally on both sides, off the plates. Paratergal plates (fig. 1) large, plate II with two short, acute lobes and two long apical setae. Plate III with two setae which reach beyond apex of the two subequal, truncate, scalloped apical lobes. Plates IV-VI shaped as plate III but with only one long apical seta which extends to or beyond apex of lobes plus a second minute seta. One paratype female has two long setae on plate VI on one side. Plate VII with short, simple ventral apical lobe and very long dorsal lobe which is almost the length of the plate proper, and which bears the usual two long apical setae. The same paratype female mentioned above has this plate lacking the ventral lobe and with the dorsal lobe only about two-thirds the length of the plate proper. Plate VIII lacks apical lobes and bears the usual two long apical setae. **Genitalia** not diagnostic.

MALE (fig. 3): **Head** and **thorax** as in female. **Abdomen:** with one tergal plate and two sternal plates per typical segment; tergal plates bearing a posterior row of eight to twelve long slender unmodified setae, the more lateral setae being larger and heavier; sternal plates with six to eight slender setae. Ventrally, segments 4-7 with one seta laterally off the plate. Paratergal plates as in female except plate VII has the dorsal apical lobe short. **Genitalia** (fig. 5) not diagnostic.

Lengths.—Female: 1.2-1.5 mm. Male: 1.0-1.1 mm.



Hoplopleura calabyi, new species. Figure 1, Paratergal plates II-VIII, female holotype; fig. 2, female holotype; fig. 3, male allotype; fig. 4, thoracic sternal plate, female holotype; fig. 5, male genitalia, paratype.

A NEW MOSQUITO RECORD FOR MARYLAND

(Diptera: Culicidae)

Psorophora (*Janthinosoma*) *cyanescens* (Coquillett) is one of the mosquito species recorded for Virginia, but not for Maryland (Bickley, Mosquito News 17(1): 22-25, 1957). This species was reported from the southwestern part of Virginia (Lee County) by Dorer, Bickley and Nicholson (Mosquito News 4(1): 48-50, 1944). A recent record by Edmunds and Blakeslee (Jour. Econ. Ent. 52(6): 1050-1053, 1959) extends the known range northward and eastward to Woodbridge in the eastern part of Virginia. In 1959 two females of *P. cyanescens* were taken in a New Jersey mosquito light trap at Cambridge, Dorchester County, Maryland. One specimen was caught on the night of September 7, 1959, and a second specimen was taken on the following night. These two specimens were tentatively identified as *P. cyanescens* by the authors and identification was confirmed by Dr. Alan Stone of the U. S. Department of Agriculture at the U. S. National Museum. A male specimen from a light trap at Berlin, Worcester County, collected on July 23, 1959 was later identified by examination of the genitalia. The known range of *P. cyanescens* is thus extended eastward.—Stanley R. Joseph, Robert A. Berry, *and* William E. Bickley, *Department of Entomology, University of Maryland and Maryland State Board of Agriculture, Salisbury and College Park.*

BOOK REVIEW

MOSQUITOES OF MEDICAL IMPORTANCE, by Richard H. Foote and David R. Cook. Agriculture Handbook No. 152. Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C. 158 pp. illus. 1959.

This work presents both an excellent summary of what is known about the distribution and relative importance of the mosquito vectors of disease and graphic keys for the identification of important disease-transmitting species. The first section discusses the diseases, malaria, yellow fever, dengue, the encephalitides, and filariasis. This is followed by a separate treatment of 38 geographical areas, discussing for each area the physical features, the diseases present, their vectors, and listing the *Anopheles* species present. The discussion of each area is accompanied by beautifully designed pictorial keys to the females and larvae of the mosquitoes. By following the clear instructions one can readily determine whether any species he has is medically important or not, and if it is, the name of the species. The final section discusses the bionomics, relation to disease, and distribution of all of the species that have been treated in the keys. There is a bibliography of 345 references. The research was financed by the United States Army, and the resulting volume reflects long hours of painstaking work by the authors, and a great deal of planning to present workable keys within the required space limits. It is a publication that should be in the hands of all who are interested in mosquitoes as disease vectors.—Alan Stone, *Entomology Research Division, A.R.S., U. S. Department of Agriculture, Washington, D. C.*

A RECENT COLLECTION OF THE MOSQUITO HAEMAGOGUS EQUINUS THEOBALD FROM THE VICINITY OF BROWNSVILLE, TEXAS

(DIPTERA: CULICIDAE)

ROBERT A. HEDEEN, FREDERICK W. WHITTEMORE, JR., and HUGH L. KEEGAN[1]

The collection of *Haemagogus equinus* Theobald from the area of Brownsville, Texas, by Trapido and Galindo (1956, Science 123:634) marked the first time any species of this genus had been reported from the United States. Since this discovery was made, additional collections have been made by Eads and Strom (1957, Mosquito News 17(2):86-90) and Breland (1958, Ann. Ent. Soc. Amer. 51(3):217-221). Apparently the collections of Breland, which were made well over a year ago, are the last official records of species of this genus having been taken in the United States until this time.

The area of Brownsville, Texas, has frequently been the collection site of insects not previously known from the United States. Some of these species have proved to be well established in this country, while the status of others is in doubt. For example, Joyce (1945, Mosquito News 5(3):86) made a single biting collection of *Psorophora* (*J.*) *mexicana* at Brownsville some fifteen years ago, and since that time no additional recoveries of *mexicana* have been made in the United States. *P. mexicana* is a species that normally inhabits the state of Oaxaca, Mexico.

Breland (op. cit.) suggests *equinus* is well established in the vicinity of Brownsville, but the population is not as yet very large. Other individuals have suggested to the writers that *equinus* is not well established, and that the specimens previously collected represent a very small population of an accidentally introduced species, having little, if any, chance to survive beyond a few generations.

In an attempt to verify its continued existence, the writers arrived in the Brownsville area on 23 May 1959 and found that in the previous 30 days only 0.07 inches of precipitation had occurred. Tree holes in all locations in the area were found to be totally devoid of free water, and no perceptible moisture could be detected in the debris occurring in the cavities. Because most mosquitoes routinely breeding in tree holes in the United States can be recovered during periods of drought by flooding the dry cavities with water, it was decided to employ this technique in an attempt to collect *equinus*. Breland (1957, Mosquito News 17(4):305-308) reported success on one occasion with this method in obtaining larvae of this species.

Several cavities in Texas ebony trees (*Pithacolobium flexicaule*) were located in an area approximately 16-18 miles from Brownsville on the Boca Chica Beach Road (Highway Number 4). This is approximately the same area from which *equinus* had been taken previously by Trapi-

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do and Galindo, Eads and Strom, and Breland. The tree holes were flooded with water which had been taken from a tap in the quarters of the writers in Brownsville. About 24 hours later, the water was removed from the cavities with a suction apparatus and transferred to quart collecting jars. No mosquito larvae were observed at this time, but about 30 hours later a few first instar larvae were observed in two of the jars, and the next day they were transferred to an enamel pan in the San Antonio laboratory. The material thus treated yielded 7 mature larvae, 6 of them *H. equinus* and 1 *Aedes zoosophus*. The determination of *equinus* was based on characters given by Breland (1958) in his key to the fourth instar larvae most likely to be found breeding in tree holes in the eastern half of the United States.

Part of the remaining debris was thoroughly dried and reflooded with distilled water in an attempt to secure additional specimens. This and one other flooding preceded by drying were unsuccessful in obtaining additional larvae.

While the writers were in the Brownsville area, portable New Jersey type light traps were operated in the vicinity of the above mentioned tree holes in an unsuccessful attempt to collect adult *Haemagogus*. *Anopheles punctipennis* and *Culex* sp. were the only mosquitoes collected in the light traps.

This collection tends to support the hypothesis that the genus is well established in the United States.

NOTES ON NERTHRA MACROTHORAX (MONTROUZIER)

(Hemiptera: Gelastocoridae)

Father G. Enrique H. Schoenig, University of San Carlos, Cebu City, Philippines, has recently sent to me a series of *Nerthra macrothorax* Montrouzier) collected under *Pandanus* and decaying leaves of *Erythrina indica* near the sea shore at Dalaguete, Cebu and Tampi (20 km. N. of Dumaguete), Or. Negros, Philippines. These specimens are the first records of the species from the two islands mentioned. The species has been previously recorded from Panay and Biliran Island. Other examples have been studied, but they were labeled only "Philippines."

The species has been previously collected in rotten *Pandanus*. However, the occurrence of these specimens in the described habitat lends additional support to the theory (see Todd, 1959, Nova Guinea, n. ser., 10(1): 71) that this widely distributed, non-flying species has been dispersed by the drift of debris, especially through the action of storms.—E. L. Todd, *Falls Church, Virginia.*

THE LYGAEIDAE OF THE VAN VOAST—AMERICAN MUSEUM OF NATURAL HISTORY EXPEDITION TO THE BAHAMA ISLANDS, 1953
(HEMIPTERA: HETEROPTERA)

HARRY G. BARBER[1] and PETER D. ASHLOCK[2]

The specimens listed in this report were collected during the Van Voast-American Museum of Natural History Bahama Islands Expedition of 1953 by E. B. Heydon, L. Giovannoli, and G. B. Rabb. Also included are some specimens belonging to the American Museum, collected by C. E. Olsen. A specimen from the U. S. National Museum has been selected as the type of the new species of *Lygaeus* described below. In order to save space the collectors have been indicated by their last initials. Localities are listed from north to south.

Oncopeltus aulicus (Fabricius)

2, **Abaco Cays,** Allans Cay, May 9, H.: 3, **Berry Islands**, Little Harbor Cay, May 1, H. & G.; 3, Nassau, **Bahamas,** Mar. 1933, O.; 1, **Turks & Caicos Isls.,** Grand Turk Isl., Feb. 19, H. & G.

Oncopeltus fasciatus (Dallas)

1, Nassau, **Bahamas,** Mar. 1933, O.

Lygaeus bahamensis, new species
(Fig. 1)

Head, including antennae, labium, and bucculae, black with median red spot basally. Thorax black with three large red spots on posterior lobe, lateral spots extending below lateral margin onto propleura, ostiolar peritreme dark red, legs black. Scutellum black. Hemelytron with clavus black; corium red with an irregular transverse black band, widest across exocorium, abruptly contracting at medial vein, continuing in a narrow band to the apical region of the commissure, posterior margin broadly red; membrane white, faintly fuliginous at base. Abdomen red except lateral and ventral areas, entire seventh segment and genital capsule black.

Head impunctate, wider than long: width, 1.0 mm.; length, 1.3 mm.; interocular space, 1.2 mm., buccalae low, diminishing posteriorly to a point at the level of the anterior margin of the eyes; antennal segment lengths: I, 0.7 mm.; II, 1.6 mm.; III, 1.3 mm.; IV, 1.4 mm.; labium reaching between hind coxae, not attaining abdomen, first segment reaching onto prosternum, segment lengths: I, 1.4 mm.; II, 1.2 mm.; III, 1.1 mm.; IV, 0.8 mm. *Thorax* impunctate, except prothorax lightly punctate dorsally behind anterior margin and between lobes, on propleura behind coxae, and on prosternum behind anterior margin; pronotal dimensions: length, 1.9 mm.; width, 3.1 mm. *Scutellum* impunctate, with a "T" shaped medial carina and low lateral carinae, length, 1.4 mm., width, 1.8 mm.

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Hemelytra with claval commissure shorter than scutellum, length, 1.0 mm.; corium just reaching abdominal segment VI, membrane extending slightly past abdomen.

Length, 8.4 mm.; width, 2.9 mm. (Range, males: length, 7.9 mm. to 9.3 mm.; width, 2.7 mm. to 3.2 mm.; females: length, 8.5 mm. to 9.3 mm., width 3.0 mm. to 3.4 mm.)

Holotype.—Male, U. S. National Museum Cat. No. 64106. Providenciales, **Caicos Isls.**, Bahama Islands, July 22, 1930, H. S. Peters. Paratypes: 1 male, **Mayaguana Island**, nr. Abraham Bay, Mar. 3, H.; 1 male, **Great Inagua Isl.**, Matthew Town, Jan. 31, H. & R.; 2 males, 2 females, **Turks & Caicos Isls.**, West Caicos Island, Feb. 4., H. & G.; 1 male, Turks & Caicos Isls., South Caicos Isl., Feb. 11, H. & B.; 1 female, Turks & Caicos Isls., Long Cay, (south of Grand Turk Isl.) Feb. 25, H. One paratype retained for U. S. National Museum collection.

This attractive species is related to *Lygaeus kalmii* Stål and its allies, but in many respects it is the most striking member of the group. The almost entirely white membrane is unusual, and the ostiolar peritreme is dark red instead of black. Most relatives of *L. kalmii* have a velvety black spot at the apex of the clavus brought about by an interruption of the short pale pilosity that otherwise covers the entire clavus and corium. In the new species the pile is quite sparse so the spot is absent. Despite these differences, a comparison of the phallus of this species with that of *L. kalmii* and of species of related genera show that *L. bahamensis* is a true *Lygaeus*.

Ochrostomus moa (Barber)

1, **Abaco Cays**, Allans Cay, Mar. 9, at light, H. & R.; 2, **New Providence Isl.**, Nassau, Apr. 16, at light, H.; 8, **Cat Isl.**, Bennetts Harbour, Mar. 24, H.; 1, Cat Isl., McQueen, Jan. 23, H. & R.; 1, **Long Isl.**, Deadmans Cay, Mar. 11, H.

Ochrostomus pulchellus (Fabricius)

2, **Abaco Cays**, Elbow Cay, Hopetown, May 4, H. & G.; 1, **Andros Isl.**, Mangrove Cay, June 19, 1924, O.; 10, **Cat Isl.**, Bennetts Harbour, Mar. 24, H.; 4, Cat Isl., The Bight, Mar. 22, H. & G.; 4, **Rum Cay**, nr. Port Nelson, Mar. 16, H. & G.; 9, **Long Isl.**, Clarence Town, Mar. 13, H. & G.; 3, **Mayaguana Isl.**, nr. Abraham Bay, Mar. 3, H. & G.; 4, **Turks & Caicos Isls.**, West Caicos Isl., Feb. 4, H. & G.

Melancoryphus albonotatus (Barber)

1, **Eleuthera** Isl., Governors Harbour, Mar. 31, H.

This single specimen is the second known of this species, which was described from Mona Island, Puerto Rico in 1923. It differs from the type in that the entire apical margin of the corium and the entire margin of the membrane are narrowly bordered with white. The species was placed in the genus *Melanocoryphus* because of the lack of a red spot on the head. It should be pointed out, however, that it seems to have no close relatives and the generic placement must remain provisional.

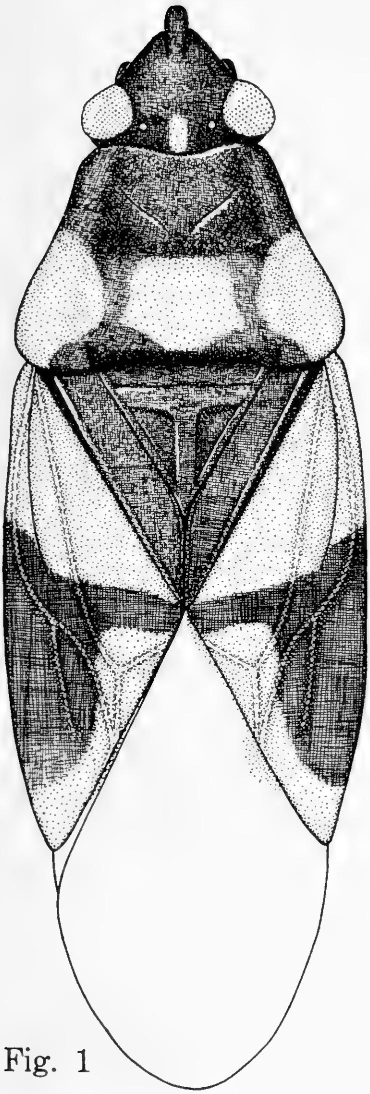

Fig. 1

Lygaeus bahamensis

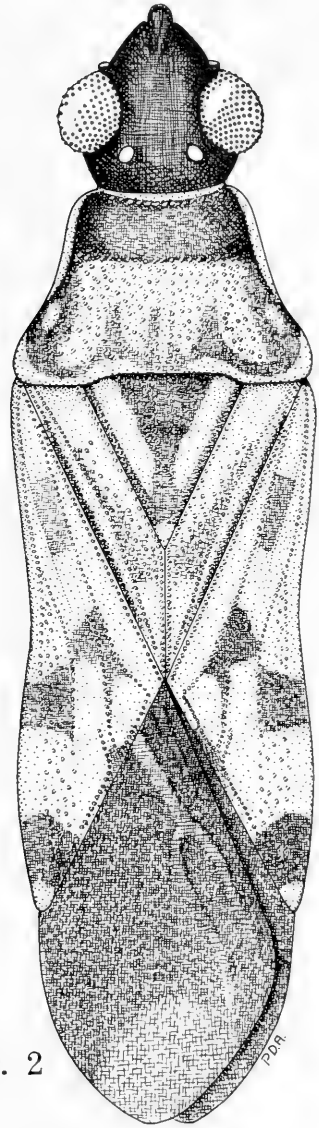

Fig. 2

Ozophora heydoni

Figs. 1 and 2. Holotypes of the new species.

Ortholomus jamaicensis (Dallas)

9, **Great Abaco Isl.**, Marsh Harbour, May 6, H. & G.; 4, **Eleuthera Isl.**, New Portsmouth (Rock South), Mar. 28, H. & G.; 3, **Cat Isl.**, The Bight, Mar. 22, H., G. & R.; 3, **Exuma Cays**, Darby Isl., Jan. 18, H. & G.; 7, **Crooked Isl.**, Landrail Point, Mar. 5, H.; 3, **Great Inagua Isl.**, Matthew Town, Jan. 31, H. & G.

Nysius basalis (Dallas)

1, **Grand Bahama** Isl., West End, May 12, H. & R.; 3, **Great Abaco Isl.**, Marsh Harbour, May 6, H. & G.

Nysius tenellus Barber

2, **Andros Isl.**, Lisbon Creek (nr. South Bight), Apr. 28, H.

Nysius scutellatus Dallas

37, **Grand Bahama Isl.**, West End, May 12, H., R. & G.; 2, **Exuma Cays**, Darby Isl., Jan. 18, H. & G.

Kleidocerys championi (Distant)

1, **Grand Abaco Isl.**, Marsh Harbour, May 6, H. & G.; 1, **Abaco Cays**, Elbow Cay, Hope Town, May 4, H.; 5, **Eleuthera Isl.**, Governors Harbour, Mar. 31, H. & G.; 36, Eleuthera Isl., New Portsmouth (Rock Sound), Mar. 28, H. & G.; 34, **Berry Isls.**, Little Harbour Cay, May 1, H., G. & R.; 3, **New Providence Isl.**, 2 mi. E. Nassau, Apr. 14, H.; 2, **San Salvador Isl.**, nr. Cockburn Town, Mar. 18, G. & R.; 20, **Rum Cay**, nr. Port Nelson, Mar. 16, H. & G.; 2, **Exuma Cays**, Staniard Cay, Jan. 13, H.

Cymoninus notabilis (Distant)

1, **Grand Bahama Isl.**, West End, May 12, H. & R.; 1, **Cat Isl.**, McQueen, Jan. 23, H.; 1, **San Salvador Isl.**, nr. Cockburn Town, Mar. 18, G. & R.; 6, **Long Isl.**, Deadmans Cay, Mar. 11, H.; 24; **Crooked Isl.**, Landrail Point, Mar. 5, H.; 1, **Great Inagua Isl.**, Matthew Town, Jan. 31, H. & G.

Cymus virescens (Fabricius)

1, Nassau, **Bahamas**, Mar. 1933, O.; 2, **Crooked Isl.**, Landrail Point, Mar. 5, H.

Ninyas deficiens (Lethierry)

3, **Grand Bahama Isl.**, West End, May 12, H. & R.; 1, Grand Bahama Isl., Pine Ridge, May 13, H.; 4, **Great Abaco Isl.**, Marsh Harbour, May 6, H. & G.; 5, **Eleuthera Isl.**, Governors Harbour, Mar. 31, H. & G.; 1, **Cat Isl.**, McQueen, Jan. 23, H. & G.; 1, **Rum Cay**, nr. Port Nelson, Mar. 16, H. & G.; 2, **Long Isl.**, Clarence Town, Mar. 13, H. & G.; 1, **East Plana Cay (or East French Cay)**, Mar. 4, H.

Geocoris punctipes (Say)

1, **Grand Bahama Isl.**, West End, May 12, H. & R.; 3, **Abaco Cays**, Elbow Cay, Hope Town, May 4, H.; 1, **Eleuthera Isl.**, Governors Harbour, Mar. 31, H. & G.

Geocoris sp.

1, **Cat Isl.**, Bennetts Harbour, Mar. 24, H.

This is a pale species related to *G. pallens* Stål.

Blissus leucopterus insularis Barber

1, **New Providence Isl.**, Nassau, Apr. 16, H.; 1, **Long Isl.**, Deadmans Cay, Mar. 11, H.

Oedancala crassimana (Fabricius)

1, **Great Abaco Isl.**, March Harbour, May 6, H. & G.; 1, **New Providence Isl.**, nr. Windsor Field, Apr. 12, H.; 13, **Andros Isl.**, Mangrove Cay, June 19, 1924, O.

Heraeus triguttatus (Guérin-Méneville)

2, **Abaco Cays**, Allans Cay, May 9, at light, H. & R.; 1, **New Providence Isl.**, Nassau, Apr. 5, H.; 5, New Providence Isl., Nassau, Apr. 16, at light, H.; 2, **Crooked Isl.**, Landrail Point, Mar. 5, H. & G.; 1, **Turks & Caicos Isl.**, Cays 3.5 mi. S.W. of North Caicos Isl., Feb. 28, H. & G.

Paromius longulus (Dallas)

5, **Grand Bahama Isl.**, West End, May 12, H. & R.; 2, **Great Abaco Isl.**, Marsh Harbour, May 6, H. & G.; 4, **Eleuthera Isl.**, Governors Harbour, Mar. 31, H. & G.; 5, Eleuthera Isl., James Cistern, Apr. 1, H. & G.; 3, Eleuthera Isl., New Portsmouth, (Rock Sound), Mar. 28, H. & G.; 1, **Berry Isls.**, Little Harbour Cay, May 1, H.; 8, **New Providence Isl.**, 2 mi. E. Nassau, Apr. 14, H.; 5, New Providence Isl., Nassau, Apr. 5, 16, at light, H.; 15, **Andros Isl.**, Mangrove Cay, June 19, 1924, O.

Pachybrachius vincta (Say)

68, **Grand Bahama Isl.**, West End, May 12, H. & R.; 1, **Great Abaco Isl.**, Marsh Harbour, May 6, H. & G.; 11, **Eleuthera Isl.**, Governors Harbour, Mar. 31, H. & G.; 3, Eleuthera Isl., New Portsmouth (Rock Sound), Mar. 29, H.; 43, **Berry Isls.**, Little Harbour Cay, May 1, H. & G.; 3, **New Providence Isl.**, 2 mi. E. Nassau, Apr. 14, H. & R.; 1, **Andros Isl.**, Lisbon Creek (nr. South Bight), Apr. 28, H.; 2, **Cat Isl.**, The Bight, Mar. 22, H., G. & R.; 15, **Exuma Cays**, Darby Isl., Jan. 18, H. & G.; 9, Exuma Cays, Staniard Cay, Jan. 13, H.; 4, **Long Isl.**, Deadmans Cay, Mar. 11, H.; 1, Long Isl., Clarence Town, Mar. 13, G.; 1, **Great Inagua Isl.**, 12 mi. N. Matthew Town, Jan. 29, H. & G.

Pachybrachius bilobatus scutellatus (Dallas)

11, **Grand Bahama Isl.**, West End, May 12, H. & R.; 1, **Abaco Cays**, Elbow Cay, Hope Town, May 4, H.; 2, **Eleuthera Isl.**, New Portsmouth (Rock Sound), Mar. 28, H. & G.; 5, **New Providence Isl.**, Nassau, Apr. 5, 16, at light, H.; 1, **Andros Isl.**, Mangrove Cay, June 19, 1924, O.; 5, **Cat Isl.**, The Bight, Mar. 22, H., G. & R.; 1, **San Salvador Isl.**, nr. Cockburn Town, Mar. 18, G. & R.; 2, **Rum Cay**, nr. Port Nelson, Mar. 16, H.; 2, **Exuma Cays**, Staniard Cay, Jan. 13, H.; 1, **Crooked Isl.**, Landrail Point, Mar. 5, H.; 1, **Great Inagua Isl.**, 12 mi. N. Matthew Town, Jan. 29, H. & G.

Pachybrachius vicarius Barber

2, **New Providence Isl.**, Nassau, Apr. 5, 16, H.; 2, **Crooked Isl.**, Landrail Point, Mar. 5, H. & G.

Pachybrachius intermedius Barber

2, **New Providence Isl.**, Nassau, Apr. 16, at light, H.

Exptochiomera minima (Guérin-Méneville)

1, **Great Abaco Isl.**, Marsh Harbour, May 6, H. & G.; 3, **New Providence Isl.**, Nassau, Apr. 5, 16, at light, H.

Exptochiomera dissimilis Barber

1, **Mayaguana Isl.**, nr. Abraham Bay, Mar. 3, at light, H.; 2, **Great Inagua Isl.**, Matthew Town, Jan. 31, H. & R.; 6, **Great Inagua Isl.**, 12 mi. N. Matthew Town, Jan. 29, H. & G.; 4, **Turks & Caicos Isls.**, South Caicos Isl., Feb. 11, under dung, H.; 1, Turks & Caicos Isls, Six Hill Cay (S. of South Caicos Isl.), Feb. 12, R.

Ozophora burmeisteri (Guérin-Méneville)

3, **Grand Bahama**, Pine Ridge, May 13, at light, H. & R.; 6, **Abaco Cays**, Green Turtle Cay, New Plymouth, May 7, at light, H. & R.; 19, **Great Abaco Isl.**, Marsh Habour, May 6, at light, H. & G.; 45, **Abaco Cays**, Elbow Cay, Hope Town, May 4, at light, H. & G.; 2, **Eleuthera Isl.**, James Cistern, Apr. 1, at light, H. & G.; 1, **Berry Isls.**, Little Harbour Cay, May 1, G.; 7, Berry Isls., Fraziers Hog Cay, Apr. 30, at light, H. & G.; 13, **New Providence Isl.**, Nassau, Apr. 5, 16, at light, H.; 3, **Andros Isl.**, Mangrove Cay, Apr. 26, H. & G.; 15, **Cat Isl.**, Bennetts Harbour, Mar. 24, at light, H. & G.; 2, Cat Isl., The Bight, Mar. 22, at light, H. & G.; 3, **Rum Cay**, nr. Port Nelson, Mar. 16, H & G.; 1, **Exuma Cays**, Darby Isl., Jan. 18, H. & G.; 4, **Long Isl.**, Deadmans Cay, Mar. 11, H.; 1, Long Isl., Clarence Town, Mar. 13, at light, H.; 1, **Crooked Isl.**, Landrail Point, Mar. 5, H. & G.; 14, **Mayaguana Isl.**, nr. Abraham Bay, Mar. 3, at light, H.; 1, **Great Inagua Isl.**, 12 mi. N. Matthew Town, Jan. 29, H. & G.

Ozophora pallescens (Distant)

2, **Grand Bahama Isl.**, West End, May 12, at light, H., G. & R.; 4, **Grand Bahama Isl.**, Pine Ridge, May 13, at light, H. & R.; 2, **Great Abaco Isl.**, Marsh Harbour, May 6, at light, H. & G.; 1, **Abaco Cays**, Elbow Cay, Hope Town, May 4, at light, H. & G.; 18, Abaco Cays, Allans Cay, May 9, at light, H. & R.; 8, **New Providence Isl.**, Nassau, Apr. 5, 16, at light, H.; 5, **Rum Cay**, nr. Port Nelson, Mar. 16, H. & G.; 1, **Exuma Cays**, Derby Isl., Jan. 18, H. & G.; 1, **Crooked Isl**, Landrail Point, Mar. 5, H. & G.; 5, **Mayaguana Isl.**, nr. Abraham Bay, Mar. 3, at light, H.

Ozophora inornata Barber

1, **Abaco Cays**, Allans Cay, May 9, at light, H. & R.; 3, **New Providence Isl.**, Nassau, Apr. 5, 16, at light, H.; 2, **Cat Isl.**, Bennetts Harbour, Mar. 24, H.; 1, **Mayaguana Isl.**, nr. Abraham Bay, Mar. 3, at light, H.; 1, **Turks & Caicos Isls.**, cays 3.5 mi. S.W. of North Caicos Isl., Feb 28, H. & G.

Ozophora atropicta Barber

2, **Abaco Cays**, Great Sale Cay, May 10, G. & R.; 1, **Grand Bahama Isl.**, West End, May 12, at light, H. & G.; 16, **Great Abaco Isl.**, Marsh Harbour, May 6, at light, H. & G.; 4, **Abaco Cays**, Green Turtle Cay, New Plymouth, May 7, at light, H. & R.; 2, Abaco Cays, Elbow Cay, Hope Town, May 4, at light, H. & G.; 30, Abaco Cays, Allans Cay, May 9, at light, H. & R.; 8, **Berry Isls.**, Little Harbour Cay, May 1, H. & R.; 4, **New Providence Isl.**, Nassau, Apr. 5, 16, at light, H.; 7, **Andros Isl.**, Fresh Creek, Apr. 23, at light, H. & G.; 8, **Cat Isl.**, Bennetts Harbour, Mar. 24, at light, H. & G.; 1, Cat Isl., The Bight, Mar. 22, at light, H. & G.; 1, **Exuma Cays,** Staniard Cay, Jan. 13, at light, H. & G.; 2, **Long Isl.,** Deadmans Cay, May. 11, at light, H.; 2, Long Isl., Clarence Town, Mar. 13, at light, H.; 9, **Crooked Isl.,** Landrail Point, Mar. 5, H. & G.; 2, **Fortune Isl. (or Long Cay),** nr. Albert Town, Mar. 7, H. & G.; 9, **Mayaguana Isl.,** nr. Abraham Bay, Mar. 3, at light, H.; 1, **Great Inagua Isl.,** 12 mi. N. Matthew Town, Jan. 29, H. & G.; 51, **Turks & Caicos Isls.,** West Caicos Isl., Feb. 4, at light, H. G. & R.; 1, Turks & Caicos Isls., cays 3.5 mi. S.W. of North Caicos Isl., Feb. 28, H. & G.; 28, Turks & Caicos Isls., South Caicos Isl., Feb. 11, H.

The eighty specimens from Turks and Caicos Islands as well as the two from Fortune Island differ greatly in color from typical members of the species. In these specimens the scutellum is entirely dark except for the extreme apex, which is pale, and the corium is dark except for broad, pale lateral margins. However, since the dark areas do not reach the costal margin of the corium, the dark postmedian transverse band found on the corium of typical *Ozophora atropicta* is absent. As typical *O. atropicta* occurs on islands both north and south of these localities, it is difficult to interpret this population as a possible subspecies. The two forms are morphologically identical, and even a careful comparison of the male parameres fails to uncover differences.

Ozophora heydoni, new species

(Fig 2)

Head brown; antennae each with first three segments pale yellow, but apical quarter of third segment darkened, basal tenth and apical two-thirds of fourth segment dark brown, remainder of fourth segment white; labium pale yellow. Thorax brown on anterior lobe of pronotum and ventrally; collar, expanded lateral carina, posterior lobe of pronotum, acetabula, acute posterior tip of metapleural plate and legs pale yellow; posterior lobe of pronotum with brown markings as figured. Scutellum brown with lateral vittae and apex pale yellow. Hemelytra pale yellow, with brown markings as figured, membrane brown with paler veins. Abdomen light brown.

Head impunctate, minutely granulose, with very short, sparce pile, length equal to width, 0.90 mm.; eyes removed from prothorax by a distance slightly less than half the length of an eye and extending well below antenniferous tubercle, interocular distance, 0.37 mm.; ocelli large, removed from eyes by a distance equal to their diameter, lying on a line drawn between posterior margins of eyes; antenna long and thin, first segment thickest, fourth slightly thicker than second and third, and lightly curved, segment lengths: I, 0.48 mm.; II, 1.05 mm.; III, 1.01 mm.; IV, 1.16 mm.; labium reaching first visible abdominal segment, first segement slightly onto prosternum; segement lengths: I, 0.84 mm.; II, 0.75 mm.; III, 0.73 mm.; IV, 0.22 mm. *Thorax* impunctate except strongly on posterior lobe of pronotum, and lightly on margin of collar and hind lobe of propleura; pilosity very short and sparce; pronotal dimensions: length, 0.90 mm.; width, 1.36 mm.; length anterior lobe without collar, 0.28 mm.; length posterior lobe, 0.54 mm.; ostiolar peritreme short, length from lower edge of orifice to apex of peritreme, 0.18 mm., length from apex of peritreme to dorsal margin of metapleuron, 0.43

mm.; legs with all femora bearing a few erect setae dorsally, fore femora each slightly incrassate, bearing seven setae beneath: apical seta very short, apical three set on tubercles and stout, basal four not set on tubercles and very fine. *Scutellum* closely punctate along lateral margins and medially, impunctate on pale lateral vittae and apex, length, 0.87 mm., width, 0.75 mm. *Hemelytra* with commissure shorter than scutellum, length, 0.63 mm.; apex of corium reaching middle of abdominal segment VI; membrane slightly exceeding abdomen; clavus linearly punctate along medial and commissural margins, along claval suture and vein, randomly punctate between claval vein and medial margin except for small areas basally and apically; corium linearly punctate along claval suture, all corial veins, and apical margin, randomly punctate lateral to outer corial vein, but with costal area impunctate.

Length, 4.75 mm., width, 1.25 mm. (Range, males: length, 4.30 mm. to 4.85 mm., width, 1.15 mm. to 1.25 mm.; females: length, 4.30 mm. to 5.15 mm., width, 1.15 mm., to 1.45 mm.)

Holotype.—Male, **New Providence Isl.,** Nassau, at light, Apr. 16, 1953, H., deposited in the American Museum of Natural History. Paratypes: 7 males, 6 females, 2 sex?, same data as type; 10 males, 1 sex?, same data as type, but Apr. 15, 1953; 1 male, 3 females, same data as type, but Jan. 3, 1953; 2 males, **Abaco Cays,** Allans Cay, at light, May 9, 1953, H. & R.; 1 female, Abaco Cays, Greer Turtle Cay, New Plymouth, at light, May 7, 1953, H. & R.; 3 males, 2 females **Great Abaco Isl.,** Marsh Harbour, at light, May 6, 1953, H. & G.; 1 female **Andros Isl.,** Fresh Creek, at light, Apr. 28, 1953, H. & G. Five paratypes retained for the U. S. National Museum collection.

This species is similar to *O. atropicta,* but the antennae are longer and thinner and the eyes dip farther below the antenniferous tubercles. It is closely related to *O. concava* (Dist.), but the posterior lobe of the prothorax is less deeply punctate. The fourth antennal segment of *O. concava* is one-tenth longer than the width of the prothorax, while in *O. heydoni* it is one-third shorter than the width of the prothorax.

Ozophora sp.

1, **Great Inagua Isl.,** Matthew Town, Jan. 31, H. & R.; 1, **Turks & Caicos Isls.,** cays 3.5 mi. S.W. of North Caicos Isl., Feb. 28, G. & R.

This species is a rare example of a brachypterous *Ozophora,* and is undoubtedly new. Since only two females were collected, it is not described at this time.

Ozophora sp.

1, **New Providence Isl.,** Nassau, Apr. 16, H.

This species is very small for the genus and is undoubtedly new. Like the last, however, it is represented by too few specimens for us to describe it now.

Antillocoris pallidulus (Uhler)

1, **New Providence Isl.,** Nassau, Apr. 5, H.

Paragonatas diversus (Distant)

1, **Abaco Cays,** Allans Cay, May 9, at light, H. & R.; 4, **New Providence Isl.,** Nassau, Apr. 5, at light, H.

HARRY GARDNER BARBER

1871—1960

If we are to believe statistics, entomologists are, by and large, a long-lived lot. Even so, few are privileged to serve their science for 65 years. Harry Gardner Barber was one of those few. Though his life coincided with the period during which professional entomology developed and reached its majority, he spent only 13 years as a salaried entomologist. During the rest of his career, he was one of the talented amateurs who contributed so notably to the development of American entomology. Although handicapped by failing eyesight and other infirmities of age, he remained active until two weeks before his death. This occurred at Doctor's Hospital in Washington, D. C. on January 27, 1960.

Mr. Barber was born in Hiram, Ohio, on April 20, 1871, son of Grove E. and Esther Gates Barber. His father had served as a veterinarian in the Union Army, and was a teacher of the classical languages. In 1881, Mr. Barber moved with his parents to Lincoln, Nebraska, where his father had accepted a position as Professor of Latin and Greek in the newly organized University of Nebraska. There he was educated in the public schools and was graduated from the University of Nebraska in 1893. As a student at the University, he was a member of Delta Tau Delta and one of the group that organized the ROTC drill team that became the first Chapter of the National Honorary Society known as the Pershing Rifles. Later, at the outbreak of the Spanish-American War, he was to turn down an opportunity to serve as Adjutant of a cavalry regiment commanded by "Black Jack" Pershing.

After his graduation in 1893 he served as assistant to Professor Lawrence Bruner at the Department of Entomology of the University of Nebraska, where he received his Master's Degree in 1895. The following year he taught science in the Nebraska City high school, where he met and married Blanche E. Davis. In 1897, he undertook graduate work at Bussey Institute, Harvard, where he was also awarded a Master's Degree in 1898. In the same year he was appointed to a position as teacher of biology at the De Witt Clinton High School, in New York City, where he continued to teach biology until December of 1930. When he retired from the New York State educational system he accepted a position with the U. S. Department of Agriculture's Bureau of Entomology. In this capacity he served as a specialist in charge of the true bugs, suborder Heteroptera, at the U. S. National Museum. In 1942, he resigned and returned to his former home in Roselle, New Jersey. After his wife's death in 1949, he returned to Washington and resumed his work at the National Museum as a Collaborator of the Entomology Research Division, U. S. Department of Agriculture.

During Mr. Barber's long career, he published only one paper directly concerned with applied entomology. This was entitled, "Experiments with infectious diseases for combating the chinch-bug." It appeared in 1894 in co-authorship with Professor Lawrence Bruner and was the first of the 110 papers he was to ultimately write. It is interesting to note that he had originally intended to specialize on butterflies but the destruction of his entire collection by fire discouraged him from continuing and perhaps because of his work with the chinch bug he turned his attention to the Hemiptera and later became the leading authority on the family Lygaeidae, to which the chinch bug belongs. His only other venture outside the field of Hemiptera was a paper listing the butterflies of Nebraska that was also published in 1894.

Mr. Barber's affiliation in 1894 with the Entomological Society of Washington, of which Professor Bruner was a charter member, also reflects Professor Bruner's early influence. At Harvard he worked under the guidance of Dr. William Morton Wheeler; however, Wheeler's influence failed to alter his basic interest in Hemiptera.

During the years that he taught biology at De Witt Clinton High School, he spent his long summer vacations collecting Hemiptera in many different parts of the United States. Mrs. Barber usually accompanied him on these trips and encouraged him to develop his avocation. It was in this way that he built his fine collection of Hemiptera. He also acquired an outstanding library and through his work and correspondence became recognized as the leading world authority on the family Lygaeidae.

As a resident of the New York metropolitan area, he almost at once became associated with its entomological activities. During a visit to Kny-Scheerer's well-known biological supply house, he by chance met Dr. William Beutenmüller of the American Museum of Natural History staff, who proposed his name for membership in the New York Entomological Society. This was in 1898. He remained a member of the Society until his death and was its Secretary, 1902-10, Vice President, 1914-15 and its President, 1916-18. He greatly enjoyed his association with this remarkable group of entomologists, mostly amateurs, who attended the regular meetings and which included such well-known names as Chas. Leng, Wm. T. Davis, Torre-Bueno, Frank Lutz, Andrew Mutchler, Wm. Beutenmüller, Chris Olsen and Harry Weiss, to cite just a few.

These men were all enthusiastic collectors of various groups of insects. From spring to fall, a small group would spend week-ends in some nearby place in the country, mostly on Long Island and in New Jersey. Memorial Day and the Fourth of July were always the occasion for a collecting trip by a larger group and many a story was told of convivialities on these excursions. When the senior author was in high school, he well remembers Mr. Barber leaving school with his suitcase just as soon as he could get away on Friday afternoons during spring and fall to go on a collecting trip with some of these men[1].

In view of his intense interest in entomology it is scarcely surprising that he also participated in the formation of the Entomological Society of America. This Society was organized in 1906 at a meeting held in the American Museum of Natural History and Mr. Barber became one of the 364 charter members. Only 20 of these survive him. Subsequently in 1930 he was elected a Fellow and in 1957 became an Emeritus Member of the Entomological Society of America.

Although Harry Barber was a first-class teacher, the daily routine of teaching biology to large classes of boys, city-born and bred, and most of whom had little real interest in the subject, must at times have been trying. Undoubtedly he found relaxation and intellectual stimulation from his week-end and long summer collecting trips as well as

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[1] I cannot refrain from adding a purely personal note regarding my relationship to Harry Barber. In the fall of 1905, I entered the DeWitt Clinton High School in New York City at the age of 15. Biology (Botany and then Zoology) was a required subject for all Freshmen and Sophomores. I was assigned to the section taught by Mr. Barber—by chance the first year, by mutual intent the second year. Having suddenly acquired an absorbing interest in birds a year before, I quite naturally showed an unusual interest in botany. In a class of boys, mostly city born and bred, I naturally attracted Mr. Barber's attention. Since he was a graduate entomologist, he began to tell me about insects. In the spring of my first year, he invited me to spend a day collecting insects with him. At the end of that never-to-be-forgotten day, I decided I wanted, more than anything else, to become an entomologist. Following Mr. Barber's recommendation to me—and to my parents—following high school I entered Cornell to prepare myself for the profession of entomology. In these ways Harry Barber charted the whole course of the rest of my life and I kept in constant touch with him until the very day of his death.—M. D. LEONARD.

from his correspondence with hemipterists in all parts of the world. In 1914 he collected extensively in Puerto Rico for the American Museum of Natural History and thus established an interest that culminated in 1939 in one of his most important and useful publications, that treating the Hemiptera-Heteroptera of Puerto Rico and the Virgin Islands (exclusive of the Miridae and Corixidae). He subsequently extended his interests to Cuba and in cooperation with Dr. S. C. Bruner he eventually published on most of the Heteroptera fauna of that Island.

Beginning in 1904, he and Mrs. Barber also spent many summers near Vienna, Virginia, and in addition to enjoying what was then a rural retreat, he collected Hemiptera and found time to become acquainted with the Hemiptera collection of the U. S. National Museum. This led to his being employed by the Museum during the summers of 1922-1926 to help arrange and classify the Museum's collection.

Immediately following his retirement from high school teaching in New York in 1930, he and Mrs. Barber moved from their home in Roselle, New Jersey, and established their residence at 2222 Q Street N. W., in Washington, where they lived until his second retirement in 1942—this time from Federal service in the Bureau of Entomology and Plant Quarantine. They then returned to their old home at Roselle. This was not an entirely happy move, for many changes had occurred in their old neighborhood. Old friends were gone. The older members of the New York Entomological Society had passed away, and the trip back to New Jersey late at night after the Society's meetings in New York City seemed no longer to be worth the trouble. Therefore, when Mrs. Barber died in 1949, Mr. Barber sold his home and early in 1950 returned to Washington where he had friends with kindred interests and where he had access to the facilities of the U. S. National Museum. He also rejoined the Cosmos Club, which he and his wife had enjoyed so much in former years, and affiliated himself with St. Margaret's Episcopal Church.

In this way started the last and one of the most productive decades of Harry Barber's life. He donated his fine Hemiptera collection and many of his books to the Museum. As a Collaborator of the Entomology Research Division, he was given desk space and facilities to carry on his work and until well into the last year of his life was to be found daily at his desk almost as though he were a regular employee of the staff. During this last period in Washington he published 17 papers, mostly of revisional or faunal nature, the most important of these being the Lygaeidae section of the Insects of Micronesia, which appeared in 1958. He properly regarded this as his second best piece of work, surpassed only by the comprehensive paper on the Heteroptera of Puerto Rico. His last paper, completed in the latter part of 1959 with the help of Peter D. Ashlock, appears in this issue of the Proceedings. Thus, his life-long hobby and one-time vocation provided him with an active and much-needed interest as well as an opportunity to remain a part of the world fraternity of entomologists until the final year of his life.

Although the Barbers had no children, they reared Mrs. Barber's younger brother, Richard, and through their contacts in later years with Mr. Barber's more youthful colleagues, they enjoyed an almost parental relationship with a generation of the younger hemipterists and other entomologists.

His character was marked by tolerance of views not coinciding with his own. He stated his opinions clearly and forcefully, but never attempted to impose them upon others. Moderation was reflected in all aspects of his life. These characteristics were without doubt responsible for the high regard in which he was held by his colleagues, many of whom are sons of a generation not yet born when his entomological career began.

In 1955 Mr. Barber was elected Honorary Member of the Washington Entomological Society and at the time of his death was the Society's oldest member in terms of both age and years of association.

MORTIMER D. LEONARD
REECE I. SAILER

H. G. BARBER: BIBLIOGRAPHY AND LIST OF NAMES PROPOSED

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86. 1948c. A case of synonomy in the family Neididae (Hemiptera-Heteroptera). Bull. Brooklyn Ent. Soc. 43:21.
87. 1948d. New records for *Stygnocoris rusticus* Fallen. Bull. Brooklyn Ent. Soc. 43:31.
88. 1948e. Concerning *Esuris* Barber (not Stål) and *Neosuris* Barber, with a new subspecies from Idaho. (Hemiptera-Heteroptera: Lygaeidae). Psyche 55: 84-6.
89. 1948f. The genus *Cligenes* in the United States (Hemiptera, Lygaeidae). Proc. Ent. Soc. Washington 50:157-8.
90. 1949a. List of the Pentatomidae of Cuba with the description of a new species (Hemiptera-Heteroptera). (S. C. Bruner & H. G. B.) Mem. Soc. Cubana Hist. Nat. 19:155-65. (See correction Bruner, 1951, Mem. Soc. Cubana Hist. Nat. 20:75.)
91. 1949b. A new genus in the subfamily Blissinae from Mexico, and a new *Nysius* from the North West. (Lygaeidae; Hemiptera-Heteroptera) Bull. Brooklyn Ent. Soc. 44:141-4, pl. 13.
92. 1949c. Some synonyms in the family Lygaeidae (Hemiptera). Proc. Ent. Soc. Washington 51:273-6.
93. 1952a. The genus *Antillocoris* Kirk. in the United States (Hemiptera-Lygaeidae). Bull. Brooklyn Ent. Soc. 47:85-7 [key].

94. 1952b. The genus *Pachybrachius* in the United States and Canada with the description of two new species (Hemiptera: Lygaeidae). Jour. New York Ent. Soc. 60:211-20 [key].

95. 1953a. A second revision of the genus *Ptochiomera* Say and its allies (Hemiptera, Lygaeidae). Proc. Ent. Soc. Washington 55:19-27 [keys to related genera, *Exptochiomera* and *Sisamnes*].

96. 1953b. A new subfamily, genus, and species belonging to the family Enico cephalidae (Hemiptera, Heteroptera). Amer. Mus. Novitates No. 1614:1-4 figs. 1-6 [key to subfamilies].

97. 1953c. A revision of the turtle bugs of North America (Hemiptera: Penta tomidae). (H. G. B. & R. I. Sailer) Jour. Washington Acad. Sci. 43:150-62, figs. 1-57 [keys].

98. 1953d. A change of name in the family Reduviidae. Hemiptera. Proc. Ent. Soc. Washington 55:142.

99. 1953e. A revision of the genus *Kleidocerys* Stephens in the United States (Hemiptera, Lygaeidae). Proc. Ent. Soc. Washington 55:273-83 [key].

100. 1954a. The family Lygaeidae (Hemiptera-Heteroptera) of the Island of Cuba and the Isle of Pine—Part II. Mem. Soc. Cubana Hist. Nat. 22:335-53, fig. 1.

101. 1954b. A report on the Hemiptera Heteroptera from the Bimini Islands, Bahamas, British West Indies. Amer. Mus. Novitates No. 1682:1-18, figs. 1-3.

102. 1954c. Some Neotropical "Lygaeidae". Rev. Brasil. Biol. 14:215-24, figs. 1-5.

103. 1955. The genus *Cryphula* Stål, with the descriptions of two new species (Heteroptera: Lygaeidae). Jour. New York Ent. Soc. 63:135-7 [key].

104. 1956a. A new species of *Leptocoris* (Coreidae: Leptocorini). Pan-Pacific Ent. 31:9-11, map.

105. 1956b. A new arrangement in the subfamily Cyminae (Hemiptera, Lygaeidae). Proc. Ent. Soc. Washington 58:282 [key to tribes].

106. 1956c. Lectotype designated for *Kleidocerys franciscanus* (Stål) 1859 (He miptera: Lygaeidae). Ent. News 67:264-5.

107. 1958a. A new species of *Nysius* from Alaska and Alberta, Canada (Hemiptera, Lygaeidae). Proc. Ent. Soc. Washington 60:70.

108. 1958b. Insects of Micronesia. Heteroptera: Lygaeidae Bernice P. Bishop Mus., Insects of Micronesia 7(4):173-218, map, figs. 1-11 [keys].

109. 1959. Nomenclatorial considerations relative to the genus *Myodocha* Latreille, 1807 (Hemiptera). (J. A. Slater, H. G. B. & R. I. Sailer) Ent. News 70:185-9.

110. 1960 The Lygaeidae of the Van-Voast-American Museum of Natural History Expedition to the Bahama Islands, 1953 (Hemiptera-Heteroptera). (H. G. B. & P. D. Ashlock) Proc. Ent. Soc. Washington 62: 117-124, figs. 1-2.

While Mr. Barber was an active member of the New York Entomological Society, he presented some notes which were subsequently published in the Proceedings. The subjects of the more important of these notes, together with volume and page references to the Journal of the Society, are given below.

1907, Alydinae, 15:116; 1911, sifting, 19:269; 1912, *Thyanta calceata* resurrection, 20:138; 1912, *Lygaeus*, 20:210-1; 1914, Virginia Hemiptera, 22:177; 1914, No. Carolina Hemiptera, 22:269; 1915, Porto Rico trip, 23:75-6; 1916, Florida Hemiptera, 24:94; 1916, Nabidae, 24:308; 1917, Virginia Hemiptera, 25:87; 1921, Cuban Thaumastocorid, 29:60; 1922, Adirondack Hemiptera, 30:110-1; 1925, maternal care by Hemiptera, 33:116; 1928, Indian Lake Hemiptera, 36:196-7; 1930, California trip, 38:77.

List of Names Proposed

On the following pages are listed, in their original form, the 5 higher categories, 40 genera, 256 species, 9 subspecies and varieties, and 2 new names proposed by Mr. Barber. The abbreviations set forth below indicate where the holotypes are deposited. The serial number of the paper and the page where the original description appears are given. A small "f" indicates that one or more figures were included with the description.

(AM) American Museum of Natural History, New York, New York. 37 types.[1]
(CA) California Academy of Sciences, San Francisco, California. 3 types.
(CM) Carnegie Museum, Pittsburgh, Pennsylvania. 11 types.[1]
(CU) Cornell University, Ithaca, New York. 6 types.
(CZ) Museum of Comparative Zoology, Cambridge, Massachusetts. 3 types.
(HH) Halbert M. Harris, personal collection, Iowa State College, Ames. Iowa. 1 type.
(IS) Illinois State Natural History Survey, Urbana, Illinois. 1 type.
(JL) John C. Lutz, personal collection, Philadelphia, Pennsylvania. 2 types.
(MB) Museu Nacional, Rio de Janeiro, Brazil. 3 types.
(NM) United States National Museum, Washington, D. C. 185 types.
(NY) New York Zoological Society, New York, New York. 8 types.[1]
(OS) Ohio State University, Department of Zoology and Entomology, Columbus, Ohio. 3 types.
(UK) Snow Museum, University of Kansas, Lawrence, Kansas. 2 types.

Cydnidae

Amnestus **diminuatus**, (NM), 74:274,f.
Geocnethus **cubensis**, (NM), 54:236.
  reversus, (NM), 54:237,f.

Pentatomidae

Acrosternum **elegans**, (NM), 90:160.
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  vanduzeei, (CA), 97:160,f.
Banasa **humeralis**, (CU), 74:297,f.
  punctatissima, (NM), 54:263,f.
Brepholoxa **rotundifrons**, (AM), 74:300,f.
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  reticulatus, (NM), 6:270.
  schaefferi, (NM), 3:262.
Dioleus **disjunctus**, (AM), 74:281,f.
Edessa **chlorophyla**, (NM), 54:272,f.
  cubana, (NM), 54:269,f.
  excoriata, (NM), 54:270,f.
  flavoflua, (NM), 54:271,f.
  florida, (NM), 62:48,f.
  paravinula, (AM), 61:1,f.
Euschistus **atromaculosus**, (NM), 43:-241,f.

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[1]In paper number 38 no mention was made of the place where holotypes were deposited. Since the paper was based on material belonging to the New York Zoological Society, it has been assumed that the types are in the Society's collection. A letter of inquiry to the Society, however, remains unanswered. Dr. Herbert Ruckes, Sr. writes that the type of *Plea punctifier* (32:10) cannot be located in the American Museum collection. Dr. George Wallace states that the type of *Ocriöessa boliviensis* (51:234) could not be found in the Carnegie Museum collection.

PYRRHOCORIDAE

TINGIDAE

ENICOCEPHALIDAE

PHYMATIDAE

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Phymata **bimini**, (AM), 101:11,f.

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var. **osorioi**, (NM), 68:186.
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Heza **angulifer**, (NM), 74:389,f.
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bruneosus, (NM), 51:214.
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Nesocastolus, 68:188.
Ocrioëssa **boliviensis**, (CM), 51:234.
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magnitylus, (NM), 52:185.
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piligera, (CU), 51:204.
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Zylobus, 51:230.
lobulatus, (NM), 51:231.

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Neogorpis, 35:136.

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Xylastodoris, 23:100.
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cavernis, (NM), 77:316,f.

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Gerridae

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Saldidae

Micracanthia **sulcata**, (AM), 74:415,f.

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flaviclavus, (NM), 12:215.

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SOCIETY MEETINGS

Held in the U. S. National Museum

687th Meeting, February 4, 1960

The meeting was held with 35 members and 20 visitors attending. President Paul W. Oman presided. The minutes were read, amended, and approved.

R. I. Sailer presented a resumé of the professional career of the late Harry G. Barber. The death of Mr. Barber, an Honorary Member of the Society, is a real loss to the field of entomology. Mortimer Leonard and R. I. Sailer were asked to prepare an obituary to appear in the *Proceedings*. (Note: Mr. Barber's obituary appears in this issue.—Ed.)

Two candidates were elected to membership: *Robert P. Harrison* and *Robert L. Walker*. Four names of candidates for membership were announced: *John R. Stough, Samuel O. Hill, James F. Cooper*, and *Sloan E. Jones*.

Dr. Oman reported highlights from the meeting of the Southern California Entomological Club on January 15, during which time he extended greetings from the Society.

William E. Bickley started a very lively discussion with his comments on using frozen insects for anatomical studies. The technique for freezing insects within three hours after being caught is deemed easy and practical, the thawed specimens being comparable to freshly-caught ones for laboratory studies. William Anderson and Ashley Gurney contributed other comments about techniques for freezing various insect specimens.

Louis G. Davis, a member of the Membership Committee of the Eastern Branch of the Entomological Society of America, reported that 96% of the entomologists in the Washington area are now members of ESA. He encouraged members of ESW to assist in making this membership reach the 99% mark.

R. I. Sailer showed Kodachromes of scenes in Pakistan where forest insect studies are under way. He also showed pictures of two well-known Indian entomologists, Dr. Hem Singh Pruthi and Dr. Sardar Singh. Dr. Sailer and John Martin attended a meeting of the Mysore Entomological Society where they extended greetings and best wishes from ESW.

The retiring President, Robert Nelson, spoke on the 75th anniversary of ESW by presenting a very entertaining resumé of the activities of our Society. His address will soon appear in the *Proceedings*. Following Mr. Nelson's talk, Robert Snodgrass reminisced on his experiences with the Society since 1903, at which time he visited the U. S. Department of Agriculture. He mentioned that the present Natural History Building did not then exist, and that seven or eight taxonomists were then working on the balcony of the old Museum Building. They reached their desks by climbing a ladder and crawling through a trap door. The last man up the ladder was responsible for closing the door in order to have space enough for one of their chairs.

J. S. Yuill showed a Russian film, *Destroyers of Forest*, which was particularly noteworthy in the photographic techniques used to show bark beetles in galleys under the bark layers.

Visitors introduced were: *D. Gordon Evans*, Florida State Board of Health;

Ronald E. Wheeler, University of Maryland; *Mrs. Charles McComb,* College Park, Maryland; *Dr.* and *Mrs. Dalcy D'O. Albuquerque,* Rio de Janeiro, Brazil.

R. I. Sailer reported on the recent conference on *Biological Control of Medically Important Arthropods,* which was held at the Armed Forces Institutes of Pathology. The concensus was that very little had been done on biological control of medically important arthropods as compared with arthropods in other fields.

Mr. Nelson announced that the new headquarters for the Entomological Society of America is 4603 Calvert Road, College Park, Maryland.

The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, *Recording Secretary.*

688th Meeting, March 3, 1960

The meeting was held with 15 members and 4 visitors attending. President Paul W. Oman presided. Because of the scanty attendance due to snow conditions, the reading of the minutes and the reports of the officers were omitted. For the lack of a quorum, the election of new members was not held. However, names of four candidates were read for the second time: *John R. Stough, Samuel O. Hill, James F. Cooper,* and *Sloan E. Jones.*

William E. Bickley gave a note on pins, drawing attention to the fact that label pins and sequin pins are the same things.

Reece I. Sailer was moderator for a panel discussion on training and requirements for entomologists. Panelists were: Arthur W. Lindquist, William E. Bickley, and Edward K. Bender. Abstracts of some of the discussions are in the Editor's file.

Minutes were taken by Charles McComb in the absence of the Recording Secretary.—ERNESTINE B. THURMAN, *Recording Secretary.*

PUBLICATION DATES

The date of publication of Vol. 62, No. 1, of the *Proceedings* was 27 April 1960. The date of publication of Vol. 62, No. 2, will be found in Vol. 62, No. 3.

FOR SALE BY THE SOCIETY

Mr. Lewis H. Weld, a long-time member of the Society recently elected as an honorary member, and widely known as a cynipid authority, has privately published a 56-page volume entitled *Cynipid Galls of the Southwest.* This book is another in a series of privately published works—the first was *Cynipid Galls of the Pacific Slope* (1957) and the second *Cynipid Galls of the Eastern United States* (1959), a volume previously announced in Vol. 61, No. 4, of the *Proceedings.* As in the case of the last-named book, one-half of the proceeds from the sale of each copy of *Cynipid Galls of the Southwest* is given to the Publication Fund of the Society by Mr. Weld, and after his death the Society shall promote the sale of the work and receive the entire amount. Mr. Weld is again to be deeply and warmly thanked for his continuing generosity.

In this new volume a list is presented of the galls on the oaks of the Southwest—Colorado, West Texas, New Mexico, Arizona, and Utah, with particular reference to the galls on the oaks of the desert ranges in southern New Mexico and Arizona. From that area a total of 130 species has been described in 26 genera (122 gall makers, 111 on oak) and eight species of inquilines. Sixty eight of the described galls on oak are represented by photographs or outline drawings. In addition to these there are listed in the host index 117 other kinds which have never been reared or described (91 of these are figured). The galls on each of 10 species of oak are listed, arranged by part of the plant on which they occur. In this paper the part on morphology and the key to genera have been omitted—these will be found in *Cynipid Galls of the Eastern United States.*

Cynipid Galls of the Eastern United States (at $2.00) and *Cynipid Galls of the Southwest* (at $1.00) may be ordered either directly from the author, *Mr. Lewis H. Weld, 6613 Washington Blvd., Arlington 13, Va.,* or from the *Custodian, Entomological Society of Washington, % Division of Insects, U. S. National Museum, Washington 25, D. C.*

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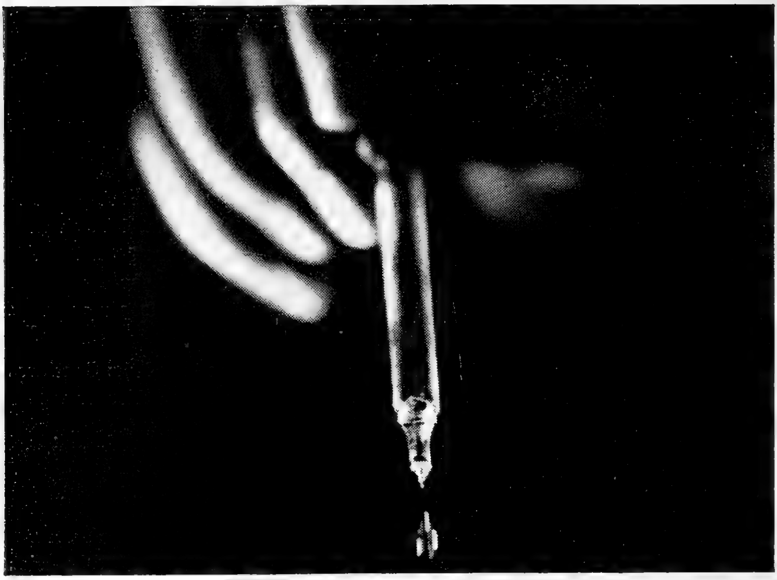

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MEMBERSHIP

Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are $5.00; initiation fee is $1.00 (U. S. currency).

PROCEEDINGS

Published quarterly beginning with March by the Society at Washington, D. C. Members in good standing are entitled to the *Proceedings* free of charge. Non-member subscriptions are $6.00 per year, both domestic and foreign (U. S. currency), payable in advance. All remittances should be made payable to *The Entomological Society of Washington*.

The Society does not exchange its publications for those of other societies.

All manuscripts intended for publication should be addressed to the Editor. Acceptable papers submitted by members will be published in the order received and will be given precedence over those by non-members. Immediate publication may be obtained at a cost to the author of about $14.00 per printed page, plus cost of *all* engraving. Titles of papers should be concise but comprehensive and should indicate the systematic position of the subject insect. By-lines should indicate present mailing address of the author and his organizational affiliation, if possible. Citations in the text of papers longer than one printed page should be by author and date and should refer to a list of concluding references in which author, year, title, name of publication, volume and page are given in that order. In shorter articles, references to literature should be included in parentheses in the text.

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GRASSHOPPERS OF THE IMMUNIS GROUP OF MELANOPLUS, AND NOTES ON THE GROUPING OF OTHER FAR WESTERN BRACHYPTEROUS SPECIES OF THIS GENUS

(ORTHOPTERA: ACRIDIDAE)

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In connection with the study of two new California species of *Melanoplus*, the related *M. immunis* Scudder and its immediate relatives have been reviewed, together with species treated by Hebard (1935) as the *lepidus* and *femur-nigrum* groups. Some modifications of Hebard's groups appear helpful to an understanding of the natural groupings of the many species of *Melanoplus*. This paper contains a synopsis of what may be called the *immunis* group, in a broad sense. It includes a key and brief individual discussions for the species in Oregon and California, and the apparent relationships of the remaining species of this group, which occur in Utah, Arizona, and New Mexico. As an aid to students, brief notes are given on the other groups of *Melanoplus* which include Far Western brachypterous species.

For much of the incentive leading to this paper's preparation, I am indebted to Jacques Helfer of Mendocino, Calif., who for two years has been collecting and sending Californian Orthoptera to me. We have collaborated in the treatment of a new species he collected, described here as *M. caroli*. Thanks are also due to J. A. G. Rehn, Academy of Natural Sciences of Philadelphia, Hugh B. Leech, California Academy of Sciences, and H. F. Strohecker, University of Miami, Florida, for making various species available for study.

THE IMMUNIS GROUP

The *immunis* group is characterized by a rather loose combination of the following features: Pronotum with median carina distinct on metazona, sometimes obsolete on prozona, clearly cut by principal sulcus; tegmina lobate, the apices usually rounded (figs. 49, 63), in males dorsally either overlapping, attingent or nearly so (except in *pinaleno* Hebard and *truncatus* Scudder), usually extending part way across second abdominal tergum (onto third and fourth tergum in *solitudinis* Hebard); male cercus variable, most often spatulate to moderately specialized with apical part dorsally or ventrally curved, sometimes with apical part much broadened and irregularly truncate (*snowii* Scudder, *calidus* Scudder) or very broad and upturned (*truncatus*, *magdalenae* Hebard, *pinaleno*); male supra-anal plate varying from broadly to narrowly triangular, margins usually simple but sometimes raised as specialized prominences, elongate ridges of discal area well developed and sometimes with minute but distinctive tubercles; furculae usually small, often minute, sometimes (*wilsoni* n. sp., *snowii*) about one-fourth as long as supra-anal plate; male subgenital plate simple, frequently with a narrow, unspecialized prominence in the middle of the apical margin (best developed and knoblike in *pinaleno*); dorsal valves of aedeagus located posterior to the apical portion of the main stem, usually closely attached to the latter, sometimes (*immunis*) little more than a weakly sclerotized thickening of the posterior lining of the latter's apex, occasionally (*truncatus*) developed as conspicuous "horns"; ventral valves located posterior to the main stem and to dorsal valves, and usually thin and parchment-like, rarely (*immunis*) heavily sclerotized and highly specialized; epiphallus usually with apices of lophi rather broad in dorsal view, sometimes (*ablutus* Scudder, fig. 24) less so.

Hebard (1920, p. 379) stated, mainly with reference to *rehni* Hebard and *usitatus* Scudder (synonym of *immunis*), that in this group the head is unusually large in proportion to body bulk. Although the head of *rehni*, at least, is rather large, I have not found this feature very helpful for distinguishing the group as a whole.

The distribution of the *immunis* group is shown in fig. 1.

KEY TO SPECIES OF OREGON AND CALIFORNIA (MALES ONLY)

1. Cercus strongly curved ventrally in apical half (figs. 21, 22); aedeagus short, neither dorsal valves nor ventral valves conspicuously developed, latter broad with apices irregularly truncate (fig. 18). (Yosemite National Park and nearby) .... *ablutus*

   Cercus not strongly curved ventrally, though it may be weakly so (figs. 12, 45); aedeagus with dorsal and ventral valves conspicuous, the latter with apices acute unless valves are narrow 2

2. Male cercus directed dorsad in apical third (figs. 4, 11); ventral valves of aedeagus either not thin and parchment-like, or their apices are blunt 3

   Cercus either simple spatulate or with apical third directed ventrally (cercus of *olamentke* as in fig. 29); ventral valves thin and parchment-like, their apices acute 4

3. Aedeagus (figs. 5, 6) with ventral valves strikingly developed, strongly sclerotized, sharply acute and directed anteriorly. (Western Oregon) .... *immunis*

   Ventral valves inconspicuous (fig. 8), thin, their apices blunt. (Southwestern Oregon) .... *rehni*

4. Cercus not simple spatulate (fig. 29), apical third of ventral margin slightly irregular; dorsal valves of aedeagus (figs. 27, 28, *dv*) with a portion of apices recurved anteriorly. (Sonoma Co., Calif.) .... *olamentke*

   Cercus with margins smoothly curved, usually more or less simple spatulate in shape (figs. 12, 43, 61); dorsal valves of aedeagus differently specialized, and without an anteriorly recurved margin 5

5. Cercus asymmetrical, apical third weakly directed ventrally (fig. 12); dorsal valve of aedeagus with maximum length near mesal area (fig. 15). (Southwestern Oregon) .... *lovetti*
   Cercus nearly symmetrical, not directed ventrally (figs. 43, 61); maximum length of dorsal valves at their lateral margins 6
6. Supra-anal plate broadly triangular, furculae widely separated and large for group (fig. 64). (San Diego Co., Calif.) .... *wilsoni*
   Supra-anal plate narrowly triangular, furculae small and close together. (Humboldt and Mendocino Counties, Calif.) .... *caroli*

Melanoplus immunis Scudder

(Figs. 1-6)

Melanoplus immunis Scudder, Proc. Davenport Acad. Nat. Sci., vol. 7, pp. 167, 170, 1899 (2 males, female, Mary's Peak, Benton Co., Oreg.). Lectotype, designated by Rehn and Hebard (1912, p. 88): Male from Mary's Peak (MCZ).

Melanoplus usitatus Scudder, Proc. Davenport Acad. Nat. Sci., vol. 7, pp. 168, 172, 1899 (male, female, Corvallis, Benton Co., Oreg.). Lectotype, designated by Rehn and Hebard (1912, p. 88): Male from Corvallis (MCZ).

Fulton (l. c.) said "Probably it is confined to isolated hilltop prai-
out that Hebard had written him that *usitatus* is a synonym. Though I have not seen the types, this synonymy is supported by all available indications.

Male cercus roughly triangular, apex narrowly rounded, ventral margin either slightly angulate or nearly straight in the middle; supra-anal plate and furculae about as in *lovetti*; paraproct unspecialized. Aedeagus with dorsal valves inconspicuous, consisting mostly of membranous attachments to main stem; ventral valves strongly sclerotized, anteriorly curved, apically acute, with narrow membranous mesal margins subapically. Epiphallus with lophi erect (fig. 10), in dorsal view (fig. 9) their apices subquadrate; ancorae widely distant.

M. immunis is known from Harrisburg, in the Diamond Hill section of Linn Co., Oreg., in addition to Mary's Peak and Corvallis. Fulton (l. c.) said "Probably it is confined to isolated hilltop prai-ries."

Melanoplus rehni Hebard

(Figs. 1, 7-11)

Melanoplus rehni Hebard, Trans. Amer. Ent. Soc., vol. 46, p. 379, 1920 (males, females, Glendale, Douglas Co., Oreg.; Siskiyou, Jackson Co., Oreg.). Type, by original designation: Male from Glendale (ANSP).

Male cercus definitely angular beyond the middle of the ventral margin; supra-anal plate and furculae essentially agree with *lovetti;* paraproct unspecialized. Aedeagus with dorsal valves lightly sclerotized except as darkened in fig. 8, dorsally projecting mesal portion visible anterior to lateral portion, in lateral view; ventral valves narrow, blunt. Epiphallus very much like *immunis*.

No records additional to Hebard's original ones have come to my attention. *M. rehni* was collected in openings among tall firs (Glendale) and in forest undergrowth (Siskiyou).

Melanoplus lovetti Fulton

(Figs. 1, 12-17, 56)

Melanoplus lovetti Fulton, Ann. Ent. Soc. Amer., vol. 23, p. 615, 1930 (males, females, Woodruff Meadows, Jackson Co., Oreg.). Type, by original designation: Male from Woodruff Meadows (USNM).

Female of *lovetti* distinctive in that the middle femur is much swollen and arcuate, in dorsal view narrow in the middle and clavate in the apical third; this specialization suggests relationship to *wilsoni.* Male cercus weakly curved ventrally at the apex and rather deeply sulcate in the apical half; supra-anal plate (fig.17) relatively simple; paraproct (fig. 56) with a very low black ridge fairly distant from the latero-posterior margin. Aedeagus with dorsal valves closely attached to apical part of main stem, each consisting mainly of a transverse, greatly concave, sclerotized band which projects dorsally at the mesal extremity, in lateral view the lateral extremity showing as a dark bar through the enlarged upper portion of the main stem, the mesal portion projecting above; main stem, in posterior view, with a sclerotized vertical flap along each mesal margin near base of ventral valve (fig. 15, *sf*); ventral valves (*vv*) feebly sclerotized, inconspicuous. Epiphallus with lophi more gradually sloping posteriorly in lateral view than in *immunis* and *rehni;* in dorsal view with apices somewhat broader than in those species.

M. lovetti is known only from Woodruff Meadows, in an area mainly covered with moss and short grass, and shaded much of the day by a nearby forest.

Melanoplus ablutus Scudder

(Figs. 1, 18-25, 54)

Melanoplus ablutus Scudder, Proc. Davenport Acad. Sci., vol. 7, p. 185, 1899 (2 males, 9 females, Wawona, Mariposa Co., Calif.). Lectotype, designated by Rehn and Hebard (1912, p. 89): Male from Wawona (MCZ).

Hebard's brief treatment (1935, p. 367) is the most recent contribution on *ablutus.* Scudder's original habitus figure of *ablutus* is very good.

Male cercus with a good deal of mesal curvature (fig. 23), so that the apex is not visible in a direct lateral view (fig. 21). Minute tubercles (fig. 25, *mt*) on the supra-anal plate, of which Hebard made special mention, so small that about 20x magnification is required to see them clearly. Paraproct bears a brief, mostly pale, raised ridge adjacent to and parallel to the latero-posterior margin (fig. 54). Main stem of the aedeagus fleshy and relatively short; dorsal valves moderately sclerotized and borne fairly well toward the base of the stem, so that each valve appears as a thin, erect flap, broadly rounded apically; ventral valves small and difficult to see, broadly irregular at their apices. Epiphallus with ancorae close together, apices of lophi relatively acute in dorsal view, in lateral

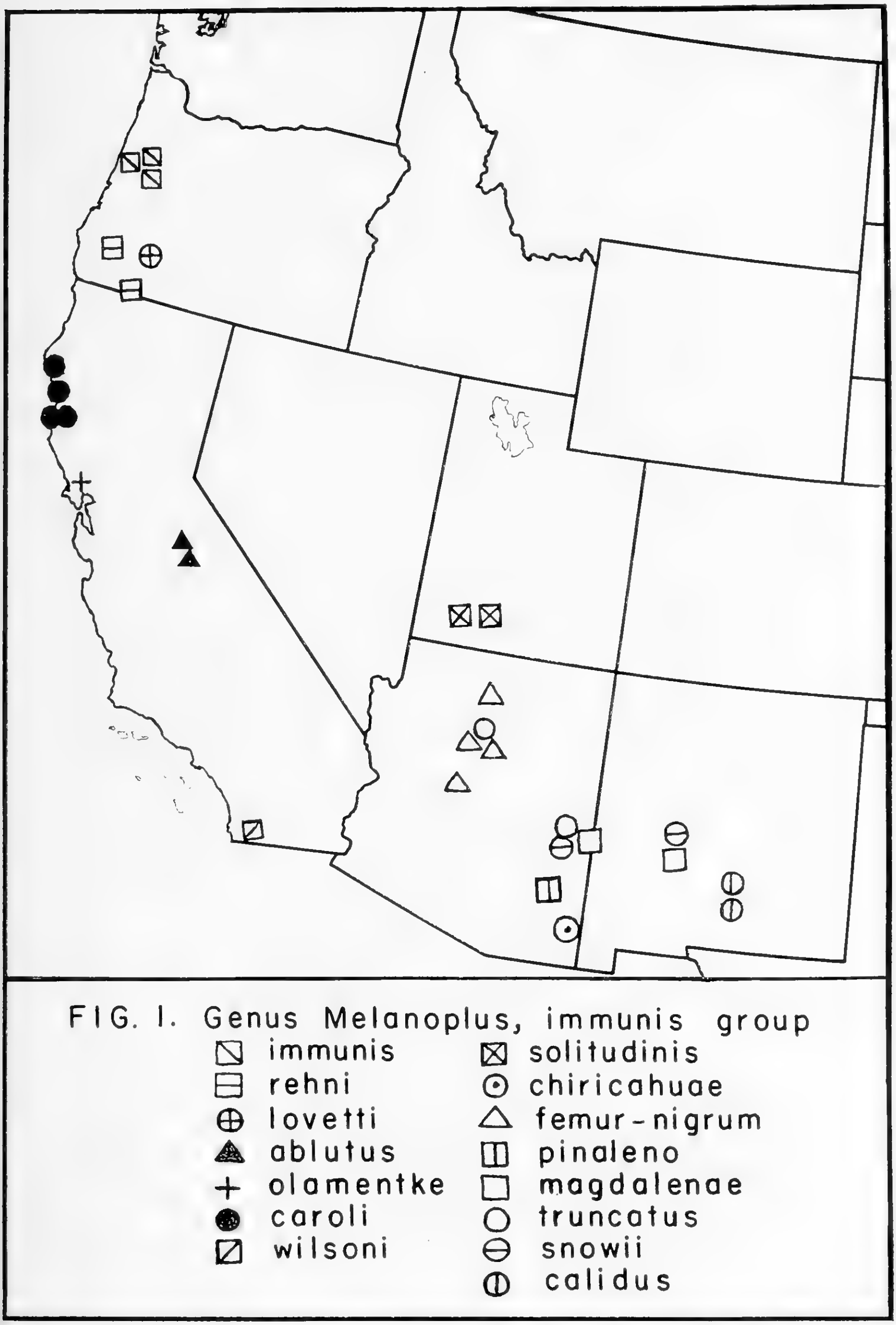


Fig. 1. Distribution of specimens examined and those recorded in literature.

view gradually and sinuately sloping posteriorly, posterior projection (fig. 24, *pj*) broadly rounded at apex in contrast to *immunis*.

M. ablutus is known only from Yosemite National Park and nearby. A single male from El Portal, near the entrance to the Park, was recorded by Rehn and Hebard (1910, p. 471) from 2,050 feet elevation, "on a steep mountain side, among dry leaves, under manzanita and other bushes."

Melanoplus olamentke Hebard

(Figs. 1, 26-32)

Melanoplus olamentke Hebard, Trans. Amer. Ent. Soc., vol. 46, p. 391, 1920 (2 males, southern Sonoma Co., Calif.). Type, by original designation: Male from southern Sonoma Co. (ANSP).

The original description was supplemented by a figure of the aedeagus (Hebard, 1935, p. 363).

General habitus of *olamentke* very much like *ablutus*, the male supra-anal plate closely similar except that no tubercles appear on the disk. Ventral margin of the cercus sinuate toward the apex, with no mesal curvature; paraproct bears a rather low but convex blackish ridge adjacent to a decided concavity in the latero-posterior margin. Aedeagus with dorsal valves showing pale areas near apex when seen in posterior view, each in lateral view (fig. 28) with a conspicuous recurved portion extending anteriorly, the acute apex distinctive in dorsal view (fig. 26). Epiphallus with ancorae more distant than in *ablutus*, and apices of lophi considerably broader in dorsal view.

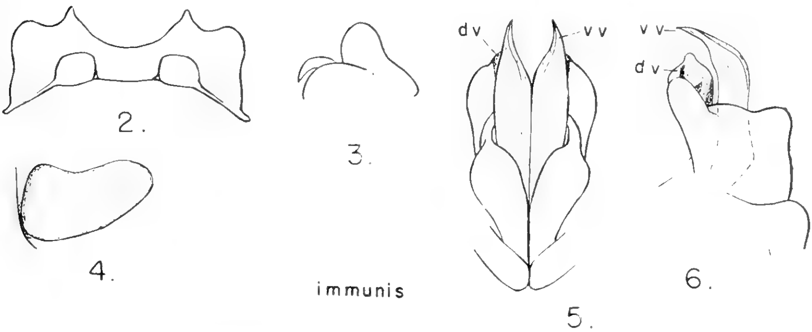
In addition to the paratype deposited in the California Academy of Sciences, I have seen a male labelled "Triniti, Sonoma Co., Calif. XII-20-37. N. W. Frazier, Collector," which belongs to the University of California. The dry aedeagus is somewhat more slender than the glycerine-preserved one of the paratype.

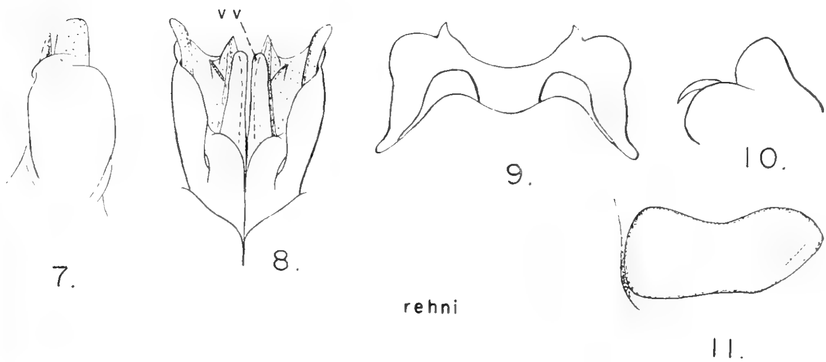
Melanoplus caroli Gurney and Helfer, new species

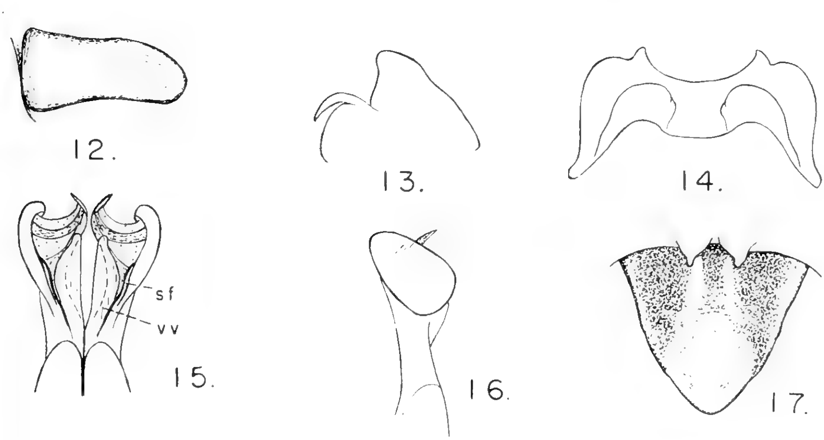
(Figs. 1, 38-50, 55)

Male (holotype).—Size medium for group; tegmina lobate; general appearance like *olamentke*. Head in dorsal view with interocular distance compared to width of a compound eye as 4:13; fastigium strongly declivent anteriorly, more so than in *wilsoni*, shallowly sulcate. Pronotum with lateral carinae straight; median carina of prozona feeble but entire, not glossy; of metazona distinct, glossy; principal sulcus sharply curved anteriorly where it transects the median carina; proportions of length of median carina on prozona and metazona as 20:17; posterior margin of metazonal disk rounded, with slight obtuse angulation;

Figs. 2-6, *Melanoplus immunis*, male, Mary's Peak, Oreg. Fig. 2, dorsal view of epiphallus; fig. 3, lateral view of epiphallus (ventral margin omitted); fig. 4, cercus; fig. 5, posterior view of aedeagus; fig. 6, lateral view of aedeagus. Figs. 7-11, *Melanoplus rehni*, male paratype, Glendale, Oreg. Fig. 7, lateral view of aedeagus; fig. 8, posterior view of aedeagus; fig. 9, dorsal view of epiphallus; fig. 10, lateral view of epiphallus; fig. 11, cercus. Figs. 12-17, *Melanoplus lovetti*,







lovetti

male holotype. Fig. 12, cercus; fig. 13, lateral view of epiphallus; fig. 14, dorsal view of epiphallus; fig. 15, posterior view of aedeagus; fig. 16, lateral view of aedeagus; fig. 17, supra-anal plate. For explanation of symbols, see p. 158.

prosternal spine regularly conical. Tegmen (fig. 49) extending slightly beyond base of abdominal tergum 2; tegmina briefly attingent dorsally at a point midway of their length. Apical portion of abdomen weakly enlarged and moderately curved dorsally.

Supra-anal plate moderately narrow for group, margins somewhat elevated in basal two-thirds, and raised portions weakly emarginate; longitudinal submedian ridges strongly developed; brief transverse ridge sharply distinct but scarcely tuberculate; curved margins of disk of apical portion prominent, the disk weakly sulcate. Furculae minute (fig. 50); cercus moderately broadened in apical third, the ventral fourth of that portion not convex on the external face; in dorsal view only a slight and broad mesal curvature evident; paraproct (fig. 55) with a black ridge, rather abruptly terminated at each end. Subgenital plate unspecialized, the apex simply and moderately narrowed in posterior view, barely curving dorsally as a slight "lip" in lateral view. Aedeagus (exposed in dry condition) agreeing with fig. 38 prepared from Mendocino paratype (preparation in glycerine), but fleshy main stem narrowed by drying to appear more slender, and membranous apical portion of dorsal valve shriveled so that details are not evident (see fuller description under variation below). Epiphallus essentially as described below from a glycerine-preserved paratype, but due to shriveling the anterior projection (fig. 48, *ap*) extends dorsally nearly to the level of the lophus (*lo*) in lateral view.

Coloration: General ground color very dark brown, tinged with black; postocular bar on head, its extension on lateral lobe of pronotum, mesepimeral stripe, and basal half of abdomen on dorsal half of sides strongly blackish, though on head and pronotum the ventral margins of the bars are poorly demarked; abdomen, except for blackish area, pale yellowish below, reddish brown on apical half above; antenna reddish brown; hind femur with 4 transverse blackish bands (including genicular one) on mesal face, largely dirty pale dorsally except for indications of the bands, lateral paginal area with poorly demarked dark bands in dorsal two-thirds, then narrowly pale along ventral margin, followed by reddish orange on entire ventral surface; hind tibia and tarsus reddish, spines and apical parts of spurs and claws black.

Measurements (in millimeters): Body, 18.7; pronotum, 3.7; front femur, 3.1; middle femur, 3.2; hind femur, 9.8; tegmen, 3.4. Greatest width of pronotum (posterior, including lateral lobes in perspective from above), 3.3; of front femur, 0.9; of middle femur, 1.0; of hind femur, 2.5; of tegmen, 2.1.

Female (allotype).—Head in dorsal view with interocular distance compared to width of a compound eye as 7:15; compound eye less globose than in male; fastigium scarcely sulcate; disk of pronotum much broader proportionally; median

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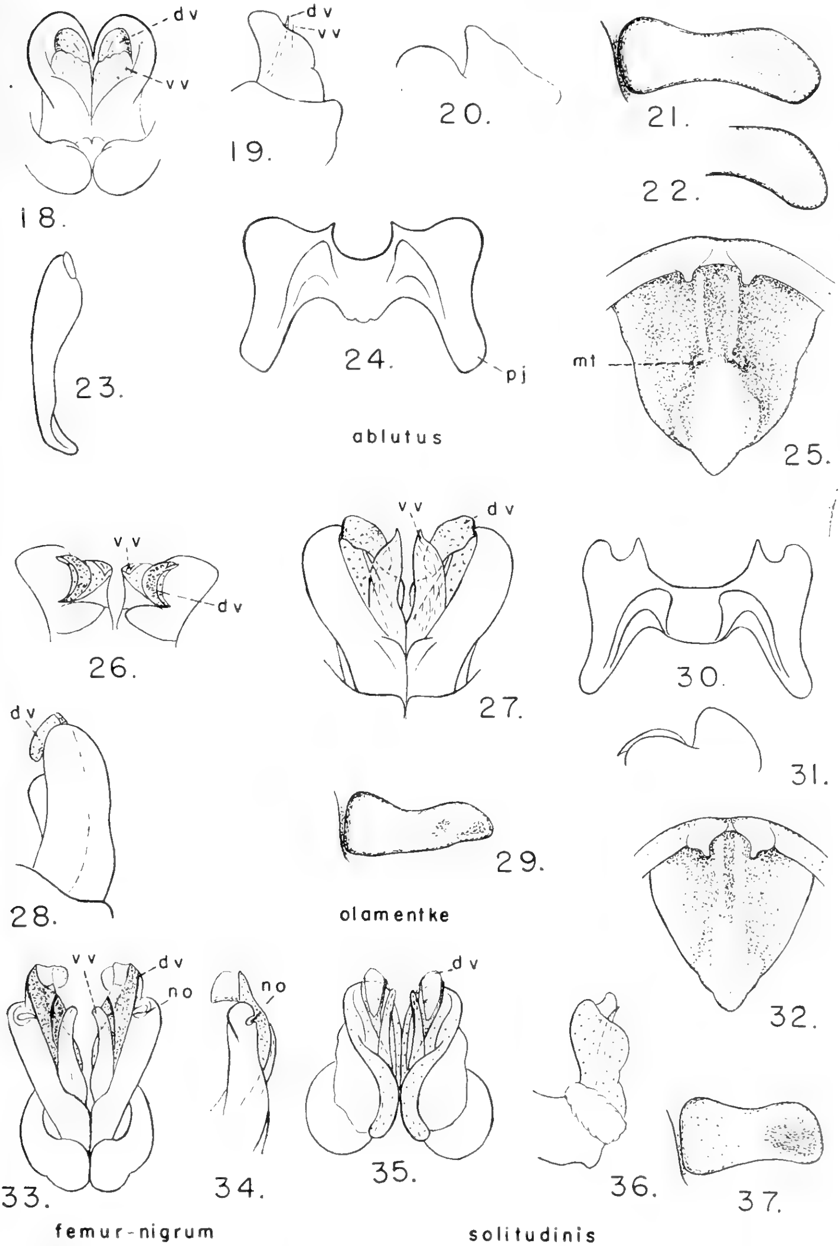
Figs. 18-25, *Melanoplus ablutus*, male, Yosemite National Park, Calif. Fig. 18, posterior view of aedeagus; fig. 19, lateral view of aedeagus; fig. 20, lateral view of epiphallus; fig. 21, lateral view of cercus; fig. 22, lateroposterior view of apical portion of cercus; fig. 23, dorsal view of cercus; fig. 24, dorsal view of epiphallus; fig. 25, supra-anal plate. Figs. 26-32, *Melanoplus olamentke*, male paratype, Sonoma Co., Calif. Fig. 26, dorsal view of aedeagus, posterior side uppermost in drawing; fig. 27, posterior view of aedeagus; fig. 28, lateral view of aedeagus; fig. 29, cercus; fig. 30, dorsal view of epiphallus; fig. 31, lateral view of epiphallus; fig. 32, supra-anal plate. Figs. 33-34, *Melanoplus femurnigrum*, male topotype, San Francisco Mts., Ariz. Fig. 33, posterior view of



aedeagus; fig. 34, lateral view of aedeagus. Figs. 35-37, *Melanoplus solitudinis*, male, Cedar Breaks, Utah. Fig. 35, posterior view of aedeagus; fig. 36, lateral view of aedeagus; fig. 37, cercus. For explanation of symbols, see p. 158.

carina of prozona and metazona proportioned as 28:23; principal sulcus broadly curved anteriorly adjacent to its cut of median carina; cercus (fig. 42) with dorsal margin weakly concave; dorsal valve of ovipositor (fig. 46) with scoop deeper than in *wilsoni*.

Coloration: Ground color with less blackish tinge, the dark areas of head, thorax, and abdomen inconspicuous.

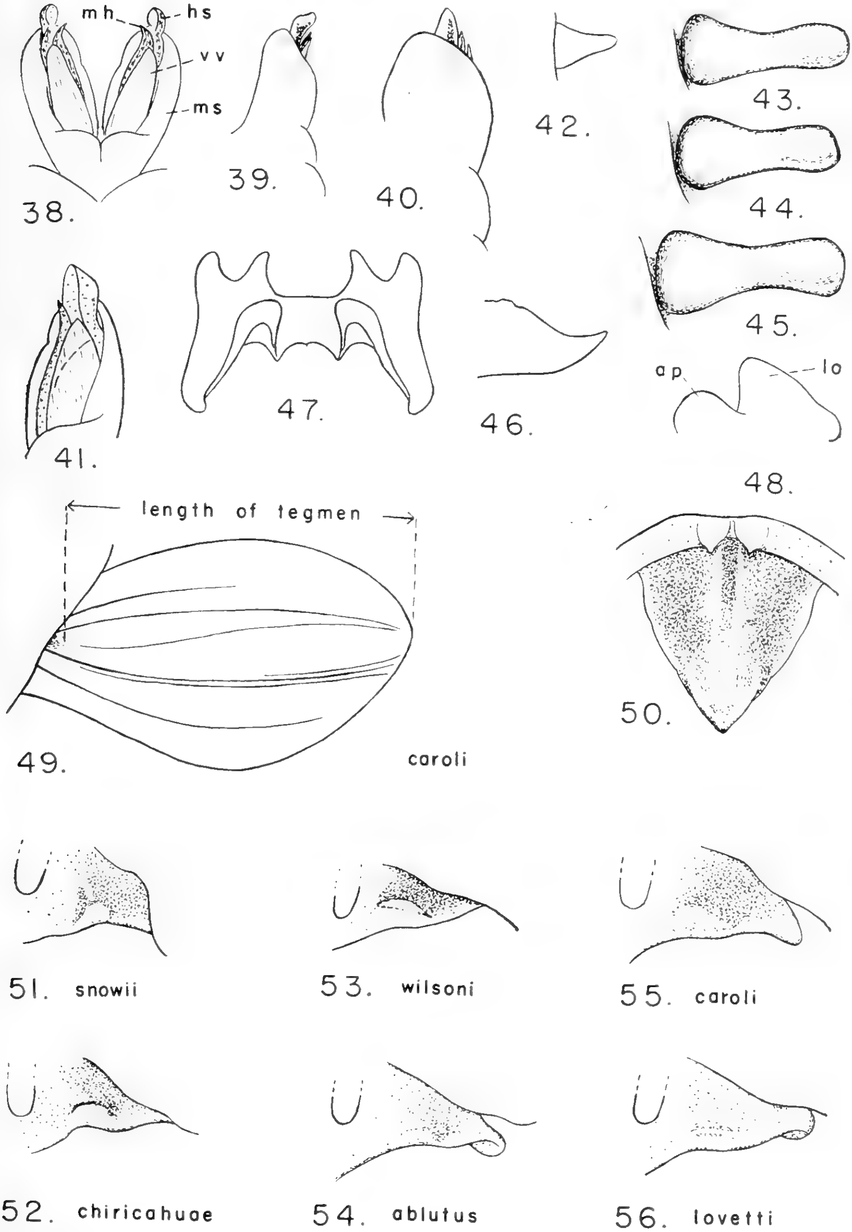
Measurements (in millimeters): Body, 23.2; pronotum, 5.1; front femur, 3.3; middle femur, 3.5; hind femur, 13.0; tegmen, 4.5. Greatest width of pronotum, 4.8; of front femur, 0.9; of middle femur, 1.0; of hind femur, 3.1; of tegmen, 3.0.

Variation: Measurements indicate that specimens from Mendocino average smaller than those from the more northern localities. Other differences correlated with distribution are noted below, but at present the recognition of subspecies does not appear warranted. The size of 10 representative males from Mendocino measured (in millimeters) varies in pronotal length from 3.6 to 4.2 (av. 3.81), in length of hind femur from 9.7 to 11.00 (av. 10.34), and in length of tegmen from 3.3 to 4.2 (av. 3.76). The same measurements for 6 males from Rockport and 1 from Honeydew are: 4.2 to 4.5 (av. 4.35), 10.5 to 11.3 (av. 10.8), and 4.1 to 5.0 (av. 4.43) (Rockport); 4.3, 10.5, and 4.2 (Honeydew). Ten measured females from Mendocino vary in pronotal length from 4.1 to 4.9 (av. 4.37), in length of hind femur from 11.3 to 13.0 (av. 11.74), and in length of tegmen from 3.7 to 4.9 (av. 4.25). The same measurements for 5 females from Willits and 1 from Rockport are: 4.2 to 5.0 (av. 4.62), 11.2 to 13.0 (av. 12.1), and 3.9 to 4.8 (av. 4.46) (Willits); 5.0, 12.1, and 4.9 (Rockport).

There is little variation in tegmen shape, but tegmina vary from slightly separated to widely overlapping, usually are attingent or weakly overlapping. There is some variation in the male cercus (figs. 43-45).

Fig. 38 of the phallic complex (in glycerine) of a Mendocino male shows, in posterior view, the moderately wide, apically tapered, parchment-like ventral valves (*vv*) with their bases surrounded by the fleshy main stem of the aedeagus (*ms*). Each dorsal valve consists of a well sclerotized, elongate portion closely attached for most of its length to the main stem anterior to the ventral valve, with a mesal hook (*mh*) which occurs as a projection extending dorsal of the ventral valve. A closely associated portion of the dorsal valve is a hook-shaped specialization (*hs*) borne near the apex of the main stem; it is well sclerotized laterally, but membranous mesally, and appears to be open mesally at the apex though an opening is not readily demonstrated. In lateral view (fig. 39) the tip of a ventral valve and one of the mesal hooks, in addition to the tip of a dorsal valve, usually are visible. The hood-shaped apical part of the dorsal valve is smaller in Mendocino males than in males from Honeydew and Rockport (fig. 40, 41).

Figs. 38-50, *Melanoplus caroli*. Fig. 38, posterior view of aedeagus, paratype, Mendocino; fig. 39, lateral view of aedeagus, same specimen; fig. 40, lateral view of aedeagus, paratype, Honeydew; fig. 41, posterior view of right half of aedeagus, same specimen; fig. 42, cercus, allotype; fig. 43, cercus, holotype; fig. 44, cercus, paratype, Honeydew; fig. 45, cercus, paratype, Rockport; fig. 46, dorsal valve of ovipositor, allotype; fig. 47, dorsal view of epiphallus, paratype, Mendocino; fig. 48, lateral view of epiphallus, same specimen; fig. 49, left tegmen, holotype; fig. 50, supra-anal plate, holotype. Figs. 51-56, *Melanoplus* spp., lateroposterior margin of left paraproct, male (base of cercus indicated at left side). Fig. 51, *M. snowii*, 10 miles w. of McNary, Ariz.; fig. 52, *M. chiricahuae*, topotype



Chiricahua Mts., Ariz.; fig. 53, *M. wilsoni,* holotype; fig. 54, *M. ablutus,* Yosemite Nat'l. Park, Calif.; fig. 55, *M. caroli,* holotype; fig. 56, *M. lovetti,* holotype. For explanation of symbols, see p. 158.

The epiphallus (fig. 47) has prominent, fairly narrowly separated ancorae. The lophi are much narrower at their apices than in *wilsoni*, and they are not directed dorsally nearly so much as in *immunis*. The posterior margin of the bridge is distinctively concave, the concave portion with a short median projection. Consistent differences in the epiphallus between populations from Mendocino and other localities have not been noted, but slight differences in the degree and width of the sclerotized area at the apices of lophi are suggested.

Most of the Mendocino specimens agree generally with the coloration of the type and allotype, but in a few of them, and nearly all from other localities, the general ground color is pale brown. In some females dark markings of the hind femora are lacking, but in most specimens they are well developed. Hind tibiae usually are reddish, but in a few specimens are pale or a dirty gray.

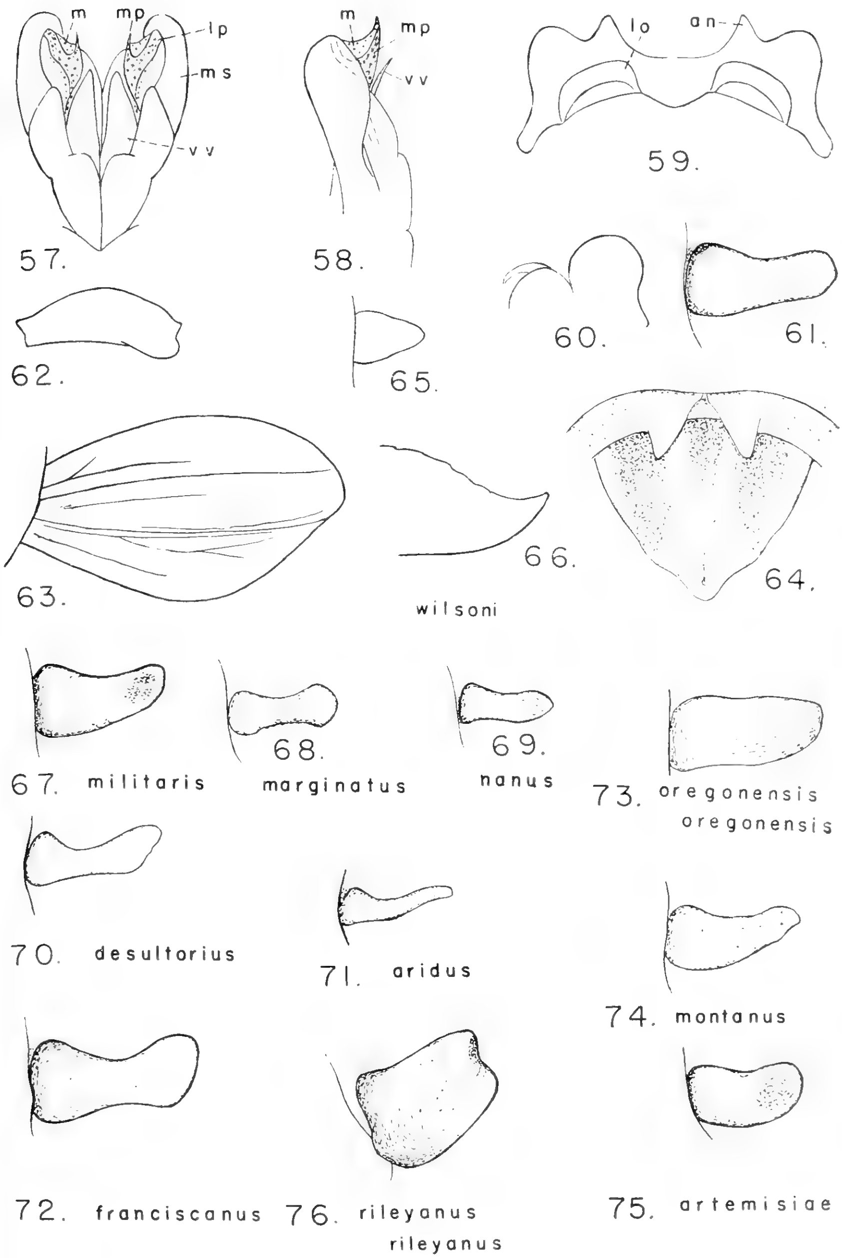
Type.—USNM Type No. 64729.
Type locality.—Mendocino, Mendocino Co., Calif.

The holotype male, allotype female, and 15 male and 14 female paratypes were taken at type locality Oct. 15, 1958, by J. R. Helfer. Other paratypes, totaling 34 and all collected by Helfer in 1958, are as follows: Mendocino, Aug. 1 (1 male), Aug. 5 (1 female), Sept. 27 (5 males, 16 females), Oct. 3 (1 female), Oct. 30 (1 female), Nov. 2 (1 female); Honeydew, Humboldt Co., Calif., July 17 (1 male); Rockport, Mendocino Co., Calif., July 16 (6 males, 1 female). There are 5 females from Willits, Mendocino Co., Calif. (2, July 23; 2, Sept. 14; 1, Oct. 3; all Helfer, 1958) which are not considered paratypes because their identity is not confirmed by a male, but they appear to be typical *caroli*.

Paratypes are deposited in the Academy of Natural Sciences of Philadelphia, the Museum of Zoology (University of Michigan), Museum of Comparative Zoology (Harvard University), California Academy of Sciences, U.S. National Museum, and the private collections of J. R. Helfer and H. F. Strohecker.

M. caroli is most plentiful in areas of scanty, short grass exposed to full sun and without trees in the immediate vicinity. Specimens occurred in modest numbers at Mendocino in two such areas, one about ⅓ mile from the ocean at an elevation of 200-250 feet, where grass was a foot or less in height in a former pasture. About 2 miles away similar grass occurred on poor whitish soil, near a "pygmy forest" of stunted trees at an elevation of about 400 feet. The grass-

Figs. 57-66, *Melanoplus wilsoni* (figs. 57-61, 63-64, holotype; 62, 65-66, allotype). Fig. 57, posterior view of aedeagus; fig. 58, lateral view of aedeagus; fig. 59, dorsal view of epiphallus; fig. 60, lateral view of epiphallus; fig. 61, cercus; fig. 62, lateral view of anterior surface of left middle femur; fig. 63, left tegmen; fig. 64, supra-anal plate; fig. 65, cercus; fig. 66, dorsal valve of ovipositor. Figs. 67-75, *Melanoplus* spp., left cercus, male. Fig. 67, *M. militaris*, Sawtooth Range, Idaho; fig. 68, *M. marginatus*, Amador Co., Calif.; fig. 69, *M. nanus*, lectoparatype, Berkeley, Calif.; fig. 70, *M. desultorius*, Sycamore Canyon, Patagonia Mts., Ariz.; fig. 71, *M. aridus*, Grand Canyon Nat'l. Park, Ariz.; fig. 72, *M. franciscanus*, Flagstaff, Ariz.; fig. 73, *M. oregonensis oregonensis*, Centennial Mt., Mont.; fig. 74, *M. montanus*, Laggan, B. C.; fig. 75, *M.*



artemisiae, Salmon City, Idaho; fig. 76, *M. rileyanus rileyanus*, Los Angeles Co., Calif. For explanation of symbols, see p. 158.

hoppers were in grass mixed with low shrubs (salal, *Gaultheria*; manzanita, *Arctostaphylos uva-ursi*; huckleberry, *Vaccinium*), and some escaped by leaping into the shrubs, but the habitat seemed definitely to be in the grass rather than the shrubs. A third Mendocino locality of dense grass about 2 feet high yielded only a few specimens. The Honeydew specimen came from an extensive grassy area, and the Rockport series occurred in low, scanty grass near unoccupied millworkers' quarters. In several of the habitats *Camnula pellucida* (Scudder) and *Melanoplus bilituratus* (Walker) were associated and abundant.

In terms of the faunal areas mapped by Miller (1951, pp. 588, 602), *caroli* occurs in the northern part of the central coastal district, with one locality (Honeydew) in the northern coastal district. These districts are regarded as primarily boreal in their affinities.

It is a pleasure to name this grasshopper in honor of the distinguished biologist Charles P. Alexander, with whom we have spent many happy hours in the field and laboratory; *caroli* is based on the latinized form of Dr. Alexander's given name.

Melanoplus wilsoni Gurney, new species

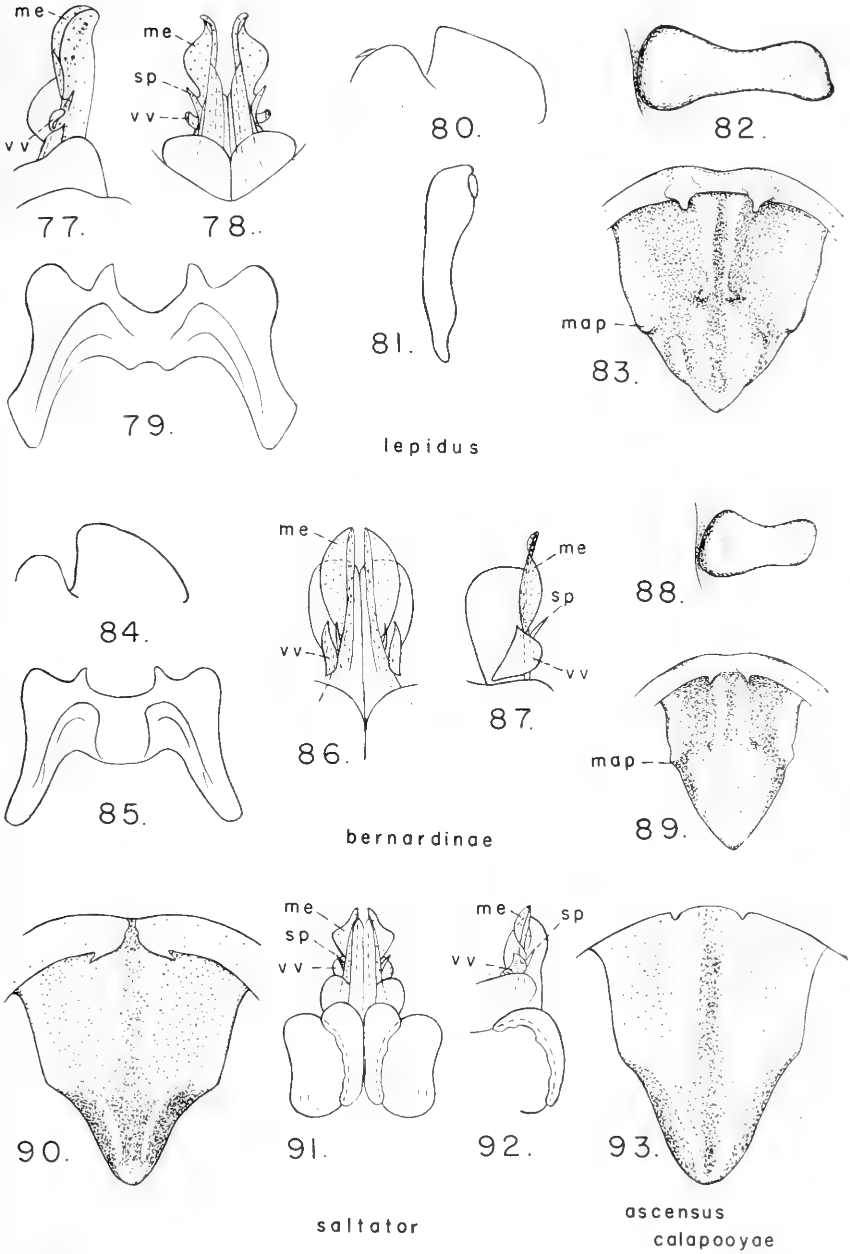
(Figs. 1, 53, 57-64)

Male (holotype).—Size medium for group; tegmina lobate; general appearance much like *immunis*. Head in dorsal view with interocular distance compared to width of a compound eye as 8:14; fastigium shallowly sulcate. Pronotum with lateral carinae weakly incurved, the narrowest point on the disk being just in front of the middle of the prozona; median carina distinct and glossy, but very low in prozona, not cut by sulci except principal one, sharply separated by principal sulcus from the more prominent carina on metazona; proportions of median carina length of prozona and metazona as 27:19; posterior margin of metazonal disk broadly rounded; prosternal spine rather sharply and irregularly rounded at apex. Tegmen (fig. 63) extending across basal third of abdominal tergum 2; tegmina not quite attingent dorsally. Front and middle femora rather robust, about as in *lovetti*. Apical portion of abdomen moderately enlarged and curved dorsally.

Figs. 77-83, *Melanoplus lepidus*, male, Tahoe, Lake Tahoe, Calif. Fig. 77, lateral view of aedeagus; fig. 78, posterior view of aedeagus; fig. 79, dorsal view of epiphallus; fig. 80, lateral view of epiphallus; fig. 81, dorsal view of cercus; fig. 82, lateral view of cercus; fig. 83, supra-anal plate. Figs. 84-89, *Melanoplus bernardinae*, male paratype, Vivian Creek, San Bernardino Mts., Calif. Fig. 84, lateral view of epiphallus; fig. 85, dorsal view of epiphallus; fig. 86, posterior view of aedeagus; fig. 87, lateral view of aedeagus; fig. 88, cercus; fig. 89, supra-anal plate. Figs. 90-92, *Melanoplus saltator*, male (90, Mary's Peak, Oreg.; 91-92, Sherwood, Oreg.). Fig. 90, supra-anal plate; fig. 91, posterior view of aedeagus; fig. 92, lateral view of aedeagus; fig. 93, *Melanoplus ascensus calapooyae*, male paratype, Divide, Lane Co., Oreg., supra-anal plate.

Explanation of symbols

an, ancora; *ap*, anterior projection; *dv*, dorsal valve; *hs*, hook-shaped specialization; *lo*, lophus; *lp*, lateral projection; *m*, membrane; *map*, marginal prominence; *me*, membranous expansion; *mh*, mesal hook; *mp*, mesal projection; *ms*



main stem of aedeagus; *mt*, minute tubercle; *no*, notch in main stem of aedeagus; *f*, sclerotized flap of aedeagus; *sp*, spinelike projection; *vv*, ventral valve. Drawings by author.)

Supra-anal plate broad for group, margins simple; longitudinal submedian ridges strongly developed in basal half; brief transverse ridge which extends each side from submedian ridge very distinct, but not with definite tubercles as in *ablutus;* median longitudinal groove in apical third deep and distinct, its lateral margins well rounded. Furculae large and robust for group. Cercus in apical third weakly curved dorsally and moderately curved mesally, the external surface of that portion broadly but rather deeply concave. Paraproct (fig. 53) with a low, rather long, ridge, the crest of which is pale. Subgenital plate unspecialized, gradually and simply narrowed at apex of dorsal margin.

Aedeagus (in glycerine) with its main stem (fig. 57, *ms*) fleshy and prominent; dorsal valve of each half with lateral portion (*lp*) closely attached to main stem, mesal portion (*mp*) extending posteriorly and dorsally as a slender and moderately sclerotized projection, connected with lateral portion by a membrane (*m*); ventral valves (*vv*) weakly sclerotized, apically acute; in lateral view the projecting dorsal and ventral valves are visible, the former quite prominent. Epiphallus with ancorae (*an*) rather widely distant; lophi (*lo*) broad in dorsal view (fig. 59), in lateral view (fig. 60) broadly erect, the posterior margin nearly vertical.

Coloration: General ground color dull reddish brown; postocular bar on head, its extension on lateral lobe of pronotum, and mesepimeral stripe blackish brown; abdominal terga 2-8 each with pair of pale basal areas; basal two-thirds of abdomen blackish along sides; ventral surfaces pale yellowish brown; hind femur dull red along ventral margin of external paginal area, ventral surface yellowish brown; hind tibia weak reddish brown, spines black.

Measurements in millimeters: Body, 19.0; pronotum, 4.6; front femur, 3.6; middle femur, 4.7; hind femur, 11.2; tegmen, 4.2. Greatest width of pronotum (posterior, including lateral lobes in perspective from above), 3.8; of front femur, 1.2; of middle femur, 1.5; of hind femur, 3.0; of tegmen, 2.5.

Female (allotype): More robust than male; differing as follows: Head in dorsal view with ratio of interocular distance to width of a compound eye as 11:15; compound eye less globose; fastigium scarcely sulcate; disk of pronotum much broader proportionately, the median carina less prominent, very weak on prozona; median carina of prozona and metazona proportioned as 33:28; middle femur notably swollen in lateral aspect (fig. 62), much like *lovetti* as shown by Fulton (1930, p. 616, fig. 1, B), in dorsal view apically clavate but not so compressed as in *lovetti;* cercus (fig. 65) broadly triangular, much more robust than that of *caroli;* dorsal valve of ovipositor (fig. 66) relatively broad, the dorsally curved apical portion short.

Coloration: Ground color reddish brown, the dark areas of head and thorax not nearly so blackish; no paired pale areas on dorsum of abdomen.

Measurements (in millimeters): Body, 24.0; pronotum, 6.3; front femur, 3.7; middle femur, 5.0; pronotum, 14.0; tegmen, 4.9. Greatest width of pronotum, 6.1; of front femur, 1.1; of middle femur, 1.6; of hind femur, 3.7; of tegmen, 3.6.

Type.—USNM Type No. 64730.

Type locality.—Lyons Peak?, San Diego Co., Calif. (see comments on locality below).

The holotype and allotype, which are the only specimens, bear identical labels: "Lyonshill, Cal. 5/16/40," "Sacramento No. 4029," "Swept from grass," "C. C. Wilson, Coll." Considerable efforts have disclosed no Lyonshill in California, and a careful check of records of the U.S. Department of Agriculture laboratory formerly located at Sacramento, Calif., and now at Bakersfield, Calif., indicates that the Lyons Peak (altitude given as 3,728 or 3,755 feet, located about one mile south of Lyons Valley, 10 miles north of the Mexican Boundary, and 6 miles east of Jamul), which is a detached portion of the Cleveland National Forest, probably is the locality in question. Mr. Wilson did grasshopper control and survey work in various parts of San Diego County in 1940, including one area 2 miles from Lyons Peak. Since records show that he was in the general area in May 1940, and various high points in the Cleveland National Forest are known as hills rather than peaks, he may have thought that the name "Lyonshill" had been applied to this locality. It should not be confused with the Lyons Peak near Lava Beds National Monument, Siskiyou Co., Calif. Frank V. Lieberman and W. B. Noble, of the Entomology Research Division, have been especially helpful in this locality investigation. Mr. Wilson was active collecting and controlling Orthoptera in California for many years, contributing numerous specimens to the National Museum. Naming this species in his honor is a tribute to the memory of an enthusiastic field observer.

Relationships Within the immunis Group

As here treated, the *immunis* group includes the following species:

immunis Scudder 1899
rehni Hebard 1920
lovetti Fulton 1930
ablutus Scudder 1899
olamentke Hebard 1920
caroli Gurney & Helfer, n. sp.
wilsoni Gurney, n. sp.
solitudinis Hebard 1935
chiricahuae Hebard 1922
femur-nigrum Scudder 1899
pinaleno Hebard 1937
magdalenae Hebard 1935
truncatus Scudder 1899
snowii Scudder 1897
calidus Scudder 1899

The species *lepidus* Scudder and *bernardinae* Hebard are grouped elsewhere (see p. 164).

Melanoplus immunis, rehni, and *lovetti* appear to be closely related, as evidenced by lack of paraproct specialization in the first two and scant specialization in *lovetti.* The shape of the epiphallus, especially of the lophi and posterior projection, also indicates close relationship. Of the three, *immunis* and *rehni* seem closest, on the basis of the cerci, paraprocts, and the epiphallus.

Of the four species in California, *ablutus* and *olamentke* are similar in the shortness and breadth of the dorsal valves of the aedeagus, though differing in the lophi and ancorae of the epiphallus. *M. wilsoni* stands apart from other members of the group in the very wide supra-anal plate with large furculae. The Oregon and California species usually have grayish or greenish hind tibiae except *caroli* and *wilsoni*, in which red is the usual color.

The more eastern species, except for *solitudinis*, were reviewed by Hebard (1935, pp. 368-374; 1937, pp. 154-157) as the *femur-nigrum* group, who included a key to their identification in 1937. He regarded *solitudinis* as a member of the *lepidus* group, near *olamentke* (Hebard, 1935, p. 364). It seems to me that basic differences are insufficient to warrant a separate *femur-nigrum* group, and that *solitudinis* shows characters common to both the California and Arizona members of the *immunis* group. The aedeagus of *solitudinis* has dorsal valves consisting of erect structures which are only partly sclerotized, as shown by dark areas in fig. 35, *dv*. In *femur-nigrum* the dorsal valve (fig. 33, *dv*) is more closely attached to the main stem near its apex, and the apical part of the dorsal valve, which shows a larger membranous area between the vertical sclerotized margins, is recurved anteriorly (fig. 34). The aedeagus of a *femur-nigrum* male from Black Bill Park, Ariz., shows the apical region of the main stem more fleshy and broadly curved than in the topotype illustrated, without a notch such as in the latter (figs. 33, 34, *no*).

As to relationships of these more eastern species, *solitudinis, chiricahuae*, and *femur-nigrum* have narrow, elongate cerci, though *solitudinis* is distinguished from the other two by rather long though lobate tegmina, lack of a pale stripe on the outer face of the hind femur, and the presence of a prominence on each lateral margin mid-way the length of the supra-anal plate. Broad cerci and relatively narrow and widely separated male tegmina apparently show the natural relationship of *pinaleno*, *magdalenae*, and *truncatus*. In a third subgroup, including *snowii* and *calidus*, the cercus has the apical third greatly broadened. The cerci of *chiricahuae, snowii, truncatus, femur-nigrum*, and *pinaleno* were illustrated by Ball, *et. al*, (1942, p. 337), those of *magdalenae* and *solitudinis* by Hebard (1935) and the cercus of *calidus* by Rehn and Hebard (1910). Fig. 37 of *solitudinis* differs from Hebard's figure, probably due to the position in which the cercus was drawn.

All of these species except *pinaleno* and *solitudinis* have a narrow pale stripe along the ventral margin of the lateral paginal area of the hind femur. All have greenish hind tibiae except *magdalenae, truncatus*, and *calidus*, which usually have reddish hind tibiae. Some minor differences among these species occur in paraproct specialization. For instance, the paraproct of *chiricahuae* (fig. 52) has a low, scarcely ridge-like protuberance parallel to the latero-posterior margin, but the corresponding protuberance in *snowii* (fig. 51) is knoblike.

Notes on Other Groups of Far Western Brachypterous Species of Melanoplus

The groups here considered occur in Idaho, Utah, Arizona, or States farther west. Several species have been omitted, including some that barely enter the eastern part of the area, and others that often have fully winged as well as brachypterous individuals. These exceptions are *borealis* (Fieber), *dawsoni* (Scudder), *dodgei* (Thomas), *fasciatus* (Walker), and *lakinus* (Scudder). Although more detailed studies are desirable, it is hoped that the characteristics of these groups will be helpful, especially in pointing out natural groups in the structural pattern of male genitalia.

Hebard (1935, p. 363, footnote 10) stated that, because of the differently developed penis (aedeagus) in some closely related species, that organ may be misleading in the association of species. It is my experience that a natural group of species usually has a common pattern in aedegal structure. Sometimes certain parts of the aedeagus are greatly accentuated, as, for instance, the hornlike dorsal valves of *M. truncatus*. As to general type, however, the aedeagus of *truncatus* agrees with that of *pinaleno*, *magdalenae*, and other allies.

Among the genital organs largely neglected in the past are the paraprocts. The surface of the paraproct, near the latero-posterior margin, is often specialized in a way that provides taxonomic characters when the cercus is swung outward on its base, following relaxation in dry specimens, so that the face of the paraproct is exposed. However, the paraproct usually is less important than the aedeagus and cercus.

Somewhat related to the *immunis* group is *franciscanus* Scudder, known from Arizona and New Mexico. In terms of the aedeagus it could be placed in the *immunis* group, but the form of the tegmen, color of hind legs (especially dark pattern on the femur), and the form of the subgenital plate suggest *walshii* Scudder and its allies. Internally, the cingulum includes a prominent, well-sclerotized, elevated arch just anterior to the base of the aedeagus; the arch is very much like one in *walshii* and *querneus* R. & H. and apparently indicates a natural grouping with those species and other eastern allies. Hebard (1920, p. 374) referred to this as the *querneus* group, which in deference to priority had best be followed, though *walshii* is the most widely distributed and probably the best known species, and *nigrescens* Scudder was the first described.

As discussed by Hebard (1937, pp. 148-153), the *saltator* group consists of *saltator* Scudder, *ascensus* Scudder, and two subspecies additional to the typical ones. A distinctive feature of these two species is the prominent submarginal ridge along each side of the apical half of the male supra-anal plate (figs. 90, 93). Other group characters, and I believe more basic ones, occur in the aedeagus. The dorsal valve is slender, elongate, and laterally there is a thin or membranous marginal expansion of variable width (figs. 91, 92, *me*). The ventral valves (*vv*) are visible anterior to the main stem, as thin, straplike structures, each with its apex curling briefly about the base. There is also a small spinelike projection (*sp*), evidently part of the dorsal valve, near each ventral valve.

The same pattern of dorsal valve structure occurs in *lepidus* Scudder and *bernardinae* Hebard, and it appears to warrant their placement either in the *saltator* group or nearby. These two species lack the submarginal, subapical specialization of the supra-anal plate that occurs in *saltator* and *ascensus*, but instead each has a marginal prominence on each side about midlength of the supra-anal plate (fig. 83, 89, *map*). The *saltator* group occurs in Washington, Oregon, and California. One of Scudder's original localities for *lepidus* (Scudder, 1897, p. 322) is the Humboldt River, Nevada, and because of the length of that river an exact locality in that State is not known.

The *indigens* group, as reviewed by Hebard (1936, pp. 168-182; 1937, pp. 157-159), includes nine species and subspecies. Earlier (1928, p. 266) he gave notes on the group under this same name, though he also used *oregonensis* group (1935, p. 370). In this group the male cercus is rather broad and unspecialized (fig. 73); the furculae usually are much longer than in the *immunis* group; the stem of the aedeagus is rather short and fleshy, the anterior part often bent anteriorly; neither dorsal nor ventral valves are conspicuously developed; and the tegmen is lobate but clearly with a pointed apex. The group occurs in Washington, eastern Oregon, Idaho, and in the Rocky Mountains from Alberta at least to southern Colorado.

The *montanus* group includes six species reviewed by Hebard (1935, pp. 377-387). The cercus is of a similar type in all—slender and elongate, usually somewhat curved dorsally, the lateral surface convex (fig. 74). The main stem of the aedeagus has a broadened, corolla-like apex, with the dorsal valves variously developed and often very slender and highly specialized. Most of the species have lanceolate though short tegmina. Group distribution is Alberta and British Columbia through most of Oregon, Idaho, and western portions of Montana and Wyoming.

The *rileyanus* group consists of *rileyanus* Scudder and *platycercus* Hebard (1920, p. 377), together with *rileyanus varicus* Scudder. In each species the highly distinctive cercus is very broad, the apical margin irregular (fig. 76). The aedeagus is of the same general type as in the *immunis* group, but the dorsal valves are conspicuously developed and the two species clearly are closely related. The group is Californian, recorded from Yuba and Placer Counties, south to Inyo County.

Hebard (1935, pp. 374-377) reviewed the *artemisiae* group, consisting of *artemisiae* Scudder and *lemhiensis* Hebard. The male cercus is elongate and blunt, the apical portion impressed and curved dorso-posteriorly and mesally, and the basal portion contrastingly convex (fig. 75). The dorsal valves of the aedeagus are very elongate, and in *lemhiensis* each valve curves forward anterior to the apex of the main stem. The lophi of the epiphallus are broadly erect and those of both species are similar. Both are Idaho species.

A rather isolated species of uncertain relationship is *militaris* Scudder, with small narrow tegmina. The apical half of cercus is roughly rectangular (fig. 67), and the aedeagus has highly specialized dorsal valves, each with a short mesal prong and a slender posteriorly recurved median appendage. This species occurs in south-central Idaho.

The *marginatus* group consists of *marginatus* (Scudder) and about ten other species. Hebard (1919) described four of them, and later added another (*fultoni*) (Hebard, 1922, p. 63), but there has been no revision. These species are small except for some specimens of *marginatus*, which has both short- and long-winged individuals. The median carina of the pronotum is conspicuous throughout its length, not obsolete in sections as in some groups. The male cercus is simple, usually slender and elongate, sometimes knobbed at apex (figs. 68, 69). The lophi usually are erect, with apices truncate in dorso-posterior view, and though the aedeagus differs among the various species in details it apparently portrays a natural group. This group occurs in California from about Sonoma and Placer Counties southward, except for *marginatus*, which extends north at least to Shasta County in the Sacramento Valley. Strohecker (Pan-Pac. Ent. 36: 33, 1960) has recently described two additional species (*fricki*, *muricolor*).

The *aridus* group, so recognized by Hebard (1929, p. 375), includes several undescribed species additional to *aridus* (Scudder) and *desultorius* Rehn, and I have a revision in progress. The cerci are rather long and slender (figs. 70, 71), those of only a few species being sufficiently distinctive to permit identification on this basis. The group is an especially natural one in terms of the aedeagus; the dorsal valves project above the main stem and are broadened apically in various highly specialized forms of a canopy-like structure; the ventral valves originate posteriorly deep at the base of the main stem, extend forward and arise anterior to the dorsal valves, each ventral valve appearing as a very slender, cylindrical appendage coiled around the bases of the dorsal valves. This group is distributed from western Texas to the Pacific coast, extending northward into southern Colorado, north-central Utah, central Nevada, and in California to about the latitude of Kern County.

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BOOK REVIEW

NEW GUINEA BITING MIDGES (DIPTERA: CERATOPOGONIDAE), by Masaaki Tokunaga. Pacific Insects 1 (2-3): 177-313, 71 text figures. $2.00.

At last a good beginning has been made in our knowledge of the New Guinea biting midge fauna with the publication of this large, well executed paper by Professor Tokunaga. That it is only a beginning is promised in the fact that here one-hundred and twelve species, of which fifty-four are new to science, are described from two hundred and fifty-five specimens, all taken in light traps. Tokunaga's classification in this paper appears to be ultra-conservative, probably because so many species are represented by single specimens. No doubt closer comparison of longer series of the New Guinea examples of exotic species will result in a greater proportion of endemism, which Tokunaga reports as seventy-three percent. It is the reviewer's opinion that special and extensive collecting in New Guinea will result in a several-fold increase in the size of the midge fauna, possibly up to a thousand species, a figure which seems fantastic at first glance.

Professor Tokunaga's descriptions, as usual, are excellent and well detailed, using most but not all of the characters recently found to be most useful in species differentiation. The illustrations are quite good and the paper is well supplied with diagnostic keys. This paper provides a good foundation on which, it is hoped, an imposing superstructure will be erected.—Willis W. Wirth, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D. C.*

PARASITES AND PREDATORS ASSOCIATED WITH SOME GRASS SCALES FOUND IN FRANCE

HARRY L. PARKER, *Entomology Research Division, ARS, U.S. Department of Agriculture*

Collections of grass scales, particularly of the genus *Antonina*, were begun in France in 1954 in an attempt to find natural enemies that could be used for biological control of Rhodes-grass scale (*A. graminis* (Mask.)) in the United States. Work was initially concentrated on *phragmitis* Marchal and *purpurea* Sign. but since the anatomical characteristics and ecological requirements of *purpurea* are more like those of *graminis*, work on *phragmitis* was discontinued. In the following discussions, observations regarding several other grass scales and associated parasites and predators precedes those concerned with *phragmitis* and *purpurea*. Although incidental to the Rhodes-grass scale problem, these observations may be useful in some future study concerning scale insects that attack grasses. With the exception of *phragmitis*, which was collected on bog reed (*Phragmites communis* Trin.), all the scale insects mentioned herein were found on false-brome (*Brachypodium ramosum* R. & S.). In the United States bog reed is also known as the common reed.

Thanks are extended to the following gentlemen for identifications. Chalcidoidea: Ch. Ferriere, B. D. Burks, J. Ghesquiere; Lepidoptera: J. F. Gates Clarke; Coccoidea: H. Morrison; Coleoptera: E. A. Chapin; Diptera: C. W. Sabrosky; grasses: M. Rombier.

Aclerda subterranea Sign.

This hard-shelled, tortoiselike scale was frequently found on false-brome. It is common in the region of Aix-en-Provence and Remoulins-Nimes, occurring singly or in clusters of various-sized individuals on the lower stems and sometimes on rhizomes near the surface of ground.

Very little attention was given to this species; nevertheless, small quantities found in grass collections were retained from time to time to ascertain what parasites or predators might issue. The following species were reared:

Eublemma jucunda (Hbn.) (Noctuidae, Acontiinae). The larva of this moth is frequently found among empty scales (and sometimes within the old shell of a scale) whose body contents have apparently been devoured by it. Larvae of all sizes are found, and their milky-white-bluish color suggests that they feed on animal matter. Herbulot (1948) listed the related species *E. scitula* (Rmb.) as a predator of scale eggs.

Paraphaenodiscus subterraneus Ferriere (Encyrtidae). This primary parasite is a short, robust species; the apterous female is greenish and the male is darker green, almost black, and winged. It was the most common parasite reared from this scale. Little is known of the biology of this species. It evidently parasitizes the scale in summer or autumn and passes the winter in the egg or larval stage, for dissections in late February and March have shown it to be in various stages of larval development. Adults begin to issue in April and continue at irregular intervals until July. It is a colonial parasite; four to six adults generally emerge from a single scale, although some small scales contain only one. The ovarian egg (fig. 2) has a stalk twice as long as the egg. The fully developed larva is of the typical chalcid type with peripneustic respiration; the mouth parts and facial sensoria are prominent (fig. 3).

Microterys ferrugineus (Nees) (Encyrtidae). This colonial parasite is evidently primary as it was reared on several occasions from *A. subterranea.*

Microterys matritensis (Mercet) (Encyrtidae). This species was reared on three occasions; it is probably a primary parasite.

Cheiloneurus elegans (Dalm.) (Encyrtidae). This species was reared on several occasions and is either a primary parasite of the scale or a secondary via *Paraphaenodiscus.*

Anabrolepis zetterstedtii (Westw.) (Encyrtidae). The true role of this species is not known. It was reared on only one occasion.

Cerapterocerus mirabilis Westw. (Encyrtidae). This secondary parasite via *Paraphaenodiscus* was reared on several occasions.

Marietta picta (André) (Eulophidae-Aphelininae). Also a secondary via *Paraphaenodiscus,* this species was reared occasionally.

Comments.—Parasitization of *A. subterranea* by these species varied considerably from year to year and in different localities. No detailed records were kept; however, in the spring of 1957, 215 scales gave a total parasitization of 68 percent, principally by *Paraphaenodiscus.*

Aspidiotus subterraneus (Ldgr.)

This scale was found on false-brome near Le Canet and La Phare (Bouches-du-Rhone). It occurs either isolated or in clusters, low on the plant at soil level and sometimes below, partly covered with soil, where it easily escapes notice. No parasites were reared from it.

Mohelnaspis massiliensis (Goux)

This small, inconspicuous scale is fairly abundant in the Mediterranean region of France. It occurs distally on the leaves of false-brome. Crawlers hatched from May 6 to 20 in the laboratory.

The parasite *Physcus* sp. (nec *testaceus* Masi) (Eulophidae, Aphe-

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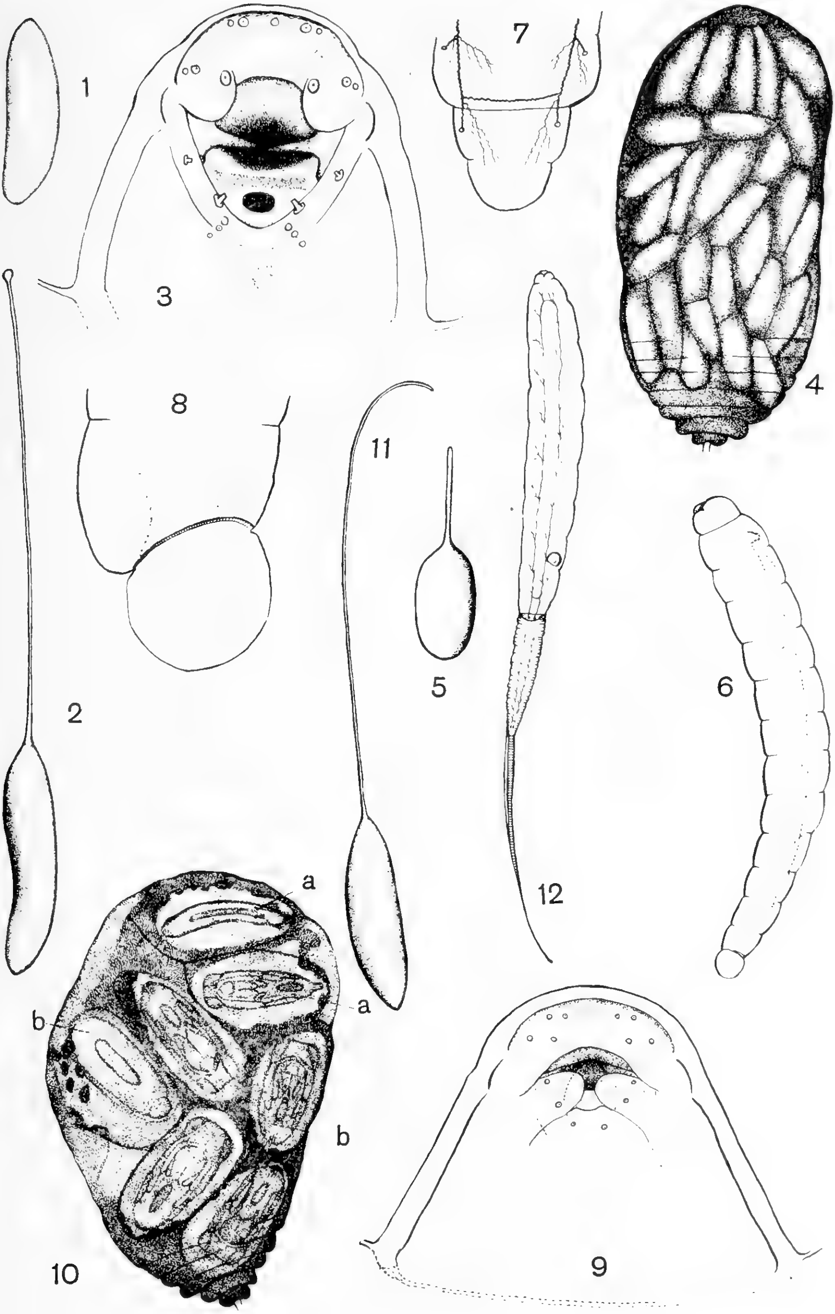
Fig. 1, ovarian egg of *Physcus* sp., parasite of *Mohelnaspis massiliensis;* fig. 2, ovarian egg of *Paraphaenodiscus subterraneus,* parasite of *Aclerda subterranea;* fig. 3, head and mouth parts of last-stage larva of *Paraphaenodiscus subterraneus;* fig. 4, *Antonina phragmitis* parasitized by *Platyrhopus meridionalis* in mummy stage; fig. 5, ovarian egg of *Ferriereus phragmitis;* fig. 6, late first-stage larva of *Platyrhopus meridionalis;* fig. 7, caudal end of last-stage larva of *Platyrhopus meridionalis;* fig. 8, caudal end of second-stage larva of *Platyrhopus meridionalis,* lateral view; fig. 9, facial plate and mouth parts of last-stage larva of *Platyrhopus meridionalis;* fig. 10, *Antonina phragmitis* parasitized by *Platencyrtus parkeri* (the cells indicated by "a" contain a larva and pupa of the hyperparasite *Urotyndarichus antoninae,* the others ("b") contain *P. parkeri*): fig. 11, ovarian egg of *Platencyrtus parkeri;* fig. 12, second stage larva of what is thought to be *parkeri* attached in remains of egg and first-stage larva.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lininae) was reared from it in considerable numbers. Fig. 1 shows the ovarian egg.

Rhodania flava Goux

Small groups of this rosy scale, partly covered with the characteristic cottony secretion, were found near Nîmes from time to time, on the lower branches and stems of false-brome. Several specimens of the jet-black encyrtid *Dinocarsus hemipterus* (Dalm.) were reared from it, as well as two specimens of *Mayridia* sp., another encyrtid. Both are undoubtedly primary parasites.

Trionymus sp. (? **thulensis** Green)

During several years of collecting only one specimen has been found. It was taken on false-brome at Nîmes.

Antonina sulci (Green)

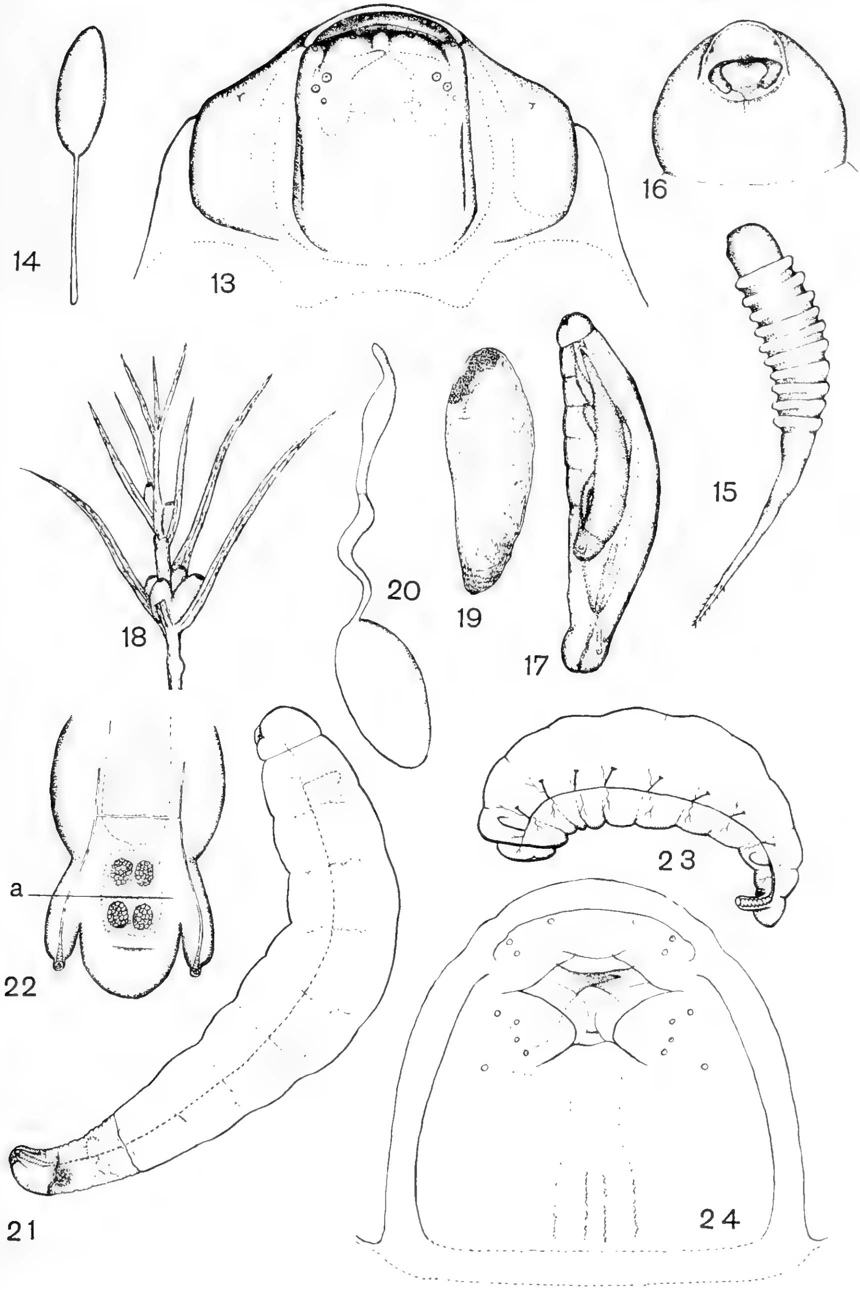
Only a few dozen of this species were taken among the large collections of *purpurea* from false-brome. Goux (1935) found it also on *Festuca ovina* in southern France, on *Festuca* sp. (nec *ovina*) in Savoy, and on an unidentified grass at Evreux, Eure. No parasites were reared from it. Young crawlers were procured, appearing in the laboratory in March.

Antonina phragmitis Marchal (Bog-reed scale)

This scale is common on bog reed all over the lower Rhone valley from a point above Donzere, and as far east along the Mediterranean coast as the Var valley near Nice. It probably occurs all over the Mediterranean region. I have not found it north of Lyon, nor have I ever found it on *Arundo donax* (L.), though I am informed by Mr. J. Ghesquière, who has studied grass-scale parasites, that he found one specimen on *donax* (Canne de Provence.)

It is fairly abundant most everywhere, some spots—e.g., near Réal Tort and at St. Chamas in the Bouches-du-Rhone Department—being particularly favorable. La Face (1921) found it abundant in Italy, where he said it was very heavily parasitized, but he did not give the name of the parasites.

Fig. 13, head of last-stage larva of *Platencyrtus parkeri;* fig. 14, ovarian egg of *Urotyndarichus antoninae*, hyperparasite of *Antonina phragmitis;* fig. 15, first-stage larva of *Urotyndarichus antoninae;* fig. 16, head of first-stage larva of *Urotyndarichus antoninae;* fig. 17, half-grown larva of *Platyrhopus meridionalis* showing position of hyperparasite larva of *Urotyndarichus antoninae* within it (slightly pressed out by cover-slip); fig. 18, diagram of a sprig of false-brome with some scales of *Antonina purpurea;* fig. 19, *Antonina purpurea,* scale in "mummy" stage parasitized by *Anagyrus diversicornis;* fig. 20, ovarian egg of *Anagyrus diversicornis;* fig. 21, second-stage larva of *Anagyrus diversicornis* with posterior end fixed in respiratory sheath; fig. 22, ventral view of posterior end of full-grown (female) larva of *Anagyrus diversicornis,* showing lobes bearing caudal spiracles originating on eighth abdominal segment, and position of imaginal discs of external reproductive organs; fig. 23, side view of last-stage larva of *Anagyrus diversicornis* removed from its respiratory sheath; fig. 24, facial and mouth parts of last-stage larva of *Anagyrus diversicornis.*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The scale is a flat amorphous one, pressed in closely between the leaf base and the stem of the plant, sometimes in dense incrustations or groups, the individual scales assuming various irregular shapes in order to accommodate themselves to the space.

My brief observations on the seasonal history confirm La Face's statement that there are several generations each year. In the fall and winter practically all the female scales are fully developed. The crawlers hatch in the spring and a few males appear. The crawlers are positively phototropic when first hatched; later they are negatively so. These reactions permit the young scales to issue from the dark region of birth and migrate from the old and dying stems to the new season's growth, where they crawl beneath the leaf sheath and establish themselves.

Release of upwards of a million crawlers on bog reed in the Seine valley near Rueil-Malmaison did not establish the scale.

In swamps where bog reed scale are common, a large number are destroyed by an unknown bird, snail, or rodent predator. By November the leaf sheaths have been torn away, evidently by a sharp beak or teeth, and the enclosed clusters of scales have disappeared.

There is also a lepidopteron, the larvae of which are often found spun up in places where a group of scales have disappeared or among an incrustation of scales, part of which appears to have been eaten by this lepidopteron. Whether or not these larvae are strictly predaceous on the bog reed scale is not known.

Parasites and hyperparasites, all belonging to the family Encyrtidae, were reared from *phragmitis* as indicated below:

Platyrhopus meridionalis (Ferriere). This species has been studied by Ferriere (1955) and Ghesquiere (1956). It is a flat, light-brown colonial primary parasite. The antennal club has three segments; the ovipositor of the female does not protrude beyond the tip of the abdomen. Females are more numerous than males. It is the most abundant of the insect enemies attacking *phragmitis*. In the winter the young larvae are found floating free in the body cavity of the host scale. When brought into the laboratory the larvae begin to grow, and soon the scale is transformed into a light-brown mummy wherein the outline of almost every individual parasite cell can be discerned (fig. 4). After several weeks of incubation the adults begin to issue, and emergence continues from April until July. The number of parasites per scale varies with the size of the host. Only one or two parasites may emerge from a small scale, whereas a large scale may produce from 40 to 50 individuals. The average number is 15-20.

The first-stage larva (fig. 6) is rather slender, distinctly segmented, with an apneustic tracheal system, indistinct mouth parts, and a small knob on the last segment which is apparently a slight extrusion of the hind intestine. This knob persists in diminishing degree until the penultimate larval stage (figs. 7, 8).

The subsequent larval stages retain approximately this form. The ultimate stage does not have the knoblike caudal projection; but it has the usual peripneustic respiration. The mandibles are very light brown, and the sensory organs of the head are but slightly developed (fig. 9).

Ferriereus phragmitis (Ferriere). This species is similar to *meridionalis* in its developmental stages, general appearance, and habits, and as yet I have found no characters that permit differentiation of the earlier forms. It is less abundant than the foregoing, in the proportion of 1 to 4. The ovarian egg of this species is shown in fig. 5.

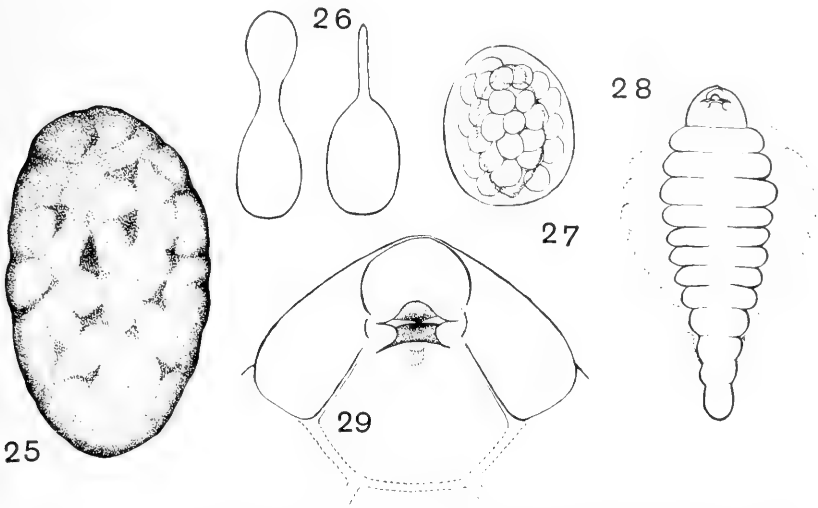

Fig. 25, mummy of *Antonina purpurea* parasitized by *Timberlakia europaea;* fig. 26, ovarian eggs of *Timberlakia europaea*, one being not fully developed; fig. 27, egg of *Timberlakia europaea* showing embryo of larva and enlarged (? trophic) cells within it; fig. 28, first-stage larva of *Timberlakia europaea* (dotted line shows approximately the aspect of this larva when about to molt into second stage); fig. 29, head of first-stage larva of *Timberlakia europaea*.

Ferriereus sp. Mr. Ghesquiere, who has kindly identified large lots of material reared from this scale, states that he has found small numbers of an undescribed species of *Ferriereus* in our rearings which he proposes to describe shortly.

Platencyrtus parkeri Ferriere. This is a flat, black species with faint green iridescence; the female's ovipositor protrudes to the wing tips. This parasite apparently goes through several generations during the year, for in scales collected in July some were found empty of this species, others had developing parasites which issued in August and September, whereas scales collected in March contained half-grown larvae to pupae.

When parasitized by *parkeri* (fig. 10), this scale is usually a mahogany-brown color, almost transparent. The full-grown larva or pupa of the parasite can be easily discerned through the shell of the scale, and each cell containing a pupa has the dark pellets of meconium voided and packed around the periphery in an irregular manner. Thus, scales parasitized by *parkeri* are easily distinguished from those parasitized by *Platyrhopus* and *Ferriereus*.

The ovarian egg of *parkeri* has a long stalk (fig. 11). Fig. 12 shows what I believe to be the second-stage larva still attached to the cast skin of the first stage and evidently by the stalk to the wall of the scale. There is one pair of spiracles situated posteriorly in both these stages.

The last-stage larva has the regular peripneustic tracheal system; otherwise the larva shows no characters of particular value for recognizing the species. Fig. 13 shows a ventral view of the head.

Total parasitization by this species in the collections is generally about 3-5%.

Urotyndarichus antoninae Ferriere is a slender, dark-green species with the ovipositor protruding slightly beyond the wing tips; the wings are smoky. No males of this species have been seen. It parasitizes *P. parkeri, phragmitis,* and *meridionalis.* The ovarian egg is oval with a stalk slightly longer than the egg itself (fig. 14). The first-stage larva (fig. 15) has a thimble-shaped head (fig. 16), comma-shaped mandibles, and a caudal process with a few weak spines distally. The last-stage larva is of the typical chalcidiform type with peripneustic respiration. This parasite is found as a first-stage larva during the winter in hosts of various stages (fig. 17), and in hosts well along in larval development *antoninae* is found also in later stages. Adults issue in April, and continue to emerge until autumn.

Parasyrpophagus lindus Mercet was reared on several occasions from *grosso modo* rearings, and seven specimens issued from one isolated scale. Examination of the host remains indicated that it is a hyperparasite, the host being either *Platyrhopus* or *Ferriereus.*

Comments.—All six of the above species have flat, paper-thin bodies and heads; one might say they are developed in two dimensions instead of three. This condition undoubtedly makes it easier for them to move about beneath the leaf base, which forms a tightly wrapped sheath around the stem of the reed, and thereby find and parasitize the host scales.

Antonina purpurea Sign. (False-brome scale)

This scale is dark purple, almost black, surrounded by a white ovisac, similar to that of *graminis.* It was collected from false-brome on the dry rocky hillsides along the Mediterranean from Nîmes (Gard) to Grasse (Alpes Maritimes). Seldom has it been found in numbers, and its distribution is spotty.

It was often necessary to search a long time for a suitable spot, although small numbers could be picked up almost anywhere in the region. Two people working for 7 weeks in the spring of 1957 collected 11,471 viable scales. They were often found in groups on the lower portions of the plants, but sometimes scales, usually occurring singly, were present rather high up on the branches. The males were very scarce, comprising less than 1 percent of the catch. The individuals (females) varied greatly in size (fig. 18).

Goux (1935) states that this scale occurs on various Gramineae in addition to false-brome, and that its biology has been studied by Signoret (1875) and by Lichtenstein (1879). We have observed it only in winter, when it is in an advanced stage. In May the crawlers hatch and a few adult males appear, probably less than one male to a thousand females.

The predators and parasites were found associated with this scale as indicated below:

Eublemma jucunda (Hbn.) (Noctuidae, Acontiinae). This species was often found as a larva among the scales and sometimes within the ovisac, where it apparently feeds on the eggs and undoubtedly upon the scale itself.

Scymnus nigrinus Kugel. (Coccinellidae). In 1954 larvae of this species were occasionally found inside the ovisac, consuming the scales. A number issued from mass collections of the scales. It was not encountered thereafter.

Chamaemyia juncorum (Fall.) and **herbarum** (R.D.) (Chamaemyiidae). Larvae of these dipterous insects were also encountered within the ovisac beside dead and emptied scales. In addition, some adults regularly emerged from the mass rearing cages. The predaceous habits of the larvae are well known. Clausen (1940, pp. 410-3) treated the family under the synonymous name ''Ochthiphilidae.''

Anagyrus diversicornis Mercet (Encyrtidae). This species and *Timberlakia europaea* were the two principal primary parasites of *purpurea*. *A. diversicornis* is found almost always in scales of smaller than average size. A parasitized scale can be distinguished by its filled-out mummified appearance and light-brown color, and often the dark, irregular blotches of the larval meconium can be seen through the cuticle (fig. 19).

This species is solitary in habit. The ovarian egg has a long, irregular pedicel (fig. 20). In winter and early spring young larvae, probably the second stage (fig. 21), are found attached to the wall of the host scale, the caudal end being inserted in a respiratory sheath. It has the typical metapneustic respiratory system, the spiracles being on two lobes originating on the eighth abdominal segment as identified by the position of the imaginal discs of the external reproductive organs of the female larva. The line indicated by ''a'' in fig. 22 separates the eighth and ninth abdominal segments. These lobes become even more pronounced in the last larval stage, at which time eight other pairs of spiracles open laterally (fig. 23). The head of the last-stage larva is shown in fig. 24. The pupa has five pairs of lateral tubercles on the abdomen.

In early March small numbers of mummies were found that contained fully developed larvae and pupae; there were also some empty mummies from which the adults had issued. Adults issued from early spring to June in our collections, but the subsequent seasonal activity, July to November, has not been elucidated. It is possible that the species has a two-generation cycle. Males and females are about equally abundant. The ovarian tubes of newly emerged females contain 30-40 fully developed eggs.

The detection of parasitized scales is a slow and tedious process; the ovisac of each individual must be opened (under binocular to prevent injury) so that it can be seen. As the season progresses the scales are re-examined one by one, the mummies removed, and the healthy ones left until it is certain no more parasites are present. This method is also used for handling *Timberlakia europaea*.

Timberlakia europaea (Mercet) (Encyrtidae). This tiny, yellowish colonial parasite is but slightly larger than the well-known *Trichogramma.* It is found in scales of all sizes. In the large ones a colony often consists of 40 50 individuals. Dissection of a small scale may reveal several large larvae and a larger number of small unhealthy-looking larvae apparently in the process of being crowded out. As in *diversicornis,* the parasitized scale can readily be distinguished when the parasites approach larval maturity. It is somewhat swollen and brownish-red in color, and the individual parasite cells form swellings on the periphery. Here and there small dark blotches of cast meconia can be distinguished through the mummified skin (fig. 25).

This species is found throughout the winter and early spring as eggs and young larvae floating free in the body cavity of the host. The ovarian egg (fig. 26) is racket-shaped with a simple pedicel about three-fourths as long as the egg. An egg in a later stage taken from the host scale shows the chorion greatly enlarged, almost spherical, and the embryonic larva surrounded with large cells (fig. 27).

The first-stage larva is spindle-shaped, distinctly segmented, with apneustic respiration (fig. 28). As it passes into the second stage, the thorax and first five or six abdominal segments are swollen by food contents, and the last three segments remain roughly caudiform. The facial parts and structures of the head are difficult to discern; the mandibles are almost hyaline; the sensory organs of the mouth are almost invisible except in the last larval stage, when two small circular sensilli appear on the labrum (fig. 29); nine pairs of spiracles appear in this stage.

Mummies appear in March, and in our 1957 collections adults issued from April 8 to June 15. Males are scarce, probably not exceeding 5 percent of the total emergence; they have minute wings. Apparently adults of this species live only a short time. We were not able to prolong their life beyond 4 days in the laboratory.

Cheiloneurus elegans (Dalm.) (Encyrtidae). This species was encountered frequently in the mass rearings, and individuals were reared from isolated scales. On two occasions examination of host remains showed no evidence that it was a hyperparasite, and I am inclined to think it was a primary; however, oftentimes the remains of primary parasites are so minute that they escape detection. The method of looking for these remains was as follows: The empty host scale was warmed to about 80°C. in a weak potash solution (if boiled, parts of remains may be boiled out into the water and lost) and left overnight in this to relax. The scale was then put into a drop of Faure's liquid on a microscope slide and dissected under a high binocular. Usually the mandibles of both primary and secondary larvae can be found in this manner.

Cheiloneurus formosus (Boh.) (Encyrtidae). This species was also reared several times from *grosso modo* collections; however, no records as to its true role are available.

Metanotalia hispanica Mercet (Encyrtidae). This species issued once from Sôme dish rearings, and its role is unknown.

Azotus sp. (Eulophidae, Aphelininae). This species emerged from an isolated scale and was obtained only once. It is either a primary or a hyper via *Anagyrus.*

Cerapterocerus mirabilis Westw. (Encyrtidae) and *Marietta picta* (André) (Eulophidae, Aphelininae). These two hyperparasites issued often in the Sôme dishes and also from isolated scales parasitized by *Anagyrus diversicornis.*

Comments.—No hyperparasites issued in our laboratory from scales parasitized by *Timberlakia europaea.*

Collecting and Caring for Scales

Bog-reed scales were collected by cutting large lots of bog reed from infested spots in southern France. The reeds were then shipped to the laboratory where the leaf bases were removed and the scales brushed off into a dish. The scales were then placed on a cloth stretched over the top of a cylindrical glass vessel half full of water. Another glass dish smaller in diameter than the one holding the water was inverted over the scales. This device is known as a Sôme dish; in addition to providing for circulation of air and the removal of noxious gases, it permits humidity to be regulated through addition of different amounts of salts to the water.

False-brome scales were collected by uprooting or breaking off infested pieces of false-brome. Each day they were sent to the laboratory, where the stems and branches containing scales were trimmed off to within 1-2 mm., or as close as possible to the scales without causing them injury. This material was then placed in the Sôme dish.

As the parasites reached the late larval stages, mummies began to appear, and the whole collection was passed under the binocular at intervals of about 10 days. At the first examination, it was necessary to open the tough ovisac with needles (under binocular) to expose the scale. The second and third examinations were not so tedious, except where the ovisac had not been opened enough and the scale had sealed it up again. The mummies containing *Anagyrus* and *Timberlakia* were separated out by species and forwarded to the Entomology Research Division's Parasite Introduction Laboratory at Moorestown, N. J. where they were reared to adults. The adults were then sent to field stations in Texas and Florida, where attempts were made to establish these parasites on Rhodes-grass scale.

Prevalence and Degree of Parasitization

Parasitization of the bog-reed scale by all the species was about 50-60% in the best spots, such as Réal Tort and St. Chamas, Bouches-du-Rhone; at other locations such as those near Avignon, Donzere, and farther up the Rhone, parasitization ranged between 5 and 20%. At no place in the lower Rhone valley from Donzere to St. Gilles and east to the Var valley near Nice did we find the parasites entirely absent.

There are few definite and reliable records on the degree of parasitization. In 1953, of 271 scales dissected, 58% were parasitized by *Platencyrtus, Platyrhopus,* and *Ferriereus;* in 1955, of 2,531 scales dissected or examined for parasitism, 931 were parasitized by *Platyrhopus* and *Ferriereus* and 151 by *Platencyrtus* or a total of 23%.

Dissection of 219 false-brome scales in the spring of 1955 gave 12 *Anagyrus* and 30 *Timberlakia*, or 19%; and dissection of 500 scales in the spring of 1956 gave 71 *Anagyrus* and 53 *Timberlakia*, or 25%. The record for the spring of 1957 is more extensive and significant. Table 1 shows exactly what was contained in 11,471 scales.

Table 1.—Parasitization of the false-brome scale by *Anagyrus diversicornis* and *Timberlakia europaea*, southern France, 1957.

Locality	Number of live scales studied	Percent parasitized By *A. diversicornis*	Percent parasitized By *T. europaea*	Total percent parasitized
Vinon sur Verdon, Var	1,341	8.2	24.4	32.6
Rochefort du Gard, Gard	10,130	9.1	16.5	25.8

Importation into the United States

The parasites of the bog-reed scale shipped to the United States were as follows: In 1953, 674 parasitized scales; in 1954, nothing; in 1955, 3,072 parasitized scales. These mummies contained unknown proportions of the following parasites: *Platencyrtus parkeri*, *Platyrhopus meridionalis*, *Ferriereus phragmitis*, and possibly *Ferriereus* sp. In 1956, 130 adults of *parkeri* were exported.

Shipments of the false-brome scale parasites since 1953 are shown in table 2.

Table 2.—Shipments of false-brome scale parasites to the United States.

Year	*Anagyrus diversicornis* Mummies	*Anagyrus diversicornis* Adults	*Timberlakia europaea* Mummies[1]	*Timberlakia europaea* Total individuals[2]
1954	0	295	0	0
1955	195	1,127	465	6,975
1956	180	0	223	3,345
1957	1,109	179	1,991	29,865
Total	1,484	1,601	2,679	40,185

[1]No adults. [2]Estimated 15 per mummy.

Most of the material from both species was sent from the Moorestown laboratory to the Texas Agricultural Experimental Station at Weslaco. Dean and Schuster (1958) have reported on their attempts to colonize and establish the parasites on Rhodes-grass scale.

Laboratory efforts to colonize *Platencyrtus parkeri* and *Timberlakia europaea* were unsuccessful. In the case of *Anagyrus diversicornis* some first-generation adults were obtained, but they failed to produce a second generation. No recoveries of any species from field releases made during 1955, 1956, and 1957 have been reported. Although these results are not encouraging, it is possible that one or more of the parasites might be effective against the Rhodes-grass scale or other grass scales in areas having different conditions of soil and climate.

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THE IDENTITY OF LIPEURUS VOLSELLUS EWING

(Mallophaga: Philopteridae)

Ewing (1930. Proc. Ent. Soc. Wash., 32: 119) described *Lipeurus volsellus* from a female thought to be collected off *Aramides cajaneus chiricote* and a male "straggler from a quail" both collected in Panama. The female was designated holotype. Hopkins and Clay (1952, *A check list of the genera and species of Mallophaga,* London) placed the species in the genus *Fulicoffula* "—with considerable doubt. It has not been figured and the type is mislaid, but it may be a somewhat aberrant *Fulicoffula.*" In view of the inadequate description, Hopkins and Clay probably made their decision based on the host data.

Through the courtesy of Mr. C. F. W. Muesebeck, the two specimens have been located and the following comments are based on a study of them.

The holotype female has collection data "*Aramides cajaneus chiricote,* Gatun, C. Z., May 4, '11, Biol. Suv. J. H. P." This specimen was remounted October 7, 1925, presumably by Ewing, and is now minus one antenna. The allotype male has collection data "*Odontophorus marmoratus,* Canal, E. Panama, Biol. Suv., J. H. P." This specimen was also remounted on October 7, 1925, presumably by Ewing, and is now minus the antennae and five legs. Both specimens belong to the genus *Oxylipeurus* normally found on avian hosts of the order Galliformes.

These types have been compared with the description and illustrations of *Epiconolipeurus* (= *Oxylipeurus*) *repandus* Carriker (1945. Rev. Brasil Biol., 5: 101) found on *Odontophorus gujanensis marmoratus* (Gould), a gallinaceous bird found in Panama and Colombia. The two are conspecific, therefore *Oxylipeurus repandus* (Carriker, 1945) becomes a synonym of *Oxylipeurus volsellus* (Ewing, 1930). The type host of *Oxylipeurus volsellus* (Ewing, 1930) is established as *Odontophorus gujanensis marmoratus* (Gould).

—K. C. EMERSON, *Stillwater, Oklahoma.*

OCCURRENCE OF THE DERMESTID BEETLE, ORPHINUS FULVIPES, IN THE UNITED STATES, WITH ADDITIONAL NEW WORLD RECORDS

(COLEOPTERA: DERMESTIDAE)

The genus *Orphinus* has not been reported previously from the United States, although a specimen of *Orphinus fulvipes* (Guérin-Méneville) was collected by H. G. Hubbard and E. A. Schwarz on Key West, Florida, more than sixty years ago. Another specimen was collected on Key West by E. A. Schwarz on March 25, 1912. More recently, on April 12, 1960, one larva and numerous exuviae were collected from a warehouse at Hialeah, Florida, by E. M. Collins, Jr. The above mentioned specimens are deposited in the collection of the U.S. National Museum, Washington, D. C.

O. fulvipes has been recorded from the Seychelles, Madagascar, North Australia, Java, the Hawaiian Islands, and Brazil. Data on additional New World specimens of this species deposited in the U.S. National Museum are the following:

BOLIVIA: Ivon Beni, February, 1921-1922 (W. M. Mann). COSTA RICA: San José, 1,000 to 1,200 meters, May 16, 1932 (F. Nevermann). CUBA: Cayamas, February 21, May 18 (E. A. Schwarz). LEEWARD ISLANDS: Dominica Island: Roseau, July, 1936 (Blackwelder); Montserrat Island, January 3 (H. G. Hubbard), July 4, 1905 (Aug. Busck); St. Kitts Island [St. Christopher Island], Oct. 19, 1936 (Blackwelder). MEXICO: Veracruz: San Carlos, 1939 (J. Camelo G.). PANAMA CANAL ZONE: Culebra, 1910 (H. H. Rosseau). PORTO RICO: Bayamon, December 26, 1932; Lajas, December 17, 1939 (J. A. Ramos); Mayaguez, September 18, 1937 (R. Bray, Jr.); San Juan, March 14, 1932 (C. G. Anderson), March 29 to April 2, 1932 (Anderson), August 17, 1933 (A. S. Mills). VIRGIN ISLANDS: St. Croix Island (H. A. Beatty). TRINIDAD: June (Aug. Busck).

—R. S. BEAL, JR., *Arizona State University, Tempe;* and P. J. SPANGLER, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D. C.*

THE SPERMATHECAE AS TAXONOMIC FEATURES IN PHYTOSEIID MITES OF WESTERN NORTH AMERICA

(ACARINA: PHYTOSEIIDAE)

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The occurrence of "coxal glands" or "vesicles" has long been recognized in females of *Typhlodromus*. Nesbitt (1951) included them for Oudemans' species *T. aberrans*, *T. reticulatus*, *T. cucumeris* and *T. tiliarum* either in the translations of the original descriptions or in the illustrations. Smith and Summers (1949) illustrated this character for *Phytoseiulus macropilis* (Banks). Womersley (1954) illustrated the spermathecae of *T. longispinosus* Evans, *T. bellinus* Womersley and *T. reticulatus* Oud. Schuster (1957, 1959) illustrated them for *T. smithi* and *T. caudiglans* and Garman (1958) sketched the structure for *T. grandis* Berlese and *Amblyseiopsis floridanus* Muma. Dosse (1957, 1958) described and illustrated spermathecae for eighteen species of *Typhlodromus*, *Phytoseiulus* and *Phytoseius*. However, for the majority of the phytoseiid species no mention of this structure has been made.

Various workers at the University of California have long utilized the shape of the spermathecae for the recognition of certain species. This criterion was employed particularly for the species in which the structure is clearly of characteristic shape. Recent studies of other species have shown it to be of definite value in the identification of species having similar setal arrangements and lengths. There is also an indication that the shape of the spermathecae will best demonstrate the relation of groups of species. As an example: *T. arboreus* and *T. smithi*, with eight pairs of lateral setae, are more closely related to *T.* "new species" with nine pairs of laterals than to *T. conspicuus*, a species with only eight pairs of lateral setae.

Within the body of every adult female *Typhlodromus* there is a pair of structures each of which has an organization resembling that shown in figure 1. A relatively large duct (major duct) opens between coxae III and IV. An atrium of varying size and complexity occurs at the juncture of the major duct and an exceedingly fine duct (minor duct) that, according to Dosse, leads to the ovary. The atrium is contiguous with or very slightly removed from a heavily sclerotized cervix having at its other end a thin walled vesicle. The spermatophores are formed in the spermatheca (Dosse, 1958), as shown in the illustration (Fig. 1). Older spermatophores are displaced further into the vesicle. More than one spermatophore frequently is seen to be connected to the atrium.

The spermathecae are formed in the deutonymph prior to the final molt and their reaction to stains indicates that they are of ectodermal origin. We have not identified spermatozoa in these structures either by gross mounts in aceto-carmin or by thin sections.

The presence or absence of spermatophores, the exact shape and size of the vesicles and their ducts are either variable or difficult to see unless specimens are specifically prepared for their study. These features are not emphasized or are omitted from our drawings. The cervix and usually the atrium, if it is differentiated, are sclerotized, quite consistent in shape, and are illustrated as they are to be seen in routine preparations. All of the figures except figure 1 are drawn to the scale indicated.

Spermathecae are obvious in the subgenera *Typhlodromus* (*Typhlodromus*) *and Typhlodromus* (*Amblyseius*) and in the genera *Blattisocius, Phytoseiulus* and *Phytoseius.* They are also demonstrable in a number of other mesostigmatid mites, for example *Garmania*, but are more difficult to observe. These structures retain their characteristic shape for each species throughout the year and are consistent in specimens taken from widely separated localities.

The authors have not seen the types of many of the species treated herein, and have relied on determined specimens and literature. Many of the species have been determined by Dr. D. A. Chant and his efforts are greatly appreciated. In the following discussion, the species listed as belonging to the genera *Amblyseius, Amblyseiella* and *Amblyseiopsis* would, in the opinion of Chant (1957), belong in the subgenus *Amblyseius.* Since this opinion is not universally held by contemporary students of phytoseiids, we have elected not to change the status of species presently assigned to these genera.

Typhlodromus (T.) arboreus Chant, 1957. Fig. 2. In the species *T. arboreus* Chant, *T. pini* Chant and *T. anchialus* Kennett, the spermathecae are, for practical purposes, identical. Although we have not seen identified specimens of *T. citri* Garman, the species undoubtedly belongs with this group. The cervix is of nearly uniform caliber and quite blunt, the atrium not differentiated as a separate structure.

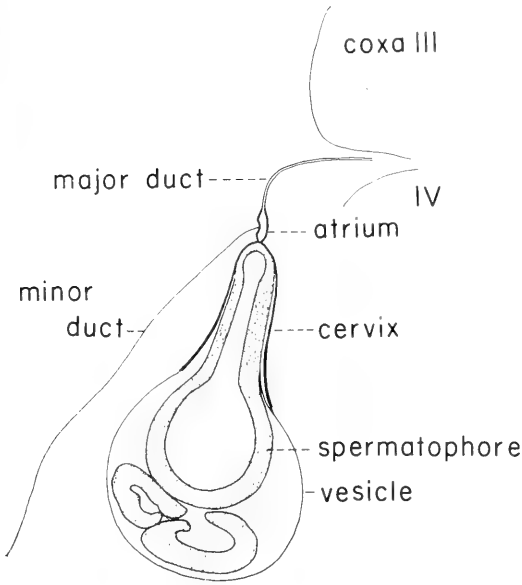
Typhlodromus (T.) smithi Schuster, 1957. Fig. 3. The cervix is normally shorter than it is in *T. arboreus.* However, identical lengths can be found in both of these species and in *T.* "new species" which is also similar.

Typhlodromus (T.) conspicuus (Garman, 1948). Fig. 4. The cervix is nearly cylindrical, bluntly rounded at the apex. The atrium consists of a small, poorly defined crescent-shaped structure at the apex of the cervix. This configuration sets *T. conspicuus* apart from other species in our area which have only eight pairs of lateral setae.

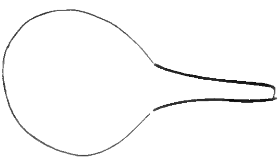
Typhlodromus (T.) "new species". Fig. 5. This species, considered as *T.* "new species" by Cunliffe and Baker (1953), has spermathecae of the type found in *T. arboreus* and *T. smithi,* and is probably closely related to them. Although this species is well known and has a wide range in Western North America, it apparently remains undescribed.

Typhlodromus (T.) pomi (Parrott, 1906). Fig. 6. *T. pomi* is very similar to *T.* "new species" in most characters including the spermathecae. In the few specimens we have seen, the spermathecae are of similar shape but slightly smaller.

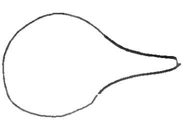
Typhlodromus (T.) occidentalis Nesbitt, 1951. Fig. 7. The cervix is long and thin, unlike any other members of this subgenus occurring in our area. The



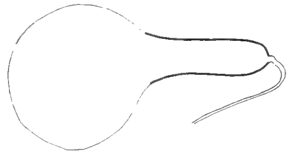
1 bellinus



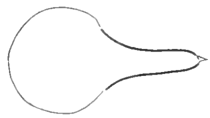
2 arboreus



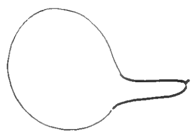
3 smithi



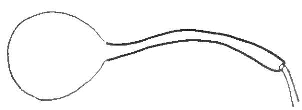
4 conspicuus



5 "new species"

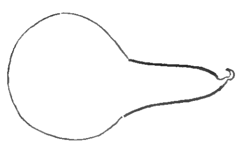


6 pomi



7 occidentalis

17μ



8 tiliae

Fig. 1, details of spermatheca containing spermatophores; figs. 2-8, spermathecae of *Typhlodromus* (*Typhlodromus*).

atrium is undifferentiated. *T. longipilus* Nesbitt and *T. floridanus* Muma are closely related to *T. occidentalis* on the basis of the structure of the spermathecae.

Typhlodromus (T.) tiliae Oud., 1929a. Fig. 8. The definite crescent-shaped atrium distinguishes this species from any others in our fauna having only nine pairs of lateral setae.

Typhlodromus (T.) rhenanus (Oud., 1905). Fig. 9. The cervix is similar to that of *T. tiliae,* however, *T. rhenanus* has ten pairs of lateral setae. Specimens of this species from California are not strictly comparable to those from Europe and may represent an undescribed taxon near *T. rhenanus.*

Typhlodromus (T.) caudiglans Schuster, 1959. Fig. 10. The crescent-shaped atrium is separated from the nozzle-shaped cervix by a narrow, weakly sclerotized duct.

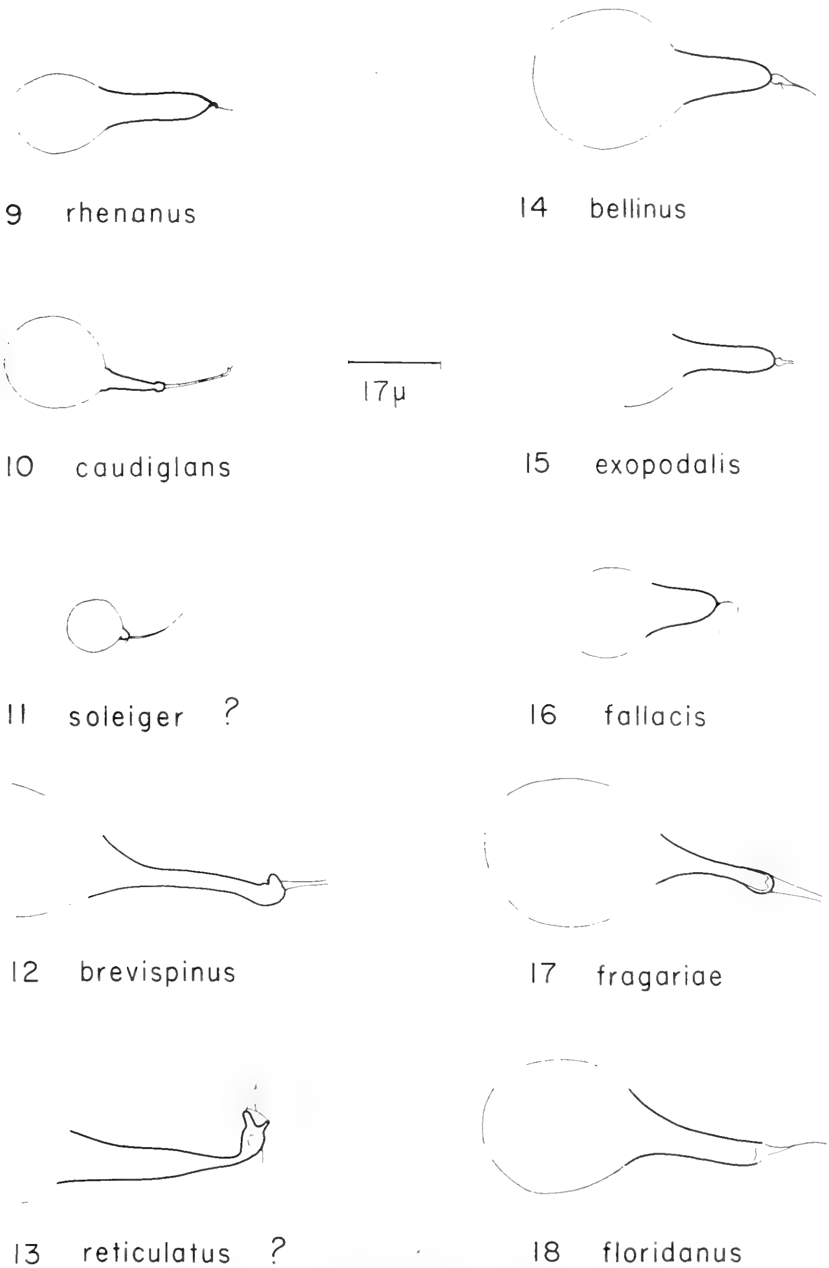
Typhlodromus (T.) soleiger ? (Ribaga, 1902). Fig. 11. Specimens of a California mite agree in other anatomical aspects with *T. soleiger,* but they have spermathecae in which the cervix shows little resemblance to that illustrated by Dosse. These probably represent an undescribed species.

Typhlodromus (A.) brevispinus Kennett, 1958. Fig. 12. The cervix is long, thin and uncomplicated. The atrium, in most mounts is not evident, however, in infrequent specimens the aspect we have illustrated can be seen.

Typhlodromus (A.) reticulatus Oud., 1930. Fig. 13. Oudemans, in describing this species, referred to "internal bladders with the bell shaped intermediate piece" as being readily visible. Our California species is the same as that which Womersley considered to be *T. reticulatus* in Australia. The cervix tapers to a thin constriction and the atrium is large and apparently bifid. The shape of the cervix does not appear to us to be "bell shaped," and the species, although well known, may be undescribed. Kennett, (1958) also expressed doubts that our species is conspecific with *T. reticulatus* Oud. on the basis of differences in habits.

Typhlodromus (A.) bellinus Womersley, 1954. Fig. 14. The spermatheca agrees with the illustration accompanying Womersley's description of *T. bellinus* as well as with the illustration by Dosse of *T. cucumeris.* We have accepted the *T. bellinus* designation on the basis of the dorsal setal pattern and on the basis of the larva, which has seven pairs of lateral setae instead of the six pairs as described by Chant for the larva of *T. cucumeris.* An unidentified species of this group occurs in California. Its dorsal setae L1 through L4 are slightly shorter and the dorsal pores are in different positions but the relative lengths of L9 and M2 are as in *T. bellinus.* The cervix of this species is as short or shorter than in *T. fallacis,* about one half as long as in *T. bellinus,* and the atrium is developed into a small triangular-shaped structure. Before any additional species are described in this group, a careful study of certain morphological structures, such as the dorsal pores and the spermathecae, should be made of the types of existing species.

Amblyseius exopodalis Kennett, 1958. Fig. 15. The cervix is slenderer but similar in shape and size to the preceding species. A number of closely related species, or distinct populations, with minor distinguishing features including the spermathecae, will eventually be described near *A. exopodalis* but from other geographic areas.



Figs. 9-11, spermathecae of *Typhlodromus* (*Typhlodromus*); figs. 12-14, 16, *Typhlodromus* (*Amblyseius*); figs. 15, 17, *Amblyseius*; fig. 18, *Amblyseiopsis*.

Typhlodromus (A.) fallacis (Garman, 1948). Fig. 16. The cervix is shorter than in *T. bellinus* and the atrium less distinct. A species closely related to *T. fallacis*, probably *T. mungeri*, differs in the lengths of the dorsal setae which are comparable to those of *T. bellinus.*

Amblyseius fragariae Kennett, 1958. Fig. 17. The cervix is slightly constricted in its mid-region. A rather wide, moderately sclerotized area which may represent the atrium tapers from the apex.

Amblyseiopsis floridanus Muma, 1955. Fig. 18. The cervix gradually tapers in its basal third and is cylindrical in its distal two-thirds; the apex is blunt. This structure remains quite constant in our material from Arizona, California, and Oregon.

Typhlodromus (A.) finlandicus ? (Oud., 1915). Fig. 19. In California specimens the cervix is long, slender and of nearly uniform caliber, unlike that of the species illustrated by Dosse. Records of *T. finlandicus* from this area are either in error, or our most prevalent species is undescribed. The cervix is illustrated as it is normally seen, and as it infrequently appears.

Amblyseius limonicus Garman, 1956. Fig. 20. The cervix is long and slender, apically terminating in a blunt knob. A duct connects the cervix to a sclerotized, semicircular structure. The latter is assumed to be the atrium although the origin of the minor duct has not been established.

"Amblyseiopsis reticulatus" Garman, 1956. Fig. 21. The short, conical cervix with a blunt apex separates this species which superficially resembles *A. fragariae.* Since this species should be placed in the subgenus *Amblyseius,* as defined by Chant, the homonym resulting from this transfer will necessitate the renaming of this species.

Typhlodromus (A.) similis (Koch, 1839). Fig. 22. The specimens examined, in which the cervix gently tapers to a large, rounded atrium, are probably *T. similis.* If so, there is a question as to the identity of the species considered to be *T. similis* by Dosse.

Blattisocius tineivorus (Oud., 1929b). Fig. 23. The cervix tapers to a point from which both ducts appear to originate.

Phytoseius plumifer (C. & F., 1876). Fig. 24. The cervix becomes constricted forming a short, narrow tube with a small apical swelling. At the apex there is a thinly sclerotized, spindle-shaped structure which may be the atrium.

Phytoseiulus macropilis (Banks, 1905). Fig. 25. In this species the spermatheca is similar to *P. plumifer.* The cervix is longer and the structure which may be the atrium is more distinctly connected to it.

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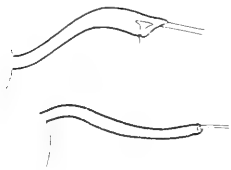
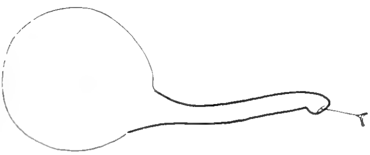
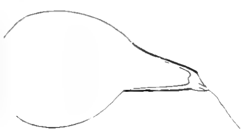


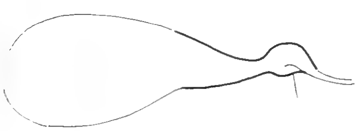
19 finlandicus ?



20 limonicus

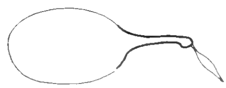


21 "reticulatus"

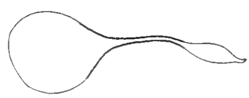


22 similis

23 tineivorus



24 plumifer



25 macropilis

17 μ

Figs. 19, 22, spermathecae of *Typhlodromus* (*Amblyseius*); fig. 20, *Amblyseius*; fig. 21, *Amblyseiopsis*; fig. 23, *Blattisocius*; fig. 24, *Phytoseius*; fig. 25, *Phytoseiulus*.

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BOOK NOTICE

A DESCRIPTION AND CLASSIFICATION OF THE FINAL INSTAR LARVAE OF THE ICHNEUMONIDAE, by J. R. T. Short. Proceedings of the U. S. National Museum, vol. 110, no. 3419, pp. 391-511; 64 figs.; 1959. U. S. Government Printing Office, Washington, D. C.

A NEW SPECIES OF ACONTIA OCHSENHEIMER FROM CUBA

(LEPIDOPTERA: NOCTUIDAE)

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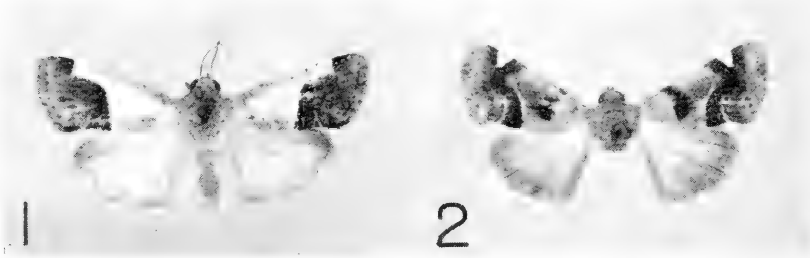
A male of an undescribed species of *Acontia* Ochsenheimer from Santiago de Cuba, Oriente, Cuba, has been in the collection of the United States National Museum for many years. William Schaus compared the specimen with other species of the genus in the collection of the British Museum (Natural History) in 1925. He concluded that the species was not represented in that collection but he did not describe it. Seven more specimens, four males and three females, are now available for study through the kindness of Ing. Fernando de Zayas Munoz, Jefe, Seccion Sanidad Vegetal, Ministerio de Agricultura, Habana and Pastor Alayo Dalmau, Santiago de Cuba. The species is named and described as follows:

Acontia isolata, n. sp.

(Figs. 1-4)

Head with proboscis well developed; labial palpi small, oblique, reaching about to or slightly exceeding ventral margin of frons, third segment short (0.25 mm.), clothed with small dark scales, first and second segments longer (0.40 mm.), subequal, clothed laterally and ventrally with larger, looser, pale-colored scales; frons rather bulbous, exceeding anterior margin of eye about one-fourth length of eye, rather rough, depressed before slightly porrect ventral margin; eyes large (width [frontal aspect] half again as wide as frons), naked, hemispherical; ocelli present, moderately large, adnate to dorsal margin of eyes caudad of antennae; antennae filiform, spiculate ventrally and laterally, the spicules larger on apical segments. Vestiture of head, patagia, tegulae and thorax of broad, light brown or gray, pale-tipped scales. Abdomen yellowish brown, the scales at the caudal margin of segments paler than others; dorsal tufts absent; well-developed coremata present on seventh segment. Pectus clothed with large pearlaceous scales and sparse, long, fine white hairs; tympanum rather large, shielded dorsally by an alular fan of broad pearlaceous scales; legs normal, inner tibial spurs long, at least twice as long as width of tibia or length of outer spurs, hind legs nearly white, mid legs pale, flecked with brown scales, fore legs mostly dark brown except white ventral portion of femora and apices of tarsal segments. Forewing triangular, 10 mm. in length; costa nearly straight, slightly convex basally and apically; termen more or less evenly curved; inner margin slightly sinuous, convex basally, concave distally; R_1 free, from near middle of cell; R_3 from R_2, anastomosing with R_{4+5} to form small, triangular areole; R_3 and R_4 stalked, the stalk connate with R_5 at apex of areole; M_1 from slightly below areole; M_2, M_3 and Cu_1 from near lower angle of cell; Cu_2 from apical third of cell; a transparent, oval fovea present between anal veins near base of wing in males. Hind wing with $Sc + R_1$ adnate with cell to near middle; Rs and M_1 connate at upper angle of cell; M_2 very weak, from shortly above lower angle of cell; M_3 and Cu_1 stalked from lower angle of cell.

Pattern of maculation of dorsal surfaces of wings dissimilar in the two sexes. *Male* (Fig. 1): Basal half of forewing white, suffused with gray, the degree of suffusion variable, white coloration of basal area extending distad between costa and vein R_5 to apical fourth of wing, abruptly truncate at end; distal half of forewing mostly ferrugineous; antemedial band nearly obsolete, when present, appearing as vague, outward-curved white line; ordinary spots obsolete; postmedial band vague, limited basally between vein R_5 and inner margin by line of demarcation between light and dark portions of wing, the outer line formed between costa and R_5 by line of demarcation between light and dark areas followed by an irregular black line between R_5 and fold and by an outward-concave fine white line between fold and inner margin; an irregular ferrugineous shade present immediately distad of postmedial band in subterminal area; a series of



Acontia isolata, n. sp., photographs of adults: Fig. 1, male; fig. 2, female. Approximately two times natural size.

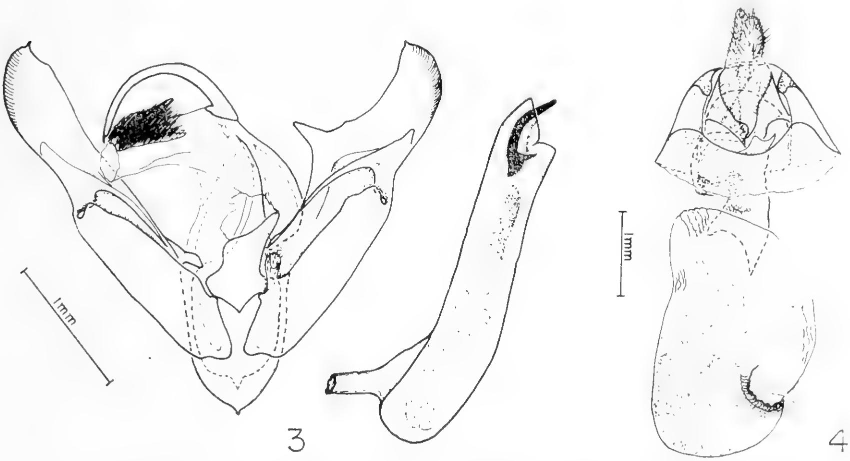
small black terminal points present; fringe dark gray. Hindwing mostly white, but clothed with long yellow hairs; heavily suffused with fuscous along costa, less heavily suffused with fuscous along termen and on apices of the veins; fringe yellowish flecked with gray near margin of wing.

Female (Fig. 2): Basal half of forewing dark gray; ordinary spots absent; antemedial band a dark, nearly black, outwardly convex line extending from costa to fold, slightly broader in fold; postmedial band defined basad between M_2 and inner margin by an incurved white line, central portion of postmedial band dark olivaceous brown between costa and Cu_1 then ferrugineous to inner margin, outer elements of postmedial band consisting of a white wedge-shaped spot on costa to R_5 continued as an irregular black line between R_5 and Cu_1 and finally as a white outwardly concave line from Cu_1 to inner margin; subterminal line vague, irregular, ferrugineous in color; fringe and terminal portion of wing gray, black terminal intervenular points present. Hindwing yellowish, suffused with fuscous, marginal band wider and more distinct than in males.

Ventrally both sexes mostly pale yellow or yellowish brown, a patch of dark brown scales at end of cell, fringe of forewing dark grey.

Male and female genitalia specifically distinct. Male genitalia (Fig. 3) asymmetrical, costa of right valve with a spur-shaped process near middle; aedeagus with a large digitiform cornutus. Female genitalia (Fig. 4) with sternites of eighth segment uniting to form dorsal part of ostium; vagina enlarged, expanded to the left; ductus bursae moderately short, stout, twisted and sclerotized; bursa copulatrix large, a small, wartlike lobe near anterior third of right side; ductus seminalis arising from wartlike lobe.

Type, male, Santiago de Cuba, Oriente, Cuba, type number 64399, and one female paratype, Daiquiri, Oriente, Cuba, May 1955, F. de Zayas, in the United States National Museum, Washington, D. C. One male paratype, Buenos Aires, Las Villas, Cuba, July 1953, F. de Zayas; one male paratype, "Peninsula de Guanacahabibes" [Peninsula de Guanahacabibes] Pinar del Rio, Cuba, July 1955, F. de Zayas; one female paratype, C. de Jagua, Cienfuegos, Las Villas, Cuba, June 1954, F. de Zayas; and one male and one female paratypes, Daiquiri, Oriente, Cuba, May 1955, F. de Zayas, in the personal



Acontia isolata, n. sp., male and female genitalia: Fig. 3, ventral view of male genitalia, aedeagus removed and shown to one side; fig. 4, ventral view of female genitalia.

collection of Mr. de Zayas, Habana, Cuba. One male paratype, "37," in the personal collection of Mr. Alayo, Santiago de Cuba, Cuba.

Acontia isolata, n. sp., belongs to the group of species containing *Acontia dacia* Druce and *Acontia terminimaculata* (Grote). Both sexes are readily separated from those species, however, by the shape of the white markings of the costa of the forewing. The male genitalia of *isolata* differs from those of *dacia* and of *terminimaculata* in that there is no process on the costa of the left valve in *isolata* and the cornutus is single, not double as in those species. The female genitalia are similar to those of *dacia* and *terminimaculata,* but differ in the shape of the parts forming the ostium, the expanded vagina, and the abdomen lacks lateral membraneous scale pouches on the seventh sternite. Illustrations of the adults and figures of the genitalia of *dacia* and *terminimaculata* appear in my paper published in the Journal of Economic Entomology, vol. 48, no. 5, pp. 599-601, 1955.

CRYPTOCHETUM NIPPONENSE (TOKUNAGA), A PARASITE OF DROSICHA CORPULENTA (KUWANA) IN JAPAN

(Diptera: Cryptochetidae and Homoptera: Margarodidae)

Recently Foote and Arnaud reported upon *Cryptochetum nipponense* (Tokunaga) in these Proceedings (60(6):241-245, 1958). The unknown host was presumed to be a monophlebine coccid (family Margarodidae). Because of the pestiferous habits of the adult fly it was suggested that these be considered before introducing it into new areas for purposes of biological control. C. P. Clausen's host information (Entomophagous Insects, pages 409-410, 1940) on a *Cryptochetum* sp. in Japan was overlooked in the 1958 paper. In Clausen's reference, *Cryptochetum* sp. is reported as a parasite of *Drosicha corpulenta* and other coccids of that genus. It appears likely that the *Cryptochetum* sp. reported by Clausen and the *Cryptochetum nipponense* (Tokunaga) reported by Foote and Arnaud are the same. A new rearing record of *C. nipponense* which is reported below, from *Drosicha corpulenta* on Shikoku Island, substantiates this belief.

From specimens of *Drosicha corpulenta* (Kuwana) collected at Higashino-chō, Matsuyama, Ehime Prefecture, Shikoku Island, on *Quercus* sp., T. Tachikawa reared a male and female of *C. nipponense* on May 2, 1956. This pair, determined by Sasakawa, is deposited in the collection of the Entomological Laboratory, Kyoto Prefectural University.

With this knowledge a search was made on April 28, 1959, by Sasakawa at Hozu (Arashiyama) Valley, Kyoto Prefecture, Honshu Island. *Drosicha corpulenta* occurred abundantly on *Quercus acutissima* Carruthers, but no larvae or pupae of the fly were found or reared, although adults were observed flying about the oak trees. Even though the immature stages of *Cryptochetum* were not found, two other insect associates were collected. The larval stage of *Rodolia limbata* Motschulsky (Coleoptera: Coccinellidae, det. M. Sasakawa) was observed feeding upon, and a parasite, *Metaphycus* sp. (Hymenoptera: Encyrtidae, det. T. Tachikawa) was reared from the margarodid.

Dr. Clausen, in a letter dated April 22, 1960, reports the coccinellid might be considered at times as an external parasite. In Japan he had a number of these under observation and quoting from his letter ". . . quite frequently the first-instar larva attached itself to the body of the mature *Drosicha* female and completed its larval development upon that single individual. This is understandable inasmuch as there is enough food material in the single *Drosicha* female to provide the needs of a number of the coccinellid larvae."

The original orthography of Rondani's generic name *Cryptochetum* is used. Acknowledgment of aid, with thanks, is extended to C. P. Clausen, Richard H. Foote, and T. Tachikawa.

—M. Sasakawa, *Entomological Laboratory, Kyoto Prefectural University, Kyoto, Japan*, and P. H. Arnaud, Jr., *Department of Entomology, California Academy of Sciences, San Francisco.*

FORBESOMYIINI, A NEW TRIBE OF GALL MIDGES
(DIPTERA: CECIDOMYIIDAE)

A. EARL PRITCHARD, *University of California, Berkeley*

The genus *Forbesomyia* is known only from Malloch's (1941) meagre description and crude drawings of the wing and antenna of the type. Malloch referred to this genus as related to *Scatopse* Geoffroy, then included by him in the Bibionidae, but he stated that it was very difficult to locate properly in any of the families. Edwards (1930) considered *Forbesomyia* to belong to the Scatopsidae, but he had not studied a representative of the genus.

Forbesomyia is based on a single species, *F. atra* Malloch, and only females have been collected. The relationships of the genus can be demonstrated with more clarity when the male sex or the larva is known. In the meantime it is desirable to redescribe the midge, propose for it a suprageneric category, and indicate that it probably belongs to the gall midge subfamily Lestremiinae.

Dr. Richard H. Foote called my attention to the possibility that *Forbesomyia* may belong to the Cecidomyiidae and kindly sent me specimens from the U.S. National Museum. Dr. Edwin F. Cook, University of Minnesota, very kindly compared this species in considerable detail to the scatopsids.

Forbesomyiini, new tribe

With the characters of the genus.

Genus **Forbesomyia** Malloch

Forbesomyia Malloch, 1914, Bul. Ill. State Lab. Nat. Hist. 10 (4): 234; Edwards, 1930, Dipt. Patagonia So. Chili, 2 (3): 93; Tollet, 1959, Bul. Ann. Soc. Roy. Ent. Belg., 95 (5-6): 137. Type of genus: *Forbesomyia atra* Malloch, by original designation and monobasic.

Head orbicular. Eyes bare, confluent dorsally by a short, narrow bridge. Ocelli three. Palpus with four segments, bearing only tactile setae; first segment with a deep sensory pocket. Antenna of female with 2 + 6 segments; pedicel moderately enlarged; first flagellar segment with a short but distinct proximal stem, the second to fifth segments sessile, broader than long, the sixth segment about as long as broad; each flagellar segment except last with several short tactile setae. Many slender sensory setae distally except on inner face, and a deep, open pocket of sensory setae on outer distal margin; terminal segment with scattered sensory setae only. Legs with microchaetae and numerous tactile setae; tibiae each with a row of about 12 short ventrodistal spines; tarsus with five segments, the first nearly twice as long as the second; claws simple, slightly curved; empodium absent. Wing (fig.1) membrane with very fine microtrichia only; C extending around wing except for distinct break at end of R_5; h absent; Sc present; R_1 very short, strong; R_s obliterated; R_5 strong, very short, close to R_1 and united with it terminally; stem of medial fork very short, M_1 being strong and reaching anterior margin of wing, and M_2 faint and reaching margin before apex of wing;

M_{3+4} strong and free, being evanescent proximally; Cu strong, unbranched, sigmoid; PCu present, free; Pl faint. Female with two circular, pigmented spermathecae; first segment of lamellae of ovipositor fused with tergum of tenth segment.

Although the wing venation of *Forbesomyia* resembles that of *Scatopse*, other morphological features show the relationship to be quite distant. The eyes of *Forbesomyia* are bare; the ovipositor is slender, with two-segmented lamellae; and the membranous areas of the abdomen are smooth. *Forbesomyia* further differs from the Scatopsidae in that the costa is continuous around the wing (except

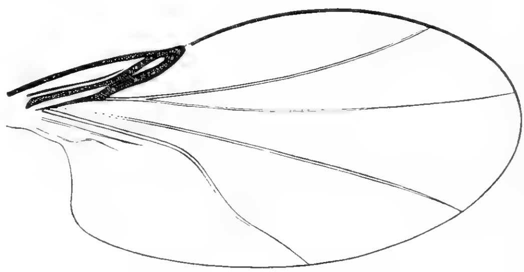


Fig. 1. Wing of *Forbesomyia atra*.

for a break at the end of R_5), the microchaetae on the wing membrane are very minute, the empodium is absent, the flagellar segments are sessile and without complete whorls of setae, the mesonotal phragma is comparatively small, and there are two spermathecae. All of these characters may be found in the Lestremiinae. Moreover, the four palpal segments and the sensory pockets of the female flagellum are characteristic of certain members of the Lestremiinae, and the ventrodistal spines on the tibiae are also characteristic of the lestremiine genus *Acoenonia* Pritchard.

The wing venation of *Forbesomyia* is distinctive in that the branches of the radius (R_1 and R_5) are very short and the very long anterior branches of the media (M_1 and M_2) both terminate on the costal margin of the wing.

Vein M_{3+4} is distinct but free as in some lestremiine tribes and the Scatopsidae. This vein is the same as that referred to as Cu_1 in part by Enderlein (1911, 1929) and Edwards (1938), and as M_4 in part by Hennig (1954). Pritchard (1947, 1953, 1958) presented reasons for considering M_{3+4} to be distinct from Cu_1, a branch near the middle of the cubitus that is often found in the Cecidomyiidae. Vein M_{3+4} arises from M in the lestremiine tribe Catotrichini, and it is often found concurrently with Cu_1 in the Cecidomyiinae.

Vein Cu is simple and sigmoid as in some members of the lestremiine tribe Catochini and in the Scatopsidae. PCu is present and free as in some lestremiine tribes, but not the Scatopsidae.

Forbesomyia atra Malloch

Forbesomyia atra Malloch, 1914, Bul. Ill. State Lab. Nat. Hist. 10 (4): 235. Type: female, Urbana, Illinois; in the collection of the Illinois State Natural History Survey.

Specimens examined.—1 female, Friday Harbor, Washington, July 9 (J. M. Aldrich); 1 female, Kaslo, British Columbia, June 22 (R. P. Currie); and 1 female, Hamilton Lake, Revalli Co., Montana, September 17, 1932 (C. B. Philip). An additional female, studied by Edwin F. Cook, is from Urbana, Illinois, June 13, 1915, at window.

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A NEW GENUS IN CYNIPOIDEA

(HYMENOPTERA)

Among some Cynipidae from Panama sent to the U.S. National Museum by Mr. Carl W. Rettenmeyer of the University of Kansas were some specimens which represent a new genus.

Emargo, n.g.

Differs from all other genera in the Figitinae in having the forewings deeply emarginate. Scutellum rounded behind, with a median depression at base. Head massive, broader than thorax; last segment of antennae not enlarged. Abdomen sessile, almost as long as head plus thorax, tergite II with pubescent patches at base. With a rounded wing it would run near *Lonchidia* Thomson. Monobasic.

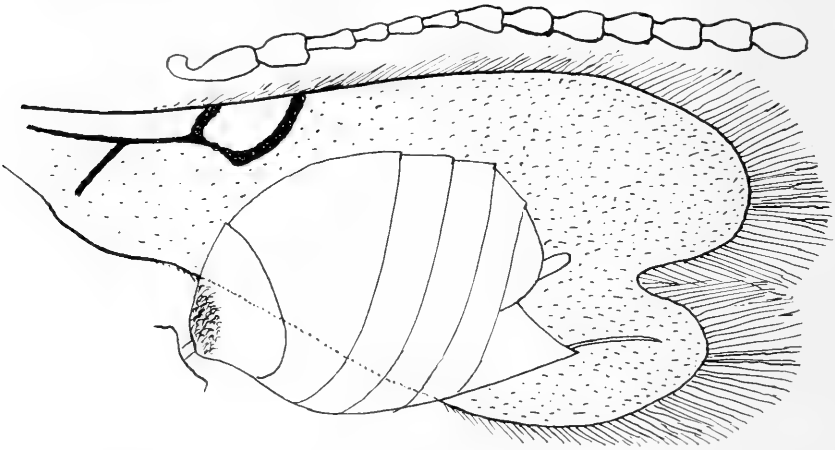

Fig. 1. *Emargo eciton*, n. sp. Antenna, wing, abdomen of female.

Emargo eciton, n. sp.

Female (Fig. 1).—Black. Head smooth, bare, cheeks not broadened behind eyes. Antennae 13-segmented, second stoutest, last 7 forming an indistinct club. Pubescent patches on sides of pronotum. Mesonotum and mesopleura bare, smooth; parapsidal grooves fine. Scutellum disk smooth, bare, tapering behind. Wings pubescent, long-ciliate distally, radial cell small, open. Hind wings narrow. All tibiae stouter distally. Propodeum richly pubescent. All tergites visible in side view. Length 0.6-0.85 mm., average 0.73 mm.

Types.—U.S.N.M. Type No. 65148. Paratypes in British Museum, Paris, Bishop Museum, and Snow Entomological Museum at the University of Kansas.

Described from 16 specimens taken from Jan. to Mar. 1955 or 1956 at Barro Colorado Island, Canal Zone, Panama by Carl W. and Marian E. Rettenmeyer. All specimens were taken by Berlese funnel extraction of material from refuse deposits of the army ant, *Eciton burchelli* (Westwood). Presumably the host is one or more flies (Phoridae, Muscidae or Sarcophagidae) commonly found in refuse deposits.

Congeneric are a specimen from Cordoba, Mexico (now without head), May 1, 1900 (Dr. A. Fenye), and one from Saipan, Marianas Islands, Nov., 1948 (R. L. Doutt).

—LEWIS H. WELD, *Arlington 13, Va.*

INNERVATION AS A CRITERION OF HOMOLOGY OF THE ELEMENTS OF THE LARVAL AND PUPAL CHAETOTAXY OF MOSQUITOES

(DIPTERA, CULICIDAE)

The constancy of the chaetotaxy pattern in the different instars of the immature stages throughout the family Culicidae (in the broad sense) suggests that this chaetotaxy is of monophyletic origin and consists of elements that are homologous phylogenetically as well as ontogenetically and in part serially. Attempts to homologize the chaetotaxy have been hampered by the complexity of the pattern and the lack of reliable direct criteria. In the course of recent studies on the mosquitoes of the South Pacific, I have seen several slides of prepupal fourth instar larvae in which nerve connections between the external hairs of the fourth instar and the internal developing hairs of the pupa show very clearly. These connections provide for the first time an absolute criterion of ontogenetic homology of the elements of the mosquito chaetotaxy and demonstrate the sensory nature of the hairs. It is well known that setae and various other cuticular modifications in insects are connected to distal filaments of sensory neurones to form sensilla of different types. Wigglesworth (Q. J. Micros. Sci. (n.s.) 94: 93-112, 1953) showed that the cuticular portions of some sensilla in *Rhodnius* are reformed in successive instars by the identical tormogen and trichogen cells which formed the preceding sensillum and that the new sensillum is innervated by a branch from the distal filament of the original sensory neurone. Owing to this relationship of the sensory filament the sensillum of the older instar remains functional while the new sensillum of the following instar is being formed under the loosened cuticula. In mosquitoes there is a dramatic change in morphology between the fourth instar larva and the pupa but the majority of the sensilla are carried over from the larva to the pupa as shown by the nerve connections. Owing to differential growth of the integument of the pupa the new sensilla come to occupy very different positions from those of the larva but retain the nerve connection by elongation of the original branch of the distal sensory filament. The different sensilla develop at different times and this allows for shifts in position which can be clearly seen in the crossing of filaments from different sensilla. Common innervation thus demonstrates the ontogenetic homology of individual hairs beyond any question from the first instar larva to the pupa. Serial homology and phylogenetic homology of the chaetotaxy, of course, cannot be proved in this manner but the similarity in the pattern on the abdominal segments is strongly suggestive of serial homology, and the constancy of the pattern on all body regions throughout the family likewise probably indicates phylogenetic homology. A reinterpretation of the homology of the larval and pupal chaetotaxy based on innervation is presented in a forthcoming publication on the mosquitoes of the South Pacific (Univ. of California Press).

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ARTHUR BURTON GAHAN
1880—1960

With the sudden death of Arthur B. Gahan on May 23, 1960, the Entomological Society of Washington lost one of its oldest and staunchest members. He was elected to membership in 1907, and until a few years before his death he attended the meetings very regularly and participated actively in the discussions. From 1915 to 1918 he served as Recording Secretary. He was Vice-President in 1920 and 1921 and President in 1922, and as Retiring President he addressed the Society on "The role of the taxonomist in present-day entomology." In 1958 he was elected an Honorary Member.

Mr. Gahan was born December 9, 1880, on his parents' farm three miles from Manhattan, Kansas. He was one of a large family, having six brothers and two sisters; and he lost his mother when he was seven. He attended the local public schools and after completing his high-school training he attended Kansas State College in Manhattan, walking the three miles back and forth daily. During the summers he worked in the Kansas wheat harvests. He received the B.S. degree from Kansas State College in 1903, and in 1904 he left for College Park, Maryland, to accept an assistantship in the Department of Entomology at the Maryland Agricultural College. Upon his arrival, and even before he had had an opportunity to look for living quarters, Professor T. B. Symons, Head of the Department of Entomology at that time, told him that he himself had to visit the Eastern Shore of

Maryland to look into an urgent insect problem, and that young Gahan should take over his class that afternoon. So, with no preparation at all, Gahan began his teaching. Possibly it is unfortunate that he taught only a short time for he had the gift of clear expression and of developing a subject in a logical and easily understood fashion.

In 1906 Gahan received the M.S. degree from the Maryland Agricultural College, and he remained in the Department of Entomology there as Assistant Entomologist until 1913. It was during this period that he developed an interest in the taxonomy of the parasitic Hymenoptera, his first paper in this field being published in 1909. By this time he had begun an intensive study of the aphid parasites that comprise the braconid subfamily Aphidiinae, and in 1911 he published the first comprehensive treatment of the North American species of this group.

In 1913 he accepted an appointment as Assistant Entomologist in the Division of Cereal and Forage Insect Investigations of the then U.S. Bureau of Entomology, with assignment at the National Museum in Washington; and so began his long career of intensive work on the taxonomy of the parasitic Hymenoptera. During the early years of this appointment Gahan was compelled to cover nearly the entire field, and he published on the taxonomy of the Ichneumonidae, Braconidae and Proctotrupoidea as well as the Chalcidoidea. However, as other workers were added to the taxonomic section at the Museum he came gradually to concentrate his efforts on the Chalcidoidea, and he soon became widely recognized as one of the foremost specialists in this group. Among the more significant of his published contributions were an exhaustive study of the serphoid and chalcidoid parasites of the Hessian fly, published in 1933, and a precise work on the type species of the genera of the Chalcidoidea, which appeared in 1922.

Gahan visited Europe in 1927 and spent several months studying types of Chalcidoidea in European museums, including those in London, Paris, Vienna, Budapest, Berlin and Eberswalde (Germany).

On September 30, 1908, Gahan married Emily Bonnet. Throughout their married life they resided on what is now Berwyn Road in College Park, Maryland. Here Gahan was active in civic affairs, being for many years president of the Home and School Association of the Berwyn Elementary School and election supervisor; he was also an active member of the Berwyn Citizens Association. One of his hobbies was gardening, especially the growing of dahlias, gladioli and Amaryllis; and he was fond of sports. Although a quiet man and slow of speech, he had a dry wit and a surprising sense of humor that made him always a delightful companion. He is survived by his widow; a son, James B. Gahan, of Orlando, Florida; a daughter, Winifred, and a sister, Winifred Elizabeth both of the home address.

—E. N. Cory and C. F. W. Muesebeck

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SOCIETY MEETING

689th Regular Meeting, April 7, 1960—

President Paul W. Oman presided at the 689th regular meeting of ESW in the USNM, Room 43, on April 7, 1960, with 39 members and 20 visitors attending. The minutes for the 687th and 688th regular meetings were read and approved.

The names of seven candidates for membership were presented: *Edward K. Bender, Richard S. Casebeer, Samuel C. Dews, Wilbur R. Enns, Philip Luginbill, Jr., J. Douglas Rollow,* and *Ronald E. Wheeler.*

John Fales announced that the Annual Picnic will be held in the Log Lodge at ARS, Beltsville, Md., on Wednesday, June 8, at 6:00 p.m. Families and friends are invited.

President Oman reported on actions taken at the Executive Committee meeting on March 7th.

1. Approval of $100.00 as a contribution to the Joint Board on Science Education.
2. ESW acknowledgment of a communication from the Washington Branch of the American Society of Bacteriologists which expressed concern over possible abuses of the Science Fair Program.
3. ESW has agreed to act as Custodian of a new publication by Lewis H. Weld, ''Galls of the Eastern United States.'' ESW will receive one-half of the proceeds during the life time of the author, and total proceeds after his death.

Harold H. Shepard discussed the affiliation between ESW and the Washington Academy of Sciences. There are 53 members of ESW who are also members of WAS. Dr. Shepard serves as a vice president of WAS, and as chairman of the Committee on By-laws for the Academy.

William Anderson reported attending the meeting of the Georgia Entomological Society on the campus of the University of Georgia, Athens, on March 30 and 31. The GES has a membership of 150. Some 120 members and guests attended the meeting in the new Science Center. From the P. W. Fattig Scholarship Fund, which was established to offer scholarships to two majors in entomology, the first scholarship was awarded this year. The recepient was Miss Nancy Jane Craft.

Reece I. Sailer read a letter received as regular office correspondence (USDA, ARS) from a layman (an M.D.) describing the habits and appearance of a reduviid bug. The description was quite detailed and very humorous as compared to the frequently stilted descriptions by entomologists.

Clyde S. Barnhart showed a picture of a Korean boy collecting insects for his school. The insect net was unique in being made of spiderwebs.

Principal speakers for the evening were Karl V. Krombein and Louis G. Davis, both of ARS, USDA. Dr. Krombein presented ''Nesting Habits of Some Southwestern Wasps and Bees,'' a talk based on observations made July 17-31, 1959, during residence at the Southwestern Research Station near Portal, Arizona. He discussed four species that nested in artificial borings in wood. Three of these were megachilid bees, *Ashmeadiella occipitalis* Mich., *Megachile policaris* Say and *Anthidium maculosum* Cr.; and one was a sphecid wasp, *Isodontia elegans* (Sm.). He also reported on two ground-nesting, sphecid wasps that preyed on weevils, *Cerceris f. frontata* Say and *Eucerceris triciliata* Scul. He illustrated his talk with Kodachromes of the nests and of the environment in which the studies were made.

Mr. Davis presented the ''Insect Survey Detection Operation—Past and Present'' in a very interesting and provocative manner. The value of insect surveys as a basis for guiding research, control, quarantine, or eradication operations has long been recognized by Federal, State, and commercial entomologists. Guided by the American Association of Economic Entomologists, the first voluntary cooperative State-Federal insect reporting service was inaugurated in 1921 in the Federal Bureau of Entomology. The program was revitalized in 1950 in the Bureau of Entomology and Plant Quarantine, but the Section was moved to the Plant Pest Control Division in 1953. The official publication, *Plant Pest Survey Bulletin*, was changed to the weekly *Cooperative Economic Insect Report* in 1951. It is mailed to approximately 3,000 readers. Therein are published all of the important insect distribution notes and other survey information furnished by nearly 700 cooperators to the state clearing houses in 50 states. The survey office also publishes information about insects not known to occur in the United States, insect surveys, and insect distribution in the form of maps. The survey operations have benefited materially from advice and council provided by the advisory committee on surveys established by the Entomological Society of America in 1951. In 1953 Federal survey funds were made available through cooperative agreements to pay part of the cost of survey entomologists. As many as 30 states have participated. The aims of the survey program include distribution of insect activity information to aid farmers in protecting their crops from insect damage, aid equipment and insecticide manufacturers to spot supplies, aid with the detection of newly introduced pests, develop a pest forecasting service, develop uniform reporting methods, assist with assembly of insect loss data, maintain insect records, and to provide a reporting procedure in the event of biological warfare.

Visitors introduced were: *Mr.* and *Mrs. Daley D'O. Albuquerque* of Brazil, *Dr. K. Princis* of Sweden, *Dr. Avery S. Hoyt*, *Mr. Tom Henry*, *Mrs. S. A. Rohwer*, *Mr. Greg. G. Rohwer*, and *Dr. Richard M. Thompson*.

The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, Recording *Secretary*.

PUBLICATION DATES

The date of publication of Vol. 62, No. 2, of the *Proceedings* was 5 July 1960. The date of publication of Vol. 62, No. 3, will be found in Vol. 62, No. 4.

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Vol. 62 DECEMBER, 1960 No. 4

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of the
ENTOMOLOGICAL SOCIETY of WASHINGTON

U. S. NATIONAL MUSEUM
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Members shall be persons who have demonstrated interest in the science of entomology. Annual dues for members are $5.00; initiation fee is $1.00 (U. S. currency).

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Vol. 62 DECEMBER, 1960 No. 4

NOTES ON SAPROGLYPHID MITES ASSOCIATED WITH SOLITARY WASPS

(ACARINA: SAPROGLYPHIDAE)

EDWARD W. BAKER and FREDERICK CUNLIFFE[1]

This paper is an introductory study to certain saproglyphids found associated with solitary wasps, and is by no means to be considered as a definitive work. A comprehensive review of the group will take years and much more collecting and study. The information here presented has been made possible by the studies on the biology of the solitary wasps by K. V. Krombein, of the U. S. Department of Agriculture. All the mites mentioned in this paper were removed from nests under study or collected from wasps in the U. S. National Museum by Dr. Krombein. The information gathered indicates that each wasp is parasitized by its own species of mite. Although the specific characters separating these mites species are small, they are constant within the small series studied, especially in the hypopial nymphs which a collector almost invariably encounters. Adults are at present little known, and the characters found useful in other groups for species differentiation are, in these mites, of little use. It is possible that in the evolution of these mites there has been little differentiation because of the close similarity of the habitats on the wasps and in the nests.

Too few species are available to develop a satisfactory systematic arrangement, or to determine if an arrangement might follow the one accepted for the wasps. The structure of the ventral apodemes of the hypopi separates the mites into groups. However, the apodemes may be of secondary importance, and other more minute characters may be of greater importance in interpreting evolutionary trends.

Generic and specific characters in the hypopi are to be found in the location of the eyes, in the structure of the ventral apodemes, in some cases in the structure of the suctorial plate and its discs, in the leg setation, and in the type of tarsal appendages. Descriptions are difficult and figures should be referred to for specific determinations.

There has been very little previous work. Vitzthum (1925), and Cooreman (1942, 1954) each has described a genus and species. Zachvatkin (1941) in a very comprehensive paper described and gave keys to the mites in this and related groups. Cooper (1955) has discussed

[1] Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.; and Pinellas Foundation, Inc., respectively.

venereal transmission of hypopi from male to female wasps. Hughes and Jackson (1958), Turk and Turk (1957), and Scheucher (1957), have discussed sarcoptiform mites that possess hypopial stages.

A key to the families of sarcoptiform mites may be found in Baker *et al* (1958). The family Glycyphagidae, as defined by Zachvatkin, included several subfamilies, some of which should be raised to family status, giving us the Labidophoridae, the Chaetodactylidae, the Chortoglyphidae, and the Carpoglyphidae. We are concerned here only with the Saproglyphidae with the hypopial stages. These hypopi are active; they have sucking discs, short, stout legs, with tarsi and tibiae III and IV short and stout, with long, strong pretarsi bearing empodial claws (the pretarsus and claw may be missing on leg IV), and with the gnathosoma missing, being represented only by setae.

The adults may be described as follows: The genital opening of the female is large, triangular, longitudinal, with well-developed genital discs. These discs are relatively large in the free-living forms such as *Czenspinskia*, and small in those associated with wasps. The caruncles are broadly connected to the tarsus, not stalked, elongate; the empodial claw lies free in the caruncle, not being connected to the tarsus by small rods; the skin is smooth or striate; the body setae are smooth. Most of the mites are small, but those found on wasps are large. Many saproglyphids are free living, and it is possible that a detailed study will show enough differences between those associated with wasps and those that are free living to separate them into two groups.

Key to the Genera of Saproglyphid Hypopi

1. Without well-developed gnathosoma 2
   With well-developed gnathosoma; with eyes **Calvolia** Oudemans, 1911
2. Tarsus IV sharp distally 3
   Tarsus IV blunt distally and with terminal setae **Vidia** Oudemans, 1905
3. Tarsus IV with pointed distal tip, but without thornlike process 4
   Tarsus IV with pointed tip; tarsus III and IV each with a thornlike process .... **Ensliniella** Vitzthum, 1925
4. Small seta of tarsus IV minute, spinelike; gnathosomal setae long 5
   Small seta of tarsal IV relatively large, broad, lanceolate; gnathosomal setae short .... **Kennethiella** Cooreman, 1954
5. Coxal apodemes III-IV not meetng medially **Monobiacarus**, new genus
   Coxal apodemes III (when complete)-IV meeting medially .... **Vespacarus**, new genus

Monobiacarus, new genus

Adult.—In the known adults of both sexes, all body setae slender, whiplike; venter with two pairs of genital setae, three pairs of anal setae, and *two* pairs of ventral setae; body globose, legs relatively small.

Hypopus.—Dorsal body setae short, propodosomal setal bases not in straight line but in a gentle arch; gnathosomal setae long, ventral pair far surpassing in length the other pair and reaching well past the margin of the body, lateral pair missing; integument in this and other genera discussed, striate, punctate; eyes on anterior margin of body; apodemes I not fused with apodemes II; apodemes III and IV not meeting medially, but separated by only a short distance; tarsus IV sharp distally, the setae arising from below the apex of the segment; small seta of tarsus IV long, lanceolate; a small spinelike fifth seta present; tarsus III with one long whiplike seta, four large lanceolate setae, and a short seta; tarsus III blunt distally, and the pretarsus arises from the apex; true (functional) suckers on suctorial plate small, smaller than discs.

Type.—*Monobiacarus quadridens,* new species. Type by original designations.

Monobiacarus quadridens, new species
(Figs. 1-8, 11, 111)

Female.—This is the only species in the genus in which males and females are known. The female is figured and has been briefly described in the generic description. It is a large mite, being 1450 μ long.

Male.—The male is similar, but with a smaller body measuring 770 μ in length; the legs and body setae appear relatively long.

Hypopus.—Body broadest at middle, tapering posteriorly. Eyes anterior dorsal-lateral, separated by a distance subequal to the width of each; gnathosomal setae of normal length, as figured. Apodemes III and IV as figured. Tarsus IV with three long whiplike setae, one being abruptly attenuate near its base, one short spinelike seta, and one swordlike seta of medium length and of equal strength throughout; tibia IV with spinelike seta of medium length and rodlike sensory seta barely discernible, seen only as a dark mark. Tarsus III with empodial claw with inner basal protuberance, with four large lanceolate setae, one long whiplike seta, and a short spinelike seta; tibia III with a tactile seta of medium length and a sensory seta about one-third longer. Length 255 μ.

The position of the eyes and the setal pattern of tarsus IV are distinctive in the hypopial stage.

The holotype hypopus, U. S. National Museum No. 2568, and 9 paratype hypopi were collected at Kill Devil Hills, North Carolina, August 4, 1956. Other material examined was from nests collected at Lake Placid, Florida, as follows. Eleven females and one male, September 25, 1957; two females, January 28, 1958; three females, February 3, 1958 (these were collected from the genitalia of the male wasps). Six hypopi were taken from a nest January 28, 1958. All were associated with *Monobia quadridens* (L.). All material was collected in Washington, D. C.

Monobiacarus funebris, new species
(Figs. 13-16, 97, 109)

Male and female.—Not known.

Hypopus.—Body broadest at middle, similar to *M. quadridens.* Anterior margin of the propodosoma sharply rounded; gnathosomal setae long, as figured; anterior propodosomal setae of medium length; eyes separated by a distance subequal to one third of the width of each, located anteriorad and laterad on the propodosoma. Tarsus IV with three long whiplike setae—one much more slender than the others, a small spinelike seta, and a swordlike seta which expands from the base to the distal third and then tapers to a point; tibia IV with spinelike seta but no rodlike sensory seta, the base being all that remains. Tarsus III with the usual empodial claw with the basal thumb more hooklike than in the other two species, the four large lanceolate setae, the long whiplike seta, and a rodlike rather than spinelike small seta; tibia III with sensory seta only slightly longer than tactile seta. Length 293 μ.

The location of the eyes and the setal pattern of tarsus IV are distinctive.

The holotype hypopus, U. S. National Museum No. 2567, and 16 paratype hypopi were collected from *Monobia apicalipennis* var. *funebris* Grib., Santa Rosa, Veracruz, Mexico, August—(W. Schaus, colr.) (no other data given). Specimens were collected from the acarinarium at the base of the second abdominal tergite by K. V. Krombein, Washington, D. C., 1957.

Monobiacarus insularis, new species
(Figs. 9-12, 96, 110)

Males and Females.—Not known.

Hypopus.—Anterior margin of propodosoma rounded, eyes set anteriorly and separated by a distance subequal to one-fourth of the width of each. Gnathosomal setae as figured, the anterior propodosomals short. Apodemes III with anterior "horns" not as well developed as in other species. Tarsus IV with three long whiplike setae, two stout and one slender, one small spinelike seta, and a large flat swordlike seta which gradually tapers to a point; tibia IV with a spinelike seta but without a rodlike sensory seta, only the setal base remaining. Tarsus III typical for the genus, with four large lanceolate setae, the single long whiplike seta, but the "small spinelike" seta is strong and prominent; the sensory and tactile setae of tibia III are subequal and of medium length. Length 255 μ.

The hypopus is similar to that of *quadridens*, but differs in the location of the eyes, and in the setation of the leg.

The holotype hypopus, U. S. National Museum No. 2569, and 8 paratype hypopi were collected in Washington, D. C., by K. V. Krombein from the acarinarium of a male *Monobia angulosa var. insularis* (Ashm.) from San Rafael, Jicoltepec, Mexico (no other data given).

Ensliniella Vitzthum, 1925

Vitzthum, H. G., 1925, Eine neue Milbengattung und -art als Parasit von *Odynerus* (*Lionotus*) *delphinalis* Giraud 1866. Deutsch. Ent. Zeitschr. IV: 239-305.

Adults.—The adults are not recognizable in detail from the original figures, but they appear to be near *Vespacarus*, new genus. The hypopial forms must be used for generic differentiation.

Hypopus.—Dorsal body setae short except for the propodosomal humerals (DM5 of Hughes and Jackson); the setae bases of the propodosomals are so arranged that they almost form a square, the inner pair being far forward and only slightly closer together than the outer pair; gnathosomal setae short to long, the paired setae always long; eyes on anterior margin of body; apodemes I united, not connected with apodemes II which are free posteriorly; coxal apodemes III and IV united; tarsus III and IV each with thornlike process distally; tarsus IV with two long whiplike setae, one short spinelike seta, and a large flat lanceolate seta; tarsus III with four large lanceolate setae, one long whiplike seta, and a short spinelike seta; functional suckers of suctorial plate smaller than discs.

Type. Ensliniella parasitica Vitzthum, 1925. Monotypical.

Monobiacarus quadridens, new species. Fig. 1, dorsal view of female; fig. 2, ventral view of female; fig. 3, ventral view of hypopus; fig. 4, coxal apodemes III and IV of hypopus; fig. 5, dorso-anterior part of propodosoma of hypopus; fig. 6, ventral view of same region; fig. 7, tibia and tarsus III of hypopus; fig. 8, tibia and tarsus IV of hypopus.

Ensliniella parasitica Vitzthum, 1925
(Figs. 42-46, 100, 105)

Ensliniella parasitica Vitzthum, 1925. Eine neue Milbengattung und -art als Parasit von *Odynerus* (*Lionotus*) *delphinalis* Giraud 1866. Deutsch. Ent. Zeitschr. 4: 289-305. Cooreman, J. 1942. Notes et observations sur les acariens. II. Bull. mus. roy. hist. nat. Belg. XVIII (58): 1-12.

Adults.—Known only from figures by Vitzthum.

Hypopus.—Elongate, narrowing posteriorly. Eyes prominent, set very close together, almost touching, on anterior margin of propodosoma. Anterior propodosomal setae shorter than gnathosomals which are long and of equal length. Coxal apodemes III nearly straight on anterior margin and only slightly indented at median junction; apodemes IV form less than a 45 degree angle with each other; sternum reaches posteriorly past distal ends of apodemes IV. Apodemes VI contiguous with apodemes of suctorial plate. Tarsus IV with strong, blunt thornlike process, two long whiplike setae, one short spinelike seta, and a broad but distally attenuated seta about two times as long as thornlike process; setae on tibia IV of medium length, the sensory rod slightly longer than the tactile seta. Tarsus III with empodial claw, a strong blunt thornlike process, four large lanceolate setae, one long whiplike seta, and one short, spinelike seta; tibia III with tactile seta of medium length, and a sensory seta which is about three times longer. Functional suctorial discs smaller than in the other two species. Length 268 μ.

This species is similar to *aegyptiana* in the structure of the posterior coxal apodemes and those of the suctorial plate, but differs in that both pairs of gnathosomal setae are long and of equal length.

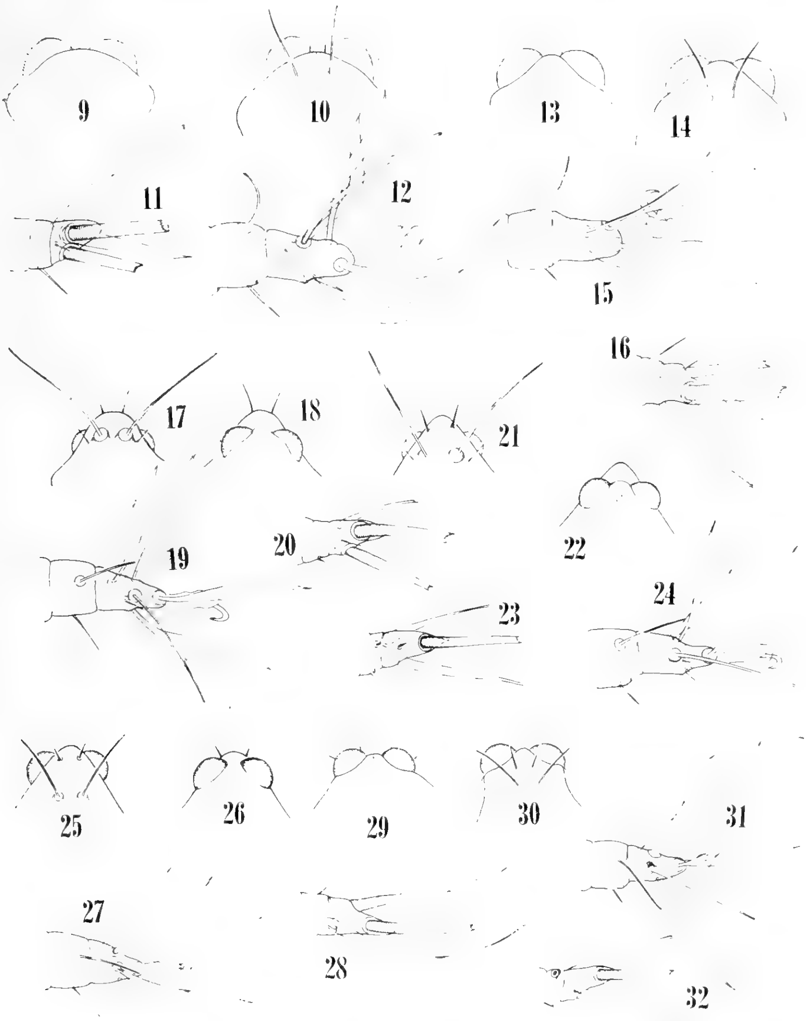
Six hypopi were collected in Washington, D. C., by K. V. Krombein, 1957, from *Allodynerus delphinalis* (Gir.), ♂, ♀, Lido, Vinezia, Italy, July 31, 1934 (A. Giordani Soika, colr.).

Ensliniella aegyptiana, new species
(Figs. 33-37, 98, 106)

Males and females.—Not known.

Hypopus.—The body is broadest medially, although this may be due to mounting and flattening. The eyes large, anterior and marginal, and separated by a distance subequal to one-third of the width of each. Anterior propodosomal setae short; the medial gnathosomal setae long, and the laterals short. Apodemes III and IV as figured, III indented medially (mounting may distort the appearance of this indentation); apodemes IV form more than a 45 degree angle with each other. Apodemes VI (see Hughes and Jackson) not connecting with apodemes of suctorial plate. Tarsus IV with a strong blunt thornlike process, with two long whiplike setae, with one short spinelike seta, and a broad, distally attenuate seta that is

Monobiacarus insularis, new species. Fig. 9, dorso-anterior part of propodosoma of hypopus; fig. 10, ventral view of same region; fig. 11, tibia and tarsus IV of hypopus; fig. 12, tibia and tarsus III of hypopus. *Monobiacarus funebris*, new species. Fig. 13, dorso-anterior part of propodosoma of hypopus; fig. 14, ventral view of same region; fig. 15, tibia and tarsus III of hypopus; fig. 16, tibia and



tarsus IV of hypopus. *Vespacarus rufovestis*, new species. Fig. 17, ventral view of anterior part of propodosoma of hypopus; fig. 18, dorsal view of same region; fig. 19, tibia and tarsus III of hypopus; fig. 20, tibia and tarsus IV of hypopus. *Vespacarus saecularis*, new species. Fig. 21, ventral view of anterior part of gnathosoma of hypopus; fig. 22, dorsal view of same region; fig. 23, tibia and tarsus IV of hypopus; fig. 24, tibia and tarsus III of hypopus. *Vespacarus pedestris*, new species. Fig. 25, ventral view of anterior part of propodosoma of hypopus; fig. 26, dorsal view of same region; fig. 27, tibia and tarsus III of hypopus; fig. 28, tibia and tarsus IV of hypopus. *Vespacarus vagus*, new species. Fig. 29, dorsal view of anterior part of propodosoma of hypopus; fig. 30, ventral view of same region; fig. 31, tibia and tarsus III of hypopus; fig. 32, tibia and tarsus IV of hypopus.

about three times as long as that on *parasitica;* tarsus III with an empodial claw, a small, sharp thornlike process, and the usual lanceolate whiplike setae; tibia III with the tactile and sensory setae similar to those in *parasitica,* the sensory seta being three times as long as the tactile. Length 248 μ

This species is easily separated from the other two in the genus in that the apodemes of the large disc of the suctorial plate are free and do not connect with the last apodeme of coxae IV.

The holotype hypopus, U. S. National Museum No. 2580, and eight paratype hypopi were collected in Washington, D. C., by K. V. Krombein, 1957, from *Allodynerus vinciguerrae* (Guiglia), ♀, Abu Suttan, Egypt, August 14, 1949 (D. B. Baker, colr.). The hypopi of this and the other two species described here were collected from a small, rounded flat area on the propodeum above the abdominal insertion in a small anterolateral pit adjacent to the disc of the scutellum,or occa ionally beneath the apex of tergite I.

Ensliniella königi, new species
(Figs. 38-41, 99, 107)

Males and females.—Not known.

Hypopus.—The body is similar to that of the other two species; the anterior part of the propodosoma is similar to that of *aegyptiana* in the position of the eyes and type of setae; the venter of the propodosoma is, however, more rounded; the medial gnathosomal setae long, the laterals short. Ventral apodemes III well indented anteriorly at median junction, rounded and not flat; apodemes IV form a 45 degree angle with each other; sternum reaches past posterior ends of apodemes IV. Apodemes VI contiguous with the apodemes of the suctorial plate. Tarsus IV similar to those of *parasitica* in setal pattern and type of thornlike process; tibia IV however, differing from *aegyptiana* and *parasitica* in that both sensory and tactile setae are short and of equal length. Tarsus III possesses the usual empodial claw, the gently rounded thorn-like process intermediate in size between that of *aegyptiana* and *parasitica,* and the other setae typical for the genus; tibia III with sensory seta about twice as long as tactile. Length 255 μ

This species may be separated from *aegyptiana* in that the apodemes of the suctorial plate and apodemes VI are contiguous, and from *parasitica* in that the tactile and sensory setae of tibia IV are subequal in length.

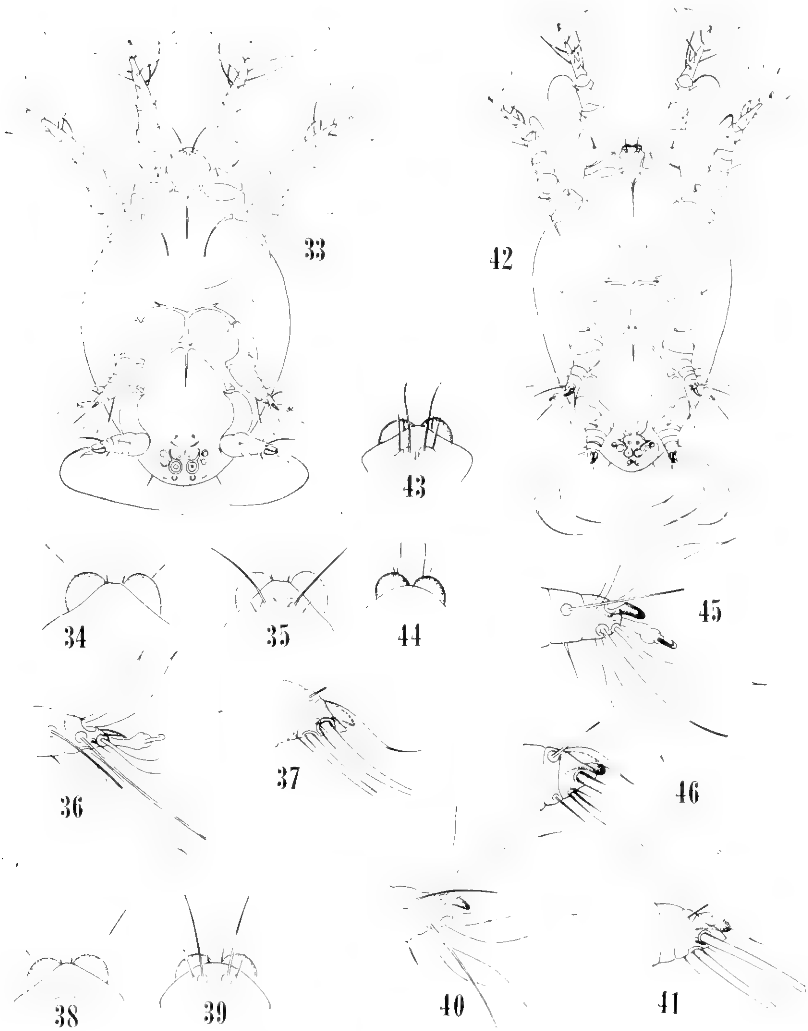
The holotype hypopus, U. S. National Museum No. 2571, and one paratype hypopus were collected in Washington, D. C., by K. V. Krombein, 1957, from *Allodynerus königi* (Dusmet), ♂, Ijonkak, Moyen, Atlas, Maroc, May 9, 1947 (Naef, colr.).

Kennethiella Cooreman, 1954

Cooreman, 1954. Notes et observationes sur les acariens. VI. Sur le Genre *Kennethiella* n. gn., parasite des Odyneres du genre *Ancistrocerus* Wesmael. Bull. inst. roy. sci. Belg. XXX (37): 1-10.

Adult.—Both sexes with strong, spinelike setae; with only a single pair of ventral or post-genital setae.

Hypopus.—All dorsal setae short; propodosomal setae bases not in a straight line but in a gentle arch; gnathosomal setae all short, of about equal size, not



Ensliniella aegyptiana, new species. Fig. 33, ventral view of hypopus; fig. 34, dorso-anterior part of propodosoma of hypopus; fig. 35, ventral view of same region; fig. 36, tibia and tarsus III of hypopus; fig. 37, tibia and tarsus IV of hypopus. *Ensliniella königi,* new species. Fig. 38, dorso-anterior part of propodosoma of hypopus; fig. 39, ventral view of same region; fig. 40, tibia and tarsus III of hypopus; fig. 41, tibia and tarsus IV of hypopus. *Ensliniella parasitica* Vitzthum. Fig. 42, ventral view of hypopus; fig. 43, ventral view of anterior part of propodosoma of hypopus; fig. 44, dorso-anterior part of propodosoma of hypopus; fig. 45, tibia and tarsus III of hypopus; fig. 46, tibia and tarsus IV of hypopus.

reaching past edge of body; eyes dorsal, not distal, apodemes I contiguous, not fused with apodemes II which are free posteriorly; coxal apodemes III and IV contiguous; small seta of tarsus IV lanceolate, larger than in the related mites; tarsus IV with one long whiplike seta, four large flat lanceolate setae, and one short spinelike seta; both tarsus III and IV pointed distally, pretarsi and setae arising from below apex; true suckers of suctorial plate larger than other discs.

Type.—*Ensliniella trisetosa* Cooreman, 1942. Monotypical.

Kennethiella trisetosa (Cooreman, 1942)
(Figs. 47-54, 108)

Ensliniella trisetosa Cooreman, 1942. Notes et observations sur les acariens. II. Bull. mus. roy. hist. nat. Belg. XVIII (58): 1-12.

Kennethiella trisetosa Cooreman, 1954. Notes et observations sur les acariens. VI. Sur le genre *Kennethiella* n. gen., parasite des Odyneres du genre *Ancistrocerus* Wesmael. Bull. inst. roy. sci. nat. Belg. XXX (37): 1-10.

Ensliniella trisetosa Cooreman, 1942. Cooper, K. W., 1955. Venereal transmission of mites by wasps, and some evolutionary problems arising from the remarkable association of *Ensliniella trisetosa* with the wasp *Ancistrocerus antilope.* Biology of Eumenine Wasps II. Trans. Amer. Ent. Soc. LXXX: 119-174.

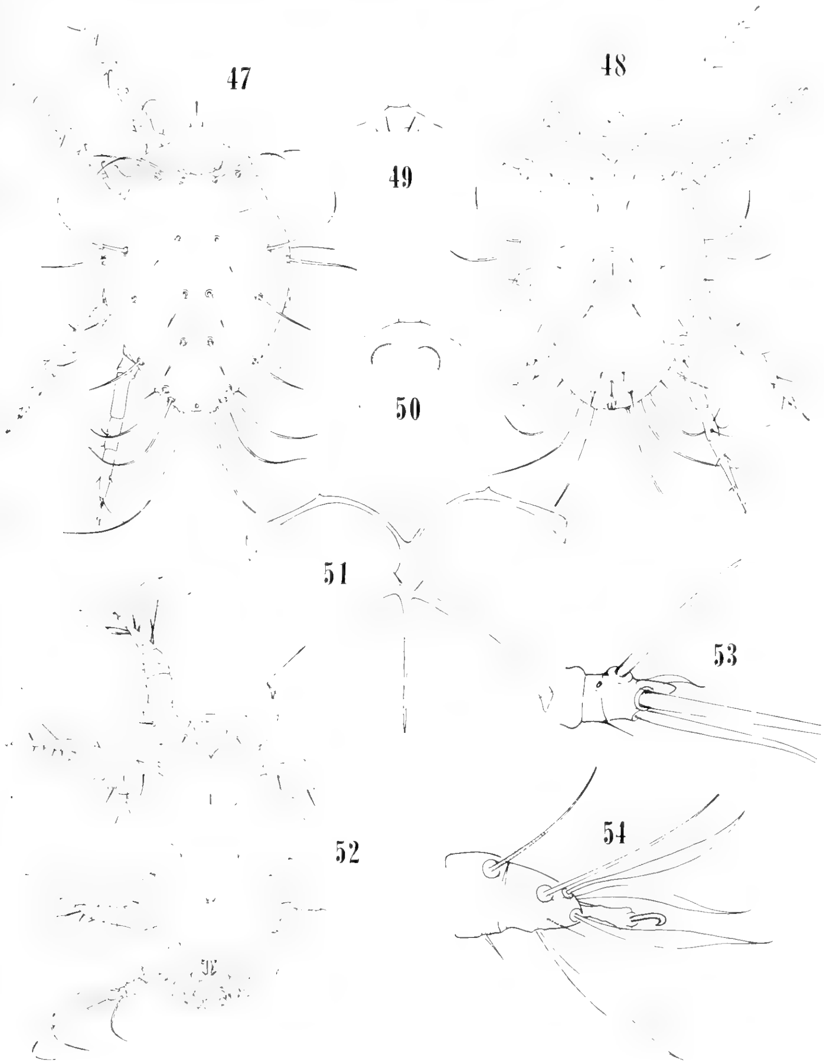
Female.—Elongate, narrowing anteriorly and posteriorly from midline, not baglike. All dorsal body setae very strong except the anterior propodosomals which are relatively short and weak; the posterior propodosomals strong, long, about as long as propodosoma; hysterosomal setae of varying lengths, the three pairs of dorsomedians short and spiny, the marginals much longer and varying in length, the long posterior pair actually being the posterior anal setae. Ventral apodemes as figured. The two pairs of genital setae short, fine; the single pair of postgenital setae short, spinelike. The first two pairs of anal setae short, fine, the posterior pair strong, long, about 2/3 the length of the body. Leg setae few, simple. Length of gravid female 850 μ; nongravid female 690 μ.

Male.—Similar to female except for presence of aedeagus. Length 690 μ.

Hypopus.—The broad anterior part of the propodosoma bears the eyes dorsally; the anterior propodosomal setae and both pairs of gnathosomal setae are short and of equal length. The dorsal shield narrows rapidly behind legs IV. Apodemes III indented anteriorly at median junction; apodemes IV only very slightly curved and forming slightly more than a 45 degree angle with each other; sternum reaches slightly past posterior ends of apodemes IV. The suctorial plate as figured; the functional suckers large. Tarsus IV sharp distally, possessing three strong, long whiplike setae and one short broad lanceolate seta attenuate distally (sometimes this whiplike process is broken off giving the seta a spinelike appearance); tibia IV with short, barely discernible rodlike sensory seta and a tactile seta of medium length. Tarsus III with clawlike empodium, four large lanceolate setae, one long whiplike seta, and one short spinelike seta; tibia III with sensory seta at least three times as long as tactile seta. Length 287 μ.

The collections which were studied were made in Washington, D. C. by K. V. Krombein from *Ancistrocerus a. antilope* (Panz.) or their nests. The hypopi were taken on the propodeum of the ♂ wasps. There is no real acarinarium, only a modified surface area on the lateral and posterior surfaces of the propodeum.

Specimens were collected as follows. Derby, New York; adults and hypopi were taken from nests. Forest Lawn, Buffalo, New York; hypopi were taken from a ♂ wasp. Kill Devil Hills, North Carolina; one female was taken from a nest. Europe; hypopi were taken from



Kennethiella trisetosa (Cooreman). Fig. 47, dorsal view of female; fig. 48, ventral view of female; fig. 49, ventral view of anterior part of propodosoma of hypopus; fig. 50, dorsal view of same region; fig. 51, coxal apodemes III and IV of hypopus; fig. 52, ventral view of hypopus; fig. 53, tibia and tarsus IV of hypopus; fig. 54, tibia and tarsus III of hypopus.

specimens from Finland and "Europe" (these hypopi appear to have slightly longer gnathosomal setae).

Vespacarus, new genus

Hypopus.—Dorsal setae short except for outer propodosomals and hysterosomal humerals (*vagus* and *tigris* are exceptions); gnathosomal setae short to long, the paired setae long, the laterals short; eyes dorso-anterior or dorsal; apodemes I and II free as in other genera; apodemes III may be incomplete and not meet medially, or complete and meet medially with apodemes IV which connect medially; tarsus IV pointed distally; tarsus III ends bluntly; tarsus IV with four setae, three long and whiplike and one small spinelike; tarsus III with four large lanceolate setae, one long whiplike seta, and one small spinelike seta; functional suckers usually much smaller than discs.

Type.—*Vespacarus rufovestis*, new species. Type, by original designation.

The genus *Vespacarus* may be separated into two major groups: Those with apodemes III not connecting with apodemes IV; and those with apodemes III complete and connecting with apodemes IV. Group I may be further separated into two groups, those with sternum IV flanged and those with sternum IV daggerlike and not flanged. All of group II have the sternum daggerlike. This may not be phylogenetically correct, but at present it is simple and practical.

Apodemes III not distinctly connecting with apodemes IV
  Sternum IV flanged: *rufovestis, fulvipes, histrio, saecularis.*
  Sternum IV daggerlike: *anacardivorus, toltecus, pedestris.*
Apodemes III complete and distinctly connecting with apodemes IV
  Sternum IV daggerlike: *vagus, tigris*

Vespacarus rufovestis, new species
(Figs. 17-20, 101)

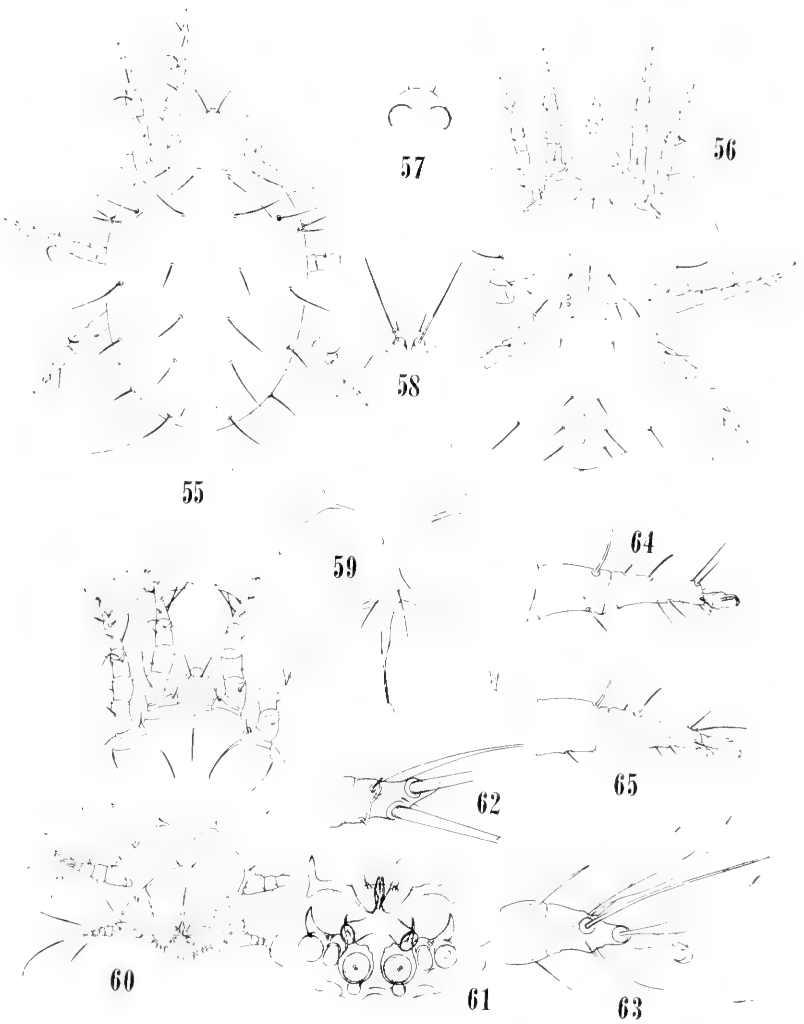
Female.—At present the female cannot be separated from the others in the genus. Length of nongravid female 586 μ.

Male.—Similar to female; length 360 μ.

Hypopus.—The hypopus belongs to the group of species in which the apodemes of coxae III are not connecting with those of coxae IV, and sternum IV is flanged; in this case there is apparently no remant left of the connecting apodemes. Eyes set dorsally, separated by a distance less than the width of each, and projecting laterally over the edges of the propodosoma; anterior part of propodosoma gently rounded; gnathosomal setae as figured, the tiny lateral setae difficult to see, the anterior setae of the propodosoma of medium length. Apodemes III distinctly delineated medially; anterior junction of apodemes IV well delineated, split, approaching apodemes III; apodemes IV slightly curved, forming only slightly more than a 45 degree angle with each other; sternum barely reaching past posterior ends of apodemes IV, broad, flattened distally. Tarsus IV with two large and one weaker whiplike setae and the usual small spinelike seta; tibia IV with small spinelike seta, but only the base is left of the rodlike sensory seta which is missing. Tarsus III with the usual four large lanceolate setae, one long whiplike seta, and one short, small, simple, spinelike seta; tibia III with both sensory and tactile setae of medium length and equal. Length 255 μ.

The hypopus is distinctive in that the sensory and tactile setae of tibia III are of equal length, and the sensory seta of tibia IV is missing.

The holotype hypopus, U. S. National Museum No. 2572, and one paratype hypopus were collected in Washington, D. C., by K. V.



Vespacarus fulvipes, new species. Fig. 55, dorsal view of female; fig. 56, ventral view of female; fig. 57, dorsal view of anterior part of propodosoma of hypopus; fig. 58, ventral view of same region; fig. 59, coxal apodemes III and IV of hypopus; fig. 60, ventral view of hypopus; fig. 61, suctorial plate of hypopus; fig. 62, tibia and tarsus IV of hypopus; fig. 63, tibia and tarsus III of hypopus; fig. 64, tibia and tarsus I of female; fig. 65, tibia and tarsus I of male.

Krombein, from the acarinarium of the wasp *Stenodynerus* (*Parancistrocerus*) *fulvipes rufovestis*, Lake Placid, Florida, February 17, 1958; two other paratype hypopi were collected from the same host and locality July 25, 1958. Male and female adults were from the same hosts and localities.

Vespacarus fulvipes, new species
(Figs. 55-65)

Female.—The female is similar to the others in the genus, with all dorsal body setae long and slender and of about equal length, as figured; the third pair of dorso-hysterosomals longer than others. Ventral apodemes as figured; genital setae short, simple; ventral setae slightly shorter, and two to three times as long as genital setae. Leg setation simple, as figured. Length 660 μ.

Male.—Similar to female. Length 319 μ

Hypopus.—The hypopus belongs to the species group in which the inner sections of apodemes of coxae III are incomplete, and sternum IV is flanged. The anterior part of the propodosoma is gently rounded; eyes are dorso-lateral, separated by a distance less than the width of each. Apodemes III thin but well delineated; anterior central portion of apodemes IV indistinctly connecting with apodemes III; apodemes IV thin, slightly curved, forming slightly more than a 45-degree angle with each other; sternum broadly flanged, reaching a short distance past the posterior ends of apodemes IV. Tarsus IV with the usual three strong whiplike seta and small spinelike seta; tibia IV with a short rodlike seta and whiplike seta of equal length. Tarsus III with the empodial claw, the usual lanceolate, whiplike, and spinelike setae; tibia III with the rodlike sensory seta about one-third longer than the spinelike tactile setae. Length 274 μ

The hypopus is distinctive in the shape of the propodosoma and the location of the eyes.

This species was collected in Washington, D. C., by K. V. Krombein from *Stenodynerus* (*Parancistrocerus*) *fulvipes fulvipes* (Sauss.) from Kill Devil Hills, North Carolina, as follows: The holotype hypopus, U. S. National Museum No. 2573, and 56 paratype hypopi were collected from the acarinarium of a wasp August 11, 1955. Adults and nymphs were collected from nests on July 4 and 11, August 2, 3, 4, 6, and 12 in 1955, and on April 30, June 1, and 6, and October 10 in 1956.

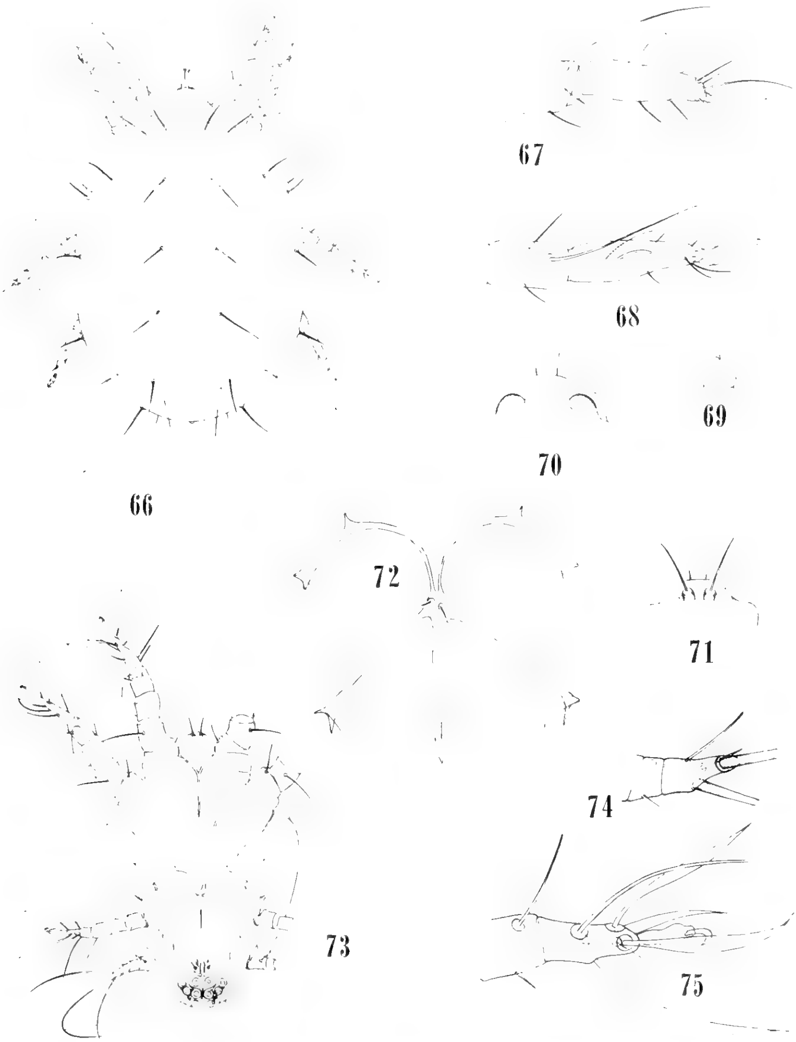
Vespacarus histrio, new species
(Figs. 76-83, 112)

Female.—Body large, baglike; all dorsal setae long, slender, whiplike, of about equal length. Propodosomal shield about as wide as distance between outer propodosomal setae. Venter without distinguishing characters. Length 530 μ.

Male.—Similar to female, except that dorsal setae, with the exception of the anterior propodosomals, are strong, whiplike; anterior propodosomals slender, and at the most, only about one-half as long as others. Length 400 μ

Hypopus.—Belongs to the group of species in which apodemes III are not contiguous, and sternum IV is flanged. Anterior part of propodosoma triangular, setae typical; gnathosomal setae typical; eyes less than eye width apart. Apodemes III strong, well delineated medially; junction of apodemes IV projecting only slightly anteriorly, the two arms connecting apodemes III and IV barely visible;

apodemes IV broadly rounded; sternum broadly flanged, reaching only a short distance past posterior ends of apodemes IV. Tarsus IV pointed distally, with the usual three long, whiplike setae and short spinelike seta; tibia IV with a short



Vespacarus tigris, new species. Fig. 66, dorsal view of female; fig. 67, tibia and tarsus I of female; fig. 68, tibia and tarsus I of male; fig. 69, empodial claw; fig. 70, dorsal view of anterior region of propodosoma of hypopus; fig. 71, ventral view of same region; fig. 72, coxal apodemes III and IV of hypopus; fig. 73, ventral view of hypopus; fig. 74, tibia and tarsus IV of hypopus; fig. 75, tibia and tarsus III of hypopus.

tactile seta, and the rodlike seta consisting of a small protubrance. Tarsus III with the usual setae; tibia III with rodlike and sensory seta and tactile seta subequal, of medium length. Length 255 μ.

The hypopus is distinctive in the shape of the propodosoma, and in the small size of the rodlike sensory seta on tibia IV.

The holotype hypopus, U. S. National Museum No. 2574, and thirteen paratype hypopi was collected in Washington, D. C., by K. V. Krombein from the acarinarium of *Stenodynerus* (*Parancistrocerus*) *histrio* (Lep.) from Kill Devil Hills, North Carolina, July 24, 1955. Males and females were collected from nests, brought from Kill Devil Hills, at Washington, D. C., as follows: July, 1954; August 2, 1955; September 23, 1955; August 14, September 10, and October 10, 1956.

An interesting series of *histrio* hypopi was collected in Washington, D. C., from the acarinarium of *Stenodynerus* (*Parancistrocerus*) *fulvipes fulvipes*, Kill Devil Hills, North Carolina, February 18, 1959. Their presence on two species of wasps is possibly due to the overlapping of the wasps ranges and the similar biology of the wasps.

Krombein (1955A) has published a brief note on the biology of this mite and its host wasp.

Vespacarus saecularis, new species
(Figs. 21-24, 102, 118)

Female.—The female appears similar to the others with long, slender whiplike setae; the body is baglike, and indistinguishable from the others in this group. Length 666 μ.

Male.—Similar to the female. Length 426 μ.

Hypopus.—The hypopus belongs to those species in which apodemes III are incomplete, and sternum IV is flanged. The anterior part of the propodosoma sharply pointed, eyes set dorso-laterally and slightly less than eye width apart. Gnathosomal setae typical for the group. Apodemes of coxae III are incomplete, not meeting those of coxae IV; coxal IV apodemes broadly rounded, far removed from apodemes III; apodemes III and IV only faintly connected; sternum broad, flattened, and projecting past posterior ends of apodemes IV. Tarsus IV with the three large whiplike setae and a very small spinelike seta; tibia IV with a short rodlike sensory seta and a tactile seta of medium length. Tarsus III typical; tibia III with tactile and sensory setae subequal, of medium length. Length 255 μ.

The hypopus is distinctive in having broadly rounded coxal IV apodemes and a sharp propodosoma.

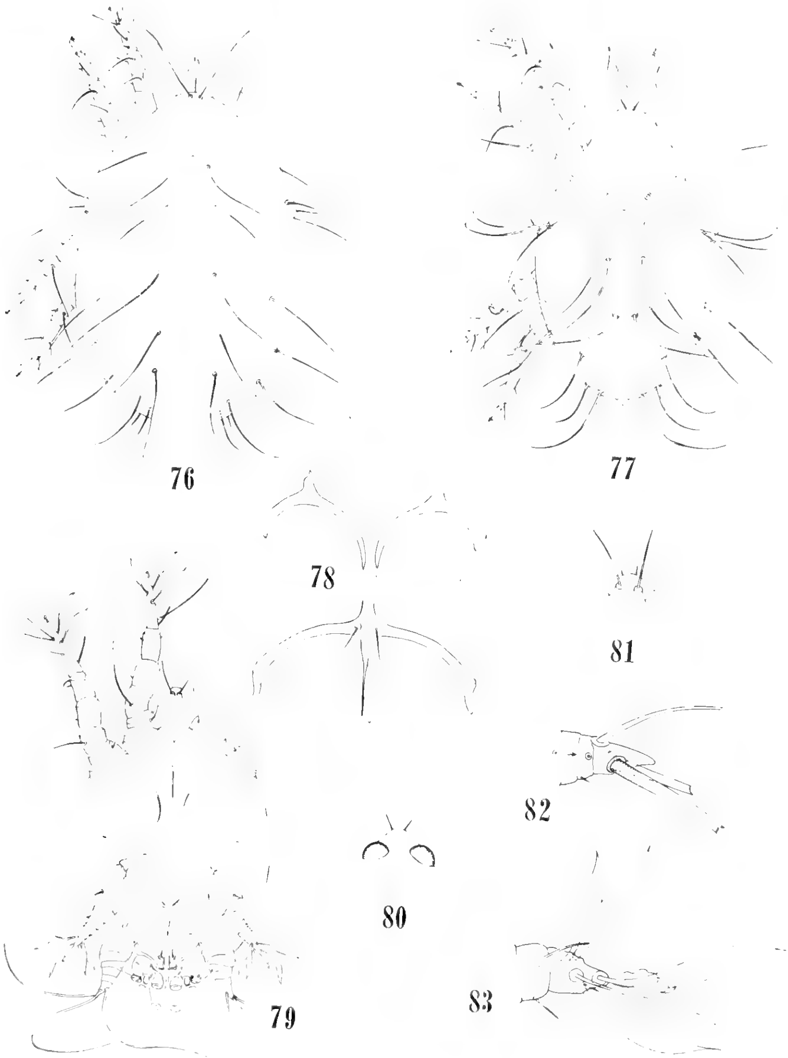
All specimens were collected in Washington, D. C., by K. V. Krombein from nests of *Stenodynerus* (*Parancistrocerus*) *saecularis rufulus* Bohart, from Lake Placid, Florida.

The holotype, U. S. National Museum No. 2575, and 121 paratype hypopi were collected February 17, 1958. Twenty-eight males and 59 females were collected from the same habitat at the same time.

Vespacarus anacardivorus, new species
(Figs. 90-95, 115)

Female.—The female is very similar to the others in the genus. All dorsal setae are long, slender, whiplike; the anterior propodosomals are long, but only about two thirds as long as the other propodosomals. The rest of the body setation is not distinctive. Leg setation is simple. Length 560 μ.

Male.—Similar to female. Length 530 μ.



Vespacarus histrio, new species. Fig. 76, dorsal view of female; fig. 77, dorsal view of male; fig. 78, coxal apodemes III and IV of hypopus; fig. 79, ventral view of hypopus; fig. 80, dorsal view of anterior part of propodosoma of hypopus; fig. 81, ventral view of same region; fig. 82, tibia and tarsus IV of hypopus; fig. 83, tibia and tarsus III of hypopus.

Hypopus.—The hypopus belongs to that group in which the apodemes of coxae III are incomplete and sternum IV is daggerlike. The eyes are set less than eye width apart; the propodosoma broadly rounded anteriorly; gnathosomal setae typical for the group. Apodemes III thin, the medial arms indistinct but connected with apodemes IV by lightly sclerotized arms; apodemes IV thin, slightly curved, forming more than a 45 degree angle with each other; sternum slender, abruptly narrowing just behind junction of apodemes IV and reaching to level of posterior arms of apodemes IV. Suctorial plate as figured. Tarsus IV with a large median seta, a slightly smaller lateral seta, and a relatively slender posterior lateral seta, as well as the usual simple spinelike seta; tibia IV possesses the short simple spinelike tactile seta, but the sensory seta consists of a small protuberance. Tarsus III with typical setation. Length 230 μ.

The hypopus is characterized by the faintness of the apodemes of coxae III medially, and by the closely set eyes.

The holotype hypopus, U. S. National Museum No. 2576, was collected in Washington, D. C., by K. V. Krombein from the acarinarium of *Stenodynerus* (*Parancistrocerus*) *perennis anacardivora* (Roh.), Paradise Key, Everglades National Park, Florida, April, 1954. Four females and two hypopi (paratypes) were collected from the cell of this wasp April 19-23, 1954.

Some brief notes have been published on the biology of this mite and its host wasp (Krombein, 1955B).

Vespacarus toltecus, new species
(Figs. 84-89, 116)

Male and female.—Not known.

Hypopus.—The hypopus belongs to the group with the incomplete coxal III apodemes and daggerlike sternum IV. The eyes are set on an elongate propodosomal projection, being separated by less than their width. Gnathosomal setae are normal. Ventral apodemes as figured, those of coxae III not meeting medially and barely discernible as they turn posteriorly to meet apodemes IV. Apodemes IV rounded, almost forming a circle. Suctorial plate as figured. Tibia IV with a short sensory seta and a tactile seta of medium length; tarsus IV with three large whiplike setae and a small slender spinelike seta. Tibia III with sensory rodlike seta longer than tactile seta; tarsus III typical. Length 242 μ.

The hypopus is distinctive in having closely set eyes on an elongate anterior projection of the propodosoma, and in that tibia IV has a short rodlike sensory seta.

The holotype hypopus, U. S. National Museum No. 2577, and 7 paratype hypopi were collected in Washington, D. C., by K. V. Krombein from *Stenodynerus* (*Parancistrocerus*) *toltecus* (Sauss.), Chisos Mts., Brewster County, Texas, June 10-12, 1908 (Mitchell and Cushman, colrs.).

Vespacarus pedestris, new species
(Figs. 25-28, 104, 117)

Female.—The female differs very little from others with long, slender, whiplike setae of about equal length; the anterior propodosomals are long but only about two-thirds as long as the others. Leg setae are typical. Length 613 μ.

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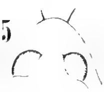

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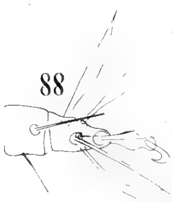

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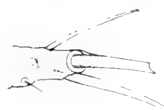

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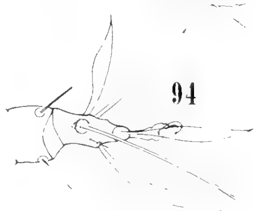

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Vespacarus toltecus, new species. **Fig. 84**, ventral view of hypopus; fig. 85, dorsal view of anterior part of propodosoma of hypopus; fig. 86, ventral view of same region; fig. 87, tibia and tarsus IV of hypopus; fig. 88, tibia and tarsus III of hypopus; fig. 89, coxal apodemes III and IV of hypopus. *Vespacarus anacardivorus*, new species. **Fig. 90**, ventral view of hypopus; fig. 91, ventral view of anterior part of propodosoma of hypopus; fig. 92, dorsal view of same region; fig. 93, tibia and tarsus IV of hypopus; fig. 94, tibia and tarsus III of hypopus; fig. 95, coxal apodemes III and IV of hypopus.

Male.—Not known.

Hypopus.—The hypopus belongs to the group with incomplete coxal III apodemes and a daggerlike sternum IV. The eyes are less than eye width apart; the anterior propodosomal margins form less than a 45 degree angle; the gnathosomal setae are typical for the genus. Coxal IV apodemes complete and forming a half circle across venter of the body, with two well delineated prongs pointing anteriorly; sternum tapering, well surpassing posterior ends of apodemes IV. Tarsus IV with three strong whiplike setae and one small simple spinelike seta; tibia IV with a short tactile seta and a short sensory seta. Tibia III has a short to medium length tactile seta; the sensory seta is about a third longer; tarsus III with typical setation. Length 230 μ.

The hypopus is distinctive in having closely set eyes and a sharp propodosoma.

The holotype hypopus, U. S. National Museum No. 2578, and 45 paratype hypopi were collected in Washington, D. C., by K. V. Krombein from *Stenodynerus* (*P.*) *pedestris pedestris* (Sauss.), Derby, New York, July 1955. Five females and one hypopus were collected from a nest from the same locality in August, 1955.

Vespacarus vagus, new species
(Figs. 29-32, 103, 113)

Male and females.—Not known.

Hypopus.—The hypopus belongs to those species in which the apodemes of coxae III and IV meet medially. All dorsal body setae are short and of equal length except for the outer propodosomals which are about two times longer. The eyes are terminal, prominent, and less than eye width apart. The lack of the short gnathosomal setae is distinctive (they are also missing in *Monobiacarus*). The apodemes of coxae III are slender, rounded, not meeting medially, and only lightly sclerotized medially where they meet apodemes IV; coxal apodemes IV are gently rounded and form an arch of more than 45 degrees and less than 60 degrees; the sternum of coxae IV is short, tapering, barely surpassing posterior ends of apodemes IV. Tarsus IV with four strong whiplike setae, and one short spinelike seta; tibia IV with the short spinelike seta and a very short rodlike sensory set. Tarsus III with the four usual large lanceolate setae, one long whiplike seta, and a short spinelike seta; tibia III with a medium length rodlike sensory seta and a shorter tactile seta. Length 217 μ.

The hypopus is characterized by the closely set terminal eyes, and the missing gnathosomal setae.

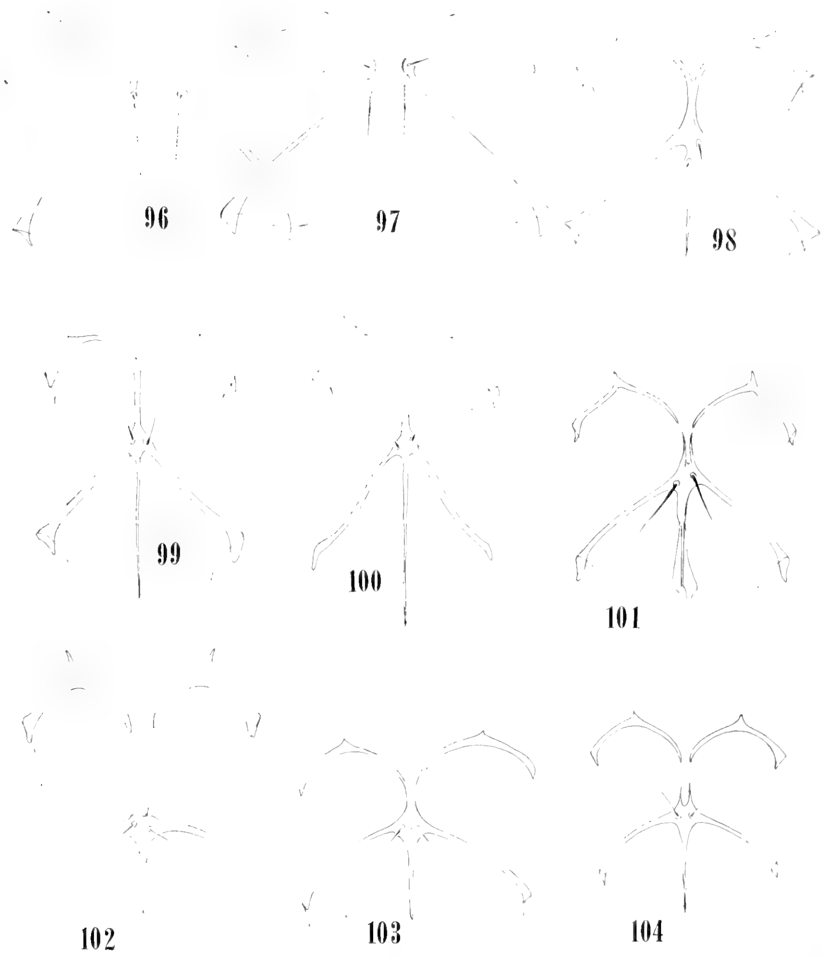
The holotype hypopus, U. S. National Museum No. 2579, and 46 paratype hypopi were collected in Washington, D. C., by K. V. Krombein, March, 1958, from *Stenodynerus* (*P.*) *vagus vagus* (Sauss.), Toronto, Canada, August 16, 1896 (R. J. Crew, colr.).

Vespacarus tigris, new species
(Figs. 66-75, 119)

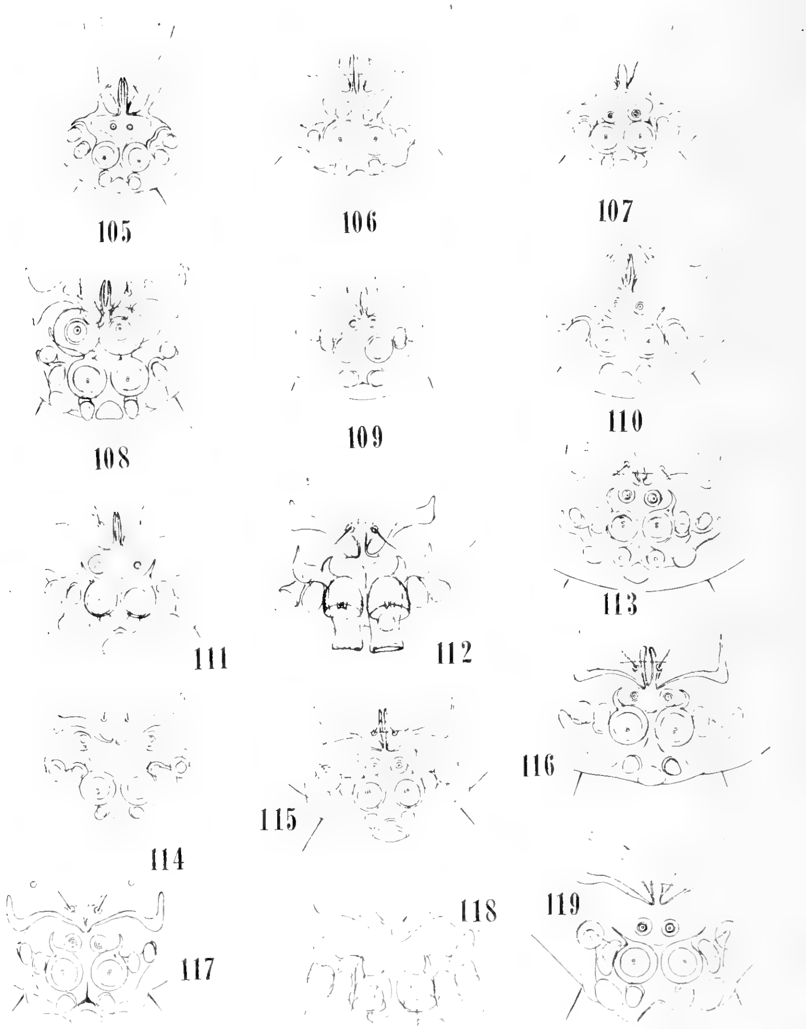
Female.—The body is baglike, with long slender setae of about equal length except for the pair of short anterior propodosomals, which are about one-third as long as the others; the propodosomal shield is small, not much wider than distance between inner pair of propodosomal setae. Length 813 μ.

Male.—Not known.

Hypopus.—The hypopus belongs to the group in which apodemes of coxae III and IV meet medially. All dorsal body setae are short and of equal length. Anterior part of propodosoma broadly rounded, with setae of medium length; gnathosomal setae typical; eyes dorsal, well separated by width of eye. Apodemes of coxae III well sclerotized and connecting to apodemes of coxae IV: apodemes III and IV thin, apodemes IV straight, forming an angle of about 45 degrees; sternum not



Coxal apodemes III and IV of hypopi. Fig. 96, *Monobiacarus insularis*, new species; fig. 97, *Monobiacarus funebris*, new species; fig. 98, *Ensliniella aegyptiana*, new species; fig. 99, *Ensliniella königi*, new species; fig. 100, *Ensliniella parasitica* Vitzthum; fig. 101, *Vespacarus rufovestis*, new species; fig. 102, *Vespacarus saecularis*, new species; fig. 103, *Vespacarus vagus*, new species; fig. 104, *Vespacarus pedestris*, new species.



Suctorial plates of hypopi. Fig. 105, *Ensliniella parasitica* Vitzthum; fig. 106, *Ensliniella aegyptiana*, new species; fig. 107, *Ensliniella königi*, new species; fig. 108, *Kennethiella trisetosa* (Cooreman); fig. 109, *Monobiacarus funebris*, new species; fig. 110, *Monobiacarus insularis*, new species; fig. 111, *Monobiacarus quadridens*, new species; fig. 112, *Vespacarus histrio*, new species; fig. 113, *Vespacarus vagus*, new species; fig. 114, *Vespacarus rufovestis*, new species; fig. 115, *Vespacarus anacardivorus*, new species; fig. 116, *Vespacarus toltecus*, new species; fig. 117, *Vespacarus pedestris*, new species; fig. 118, *Vespacarus saccularis*, new species; fig. 119, *Vespacarus tigris*, new species.

tapering, daggerlike, well surpassing posterior ends of apodemes IV. Tarsus IV distinctive in that the small spinelike seta is strong; tibia IV has only the small tactile seta and the remnants of the base of the rodlike sensory seta. Tarsus III with the usual setae; tibia III with the sensory seta more than twice as long as the tactile seta. Length 261 μ.

The hypopus is characterized by having a broadly rounded propodosoma, the eyes being separated by eye width, and the strong sternum IV.

The holotype hypopus, U. S. National Museum No. 2580, and 25 paratype hypopi were collected by K. V. Krombein on August 8, 1954, from nests of *Ancistrocerus tigris tigris* (Sauss.) from Arlington, Virginia. Seven hypopi and 4 females were collected from the same nests August 14, 1954. Sixteen hypopi and 3 females were collected in July, 1950 from nest material from Derby, New York. Two females were collected May 1, 1957 from nests of wasps collected by Kill Devil Hills, North Carolina. All collections were made in Washington, D. C.

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NOTES ON CACAO INSECTS

Lack of time to do more extensive work on cacao insects makes it advisable to put the following data on record. In 1956 a collection of several hundred species of cacao insects was made in Costa Rica for the University of Wisconsin. The report, in several parts, was entitled *Costa Rican Cacao Insects* and was duplicated by their Entomology Department. None of the records are included here. Some coccids pastured on cacao roots by ants were alluded to in 1944 (Ann. Ent. Soc. Amer., 37: 89-122) and have been further studied by Dr. Harold Morrison.

Homoptera (Coccoidea)

Eumyrmococcus sp.—St. Augustine, Trinidad, B.W.I., 12 May 1935, on cacao roots and tended by *Acropyga (Rhizomyrma) berwicki* Wheeler (*loc. cit.*, p. 109). San Rafael, Trinidad, 31 May 1935, tended by the type colony of the above ant on cacao roots. The same genus of coccid was also taken near the Forest Settlement, Mazaruni River, British Guiana, 21 August 1935 in a *Pterocarpus* tree stump with the type colony of *Acropyga paludis* Weber (*loc. cit.* p. 121).

Pseudococcus (*Planococcus* of Ferris) sp. ("may well be the common *citri* (Risso)," Dr. Morrison).–Viti Levu, Fiji Is., 27 February 1959, Naduruloulou Cacao Research Station, Department of Agriculture. Through the courtesy of Dr. B. O'Connor the experimental plantings of cacao were visited. The coccids were on the flower buds, the young fruit petioles and the leaves and were being tended by *Pheidole megacephala* Fabr. These were identified also as *Planococcus citri* by Dr. O'Connor in the field.

Homoptera (Aphididae)

Toxoptera aurantii *(Fonsc)*, apparently (det. L. M. Russell).—On the above Fiji cacao flower buds and young fruit.

Hymenoptera (Formicidae)

Pheidole megacephala Fabr.—The commonest ant seen in Fiji cultivations and foraging generally over the 20-year cacao trees, where they were tending the above coccids and aphids.

Brachymyrmex, Monomorium, and ***Oligomyrmex.***—Ants were in clay tunnels at the base of the above Fiji cacao but time did not permit detailed study. They may have been associated with root coccids like *Acropyga* ants. The latter, however, appear to be obligatory coccidophiles.

Miscellaneous

Acarina (Accosejidae), *Lasioseius* sp. (det. E. W. Baker).—Fiji, at above coccid-aphid site.

Lepidoptera (Gelichiidae probably) (det. H. W. Capps).—Fiji, larva in curled-up petal at base of young fruit at above coccid-aphid site.

Diptera (Cecidomyiidae) (det. R. H. Foote).—Fiji, larva in flower bud of cacao at above coccid-aphid site.

—Neal A. Weber, *Swarthmore College, Swarthmore, Pennsylvania.*

SEVERAL STIGMAEID MITES FORMERLY INCLUDED IN MEDIOLATA REDESCRIBED IN ZETZELLIA OUDS, AND AGISTEMUS, NEW GENUS (ACARINA)

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Stigmaeid mites are especially confused in the generic categories, and the disposition of the new species herein described presents a problem of this nature. Quayle (1912) described one of these species as *Caligonus terminalis;* Ewing (1917) described another as *C. mali*. *Caligonus* Koch is not understood by contemporary workers and is a *nomen dubium* in the light of its inadequately defined type species, *C. rufulus K*. A third species was described by Nesbitt (1946) as *Mediolata novae-scotiae*. Nesbitt appreciated the close affinities of *novae-scotiae* with *mali* and *terminalis* and he therefore referred the two latter species to *Mediolata*.

Berlese (1893) made *Mediolata* G. Can. 1889 (type: *Stigmaeus longirostris* Berl.) a synonym of *Eupalopsis* G. Can. 1886. It is apparent, however, that neither *Eupalopsis* nor *Mediolata* is appropriate for the species with which Nesbitt was concerned. *Eupalopsis* was created with *Eupalus maseriensis* Can. and Fanz. 1876 as the type species. The unusual elongation of the mouthparts, especially of the palptarsus, and the manner of subdivision of the dorsum in *E. maseriensis* and *E. pini*, as illustrated by Berlese 1887 (*maseriensis*, *longirostris*, *pini*) and Canestrini 1889 (*pini*), do not characterize the species with which this paper is concerned.

In order to name a new species close to *terminalis*, it was desirable to begin with a re-study of the species *terminalis*, *mali*, and *novae-scotiae* and to settle the matter of their generic status.

A new genus is proposed to accommodate two mites of the *terminalis* group.

Copies of Oudemans' unpublished drawings of his three described species of *Zetzellia* were recently sent to the writer by courtesy of Dr L. van der Hammen, Rijksmuseum van Natuurlijke Historie, Leiden, Holland. These illustrations clarify the generic status of *Caligonus mali* Ewing. Existing descriptions alone have not sufficed to relate these works of the two authors. Comparison of specimens of *C. mali* with illustrations of *Z. zacheri* Ouds. indicates that both authors were concerned with the same species. Furthermore, since *Z. methagli* Ouds., genotype, and *Z. zacheri* are clearly shown to be congeneric, it follows that the genus is appropriate for *mali* and a closely related new species herein described as *yusti*.

Insofar as generic and specific characters of stigmaeids are found in the divers arrangements and relations of platelets, setae, and special sensilla, there is a need for a generalized nomenclature to simplify description. The setae and sensilla have been typed and intricately designated by Grandjean (1944). His system has its hazards in the hands of others because homologous parts may not be correctly identified throughout the family group when supers, intergrades, and unusual relations obtain. The systems introduced here borrow from existing nomenclatures whenever practical but are intended to be topographic or descriptive, without emphasis upon phyletic, homodynamic, or functional implications. The author's acquaintance with other genera in this and related families indicates that a flexible, utilitarian terminology is desirable, at least for the present. The nomenclature of body setae and plates is indicated on figs. 5 and 11; the leg setae and sensilla referred to in the text are labelled on figs. 2, 12, and 13.

Agistemus, new genus

(anagram of *Stigmaeus, masculine*)

(Figs. 1-7)

Dorsum of females incompletely covered with 7 delicate plates arranged as follows: 1 trapezoidal plate MP covers propodosoma to circumscribe area occupied by three pairs setae, *ae, be, ce;* 1 pair humeral plates HP; 1 large polygonal plate MM centers over metapodosoma; 1 pair small intercalary plates IN, and 1 unpaired suranal plate SA cover opisthosoma. Larger plates with or without reticular sculpturing. Eyes: 2 pairs. Twelve pairs dorsal setae; all minutely denticulate, none longer than preoculars *be* or shorter than lateral suranals *le;* all implanted on plates. Distal seta *dt* present on tibiae I, III, IV as a long flagelliform eupathid, longer on hinglegs than on foreleg. Counts of leg setae (including special sensilla—solenidia, eupathidia, *k*-spines) for individual podomeres of legs I to IV are: tarsi 13-10-8-7, tibiae 6-6-6-6, genua 4-1-0-0, femora 5-4-2-2. Each empodium with three pairs capitate rays. Trifid sensillum (multiple eupathid) on apex of palptarsus with its 3 processes reduced to minute frayed points. Males (*fleschneri*) with dorsal plates MM and IN integral; median setae thereon become shorter in rearward progression (fig. 7). Two prominent solenidia (*w*, *w* ♂) on tarsi I and II; tarsi III and IV with 1 diminutive solenidion each.

Type species: *Caligonus terminalis* Quayle.

Agistemus terminalis (Quayle)

(Figs. 1-3)

Caligonus terminalis Quayle, 1912, U. Calif. Agr. Exp. Sta. Bull. 234:499.
Mediolata terminalis (Quayle), Nesbitt, 1946, Canad. Ent. 78(1):15-18.

Female.—Chelicerae with retractile stylets sharply tipped, anchored in distal one-quarter of basal pieces, partly sheathed by fixed digits; in relaxed mounts these do not protrude beyond palptibiae. Rostrum conical, does not project forward beyond mesal seta of palpfemur. Tip of palpus extends to tibio-tarsal flexure of first leg; primary claw slightly curved, about as long as palptibia, with slender accessory claw arising medially near its base. Coxal areas of capitulum (maxillicoxae) with 2 equally long (26μ) pairs flagelliform setae, alveoli of posterior pair close (8μ) behind and in line with alveoli of anterior pair; alveoli

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Agistemus terminalis. Fig. 1, Preocular setae *be* of *A. terminalis* (right) and *A. fleschneri* (left); Fig. 2, three segments of leg I; fig. 3, dorsal aspect of female. Millimeter scale applicable only to figs. 3, 5 and 7.

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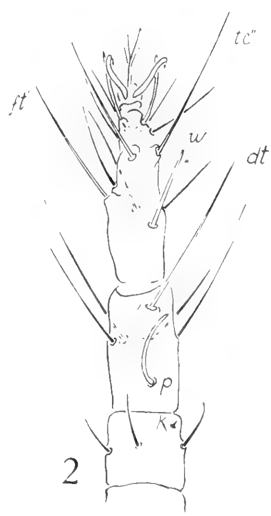

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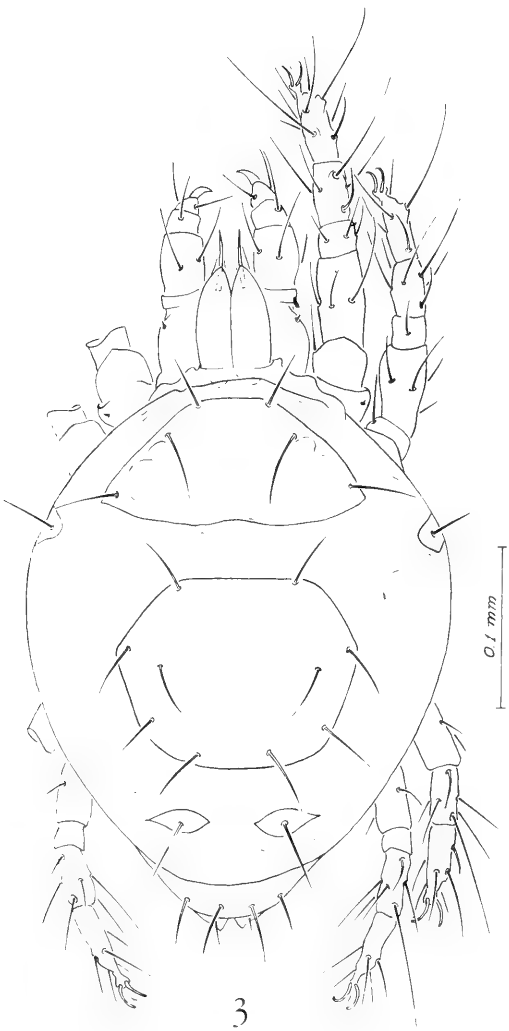

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of each member of posterior pair 40μ apart. Idiosoma widest at anterior third, gently narrowing to rounded posterior; anal covers protrude behind, visible from above (fig. 3). Median propodosomal plate MP semicircular to trapezoidal in outline, on dorsum proper but not wide enough to invade pleural region above anterior coxae. Median metapodosomal plate MM covers only mid-section of metapodosoma, roughly hexagonal to octagonal in outline, barely circumscribes area delimited by alveoli of first 5 pairs of hysterosomal setae. Paired intercalary plates IN small, delicate, well-separated. Suranal plate SA restricted to hindermost tip of opisthosoma. All plates in specimens examined without obvious surface dimpling or reticulation. Dorsal setae slender, minutely denticulate, without basal tubercles; length of verticales *ae* slightly shorter than postoculars *ce* (ref. to fig. 5 for labels); preoculars *be* slightly longer than all others on idiosoma, approximately as long as distance from alveoli *be* to *ce;* length of each seta on plate MM obviously shorter than distance from its alveolus to that of seta next behind in same series, i.e., length $a <$ distance a to b, length $la <$ distance la to lm, length $b <$ distance b to c. Anal and genital covers confluent, with 4 pairs slender setae— 2 pairs on genital and 2 pairs on anal regions of covers. Genital plate a narrow, inverted crescent bordering genital aperture, almost bissected anteriorly by forward projection of ano-genital covers; with 2 pairs genital setae, hindermost pair on transverse line with first pair on, ano-genital covers. Venter of idiosoma without other evident plates or coxal flanges; with 3 pairs of fine setae—1 pair on propodosoma between coxae II, 2 pairs on metapodosoma, none except genitals on venter of opisthosoma. Chaetotaxy of appendages as illustrated. Lengths of parts in microns ($M \pm \sigma$, $n = 10$):—

Anal covers to palp claw	469 ± 23
Idiosoma	354 ± 19
Leg I (coxo-troch. artic. to claw tips)	205 ± 5
Distant *be* to *ce*	46.9 ± 2.7

Dorsal setae:

ae	35.8 ± 2.9	*c*	37.2 ± 2.7
be	47.7 ± 2.4	*e*	34.9 ± 1.9
ce	40.5 ± 2.3	*le*	29.3 ± 2.4

Male.—Not known.

Collection data.—One ♀, Santa Paula, California, Sept. 30, 1938 (E. Buckner), *ex* lemon bud; 3 ♀ ♀, Santa Paula, Calif., Oct. 5, 1938 (E. Buckner), *ex* lemon; 4 ♀ ♀, Carpinteria, Calif., Apr. 22, 1952 (C. A. Fleschner and D. W. Ricker), *ex* avocado (*Persea americana*); 3 ♀ ♀, Encinitas, Calif., Nov. 16, 1953 (J. C. Hall), *ex* avocado; 35 ♀ ♀, Encinitas, Calif., Dec. 21, 1953 (D. W. Ricker), *ex* avocado; 2 ♀ ♀, Carlsbad, Calif., Dec. 21, 1953 (D. W. Ricker), *ex* avocado; 17 ♀ ♀, Encinitas, Calif., Jan. 1, 1954 (D. W. Ricker), *ex* avocado; 16 ♀ ♀, Encinitas, Calif., Feb. 15, 1954 (D. W. Ricker), *ex* avocado; 2 ♀ ♀, Vista, Calif., June 1, 1954 (D. W. Ricker), *ex* citrus; 2 ♀ ♀, Atlixco, Puebla, MEXICO, Jan. 26, 1954 (C. A. Fleschner), *ex* avocado; 4 ♀ ♀, Huatusco, Veracruz, Mexico, Feb. 9, 1954 (C. A.

Fleschner), *ex* avocado; 1 deuton, Mixco, GUATEMALA, Dec. 29, 1953 (C. A. Fleschner), *ex* avocado; 23 ♀ ♀, JAPAN (Intercepted at Seattle), Jul. 26, 1948 (R. P. Owen), *ex* cypress foliage; 1 ♀, Japan (intercepted at San Francisco), Oct. 11, 1949 (E. V. Lehner), *ex* juniper; 4 ♀ ♀, Japan (intercepted at Seattle), Nov. 8, 1948 (C. A. Leckie), *ex* juniper; 2 ♀ ♀, Japan (intercepted at Seattle), Dec. 16, 1947 (W. J. N. Brown), *ex* juniper; 5 ♀ ♀, Japan (intercepted at San Pedro, Calif.), Apr. 13, 1952 (E. van Zee), *ex Citrus reticulata* fruit; 2 ♀ ♀, Japan (intercepted at Jacksonville, Fla.), Mar. 22, 1953 (J. M. Henderson), *ex* orange.

Agistemus fleschneri new species
(Figs. 4-7)

Female.—Chelicerae, rostrum, palpi as described for *terminalis.* Two pairs flagelliform setae on inferior surfaces of maxillicoxae, unequal, posterior pair (47 μ) longer than anterior pair (27 μ); distance between alveoli of posterior pair (31 μ) shorter than distance between anterior pair (41 μ); setae of anterior pair originate on tubercles. Idiosoma, dorsal plates as described for *terminalis;* larger plates of type specimen reticulated. Dorsal setae stout (fig. 1), long, minutely denticulate, set on obvious tubercles: lengths of preoculars slightly longer than all others on idiosoma, at least 2 times as long as distance *be* to *ce;* length *a* equals distance *a* to *b,* length *la* equals distance *la* to *lm,* length *b* equals distance *b* to *c.* Genital plate a narrow crescent surrounding anogenital covers, with I pair genital setae (fig. 6). Venter of idiosoma covered with fine integumental striae, without obvious plates; 3 pairs very slender setae, pairs about equally spaced along sternal area between coxal groups. Setae, apical sensilla of appendages numerically equal, qualitatively similar to those of *terminalis.* Lengths of parts in microns ($M \pm \sigma$, $n = 10$):—

Anal covers to palp claw	457 ± 22
Idosoma	365 ± 17
Leg I (coxo-troch. artic. to claw tip)	229 ± 8

Dorsal setae:

Distance *be* to *ce*	41.3 ± 4.4

ae	50.7 ± 2.7	*c*	69.5 ± 9.4
be	78.3 ± 3.9	e	46.4 ± 4.5
ce	69.1 ± 6.6	*le*	33.4 ± 4.5

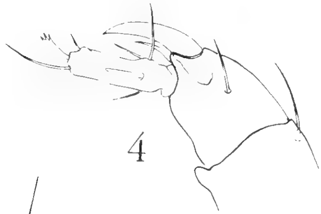
Male.—Idiosoma fusiform, smaller in relation to lengths of legs and dorsal setae than in female; posterior tip of hysterosoma almost conical, pointed (fig. 7); ano-genital covers terminal, with 3 pairs setae, dorsal pair reduced to spine-like pegs set on tubercles. Median metapodosomal and intercalary plates integral as a unit shield on dorsum; reticulated in allotype specimen; median setae thereon become shorter in rearward progression—*b* approximately 0.8 times as long as *a*, *c* approximately 0.7 times as long as *b*, *c* approximately 0.4 times as long as lateral seta *li* next behind. Setae *le, e* on suranal plate reduced in length over those of female, *e* about one-half as long as *le,* the latter not longer than those on ano-genital covers. Genital plate situated beneath tip of opisthosoma, with 1 pair genital setae. Two prominent solenidia *w* and *w* ♂ on each tarsus I and II;

solenidion of tarsus I less robust and storter than on tarsus II; alveolus of *w* on tarsus I distal, almost in line with alveolus of *w*♂ and closer to *ft'* than to *w*♂; solenidion *w* on tarsus II about equal in size to *w*♂, both addorsal, opposite. Seta *dt* of tibia II not a flagelliform eupathid, scarcely longer than dorsal seta next adjacent. Solenidion *w* present as a slender curved sensillum on tarsi III and IV, *w*♂ absent on these podomeres.

Types.—Holotype female and allotype with 6 paratypes on one slide, Charlottesville, Virginia, 1948 (H. N. Pollard), *ex* apple foliage, in U. S. National Museum. Paratypes: 3 ♀♀, 1♂, Indiana, Jul. 21, 1948 (Anon.), *ex* apple; 1 ♀, Maryland, Sept. 21, 1948 (Anon.), *ex* apple.

Collection data.—One ♀, Riverside, California, Jul. 20, 1951 (M. M. Barnes), *ex* grape; 2 ♀♀, 1 ♂, Carlsbad, Calif., Feb. 20, 1952 (D. W. Ricker), *ex* Sapota; 1 ♀, Carpinteria, Calif., Mar. 26, 1952 (C. A. Fleschner and D. W. Ricker), *ex* avocado; 1 ♀, Goleta, Calif., Nov. 6, 1952 (C. A. Fleschner and D. W. Ricker), *ex* chestnut; 1♀, Ventura, Calif., Nov. 18, 1952 (D. W. Ricker), *ex* avocado; 1 ♀, Santa Paula, Calif., Sept. 8, 1953 (D. W. Ricker), *ex* avocado; 7 ♀♀, 1 ♂, Ventura, Calif., Oct. 12, 1953 (D. W. Ricker), *ex* avocado; 5 ♀♀, 1 ♂, Ventura, Calif., Nov. 16, 1953 (J. C. Hall), *ex* avocado; 9 ♀♀, Carpinteria, Calif., Dec. 29, 1953 (D. W. Ricker), *ex* avocado; 15 ♀♀, 14 ♂♂, San Mateo, Florida, Feb. 17, 1950 (O. D. Link), *ex* oak leaf; 2♀♀, Valles, MEXICO, Feb. 12, 1953 (H. D. Smith), *ex* citrus; 2 ♀♀, 3♂♂, Fortin y Cordoba, Veracruz, Mexico, Feb. 6, 1954 (C. A. Fleschner), *ex* avocado; 2♀♀, 2♂♂, Huatusco, Veracruz, Mexico, Feb. 9, 1954 (C. A. Fleschner), *ex* avocado; 2 ♀♀, Escuintla, GUATEMALA, Dec. 23, 1953 (C. A. Fleschner), *ex* avocado; 2 ♀♀, Mixco, Guatemala, Dec. 29, 1953 (C. A. Fleschner), *ex* avocado; 2 ♀♀, 1 ♂, Amatitlan, Guatemala, Jan. 1, 1954 (C. A. Fleschner), *ex* avocado; 1 ♀, 1 ♂, Guatemala City, Guatemala, Jan. 3, 1954 (C. A. Fleschner), *ex* avocado; 1♀, 5♂♂, Mt. Uyuca, HONDURAS, Nov. 7, 1953 (C. A. Fleschner), *ex Persea gigantea*; 3 ♀♀, 1 ♂, Turrialba, COSTA RICA, Nov. 17, 1953 (C. A. Fleschner), *ex* avocado; 7♀♀, 5♂♂, San Salvador, EL SALVADOR, Nov. 29, 1953 (C. A. Fleschner), *ex* avocado; 6 ♀♀, 1♂, SO. AFRICA, Sept. 22, 1950 (P. J. Quin), *ex* not given.

When specimens of *fleschneri* and *terminalis* are examined side by side, the first is readily distinguished from the second species by its much longer dorsal setae set on tubercles. However, casual identifications to be made when one or the other of these species is not available may be troublesome since their differences are essentially quantitative. the lengths of the setae implanted on plate MM of *fleschneri* are at least equal to or greater than the distances between the bases of adjacent setae in the same linear series (i. e., *a-b-c*, *la-lm*). The length of seta *be* is approximately twice the distance between *be* and *ce* in *fleschneri*, whereas the corresponding measurements are approximately equal in *terminalis*. In *fleschneri* the posterior pair of setae on the inferior face of the maxillicoxae are much longer than the setae of the anterior pair. The fact that collections of *fleschneri* frequently contain males whereas numerous collections of *terminalis* do not may be significant.



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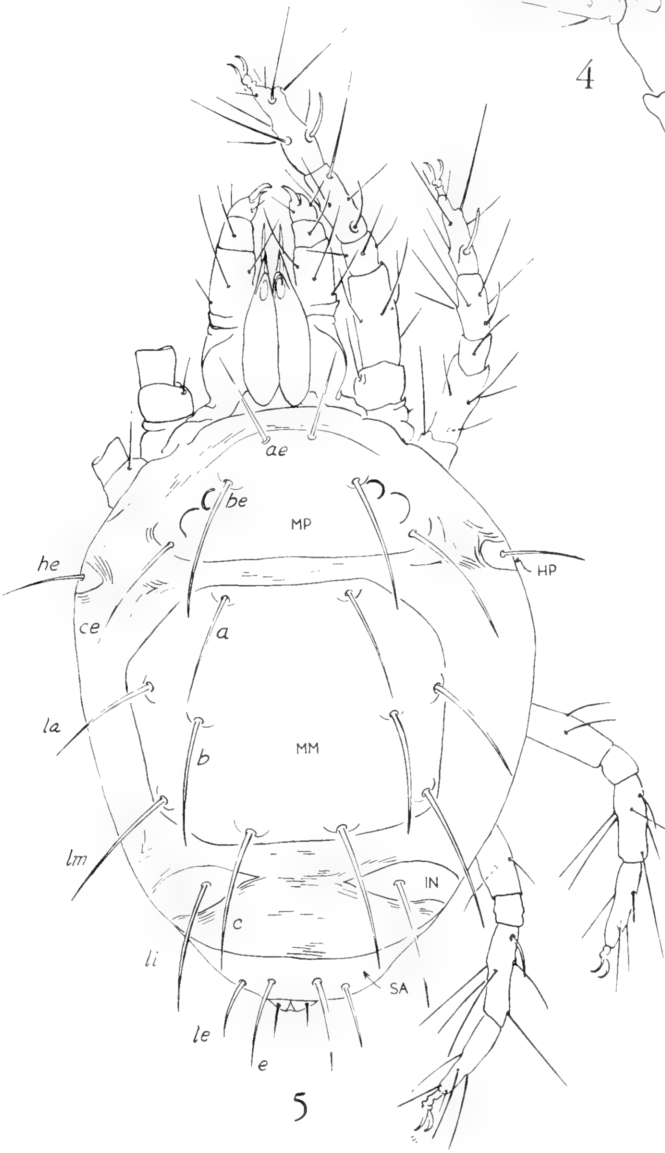

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Agistemus fleschneri. Fig. 4, Ventral face of left palpus; fig. 5, dorsal aspect of female.

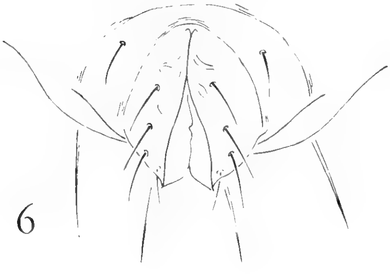
Body setae appear to be long or short in relation to other anatomical features, such as size of body, and this illusion of heterogeneity is further affected by age, condition of engorgement, and pressure in mounting. When a series of collections of these mites from avocado trees were sorted in a tentative way, the range of variations encountered, such as small bodies and ultralong setae or large bodies with comparatively short setae, conveyed to the author the impression that the aggregate comprised more than one species of the *fleschneri* type. The application of statistical procedure to 17 different body and leg structures was attempted but eventually was abandoned for lack of sufficient numbers of representatives of each population sampled. This abortive attempt did show, however, that the lengths, numbers, and locations of appendicular setae did not vary greatly between samples taken from different localities whereas there were very significant deviations in lengths of dorsal setae, particularly *be* and *ce*.

Another puzzling variation was found to occur in the sculpturing of the major body plates. Most collections contained individuals without reticulated plates (avocado), some contained a few reticulated individuals (avocado), and a few others contained only reticulated individuals (apple). All of the clearly reticulated individuals so far examined possess only 1 pair of setae on the genital plate (fig. 6) instead of the two pairs more commonly seen on nonreticulated individuals. But non-reticulated specimens from some samples also showed the reduced number of genital setae. All of the specimens available from apple trees in eastern United States show clear-cut reticulation, even in deutonymphal stadia.

Possibly the range of specimens here designed as *fleschneri* includes more than a single species which cannot now be separated—a few specimens from each locality or situation do not suffice to resolve the problem. It is expedient for the present to regard these observed differences as intra-specific variations subject to re-evaluation when longer series become available. Since uncertainty prevails, it should be noted that the type specimen selected is a reticulated female associated with apple; and the numerical values given in the descriptive paragraph apply only to these individuals. The reason for selecting a less common variant as type specimen relates to the fact that the distribution of sexes in one of the collections from apple trees provided the best opportunity for properly matching opposite sexes.

Zetzellia Oudemans, 1927

Idiosoma of female with 2 relatively large but not emphatically sclerotized median plates and several smaller plates arranged as follows: 1 triangular or semicircular plate MP surmounting propodosoma; 1 pair small numeral plates HP; 1 median hysterosomal plate MM, rounded or pyriform in shape, or with a pair of small antero-median plates AH adjoining MM in front (fig. 11); 1 pair anterolateral plates ALM in marginal position overlying coxae III; 1 pair intercalary plates IN behind MM, 1 unpaired suranal plate SA capping posterior tip of opisthosoma. Reticulation of dorsal plates not observed. Eyes: 2 pairs; anterior pair with well-defined dioptic apparatus; posterior pair faintly discernible.



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Agistemus fleschneri. Fig. 6, female genital area; fig. 7, dorsal view of male.

Twelve pairs dorsal setae, all slender, minutely denticulate; preocular pair may be slightly longer than all others on idiosoma, all associated with plates, viz.: 3 pairs on plate MP (postocular pair *ce* occasionally originate on lateral plates not integral with MP); 1 pair humeral setae on plaes HP; 4 pairs, *a, b, c, lm,* on ovoid plate MM—or pair *a* may be set apart on small plates AM not integral with MM of pyriform shape (c. f. *mali*); pair *la* on outlying plates ALM; pair *li* on intercalary plates IN; pairs *e, le* on plate SA. Two pairs genital setae flank ano-genital covers. Solenidia *w* prominent on tarsi I and II, reduced on tarsi III, absent on tarsi IV of females. Empodial rays capitate, 3 pairs. Trifid sensillum on palptarsus with 3 short but discernible prongs. Plates IN of males not combined with plate MM. Two solenidia *w* and *w* ♂ on male tarsi I and II; tarsi III and IV with 1 diminutive solenidion each.

Type species: *Zetzellia methagli* Ouds., 1927 (original designation).

Zetzellia mali (Ewing), new combination

(Figs. 8, 9, 11, 12-15)

Caligonus mali Ewing 1917, Jour. Econ. Ent. 10(5):499, figs. 25-6.

Syncaligus mali (Ewing), 1921. Proc. U. S. Nat. Mus. 59(2394):664.

Syncaligus quercus Ewing 1921, Proc. U. S. Nat. Mus. 59(2394):665. **New synonymy.**

Zetzellia zacheri Oudemans 1929, Ent. Ber. 7(165):396; allotype male, Ent. Ber. 8(179):257. **New synonymy.**

Mediolata mali (Ewing), Nesbitt, 1946, Canadian Ent. 78(1):15-18; Garman, 1948, Connecticut Agr. Exp. Sta. Bull. 520.19; Baker and Wharton, 1952, Acarology, Macmillan Co., N. Y.

Mediolata novae-scotiae Nesbitt, 1946, Canadian Ent. 78(1):15-18. **New synonymy.**

Female.—Palptarsus with accessory claw slender seta-like (fig. 15). Dorsal setae faintly denticulate (fig. 8). Preocular setae obviously longer than postoculars. Striae of integument sharply etched, these tend to invade and subdivide delicately sclerotized median plates. Plate MP typically a unit sclerite on propodosoma; in some specimens its postero-lateral corners are isolated as plates bearing postocular setae. Plate MM approximately as long as greatest width at position of setae *lm*, rounded in front, sides concave; paired plates AM which bear setae *a* distinctly separated from front margin of MM; rows of short striae may also isolate plates bearing setae *b* from its lateral margins; likewise striae infrequently isolate postero-lateral plates with setae *lm* and *c* on one or both sides of MM. Reticulation of plates not observed. Counts of leg setae, including special sensilla, for podomeres I-IV are: tarsi 12-10-8-7, tibiae 6-6-6-4, genua 3-0-0-0, femora 4-4-2-2. Solenidion *w* on tarsus I short (11.5 μ), its length equal to 1.3 times distance from its alveolus to alveolus of opposite eupathid *ft'*. Distal seta *dt* developed as a long flagelliform eupathid on tibiae I and III only. Length of parts in microns ($M \pm \sigma$, $n = 10$):—

Zetzellia. Fig. 8, Preocular setae *be* of *Z. mali* (right) and *Z. yusti* (left); fig. 9, three segments of leg I of female; fig. 10, tarsus I of *Z. yusti* drawn to same scale as fig. 9. Scale for fig. 11 also applicable to fig. 14.

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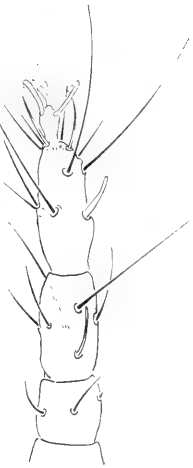

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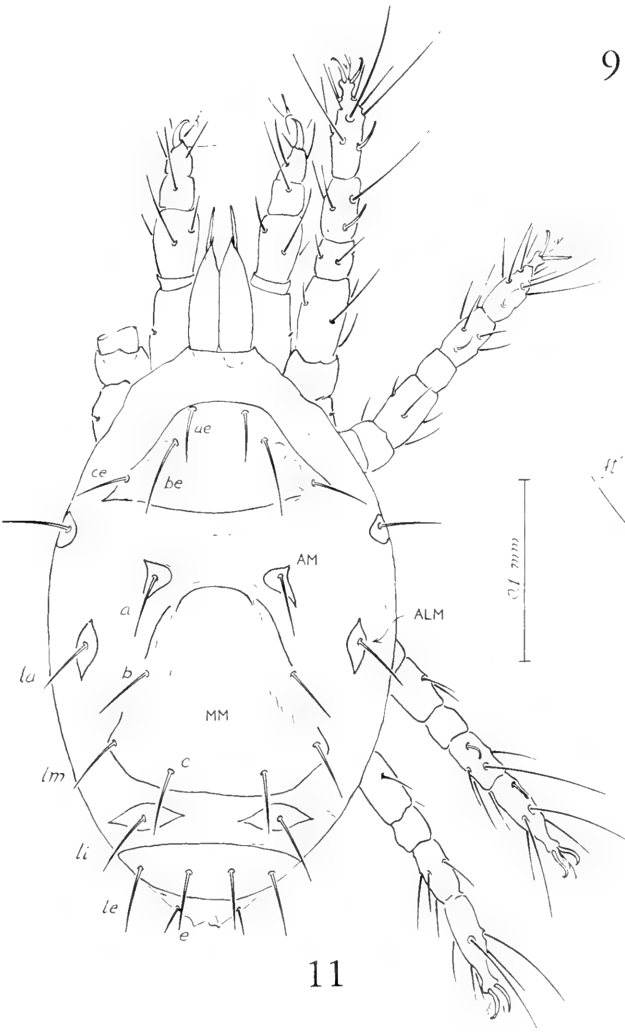

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Anal covers to palp claw	398 ± 29
Idiosoma	282 ± 12
Leg I (coxo-troch. artic. to claw tips)	158 ± 8

Dorsal setae:

Distance *be* to *ce*	32.9 ± 2.0

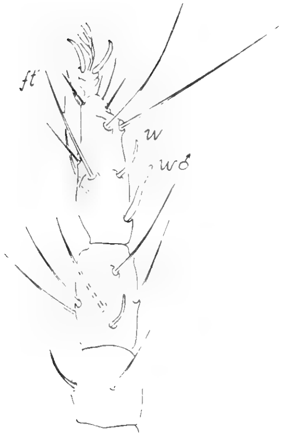
ae	23.8 ± 1.4	*c*	30.9 ± 2.5
be	36.7 ± 3.9	*e*	33.6 ± 2.4
ce	31.6 ± 2.3	*le*	31.9 ± 2.0

Male.—Idiosoma reduced, spindle-shaped (fig. 14); distribution of dorsal setae and arrangement o fplaes same as fr ofemale (i.e., plates IN not fused with MM). Seta *a* on hysterosoma as normal for female; lengths of *b, c, e* progressively shorter, such that *a* is twice as long as *e*. Suranal and genital plates appear to comprise as annulus surrounding conical tip of opisthosoma, 1 pair setae in genital field; ano-genital covers with 3 pairs setae, dorsalmost pair reduced to very small spines originating on papillae. Inclusive counts of leg setae same as for female except for 1 additional solenidion (*w*♂) on tarsi I and II, and presence of a diminutive solenidion on tarsi IV.

Collection data.—One ♀, Piermont, New York, Sept. 1908 (N. Banks?), *ex* oak leaves (co-type of Ewing's *Syncaligus quercus*); 1 ♀, Geneva, N. Y., Jul. 13, 1949 (S. Lienk), *ex* apple; 2 ♀♀, Geneva, N. Y. Aug. 5, 1949 (S. Lienk), *ex* apple leaf; 1 ♀, Princeton, N. J., Aug. 18, 1949 (H. J. Dodd), *ex* linden tree; 2 ♀♀, Charlottesville, Virginia, 1948 (H. N. Pollard), *ex* apple foliage; 4 ♀♀, Monroe, Oregon, Sept. 28, 1939 (Jones), *ex* pear; 2 ♀♀, Hood River, Ore., May 23, 1951 (E. W. Baker), *ex* apple; 12 ♀♀, 5 ♂♂, Yakima, Washington, Aug.-Sept., 1948 (R. W. Burrell), *ex* apple foliage; 2 ♀♀, Yakima, Wash., May 17, 1951 (McCormack), *ex* apple; 2 ♀♀, Yakima, Wash., May 21, 1951 (McCormack and Burrell), *ex* apple; 14 ♀♀, 3 ♂♂, Yakima, Wash., Aug. 8, 1952 (R. W. Burrell), *ex* box elder tree; 2 ♀♀, Woodlake, California. Feb. 7, 1951 (C. A. Ferris), *ex* Satsuma plum; 3 ♀♀, American Canyon, Solano County, Calif., Feb. 15, 1951 (S. F. Bailey), *ex* willow bark; 2 ♀♀, 2 ♂♂, Dairyville, Tehama County, Calif., May 22, 1952 (Summers and Schlinger), *ex* French prune; 2 ♀♀, Gridley, Calif., Dec. 15, 1956 (F. M. Summers), *ex* plum twig; 1 ♀, HOLLAND, intercepted Hoboken, N. J., Dec. 5, 1947 (Limber), *ex* azalea stem; 1 ♀, W. SWITZERLAND, Dec. 18, 1951 (P. Geier), *ex* apple tree.

Type specimens of *Caligonus mali* Ewing do not exist to assure positive identification of the species. The writer's identification of this species rests upon clues afforded by one ill-preserved specimen labelled by Ewing, his description and illustrations, and upon the fact that available collections from apple foliage in the Pacific Northwest include only the species herein re-described as *mali*.

Zetzellia. Fig. 12. Right leg I of *Z. mali* male; fig. 13, tibiae IV of *Z. mali* (left) and *Z. yusti* (right); fig. 14, dorsal aspect of Z. mali male; fig. 15, ventral view of right palpus, *Z. yusti* (above); dorsal aspect of right palpus, *Z. mali* (below).



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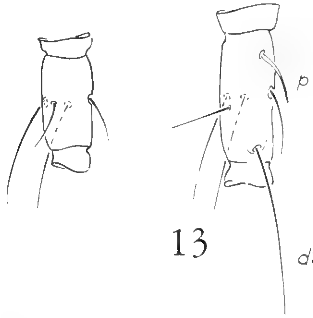

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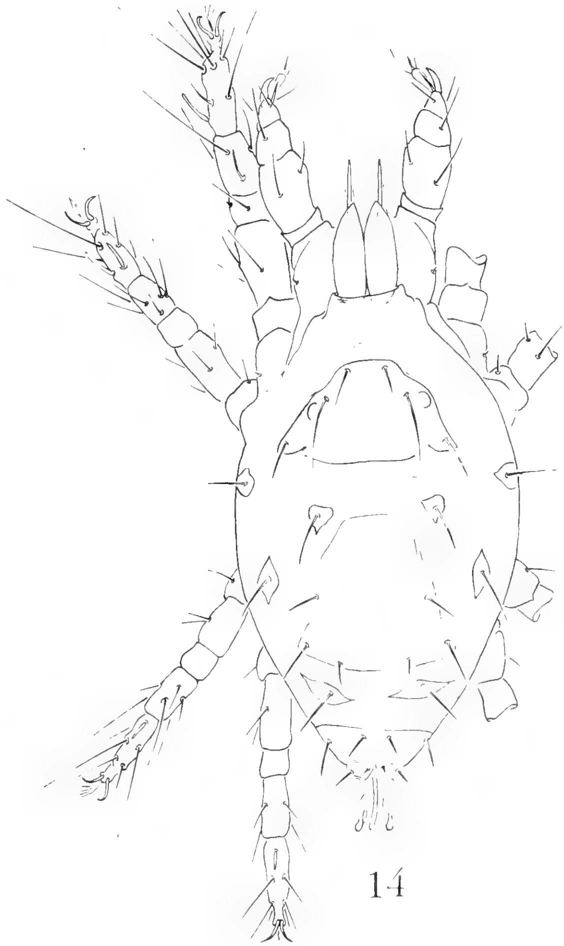

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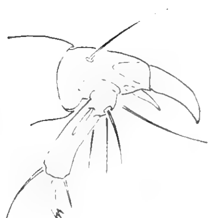

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Mediolata novae-scotiae is here regarded as indistinguishable from *Zetzellia mali* (Ewing). This conclusion is based upon a study of paratypes of *novae-scotiae* in the U. S. N. M. and supplemental material from apples in British Columbia. Paratype males of *novae-scotiae* and males of the species here described as *mali* are not separable according to criteria proposed by Nesbitt. Also the tendency of the median metapodosomal plate to show marginal subdivisions into adnexed plates, as described for females of *novae-scotiae*, occurs within the range of examples regarded as *mali*. Among the study specimens listed under collection data, none show reticulation of the dorsal plates noted for *mali* by Nesbitt.

Ewing distinguished *Syncaligus quercus* from his species *mali* by the absence of the 3-pronged spine on the tip of the palptarsus. One of the original type specimens, presumably a co-type, clearly shows this special sensillum to be present on the palptarsus. Since no other specific differences are discernible, *S. quercus* is judged to be conspecific with *Zetzellia mali.*

Zetzellia yusti, new species
(Figs. 8, 10, 13, 15)

Female.—Palptarsus with accessory claw stout, a small talon-like replica of major claw (fig. 15). Dorsal setae coarsely denticulate, bluntly tipped with clusters of denticles (fig. 8). Preocular setae *be* not significantly longer than postoculars *ce*. Integumental striae fine, close-set, their patterns difficult to see. Invasion of larger median plates by striae not characteristic of specimens examined. Plate MP integral. Shape of plate MM as described for *mali;* paired plates AM with setae *a* clearly separate from front margins of MM; otherwise MM appears to be entire. Reticulation of plates not observed. Inclusive counts of leg seta are: tarsi 12-10-8-7, tibiae 6-6-6-6, genua 4-1-0-0, femora 5-4-2-2. Solenidion *w* on tarsus I relatively long (22.3 μ), its length equals 2 times distance from its alveolus to that of opposite eupathid *ft'* (fig. 10). Distal setae *dt* developed as long, flagelliform eupathids on tibiae I, III and IV (fig. 13). Lengths of parts in microns ($M \pm \sigma$, $n = 6$):—

Anal covers to palp claw	438 ± 9
Idiosoma	348 ± 9
Leg I (coxo-troch. artic. to claw tips)	180 ± 4

Dorsal setae:

Distance *be* to *ce*			34.2 ± 1.6
ae	24.3 ± 2.2	*c*	33.8 ± 1.4
be	37.2 ± 1.9	*e*	27.0 ± 0.0
ce	36.5 ± 1.9	*le*	26.6 ± 0.7

Male.—Not observed.

Holotype.—Female, Tumbaco, ECUADOR, Feb. 12, 1954 (H. R. Yust), *ex* avocado leaves. Type slide, holotype and 4 paratype ♀♀, in U. S. National Museum.

Several characters distinguish females of *yusti* from those of *mali*. In the former, the accessory palpclaw is talon-like instead of seta-like;

the dorsal setae are coarsely denticulated; solenidion *w* of tarsus I is twice as long as the distance between its base and the base of the eupathid *ft'* opposite: the preocular *be* and postocular *ce* setae on propodosoma are equally long; solenidion *p* and eupathid *dt* occur on *tibia* IV (these are absent on the corresponding podomeres of *mali*); there is one addtional seta on genua I and II and on femora I.

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PARASITES OF THE ELM SPANWORM, ENNOMOS SUBSIGNARIUS (HBN.), IN GEORGIA

(Lepidoptera: Geometridae)

Defoliation of the Appalachian hardwoods, particularly hickory and red oak, by the elm spanworm, *Ennomos subsignarius* (Hbn.), was first detected in 1954 on the Chattahoochee National Forest in northern Georgia. At that time defoliation was confined to a few small spots in the areas of Potato Patch and Three Forks Mountains. Since its detection the area of infestation has expanded substantially each year. The present area infested is in excess of 860,000 acres, covering large sections of western North Carolina and eastern Tennessee as well as north Georgia.

During the course of this infestation two attempts have been made to recover parasites. In 1956 one hundred pupae were collected from each of four locations. In 1959 collections totaling 1,166 larvae and 845 pupae were made at five locations. Because several of the parasites reared from this material are new to the literature as attacking the elm spanworm, they are worth mention.

The 1956 determinations, with the exception of *C. analis,* were kindly provided by P. B. Dowden, U. S. Forest Service, Northeastern Forest Experiment Station, New Haven, Connecticut. Determinations of *C. analis,* and those for 1959 were made by personnel of the Insect Identification and Parasite Introduction Section, Agricultural Research Service, U.S. Department of Agriculture. The asterisk denotes species not previously recorded as attacking *E. subsignarius.*

1956 COLLECTION

	Number of Specimens Recovered
Diptera	
Tachinidae	
**Chaetogaedia analis* (Wulp.)	1
**Euphorocera floridensis* Tns.	19
Eusisyropa blanda (O. S.)	44
Hymenoptera	
Ichneumonidae	
Itoplectis conquisitor (Say)	9
Chalcididae	
**Brachymeria ovata* (Say)	4

1959 COLLECTION

Diptera	
Tachinidae	
**Achaetoneura aletiae* (Riley)	1
Eusisyropa blanda (O. S.)	68
?Xanthoernestia sp.	1
Sarcophagidae	
**Sarcophaga rapax* Walk.	3
Sarcophaga houghi Ald.	4
Hymenoptera	
Ichneumonidae	
Itoplectis conquisitor (Say)	26
Pimplopterus sp.	4
Scambus hispae	5
Chalcididae	
**Brachymeria ovata* (Say)	204

—ROBERT DAVIS, *Div. of Forest Insect Research, Southeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture, Asheville, N. C.* Present address: *Entomology Department, University of Georgia, Athens.*

A NEW NAME FOR AEDES WATERHOUSEI DOBROTWORSKY
(DIPTERA: CULICIDAE)

The name *Culicada waterhousei* was used by Theobald (1905, *in* Waterhouse, Ann. Mag. Nat. Hist. 16:674). This name was found to be a synonym of *Culex cantans* Meigen, which was placed by Edwards (1921, Bull. Ent. Res. 12:304) in the genus *Aedes*. This transfer invalidates the name *Aedes waterhousei* Dobrotworsky (1960, Proc. Linn. Soc. N. S. Wales 85:57) so the new name *Aedes silvestris* is here proposed.—N. V. DOBROTWORSKY, *University of Melbourne, Melbourne, Australia.*

A NEW SUBSPECIES OF URANOTAENIA UNGUICULATA EDWARDS FROM ARABIA

(DIPTERA: CULICIDAE)

ALAN STONE, *Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.*

A light trap operated in June and early July 1960 in the Qatif Oasis, Saudi Arabia, by R. L. Peffly, entomologist with the Arabian American Oil Company captured 13♀♀ and 38♂♂, as well as others not submitted, of what appears to be a new subspecies of the widespread Mediterranean species *Uranotaenia unguiculata* Edwards 1913. Specimens from the Qatif Oasis population have been compared with the original description of the single male of *unguiculata* collected at Tiberias, Israel and with 10 specimens from France, Algeria, Macedonia, Israel, Iran, and Iraq. These typical specimens of *unguiculata* are very uniform as are those from Arabia, but the two groups differ noticeably in size and coloration. I take pleasure in naming this subspecies in honor of the collector.

Uranotaenia unguiculata peffiyi, New subspecies

Agreeing with the typical subspecies in all particulars except as shown in the following comparative statements:

ssp. *pefflyi* : Smaller, the wing length 1.78 - 2.38 mm (mean of 10♀♀, 10♂♂ 1.9 mm). Integument of thorax nearly black, paler only below the pleural scale stripe; dark scales of thorax and abdomen nearly black; usually some dark scales on venter of abdomen; lateral patches of white scales usually confined to terga 5-7.

ssp. *unguiculata* : Larger, the wing length 2.21 - 3.4 mm (mean of 5♀♀, 5♂♂ 2.81 mm). Integument of thorax orange brown, slightly darker just mediad of marginal pale scale stripe of scutum; pleura mostly yellowish brown; dark scales of thorax and abdomen rich orange brown, but distinctly not black brown; scales of venter all pale; pale lateral scale patches of abdomen usually start on tergum 2.

Holotype ♀, Qatif Oasis, Al Hasa Province, Saudi Arabia, July 1960 (R. L. Peffly). Paratypes, 7♀♀ 20♂♂ same date. Additional material in too poor a condition for paratypic designation. Holotype in U. S. National Museum, paratypes in U. S. National Museum and British Museum.

ORTHOPODOMYIA KUMMI NEW TO THE UNITED STATES

(DIPTERA: CULICIDAE)

Reexamination of 3 collections of *Orthopodomyia* from Santa Cruz Co., Arizona, reveals that the species occurring in this area is *O. kummi* Edwards, 1939 and not *O. signifera* (Coquillett, 1896) as previously reported by C. S. Richards, L. T. Nielsen and D. M. Rees (Mosquito News 16:16; 1956) and W. A. McDonald (Ent. Soc. Amer., Ann. 50:505,535; 1957). *O. kummi*, formerly reported only from Costa Rica (type locality), Panama and Mexico, is easily recognized in the adult stage from other species of *Orthopodomyia* in the United States by the following: (1) wing largely or completely dark-scaled except for a conspicuous white-scaled line on vein R from base to separation of vein R_s, vein 1A dark-scaled, a variable but always small number of scattered light scales sometimes present in radial and subcostal fields, (2) thoracic pleuron with 3 very narrow discrete longitudinal lines of white scales, the lowest line continued anteriorly across prosternum to form a complete or nearly complete band in front. A detailed description of all stages of *kummi* is being prepared for a forthcoming review of the genus in the United States.

WILLIAM A. MCDONALD *and* JOHN N. BELKIN, *University of California, Los Angeles.*

THE TERM "PHRATRY" PREOCCUPIED

In studying the milliped genus *Pachydesmus* some years ago, I was impressed with the apparent alignment of the subspecies of *P. crassicutis* (Wood) into two discrete series. Thinking this to be a novel situation, I proposed the name "phratry" (from the Greek *phratria,* a tribe) for such groups of subspecies in my recent revision of *Pachydesmus* (1958, Proc. U. S. Nat. Mus., vol. 108). Selection of the name, I have subsequently discovered, was unfortunate for two reasons.

First, the term phratry was used as long ago as 1931 by C. L. Fenton (Publ. Wagner Free Inst. Sci., 2: 1-436) as a supraspecific ensemble designation in the brachipod genus *Spirifer.* In addition, it now comes to my attention that the recognition of subspecific groups is by no means original with me, having been done as long ago as 1926 by R. Verity (Zeitschr. Wiss. Ins.-Biol., 21: 191-208), who proposed the term *exerge* for a well-defined group of subspecies. More recently, the term has been found useful by G. E. Ball (1959, Mem. Amer. Ent. Soc., 16: 152) to express the relationships of the four subspecies of the carabid *Dicaelus purpuratus.*

It is obvious the word phratry is not only preoccupied but is also, in my usage, synonymous with an older term, and should be replaced by Verity's expression *exerge.* In the genus *Pachydesmus,* each of the two exerges of *P. crassicutis* is composed of four subspecies.

RICHARD L. HOFFMAN, *Radford College, Radford, Virginia.*

BOOK NOTICE

IDENTIFICATION KEYS FOR THE COMMON MOSQUITOES OF UNITED STATES, by H. D. Pratt and R. C. Barnes. Training Branch, Communicable Disease Center, Public Health Service, Atlanta, Ga. Nov. 1, 1959.

SOME SYNONYMY IN ORYZAEPHILUS

(COLEOPTERA: CUCUJIDAE)

Catalogues of beetles list four species of *Oryzaephilus* in America, north of Mexico. One of these was originally described as *Silvanus gossypii* by Chittenden in 1897 (U.S.D.A. Div. Ent. Bull. No. 8 (n.s.): 12, fig. 5). The holotype is in the U. S. National Museum; it was received at "Washington, D. C., in November, 1893, in cotton seed from India." A comparison of that holotype with a large number of specimens of *O. mercator* (Fauvel), 1889, has convinced me that it will easily fall within the range of variation of *mercator*. All the characteristics which Chittenden says are distinctive in *gossypii* occur also in *mercator*. The two names are synonymous (NEW SYNONYMY).

Another name to consider is *O. bicornis*, originally described as *Silvanus bicornis* by Erichson in 1846 (Naturg. Ins. Deutschlands 3, Abt. 1:337). In Europe this form is usually considered a synonym of *surinamensis* (L.) or a variety of it. Its genitalia are identical to those of *surinamensis*. It seems better at present to consider *bicornis* (Erichson) a synonym of *surinamensis* (L.).

The only two species of *Oryzaephilus* in America, north of Mexico, are well-known throughout the world, being common stored grain pests, distributed far and wide by commerce. The Saw-Toothed Grain Beetle is *O. surinamensis* (L.), and the Merchant Grain Beetle is *O. mercator* (Fauvel). They are easily separated morphologically by the temples, that area posterior to the eyes and anterior to the constriction of the neck. In the former species the temples are about two-thirds of the length of the eyes, whereas in the latter they are very short and tubercular in form.

A full morphological comparison of *O. surinamensis* and *O. mercator* was given by Slow in 1958 (Bull. Ent. Res. 49:27-34, 8 figs.), and their biologies were described by Howe in 1956 (Ann. Appl. Biol. 44:341-355, 6 figs.).

To Dr. R. W. Howe, of Slough, Bucks., England, I offer thanks for advice given.

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NOTES ON THE SYNONYMY OF A NORTH AMERICAN ANT

(HYMENOPTERA: FORMICIDAE)

In 1914 Santschi described an ant, *Formica cinerea* var. *canadensis*, from a series of 6 workers and 5 females from Saskatchewan, Canada. In his brief and rather inadequate description Santschi emphasized the black color of the ant, stating that it somewhat resembled *Formica* *fusca* var. *subaenescens* Emery, which was synonymized in 1950 by Creighton with *Formica fusca* L. North American workers have never been able to recognize *canadensis* due to the very poor description and lack of types for study. Wheeler (1917, Proc. American Acad. Arts and Sci., 52: 550-551) thought Santschi might have confused the species with *hewitti;* Creighton (1950, p. 531) could not place *canadensis* with certainty but thought it most likely to be *altipetens* Wheeler or *cinerea lepida* Wheeler. Gregg (1953, p. 328) was more inclined to believe it a northern sample of the *lepida* population.

Hoping to establish the identity of *canadensis* with certainty, I borrowed 2 female and 2 worker cotypes of *canadensis* from the Musée d'Histoire Naturelle, Basel, Switzerland, through the kindness of Dr. Fred Keiser. In addition to the material in the *cinerea* complex available to me in the U.S. National Museum, I also borrowed approximately 500 specimens from the collections of Drs. W. S. Creighton and Robert E. Gregg. Since the cotype workers of *canadensis* were in an unusually poor condition it was necessary to compare the cotype females with that of a female of *lepida* in a series of workers and female from Cedar Breaks, Utah, collected by W. S. Creighton on August 12, 1934. No important differences could be detected; therefore, I conclude that *canadensis* is the same as *lepida.*

Creighton gives the range of *lepida* as from the western Dakotas to the Pacific Coast and as far south as Utah. Gregg also records the sub-species from Colorado, but it is quite likely that *lepida* may range even farther south than this. It would be wise not to accept any published records outside of this definite range, unless such records can be confirmed. Creighton has pointed out that the species has a broad tolerance for altitudes and also individuals may vary greatly in color. He states that the ants from the higher altitudes are usually darker than those from lower altitudes. Latitude may also influence color as is evidenced by the dark Saskatchewan types.

Below are recorded original citations, type localities, and type repositories, as well as other important bibliographical references:

Formica cinerea cinerea var. *lepida* Wheeler, 1913, Bul. Mus. Compar. Zool., Harvard Univ., 53 (10): 526, worker. Type locality: Blue Lake, Humboldt County, California; types in Museum of Comparative Zoology.

Formica cinerea var. *canadensis* Santschi, 1914 (1913), Ann. Soc. Ent. de Belg., 57: 435-436, worker, female. Type locality: Saskatchewan Province (no specific locality cited), Canada; types in Musée d'Histoire Naturelle, Basel, Switzerland. **New synonymy.**

Formica cinerea lepida, Creighton, 1950, Bul. Mus. Compar. Zool., Harvard Univ., 104: 517-519, 529, 531, worker.—Gregg, 1953, Proc. Ent. Soc. Washington, 55 (6): 325-328, worker, figs. 1, 2.

—MARION R. SMITH, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D. C.*

THE GENUS ORELLIA R.-D. IN AMERICA NORTH OF MEXICO[1]
(DIPTERA: TEPHRITIDAE)

MAX W. MCFADDEN[2] and RICHARD H. FOOTE[3]

The Holarctic genus *Orellia* Robineau-Desvoidy comprises 11 Palaearctic, three Nearctic, and one Holarctic species. In Europe, larval *Orellia* inhabit inflorescences of plants belonging to the composite genera *Arctium, Carduus, Centaurea, Circium, Onopordum,* and *Tragopogon;* occasionally species have been reared from other composites as well. The North American species, however, have been reared from only two plants—*Circium arvense,* Canada thistle, and *Circium pumilum,* pasture- or bull-thistle. The lack of more extensive rearing data is surprising in view of the relatively great abundance of at least one western North American species, *occidentalis* (Snow), which is represented in this study by a large number of specimens collected from many localities throughout its range. Members of the genus are rather large yellow flies bearing characteristic black markings on the body and spots or transverse bands upon the wing.

The present study brings together for the first time the North American species of *Orellia,* and presents the information now known about their distribution and taxonomy.

The assistance of the following persons and institutions is gratefully acknowledged: F. L. Blanc, California Department of Agriculture, Sacramento; W. L. Brown, Jr., Museum of Comparative Zoology, Cambridge, Massachusetts; G. W. Byers, University of Kansas, Lawrence; R. R. Dreisbach, Midland, Michigan; B. A. Foote, University of Idaho, Moscow; R. C. Froeschner, Montana State College, Bozeman; M. Kohn (Marian Adachi), formerly University of Arizona, Tucson; A. T. McClay, University of California, Davis; H. Rodeck, University of Colorado Museum, Boulder; C. W. Sabrosky, U. S. Department of Agriculture, Washington, D. C.; and G. Wallace, Carnegie Museum, Pittsburgh, Pennsylvania. The U. S. National Museum, Washington, D. C., was an important source of study material.

Genus **Orellia** Robineau-Desvoidy

Orellia Robineau-Desvoidy, 1830, Acad. des Sci. Mém. Sci. Math. et Phys. 2:765.—Hendel *in* Lindner, 1927, Flieg. Palaearkt. Reg. 5(49):129.—Collin, 1947, Ent. Rec. & Jour. Var. 59 (suppl.):(11).

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[1]Scientific Article No. A831, Contribution No. 3115 of the Maryland Agricultural Experiment Station, Department of Entomology.

[2]This work was performed while the senior author was in attendance at the Department of Entomology, University of Maryland, College Park. Present address: Department of Entomology, University of Alberta, Edmonton.

[3]Entomology Research Division, ARS, U. S. Department of Agriculture, Washington, D. C.

Generic diagnosis.—Head subquadrate in profile; frons bare, 2.0 to 2.5 times as wide as one eye at vertex; oral margin produced anteriorly but never beyond third antennal segment; proboscis rarely geniculate, never strongly so; palpi usually projecting conspicuously anterior to oral margin; two or three pairs lower fronto-orbitals; two pairs upper fronto-orbitals, the posterior pair well developed and strongly convergent; ocellars long. Mesonotum black centrally, leaving humerus and lateral margin yellow, black area lightly pollinose and covered by short, blunt, yellowish setae; humeral, supra-alar bristle present; one pair dorsocentrals situated on a transverse line connecting anterior supra-alars; one pair acrosticals, usually arising from black spots. Halter yellow. Legs yellow; tarsi yellowish brown; meso- and metathoracic coxae each with a dark spot. Wing pattern consisting of dark transverse bands, or combination of bands and spots, on a hyaline field; one to several setae on node at junction of veins R_{2+3} and R_{4+5}. Abdomen yellow; terga II, III, IV, and V each with four basal black spots.

Type-species. (*Orellia flavicans* Robineau-Desvoidy) = *Orellia punctata* Schrank.

Discussion.—Robineau-Desvoidy (1830), proposed the genus *Orellia* with *flavicans* R.-D. as sole species. Subsequently many European autors regarded *flavicans* to be a synonym of *Trypeta wiedemanni* Meigen, the type-species of *Goniglossum* as proposed by Rondani in 1856. That synonymy was adopted by Coquillett (1910), who duly recorded *Goniglossum* as a synonym of *Orellia.* However, as pointed out by Collin (1947), it seems hardly possible that *wiedemanni* and *flavicans* can be the same species—the limited number of specimens available to us correspond poorly to the brief description of *flavicans* set forth by Robineau-Desvoidy. Until the correct synonymy of the name *flavicans* is established by competent authority, we prefer to accept Hendel's (1927) view that *flavicans* is the same as *punctata* Schrank, a species closely resembling the four discussed herein below and obviously related to 10 additional European species. The generic diagnosis recorded above applies to all these forms.

The convergent upper fronto-orbitals, the yellow abdomen marked with black, and the distinctive black, pollinose mesonotal pattern densely set with pale hairs mark the genus *Orellia* as belonging, along with the two wholly Nearctic *Paraterellia* Foote (1959) and *Neaspilota* Osten Sacken, to the Holarctic subfamily Terelliinae. Species of *Neaspilota* usually have a haired frons—those species in which the frons is bare lack extensive dark markings on the wing. *Orellia* is distinguished from *Paraterellia* by the much wider frons (in *Paraterellia* only about as wide as the eye), and by the position of the dorsocentrals, which in *Paraterellia* are closer to the acrosticals than to the supra-alars.

Key to the Species of North American Orellia

1. Brown spots lying upon stigma and vein r-m never connected to each other .... **ruficauda** (F.)
   A continuous dark band from stigma to at least vein M_{1+2} covering vein r-m .. 2

2. Dark spot dorsally at apex of scutellum; 1 to 6 long, slender, dark setae anterior to genal bristle near oral margin .... **undosa** (Coq.)
   Apex of scutellum without dark spot; setae anterior to genal bristle small and inconspicuous 3
3. Bands lying upon veins r-m and m completely separated and crossing vein M_3+Cu_1; no band lying along vein M_3+Cu_1 .... **occidentalis** (Snow)
   Wing with dark streak lying upon basal three-fourths or entire length of vein M_3+Cu_1, usually joined to dark band lying upon vein m and occasionally to band lying upon vein r-m .... **palposa** (Lw.)

Orellia ruficauda (Fabricius)
(Fig. 1)

Musca ruficauda Fabricius, 1794, Ent. Syst. 4:353.
Trypeta ruficauda: Aldrich, 1905. Smithsn. Misc. Collect. 46(1444):605.—Johnson, 1909, Psyche 16:113.
Terellia ruficauda: Phillips, 1923, Jour. New York Ent. Soc. 31:139.
Orellia ruficauda: Hendel *in* Lindner, 1927, Flieg. Palaearkt. Reg. 5(49):135.
Musca florescentiae L. of authors.
Terellia florescentiae (L.) of authors.

Diagnosis.—Frons bare, at vertex 2.0 to 2.1 times as wide as one eye and 0.90 to 0.95 times as wide as long; head in profile about as high as long; cheek 0.15 times as high as eye; eye 0.85 times as high as head; ventral one-fourth of face projecting anteriorly at oral margin; setae anterior to genal bristle dark, short, very slender. Scutellum mostly yellow, with a pair of small black spots at extreme base laterally; dorsal surface and apical margin of post-scutellum yellow, ventral surface black, the line of demarcation sharp and occurring immediately below apical margin; metanotum entirely black. Wing pattern as in fig. 1; dark spot at apex of vein R_{2+3} rarely large enough to join the two adjacent dark markings; spot lying upon vein m sometimes connected with dark mark directly anterior to it; dark spot lying upon stigma never connected with the faint dark mark lying upon vein r-m; occasionally a distinct spot on vein M_3+Cu_1 at middle of cell 1st M_2. Proximal one-fifth to one-third of ovipositor sheath dark brown to black, remainder yellow; proportion of length to width at base dorsally as 6:6.

Material examined.

CANADA.—

BRITISH COLUMBIA: 1 ♀; Merrit; 3.VIII, 1931. MANITOBA: 2 ♂ ♂, 1 ♀; Russel, The Pas; 22.VII to 1.VIII, 1936-1937. ONTARIO: 6 ♂ ♂, 14 ♀ ♀; Sault Ste. Marie, Swansea, Toronto, Thunder Bay Beach, Waubamic; 6.VII to 8.XI, 1888-1941. NEW BRUNSWICK: 7 ♂ ♂, 2 ♀ ♀; Boiestown; 13.VII, 1931. NEWFOUNDLAND; 2 ♂ ♂, 4 ♀ ♀; St. George (no further data).

UNITED STATES.—

CALIFORNIA: 9 ♂ ♂, 10 ♀ ♀; 40 mi. s. Crescent City, Sacramento, San Joaquin Co.; 6.VI to 22.X, 1942-1958. IDAHO: 1 ♀; Parma; 3.VII, 1956. MASSACHUSETTS: 2 ♀ ♀; Mt. Greylock, Wood's Hole;

1.VIII, 1898-1907. MICHIGAN: 14 ♂ ♂, 15 ♀ ♀; Cheboygan Co., Delta, Douglas Lake, Eaton Co., Ionia, Iron Co., Keeweenaw, Manistoe, Mecosta, Midland Co., Traverse City, Tusceola Co.; 7.V to 5.IX, 1931-1953. MINNESOTA: 1 ♀; St. Paul; 17.VII, 1910. MONTANA: 1 ♀; Ravalli Co.; 12.VII, 1931. NEW YORK: 2 ♂ ♂, 2 ♀ ♀; Albany, Greene Co., Hancoye, Ithaca, Saranac Lake, Stony Island; 27.VI to 27.IX, 1885-1932. NORTH DAKOTA: 1 ♂; Grand Forks Co.; 3.VII, 1941. OHIO: 5 ♂ ♂, 3 ♀ ♀; Summit Co.; 30.VI, 1936. OREGON: 6 ♂ ♂, 7 ♀ ♀; Corvallis; 21.VI to 12.VIII, 1927-1932. PENNSYLVANIA: 3 ♂ ♂, 2 ♀ ♀; Mansfield; 1 to 7.VIII. VIRGINIA: 1 ♀; Mt. Vernon; 23.VI, 1945. VERMONT: 1 ♀; S. Hero; 9.VII. WASHINGTON: 4 ♂ ♂, 1 ♀; Arlington, Buckley, Conway; LaConner; 6.VII to 7.IX, 1931-1944.

Hosts.—*O. ruficauda* has been reared from heads of Canada thistle (*Circium arvense*) at various localities throughout Europe, northern and central United States, and southern Canada. Adults have been found on Canada thistle, carrots, and raspberry plants in the New World.

Discussion.—According to Hendel (1927) *ruficauda* is found in central and northern Europe—the range extends eastward north of 45° N. Lat. to an unknown extent in the U.S.S.R. The species may be found eventually throughout the Holarctic Region. In the United States the species has been recorded as *ruficauda* from Maine, Massachusetts, and New York and from many localities in the United States and southern Canada as *florescentiae* (L.). Schiner (1863) has shown that *florescentiae* is not the same species as *ruficauda*—it does not occur in the Nearctic Region.

Among the North American species of *Orellia*, *ruficauda* is distinctive in that spots rather than bands comprise the wing pattern (fig. 1). The indistinct spot lying upon vein m is occasionally darker than shown, but it is never connected to that lying upon and posterior to the stigma.

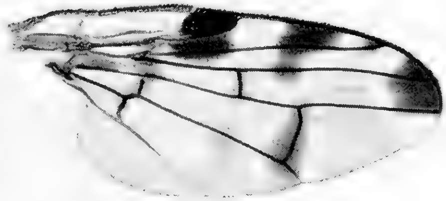
Detmers (1927) reported that young larvae hatching from eggs laid among the achenes of Canada thistle in Ohio gain entrance to the achenes by eating through the pericarp. After completing development the larva leaves the seed and constructs a cocoon in the flower head, where it pupates.

Orellia undosa (Coquillett), new combination

(Fig. 2)

Trypeta undosa Coquillett, 1899, Jour. New York Ent. Soc. 7:262.—Aldrich, 1905, Smithsn. Misc. Collect. 46(1444): 605.

Orellia species, right wing, dorsal view. Fig. 1, ruficauda (F.); fig. 2, *undosa* (Coq.); fig. 3, *occidentalis* (Snow); fig. 4, *palposa* (Lw.).



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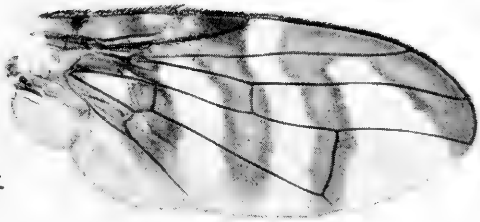

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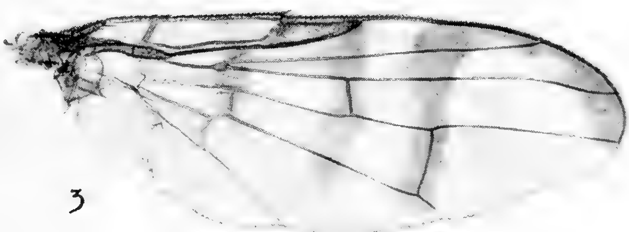

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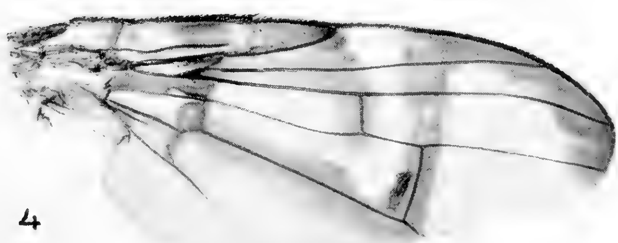

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Diagnosis.—Frons at vertex 2.0 to 2.1 times as wide as one eye and about as wide as long; head in profile about as high as long; cheek 0.35 to 0.38 times as high as eye; eye 0.63 to 0.65 times as high as head; ventral one-third of face projecting anteriorly at oral margin; 1 to 6 dark, slender setae about same length as genal bristle, situated laterally near oral margin anterior to genal bristle. Scutellum yellow, with a prominent median apical black spot and a pair of small black spots laterally; dorsal surface, apical margin, and apical half of ventral surface of post-scutellum yellow, proximal half of ventral surface black; metanotum entirely black. Wing pattern as in fig. 2, the bands dark; occasionally with a small, triangular, hyaline wedge based on costa at apex of inverted V-shaped dark mark in distal third of wing, or the two arms of that mark completely separated; band lying upon vein m usually attaining posterior margin of wing without fading and usually giving the appearance of a faded connection with posterior end of band lying upon vein r-m. Ovipositor sheath entirely yellow, proportion of length to width at base dorsally as 6:6.

Material examined.—Holotype ♀, with the following labels: "Colo., 1582," "Collection Coquillett," "Type No. 4401, U.S.N.M.," and "*Terellia undosa* Coq." In the U.S. National Museum. CALIFORNIA: 6 ♂ ♂, 12 ♀ ♀; Cedar Pass, Presidio; 3.IV to 29.VI, 1909-1955. COLORADO: 1 ♂, 1 ♀; Science Lodge, Tennessee Pass; 26.VI to 7.VII, 1940. IDAHO: 2 ♂ ♂; Arco, Moscow; 5 to 22.V, 1913-1957. WYOMING: 1 ♂; Teton National Park; 20 to 30.VI, 1941.

Host.—In California adults have been collected from *Circium occidentalis.* There are no verified rearing records for this species known to us.

Discussion.—Colorado, the type locality of *undosa*, is the only state mentioned in the literature in connection with its distribution. The localities recorded above constitute entirely new records for this western United States species.

O. undosa is readily recognized by the characters of the genus, the prominent dark spot dorsally at the apex of the scutellum, and the slender dark setae situated laterally near the oral margin anterior to and nearly as long as the genal bristle. The wing bands are almost always darker than those of *palposa* and *occidentalis*, and vein M_3 is almost exactly in line with the sharp bend in vein Sc. In the other three *Orellia* species, that vein is distinctly proximal to the subcostal bend.

Orellia occidentalis (Snow), new combination

(Fig. 3)

Trypeta occidentalis Snow, 1894, Kansas Univ. Quart. 2:163; pl. VII, fig. 11.—Doane, 1899, Jour. New York Ent. Soc. 7:179.—Coquillett, 1899, Jour. New York Ent. Soc. 7:262.—Doane, 1900, Jour. New York Ent. Soc. 8:47.—Coquillett *in* Baker, 1904, Invertebrata Pacifica 1:30.—Aldrich, 1905, Smithsn. Misc. Collect. 46(1444):605.—Janes and Thomas, 1932, Utah Acad. Sci. 9:103.

Trypeta straminea Doane, 1899, Jour. New York Ent. Soc. 7:179; pl. III, fig. 2.—Coquillett, 1899, Jour. New York Ent. Soc. 7:262.—Doane, 1900, Jour. New York Ent. Soc. 8:47.—Aldrich, 1905, Smithsn. Misc. Collect. 46(1444):605.

Diagnosis.—Frons at vertex 2.3 to 2.5 times as wide as one eye and wider than long; head in profile higher than long; cheek 0.4 times as high as eye; eye 0.6 times as high as head; ventral one-third of face projecting anteriorly at oral margin; setae anterior to genal bristle short, very slender. Scutellum mostly yellow with small black spots at extreme base laterally; dorsal surface of postscutellum entirely yellow, ventral surface black, line of demarcation along apical margin sharp; metanotum entirely black. Wing pattern as in fig. 3; bands lying upon vein r-m and m never darkly connected posteriorly; inverted V-shaped mark in distal third of wing sometimes broken anteriorly. Ovipositor sheath entirely yellow; proportions of length to width dorsally as 7:6.

Material examined.—1 ♂ with the following labels: "Bailey, Colo., Aug. '90," "Type," "Co-type Trypeta occidentalis Snow." 1 ♀ with the following labels: "Manitou Park, Colo. July," "Type," "F. H. Snow," "Co-type Trypeta occidentalis Snow," and "Lectotype, *Orellia occidentalis* (Snow)." Both in the University of Kansas, Lawrence. See below for lectotype designation. ARIZONA: 7 ♂ ♂, 13 ♀ ♀; 4 mi. n. Grand Canyon Junct., South Fork, Taylor, Vernon; 25.VI to 17.VIII, 1948-1957. CALIFORNIA: 31 ♂ ♂, 17 ♀ ♀; Bair's Ranch, Bartlett Spring, Cedar Pass, Davis, Davis Creek, Filmore, Fredericksburg, Moss Beach, Pt. Reyes, Sagehen, 4 mi. n. Silver Lake, 9 mi. w. Soquel, 34 mi. n. Ventura, Yosemite; 21.IV to 25.VII, 1922-1958. COLORADO: 27 ♂ ♂, 26 ♀ ♀; Boulder, Castle Park, Estates Park, Florissant, Ft. Collins, 30 mi. n. Ft. Collins, Grant, Limon, 5 mi. nw. McCoy, Nat'l. Monument (Pueblo Co.), Rabbit Ear Pass, Science Lodge, Steamboat Springs; 13.VI to 26.VIII, 1890-1953. IDAHO: 6 ♂ ♂, 7 ♀ ♀; Bear Creek Camp, Cascades, High Prairie, Lawyer's Canyon, Lewiston, 5 mi. s. Malad, Moscow, 5 mi. nw. Murphy; 17-VI to 27.VII, 1953-1957. MONTANA: 6 ♂ ♂, 4 ♀ ♀; 4 mi. n. Choteau, Choteau, Florence, Gallatin Co., Hamilton, Jefferson Co.; 12 to 30.VI, 1912-1955. NEVADA: 1 ♂ 10 mi. w. Carlin; 6.VII, 1956. NEW MEXICO: 5 ♂ ♂, 9 ♀ ♀; Beulah, Cloudcroft, Raton, Springer; 27.VI to 6.VIII, 1925-1952. OREGON: 2 ♀ ♀; Arlington, Blalock, Eugene; 9.V to 23.VI, 1945-1951. SOUTH DAKOTA: 2 ♀ ♀; Brookings, Rapid City; 16.VII, 1891. TEXAS: 5 (sex unknown); Davis Mts., Quemada; 14.IV to 2.VI, 1937-1949. UTAH: 41 ♂ ♂, 22 ♀ ♀; Black's Fork Ranger Sta., Blanding, Blue Creek, Cache Co., Clover, Garden City, Gooseberry Lake, Kimball's, La Sal, Logan, Soldier's Summit, Spanish Fork Canyon, Warship, Woodruff; 3.VI to 26.VIII, 1912-1958. WASHINGTON: 2 ♂ ♂, 1 ♀; Mt. Rainier, Olympia, Pullman; 20.VI to 6.VII, 1894-1935. WYOMING: 10 ♂ ♂, 8 ♀ ♀; Jackson's Hole, Kemmerer, Pass City, Summit Co., Teton Co., Tie Siding, Yellowstone Park; 30.VI to 3.VIII, 1927-1954.

Lectotype designation.—The female co-type from Manitou, Park Colo., bearing our label "Lectotype, Orellia occidentalis (Snow)" in the University of Kansas collection is hereby designated lectotype of *occidentalis* (Snow).

Hosts.—*O. occidentalis* has been collected from species of *Achilles*, *Carduus*, *Chenopodium*, *Circium*, and *Cnicus*. We are able to find no records of hosts from which this fruit fly has been reared.

Discussion.—Brookings, South Dakota, is the eastern-most point from which *occidentalis* has been recorded. It has been previously recorded from many of the western United States and is the most commonly encountered Nearctic *Orellia*.

The transverse bands lying upon vein m and r-m are never darkly connected to each other posteriorly, nor is there a connection upon vein M_3+Cu_1 between the proximal and middle transverse band as often occurs in *palposa*. The band lying upon vein m is never broken in cell 1st M_2 in contrast to that of *palposa*, in which this break is commonly encountered. The inverted V-shaped band at the wing apex is occasionally broken at the costa by an anterior extension of the enclosed hyaline wedge.

Orellia palposa (Loew), new combination
(Fig. 4)

Trypeta palposa Loew, 1862, Smithsn. Misc. Collect. 6(1):63, 74; pl. II, fig. 9.—Loew, 1873, *Ibid.* 11(256):253; pl. IX, fig. 9.—Osten Sacken, 1878, *Ibid.* 16 (270):190.—Snow, 1894, Kansas Univ. Quart. 2:162, 163.—Doane, 1899, Jour. New York Ent. Soc. 7:179.—Johnson *in* Smith, 1900, Suppl. 27th Ann. Rept. State Board Agric. New Jersey, p. 687.—Aldrich, 1905, Smithsn. Misc. Collect. 46(1444):605.—Johnson, 1909, Psyche 16:113.—Johnson, 1910, Ann. Rept. New Jersey State Mus. (1909):801.

Terellia palposa: Phillips, 1923, Jour. New York Ent. Soc. 31:138; pl. 18, fig. 32. —Johnson, 1925, Occas. Papers. Boston Soc. Nat. Hist. 7:262.

Diagnosis.—Frons at vertex 2.1 to 2.3 times as wide as one eye and wider than long; head in profile only very slightly higher than long; cheek 0.38 to 0.40 times as high as eye; eye 0.58 to 0.60 times as high as head; ventral one-half of face projecting anteriorly at oral margin; setae anterior to genal bristle yellow, short, very slender. Scutellum mostly yellow with small triangular black spots at extreme base laterally; dorsal surface of post-scutellum entirely yellow, ventral surface black, the line of demarcation along apical margin sharp; metanotum entirely black; sides of ventral half of postscutellum and center of metanotum shining. Wing pattern as in fig. 4; dark band lying upon vein m sometimes completely separated by a hyaline area from dark stripe lying upon vein M_3+Cu_1; dark band lying upon vein r-m sometimes fully connected to stripe lying upon vein M^3+Cu^1; inverted V-shaped mark in distal third of wing rarely broken anteriorly. Ovipositor sheath entirely yellow; proportions of length to width at base dorsally as 6:6.

Material examined.—Holotype, ♂, bearing the following labels; "N. Wiskons.," "Loew Colln.," "palposa Lw.," and "Type 13292." In the Museum of Comparative Zoology, Cambridge, Massachusetts. ALABAMA: 1 ♂, 1 ♀; Pheniv City; 13.IV, 1955. CALIFORNIA: 1 (sex unknown); San Francisco Co.; 13.IV, 1954. COLORADO: 1 ♀; Golden; 20.VII, 1904. GEORGIA: 1 ♂, 1 ♀; Griffin, Thomaston; 2.V to 21.VI, 1929-1951. IOWA: 1 ♂, 1 ♀; Ames; 17.VI to 7.VIII, 1890-

1933. KANSAS: 2 ♂ ♂, 2 ♀ ♀; Cheyenne Co., Lawrence, Rawlins Co.; 3.VII to 28.VIII, 1895-1925. MASSACHUSETTS: 2 ♂ ♂, 2 ♀ ♀; Cape Cod, Nantucket; 24.VI to 21.VII, 1929. MICHIGAN: 3 ♂ ♂, 3 ♀ ♀; ner. Lewiston, Nottawa; 20.VII to 27.VIII, 1942-1957. NEW JERSEY: 2 ♂ ♂, 2 ♀ ♀; Avalon, Cape May, Troy Meadows; 8.VI to 10.VIII, 1933-1947. NEW MEXICO: 7 ♂ ♂, 10 ♀ ♀; Alamagordo, Carlsbad, Cloudcroft, Grady, Koehler, Nogal, Pescado, Raton, Springer; 25.VI to 6.VIII, 1916-1952. NEW YORK: 44 ♂ ♂, 40 ♀ ♀; Babylon, Majestic Beach, Melville; 6.VI to 16.VIII, 1933-1940. OHIO: 1 (sex unknown); Wauseon; 23.VIII, 1902. OREGON: 1 ♂; Grant's Pass; 1.VII, 1916. RHODE ISLAND: 1 ♂, 1 ♀; Buttonwoods; 15.VI. TEXAS: 2 ♂ ♂, 6 ♀ ♀; Davis Mts., Donna, Kerrville, Kingsville, Quemada, Southmost, Stonewall, Valentine; 18.III to 13.VII, 1927-1953. WISCONSIN: 1 ♀; Milwaukee (no further data).

Host.—One specimen in the U.S. National Museum bears a label, "on thistle." This is not an authenticated rearing record. Johnson (1909, 1910) records this species on "thistle" in New Jersey and Massachusetts and later (1925) states that larvae "live in the flower buds of pasture thistle (*Circium pumilum*)."

Discussion.—*O. palposa* is the only species treated in the present paper to be found throughout the entire United States. It is not a common species.

The species is easily recognized by the presence of a broad dark band extending from the base of vein M_3+Cu_1 to at least a point on that vein at which it is intersected by the transverse band lying across vein m, or its extension. These two bands may be separated (as in fig. 4) or completely fused. The band lying upon vein M_3+Cu_1 may occasionally extend to the posterior wing margin without a break.

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ON TWO ARCHAEOLOGICAL RECORDS OF FLEAS
(SIPHONAPTERA)

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Interest in archaeology appears to be booming and the time is therefore opportune to draw attention to two published, but overlooked, records of 'archaeological fleas'.

The two papers concerned, by Lethbridge and Wilson, have never been referred to by students of fleas, but who would go through such journals as the "Cambridge Antiquarian Society's Quarto Publications" to search for records of fleas.

Wilson (1933) reports that in 1916-1917 remains of Basket-Maker Indians were excavated from desert caves in the north-eastern part of Arizona. Besides remains of several human bodies, two dogs were found in undisturbed burial cists. With the larger dog were found the bodies of many thousand blow-flies (*Calliphora coloradensis*). Wilson then states that "Just recently a thorough microscopic examination has been made of uncontaminated skin and hair taken from the larger dog, and in surprisingly well-preserved state have been found the eggs and young adults of a louse (*Trichodectus*), eggs and adults of a flea (*Sarcopsylla penetrans*), and numerous colonies of a fungus (*Trichosporum giganteum*) growing upon the hair shafts. The only claim to fame of these insignificant parasites is their age, which has been conservatively estimated to be between six and ten thousand years."

Finding eggs and adults (surely one cannot distinguish "young" (= teneral) adults from older ones in such material) of the dog-louse *Trichodectes* is not unexpected, but the flea-record poses serious problems. *Sarcopsylla penetrans* (now known as *Tunga penetrans* (L.)), the well-known sand-flea or jigger, is indigenous in South America and during the last century has been introduced into Africa where it is now well established. On a few occasions this flea was introduced into Florida, Louisiana and Texas, but it failed to become established in these southern States (Ewing & Fox, 1943: 122). If the sand-flea had been common some six to ten thousand years ago (which is geologically quite recent) in central North America, one would expect that representatives of the species would still be present in the warmer southern States of the U. S. A.

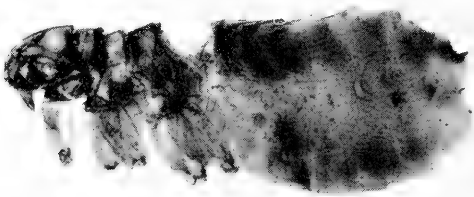
At first sight it would appear incredible that eggs of the flea were also found, and it would have been impossible if the flea concerned had not been a sand-flea, since no fleas lay eggs on their hosts (unless accidentally); free-living fleas deposit their eggs in the nest or lair of the host, while stick-tight fleas and embedded females of sand-fleas eject their eggs forcibly so that they fall on the ground away from the host. But during her egg-producing period the abdomen of an embedded female sand-flea contains numerous eggs, so it is conceivable that the dog of the Basket-Maker Indians may have been infested with pregnant embedded sand-fleas. In this connection it is of interest to note that Ewing (in Ewing & Fox, 1943: 122) claimed to have "extracted many eggs of *penetrans* from a lump of skin of a baby gorilla taken in the Belgian Congo. . .", since the lump of skin must surely have been an embedded female *Tunga*. Nevertheless, it remains difficult to accept that *Tunga penetrans* once occurred in central North America, particularly as Wilson's note gives no indication who determined the specimens. I am deeply indebted to Dr. G. E. Wilson for sending me four of the slides with objects removed from hairs of one of the dogs, but these slides contain no specimen of *Tunga penetrans,* nor *any part* thereof.

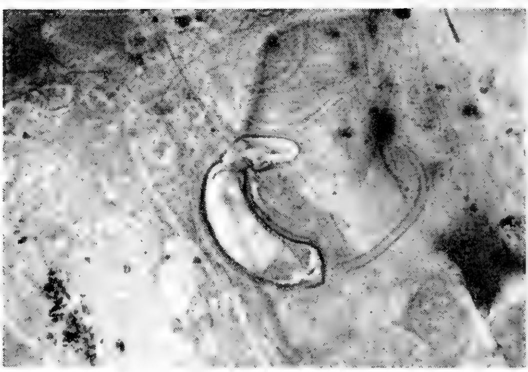
The record of the prehistoric sand-flea from Arizona should not be accepted until a serious student of fleas confirms the determination or succeeds in removing remains of *Tunga penetrans* from a Basket-Maker Indian or his dog; the prospect of his doing this is far from bright.

The second record of an archaeological flea was published by Lethbridge (1931), who reported on the contents of numerous graves from Anglo-Saxon village cemeteries in Cambridgeshire and Suffolk, England. In grave No. 85 of the cemetery discovered at Holywell (or Hollywell) Row, Suffolk, were found, among other things, some hasps and a loop, which "formed part of the fittings of a leather case. This case certainly contained a strike-a-light and pyrites. Whether the rotten wood formed a backing to the case or was put in to provide firing is uncertain, but when it was washed a flea was found in it. This flea has been identified as *Ceratophyllus gallinae*, a bird parasite sometimes found under bark, and so it seems probable that it was introduced into the pouch with tinder."—As in the case of the Basket-Maker Indian remains, evidence of fly-infestation is given by Lethbridge on p. 50 of his report: "Grave No. 16 [at Burwell, Cambridgeshire]. An iron knife in the remains of a sheath lay at the left hip . . . When the knife was washed, the pupa cases of maggots, which had been feeding on the leather sheath, were clearly visible, preserved in rust."

Through the kind offices of Dr. G. H. S. Bushnell and Miss M. D. Cra'ster I was allowed to borrow from the University Museum of Archaeology and Ethnology, Cambridge, the articles which had been found in grave No. 85. The small pieces of bark show some round holes which are evidently the work of a wood-boring beetle. The flea was preserved in a small tube from which the fluid had evaporated, although a little glycerin had prevented the specimen from becoming hard. On the back of the board, on which the various articles—including the tube with the flea—were mounted, was attached a letter from the late Dr. Karl Jordan, which reads: "The flea you sent is a female of *Ceratophyllus gallinae* Schrank. This species (and other bird-fleas which live in nests in bushes and trees) is often found under the bark of trees, and it is therefore quite possible that the specimen was buried with the Saxon."

I have mounted the flea without previous maceration, and am able to confirm the correctness of the identification. Considering the supposed antiquity of the specimen (the graves date from the seventh century), it is remarkably well-preserved. Although the segments of the legs beyond the coxae are lost, as well as all setae, the spermatheca and the genital ducts are clearly visible. (These organs also show up very well in specimens which have been kept dry for a good many years.)





The whole specimen of the Anglo-Saxon bird-flea is shown in Fig. 1 (top), the spermatheca and part of the spermathecal duct in Fig. 2 (bottom). I am indebted to the Trustees of the British Museum for these two photographs.

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SOME WORDS AND THEIR WAYS IN ENTOMOLOGY

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The title of this paper is an adaptation from "Words and their Ways in English Speech," by Greenough and Kittredge (1901), wherein it is shown that vast numbers of words in our presentday language have departed far and in many ways from the primitive meanings of their roots. This is the natural evolution of spoken language, in which usage becomes accepted by the dictionaries as standard for definitions.

The ways of words in scientific terminology, however, should not be the ways of words in common language. Technical terms are *special creations,* not the products of evolution, and must be free from mutations. They are either taken directly from Latin and Greek words, or they are compounded from words of these languages. They are designed to mean something that can be defined according to the meanings of their Latin and Greek roots, and should not be subject to change by usage, or made to mean something not implicit in their origins. Yet, from long association with entomologists, including teachers and their students, the writer has observed that many anatomical terms are used in senses not strictly in accord with their derivational meanings. Some entomological terms, in fact, have become so ingrained in a false sense that, as commonly used, they do not express what they are intended to mean.

Furthermore, there is no uniform observation of the proper pronunciation of many terms, even by specialists that use them. Melander (Source Book of Biological Terms, 1940) has critically said: "The technical expressions pertaining to Biology are used by educated specialists and therefore should not be subject to the vagaries of pronunciation into which laymen may drift." It really seems that not only laymen but most entomologists ignore dictionaries. Fortunately, the dictionaries may be accepted as reliable for the pronunciation of technical terms, because they follow the simple rules of phonetics for Latin and Greek words.

Finally, it should be noted that good usage does not sanction the formation of technical terms by combining Latin and Greek roots. While a few such terms ("archicerebrum" is one) have long been accepted, linguistic hybridization should be avoided wherever possible.

With little hope of effecting a reform, the writer submits the following list of anatomical terms, which, as used by many entomologists, do not conform with the facts they are intended to describe, or with standard rules of pronunciation. The pronunciations here given are those found in Webster's International Dictionary, 1950.

Abdomen (L. from *abdo,* give, or put away from view).—The term thus appears to mean originally the part of the human body where the viscera are concealed. Since the *o* is long, it should carry the accent, *ăb-dō'-men,* but *ăb'-do-men* is frequently heard and is sanctioned by dictionaries.

Alinotum.—A hybrid term from L. *ala,* wing and Gr. *notos,* back. Better *pteronotum.*

Anatomy and Morphology.—Two words by derivation of entirely different meanings, but often used as synonyms by entomologists.

Anatomy (Gr. *ana*, apart + suffix *tomy*, from *tomos*, cut) means literally "cutting apart," and is thus synonymous with L. *dissection*. While *dissection* retains its derivational meaning, *anatomy* has come to mean the facts we learn by dissection, or by any other technique, i.e., the structure of the animal. The taxonomist, it is true, may study an insect for external characters without dissection, but the anatomist must usually dismember it.

Morphology (Gr. *morphe*, form + *logos*, word, reason, discourse) may be defined as the science or philosophy of form including theoretical opinions not capable of definite proof. There can be no objection to speaking of the morphology of an animal if the verbal discussion of its structure is meant, but too often written descriptions entitled "morphology" are found to treat only of anatomical facts, as if the material tissue and structure of the animal were its morphology. In its proper meaning *morphology* corresponds with *entomology*, *ornithology*, *neurology*, etc., but usually involves a lot of controversial theorizing.

Antenna.—An anatomical term of curious origin from L. the sailyard of a ship, later given to the sensory head appendages of an arthropod, and then to the receptive apparatus of a radio.

The antennae of Collembola and Diplura consist of a variable number of musculated segments; those of Thysanura and Pterygota have not more than three true segments, of which the third is the flagellum. The flagellum is usually subdivided into short, nonmusculated sections, commonly called "segments," or sometimes "articles." Segments they are not in a defined sense (see segment). *Article* is diminutive of L. *artus*, a joint, which is a point of movement in an appendage, but in English the word has taken the meaning of a discrete part or object, as articles in a journal, toilet articles, etc. Apparently in this sense the term has been applied to the flagellar units of the antenna. The latter might be termed "flagellomeres," but this combines Latin and Greek. "Flagellites" is linguistically unobjectionable but has not been used. Flagellar "units" is short and expressive.

The Gr. *keros*, a horn, is sometimes used for *antenna* in compounds, as in Brachycera, Myocerata.

Blasto (Gr. *blastos*, a bud, shoot, sprout).—Used in compound embryological terms for most any part of the embryo, as *blastoderm*, *blastopore*, *blastocoele*, *blastocephalon*, etc.

Caecum (L. neuter, blind, pl. *caeca*).—In the laboratory students often speak of the gastric "seekee," meaning the feminine plural *caecae*, which, since both syllables are the same, phonetically should be *see-see*. In anatomical terminology, however, a blind pouch is a *caecum* (seekum), plural *caeca* (seeka).

Cardo (L.a hinge, plural car′-dĭ-nēs).

Ch (Gr. letter X, Chi).—Always pronounced as *k* in words of Greek derivation, as in chela, chelicera, chilopod, echinoderm, etc.

Cockroach.—The name is an English phonetic corruption of the Spanish *cucaracha*. When shortened to "roach" it becomes etymologically meaningless, and zoologically conflicts with the common name of the fish *Rutilus* and other members of the Cyprinidae long known as roaches (ME. and OF., *roche*). Entomologically, therefore, the insect should remain a cockroach, though to the general public and advertisers of insecticides it will be a ''roach.''

Ecdysis—(ĕc′-dy-sis, not ec-dy′-sis. Gr. a putting off, or coming out of).—The emergence of the insect from its moulted cuticle. The term has often been defined as synonymous with moulting, but *moulting* and *ecdysis* are two distinct and separate events in the life of an insect (see moult).

Either or **Each?**—We often read in anatomical descriptions that a structure is present on ''either side,'' when evidently it is meant that it is present on *each* side rather than on one side or the other.

Elytron.—Pronounced ĕl′-y-tron, not e-lyt-ron or e-lect-ron. Plural ĕl′-y-tra.

Embryology.—The science of embryonic development. The development of the embryo is *embryogeny.*

Epidermis.—(See Hypodermis or Epidermis?)

Epimeron (from Gr. *mēros*, upper part of the thigh).—The long e puts the accent on the penult, epimē′ron, not e-pĭ′pim-eron.

Epipharynx.—(See preoral cavity.)

Flagellum.—(See under antenna.)

Gaster (Gr. paunch, or belly, L. *venter*).—Used by hymenopterists for the free part of the abdomen supported by the pedicel. This usage may be etymologically unobectionable, but in vertebrate anatomy the *gaster* is the stomach, and in entomology we have *gastric caeca,* though the stomach is the *ventriculus.* (See venter).

Gonopore and **Phallotreme.**—The *gonopore* is the aperture of a genital duct. In most male insects it discharges into an inner chamber of the aedeagus, the external opening of which is thus not the gonopore, but may be termed the *gonotreme,* or *phallotreme.*

Halter.—Pronounced hăl′-ter, not hälter, pl. hăl-tē′-res. While the term means a ''balancer'' such as used by athletes, the vibrating halteres of Diptera are now known to function as gyroscopic organs of equilibrium during flight.

Hypoderm or **Epidermis?**—Neither term is literally correct in entomology because the insect has only one skin layer, which is neither under (*hypo*) or above (*epi*) another layer. *Epidermis, however,* is preferable to ''hypoderm'' because the skin layer in question is the ectodermal ''epidermis'' of other invertebrates. The vertebrate *hypodermis* is a mesodermal inner skin.

Hypopharynx (literally, something below the pharynx).—The organ called the hypopharynx has no relation to the pharynx. It is an outgrowth of the ventral wall of the head between the mandibles and maxillae, behind or below the mouth. The name comes from the old error of calling the preoral food cavity between the mouth parts the ''pharynx,'' and is retained because we have no substitute. A similar structure in Crustacea is appropriately named the *metastome.*

Instar.—In life-history studies an "instar" is commonly defined as the insect between ecdyses. This usage, however, does not recognize the fact that the new stage of the insect is formed inside the old moulted cuticle a variable length of time before the cuticle is shed. An instar, therefore, biologically is the life of the insect between moults. The enclosed period before ecdysis is the *pharate* (cloaked) stage of the instar. The pharate stage of the pupa is quite incorrectly called the ''prepupal stage of the larva,'' since in this case the insect ceased to be a larva with the moult to the pupa. (See moult.)

Intersegmental membranes.—The name commonly given to the membranous connectives between tergal and sternal plates, but these membranes are really the nonsclerotized posterior parts of the body segments. The segments are limited by the transverse lines of attachment of the longitudinal body muscles.

Invagination and Introversion.—Any external structure, such as a leg or wing rudiment, that becomes sunken into a pocket of the body wall is *invaginated* (ensheathed by the pocket). If restored to the surface it is evaginated. A simple ingrowth, as a forming duct, trachea, or apodeme, is not an invagination, though often described or defined as such. An external process turned in upon itself (like the finger of a glove) is *introverted,* if turned out it is *everted,* or *extroverted.*

Ite.—A suffix denoting a member of a group, as in Canaanite, Hittite, Mennonite, Manhattanite. In biology it means ''a part of'' some larger unit, as in *somite, podite, sclerite.* Entomologists, however, are so fond of this suffix that they commonly call the major segmental plates of the abdomen ''tergites'' and ''sternites'' instead of *terga* and *sterna.* This usage leaves no term for parts of segmental plates, which properly are *tergites, pleurites,* or *sternites.* If the major plates are called ''*ites,*'' we should have to speak of ''intertergital'' and ''intersternital'' muscles, or still worse, 'tergitosternital'' muscles. None of the iteists, however, has observed consistency to this extent.

The basal plate of a male genital clasper is commonly called a ''coxite,'' or ''gonocoxite,'' but if the plate is supposed to be a coxa, the suffix *ite* is superfluous and meaningless. *Coxopodite* (coxal part of a limb) is a properly formed word.

Larva (L. a spectre, ghost, phantom, hobgoblin, etc., or also a mask).—Regarded as a *mask,* a larva may be defined as a juvenile form that conceals the real structure of its species as developed in the adult. In this sense, therefore, the young of any insect that goes through a metamorphosis to attain the adult form is appropriately termed a *larva.* Some writers, however, restrict the term to the young of insects that go through a pupal stage, while others extend it to include the immature stages of any insect, whereby it loses all relation to its original meaning.

Leg segments, joints, and **articulations.**—In the study of an insect leg we have three principal features to define, and we have three terms for naming them, but there is some confusion in their usage.

The term *leg segment,* or *podite* (Gr. *pous, podos*+*ite*) is best restricted to an independently musculated movable part of the limb. A *joint* (Fr. *joindre,* to join) should be the flexible membranous connection between segments. It becomes confusing to use this term for the segment itself, as some do. Finally, then, we have the term *articulation* (L. *artus,* a joint between bones) for the sclerotic hinge or hinges that limit the movement of segments on each other. (See *tarsus* and *pretarsus.*)

Metamorphosis.—This term means simply "a change of form." In entomology it commonly refers to the transformation of the young insect, nymph or larva, into the adult form. This visible change of form by the individual, however, is merely the resumption of normal development after its release from the aberrant course of development in the larva. By a primary metamorphosis at some time in the past history of its species the young insect acquired its special larval form, which is recapitulated in the embryo. The insect thus goes through a *divergent* metamorphosis by which the larva became adapted to a special way of living, and later a *convergent* metamorphosis by which it resumes the parental form.

Morphology (see Anatomy and Morphology).

Moult. The physiological process of separating the old cuticle from a new cuticle being formed beneath it. Not synonymous with *ecdysis* (which see). The abbreviated form ''molt'' is a recent U. S. phonetic spelling not justified by the derivation of the word, from L. *mutare*, to change. (Ital. *mudare*, Sp. *mudar*, Port. *mudar*, ME. *mouten*, Fr. *muer*). Clearly the *u* is the essential vowel in the word.

Notum (Gr. *noton*, the back, L. tergum).—Used for the dorsal plates of the thorax to harmonize with the Greek prefixes *pro*, *meso*, and *meta*.

Pharate stage (Gr. *pharos*, a cloak).—The early period of any instar before ecdysis, concealed within the moulted cuticle of the preceding instar.

Pharynx.—This term refers properly to an anterior part of the alimentary canal following the mouth. Yet, for many years it has been given in entomology to a part of the *preoral* space between the mouth parts of the insect, now known as the *cibarium*. From this misapplication of the name *pharynx* we still have such misplaced terms as ''epipharynx'' and ''hypopharynx.''

Planta (L. sole of the foot).—Improperly applied to the enlarged basal subsegment of the tarsus in Hymenoptera.

Pleuron (Gr. a rib).—The lateral sclerotization of a thoracic segment, giving articulation to the leg below, and, in winged segments, supporting the wing above. Subdivisions of a pleuron are *pleurites*. The side of a segment between the tergum and the sternum, whether sclerotized or not, may be termed the *pleural area*. On the abdomen *laterotergites* and *laterosternites* are often mistaken for pleurites.

It is sometimes suggested that *pleuron* be Latinized as ''pleurum'' to conform with *notum* and *sternum*, but if this uniformity is carried over to *meron*, it will be found that *merum* in Latin means ''fresh wine.''

"Prepupal Stage of Larva."—This term is often improperly given to the pharate stage of the pupa. When the last larval cuticle is moulted, the insect is no longer a larva, though before ecdysis it is still within the larval cuticle.

Pretarsus.—The apical section of a leg, a true, individually musculated, claw-bearing leg segment, the *dactylopodite*. The leg claws, therefore, are *pretarsal claws*, not ''tarsal claws.''

Rudiment and **Vestige.**—A *rudiment* in biology is the simple beginning in the embryo or a later stage of a more complex definitive structure. (*L. rudimentum*, from *rudis*, rough, something unfinished, as a sketch for a picture, or a statue roughly cut out, Ger. *Anlage*, Fr. *ébauche*). A *vestige* is the persisting remnant of a part or organ that has undergone an evolutionary reduction. (L. *vestigium*, a foot print, track, or trace of something that has been.) A rudiment has a future, a vestige a past. Yet, in entomology we often read that an organ has become ''rudimentary,'' or ''reduced to a rudiment.''

Sclerite (Gr. *scleros*, *hard* + *ite.*)—Literally ''a hard part of the cuticle.'' Preferably given to individual plates of the skeleton, but commonly applied also to skeletal areas separated by grooves.

Sclerotization.—The hardening of the protein component of the cuticle by phenolic substances from the epidermis. The expression ''strongly chitinized'' for the hard parts of the body wall is now an anachronism, though still sometimes seen in print.

Segment (L. *segmentum*, from *seco, sectum*, a piece cut off). By derivation any section of the body or an appendage might be a segment, but many such sections are of different anatomical value. Hence, we must have an arbitrary definition to distinguish a segment from the parts of a subdivided segment. The body segments (somites) and the major parts of a leg (podites) are muscularly movable. We may, therefore, define a *segment* in general as a part that is movable as a whole by muscles attached on its base. Subdivisions of a leg segment may be movable, but have no muscles of their own.

Sensillum (pl. *sensilla*).—A coined word (from L. *sentio*, perceive) meaning a sense organ. Sometimes used in the feminine (*sensilla, ae*), but it is presumptuous to give sex gender to words not in the language of their origin.

Spiracle (L. *spiraculum*, from *spiro*, to breathe).—A better term for a ''breathing hole'' than *stigma*, meaning a spot.

Stipes (L. a stalk).—Pronounced: stī′-pēz, pl. stĭp-ĭ-tez.

Sulcus and Suture.—The skeleton of an insect, especially on the head and thorax, is strengthened by internal ridges formed by inflexions of the cuticle marked externally by grooves, or *sulci* (L. *sulcus*, a furrow), commonly called ''sutures'' by entomologists. A *suture* (L. *sutura*, a seam), however, is properly a line where adjacent parts have united. The indiscriminate use of ''suture'' for any kind of skeletal groove has no excuse other than long usage. But why perpetuate a self-evident error? Words should mean what they say.

Tarsus.—The penultimate segment (propodite) of a leg. Usually subdivided into movable but nonmusculated sections, or *tarsomeres*, miscalled ''tarsal segments.'' The only tarsal muscles are those attached on the basal tarsomere.

"Tarsal Claws".—(See *pretarsus*.)

Tentorium.—The term *tentorium*, meaning a ''tent,'' seems particularly inappropriate for the internal skeletal structure of the head, but when its four arms are united in a central plate, it might suggest a canopy supported on four stays. We can at least credit the inventor of the term with a good imagination.

Tergum and **Tergites.**—(See *ite*.)

Venter.—This term of Latin origin probably first referred to the under (anterior) surface of the abdomen, or belly, but it was also given to the cavity of the abdomen, to the stomach, and in the diminutive to a chamber of the heart. We may note that in common English ''stomach'' becomes euphemistic for belly.

When anatomical names have several applications in their origins and in common usage, we must have arbitrary definitions for technical purposes. The *venter*, therefore, is best defined as the whole under surface of the animal, whence we have *ventral* as the opposite of *dorsal* (from *dorsum*, the back). However, we inconsistently call the insect stomach the *ventriculus*, and a chamber of the heart a *ventricle*.

ANNOUNCEMENT

The 10th Pacific Science Congress will be held at the University of Hawaii, Honolulu, from 21 August to 6 September, 1961, sponsored by the National Academy of Sciences and the Bernice P. Bishop Museum.

THE JUBILEE YEAR[1]

R. H. NELSON, *Entomological Society of America,*
4603 Calvert Rd., College Park, Md.

On the masthead of every number of the *Proceedings of the Entomological Society of Washington* appears this statement, "Organized March 12, 1884." It does not require advanced mathematics to determine that 1959 was the 75th, or what may be called the Jubilee Year of the Society. The membership extended to the speaker the honor (probably undeserved) of being President during this 75th year since the organization and the first year under the present Bylaws. These Bylaws are printed in the January 1959 *Proceedings.*

There is a provision in these Bylaws which reads as follows, "The President shall deliver an address on some subject pertinent to the objectives of the Society at the first or second meeting subsequent to the completion of his term of office." In compliance therewith I am here tonight.

It is known, to this audience at least, that the speaker is no longer engaged in regular entomological work, but is rather in the terms of the times "an Organization Man." As such I have a deep interest in the who, the what, the when and the why of such groups as our Society. I propose to devote this Presidential address to an examination of the Society's beginning, of the men of vision who started it on its way and to selected blazes along the trail.

I am not unaware of the poet's admonition:

> Alas, the journey back to yesterwhiles!
> How tangled are the trails! The stubborn miles,
> How wearily they stretch! And if one win
> The long way back in search of what has been,
> Shall he find aught that is not strange and new?

Be that as it may, I wish to take a backward look.

1884. The swirling mists of three quarters of a century are between us and that time—but such a time there was. Men of flesh and blood lived and loved, worked and played, rested and rose refreshed under the same sun and same moon as you and I. It may be parenthetically observed that if they shot at the moon it was only in fun and not in frenzied competition with the barbarians.

To borrow from the broadcasters, "What sort of a year was 1884?" Perhaps we can give it some semblance of reality.

Chester A. Arthur was President of the United States having stepped up from Vice-President to replace the murdered James A. Garfield in 1881.

Queen Victoria ruled the circumpolar British Empire, although her long reign was nearing the end.

Only 19 years had passed since the guns were stilled on *that* Palm Sunday at Appomatox Courthouse and since *that* Black Friday when Lincoln was shot three and ½ blocks north on 10th Street from where we sit tonight.

There were 38 states in the Union and therein lived some 55 million people. Many of their leaders were men in their 4th and 5th decades, nearly all of whom, as bearded youngsters, had worn the blue or the gray and had somehow survived the bullets and bacteria of that disease-stricken war.

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[1]This paper represents the 1959 Presidential Address delivered to the Society at its 687th regular meeting on February 4, 1960.—Ed.

It was an election and a leap year. No doubt there was, then as now, a great squealing of politicians seeking the true trail to the trough. For the first time a woman ran for the President of the United States. I mean for the office of president! Her name was Belva Ann Bennett Lockwood. For the first time in more than a quarter century a Democrat was elected President. A rare event then as now! He was Grover Cleveland of New York. The Providence, Rhode Island, baseball team won the National League pennant for the second and last time. There was no American League.

Fred C. Bishopp was born in Virginia Dale, Colorado and R. W. Harned near Bryantown, Maryland. Joseph S. Wade was four years old down in Kentucky and Honorary President Snodgrass was a 9-year-old Missourian living in Kansas. My Danish grandparents, with little money and less English, drove from the rail-head into northern Nebraska seeking a homestead in the hunting ground of the Sioux. My father walking beside the wagon was 10 years old. My mother was a 4-year-old in her father's sod house on the Elkhorn river in northeastern Nebraska.

I am a Methodist. The American branch of that denomination had been sending our horseback-riding pastors of the frontier for 100 years since its organization at Lovely Lane Church in Baltimore in 1784.

Such was the year, hastily sketched, which saw the beginning of the Entomological Society of Washington. Who were the organizers—Who were the founders?

Dr. L. O. Howard, in a paper published in the March 1934 *Proceedings,* says that of the 25 men listed as charter members in Volume 1 of the *Proceedings* there were 9 who joined after March 1884 and that there were only 16 real founders. He lists them and he should have known. He was there.

Of these 16, eight were officers. One might say that there were 8 chiefs and 8 Indians. Washington was Washington, even then! Beginning with the officers, we will discuss these founders as we see them from this day of edification and of fallout.

Very complete biographical references for most of these founders are given by Wade in his well-known paper in the June 1936 *Proceedings,* which will be mentioned later.

President: **Charles Valentine Riley.** Who else? He was 41, born in England, educated there and on the Continent, he had crossed to the United States and served in the Union Army. A professional entomologist, he had been State Entomologist of Missouri where he issued his justly famous reports. He was Chief of the Entomology Division in what is now the U.S. Department of Agriculture. Brilliant, dedicated, an organizer and a leader of men. Much has been written about this man whose shadow falls so long in the profession of entomology. Read if you will the paper *Vice, Virtue and the Vedalia* by R. L. Doutt in the December 1958 *Bulletin of the Entomological Society of America* or the address entitled *Charles Valentine Riley* presented by Edwin P. Meiners in 1943 and distributed by the C. V. Riley Entomological Society at the University of Missouri. There have been many critical comments in regard to Riley, but I believe that his co-workers knew what they were doing when they honored him as their first President—the chief of the founding fathers. He is the only President who was elected to and served four terms.

1st Vice President: **John Gottlieb Morris,** amateur entomologist, Lepidopterist, retired Lutheran Pastor. He was 81 years of age. He was of German ancestory, the family name having been Moritz. He was born in York, Pennsylvania, educated at Princeton and at the Gettysburg Theological Seminary, the institution destined to give the name of Seminary Ridge to an area forever to be marked in American history. He knew the Melsheimers and others among the early Pennsylvania entomologists and may have known Say. He and a friend founded Lutherville, now a suburb of Baltimore. He served 3 additional terms as 1st Vice President, but never became President.

2nd Vice President: **George Marx.** Marx, who was 46, had been born in Loubach, Germany and educated at Darmstadt. He came to the United States in 1860 and served as an assistant surgeon in the Union Army, was wounded and discharged in 1862. A natural history artist, Arachnologist and bibliographer, he earned an M.D. degree at 47. He became President of the Society in 1890.

Corresponding Secretary: **Leland Ossian Howard.** In 1884 he was 27, his long, illustrious and well-documented career just under way. He was destined to live to the middle of the 20th century and to be a bridge between the founders and later generations. Personally known and honored by many who are here tonight, I shall not attempt to discuss him in detail. I refer you to the Howard centennial address by Bishopp printed in the September 1955 *Bulletin of the Entomological Society of America* for a recent review of his life and to Wade's previously mentioned paper.

May I digress for a few minutes? I joined the Society in 1933 and I remember Dr. Howard's attendance at our meetings during the early 30's. He was a teller of tales and when called upon (as he usually was) he would recount some event out of his long experience. Then as now, we met in this room. He always sat toward the front. This one I remember. The program had been on mosquitoes, perhaps Alan Stone talked, but I cannot be sure. In the discussion, Dr. Howard rose and leaning on his cane, told the following: Shortly after the turn of the century he asked W. D. Hunter to meet him in New Orleans to discuss the spread of the cotton boll weevil as well as Reed's recent discoveries on mosquitoes and yellow fever, the disease which not long since had been a plague in that city. One evening they walked down Canal Street, turned on Royal past Gluck's Restaurant and on into the Old Absinth Bar to bend their elbows. Two boatmen up from the lower river were arguing in the patios of the Bayou. The argument waxed until one, evidently a newspaper reader, exhausting his French epithets, crashed his glass upon the bar, shook a fist beneath his adversary's nose and sputtered "You-You *Stegomya fasciata*, cotton boll weevil, You!"

This one only of the 16 I knew and he will not be forgotten. He later served three terms as President and was Honorary President from 1929 until his death in 1950.

Recording Secretary: **Eugene Amandus Schwarz.** The great coleopterist was 40 years of age. Born and educated in Germany, he had been a soldier in the German Army in the Franco-Prussian War. He came to the United States in 1872. C. V. Riley brought him into Government service in 1878 and here he remained as long as he could work. He became President in 1888 and was Honorary President (the position was created for him) from 1917 until his death in 1928. Howard recounts that B. P. Mann once remarked to him, "The principal reason for the existence of the Entomological Society of Washington is E. A. Schwarz." Certainly he did much including an appreciable bequest of funds in his will.

Treasurer: **Benjamin Pickman Mann.** This native of Massachusetts and graduate of Harvard was 36. He served 7 more years as Treasurer but never was President. He was a professional entomologist, a specialist in scientific bibliographies, a compiler of indices and an editor. His editorial work on *Psyche* was especially well known.

Executive Committee. There were three members of the Executive Committee but one of these as listed in the record is not included in Howard's 16. He was P. R. Uhler, who must have joined very soon after the organization meeting in March. The other two were William Stebbins Barnard and Adolph Julian Christian Schafhirt.

W. S. Barnard was 35. He was born in Ohio and held a Ph.D. from the University of Jena. He was assistant in entomology under Riley from 1881 to 1885. He was the inventor of the famous spray nozzle known as the "Cyclone" or "Riley" or "Vermorel Nozzel." He also worked with insecticides being one of the first to use kerosene emulsion.

A. J. C. Schafhirt was 43. He was born in Germany where 5 generations of his ancestors had been instructors in anatomy in the University of Goettingen. He came to the United States in 1846, earned an M.D. at the University of Pennsylvania and later served with the medical service in the Union Army. After the war he became a druggist in Washington. L. O. Howard says his interest in entomology was largely concerned with observations on the drug store beetle and that he may have been the first to note this insect as feeding on pyrethrum powder.

So much for the officers who served in the alpha year. What of the eight who sat below the salt? We shall consider them in alphabetical order.

Lawrence Bruner. He was 28 and was in Washington on an entomological visit as well as being on his wedding trip from his home in Lincoln, Nebraska. There he was head of entomology in the Agricultural College and in the state experiment station. He and Riley had worked together on the U.S. entomological commission. I am pleased that there was a Nebraskan among the organizers.

E. S. Burgess. His age is not recorded and there is little other data. He was a botanist and taught that subject in a Washington high school and later in a university in New York City.

Lawrence Johnson. Dr. Howard says he was about 55 or 60 and refers to him as Judge. He was from Holly Springs, Mississippi and the title may have been somewhat honorary. He was interested in chiggers and mosquitoes and their control and made trips to Washington in this connection. He may have been a confederate veteran.

Albert Koebele. Born in Germany, he was 32 years old. He it was who later collected the first vedalia ladybird beetles in Australia and sent them to Coquillet in California thus inaugurating the most famous of all biological control episodes. The discussion of this by Doutt in the paper previously mentioned is most interesting.

John Murdoch. I do not know his age. He was a Harvard graduate, a zoologist and a librarian. He was a librarian for the Smithsonian Institution for some time. The entomological record is brief.

Theodore Pergande. Born in Germany he came to the United States early in the Civil War and served from 1861 thru 1865 in the Union Army. He was 46. He worked for Riley in Missouri and the latter brought him to Washington and into the Federal service. Here he remained the rest of his life. He is the "little man with his big brown beard" of some of L. O. Howard's stories. He did a great deal of painstaking biological work especially with aphids.

John Bernhard Smith. He was born in New York City and at 26 in that year of 1884 had come to Washington to work for Riley in the Division of Entomology. Later he became head of the Department of Entomology at Rutgers University in New Jersey where he was to develop as one of the better known of American entomologists.

Alonzo H. Stewart. Dr. Howard says he was 17 or 18 and a page at the Capitol. The illumination of the dome of the Capitol by electric lights was new then. Stewart became interested in the insects attracted to the lights and made a large collection. Hence his interest in the Society. Apparently his interests changed later. At least his name drops from the chronicles of entomology.

And so the roll is called and none can answer ''here.'' They are all dead now. And of these 16, which ones were particularly responsible for our Society? Each, of course, had his part and his name is on the scroll. But I submit my opinion that three men, Riley, Schwarz and Howard, were the ones to whom we owe the most. You may arrange them in any order you wish, but as here listed the erudite, controversial Riley was, I think, the spark, the starter, the leader who helped the new Society into the world and assisted in its formative years. The inspiration for continued interest was the illustrous and scholarly Schwarz. B. P. Mann's comment has been mentioned. The Germanic tone and Sangerbund milieu of the early Society were largely due to Schwarz and his friends. He was faithful to the end. And Howard. I spoke of him somewhat at length earlier. Certainly his 66 years of membership, his untiring loyalty and his interest in and encouragement of younger workers were all vital factors in the making of this Society an honored and a contributing group.

I have said that I joined in 1933. My first full year of membership was 1934. That year the Society was 50 years old—the golden year. Joe Wade was President. The March meeting to commemorate the occasion was held in the old Cosmos Club on Lafayette Square. I do not remember it, but the record says that among the notes given that night was one by R. H. Nelson on ''*Drosophila* in Tomatoes.'' The record must be right. The Recording Secretary was P. W. Oman! L. O. Howard and S. A. Rohwer were the speakers of the evening. I have borrowed from their published speeches.

In January 1935, Mr. Wade gave his Presidential address entitled, ''The Officers of Our Society for Fifty Years.'' This has been mentioned earlier and is published in the *Proceedings* for June 1936. This is a most excellent work with exhaustive bibliographic references. Only a bibliophile of deep devotion and a great sense of service could have written as Mr. Wade did. Included in that paper is a chronological listing of the 31 men who served as President from 1884 through 1933. It was quite the usual thing for a man to serve two terms and in certain cases more in those early years. The last man to be so honored was John Graf. Perhaps you would be interested in a roll call of those who have been President since 1933. These are listed here by the years of Presidency beginning with 1934 and in addition to the man's name his date and place of birth are given. If deceased, the place and date of death are recorded.

1934. Joseph Sanford Wade. July 20, 1880, Cumberland County, Kentucky
1935. Bennet Allen Porter. July 12, 1892, Northhampton, Massachusetts
1936. Stanley Black Fracker. April 8, 1889, Ashton, Iowa
1937. Norman Eugene McIndoo, April 11, 1881, Lyons, Indiana
September 7, 1956, Takoma Park, Maryland
1938. Ernest Adna Back. October 7, 1880, Northhampton, Massachusetts
May 21, 1959, Chaplin, Connecticut
1939. Robert Evans Snodgrass. July 5, 1875, St. Louis, Missouri
1940. Carl Frederick William Muesebeck. September 24, 1894, Medina, N. Y.
1941. Henry Ellsworth Ewing. February 11, 1883, Arcola, Illinois
January 5, 1951, Washington, D. C.
1942. Ernest Neal Cory. August 13, 1886, Alden, New York
1943. Robey Wentworth Harned. July 16, 1884, Bryantown, Maryland
1944. Percy Nicol Annand. November 16, 1898, Telluride, Colorado
March 29, 1950, Arlington, Virginia
1945. Frederick W. Poos. November 12, 1891, Potter, Kansas
1946. Charles Adolph Weigel. September 27, 1887, Matheun, Massachusetts
1947. Austin Hobart Clark. December 17, 1880, Wellesley, Massachusetts
October 28, 1954, Washington, D. C.
1948. Edouard Horace Siegler. August 29, 1888, Philadelphia, Pennsylvania
1949. Thomas Elliott Snyder. February 6, 1885, New York, New York
1950. William B. Wood. August 30, 1886, Anthony, Kansas
1951. Alan Stone. January 23, 1904, Brooklyn, New York
1952. William Doyl Reed. September 25, 1897, Eupora, Mississippi
1953. William Henry Anderson. November 21, 1908, Chesterfield, Mass.
1954. Ashley Buell Gurney. May 16, 1911, Cummington, Massachusetts
1955. Theodore Lemuel Bissell. December 9, 1899, St. Mary's, Ohio
1956. Raymond Alexander St. George. September 19, 1894, Lynn, Mass.
1957. Frank Leslie Campbell. September 5, 1898, Philadelphia, Pennsylvania
1958. Reece Ivan Sailer. November 8, 1915, Roseville, Illinois
1959. Robert Hale Nelson. June 13, 1903, Bristow, Nebraska

In this way the last named salutes his precedessors and is delighted to see many of them in the audience tonight.

In conclusion I must again mention the address of Wade in celebration of the 50th year of the Society. He concluded that fine talk with comments in the scholar's vein pointed toward 1984, the Society's century mark. Half of the 50 years then in the future (and of which he spoke) have now fled through the glass and are past. It was a privilege for the speaker to preside over this Society in the year of that half-way point. It is an honor not lightly considered to be in the line of succession from the stalwarts of yesterday toward the unknown who will serve in 1984. Perhaps he listens here tonight. I quote from Wade and I echo him.

"How large will our Society be then? What famous names will be on its rolls of members and officers during that period? What contributions to science and to the welfare of humanity will be made during that time? What new insects will they then have to deal with? What better control measures will be worked out? What better methods of study? What better microscopes and equipment?"

If the rulers of men in this shrinking, shrieking world can somehow, in some way find something of wisdom and the fetters on Mars remain unstruck, there are those here tonight who will see the Society's centennial twenty four years hence. Remember the nthe 16 who fashioned the Society's genesis, think then of Wade's probing questions, consider then those who have served along the way.

"The Bird of Time has but little way
To fly—and Lo! the Bird is on the Wing."

BOOK REVIEW

THE CONTROL OF GROWTH AND FORM: A STUDY OF THE EPIDERMAL CELL IN AN INSECT, by V. B. Wigglesworth. Cornell University Press, 140 pp., 47 text figs., 8 pls. Price: $3.00.

In this book the author gives us a most illuminating explanation of how insects are able to take on the many forms for which they are noted. It is all owing to the capacity of the epidermal cells for diversified chemical activity and their almost unlimited power of differential growth. The evidence is derived principally from a study of the blood-feeding hemipteron, *Rhodnius prolixus*, but the results undoubtedly apply to most of the insects and probably to the other arthropods as well. The diversity of the arthropods is made possible by the sclerotization of their integument, which allows them to take on an endless variety of external forms impossible to soft-skinned animals, or to those whose shape is limited by an internal skeleton of bones. The integument of the arthropod, regardless of the shape of the animal or its changing form, is a product of the epidermal cells.

The sclerotization of the cuticle involves its periodic renewal to allow new growth and a shedding of the old cuticle. This is no simple process and is accomplished by many successive chemical secretions discharged from the epidermal cells. The cuticle consists of several layers of different composition, mostly chitin and protein, but it must be protected externally by waxy waterproof coverings. Sclerotization is produced by phenolic substances discharged from the cells. Then the old cuticle must be separated from the new, and this is accomplished by enzymes from the epidermis that digest and liquefy the inner layers of the old cuticle, the products of which are then absorbed into the body. Furthermore, the inner surface of the epidermis gives rise to oenocytes, which elaborate lipoproteins passed into the epidermis for discharge on the surface. The description of the moulting processes occupies many pages of Chapter I in the text, but the author refers to it as a "brief summary" serving "to emphasize the amazing range of activities in the epidermal cell."

In addtion to their numerous chemical activities the epidermal cells have the capacity for differential growth. This is discussed in Chapter II, citing particularly the transformation of epidermal cells into gland cells and into cells that form the external sense organs. The differentiation of sensory nerve cells, it is pointed out, shows the persistence of the faculty of the epidermis for forming nerve tissue. An important feature here is the demonstration of the ingrowth of sensory axons until they find a ganglion in which they can make connections with the central motor system.

The capacity of the epidermis for differential growth is seen further in the fact that the cells successively form the body wall of the embryo, the juvenile stages, and the adult, including the larva and the pupa in holometabolous insects. Here, however, they need hormones for their control and guidance. Chapters III and IV, therefore, are devoted to the subject of endocrine control of the juvenile form and the hormonal activation of moulting and adult development. In this there is little that not already known. The author points out, however, that the corpus-allatum hormone is not merely an inhibitory agent as usually supposed. Since it allows many growth processes of larval type, it clearly does something active and positive.

Still other examples of the potentiality of the epidermis for differential growth are discussed in Chapter V under the heading of polymorphism. This includes the polymorphism of the individual in its growth, the difference in external sex characters of the adult, the different forms amputated appendages may take on regeneration, and the caste differention among social insects.

Chapter VI is a discussion of the possible ways by which growth and development is integrated and controlled in the various parts of the body. The ability the author suggests is of a chemical nature distributed by the tissue fluids, which he likens to the food-sharing of social insects known to regulate the activities of the members of the colony.

In the analysis of the activities of the epidermal cell, Dr. Wigglesworth gives us a new understanding of the nature of an insect. A bibliography of 120 pertinent citations completes the text.–R. E. SNODGRASS, *Research Associate, Smithsonian Institution, Washington, D. C.*

BOOK REVIEW

THE GENUS LAELAPS WITH A REVIEW OF THE LAELAPTINAE AND A NEW SUBFAMILY ALPHALAELAPTINAE (ACARINA: LAELAPTIDAE). Vernon J. Tipton. University of California Publications in Entomology 16 (6): 233-356, Pls. 22-47. 1960. University of California Press, Berkeley and Los Angeles, California. Price $2.50.

This is another monograph the editors of the University of California Press can well be proud of. The parasitic genus *Laelaps*, although not directly implicated in disease transmission, is of interest because of the relative abundance of these mites on animals and their wide distribution throughout the world. The paper is more than a review of the genus. Tipton discusses the genera now in the Laelaptinae, as well as those once considered to belong in this subfamily. The systematics of the genus *Laelaps* is discussed; excellent keys and figures are given. Also, there is a section on the many species formerly placed in the genus. The hosts and their parasites are listed, and a complete bibliography is given. A new subfamily closely related to the Laelaptinae is described. This paper is recommended for those interested in the medical aspects of arthropods, as well as in the systematics of mites.

EDWARD W. BAKER, *Entomology Research Division, ARS, U.S. Department of Agriculture, Washington, D. C.*

MECONEMA TAKEN IN THE UNITED STATES IN 1957
(ORTHOPTERA: TETTIGONIIDAE)

In a recent note (Gurney, Proc. Ent. Soc. Washington *62:* 95-96, 1960), I reported the finding, at Little Neck, Long Island, N. Y., of two specimens of *Meconema thalassinum* (De Geer). These specimens were collected in 1959 by John K. Terres, editor of *Audubon Magazine,* on the grounds of his home, and it was supposed that this katydid, a native of Europe, had become established in the United States. In September 1960, Mr. Terres sent me four more specimens, collected by him at the same locality in 1957 but previously overlooked in his collection. They apparently confirm the establishment of a breeding colony in this country, as well as antedate the first-reported record by two years.

The four adults taken in 1957 are as follows: 1♂ which flew onto a person resting on an outdoor chaisé longué, July 20; 1♀ collected from leaf of spicebush in garden, July 20; 1♂ found dead on window screen, August 11; 1♀ found in daytime under tarpaulin in garden, August 24.

ASHLEY B. GURNEY, *Entomology Research Division, A.R.S., U.S. Department of Agriculture, Washington, D. C.*

SOCIETY MEETINGS

690th Regular Meeting, May 5, 1960—

President Paul W. Oman presided at the 690th regular meeting of the Society in the USNM, Room 43, on May 5, 1960, with 22 members and 25 visitors present. The minutes of the 689th regular meeting were read and approved.

The names of three candidates for membership were presented: *Robert C. Bechtel, Theodore D. Godek,* and *Kenneth H. Kalmbach.*

President Oman reported on actions taken at the Executive Committee meeting on May 2, 1960. It was voted to increase the cost of reprints. Lewis H. Weld was recommended for honorary membership in the Society.

Members were urged to attend the annual picnic to be held jointly with the Insecticide Society of Washington on June 8, 1960, at 6:00 p.m. at the Log Lodge, Beltsville, Md.

R. I. Sailer exhibited a fossil found in a shale deposit at Ruby Bend, Montana. The fossil is clearly identifiable as a member of the subfamily Acanthosomatinae, family Pentatomidae. It is not generically distinguishable from the living genus *Sinopla* which is found in southern Argentina and Chile. An example of the living genus was also exhibited.

Ernestine B. Thurman presented a copy of the *Illustrated Key to Common Mosquitoes of Southeastern United States* by C. J. Stojanovich.

Five participants who had entered outstanding entomological projects in the local Science Fairs were presented. Each spoke briefly about his project which was exhibited during the meeting.

The exhibitors and their exhibits were Miss Bettijean Liebersohn—*Chow Time,* a study of the stimulus for eating found in fruit flies; Miss Gail R. Sander—*War Declared on Japanese Beetle;* Mr. Michael D. McAdmans—*An Insect Collection;* Mr. Carl B. Ihli—*An Insect Collection;* and Mr. Pete Thacher—*Natural Resistance of Maggots to Pathogenic Microorganisms.*

W. H. Anderson spoke on the need for additional sustaining members of the Science Fair Association of Prince George's County in order to meet the cost of sending two teachers and two student winners to the International Fair in Kansas City and next year in Seattle.

Speaker for the evening was Mr. M. H. Sartor, ARS, USDA, who presented the work of the Plant Quarantine Division and a movie, *The Hidden Menace.*

Among the 25 visitors were parents and sponsors of the Science Fair exhibitors and *Dr. Arthur Coatz* of ICA.

The meeting was adjourned at 10:00 p.m.—ERNESTINE B. THURMAN, *Recording Secretary.*

691st Meeting, June 8, 1960—

The annual picnic was held from 6:00 to 9:00 P.M. at Log Lodge, Agricultural Research Center, Beltsville, Maryland, on June 8, 1960. More than 100 members and guests from the Insecticide Society of Washington and ESW enjoyed numerous games and contests followed by a picnic dinner.—ERNESTINE B. THURMAN, *Recording Secretary.*

CORRECTION

In the paper by A. B. Gurney entitled 'Grasshoppers of the *immunis* group of *Melanoplus,* and notes on the grouping of other far western brachypterous species of this genus,'' which appeared in the Proceedings, Vol. 62, No. 3, September, 1960, the first line of the discussion of *Melanoplus immunis* Scudder on p. 47 should read:

''Fulton (1930, p. 618) discussed *immunis* briefly, and he pointed''

PUBLICATION DATES

The date of publication of Vol. 62, No. 3, of the *Proceedings* was 3 October 1960. The date of publication of Vol. 62, No. 4 will be found in Vol. 63, No. 1.

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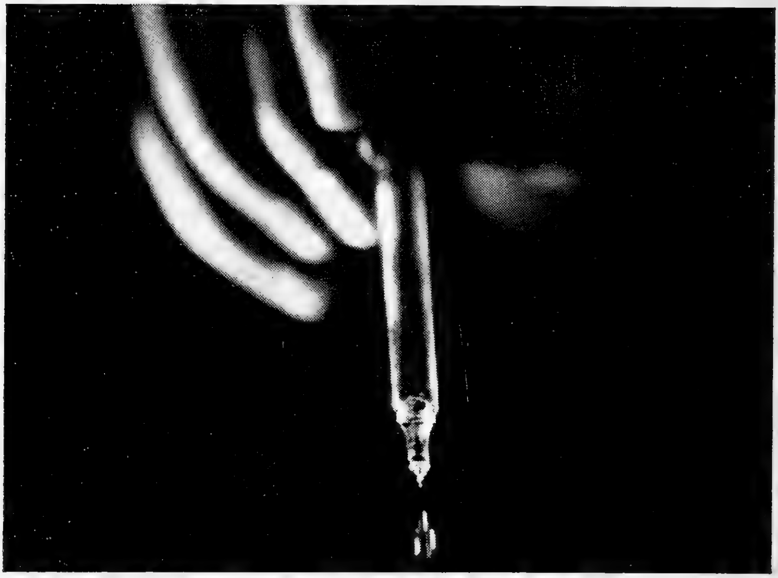

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