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UNUSUAL SCALP DERMATITIS IN HUMANS CAUSED BY THE MITE, DERMATOPHAGOIDES

(ACARINA, EPIDERMOPTIDAE)

By JAY R. TRAVER, *Department of Zoology, University of Massachusetts, Amherst*

The writer and two other members of her immediate family, all of us adult females, have been for the past several years the unwilling hosts to the mite, *Dermatophagoides scheremetewskyi* Bogdanow. Since the published reports on this mite as a parasite of humans are not numerous, it seems desirable to present an account of the activities of the mite from first-hand information. Symptoms, treatment employed in the attempt to control or eradicate the mite, reaction of certain members of the medical profession to this problem, and the present status of the situation are therefore set forth.

It is to Dr. Edward W. Baker of the Division of Insect Identification, Bureau of Entomology and Plant Quarantine, Washington, D. C., that we owe the identification of this mite, and the synonymy herewith presented. It is to him also that the writer owes her contact with Dr. Gaines W. Eddy of the same Bureau in Washington, who has suggested the use of certain new synthetic organic compounds as scabicides in the treatment of this mite. Had it not been for Dr. Baker's interest in this problem, expressed in personal correspondence, it is quite possible that no attempt would have been made to publish this personal account of an infestation with the mite *Dermatophagoides.*

PERSONAL OBSERVATIONS OF THE ACTIVITY OF THE MITE

Small itching red papules on the scalp were noted as early as 1934. This condition persisted without much change in spite of sporadic efforts to control it, until the spring and early summer of 1943. At this time, the sensations as of some arthropod crawling, scratching and biting became very pronounced, and occurred over wide areas of the scalp. The idea that *Pediculus humanus capitis* might be the causative agent was not borne out since at no time was it possible to 'comb out' a louse nor to locate nits on the hairs. Further, the infestation did not yield to treatment known to be effective against pediculosis. The itching and crawling sensations were most pronounced between about 10 p.m. and the early hours of the morning.

By the middle of August, 1943, the annoyance had become excessive and more strenuous efforts were made to clear up the infestation and to locate the causative agent. Three areas of the scalp were principally involved, a space as large as the palm of the hand above and behind each ear, and an even larger area on the top of the head in the frontal region. The sensations as of something biting, scratching and crawling from place to place were now almost continuous, becoming apparent as early as 10 a.m. and continuing all day and far into the night, increasing in intensity from 11 p.m. onward. Sound sleep was quite impossible. The principal areas involved were also painful and swollen, and as was discovered later, the epidermis over each of them was extremely thickened. On the suggestion of a druggist, a soap containing 1% mercuric iodide was employed as a shampoo. This seemed to irritate the mites, which became very active after the use of this soap. Many of them began to move down out of the scalp, and some of the thickened epidermis began to slough off.

Those that continued down on to the body soon became embedded in itching red papules reminiscent of trombiculid infestations. Treated with strong sulphur ointment they apparently did no further damage. They could be found on the shoulders, under the arms, beneath the breasts, on chest and both upper and lower back, occasionally around the umbilicus. The sensations of crawling and biting which were felt on legs and feet, in the latter case often on but seldom between the toes, indicated that some of the mites had migrated to the lower extremities.

Others of the mites, however, moved down on to the face, invading eyes, ears and nostrils. It was the mites in these locations that did the most damage. Both eyes became so badly swollen that it was impossible to move the eyeballs; to look to right or left it was necessary to move the entire head. Invasion of the eyes was not confined to the period immediately following the use of the mercuric iodide soap, but continued for many days thereafter, this invasion occurring mostly between midnight and 3 a.m. The victim of their attack would have fallen into a light sleep, when a sharp pinprick-like sensation in one eye, followed by an immediate response on the part of the already badly swollen eye would drive sleep away quite effectively. The movements of a mite that had entered under the eyelid could be felt as it crawled slowly about, then began to "dig in" at which moment the eye suddenly became even more swollen than before. An almost continuous flow of lachrymal secretion seemed to attract the mites and made vision difficult. At no time, however, was there evidence of the formation of pus in the affected eyes.

Invasion of the nostrils produced quite distressing symptoms, as of something crawling and scratching in the mucus membrane; often this was accompanied by a distinct irritation of throat, trachea and bronchi. Early invasions of the ears seemed confined to the region of the pinna, in the folds of which the mites burrowed, producing the usual itching red papules. Their presence in the ears was the cause of some concern on my part, as it is well known that certain species of mites may cause great damage in the ears of small mammals. Apparently we may consider ourselves most fortunate that this particular mite did not choose to invade the external auditory meatus, from which location it might easily have pierced the eardrum. The difficulty of controlling such an infestation in the ear, had it occurred, is at once apparent, since as yet we have found no drug that is completely effective against the mites. Even had such a drug been known, its use in the ears might have been inadvisable. Unfortunately for humans, medical doctors are much less versed in dealing with such situations than are the veterinarians who care for our dogs and cats.

In addition to the trouble caused directly by the mites a certain amount of allergic reaction and probably also of secondary bacterial or fungicidal reaction were also present. It is difficult if not impossible to determine how much additional injury and discomfort may have resulted from these secondary infections.

The most acute phase of the infestation yielded to control measures within six weeks. Henceforth, the symptoms previously mentioned became less severe and somewhat chronic, exhibiting an increase in activity more or less periodically every two and one-half to three months. This condition has continued up to the present time. Even this summer (1950), live mites have been taken from all three members of the family. July and August are their periods of greatest activity.

In spite of my optimism in regard to the limited activity of those mites that invaded the ears, there is still a question as to whether or not the difficulty I am now having with my ears, and the rather sudden onset of deafness on the part of the other infested members of my family, may have been aggravated at least by the presence of the mites. Likewise, I wonder if the chronic sinusitis to which I have been heir for some time may also have been increased by those mites which entered the nostrils.

The much-thickened epidermis had sloughed off from the three most heavily infested areas of the scalp before the end of the period of acute symptoms, and since that time no such unusual thickening in these or other parts of the body has been noted. Itching red papules continue to occur irregularly on the scalp, the pinna of the ears, on the face, and occasionally on neck, chest and back. Such areas frequently become covered with small incrustations. The mites succeeded in establishing themselves temporarily on one wrist, between the third and fourth finger of one hand, just below one ear, on the ventral surface of one knee, and just below the hair line above the left temple. Applications of 2 to 5% aqueous solution of gentian violet to each of these affected areas except the one above the temple, repeated daily for a week or ten days, finally cleared up each of these sites of infestation, some of which were reminiscent of the behavior of *Sarcoptes scabiei.* The network of red lines and itching swellings above the left temple seems also to have been brought under control, largely through the use of sulphur ointment and lysol. There still remain infested areas on the face, in the upper corner of the lower lip and in the right eyebrow, which have not yet been brought under control. Tunnels or burrows, presumably in the dermis, could be seen on the wrist, in the soft skin between the fingers, on the knee, below the ear, above the temple, and on the lower lip. On wrist and knee, these burrows took the form of one more or less straight central tunnel, visible as a slightly raised reddish line, from which extended at right angles several shorter lateral tunnels. Above the temple, as noted, a network of raised red lines with small swellings here and there, indicated the presence of the mites. In other areas mentioned, the tunnels were more or less U-shaped, somewhat wider at one end, and apparently without lateral branches. Inasmuch as it has never been possible to locate a mite in the sloughed-off epidermis or in the small incrustations which form over infested areas, it seems probable that the burrows are actually in the dermis. Further evidence for this belief is the fact that live mites have been captured from the deeper regions underlying such an incrustation when the latter had been removed. Certainly, during the period of acute symptoms, when mites could be felt running about below the thickened epidermal masses, and causing their host almost to tear off bits of the scalp in an effort to get at them, none were even inconvenienced by any substance used against them until the mercuric iodide soap was employed. One of the most annoying runways occupied by the mites, the entire length of the right eyebrow, with extensions to and from the adjacent hairline, does not show on the surface any indication of its presence save a slight swelling. Even when such a burrow does not show externally, however, its presence is readily ascertainable by reason of the activity of the mites, which habitually travel from one area to another along certain well-defined highways. If these highways were in the epidermis, it should seemingly have been possible to capture mites in them, as the mites moved from place to place.

Symptoms Experienced by the Other Members of the Family

It was not until some time after my acute symptoms had subsided that other members of the family began to feel the effects of the mites. Whether they were less susceptible to the mites, from whatever source these were originally obtained, or whether they were infested from my infestation, we shall never know. As I had not at any time discussed the details of my symptoms with either of them, it is evident that they did not develop symptoms 'in sympathy' with mine. Only now and then, one of them would mention her particular symptoms as of the moment. One has had more difficulty with mites invading the pinna of the ear than I have had. These mites, when driven from the ear by the use of sulphur ointment or some other substance, moved down on to the body and became embedded there, particularly on the chest, shoulders and lower back. This member has also had much trouble with mites invading the nostrils. The other member of the family had more difficulty with mites embedded on the neck and shoulders. At no time have either of them suffered acutely from the presence of the mites.

The Medical Profession

Aid was of course sought from the medical profession, but very little help in treatment of the symptoms was forthcoming from this source. A reliable oculist who was consulted during the period of my acute symptoms reported the finding of some foreign objects embedded in the eye, but as these were apparently not in the cornea, he thought they would do no serious damage. A dermatologist, recommended by a local physician, was apparently convinced without more than a very casual examination, that the patient's symptoms were largely imaginary, those that did exist having been caused by an ill-advised attempt on the part of the patient to rid herself of something that was not there. Not until three days after my visit to his office, however, did he tell me this. Even he could not fail to note the greatly swollen eyes and the three areas of thickened epidermis on the scalp. He X-rayed the eyes and the affected scalp areas, and recommended several days' stay in the hospital, ostensibly for further treatment of the eyes. Actually, such treatment consisted solely of applications of hot boric acid compresses to the eyes, and the use of cold boric acid as an eye wash, treatment which I could have rendered myself at home fully as well. After the third day in the hospital, he turned me over to a neurologist for treatment of my 'psychoneurotic' condition. The patient, however, succeeded in convincing the neurologist that she had no need of his services. The local physician now suggested the use of sulphur ointment on the scalp, such as had been used effectively by the patient against mites embedded elsewhere on the body. She also suggested the use of sulfathiazole, which seemed to aid materially in reducing the allergic reactions and possible secondary infections. The complete amazement of this physician, when she was later shown some of the first mites to be captured, indicated full well that she, too, had accepted at face value the dermatologist's diagnosis of 'Just imagination.' Hence any real aid in the treatment of the scabitic condition, other than the suggested use of sulphur on the scalp, came from the patient herself or from parasitologists. It is doubtful if the X-raying of eyes and scalp had much effect on the mites, although it may certainly have aided materially in clearing up secondary infections.

Treatment

To date, no treatment applied has been able to bring about complete eradication of the mites. However, many substances used on the scalp and elsewhere on the body have afforded welcome even though temporary relief from the annoying sensation produced by the mites. It would seem that a certain number of the substances employed have actually killed some or all of the adult mites, but have had no effect on the ova. Any substance used on the scalp was applied either with sterile cotton or with a pipette, usually being then well rubbed in with the finger tips. Twenty-four to 48 hours was the usual length of time between the application of any one substance and its removal by means of a shampoo, although some substances were left on the scalp for at least a week. The scalp was always shampooed as a preliminary to the application of any substance, and no other substance was used until the preceding one had been thoroughly washed out. After the use of certain of these compounds, a period of two to three months often elapsed before renewed symptoms indicating the presence of the mites were apparent. On circumstantial evidence this might be taken to indicate that the length of time required for the maturation and hatching of a young mite from the ovum is approximately two to three months. There is always the possibility, however, that the young mites may not make their presence felt at once, and that the growth period is really somewhat shorter. Attempts at control have continued actively from 1943 up to the present time.

Many substances employed as a possible means of control proved useless for that purpose. Among these may be mentioned: DDT powder, 10%, used as for pediculosis; kerosene emulsion with vinegar; Sergeant's Mange Cure, which had been of value in treating mange on two pet cats some years before, but was of no help in the present situation; ethyl, normal butyl and isopropyl alcohols, used separately and in varying strengths from 70 to 100%; ether, applied to the scalp a few drops at a time; 3% phenol, also as used for pediculosis

The following chemicals have proved of value in bringing relief, sometimes of a very temporary nature, from the activities of the mite:

Sulphur ointment, 15% USP, applied to the scalp or other parts of the body. This could be left on for several days after application. *It is one of the most helpful substances employed to date.* In the early treatment of mites on the body, a stronger preparation of sulphur was used, made by mixing flowers of sulphur with Crisco or Spry. The exact percent of the sulphur so used was never determined. At one time only during the period of acute symptoms was any sensitivity to sulphur noticed. The ointment used at that time was made up in lanolin. This sensitivity soon disappeared and no indication of it has been felt since that time. Mites treated with sulphur seem to die *in situ*.

Gentian violet, 2 to 5% aqueous solution. This, if left on any affected part of the body for a week or 10 days, and if constantly augmented by additions of the same every few days, proved completely effective in eradicating the small colonies of mites already mentioned, on wrist, knee, fingers and below one ear. Unfortunately it was never feasible to leave this dye on the scalp for more than two days at the most, as it is by no means desirable to go about with one's scalp and hair painted purple. There is also some question as to whether or not gentian violet would prove as effective over areas in which the mites were more deeply located or where they had been 'at home' for a considerable period of time.

Lysol, a relatively strong solution (4 teaspoonfuls to the pint, or even somewhat stronger), *has proved to be one of the most effective methods of killing the adult mites.* It can be used, at this strength, on small areas only. It has the disadvantage of possessing a strong odor and is also hard on the skin. The epidermis usually peels off from any area so treated some time after the use of this solution. In a weaker solution it has been used over the entire scalp following a shampoo, usually being rinsed off in a few hours. It is also by the use of lysol solution that some of the mites have been captured, as noted below.

Zemo, both regular and extra strength solutions, has proved of value in reducing the irritation caused by the mites' activities, and may even have killed some of the adult mites.

Germicidal soap, 1% mercuric iodide, used as a shampoo, appears to be quite effective against the mites, but does not eliminate all of them, nor does it appear to have any effect upon the ova. This soap is used quite regularly as a shampoo, and since no ill effects have followed its use except at the one period of acute symptoms, it seems evident that this soap cannot have been the causative substance which precipitated the acute attack. No evidence of sensitivity to this soap has been noted. It often causes the mites to migrate, however, which is not desirable if the migration is toward eyes or ears.

Zinc oxide ointment. This has been used at times alone or in combination with sulphur ointment, as is sometimes recommended, to alleviate itching on areas of the face and neck. Painted around each eye, it served to prevent the entrance of many mites into the eyes, as they could be felt moving up to this barrier but going no further.

In addition, certain other compounds known to be of value in the control of sarcoptic and other forms of mange, have been employed. Of these, the first two were suggested by Dr. Gaines W. Eddy, who has recently published the results of a series of experiments with some new synthetic organic compounds as scabicides (Jour. Investig. Dermatology 12(2): 117-123, 1949). He likewise sent me samples of several of these substances, enough for two or more treatments with each. It seems quite possible at the present writing that one or both of these two new chemicals may eventually prove effective in the eradication of our mites.

Benzyl salicylate. An aqueous solution of salicylic acid and benzyl ester 10%, in 2% of Tween 20, is the first of these two drugs. Samples of the Tween 20 were kindly donated by the Atlas Powder Company of Wilmington, Del. This has been used on my own scalp for several different doses during the past two months. After each such use, the symptoms were temporarily eliminated, but migration of the mites was quite noticeable. It has recently been employed in the treatment of one of the members of my family, but living mites are still present on her scalp.

2-phenylcyclohexanol 10%, and Tween 20, 2% as an aqueous solution, is the second chemical recommended by Dr. Eddy. The Dow Chemical Company of Midland, Mich., was kind enough to provide me with samples of this compound. It has recently been used on my own scalp. As yet the results are inconclusive, but again the symptoms are temporarily alleviated. Migration of mites occurs after its use. Ultimate success might be achieved by the frequent repetition of this substance to the scalp and other affected areas, if used repeatedly over a sufficient period of time so as to kill all newly hatched larvae before they reach maturity.

Benzyl benzoate. This has been employed in two forms: first as a liquid, and second as an emulsion, the Wellcome brand, which was much used by British scientists during World War II in the treatment of human scabies. Some relief was obtained from its use, particularly when the emulsion was employed. It seemed especially effective against those mites which had located in the pinna of the ears. Migration of the mites after the use of this compound was most pronounced. Recently, the emulsion has been used on small areas of the scalp at double the strength recommended. Some migration has been caused, but many of the mites seem to have been killed in *situ*. As it is probably unwise to use benzyl benzoate at double strength except on very limited areas, and as it fails to effect a complete cure even when so used, this drug cannot be relied upon to control the mite under consideration.

Tetraethylthiuram monosulphide. Another remedy much used, and with good success according to the literature on the subject, against human and animal scabies. Used as an alcoholic solution as recommended, it has not proved as useful in the treatment of our mite as have several other substances. It is stated to give excellent control against *Sarcoptes* and *Notoedres*, but it seems not to be the answer when used against *Dermatophagoides*.

Gamma isomer of hexachlorocyclohexane. This was used in the form of an ointment sold under the commercial name of KWELL. Ticks and mites are reported to be killed readily by this substance, but not so the mite *Dermatophagoides*. It was left on the scalp for several days before removal with a shampoo, and almost immediately thereafter the mites could be felt moving about in their accustomed places.

40% aqueous hypo (sodium hyposulphite). This was allowed to dry on the scalp, and was followed by a second application, which was also allowed to dry. Sometimes hypo was used alone, or again was followed by 5% HC1 after the second application was thoroughly dry. Both methods often brought relief for several days, even for a week or more. But again the ova were evidently not destroyed. Although this treatment has been repeated many times during the past four years, the mites are still with us. However, it did give temporary relief, and caused only a moderate amount of migration on the part of the mites.

Considering the above list of chemicals, many of which are purported to eradicate several species of mites commonly infesting man and domestic animals, it would seem that the mite presently under consideration is much more difficult to deal with than are such genera as *Sarcoptes*, *Notoedres*, *Psoroptes* and *Chorioptes.* Whether or not this is due to an inherent ability of *Dermatophagoides* to withstand strong chemicals or whether, as seems more likely, this mite inhabits the dermis and is therefore less subject to contact with chemicals which are employed against it, we cannot say. At any rate, we have first-hand information that this mite is not easily eradicated.

Capturing the Mite

This was a tedious process, and the number of mites actually captured is surprisingly low. This does not mean, to me at least, that there were not many more mites present at any given time, which could not be captured by any method employed.

My first attempt at locating the causative agent by examining sloughed-off epidermis and incrustations from infested areas, after treating these with KOH, was completely negative. Hence it followed that similar material which was collected from my scalp and body and sent away to two different parasitologists for examination also yielded negative results. Both of the parasitologists were interested in the case, and anxious to help if possible, but they were located many miles away from the individual who had the infestation.

During the period of the acute symptoms, my eyes were so badly swollen that it would have been impossible for me to recognize a mite had I been able to capture it. Furthermore, during that summer I did not have a microscope at my disposal. A few months after the acute symptoms had subsided, however, I captured two very small Hymenoptera which had been felt crawling about on the scalp. These have been identified by Mr. C. F. W. Muesebeck, Chief of the Division of Insect Identification Bureau of Entomology and Plant Quarantine, in Washington, as members of the Trichogrammatidae, known to be egg parasites. There will never be any certainty as to whether or not these Trichogrammatidae bore any relation to the mite infestation, but of course there is always at least a possibility that they were parasitic upon the ova of *Dermatophagoides.* The technic, if one may call it that, of their capture was the same as that which was soon successful in the capture of the first mite found. It consisted in holding a bit of sterilized cotton, dipped in lysol solution, firmly in place for several minutes directly over a spot where a mite or some other arthropod could be felt moving about. Success by this method was never very great, but at least it was thus that most of the few mites taken directly from the scalp have been captured. If successful, the mite, still alive and moving sluggishly, would be found adhering to the cotton when the latter was removed from the scalp.

A rather amazing number of other arthropods have likewise been captured from the scalp in the same fashion. Among these were: several Hymenoptera of a considerably larger size than the Trichogrammatidae; an oribatid mite; small portions of the skeleton of an unknown arthropod bearing feathered hairs similar to those of a trombiculid mite; what appears to be the cast skin of a small spider; an apparent jassid; and of course many small gnats and other Diptera, among these being psychodids and ceratopogonids. Pollen of various sorts was also found commonly. Perhaps a study of the flora and fauna of the human scalp in summer might be interesting.

A modification of the method of capture indicated above also yielded several mites of *Dermatophagoides*. Immediately following a shampoo, especially when the mercuric iodide soap had been employed for that purpose, mites could be felt moving and scratching at various places on the scalp. Sometimes, following such activity, there would occur a sharp pinprick-like sensation in a different spot than the original one, and the appearance at that spot of one of the customary itching red papules which often increased in size later. This I interpret to mean that the mite, disturbed but not killed by the substance used in the shampoo, had come up from its "den" in the dermis, and when on the surface of the skin had moved to a new location, when again it burrowed in, perhaps using a hair follicle as its point of entrance. If now the saturated cotton was applied before the second burrowing-in took place, there was a good chance of capturing the mite.

Another method of capture that has met with greater success is as follows. After treatment of the scalp or face with sulphur or indeed with almost any of the chemicals listed as being of value, mites could sometimes be found the following morning on the pillow of the individual using this treatment. These mites, collected by means of a bit of cotton moistened with water, were usually dead when taken, but recently several live, active, impregnated females have been captured in this manner.

At one time only did I succeed in "digging out" a mite from my own scalp, by means of an exploratory fingernail applied to the area beneath an incrustation, the latter having been forcibly removed. The mite had been felt moving about under this incrustation. When thus captured, the mite was quite alive and healthy, and waved its legs lustily as it was being examined under the microscope.

It is perhaps worthy of note than even a small mite, when moving about actively in or on one's scalp feels "as large as a cat." A peculiar sensation as of pressure sometimes occurs synchronously with the activities of a mite which has been annoyed by treatment with some chemical. This has been especially noticeable after the use of sulphur ointment. Then there is another peculiar sensation sometimes felt: a "streaming" activity, as though many mites, perhaps small ones, were leaving some common center, due to the use on the scalp of some chemical distasteful to them, and "fanning out" in various directions from this center. In fact, some mites may later be located in red papules that had not been there before, on face, neck or shoulders, following such a streaming. I venture to predict that if any dermatologist should become the host of this mite, he would not diagnose *his* case as "Just imagination."

Possible Source of the Infestation

The source of the infestation is completely unknown. Two possible sources are: (1) two pet cats of the household, the last one of which died at least ten years ago; these cats suffered from what we called "mange," for which ailment we treated them, with some degree of success, with Sergeant's Mange Cure; and (2) a neighbor's dog, which for years suffered from some severe skin infection which several good veterinarians tried in vain to bring under control, so that the dog had finally to be destroyed. It is possible that our cats acquired their infestation from the dog, and that we acquired ours from either the cats or the dog.

At the time of the most acute symptoms, in the summer of 1943, I tended toward the belief that the infestation had been acquired, in my case, from a woodchuck which I had used to obtain material for some histological preparations. That the woodchuck did have ectoparasites I know for a certainty, as I not only removed from its body some lice (apparently *Enderleinellus marmotae*) but also some immature or nymphal *Ixodes*. I noted some of the latter climbing my arm as I worked on the woodchuck, and later captured one nymphal *Ixodes*, probably *cookei*, from my own scalp. However, the fact that I had noted itching papules in my scalp for some years previous to this time, leads me to believe now that the mite *Dermatophagoides* did not come to me from the woodchuck. This mite has been rather recently reported from rats, but I have had no occasion to work with rats other than to kill an occasional white rat for histological purposes. The same mite has been reported from the skins of birds. But I have had occasion to come in contact with birds only to pick off a few ectoparasites from such dead specimens as may have been brought into the laboratory, and most of this has been done since 1943.

The fact that the infestation has lasted for so many years seems to indicate that the mite can adjust itself readily to life on or in the human skin, and maintain itself there once it is well established.

Taxonomic Considerations

This mite belongs to the family Epidermoptidae, which may be easily distinguished from its nearest ally, the family Psoroptidae, by the fact that the females of the Epidermoptidae possess suckers on all the tarsi, whilst females of the family Psoroptidae have long whiplike setae on the third tarsi.

Dermatophagoides Bogdanow, 1864

Dermatophagoides Bogdanow, 1864. Bull. Soc. Imp. Nat. Moscou 37(1):341-348, pl. 7, figs. 1-2.—Vitzthum, 1929. Tierreich Mitteleuropas, Acari, Bd. 3, 1f. 3, 102.—Sasa, 1950. Japanese Journal of Experimental Medicine 20:519-525.

Pachylichus Canestrini, 1894. Prospetto del' Acarofauna Italiana, fasc. 6:824-829, pl. 77, figs. 1-4.—Berlese, 1897. Acari, Myriopoda, Scorpiones, Cryptostigmata, Sarcoptidae, fasc. LXXXII, no. 12.—Oudemans, 1904, Ent. Bericht. 20:190-195 (synonymy with *Dermatophagoides*).

Mealia Berlese, 1897. Acari, Myriopoda, Scorpiones, Cryptostigmata, Sarcoptidae 1:104.—Berlese, 1898. Idem., fasc. LXXXIX, no. 10, and XCII, no. 3 and no. 4.—Canestrini and Kramer, 1899, Das Tierreich, Demodicidae and Sarcoptidae, 137-138.—Trouessart, 1901, Bull. Soc. Zool. France XXVI:82-84.

Viscopteres Sasa, 1947. Nisshin Igaku 34(3):167-170.

Type: *Dermatophagoides scheremetewskyi* Bogdanow, 1864.

Bogdanow described two forms of mites. The first of these, designated *D. scheremetewskyi*, is a female, depicted in dorsal and ventral view in figs. 1a and 1b. It occurred on the surface of the skin of humans suffering from the itch. The mite of the second type, found on a single occasion on a child suffering from herpes farinosus, and designated by Bogdanow as "Acarus de l'Herpes farinosus," is depicted in figs. 2a and 2b. It is a male, very probably that of *D. scheremetewskyi*, as Bogdanow himself suggested; certainly it belongs in the same genus as the previously described female mite. Bogdanow compares his new genus with *Dermatophagus*, saying that it has "une grande resemblance avec selui des acariens due genre *Dermatophagus*, decrit en detail par Fürstenberg."

He notes two differences between *Dermatophagoides* and *Dermatophagus:* (1) the conformation of two lyre-shaped chitinous arcs near the genital opening of the female; and (2) differences in the termini of the third legs of the females. (*Dermatophagus* Fürstenberg, 1861, is a synonym of *Chorioptes* Gervais, according to Ewing, 1929.)

Dr. Menger, an M.D., reports on the finding of a species of parasitic mite infesting the human skin and causing a severe dermatitis. This mite he describes and figures, as: "*Acarus incapsulator* or *Sarcoptes trichogenetos* (Boeking)." The mite is said to have been found also in capsules beneath the skin of the same patient, and was thought to be related to or be the causative agent of trichinosis, hence the specific name applied to it.

North American records are: Texas; in house in Kentucky; from rat in Florida; from house in Chester, N. H., causing an itch; and from New York. These, combined with the European distribution, indicate a rather widespread range and eventually the mite should be found throughout most of the world.

Several other species have been placed in *Dermatophagoides,* but much work is needed before the exact status of the various species can be determined with certainty. Dr. Manabu Sasa, of the Institute of Infectious Diseases, University of Tokyo, Japan (The Japanese Journal of Experimental Medicine, vol. 20, pp. 519-525, 1950), discusses the genus *Dermatophagoides* in Japan. *D. saitoi* (Sasa) was taken in sputum of a patient with typical Loeffler's syndrome, *D. takeuchii* was found in urine, and an undetermined species was obtained from a patient with chronic bronchial asthma.

Generic characters. Body oval. Dorsal shield present. Prominent transverse groove anterior to middle of body, the two hind pairs of legs posterior to this groove. Sexual dimorphism evident, especially noticeable in legs of male; however, all legs in both sexes are well developed. Posterior end of body more or less rounded, not lobed in either sex. A pair of copulatory suckers present on anal plate of male. Genital opening of female between third coxae; surrounded by a crescentic anterior and two curved lateral sclerotized supports. Corresponding opening of male somewhat more posterior, lying between fourth coxae. Penis short, conical. Epimera of first legs not united. All tarsi in both sexes with short terminal stalks (peduncles) which bear cup-shaped suckers. Claws, where present, small and not easily discernible. Two pairs of long, strong posterior setae, the outer pair longer. One pair of vertical setae, also long and strong, arise from anterior portion of dorsal shield. Chelicerae powerful, terminating in paired chelate cutting surfaces which are dentate on the inner margins. Legs I and II directed forward; legs III and IV directed backward.

Dermatophagoides scheremetewskyi Bogdanow

Dermatophagoides scheremetewskyi Bogdanow, 1864. Bull. Soc. Imp. Nat. Moscou 37(1):341-348.

Mealia pteronyssina Berlese, 1897. Acari, Myriopoda, Scorpiones, Cryptostigmata, Sarcoptidae 1:104.

Acarus incapsulator Menger, 1896. Texas Medical News, San Antonio, Texas, Sept. 25:1-20 (attributed to Boeking).

Sarcoptes trichogenetos Menger, 1896. Texas Medical News, San Antonio, Texas, Sept. 25:1-20 (attributed to Boeking).

Eleven females and nine males, all adults, were available for study. Three of the females, taken alive, were observed before being killed. One larva and two nymphs are also present in the available material. Mites were mounted (a) in clarite, after clearing in xylol, or (b) in modified Berlese's medium, usually direct from 35% alcohol. Some mites were cleared in KOH previous to mounting; others, including most of those mounted by the second method, did not undergo such preliminary treatment. Male mites are almost transparent, but female mites, unless cleared, show well only such structures as are on the surface which is uppermost. Certain morphological features are seen more clearly in mites mounted by the first method; others, by the second.

Size. Female: 10 specimens measured. Average length, 355.2μ from tips of mouthparts to tip of abdomen; average width, 196.8μ. Longest, 400μ; shortest, 320μ; widest, 240μ; narrowest, 160μ. Male: 8 specimens measured. Average length: 296μ; av. width, 180μ. Longest: 352μ; shortest, 256μ; widest, 208μ; narrowest, 128μ.

Mouthparts. See Plate III, figs. 15, 16, 17, 18 and 19. These are quite complicated, heavily sclerotized, and interpretation of some of the parts is difficult. Two large chelicerae are present, each bearing distally a pair of cutting surfaces, the inner margins of which are dentate or serrate, as indicated in figures 15, 16, 17 and 18. From ventral view, two large triangular or conical structures are seen; from beneath these, the cutting surfaces are visible. Perhaps these represent a bilobed hypostome or rostrum. These structures are shown in the ventral views of male and female mites, Pl. I, figs. 3 and 4. Viewed from above, a very similar pair of triangular structures lying directly beneath the basis capituli almost obscures the cutting surfaces, which can be seen only by focussing downward. These are perhaps the basal portions of the chelicerae, on which the cutting surfaces are borne. It appears, then, that there are two sets of sclerotized, conical structures, one pair dorsal, the other ventral, with the cutting surfaces between them, and attached to the uppermost pair of sclerotized cones. A pair of well-developed palps is present, one palp lying on each side of the conical structures. Each is four-segmented, if the basal segment

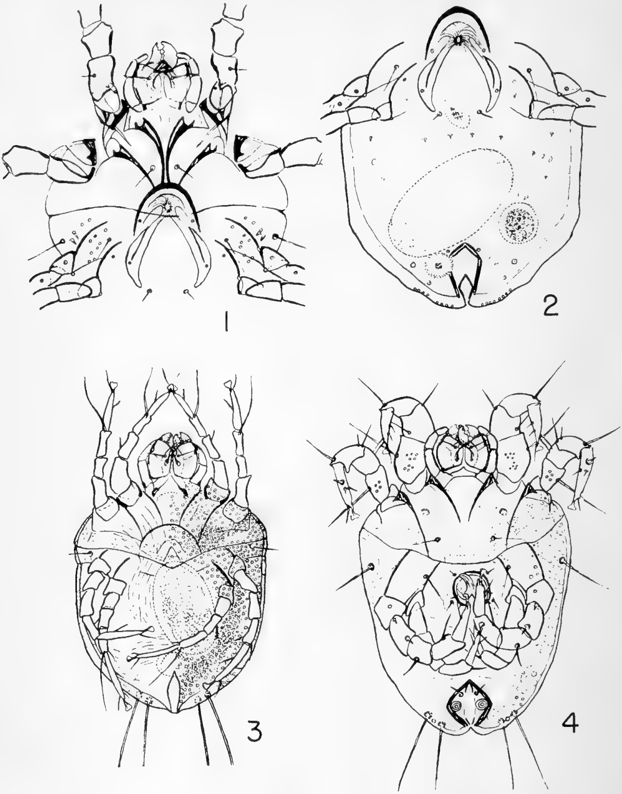

PLATE 1

Fig. 1, adult female mite, ventral view, showing details of skeletal structures; tips of one pair of chelicerae are shown, also location of the pair of large anterior dorsal spines; posterior half of body shown in Fig. 2. Fig. 2, adult female mite, ventral view, showing skeletal structures of posterior half of body. Fig. 3, adult female mite, ventral view; embossings and granulations shown on right side; on left side, fine cuticular lines are indicated; only basal portions of long posterior spines are shown; these are the only dorsal structures seen, except tips of mouthparts. Fig. 4, adult male mite, ventral view; fine granube counted. On each of the paired conical structures are more heavily sclerotized areas; these I am unable to interpret. The pharynx is visible through the mouthparts, especially in specimens well cleared before mounting. The general appearance of the mouthparts is reminiscent of those of *Chorioptes*.

Legs. On all tarsi of both sexes, the short terminal stalks inserted before the end of the tarsus, and bearing prominent cup-shaped suckers, are much like those seen in *Chorioptes*. Stalks on legs III and IV appear slightly longer than those on legs I and II, in both sexes. Tarsi of legs III and IV are likewise longer than those of legs I and II, in both sexes. Setae and spines ornamenting the legs are shown in several of the figures indicated below.

(a) *Female.* See Plate II, figs. 7, 8 and 9; and Plate III, figs. 11 and 13. Legs slender, subequal. In specimens mounted in clarite, a single terminal tarsal claw is seen on leg I. This claw, however, is not clearly evident except under oil immersion. In mites mounted in Berlese's medium, the claw does not show well. On tarsi of legs II, III and IV, one or two lobes are present, but nothing that seems interpretable as a claw.

(b) *Male.* See Plate II, fig. 6; and Plate III, figs. 10, 12 and 14. Legs I and III are definitely much thicker than II and IV; leg I is more thickened than III. Even II and IV, however, are less slender than legs of the female. In males mounted in clarite, claws are discernible, under oil immersion, as follows: Tarsus I, one rather heavy claw and one much smaller; Tarsus II, one claw; Tarsi III and IV, two claws each, one of each pair larger than the other.

Dorsum. Fine cuticular lines are present over the entire dorsal surface, in both sexes. The dorsal shield seems divided into an anterior portion, likewise shield-shaped, and a larger medio-posterior portion; between these, an apparent narrow area which is thinner. On one male, an urn-shaped sclerotized area is present at the anterior margin of the medio-posterior portion, as shown in Plate II, fig. 5. In the male, this dorsal shield seems to extend almost to the posterior tip of the body, and almost to the lateral margins. Large bosses ornament it laterally and posteriorly, as well as a few granulations; the latter are much less conspicuous than in the female. In the female, both portions of the shield are quite heavily granulated, with but a few bosses present. Laterally, a wider area of the body is left exposed than in the male; posteriorly also, the shield fails to cover quite an area. In mounted specimens, the posterior margin appears undulated, but in the live mite it is evenly rounded. In both sexes, but more apparent in the female,

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lations and small spines indicated in right half, where also is shown in dotted lines the position of embossings on the dorsal surface; on left half, fine cuticular lines are indicated; location of large, long spines on dorsal shield, in anterior portion, shown in dotted lines; only the basal half of the long posterior spines is shown.

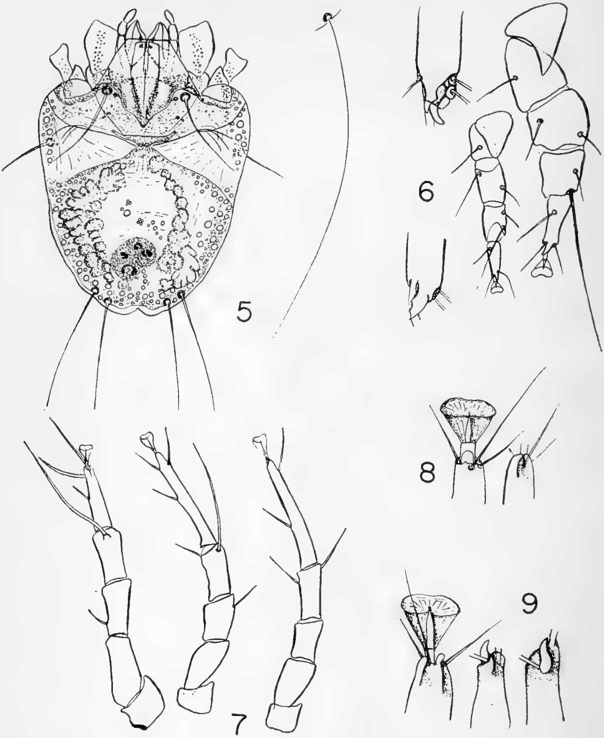


PLATE 2

Fig. 5, adult male mite, dorsal view; structures interpreted as sperm ducts and testis are indicated; at right, one of the outer pair of posterior spines, full length. Fig. 6, leg I of male mites; left—tips of tarsi of legs of adult mites, center—leg of young adult, right—leg of fully-developed adult. Fig. 7, legs of adult female mite; left—leg I, center—leg 3, right—leg IV. Fig. 8, tips of tarsi of leg II, adult female mites; right—mounted in clarite, left—mounted in modified Berlese's medium; sucker omitted from leg at right. Fig. 9, tips of tarsi of leg I, adult female mites; center and right—mounted in clarite, left—mounted in modified Berlese's medium; sucker omitted in figures center and right.

a central oval area within the anterior portion seems set off distinctly from the surrounding parts, perhaps due to heavier sclerotization. In the living female, this central portion seems to terminate anteriorly in a sort of triangle overlying the basis capituli. The central area of the medio-posterior portion of the shield in the female is separated from the lateral parts by two deep longitudinal grooves.

Venter. See Plate I figs. 1, 2 and 3, for female mite; and Plate I, fig. 4, for male mite. Definite spines are present on epimera I and II, and on the bars supporting the bases of the legs. Only the coxa of leg I is complete. Fine cuticular lines are present on all parts of this surface also. Openings of the genital apparatus are as noted in generic characters. The anus appears to be subterminal, and is surrounded by a sclerotized border, in which is set one pair of spines. Granulations occur on this surface also, in the female. In all females examined, one large ovum or perhaps a developing embryo occupies a large part of the abdomen. In several females, a round or nearly round structure, with sclerotized margin thicker on one side, lies on or near the mid-line a short distance anterior to the anus. Is it perhaps the ovary? In one male, a granular structure, apparently duplex and interpreted as the testis, occupies approximately the same position; from it extend on each side a series of granules, these being interpreted as sperms within the sperm ducts, since the series of granules terminates near the conical penis.

Body setae. In addition to the granulations, bosses and occasional stubby spines (most numerous on the female), several pairs of setae are present, in both sexes. The most conspicuous of these have been noted in the account of the genus. Four pairs of dorsal and six pairs of ventral setae are recognizable. These include on the dorsum: the strong vertical setae on the anterior dorsal shield; the two pairs of posterior setae, of which the outer pair are longer and stronger than the inner; and a pair of shorter and weaker setae, also on the anterior dorsal shield, and toward the mid-line from the strong pair. Setae of the outer pair of posteriors are usually longer than the body. Ventrally, there is one medium sized pair anteriorly, toward the mid-line; one quite strong pair of laterals arising just anterior to coxa III; three pairs of genitals (in the male, the first two pairs of these are very short, weak and directed inward; in the females, only the bases of the setae can be seen); and one pair of anals, which are relatively better developed in male than in female.

Larva. Only one larva, legs I, II and III present, has been studied. The tips of the legs are curled in such a fashion that it is impossible to be certain of their structure. Body markings in this one specimen resemble those of the male. An oval dark structure laterad of the mid-line might, in that case, be the testis, corresponding to the granular duplex structure seen in the adult male.

Nymph. One male and one female nymph have been found. In each leg IV is now well developed, and in the male the first and third legs

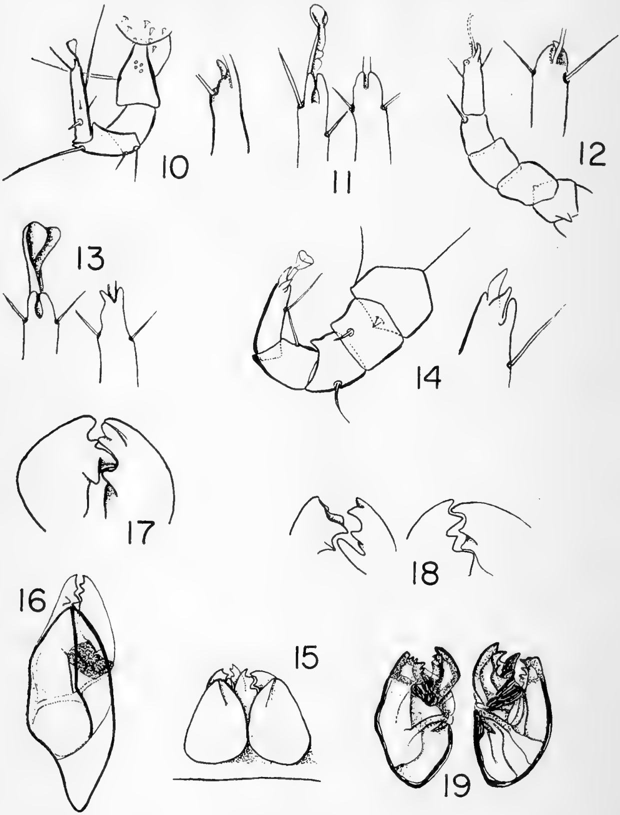


PLATE 3

Fig. 10, leg II of adult male mite; right—tip of tarsus, left—leg. Fig. 11, tips of tarsi of leg III of adult female mites; right—mounted in clarite, left—mounted in modified Berlese's medium; sucker omitted from leg at right. Fig. 12, leg IV of adult male mite; right—tip of tarsus, left—leg. Fig. 13, tips of tarsi of leg IV of adult female mites; right—mounted in clarite, left—mounted in modified Berlese's medium; sucker omitted from leg at right. Fig. 14, leg III of adult male mite; right—tip of tarsus, left—leg. Fig 15, mouthparts of one male mite are already thicker than the other pairs. Testis and sperm ducts are evident in this specimen, and the region of the genital aperture is defined, but is apparently not yet functional. In the female, the genital opening and its surrounding sclerotized supporting structures are not yet developed. Nymphs are less heavily chitinized than the adult mites, and tend to become contorted in the process of mounting. In the female specimen, however, the suckers on the tarsi are seen. Legs of the male are so turned that the tips of the tarsi cannot be seen clearly.

Observations on the Living Mite

Three living females have been observed under the binocular. Each was placed in a Plant Industry watch glass, on a tiny bit of cotton, which was slightly moistened at intervals. The watch glass was covered between periods of observation.

In color, the living female is creamy white as to body, with reddish brown or amber conical mouthparts and paler amber legs. Two or three dark "blobs," apparently close beneath the dorsal surface and in the mid-dorsal line, were observed to change position as the mite moved. Finally one of these was seen to be extruded through the anus. These, then, were food pellets. An opaque colorless rounded structure was seen in one female, anterior to the anus. Perhaps this is the structure postulated to be the ovary.

The mite moved about actively, climbing on and among the fibers of cotton. Often it burrowed into the cotton, using the fore legs to burrow and both pairs of anterior legs to pull the body forward. The third leg seemed used to steer the body. The fourth pair of legs was seldom seen from dorsal view, but probably assists the third pair. Strands of cotton are grasped by the first and second pairs of legs. At one time, when an hour or more had elapsed since the previous observations, the mite could not be seen. It was finally located, hidden completely beneath the entire layer of cotton. Frequently when at rest the mite held the first pair of legs over the mouthparts.

The central oval area of the anterior portion of the dorsal shield appeared amber in color on one mite. It stood out quite distinctly from the areas around it. In another mite, this region was merely less opaque than surrounding portions.

as seen in dorsal aspect, not removed from head of mite. Fig. 16, chelicera, dorsal aspect, after removal from head of female mite; compare with ventral aspect of chelicera from another mite, as shown in Fig. 19. Fig. 17, details of distal cutting edges of chelicera of a female mite. Fig. 18, details of cutting edges of both chelicerae of a male mite. Fig. 19, chelicerae as seen from ventral aspect, after removal from head of female mite; this is a pair taken from the same mite; compare with dorsal aspect of chelicerae from another female mite.

One mite was kept alive for two days, at the end of which period it was as lusty and active as when first caught. Immersion in water, in which the cotton was kept moist, did not seem to disturb the mite. Occasionally a mite would leave the cotton and try to crawl about on the floor of the watch glass, but made little progress.

One mite was killed in warm, not hot, water, in which it died very quickly. A second was immersed in lysol solution of the strength used for treatment of the scalp. For 30 seconds it swam actively, then became quiescent. At 45 seconds, no movement could be detected. It is thus evident that the mites are susceptible and easily killed, if the killing substance can be brought into contact with them. But when in or under the epidermis, they are well protected.

* * * * * *

Opportunity is taken here to mention a similar situation in which another mite, *Bdellonyssus sylviarum* (C.&F.), family Laelaptidae (Dermanyssinae), was the causative agent. Several years ago a Mrs. X wrote me in regard to a difficulty which she and other members of her family had been experiencing. They had been suffering considerably from the attacks of an unknown ''something'' which was present on their scalps and bodies, and which they had been unable to eradicate. Mrs. X, on the advice of her physician, had consulted a dermatologist, who told her she was merely suffering from a ''phobia,'' and to go home and forget it. Two days later, Mrs. X was fortunate enough to capture two dead mites that fell from her scalp. These she took to the dermatologist, who now became interested in her case, and prescribed some lotion as treatment. Meantime he sent the two mites off for identification, and in due time they came to me. I believed them to be *Bdellonyssus sylviarum*, but sent them to Dr. Edward W. Baker for confirmation. He concurred in the above identification.

I have had some further correspondence with Mrs. X on this subject. The last letter, written several months ago, indicated that she was still suffering from the effects of the parasites, and that nothing prescribed by doctor or dermatologist had been of permanent value in controlling her trouble. On the theory that English sparrows nesting under the eaves might have brought the mites into their home, the family had had the entire house fumigated, repainted and repapered, and still Mrs. X suffered from the mites. The other members of her family had meantime recovered from their unpleasant experience with the arthropods.

Here, then, is another instance in which humans, attacked by mites other than *Sarcoptes*, have received scant attention from the medical profession. Had Mrs. X not been fortunate enough to capture the two mites, she might really have come to believe that she did have a "phobia," whatever that expression may be taken to mean. And even with the causative agent at hand, and identified, the dermatologist was unable to treat the infestation successfully.

A certain parasitologist, in conversation on the subject of mites, has told me that he has had several experiences similar to the above, in which persons fairly frantic from the attacks of some unknown creature had been unable to obtain aid from their doctors, and had written him or come to him for help.

What, on the other hand, could a medical adviser or dermatologist prescribe, in the present state of our lack of knowledge, in such a case? So little is known of the activity and behavior of many mites that may occasionally infest man, and so little also as to the effective methods of treatment. This is, I believe, a subject which is in great need of further investigation. I suggest also that the medical profession might do well to take the lead in such a study.

Summary

The mite *Dermatophagoides scheremetewskyi* Bogdanow, a member of the family Epidermoptidae, is herewith reported as attacking humans, infesting the scalp as well as other parts of the body. Its behavior is *not* similar to that of such mites as *Sarcoptes*. It is believed that the mites burrow down into the dermis, in which they make their runways, and that they occasionally come to the surface from these runways. In general, movements of the mites from place to place are believed to occur within the shelter of these runways.

To date, no treatment employed against the mite has been completely effective, in the sense of killing the ova as well as the adult mites. Nor has repeated re-application of any of the substances used, proved effective in eradication. Many different substances known to be highly effective against *Sarcoptes* and *Notoedres* have been employed as scabicides over the past seven years, in attempts to bring about control or eradication of the mites. Of these, the old standby, sulphur ointment 15%, is the one to which we return again and again, after other substances have failed. Yet it, too, has been unable to eradicate these arthropods. Three compounds which have been most recently used, benzyl salicylate, 2-phenylcyclohexanol, and benzyl benzoate used at double strength, may perhaps be the answer to our problem, but it is still too soon to know. Certain other substances known to be effective against sarcoptic scabies have proved of little value in the treatment of *Dermatophagoides*. Among these are

tetraethylthiurum monosulfide, and benzyl benzoate used at the usual strength.

The infestations here reported have lasted over a period of at least seven years, and have occurred on three adult members of the same family. The source from which the infestation was originally obtained is unknown. If, as we surmise, infested cats or a dog suffering from mange may have been the source or sources, there has been no chance for reinfestation for some years, as these animals have long since died. But there is no certainty that the "mange" from which they suffered was produced by the same causative agent as that which has infested us. It seems probable that the human infestation has lasted for this period of time due to continued self-reinfection of each individual concerned, since the ova are apparently never destroyed by any treatment we have employed. It should be noted that the mites seem to thrive on cleanliness, if weekly, sometimes semi-weekly, shampoos during that entire period of time can be used as a criterion. The mites, be it recalled, occur principally on the scalp.

It is to be hoped that members of the medical profession may soon come to realize that it is possible for humans to be infested with mites other than *Sarcoptes,* give the patient the benefit of the doubt, and try to determine the real cause of the ailment. It is not too easy for a person infested with said mites to make a diagnosis himself, nor to prescribe treatment if he is fortunate enough to locate the causative agent. The medical adviser and the dermatologist, on the other hand, are in a position to add much valuable information in regard to the habits and activities of this and other human-infesting mites, as well as to determine methods of control or eradication, if only they are willing to do so. We can but echo Bogdanow, when he states: "Il serait a desirer que les observations prochains de M. Scheremetewsky et des autres dermatologues nous donnent plus des details sur les acarides, parasites de la surface de la peau de l'homme."

Had it not been that the writer of this article was (1) unwilling to accept the dermatologist's verdict of "Just imagination"; (2) had sufficient knowledge of parasitology and access to enough literature on this subject so that she was able to proceed "on her own" in quest of the invading organisms; and (3) knew how to preserve and mount the mites when found, this mite would in all probability not have been located, and the difficulties experienced would never have been attributed to their real cause. It is quite possible that the mite *Dermatophagoides* infests humans more often than anyone has known, but that its attacks are usually of a minor order, so that the itching and other annoyances caused by its presence may be attributed by the human host to (1) "imagination," as the doctors would have us believe; (2) "summer heat," since the mites are most active during hot weather; or perhaps (3) "dandruff." A wide-open field exists for anyone enterprising enough to do some real investigation on this subject.

The presence of the mite *Bdellonyssus sylviarum* as a causative agent of dermatitis in the human scalp and on the human body is likewise reported. At last reports, the unfortunate host of this mite was still suffering from its depredations. In this case, the diagnosis had been: "Just a phobia." Here is another field in which to date there has been no competition in the matter of studying the mite as an occasional human parasite.

THE GENUS PROBEZZIA IN NORTH AMERICA

(DIPTERA, HELEIDAE)

By WILLIS W. WIRTH, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture*

The purpose of this paper is to call attention to the proper application of the generic name *Probezzia* Kieffer, to present descriptions of four new species from the United States, to include notes and distribution records for the seven previously known species and to offer a key for their separation.

Most of the material studied is from the U. S. National Museum collection (abbreviated USNM in the distribution lists). Short series were also examined from the California Academy of Sciences (CAS) through the courtesy of E. S. Ross and E. L. Kessel, from Curtis W. Sabrosky's collection of Michigan and Kansas Diptera, and from the writer's personal collection from Louisiana and California.

Genus **Probezzia** Kieffer

Probezzia Kieffer, 1906, Gen. Insectorum, fasc. 42:57; Coquillett, 1910, Proc. U. S. Nat. Mus., 37:594; Malloch (part), 1914, Proc. Biol. Soc. Wash. 27:137; Malloch (part), 1915, Bull. Ill. St. Lab. Nat. Hist. 10:352. (Genotype: *Ceratopogon venustus* Meigen, desig. Coquillett, 1910).

Dicrobezzia Kieffer, 1919, Ann. Mus. Nat. Hungarici 17:127; Ingram & Macfie, 1921, Ann. Trop. Med. and Parasitol. 15:371; Edwards, 1926, Trans. Ent. Soc. London. 74:414; Johannsen, 1943, Ann. Ent. Soc. Amer. 36:785; Lane, 1947, Arq. Fac. Hig. S. Pub. U. São Paulo 1:232. (Genotype: *Ceratopogon venustus* Meigen, orig. desig.). New synonymy.

Diagnosis: Body slender and nearly bare. Eyes bare and usually well separated; antennae with flagellar segments elongate, verticils short and sparse, in male with plumes scanty; palpi slender. Mesonotum without anterior spine or tubercle; dorsum with short scattered erect bristles.

Femora slender and unarmed; fourth tarsal segment bilobed; fifth tarsal segment of female with blunt strong spines or batonnets below, the claws large and bifid. Wing with vein R_2 absent, thus with a single long radial cell, in female reaching nearly to wing tip; median fork broadly sessile. Female abdomen without eversible glands or internal sclerotized rods; eighth sternite with a pair of prominent submedian tufts of long fine hairs on posterior margin. Male genitalia with ninth sternite very short and deeply emarginate; ninth tergite long, slender, and tapered distad, with large dorso-lateral lobes; basistyles long and slender; dististyles short and pointed, aedeagus tapered, with short anterior arch and caplike posterior point; parameres slender, parallel sided, and fused more or less in middle.

Through some oversight or other circumstances, *Probezzia* has until now been recognized as distinct from *Dicrobezzia* and usually closely related to, or a subgenus of, *Bezzia* Kieffer. However, since the same species, *venustus* Meigen, is the genotype of both *Probezzia* and *Dicrobezzia*, the earlier name *Probezzia* must prevail for the group with the characters of *venustus*. This change, though unfortunate, is unavoidable if the rules of nomenclature are to be followed. The designation, with a question, of *Ceratopogon albiventris* Loew as the genotype of *Probezzia* by Macfie (1940), even if it were not invalid, would not alter this synonymy, since this American species is also a typical *Dicrobezzia* in the old sense. I prefer not to recognize a separate category for the species of *Bezzia* with unarmed femora which Macfie (*loc. cit.*), Johannsen (1943), and other authors erroneously call *Probezzia*, agreeing with Edwards (1926) that this criterion alone is an artificial one for splitting the genus *Bezzia*. Therefore, it is not necessary, in my opinion, to find a new name for the *Probezzia* of these authors.

As pointed out by Edwards (*loc. cit.*), *Probezzia* bears the same relationship to *Bezzia* that *Johannsenomyia* does to *Palpomyia*, with slender unarmed femora, fifth tarsal segment of female with ventral batonnets, and female abdomen without internal sclerotized rods.

The following key and descriptions refer primarily to female specimens, which are far more common in collections than the males. Males are much more difficult to separate, only slight differences being found in the genitalia of those species that have been examined. As a rule the males are much smaller, about half the size of the females, and the extent of dark markings is greater. The males lack the great prolongation of the radial cell to the wing tip, but several of the ventral batonnets are usually present on the ventral side of the dark-colored fifth tarsal segment, serving to distinguish them from males of *Bezzia*.

KEY TO THE NEARCTIC SPECIES OF PROBEZZIA

1. Knob of halteres black, stem yellow ... 2
   Knob of halteres yellow or white ... 5
2. Femora black, sometimes narrowly yellow at base ... 3
   Femora yellow except distal third black; abdomen yellow with segments 4, 5, and 6 black; wing with broad dark band from **r-m** crossvein to apex ... *infuscata* Malloch
3. Abdomen white except segments 8 and 9 dark; base of femora often yellowish; basal flagellar segments white; small, length less than 3 mm.; wing white ... *albiventris* (Loew)
   Abdomen all dark or with broad dark preapical band ... 4
4. Abdomen white with tergites 4, 5, 8, and 9 dark; legs dark, only trochanters yellowish; basal flagellar segments whitish; anterior wing veins yellowish ... *ludoviciana* Wirth
   Abdomen all dark; legs with trochanters dark; basal flagellar segments brownish annulated; wings milky white *atriventris* Wirth
5. Thorax entirely yellowish; legs yellow to pale brownish *pallida* Malloch
   Thorax shining black, at least on posterior half; legs with dark brown bands ... 6
6. Mesonotum yellow on anterior half; wings hairy on distal half *unica* (Johannsen)
   Mesonotum entirely shining black; wings bare ... 7
7. Legs dark except trochanters, extreme base of femora and tarsi yellowish; wings infuscated more or less deeply, all veins dark brownish ... *smithii* (Coquillett)
   Legs with at least basal third of femora white; wings with less than a fourth of the antherior margin lightly infuscated ... 8
8. Abdomen white; wings whitish, the veins colorless; legs yellowish white, apical third of all femora black ... 9
   Abdomen white, intermediate three segments infuscated; wings whitish, more or less infuscated in an anterior median patch centering on **r-m** crossvein about a fourth of wing length, the veins brownish in that area; legs with apical third of mid and hind, and all except base or only a narrow apical band on fore femur black ... 10
9. Base of hind tibia yellow ... *xanthogaster* (Kieffer)
   Base of hind tibia with dark band ... *sabroskyi* Wirth
10. All except extreme base of fore femur black; basal two-thirds of hind tibia black, as well as narrowly at apex; fore and mid tibae darkened on basal fourth; wing veins black adjacent to crossvein, the membrane in this area infuscated; length about 2 mm. ... *rosewalli* Wirth
    Fore leg with only knee narrowly dark; hind tibia with narrow yellow band at base, then broadly black to mid-length, as well as narrowly at apex; wing veins very slightly infuscated near crossvein, the membrane clear; length about 3 mm. *flavonigra* (Coquillett)

Probezzia infuscata Malloch

Probezzia infuscata Malloch, 1915, Bull. Ill. St. Lab. Nat. Hist. 10:316; Johannsen, 1943, Ann. Ent. Soc. Amer. 36:785.

Length 3.5 mm. A large black and yellow species; thorax shining black; wings whitish hyaline on basal third, smoky brown with brown veins from **r-m** crossvein to apex; halteres with black knob; antennae yellow, last five segments dark; legs yellow, coxae, distal third of femora, all of tibiae and fifth tarsal segment brownish black; abdomen yellow with segments 4, 5, and 6 black.

Recorded Distribution: Malloch (1915) type locality, White Heath, Ill., type female in Illinois Natural History Survey, Urbana.

Material examined: MICHIGAN: E. Lansing, June 18, 27, 1936 (Sabrosky) 2 ♀♀.

ONTARIO: Fort Erie, July 4, 1910 (Van Duzee) (CAS) 12 ♀♀. Ridgeway, June 22, 1919 (Van Duzee) (CAS) 1 ♀.

Probezzia albiventris (Loew)

Ceratopogon albiventris Loew, 1861, Berlin. Ent. Ztschr. 5:311. (Cent. I. No. 7).

Bezzia albiventris, Kieffer, 1906, Gen. Insectorum, fasc. 42:58.

Probezzia albiventris, Johannsen 1908, N. Y. State Mus. Bul. 124:267; Malloch, 1914, Proc. Biol. Soc. Wash., 27:318; 1915, Bull. Ill. St. Lab. Nat. Hist. 10:356; Johannsen, 1943, Ann. Ent. Soc. Amer. 36:785.

Bezzia (*Probezzia*) *albiventris*, Kieffer, 1917, Ann. Mus. Nat. Hungarici 15:329.

♀. Length 3.0 mm. A large black and yellow species; thorax shining black; wings whitish hyaline, including veins; halteres with black knob; antennae whitish, last five segments dark; legs yellow, coxae, femora except at extreme base, tibiae ,and last two tarsal segments brownish black; abdomen yellowish, segments 8 and 9 brown.

Recorded Distribution: Loew (1861) type locality, Georgia, type female, presumably at the Museum of Comparative Zoology, Cambridge, Mass.; Malloch (1915) New Jersey, Illinois.

Material examined: LOUISIANA: Baton Rouge, Amite River, May 16, 1947 (Wirth) 1 ♀.

OKLAHOMA: Roff, July 15, 1937 (Standish-Kaiser) (USNM) 2 ♀♀. Ardmore, June 8, 1939 (Kaiser-Nailon) (USNM) 1 ♀.

MICHIGAN: Traverse City, July 9, 1941 (Sabrosky) 1 ♀.

Probezzia ludoviciana, new species

A large shining black and yellow species with thorax, femora, and tibiae, knobs of halteres and abdominal segments 4, 5, 8, and 9 black; wings white, the veins yellowish.

♀. Length 2.8 mm., wing 2.6 mm. by 0.8 mm. Head dark brown, vertex and clypeus with scattered long brown hairs; antennae brown, segments 3-10 extensively whitish at base; palpi brown. Thorax shining black; mesonotum and scutellum with scattered strong black setae. Coxae brown, trochanters yellowish; femora except extreme bases and all of tibiae black, first three tarsal segments whitish, last two black; fifth segment stout, armed beneath with about eight long black spines, claws about half as long as segment, strong with stout outer basal tooth; proportions of segments of hind leg 22:10:100:75:45:20:7:5:15. Wings uniformly whitish hyaline, veins yellowish; costa to wing tip; halteres with knob black, stem brown. Abdomen yellowish, segments four, five, eight and nine black; eight sternite with a pair of prominent submedian dense tufts of long fine yellowish hairs on posterior margin.

Holotype female, Baton Rouge, La., May 6, 1947, W. Wirth (Type No. 59900, U.S.N.M.).

Allied to *albiventris* (Lw.), *infuscata* Mall. and *atriventris* n. sp. in the dark halteres, but readily distinguished by the banded abdomen, black femora and tibiae, and yellow trochanters.

Probezzia xanthogaster (Kieffer), new combination

Ceratopogon elegans Coquillett (not Winnertz), 1901, Proc. U. S. Nat. Mus. 23:559.

Bezzia elegans, Kieffer, 1906, Gen. Insectorum, fasc. 42: 58.

Probezzia elegans, Johannsen, 1908, N. Y. St. Mus. Bul. 124: 267; Malloch, 1914, Proc. Biol. Soc. Wash., 27: 138; 1915, Bull. Ill. St. Lab. Nat. Hist. 10:356.

Bezzia (*Probezzia*) *xanthogaster* Kieffer, 1917, Ann. Mus. Nat. Hungarici 15: 329 (n. nom. for *Ceratopogon elegans* Coq. not Winn.).

Dicrobezzia xanthogaster, Johannsen, 1943, Ann. Ent. Soc. Amer. 36: 785.

Length 2.5 mm. A rather small black and yellow species; thorax shining black; wings milky white including veins; halteres white; antennae yellow, last five segments black; legs yellow, coxae, distal third of all femora and fifth tarsal segment brownish black, abdomen yellowish.

Recorded Distribution: Coquillett (1901) type locality, Riverton, N. J., type female in U.S.N.M.; Malloch (1915), Illinois, Maryland.

Material examined: NEW YORK: Portage, July 1, 1917 (Van Duzee) (CAS) 1♀. Kearney, July 3, 1909 (Van Duzee) (CAS) 1♀.

D. C.: Washington, May 28 (Barber) (USNM) 8 ♀♀.

MARYLAND: Plummer's Island, May 14, June 11, 1914 (Shannon) (USNM) 2 ♀♀.

MICHIGAN: E. Lansing, May 26, 1936, and May 27, 1941 (Sabrosky) 2 ♀♀. Ann Arbor, June 12, 1936 (Steyskal) 1 ♀. Marble Lake, Quincy, May 31, 1942 (Sabrosky) 1 ♀.

Probezzia smithii (Coquillett)

Ceratopogon smithii Coquillett, 1901, Proc. U. S. Nat. Mus. 23:600.

Bezzia smithii, Kieffer, 1906, Gen. Insectorum, fasc. 42:58.

Probezzia smithi, Malloch, 1914, Proc. Biol. Soc. Wash. 27:138; 1915, Bull. Ill. St. Lab. Nat. Hist. 10:357.

Bezzia (*Probezzia*) *smithii*, Kieffer, 1917, Ann. Mus. Nat. Hungarici 15:329.

Dicrobezzia smithi, Johannsen, 1943, Ann. Ent. Soc. Amer. 36:785.

Length 2.6 mm. A rather small black species; thorax and abdomen black; wings uniformly brownish hyaline, the veins brown; halteres white; antennae whitish, last five segments brown; legs black, except trochanters, extreme base of femora and first four tarsal segments yellowish.

Recorded Distribution: Coquillett (1901) type locality, Riverton, N. J., type female in U.S.N.M.; Malloch (1915, Illinois; Johannsen (1943) northeastern United States.

Material examined: D. C.: Washington, Sept. 7, 1907 (McAtee) (USNM) 1 ♀.

MAINE: Belfast, Sept. 18-22, 1948 (Sabrosky) 1 ♀.

LOUISIANA: Kilbourne, May 10, 1947 (Wirth) 5 ♂♂, 12 ♀♀.

Probezzia unica (Johannsen), new combination

Lasiobezzia unica Johannsen, 1934, Jour. N. Y. Ent. Soc. 42:345; 1943, Ann. Ent. Soc. Amer. 36:784.

♀. Length 2.2 mm. A small black and yellow species; thorax shining dark brown, anterior half of mesonotum and above wing bases yellowish; abdomen yellow, intermediate segments darkened; antennae yellow, last five segments dusky; palpi yellow; legs yellow, apical half of all femora, a broad median ring and apex of hind tibia brown, fifth tarsal segment brown; wing hyaline, the veins pale, apical half of wing with sparse macrotrichiae; halteres pale (revised from original description).

Recorded Distribution: Johannsen (1934), type locality, Ithaca, N. Y., type female in Johannsen collection, Cornell University, Ithaca.

Although Johannsen referred this species to *Lasiobezzia* in 1934 and again in 1943 on the strength of the hairy wings, he pointed out that it differed from the genotype of that genus in several important features, including the lack of femoral spines, prolongation of the radial cell, armed fifth tarsal segment and the claws with a basal tooth, all of which strongly suggest that it is a *Probezzia*. The yellow markings on the mesonotum suggest affinities with *pallida* Malloch, while the leg and wing markings are similar to those of *sabroskyi* n. sp.

Probezzia pallida Malloch

Probezzia pallida Malloch, 1914, Proc. Biol. Soc. Wash. 27:138; 1915, Bull. Ill. St. Lab. Nat. Hist. 10:354; 1915, idem., 11:318; Muttkowski, 1918, Trans. Wis. Acad. Arts and Letters 19:408; Johannsen, 1943, Ann. Ent. Soc. Amer. 36:785.

Length 2.8 mm. A medium-sized, uniformly yellowish-white species; head brown, antennae yellow with last five segments brownish; fifth tarsal segment black.

Recorded Distribution: Malloch (1914) type locality, Muncie, Ill., type female in Illinois Natural History Survey, Urbana; Johannsen (1943), Eastern United States.

Material examined: MARYLAND: Plummer's Island, June 11, 1921 (Barber) (USNM) 1 ♀.

NEW YORK: Lancaster, June 28, 1914 (Van Duzee) (CAS) 1 ♀.

Probezzia atriventris, new species

A large shining black species with white tarsi and wings; antennae brown.

♀. Length 3.2 mm., wing 3.2 mm. by 1.1 mm. Head dull brownish black; vertex and clypeus with scattered long brown hairs; antennae brownish black, bases of segments 3-10 light brown; palpi light brown, slender. Thorax shining black. Legs black; trochanters brownish, first three tarsal segments whitish; fifth segment slender, with about eight long batonnets, claws about two-thirds as long as segment, with strong outer tooth at base; proportions of segments of hind legs 30:10:110:95:-55:22:10:5:15. Wings milky white, including veins; halteres with knob black, stem brown. Abdomen entirely dull black, in type with grayish pruinosity.

Holotype female, Traverse City, Mich., July 12, 1939, C. W. Sabrosky (Type no. 59901, U.S.N.M.). Paratype 1 ♀, same locality as type, July 9, 1941 (to be returned to Kans. Univ. Coll.); 1 ♀, Cheboygan Co., Mich., July 4, 1940, R. I. Sailer.

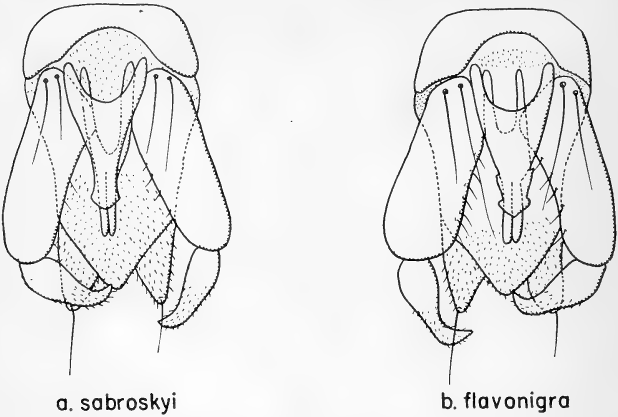
The dark halteres ally this species with *albiventris* (Lw.), *infuscata* Mall. and *ludoviciana* n. sp., but the uniform black body and legs and milky-white wings are distinctive.

Probezzia sabroskyi, new species

A medium-sized black and yellow species; halteres white; apical third of all femora black, and hind tibia with broad sub-basal black band.

♀. Length 2.8 mm., wing 2.7 mm. by 0.9 mm. Head dark brown; vertex and clypeus with scattered brown hairs; antennae brown, segments 3-10 whitish; palpi brown. Thorax shining black; legs yellowish, coxae brown; distal third of all femora, a sub-basal band a third the length of hind tibia and ends of hind tibia narrowly black; tarsi white, fifth segment black, with about eight long batonnets, claws about two-thirds as long as segment with long outer tooth at base. Wings milky white including veins; halteres white. Abdomen yellowish white, with sparse long white hairs.

Male genitalia (fig. 1, *a*); Ninth sternite deeply excavated, the posterior membrane spiculate; ninth tergite long, apex triangularly pointed and ventrally setose, with a pair of large triangular setose dorso-lateral lobes. Basistyles narrow, each with a pair of long hairs at



TEXT FIGURE 1. *Probezzia* species, male genitalia. a, *sabroskyi*, n. sp.; b, *flavonigra* (Coquillett).

base; diststyles about half as long, apex slightly curved and pointed. Aedeagus about twice as long as broad at base, anterior arch not quite a third of total length, apex slender with caplike enlargement. Parameres **H**-shaped, the basal arms well separated, about half as long as the rodlike contiguous posterior arms.

Holotype female, Kinderhook, Branch Co., Mich., May 30, 1942, C. W. Sabrosky (Type no. 59902, U.S.N.M.). Allotype, E. Lansing, Mich., May 25, 1947, C. W. Sabrosky. Paratypes: MICHIGAN: 1 ♀, E. Lansing, May 17, 1936, C. W. Sabrosky; 1 ♀, Marble Lake, Quincy, May 31, 1942, C. W. Sabrosky; 1 ♀., Detroit, May 20, 1938, G. Steyskal; 1 ♀., Chebogan Co., July 4, 1940, R. I. Sailer (to be returned to Kans. Univ. Coll.); 1 ♀., Isle Royale, Aug. 3-7, 1936, C. W. Sabrosky.

This species is closely allied to *xanthogaster* Kieffer, from which it can be distinguished by the board sub-basal dark band on the hind tibia.

Probezzia rosewalli, new species

A small black and yellow species with the fore femora mostly black, mid and hind femora with distal half dark, hind tibia with broad basal dark band, halteres yellow, wings with broad median infuscated band; abdominal segments 3-5 dark.

♂ ♀. Length 2.1 mm., wing 1.9 mm. by 0.7 mm. Head dark brown, vertex and clypeus with scattered brown hairs; antennae with second segment brown, flagellum whitish, last five segments somewhat darker; palpi yellow. Thorax shining black; legs yellow, coxae brown, femora black distad, all but base on fore leg, distal half of mid-leg and distal third on hind leg; fore and mid tibiae with basal fourth brown, hind tibia with basal two-thirds brown, all tibiae with apices narrowly brown; tarsi white, fifth segment black, with about eight very long batonnets, the claws very slender and nearly as long as segment. Wings milky white, a broad smoky brownish band across middle fourth or third at level of **r-m** cross-vein, the veins brownish on the band; halteres white. Abdomen yellowish white, segments three to five brownish black.

Holotype female, Baton Rouge, La., May 6, 1947, W. W. Wirth (Type no. 59903, U.S.N.M.). Allotype, same, May 16, 1947 (Amite River). Paratypes: LOUISIANA: 4 ♀ ♀, same data as holotype; 1 ♂, 6 ♀ ♀., Kilbourne, May 10, 1947, W. Wirth. Other material: MASSACHUSETTS: 1 ♀, Wilmington, July 4, 1910, H. S. Barber (USNM). NEW YORK: 1 ♀, Indian Lake, Sabael, Aug. 25, 1938, H. G. Barber (USNM). MARYLAND: 1 ♀, Plummer's Island, July 11, 1922, H. S. Barber (USNM), 1 ♀, same, Aug. 18, 1912, J. R. Malloch. VIRGINIA: 1 ♀, Dead Run, Fairfax County, June 22, 1915, R. C. Shannon (USNM).

Very similar to *flavonigra* (Coq.), *xanthogaster* K., and *sabroskyi* n. sp., in the white halteres and black- and yellow-banded legs, but separated from the first by the basal dark markings on the fore tibia, and from the other two by dark abdominal and wing markings. I take great pleasure in naming this species in honor of my former graduate professor, Dr. O. W. Rosewall, of Louisiana State University, the dean of Louisiana entomology.

Probezzia flavonigra (Coquillett)

Ceratopogon flavoniger Coquillett, 1905, Jour. N. Y. Ent. Soc. 13:60.

Bezzia flavonigra, Kieffer, 1906, Gen. Insectorum, fasc. 42:58.

Probezzia flavonigra, Johannsen, 1908, N. Y. St. Mus. Bul. 124: 267; Malloch, 1914, Proc. Biol. Soc. Wash. 27:138; 1915, Bul. Ill. St. Lab. Nat. Hist. 10:358; Johannsen, 1943, Ann. Ent. Soc. Amer. 36:785.

Bezzia (*Probezzia*) *flavonigra*, Kieffer, 1917, Mus. Nat. Hungarici Ann. 15:329.

♀. Length 2.4 mm. A shining black and yellow species with thorax, five distal antennal segments, and abdominal tergites three to five, black; fore femur narrowly black at tip, mid-femur with distal fourth and hind femur with distal third black; tibiae with narrow apical black band, hind tibiae with sub-basal third black; fifth tarsal segment black, the claws nearly as long as segment; wings milky white on basal third, slightly infuscated on distal portion; halteres white.

♂. Genitalia (fig. 1b): Ninth sternite deeply excavated, the posterior membrane with spiculate band; ninth tergite long and narrow, with slight preapical constriction, apex triangularly tapered and setose ventrally, with a pair of large triangular setose dorso-lateral lobes. Basistyles narrow, with a pair of long hairs at base on each side of aedeagus; diststyles about half as long as basistyles, with hook-like curved apex. Aedeagus about half as long as broad at base, anterior arch to a third of total length, gradually tapered to a trilobed apex. Parameres very slender, fused on middle third, with slender sub-parallel well separated anterior arms, and slender rodlike contiguous posterior arms exceeding tip of aedeagus by about half their length.

Recorded Distribution: Coquillett (1905) type locality, Bear Lake, B. C., type male in USNM.

Material examined: BRITISH COLUMBIA: Bear Lake, June 20, 1903 (Currie) (USNM) 1 ♂ type.

MONTANA: Big Timber, July 14, 1917 (Dyar) (USNM) 4 ♀♀.

NEVADA: Reno, July 21, 1915 (Dyar) (USNM) 1 ♀.

CALIFORNIA: Alturas, July 13-16, 1948 (Wirth) (at light) 32 ♀♀. Alturas, July, Aug., 1948 (Coleman) 20 ♀♀. Topaz Lake, Aug. 1, 1948 (Coleman) 1 ♀. Yuba City, May 29, 1937 (Christenson) (USNM) 1 ♀. Gridley, June 5, 1937 (Christenson) (USNM) 1♀.

Malloch (1915) suggested that the type of this species might be the male of *xanthogaster* (= *elegans*), but with the examination of females, it is evident that *flavonigra* is a distinct western species.

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NOTES ON PYCNOCEPHALUS ARGENTINUS BRETHES, PARASITIC ON CEROPLASTES SP. IN URUGUAY

(Coleoptera, Cybocephalidae)

By Harry L. Parker,[1,2] *United States Department of Agriculture, Bureau of Entomology and Plant Quarantine*

Various species of Cybocephalidae, a family of world-wide distribution, are known to be natural enemies of scale insects. Some comport themselves as true predators, moving about on their host plant from scale to scale, while others are considerably less motile and resemble in habits the simple external parasites, such as *Lebia*, *Exeristes*, or *Peridesmia*.

Among the former are two species, *Cybocephalus seminulum* Baudi and *C. flaviceps* Reitter[3] which are important predators of *Parlatoria blanchardi* (Targ.) in Algeria; two species predaceous on *Chionaspis* in western North America; and one species, *C. californicus* Horn, which is a very important predator of the cypress bark scale, *Ehrhornia cupressi* Ehr.

The species *Cybocephalus rufifrons* Reit., studied by Silvestri,[4] is one which may apparently be assimilated loosely with "parasites." It deposits eggs beneath female scales of *Pseudaulacaspis pentagona* (Targ.). The larva on maturity spins a cocoon upon the foliage, apparently where it has fed, in which to transform to adult. A Javanese species of *Cybocephalus* reported by Clausen and Berry[5] is a predator upon several species of *Aleurocanthus* in Java. The larva is white and is sluggish in habit, remaining upon the same leaf during the entire feeding period, and then dropping to the ground to pupate in the soil. No cocoon is formed.

Bréthes[6] describes briefly the adult of *Pycnocephalus argen-*

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[1]Publication costs paid by author as a voluntary contribution to the Society.

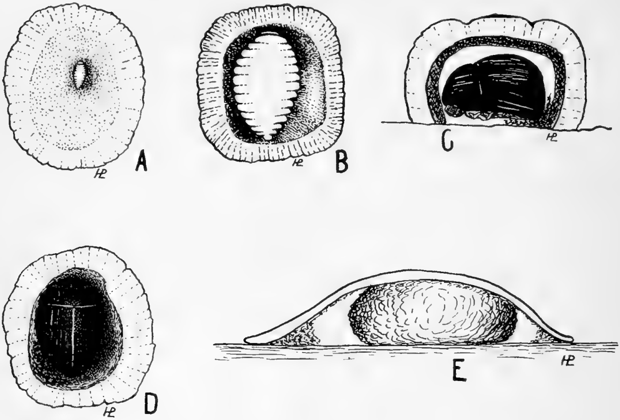
[2]The writer is obliged to E. A. Chapin, of the U. S. National Museum, and to H. H. Morrison and W. H. Anderson, of the Bureau of Entomology and Plant Quarantine, for identifications, and to H. Janvier, also of this Bureau, for the drawings of the adult *Pycnocephalus* and of the legs.

[3]Balachowsky, A. Observations biologiques sur les parasites Coccides du Nord-Africain. Ann. des Epiphyt. (July-August, 1928):280-311.

[4]Silvestri, F. Metamorphosi del *Cybocephalus rufifrons* Reit. e Notizie sui suoi costumi. Portici R. Scuola Super, di Agr., Lab. Zool. Gen. e. Agr. Bol. 4:221-227. 1910.

[5]Clausen, C. P., and Berry, P. A. 1932. The citrus blackfly in Asia, and the importation of its natural enemies into Tropical America. U. S. Dept. Agr. Tech. Bul. 320, 59 pp.

[6]Bréthes, Juan. Descripción de varios coleopteros de Buenos Aires. Soc. Cient. Argentina An. 94:263-318. 1922.



TEXT FIGURE 1. A, young larva (probably stage II) of *Pycnocephalus argentinus* in fixed feeding position beneath a female scale of *Ceroplastes* sp. on *Baccharis articulata* (Montevideo, Uruguay); B, half-grown larva of same in same position in process of destroying eggs and body contents of scale; C, recently formed adult of *Pycnocephalus* within empty shell of scale where it passed larval and pupal periods, seen in profile; D, same from below; E, cocoon of *Pycnocephalus* sp. spun beneath female shell of *Mesolecanium deltae* on orange (Colonia Suiza, Uruguay) after larva had consumed contents of scale.

tinus (Nitidulidae) as being "black with greenish reflections." The limited amount of description he allocates to this beetle agrees with the specimens studied in the present paper. Bréthes obtained the *Pycnocephalus* from stems of *Baccharis platensis* covered with *Ceroplastes* scales "on which," he states, "it probably feeds." Therefore, on the advice of E. A. Chapin and W. H. Anderson these notes are published under the name *P. argentinus*, leaving the question as to the validity of the generic name *Pycnocephalus* to the taxonomists, who will eventually find time to study this interesting group of beetles.

Life History

The egg of *Pycnocephalus* has not been seen for certain. At one time the writer found a small group of five or six empty eggshells having the general aspect of coccinellid eggs on a branch of *Baccharis* near *Ceroplastes* scales which had *Pycnocephalus* larvae under them. It was presumed that these

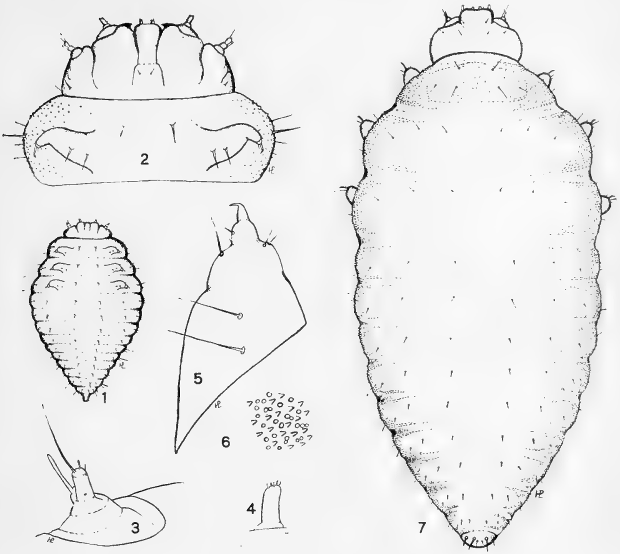


PLATE 4. LARVA OF PYCNOCEPHALUS ARGENTINUS

Fig. 1, young larva, ventral view, taken from underneath *Ceroplastes* scale on *Baccharis articulata* (Montevideo, Uruguay); fig. 2, young larva, head and first thoracic segment, ventral view; fig. 3, left antenna of last stage larva, dorsal view; fig. 4, maxillary palpus of last stage larva; fig. 5, leg of last stage larva; fig. 6, diagram of mixed spines and circles on integument; fig. 7, last stage larva, dorsal view (the larva is considerably distended in potash, normally in life it is even more disc-like than in fig. 1).

were the empty shells from which the *Pycnocephalus* larvae had hatched.

The young larva (Text fig. A and figs. 1,2) is found fixed underneath a *Ceroplastes* (or *Mesolecanium*) scale. It remains in this spot throughout its larval and pupal life, feeding on the eggs, which are expulsed, and later on the scale itself, completely destroying the scale and leaving only its empty wax covering. The parasite terminates its larval life by spinning a rough cocoon, which isolates the larva from the wax scale and in which the transformation to pupa and adult takes place (text figs. B, C, D, E). Several full-grown larvae

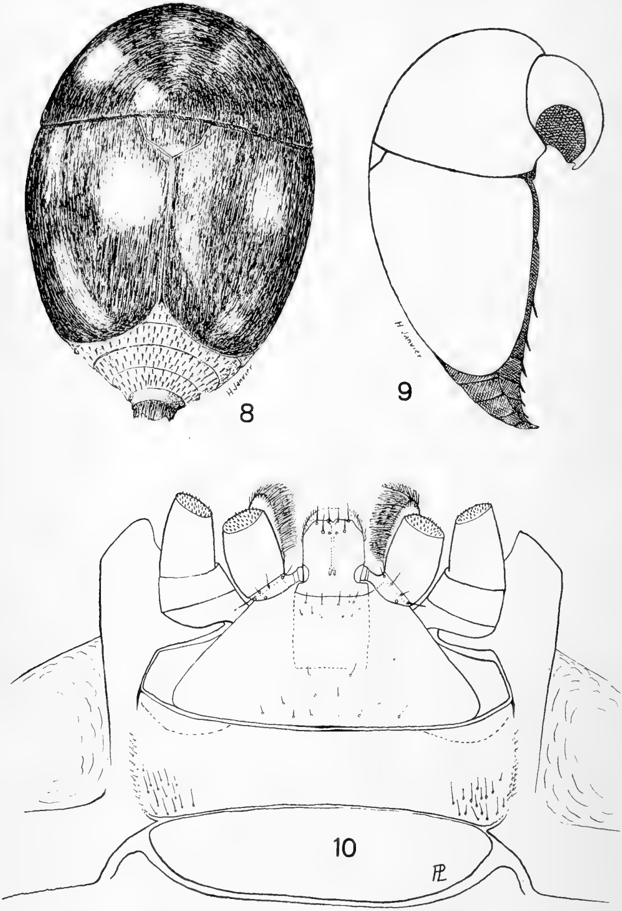


PLATE 5. ADULT PYCNOCEPHALUS ARGENTINUS

Fig. 8, dorsal view (drawn by H. Janvier); fig. 9, outline in profile (H. Janvier); fig. 10, mouth parts seen from below.

were removed from scales and placed in small cardboard boxes. The cocoons spun in these boxes were spherical, being slightly flattened at the point where they were attached to the floor of the box.

In practically all cases where this species was found in Uruguay the branches of the plant on which it was taken bore other scales, as well as the true host scale; for example, on *Baccharis articulata* and *B. genistelloides* the branches and stems were generally covered not only with *Ceroplastes* but several other scales, i.e. *Cerococcus* sp., *Lepidosaphes* sp., *Aspidiotus camelliae* Sign., and *Pulvinaria* sp., while the *Mesolecanium deltae* Lizier on orange were accompanied by *Lepidosaphes beckii* (Newm.) and *Chrysomphalus aonidum* (L.).

A single specimen resembling this *Pycnocephalus* was taken in the adult stage on branches of mulberry infested with *Pseudococcus adonidum* (L.) and *Pseudaulacaspis pentagona* (Targ.) at St. Paulo, Brazil, but whether it is the same species as that taken in Uruguay the writer cannot say.

Larvae of *Pynocephalus argentinus* were found from spring to autumn (November to March) and adults at all times of the year. It is presumed that there are several generations and that adults pass the winter in their cocoons under the scales.

Larva

The general aspect of the larva of all stages is that of a hymenopterous external parasite—for example, *Aphelinus*. It is white in color and sluggish in movement with inconspicuous legs (in the first stage leg rudiments can be discerned only under the oil immersion lens); microscopic examination, however, reveals at once that it is a coleopterous larva. The head and mouth parts of the young larva (fig.2, probably second stage) do not differ greatly from those of the last stage (fig. 7), except that the sutures in the ventral side of the head separating the cardo-stipes region are more pronounced and sclerotized, as in the example given by Böving and Craighead[7] in their Plate 37, Fig. *D*. Comparison of this larva with their data on Cybocephalidae larvae shows that it has much in common and is undoubtedly a member of this family, despite the fact that it does not agree completely with all the key characters, i.e., "mala without uncus," whereas in the present species the mala is with uncus. It is possible that this character (mala without uncus) will be found to be of secondary importance when more larvae of Cybocephalidae

[7]Böving, A. G., and Craighead, F. C. An illustrated synopsis of the principal larval forms of the order of Coleoptera. Ent. Amer. 11(3), Plate 37, Fig. *D*.

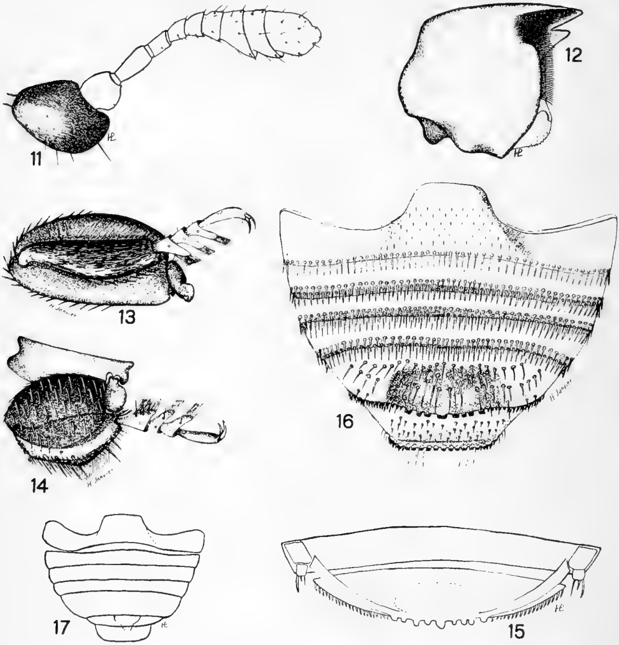


PLATE 6. ADULT PYCNOCEPHALUS ARGENTINUS

Fig. 11, antenna; fig. 12, mandible; fig. 13, left mesothoracic leg (H. Janvier); fig. 14, right metathoracic leg (H. Janvier); fig. 15, 4th and 5th abdominal segments of female from below showing palp-like processes at posterior lateral margin of 4th abdominal segment; fig. 16, abdomen of female from below (H. Janvier); fig. 17, outline of abdominal segments of male from below.

are known, and this also might prove to be the case with the lateral projections on the eighth and ninth abdominal segments, which are absent in the present species.

Some of the principal larval characters of the species considered here are as follows: Cardo not separated from stipes, or if so by a very inconspicuous suture, both membranous; mala vestigial, not divided into galea and lacinia but *with* uncus; maxillary palpus with two joints, the basal one being very short (fig. 4); the mandible has two strong subequal apical teeth; however, the inner margin is not serrate; hairs of head and body not spatulate or capitate; adhesive tarsungular hair filiform, not spatulate or capitate (whereas Böving and Craighead's figure 37, *E*, shows the adhesive tarsal hairs spatulate and some hairs of the head and body likewise spatulate); urogomphi reduced to tiny inconspicuous setae (under ordinary magnification they would be reported as "absent"); no lateral processes[8] on eighth and ninth abdominal segments, as shown by Böving and Craighead (fig. 37, *G*). The skin of this larva is covered with microscopic wedge-shaped spines interspersed with tiny circles (fig. 6).

The leg (fig. 5) is apparently composed of four joints and a tarsal claw, although unless specimens are treated in potash and well distended the leg appears (as in fig. 2) to be composed of two joints and a claw.

Adult

The adult (figs. 8, 9) is a small beetle of a coccinellid aspect measuring 1.5 mm. long and 1.0 mm. wide. It is metallic bluish-green. Seen in profile (fig. 9) its body is arched, the thorax and head are bent downwards, the latter being practically under the thorax. The last four segments of the abdomen are not covered by the elytra. Figures 13 and 14 show the middle and hind legs, respectively. Figure 15 shows the fourth and fifth abdominal segments of the female with the palplike processes on the lateral margins of the fourth segment and the tubercular projections on the posterior margin of the fifth. The sixth and last segment (fig. 16) also has a number of smaller tubercles (about 20) on its posterior border. The male has seven visible abdominal segments (fig. 17) and, although the setae and pectinate arrangement of spines on the margins and borders are the same as in the female, the large posterior tubercles are absent.

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[8]Hofneder (Über eine neue Nitidulen larve. Zool. Anz. 3:331, 1935) illustrates the larva of *Cychramus quadripunctatus* Hbst. as having prominent lateral processes on first thoraic and first eight abdominal segments.

THE STATUS OF THYANTA ACCERA McATEE
(HEMIPTERA, PENTATOMIDAE)

Thyanta accera was described by McAtee in 1919 as a color variety of *Thyanta custator* (F.). In 1926 Blatchley elevated the name to species rank. Since that time *accera* has been applied to specimens similar in size and structure to custator but which have rather well marked color differences. Uniformly green specimens often having the humeral angles tinted with red have been referred to *custator* while those having a speckled grayish to brownish green color have been called *accera*. Specimens called *accera* are also characterized by a vague pale median stripe running from the base to the apex of the scutellum and narrow fuscus to black stripes along the anterolateral margins of the pronotum. The reddish-yellow connexivum bears an oblong blackish spot on each incisure. The ventral surface of the abdomen has a black spot near each spiracle and there may be a blackish spot laterally at each incisure. These and other color differences seemed sufficient to characterize a species which, though never as abundant as *custator* had about the same range of distribution.

On August 23, 1950, I collected a typical female *T. custator* in a field near Lawrence, Kansas. This female laid one egg mass from which 18 adults were reared. To my very great surprise all adults were typical *accera* when they first emerged. Within 3 days two specimens had changed color sufficiently to be classified as *custator*. At the end of 2 weeks about half of the adults were typical *custator* and the remaining half graded from intermediate to typical *accera*. One typical *accera* remained at the end of 9 weeks when all specimens were killed.

Examination of material in the U. S. National Museum has revealed the presence of numerous intermediately colored individuals and study of the male genitalia of many specimens of both color forms has revealed no significant structural differences. It would therefore seem that the name *accera* applies to a color phase of *custator*. The fact that the color is, at least in part, determined by the age of the living individual would seem to remove any need for retaining the name *accera* as other than a synonym of custator.

In view of the general tendency in the Heteroptera for the color pattern to darken as the age of the individual increases, the gradual effacement of the black marks on the pronotum and abdomen is most remarkable. The manner in which the pigments forming these marks are absorbed or in some way altered and the general body surface suffused with green pigments offers a problem worthy of further attention.

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BUTTERFLIES OF THE MARSHALL ISLANDS[1]

(LEPIDOPTERA)

By AUSTIN H. CLARK, *U. S. National Museum, Washington, D. C.*

The following report is based upon a large collection of butterflies from a number of localities throughout the Marshall Islands. Those who contributed specimens to this collection, with the localities and dates, are:

Lt. Warren H. Wagner, Jr., USNR, Kwajalein Island, Kwajalein Atoll, October 8, 10, 15, 1944; Lt. David F. Grether, USNR, Kwajalein, Berlin (Gugegme) and Loi Islands, Kwajalein Atoll, January 1, 6, 20, 30, May 13, 1945; Capt. Frank N. Young, AUS, Perry Island, Eniwetok Atoll, May 5, 1945; Dr. Henry K. Townes, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Amoen and Engebi Islands, Eniwetok Atoll, May 16, 18, 1946; Kwajalein Island, Kwajalein Atoll, August 17, 1946; Likiep Island, Likiep Atoll, August 30, 1946; and Mogmog Island, Ulithi Atoll (Carolines), July 11, 1946; and Mr. Frederick M. Bayer, U. S. National Museum, Smithsonian Institution, Bikini Island, Bikini Atoll, July 22, 23, 1947.

Three species of butterflies occur on the Marshall Islands. One of these, *Hypolimnas bolina* (Linné), is generally distributed and occurs on every island capable of supporting it. In the Marshall Islands this species reaches its minimum size, and most of the females have more extensive dull orange on the hind wings than those found elsewhere, some being entirely dull orange. But these features are by no means constant, and the Marshall Island population intergrades abundantly with that of the smaller Carolines, which in turn intergrades with that of the larger Carolines. The incompletely differentiated and abundantly intergrading population of the Marshall Islands has been named *jaluita* by Fruhstorfer.

The two other butterflies, *Precis villida bismarkiana* (Hagen) and *Badamia exclamationis* (Fabricius), are widely distributed over the Pacific islands, but are of local occurrence in the Marshalls where neither shows any tendency toward the development of a local form. Both are active and powerful fliers and are usually very common where they occur. *Badamia exclamationis* is noted for its migratory flights, and *Precis villida* has been reported apparently in migration in New Zealand.

Mr. Bayer's records are the only ones at hand from Bikini, and the only ones subsequent to the explosion of the atomic

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bombs. He found the butterfly fauna apparently quite normal, with all three species present. Incidentally, Bikini is the only island in the Marshalls from which all three are known.

Danaus plexippus (Linné) has been recorded from the Marshall Islands (Proc. Ent. Soc. Washington, vol. 47, No. 7, p. 213, October 1945), but this is an error; it does not occur in the group.

Family Nymphalidae

Precis villida bismarkiana (Hagen)

Localities.—Bikini Atoll; Bikini Island, near the mess hall; F. M. Bayer, July 23, 1947.

Eniwetok Atoll; Amoan Island; H. K. Townes, May 16, 1946.

Eniwetok Atoll; Engebi Island; H. K. Townes, May 18, 1946.

Eniwetok Atoll; Perry Islands; F. N. Young, May 5, 1945.

Hypolimnas bolina jaluita Fruhstorfer

Localities.—Bikini Atoll; Bikini Island, near the mess hall; F. M. Bayer, July 22, 1947.

Kwajalein Atoll; Kwajalein Island; W. H. Wagner, Jr., October 8, 10, 15, 1944; D. F. Grether, January 1, 20, 30, 1945 (many larvae as well as adults); H. K. Townes, August 17, 1946.

Kwajalein Atoll; Berlin (Gugegme) Island; D. F. Grether, January 6, 30, May 13, 1945.

Kwajalein Atoll; Loi Island; D. F. Grether, January 1, 1945.

Ulithi Atoll (Caroline Islands); Mogmog Island; H. K. Townes, July 11, 1946.

Notes.—A female from Berlin Island taken on January 30, 1945, is almost wholly white, the white color extending closer to the costal border of the fore wings and closer to the base of the hind wing than in the specimen of the form *pallescens* Butler figured in Seitz (vol. 9, pl. 119). Another female almost as extensively white was taken on Berlin Island on May 13, 1945. Three pale dull orange females were taken on Berlin Island on January 6 and 30, 1945, and on Loi Island on January 1, 1945. All the females from Bikini are of the usual form.

Family Hesperiidae

Badamia exclamationis (Fabricius)

Localities.—Bikini Atoll; Bikini Island, near the mess hall; F. M. Bayer, July 23, 1947.

Kwajalein Atoll; Loi Island; D. F. Grether, January 1, 1945.

Likiep Atoll; Likiep Island; H. K. Townes, August 30, 1946.

Note.—On Likiep Island Dr. Townes found the larvae of this species feeding on *Terminalia litoralis* (Combretaceae).

THE RHAGOLETIS OF ROSES

(Diptera, Tephritidae)

By Alan Stone, *Bureau of Entomology and Plant Quarantine, United States Department of Agriculture*

Considerable confusion exists as to the correct name to be used for the fruit fly reared from roses in this country. In the literature it has gone under the names *flavonotata* Macquart, *basiolum* Osten Sacken, *setosa* Doane, and *alternata* Fallen, in several different genera. The purpose of this paper is to consider the correct application of these four names and to differentiate between the European and American species of *Rhagoletis* from rose hips.

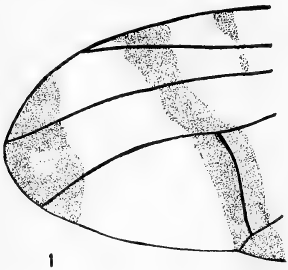
The earliest name is *Tephritis alternata* Fallen (1820, p. 5). There seems to be no reason to doubt that this is the species, currently so determined, occurring in roses in Europe. *Trypeta continua* Meigen 1826 is a synonym. F. H. Benjamin (1934, p. 18), in discussing *Spilographa setosa* Doane, wrote, "The Doane species seems practically identical with the European *alternata* Fallen, and both feed as larvae in rose hips. Larger series will be necessary to establish the synonymy." Too superficial study on my part caused me to conclude the synonymy to be correct and to use the name *alternata* in determining specimens found in America. Closer examination proves this synonymy to be incorrect, as will be shown.

Tephritis flavonotata Macquart (1855, p. 145) was described from a female specimen in the Bigot collection from "Baltimore, Amerique septentrionale." Loew (1862, pp. 58, 71) treated it as a synonym of *Trypeta electa* Say, but later (1873, p. 244) he considered a specimen from the Yukon River, Alaska, to be *flavonotata*, and he distinguished it from *electa*. Fortunately, the type of *flavonotata* is in the collection of Mr. J. E. Collin at Newmarket, England, and Mr. Collin very kindly compared specimens of both *Trypeta electa* and our rose hip *Rhagoletis* with this type. He wrote:

"I have compared the type of *Tephritis flavonotata* Mcq. with your specimens of *Trypeta electa* Say and am quite convinced that they are representatives of the same species. The type agrees with *electa*, and not with Loew's *flavonotata*, in all the characters to which Loew calls attention in his description of his Alaskan specimen.

"I would call attention to the fact that though Macquart described his species as *flavonotata* he returned the specimen to Bigot with a label in his own handwriting '*Tephritis flavovittata* ♀ Macq. n. sp.' and it was so labelled by Bigot. You will notice that Macquart described the species as—'Testacea, Thorace flavo vittata.' Under these circumstances I think that you will agree that there can be no doubt that the specimen in Bigot's Collection though labelled *flavorittata* Mcq. is actually the type of *flavonotata* Mcq.''

This then firmly establishes the identity of *flavonotata* as a synonym of *Trypeta electa* Say, if we can accept the current usage of the latter name. It should also be noted that the type locality of *flavonotata*, Baltimore, appears to be outside the known range of the rose-hip species. Loew's 1873 description of *flavonotata* agrees very well with North American rose hip species.



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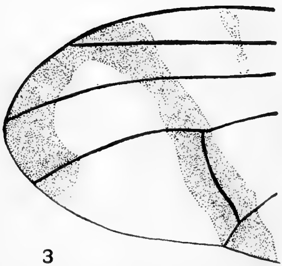

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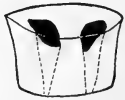

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Fig. 1, *Rhagoletis alternata* (Fallen). Apical portion of wing of specimen from Germany. Space between apical spot and transverse band somewhat wider than usual. Fig. 2, *Rhagoletis alternata* (Fallen). Postscutellum and metanotum of specimen from Germany. Fig. 3, *Rhagoletis basiola* (Osten Sacken). Apical portion of wing of lectotype of *Spilographa setosa* Doane. Connection between apical spot and transverse band somewhat broader than usual. Fig. 4, *Rhagoletis basiola* (Osten Sacken). Postscutellum and metanotum of lectotype of *Spilographa setosa* Doane. Dotted outline indicates extent of black area in lectoparatype of *setosa* from Michigan.

Trypeta (Zonosema) basiolum was described by Osten Sacken (1877, p. 348) from a pair of specimens collected at Brookline, Mass. I have not seen these specimens, but the original description is sufficiently detailed to leave no doubt that it is the rose hip species. Coquillett (1899, p. 261), in considering it a synonym of *Tephritis flavonotata* (Macq.), was evidently referring to Loew's intrepretation of Macquart's species.

Type material of *Spilographa setosa* Doane (1899, p. 178) in the U. S. National Museum consists of four cotypes, one from Vollmer, Idaho 7-31-98 being labeled "Type." This specimen is here designated as lectotype. This is a synonym of *Trypeta basiola* Osten Sacken.

Following Hendel (1927, p. 74), I treat *Zonosema* Loew (Type *Trypeta meigenii* Loew) as a synonym of *Rhagoletis* Loew (Type *Musca cerasi* Linnaeus). Separation of the two genera on the basis of wing coloration as proposed by Collin (1947, p. 11) seems to be unjustified. When the wings of *cerasi* and *meigenii* are compared, one can see that the difference is only one of degree of infuscation, and not a very great one at that. Hendel, as first reviser, had the privilege of selecting either generic name, since both were published at the same date, and I think that he was wise in retaining the more familiar *Rhagoletis* even though *Zonosema* had page precedence. The two species, *Rhagoletis alternata* (Fallen) and *Rhagoletis basiola* (Osten Sacken), the larvae of which live in rose hips, are distinguished as follows:

Rhagoletis alternata. Apical dark spot of wing usually separated from the subapical transverse band, (Fig. 1), although sometimes very narrowly so, or very rarely joined. Dark lateral areas on postscutellum and metanotum much broader than the median yellow stripe, scarcely narrowed posteriorly, and the lateral margin of each bordering the lateral margin of the metanotum (Fig. 2). Based upon 8 specimens from Europe (Austria, Germany, Denmark, England, and two indecipherable localities).

Rhagoletis basiola. Apical dark spot of wing usually joined to the subapical transverse band or narrowly separated (Fig. 3). Darkened areas behind scutellum much smaller, variable, represented by two spots on the postscutellum or as triangular spots with the base on the postscutellum, the apex reaching or approaching the hind margin of the metanotum, and always widely separated from the lateral margin of the metanotum (Fig. 4). Based upon 185 specimens from America (Alaska, British Columbia, California, Colorado, Idaho, Illinois, Indiana, Maine, Massachusetts, Michigan, Minnesota, Nebraska, New Mexico New York, Ohio, Rhode Island, Oregon, Saskatchewan, Washington, and Wisconsin).

The wing pattern shows a complete range between the two extremes figured so that this character alone will not serve to separate the species. The metanotal coloration is much more reliable even though there is considerable variation in the American species. It is possible that *basiola* may be no more than a race of *alternata*, but for the present it seems better to consider them as distinct species.

I am particularly indebted to W. V. Balduf for letting me study 103 reared specimens of *basiola*.

Summary

The fruitfly infesting rose hips in this country is *Rhagoletis basiola* (Osten Sacken) and it differs from the Old World *Rhagoletis alternata* (Fallen). *Tephritis flavonotata* Macquart is shown to be a synonym of *Trypeta electa* Say, while *Trypeta flavonotata* (Macquart) of Loew 1873, and *Spilographa setosa* Doane are synonyms of *Rhagoletis basiola* (Osten Sacken).

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TRANSFER OF GENUS FROM OTITIDAE TO CHLOROPIDAE (DIPTERA)

Aberrant genera, whose relationships are often difficult to determine, sometimes escape proper recognition for many years. In the present case, Bezzi (1916, Phil. Bur. Sci., Monog. 10:31, pl. I, fig. 2; 1917, Phil. Jour. Sci. 12, D, no. 3; 131-133, pl. I, fig. 2) described the genus *Tylopterna,* based on a new species, *T. monstrosum,* as an aberrant ortalid fly (= Otitidae). This unusual fly is particularly characterized by having the head deeply concave anteriorly and by the peculiar wing with distorted venation, a long spine arising in the second posterior cell, and several black eyelike spots, of which characters some or all may be confined to the male sex.

In the only other references that I can find to this interesting fly, Frey (1930, Notulae Ent. 10:47, 48, 64, as *monstruosum*; 1932, Ann. & Mag. Nat. Hist., ser. 10, 9:256) refers it to the subfamily Plastotephritinae of the Platystomidae (= Otitidae).

When the writer examined a series of five specimens from Luzon, Philippine Islands, in the collection of the U. S. National Museum, including four from the type locality (Mt. Makiling) and one from Los Baños, he recognized that although the habitus is strange, the fly is basically a chloropid and not an otitid. Such features as the absence of anal cell, the incomplete subcostal vein, the presence of a sharp propleural carina (first pointed out by Malloch as a family character), and the presence of a narrow but distinct "sensory area" on the posterodorsal surface of the hind tibia, point clearly to its position in the family Chloropidae, to which it is hereby referred. The costa extending to the fourth wing vein places it in the subfamily Oscinellinae. Its nearest known relative appears to be the oriental genus *Cestoplectus* Lamb.

Bezzi's description and figure will serve to identify the genus and species, with the following corrections and additions: Eyes densely pubescent to short haired (not "bare"); antennae at bases set wide apart for a chloropid, separated by three-fourths the length of an antenna; chaetotaxy of head: two pairs of bristles, the outer verticals and the erect and cruciate postverticals, strong and well developed, the ocellars erect and cruciate but weak, short, hairlike, and almost indistinguishable from surrounding hairs; notopleural bristles 0+2, the upper posterior bristle long and strong, the lower somewhat shorter and weaker; mesopleuron predominantly bare and polished, but upper fourth covered with short, fine, silky hairs.

CURTIS W. SABROSKY,
Bureau of Entomology and Plant Quarantine

ENTOMOLOGICAL SOCIETY OF WASHINGTON
602nd REGULAR MEETING, OCTOBER 5, 1950

The 602nd regular meeting of the Entomological Society of Washington was called to order by President W. B. Wood at 8 P. M., Thursday, October 5, 1950, in Room 43 of the U. S. National Museum. The room was not large enough to accommodate all those attending, but 73 members and 68 visitors were able to enter the room and sign the circulating attendance record. The minutes of the preceding meeting were read and approved.

Since this program was planned primarily to honor the late Herbert Spencer Barber, who died on June 1, 1950, the order of the meeting was changed and the business session deferred.

The Reverend R. P. Currie, formerly of the Bureau of Entomology and Plant Quarantine, was the first to speak on the life and work of Mr. Barber. Mr. Currie, who had known Mr. Barber for slightly more than 50 years, recalled his association with him, especially during the earlier part of that period—the last few years of the nineties and the first few years of the present century. During this time, Mr. Barber became acquainted with Dr. E. A. Schwarz, who, from then on, was of invaluable assistance to him in guiding his studies of Coleoptera and other insects and their development and interrelations in their natural environment. Mr. Currie commented on the collecting trips to the southwest and Guatemala early in this century. Mr. Currie recalled incidents connected with the establishment and early maintenance of the Washington Biologists' Field Club at Plummer's Island, Md., of which they were both enthusiastic members. They found it a fruitful source of new entomological discoveries; but, in addition, the island and its environs proved an ideal place for recreation—canoeing, swimming, camping, picnicking, and, in winter, skating. Characteristic traits of Herbert Barber's character seemed to Mr. Currie to be his ready and painstaking helpfulness, his love of, and interest in children, and his joy and satisfaction in showing them, as well as their elders, the wonder and beauty of the natural world. In this environment he loved to be with those who shared his appreciation of it. In such environment, on the other hand, he often, designedly, spent much time alone, yet certainly without any feeling of loneliness. (Speaker's abstract.)

C. F. W. Muesbeck, Chief of the Division of Insect Identification, in which Mr. Barber worked, said that he was one of the most outstanding and one of the ablest coleopterists this country has had. He was at home in the field and at the taxonomist's desk. Although Herbert Barber's load was one of the heaviest in the Division, he had time when necessary to add notes to identifications, with suggestions for future study . There was no one of the staff whose opinion was sought as often; his was always a *considered* opinion. Professionally, he remained young, with enthusiasm for new views and new approaches; he grew continually.

George Vogt, of the same Division, then exhibited some insects prepared by Mr. Barber and some photographs found in his office. The latter were of early days and of professional friends.

A. B. Gurney commented on letters received from several entomologists in appreciation of Mr. Barber. A statement submitted by O. D. Deputy of Brownsville, Texas, a member of the Obituary Committee, representing the feelings of quarantine inspectors along the Mexican Border, was read (published in vol. 52, no. 5 of Proceedings). Mr. Deputy had expressed a regret at being unable to attend the memorial meeting, and requested that his sentiments and those of his associates be presented. Among sympathetic letters received was one from Nathan Banks of Holliston, Mass. Mr. Banks was employed as a taxonomist in Washington several years before Mr. Barber's first official duties began, and he was closely acquainted with the latter's initial studies under E. A. Schwarz. In 1928, at the meeting of the Society held as a memorial to Dr. Schwarz, a letter from Mr. Banks was read. Gurney read a letter from Otto H. Swezey, Consulting Entomologist of the Hawaiian Sugar Planters' Association, Honolulu, Hawaii.

President Wood, saying that the ability of Herbert Barber to take photographs was outstanding, introduced David Hall, also of the Bureau of Entomology and Plant Quarantine. Mr. Hall presented kodachromes taken by Barber; these included views of the Potomac which he loved, not only around Great Falls, but down to the Chesapeake; of the seashore; his friends; and of trees and flowers. Some were taken in daylight, some at sunset, and others in the evening and at night. They were truly remarkable, both in color and composition.

The next speaker on the program was Dr. John B. Buck, of the National Institute of Health, who spoke on some of Barber's taxonomic studies of fireflies, particularly those of Jamaica. In support of Barber's keen taxonomic eye, Dr. Buck cited examples where Barber's separation of several species on rather minor differences in size and coloration were confirmed later by field studies showing that the species had characteristically different flashing signals, and where Barber's separation of one species into four subspecies on minute differences of the aedeagus was confirmed by an elaborate statistical analysis of the aedeagal dimensions in the different geographical populations. Dr. Buck concluded by reading excerpts from letters received from Mr. Barber expounding some of his views on taxonomy.

Due to the lateness of the hour, the last paper on the program was postponed until a subsequent meeting.

President Wood read the changes in the Constitution and Bylaws of the Society, which had been voted by the Executive Committee to be considered and voted upon at the regular meeting in November. These changes referred to election of officers, presentation of reports, increasing dues, and the order of business; they will be printed in full after action by the Society.

The Society elected the following to membership:

Frank G. Favorite, Office of the Surgeon General, Washington, D. C.
John T. Woodland, Melrose, Massachusetts.
Margaret L. Keister, National Institutes of Health, Bethesda, Md.
M. A. A. Moursi, Royal Egyptian Embassy, Washington, D. C.
Kellie O'Neill, Bureau of Entomology and Plant Quarantine, Washington, D. C.
Rose Ella Warner, Bureau of Entomology and Plant Quarantine, Washington, D. C.
Don J. Pletsch, U. S. Public Health Service, Washington, D. C.
T. J. Spellman, Louisville, Kentucky.
David A. Young, Jr., Bureau of Entomology and Plant Quarantine, Washington, D. C.

Since the time for adjournment had passed, visitors were not introduced. Among those whose names appeared on the attendance record, were Mrs. H. L. Palmer, sister of Mr. Herbert Spencer Barber; Mr. Barber's niece, Mrs. Rosemary Palmer Smith; his nephew, Spencer Smith, just nine months of age; and Dr. Walter Carter, Director of Oriental Fruit Fly Research, Bureau of Entomology and Plant Quarantine, Honolulu, Hawaii.

Adjournment was at 10:20 P. M.

HELEN LOUISE TREMBLEY, *Recording Secretary.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
603rd REGULAR MEETING, NOVEMBER 2, 1950

The 603rd regular meeting of the Society was held Thursday, November 2, 1950, in Room 43 of the U. S. National Museum. President W. B. Wood called the meeting to order at 8 P. M. Thirty-four members and 14 visitors were present. The minutes of the previous meeting were read and one correction noted.

Robert Rozman, 726 N. Buchanan Street, Arlington, Va., was elected to membership in the Society.

The President appointed a Nominating Committee as follows:

C. F. W. Muesebeck, Chairman, E. R. Sasscer, T. E. Snyder.

President Wood then read the following statement of proposed changes in the Constitution and By-Laws of the Society:

CHANGES TO BE MADE IN THE CONSTITUTION AND BY-LAWS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

The Executive Committee has studied the customs and condition of the Society, with the hope of making the conduct of its business activities more efficient and of placing its financial planning on a firmer basis. The study arose primarily as a result of the recommendation of former Treasurers, to the effect that customary practice has frequently resulted in a duplication of effort and a timing of audits and reports which was not fully satisfactory. It appears desirable to omit detailed reports of officers at the annual meeting in December, and to have them presented instead at the second regular meeting (February) following the annual meeting. To avoid confusion regarding the tenure of officers, it seems best to specify that officers serve until the end of the calendar year.

Increased expenses have made it imperative to consider the advisability of raising annual dues. A questionnaire submitted to members on which ballots were returned by 243, disclosed that nearly three-fourths were in favor of raising the dues to four dollars of which fifty cents would be transferred to the publications fund, primarily to support the publications of the Memoirs. The vote was: in favor of maintaining the dues at $3.00—65; in favor of increasing the dues to $4.00—172. Raising the fee of Life Members from $40.00 to $50.00 also appeared desirable if the annual dues were increased.

The following changes in the Constitution and By-Laws have been approved by the Executive Committee and are now reported to the Society in order that they may be given consideration.

Constitution

Article III, Section 1

In second sentence substitute $50.00 for $40.00.

Article IV, Section 3

Amend first sentence to read: "The Officers shall serve for one year, assuming their duties at the end of the month in which the Annual Meeting is held and serving until their successors are elected and qualified, but there shall be no limitation as to the number of terms to which an officer shall be elected."

Article V, A new section 9

At the second regular meeting following the annual meeting, the Treasurer, Corresponding Secretary and Custodian who were serving at the close of business in the preceding year, and such other officers and auditing committees as are so directed by the Executive Committee, shall present reports on their activities, said reports then being subject to approval by the Society.

Article VI

Change first sentence to read: "The Society shall maintain a separate fund to be known as the Publication Fund which shall be derived from bequests and gifts, from the sale of complete sets of the periodical published by the Society, from the fees of life and sustaining members, and from the sum of fifty cents from the annual dues of each member.

By-Laws

Article II, Filling Vacancies

Amend to read: "Vacancies in any office shall be filled by the Executive Committee. Members elected to fill such vacancies shall hold office only until their successors are elected and qualified."

Article III, Meetings

Amend first sentence of second paragraph to read: "The Executive Committee shall hold two fixed meetings during the year, one prior to February the first, and one 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.''

Article V

Under ''Order of Business at the Annual Meeting,'' change item 3 to read: ''Presentation by the President of a summary report of the state of the Society and the work of the officers.''

Article VI, Fees

Change the first sentence to read: ''The initiation fee shall be one dollar; the annual dues shall be four dollars payable January the first, or in the case of new members, one month after their election.''

The Society voted to adopt the changes as recommended.

Alan Stone read a note left by John Lane of the Faculty of Hygiene and Public Health, São Paulo, Brazil, for presentation before the Society, on luminescent mosquito pupae. Lane and Cerqueira (1942) described pupae belonging to the genus *Phoniomyia* as being iridescent. The species which they, at that time, studied were *Phoniomyia edwardsianus, palmata,* and *trinidadensis.* Later, Lane (1945) found such a character in pupae of *Phoniomyia pallidoventer.* Although, at that time, we had observed that such coloration could better be seen in a darkened room, the term selected was inappropriate. The pupae are truly luminescent and emit a purplish light similar to the one described for certain larvae of fungus gnats as described by Edwards (1933) and Fulton (1939). The patches of phosphorescence in mosquito pupae were observed to remain even after the adult emerged. The time such pupal pelts retain the luminescence has not been ascertained. Another species belonging to the genus *Culex,* subgenus *Microculex* was observed to have luminescent spots on the first abdominal tergites but we were unable to carry our investigation further due to travel. It belongs to a new subspecies of *inimitabilis* which will be described later. An interesting fact is that, so far as known, the luminiscent species above mentioned breed in the water which collects in epiphytic *Bromeliaceae* in forests. (Author's abstract.)

Helen Sollers then exhibited twenty-three postcards depicting insects. Such cards are not plentiful; and Miss Sollers' collection, ranging from the serious to the humorous evoked much pleased comment.

R. I. Sailer exhibited a reared series showing variation in the stink bug, *Thyanta custator* (F.). A detailed note will be published elsewhere in the Proceedings.

A. B. Gurney exhibited a living female of *Taeniopoda eques* (Burm.), the so-called ''horse lubber'' grasshopper, which had been collected in southeastern Arizona about two months previously by a Washington resident. This is the southwestern counterpart of the southeastern lubber, *Romalea microptera* (Beauv.) (see Hebard, 1925, Trans. Amer. Ent. Soc. 51:1-12, 2 pls.).

He also showed examples of small carton nests made by *Crematogaster lineolata* (Say) to cover the tuliptree scale, *Toumeyella liriodendri*

(Gmel.), the secretions of which the ants enjoy. Most of the nests he found are not over two inches long, and they are fairly common on tuliptree saplings in one locality at Falls Church, Va. Wheeler (1906, Bull. Amer. Mus. Nat. Hist. 22:1-18, 6 pls.) and others have discussed the nest building habits of this ant on pine, milkweed, alder and other plants. Although the carton nests of ants, usually made of vegetable detritus and saliva to shelter coccids or aphids, are more conspicuously developed in the tropics, those reported from the United States sometimes are a foot long and as bulky as a man's head. (Author's abstract.)

The first paper on the regular program was given by C. H. Hoffman of the Bureau of Entomology and Plant Quarantine; it was entitled, "Highlights of the Food and Drug Administration Tolerance Hearings."

A public hearing was called on January 17, 1950, to consider proposals to issue regulations limiting the quantity of poisonous or deleterious residues remaining on or in fresh fruits and fresh vegetables from substances used to control insect pests and plant diseases. This evidence was taken in five parts, viz: (1) Testimony regarding the necessity for using pesticides to control enemies that interfere with the production of fresh fruits and vegetables; (2) whether the substances so required are poisonous or deleterious, and for which ones tolerances must be established; (3) quantities of these substances received from all sources by consumers; (4) toxicology of the substances for which limits are to be established; and (5) testimony on amending the regulations pertaining to the fluorine tolerance.

The Presiding Officer drew up schedules for the appearance of witnesses and arranged for an orderly presentation of testimony for the official record. All witnesses testified under oath and were subject to cross-examination. Their educational background, experience, and nature and number of publications was recorded to substantiate that they were experts. Pertinent unpublished data and reprints were admissible as evidence.

Entomologists of the Bureau of Entomology and Plant Quarantine presented testimony on the necessity for using insecticides in crop production. Many different kinds of insecticides are required to produce substantial quantities of important fruits and vegetables for food that will meet present grade standards. Furthermore, an increase in food production is directly attributable to using millions of pounds of pesticides—and with no substantial evidence of any adverse effect on public health. Federal plant pathologists testified on the need of fungicides, hormones, and weed killers for improved agricultural production. State specialists provided much data on spray schedules and residues. Industry had representatives who supplemented the record with information on pesticides, including unpublished data on new spray materials. Witnesses of many Growers' Associations pointed out the problems that must be faced in offering to the public products that are not only free of insect damage and contamination but without harmful amounts of residues.

Information on the toxicology of substances for which tolerances are to be established was presented by pharmacologists and toxicologists of the Food and Drug Administration and by those engaged by industry to evaluate their products. The bulk of the testimony related to acute and chronic toxicity tests with many materials, mostly on small laboratory animals. Much discussion centered about the validity of translating the results of toxicity tests on small animals to possible effects on humans ingesting materials at comparable levels.

It is estimated that 225 witnesses presented testimony during the 82 days that the hearing was in session. The documentary evidence is massive—9,000 pages of testimony and over 1,300 exhibits. Participants praised the manner in which the hearing was conducted and feel that an extended effort was made by all to make the record a sound basis for the establishment of fair tolerances that will permit this country to retain its leadership in crop production without endangering public health. (Author's abstract.) A general discussion followed.

The next paper by John H. Fales was entitled, ''The Aerosol Industry Today.'' Mr Fales, of the Bureau of Entomology and Plant Quarantine, traced the development of the insecticidal aerosol from the first work in 1939 with smoke and steam vapors to the invention of the liquefied-gas propelled aerosol and its development as an industry today.

The principle of dispersion by propellent gases was discussed and demonstrated. The use of large quantities of the high pressure Freon ''aerosol bomb'' during World War II was the birth of a new industry. The insecticidal aerosol was successfully marketed in the post-war years. During this time, the low pressure ''beer can'' aerosol at moderate cost became a reality. The high and low pressure types are now being sold in large quantities as household type insecticides for use against flying insects in inclosed spaces. The aerosol method is widely used in greenhouses and can be used against crop pests.

Also discussed was the use of the pressure container method for delivering residual surface coats, moth proofers, and repellents. The effect of the aerosol method on the spray and sprayer industry was discussed. Improved hand sprayers were demonstrated.

The widespread adoption by industry of the pressure package as a means of dispersion was shown by the demonstration of pressure packages for use in applying whipped cream, deodorants, paints, waxes, polishes, plastic coat preservatives, germicides, cosmetics, shampoos, and shaving cream. (Author's abstract.)

After the interested discussion which followed his talk, Mr. Fales introduced Dr. L. D. Goodhue as one of the pioneers in this work in the Bureau. Dr. Raul Cortes of Santiago, Chile, and Professor Trevor Kincaid, formerly of the University of Washington, Seattle, were introduced to the Society.

The meeting adjourned at 10:15 P. M.

HELEN LOUISE TREMBLEY, *Recording Secretary.*

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THE

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PROCEEDINGS
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THE SPECIES OF THE LEUCANIA UNIPUNCTA GROUP, WITH A DISCUSSION OF THE GENERIC NAMES FOR THE VARIOUS SEGREGATES OF LEUCANIA IN NORTH AMERICA

(LEPIDOPTERA, PHALAENIDAE, HADENINAE)

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The state of the various generic names of the armyworms is at present so unsettled that it has seemed advisable to consider their history and application before discussing the species which have been confused under the name *unipuncta*.

The two most commonly applied names in this complex have been *Heliophila* Hübner, [1806], and *Leucania* Ochsenheimer, 1816; the first has been used by those workers who accept the "Tentamen" and the latter by those who reject it. The common practice has been to group all the species under one or the other of these names. However, in 1902, when Smith (Proc. U. S. Natl. Mus., vol. 25, pp. 159-209) revised the North American forms of this group, he proposed the name *Neleucania* for some slender-bodied species from the western part of the United States, and this has proved to be a sound division. Prior to this a few generic names had been proposed for segregates in the Indo-Australian Region, and an attempt had been made to employ some of the names proposed by Hübner in 1821.

However, the first consideration of the group from a world basis was by Guenée in 1852 (Histoire Naturelle des Insectes, Species Général des Lépidoptères, vol. 5), and the second by Walker in 1856 (List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 9); both workers employed the term *Leucania* for the greater part of the species of this complex. In 1906 Hampson (Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 5) again treated the complex from the world standpoint. He divided the Hadeninae, the subfamily in which the armyworms are placed, on arbitrary characters and the species of this group were dispersed into a number of genera, though most were in the genera *Cirphis* Walker and *Borolia* Moore. Hampson's usage is the one most familiar to modern workers, but it has been considerably modified by recent studies.

In order to discuss satisfactorily the application and synonymy of the generic names the following list is presented; it shows the place of original description, the species originally included and the earliest valid designation of a genotype.

ALETIA Hübner, Verzeichniss bekannter Schmettlinge, p. 239 [1821].
Included species: *vitellina* Hbn.
conigera Schiff.
turca Linn.
TYPE: *Noctua vitellina* Hübner, [1803]. Designated by Moore, Proc. Zool. Soc. London, p. 333, 1881.

BOROLIA Moore, Proc. Zool. Soc. London, p. 334, 1881.
Included Species: *fasciata* Moore
furcifera Moore [*Nomen nudum*]
TYPE: *Borolia fasciata* Moore, 1881. Monobasic.[1]

CIRPHIS Walker, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 32, p. 622, 1865.
TYPE: *Cirphis costalis* Walker, 1865. Monobasic with a new species.

DARGIDA Walker, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 9, p. 201, 1856.
TYPE: *Dargida grammivora* (*sic!*) Walker, 1856. Monobasic with a new species.

DASYGASTER Guenée, Histoire Naturelle des Insectes. Species Général des Lépidoptères, vol. 5, p. 201, 1852.
Included species: *hollandiae* Gn.
leucanioides Gn.
epundoides Gn.
TYPE: *Dasygaster hollandiae* Guenée, 1852. Designated by Hampson, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 5, p. 473, 1905.

DONACHLORA Sodoffsky, Bulletin de la Société Impériale des Naturalistes de Moscou, p. 87, 1837.
Proposed as a substitute name for *Leucania* Ochsenheimer, 1816.
TYPE: *Phalaena Noctua comma* Linnaeus, 1761. Ipso facto.

EUPSEPHOPAECTES Grote, Bull. Buffalo Soc. Nat. Sci., vol. 1, p. 137, 1873.
TYPE: *Eupsephopaectes procinctus* Grote, 1873. Monobasic with a new species.

EURYPSYCHE Butler, Trans. Ent. Soc. London, p. 392, 1886.
TYPE: *Eurypsyche similis* Butler, 1886. Monobasic with a new species.

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[1]The type was designated as *Borolia furcifera*, but this was a *nomen nudum* at the time of publication and was not validated until later in 1881 or early in 1882; *see*, Moore, Descriptions of New Indian Lepidopterous Insects from the Collection of the late Mr. W. S. Atkinson, part 2, p. 98, 1882.

FARONTA Smith, Ann. New York Acad. Sci., vol. 18, p. 106, 1908.
TYPE: *Faronta aleada* Smith, 1908. Monobasic with a new species.

HELIOPHILA Hübner, Tentamen, p. [1], [1806].
TYPE: *Phalaena Noctua pallens* Linnaeus, 1758. Monobasic.

HYPERIODES Warren, *in* Seitz, Gross-schmetterlinge der Erde, vol. 3, p. 94, 1910.
Included species: *turca* Linnaeus (*volupia* Rott.), form *limbata* Btlr., ab. *turcella* Stgr.
grandis Btlr.
divergens Btlr.
curvata Leech, ab. *obsolescens* Warren.
fuliginosa Hamps.
TYPE: *Phalaena Noctua turca* Linnaeus, 1761. Original designation.

HYPHILARE Hübner, Verzeichniss bekannter Schmettlinge, p. 239, [1821].
Included species: *albipuncta* Schiff.
lithargyrea Esp.
TYPE: *Noctua albipuncta* Schiffermüller, 1775. Designated by Hampson, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 5, p. 436, 1905.

HYPOPTERIDIA Warren, Novitates Zoologica, vol. 19, p. 11, 1912.
TYPE: *Aletia reversa* Moore, 1884. Original designation and monobasic.

ICHNEUTICA Meyrick, Trans. New Zealand Inst., vol. 19, p. 13, 1887.
TYPE: *Ischneutica ceraunias* Meyrick, 1887. Monobasic with a new species.

LEUCADIA Sodoffsky, Bulletin de la Société Impériale des Naturalistes de Moscou, p. 87, 1837.
Proposed as an emendation for *Leucania* Ochsenheimer, 1816.
TYPE: *Phalaena Noctua comma* Linnaeus, 1761. Ipso facto.

LEUCANIA Ochsenheimer, Die Schmetterlinge von Europa, vol. 4, p. 81, 1816.
Included species: *pallens* Linn.
straminea Ochs. [*nomen nudum*]
impura Hbn.
pudorina Schiff. (*impudens* Hbn.)
obsoleta Hbn.
comma Linn. (*pallens* Esp., *turbida* Hbn., *congrua* Hbn.)
l-album Linn.
TYPE: *Phalaena Noctua comma* Linnaeus, 1761. Designated by Samouelle, Entomologists' Useful Compendium, p. 251, 1819.

PSEUDOTYPE: *Phalaena Noctua pallens* Linnaeus, 1758. Designated by Curtis, British Entomology, vol. 4, p. 157, 1827.

MELIANA Curtis, British Entomology, vol. 16, Alphabetical Index, p. 4 and Systematic Index, p. 13, 1839.

TYPE: *Melia flammea* Curtis, 1828. Monobasic.[2]

MITHIMNA Sodoffsky, Bulletin de la Société Impériale des Naturalistes de Moscou, p. 87, 1837.

Proposed as an emendation for *Mythimna* Ochsenheimer, 1816.

TYPE: *Phalaena Noctua turca* Linnaeus, 1761. Ipso facto.

MYTHIMNA Ochsenheimer, Die Schmetterlinge von Europa, vol. 4, p. 78, 1816.

Included species: *oxalina* Hbn.
acetosellae Schiff.
turca Linn.
lithargyria Esp. fig. 6 (*ferrago* Fabr.)
albipuncta Schiff. (*lithargyria* Esp., fig. 5)
conigera Schiff. (*floccida* Esp.)
disparilis Ochsen. (*imbecilla* Hbn., *aliena* Hbn. Tab. 84, fig. 394)
nexa Hbn.
xanthographa Hbn. (Schiff. ?)
neglecta Hbn.

TYPE: *Phalaena Noctua turca* Linnaeus, 1761. Designated by Samouelle, Entomologists' Useful Compendium, p. 251, 1819.

PSEUDOTYPE: *Noctua albipuncta* Schiffermüller, 1775. Designated by Duponchel, *in* Godart, Histoire Naturelle des Lépidoptères de France, vol. 7, part 2, p. 71, 1829.

NELEUCANIA Smith, Proc. U. S. Natl. Mus., vol. 25, 203, 1902.

Included species: *niveicosta* Sm.
bicolorata Grt.
citronella Sm.
patricia Grt.
praegracilis Grt.

TYPE: *Neleucania niveicosta* Smith, 1902. Designated by Hampson, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 5, 576, 1905.

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[2]The name *Meliana* poses a question. I have been of the opinion that it was an emendation or a *lapsus* for *Melia*. McDunnough also thought so in 1916, Ent. News, vol. 27, p. 396. If either were so, then *Tinea sociella* Fabricius would automatically be the type. This seems the most logical interpretation, since only the species figured on the plates are listed in the index. Lately, the more accepted course has been to regard *Meliana* as a new name with only one included species; I think this is done because Curtis (1829) makes mention of a character to distinguish *flammea*. However, Stephens in 1834, Illustrations of British Entomology, Haustellata, vol. 4, p. 297, citing Curtis' statement, proposed the genus *Senta* for *flammea* Curt. and *sericea* Curt., the two species included in *Melia* which agree in possessing the short palpi mentioned by Curtis, and Westwood designated the type as *flammea* in 1840, Synopsis of the Genera of British Insects, p. 113.

PERSECTANIA Hampson, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 5, p. 386, 1905.

Included species: *ewingii* Westw.
aulacias Meyr.
steropastis Meyr.
atristrigata Wlk.

TYPE: *Xylophasia ewingii* Westwood, 1837. Original designation.

PHILOSTOLA Billberg, Enumeratio Insectorum in Museo Gust. Joh. Billberg, p. 87, 1820.

Included species: *turca* Linn.
conica Linn.
ferrago Fabr.

TYPE: *Phalaena Noctua turca* Linnaeus, 1761. Designated by Tams, Entomologist, vol. 72, p. 140, 1939.

PROTOLEUCANIA McDunnough, Can. Ent., vol. 69, p. 141, 1937.

Proposed as a new name for *Pseudoleucania* McD., 1937, *nec Pseudoleucania* Stdgr., 1898.

TYPE: *Leucania rubripennis* Grote and Robinson, 1870. Ipso facto.

PSEUDOLEUCANIA McDunnough, Can. Ent., vol. 69, p. 45, 1937 (*nec Pseudoleucania* Staudinger, 1898).

Included species: species of the *albilinea* group and *quadrannulata*.

TYPE: *Leucania rubripennis* Grote and Robinson, 1870. Original designation.

PUDORINA Gistl, Naturgeschichte des Thierreichs, p. xl, 1848.

Proposed as a substitute name for *Leucania* Ochsenheimer, 1816.

TYPE: *Phalaena Noctua comma* Linnaeus, 1761. Ipso facto.

SENTA Stephens, Illustrations of British Entomology, Haustellata, vol. 4, p. 297, 1834.

Included species: *flammea* Curtis
sericea Curtis

TYPE: *Melia sericea* Curtis, 1828. By elimination; see Opinion 6 of the International Commission on Zoological Nomenclature.

PSEUDOTYPE: *Melia flammea* Curtis, 1828. Designated by Westwood, Synopsis of the Genera of British Insects, p. 113, 1840.[3]

ZOSTEROPODA Grote, Bull. Buffalo Soc. Nat. Sci., vol. 2, pp. 22 and 67, 1874.

TYPE: *Zosteropoda hirtipes* Grote, 1874. Original designation and monobasic.

After exclusion of the species referred to *Neleucania* and *Zosteropoda*, which are closely allied to *Trichorthosia* and the *Orthodes-Hypotrix* complex, the true armyworms divide readily into three groups on the male genitalia. One possesses a

[3]See the discussion in footnote 2 for the status of this genus and its type.

cucullus of the valve with a diffuse corona of large stout spines, the second has a cucullus of the valve with only a marginal corona of slender spines, and the last lacks a corona. With these obvious differences in the type of corona or its absence are striking differences in the shape of the valves, and the construction and position of the ampulla, digitus and clasper. When the three characters, as outlined above, are applied, three very large groups will result, which I am sure will require further division upon close study. In the United States and Canada the division into subordinate groups is clear cut, but not enough of the tropical New World species have been studied to provide an adequate basis for dividing them. Only the more divergent elements of the Australian and New Zealand faunas have been critically checked.

For the North American fauna the application of the names is not difficult, being complicated only by Opinion 97 of the International Commission on Zoological Nomenclature. For the first group a number of names are available, and in view of the modifications in the group, most of these names will find use for generic concepts. The oldest name is *Heliophila* Hübner, but Opinion 97 rules it out, and its use would depend on an appeal to the Commission. The next oldest names for this immediate concept are *Aletia* Hübner and *Hyphilare* Hübner; I consider the genotypes congeneric, and I am using *Aletia* in preference to *Hyphilare* because it is a familiar name and it occurs first on the same page of the "Verzeichniss." *Eurypsyche* Butler may find use for certain closely related, slender-bodied forms from the Indo-Australian Region. *Mythimna* Ochsenheimer must be restricted to *turca*, the genotype, and its few Asiatic allies; all the species are decidedly modified forms. *Hypopteridia* and *Persectania* are allied genera, and apparently represent a primitive element in the group. However, there still remain a number of closely allied species without an available generic name; they are the species centering around the *unipuncta* group.

For the second group the oldest name is *Faronta* Smith. *Protoleucania* McDunnough is considered a synonym, because there are no significant differences in either the male or female genitalia of the two genotypes and the habitus, vestiture and pattern are similar. This is a very homogeneous assemblage of species. *Dargida* is very closely related and the genitalia show no real differences, but it may be maintained as a distinct genus on the basis of other characters, such as the vestiture and tufting.

For the last group *Leucania* Ochsenheimer is the oldest name. *Meliana* seems to represent a distinct entity within this group, but no North American species appear to be referable to it. *Extincta* Guenée, often referred to this genus, is placed in *Leucania*. There are, however, species in the American and Old World tropics which, with *extincta*, form a group of rather similar appearing species with similar genitalia. For the present I am leaving the species placed in this last group under *Leucania*, but separation of the group is not barred at some future time.

The following is a list of the species in McDunnough's 1938 Check List placed according to the present division of the group.

FARONTA Smith
PROTOLEUCANIA McD.
PSEUDOLEUCANIA McD.
aleada Sm.
tetra Sm.
diffusa Wlk.
?moderata Wlk.
harveyi Grt.
a. obscurior Sm.
b. neptis Sm.
c. limitata Sm.
rubripennis G. & R.
quadrannulata Morr.

PSEUDALETIA Franc.[4]
unipuncta Haw.
extranea Gn.

(HELIOPHILA Hübner)
ALETIA Hübner
HYPHILARE Hübner
oxygala Grt.
minorata Sm.
form rubripallens Sm.
a. luteopallens Sm.
yukonensis Hamps.

LEUCANIA Ochsenheimer[5].
pilipalpis Grt.
pseudargyria Gn.
form callida Grt.
form derufata Strand
calidior Fbs.
ursula Fbs.
inermis Fbs.
commoides Gn.
phragmatidicola Gn.
multilinea Wlk.
?solita Wlk.
lapidaria Grt.
frebrualis Hill
stolata Sm.
imperfecta Sm.
farcta Grt.
palliseca Sm. (new synonymy)
form roseola Sm.
anteoclara Sm.[6]
form calgariana Sm.
oregona Sm.
scirpicola Gn.
calpota Sm.
pendens Sm.
linita Gn.
amygdalina Harv. (new synonymy)
punctata Strand
juncicola Gn.
adjuta Grt.
humidicola Gn.
incognita B. & McD.
latiuscula H.-S.
subpuncta Harv.
complicata Stkr.
insueta Gn.
adonea Grt.
mimica Stkr.
a. heterodoxa Sm.
b. dia Grt.
c. megadia Sm.
extincta Gn.
texana Morr. (new synonymy)
ligata Grt. (new synonymy)
a. flabilis Grt.
rimosa Grt. (new synonymy)

The following species are excluded from the genera above for the reasons stated. *Protoleucania albilinea* (Hbn.) is a distinct species from Argentina. *Protoleucania ferricola* (Sm.) has spines on the mid and hind tibiae and is very close to *Trichorthosia aselenograpta* Dyar from Mexico; both species agree in all essentials with the genotype of *Trichorthosia, parallela* Grt., and are properly placed in that genus. *Leucania dissimilis* B. & McD. is a specimen of *Eriopyga crista* (Wlk.); the species of the *crista* group are superficially close to those of the *punctulum* group, *punctulum* being the genotype of *Eriopyga*. *Leucania suavis* B. & McD. is a species of the genus *Neleucania*. *Leucania pertracta* (Morr.) is *Aletia littoralis* (Curtis); the type specimen is a female of that European species to which has been glued the male abdomen of a species of the *Apamea* complex. I am indebted to the authorities of the Chicago Museum of Natural History, especially Messrs. Gerhard and Wenzel, for the privilege of examining this type.

The "Unipuncta Group"

In 1856, Walker (List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 9, p. 93) suggested the possibility that "Perhaps two or three species may be here included under the name *L. extranea*." He distinguished four varieties, which are essentially half the species discussed here. However, he later applied names to two of

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[4]*PSEUDALETIA* n. gen. Allied to *Aletia*, but differing from it in the shape of the male genitalia and its component parts. The costa of the valve more or less incurved, not elbowed or outcurved; the sacculus strongly and abruptly produced into a large flap-like process, not evenly rounded or produced from the base; clasper, ampulla and digitus much reduced and modified. Vestiture of the moths smooth, composed mostly of hair and hairlike scales with some normal scales intermixed.

Genotype: *Leucania unpuncta* Haworth, 1809 = *Pseudaletia unipuncta* (Haworth).

This genus includes the species of the *unipuncta* group, discussed herein; the South American species *impuncta* Gn:; the Hawaiian species *dasuta* Hamp., *pyrrhias* Meyr., *macrosaris* Meyr., *typhlodes* Meyr., *amblycasis* Meyr., and an undescribed one; the Galapagos Island species *cooperi Schaus*, and the Indo-Philippine species *albicosta* Moore.

[5]The name *Cirphis*, which Hampson applied in the main to this group, is untenable because the genotype, a Tasmanian species, is not congeneric with any of the American species, a fact which McDunnough pointed out in 1937, Can. Ent., vol. 69, p. 45. Dr. Elwood Zimmerman kindly furnished me with a photomicrograph of the male genitalia of the genotype, *costalis*, and I can confirm McDunnough's observation.

[6]The male and female genitalia of *anteoclara* and *farcta* show constant differences, and thus I do not agree with McDunnough (Can. Ent., vol. 75, pp. 56-57, 1943) in treating them as races of one species.

these varieties, but on the basis of other specimens, which he did not connect with his previous diagnoses, and which he apparently thought were distinct from anything he had placed under *extranea*. In 1905, Hampson (Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 5, p. 547-548) treated all the various armyworms resembling *unipuncta* Haworth (*extranea* Guenée) as a single species. This is understandable because the moths are all very similar superficially, but they exhibit rather striking differences in the genitalia of both sexes. Had Hampson known about the genitalic differences, I doubt if it would have altered his treatment because in a later volume, 9, of his Catalogue he treated all the species of the *Amphipoea* (*Apamea*) *oculea* (*nicitans*) group as one species, although he cited the two articles that dealt with the genitalic differences of the species of this group.

I was led to investigate the genitalia of the species of the *unipuncta* group, because I had collected two obviously different species in the mountainous area of north central Luzon in the Philippine Islands. At the time of collecting it was assumed that the common species was *unipuncta* and that the other was one of the species described from the Orient, but then standing in the synonymy. However in 1946, after my return to the United States and to Cornell University, a study was made of all available material at Cornell plus some from the United States National Museum, and it was found that there were not two, but probably eight or nine species.

The task of assigning the available names has been made easy because I have been able to obtain information on all the types of this group in the British Museum (Natural History). Only one name, *consimilis* Moore, has been placed on the basis of the published description and figure; specimens agreeing with this figure and from the type locality have been before me for study, and I do not hesitate to place *consimilis* as a synonym of *separata* Walker.

Pseudaletia unipuncta (Haworth), new combination

Noctua unipuncta Haworth, Lepidoptera Britannica, Pars 2, p. 174, 1809.

Type locality: ''Anglia D. Francillon.''

Location of type: British Museum (Natural History).

Leucania impuncta Stephens, Illustrations of British Entomology, Haustellata, vol. 3, p. 80, 1829. (*Lapsus calami*)

Leucania extranea Guenée, Histoire Naturelle des Insects, Species General des Lepidopteres, vol. 5 (Noct. 1), p. 77, 1852.

Type locality: ''Amériq. Septentrion., Brésil, Columbie, etc.''

Location of type: United States National Museum.[7]

[7] I have selected as the LECTOTYPE the Guenée specimen bearing the large label which carries all the information. It is U.S.N.M. Type No. 60993.

The typical race of this species occurs throughout most of southern Canada and all of the United States; it extends south, on the continent, to at least Mexico City, Mexico. It is also found in Bermuda, the Bahamas, the Azores, the Canaries and Madeira. It occurs in southwestern Europe as far north as the southern British Isles, but only apparently as a stray; all records being from August to October. The longest series of European material I have seen is from the "Pyrenees-Orientales," and the specimens are superficially indistinguishable from specimens from the United States. It is also found in the Hawaiian Islands. The Haworth type of *unipuncta* may have been a specimen collected by Abbot in Georgia and sent to Francillon, Abbot's agent in England. Apparently Francillon was not always too careful in keeping exact data on the source of his material, because both Haworth and Stephens described new species from specimens supposedly originating in England and supplied them by Francillon, but which later have turned out to be American.

Dr. Zimmerman of Hawaii had occasion to examine the type of *unipuncta* and made a slide mount of the genitalia. He was most kind in supplying me with an excellent photomicrograph of the genitalia. The shape of the sacculus of the valve is more like that of most American specimens than the one authentic English male loaned to me by the authorities of the Hope Department at Oxford. However, the differences are a matter of degree, and I have found specimens from the United States that approach very closely the one English specimen in the conformation of the prolongation of the sacculus. There is certainly nothing to indicate two species. The specimens from the Pyrenees show the same variation as specimens from the North American continent. The specimens from the Azores, Canaries and Madeira show a slightly smaller valve with a thicker "neck" to the cucullus; the females show no differences in the genitalia.

The species has been described many times, and there exist many good figures of the moth; the one in Holland's "Moth Book," plate 23, figure 40 is excellent.

Male genitalia as figured: Figures 10, 10a, 11, 11a.

Female genitalia as figured: Figure 33. The bursae of females which have mated show the ridges more rounded and broader, and the angle at which the long arm of the bursa leaves the main part is more rounded.

Pseudaletia unipuncta antica Walker, new combination

Leucania extranea Var. β Walker, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 9, p. 93, 1856.

Locality: "Venezuela and West Coast of America."

Leucania antica Walker, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 9, p. 100, 1856.

Type locality: "West Coast of America" (Hampson says "Venezuela").

Location of type: British Museum (Natural History).

Superficially this race of *unipuncta* is not as stout as the typical subspecies and the wing expanse averages two to five millimeters less. The hind wing is paler, except in the specimens from Jamaica which I associate with this race.

The fore wing tawny, yellowish or reddish, strongly flecked with black in the male, in the female much smoother looking with the flecking less obvious in most specimens; the reniform and orbicular rather obscure, but tinted with orange. The hind wing whitish with strong infuscation near the outer margin, the veins darker, but not markedly contrasting.

This race ranges from Costa Rica and Guatemala to Venezuela. The localities from which I have seen specimens are: Irazu, San Jose and the Candelaria Mts., Costa Rica; Guatemala City and Volcan Sta. Maria, Guatemala; Volcan Chiriqui and Bilbao, Panama; Venezuela, no definite locality. I have associated with this race a series of ten specimens from the island of Jamaica; they are more reddish and with darker hind wings, but agree in size and in the male genitalia with this race.

Male genitalia as figured: Figures 12, 12a.

Female genitalia as figured: Figure 34.

The genitalia of both sexes average smaller than those of the type race, but other than this there are no tangible differences.

Pseudaletia unipuncta quechua, new subspecies

This race is similar to the last, but differs in its much smoother appearance. The male genitalia are smaller and the cucullus is much reduced.

Fore wing smooth tawny, reddish or rarely yellowish, finely peppered with black scales; the reniform and orbicular inconspicuous, faintly tinged with orange; the white spot at the lower end of the discal cell evident and surrounded by a blackish shade as in the other two races. The hind wing whitish, with a slight reddish cast, the margin area strongly infuscate; the veins fuscous.

Male genitalia as figured: Figures 13, 13a.

Female genitalia: The female genitalia show no tangible differences from those of *antica*, being about the same size, and with the same conformation.

Type: ♂, Incachaca, Cochabamba, Bolivia (J. Steinbach). U.S.N.M. Type No. 60994.

Paratypes: 1 ♂, Napo, Equateur (G. Rivet) in the Museum National d'Histoire Naturelle, Paris; 1 ♂, Env. d'Ambato, Equateur (R. P. Irenee Blanc) in the British Museum (Natural History), London; 2 ♂♂ and 4 ♀♀, Aqualani, Carabaya, Peru, 9000 feet, Jube 1905 (Dry Season) (Ockenden) in the British Museum (Natural History), London.

Pseudaletia cunyada, new species

This species is very similar to *sequax,* which is described here, but it is somewhat smaller. The male genitalia are similar to those of *unipuncta,* but differ in the broader juxta and the longer, stouter and more bluntly pointed spines at the apices of the cuculli of the valves. The female genitalia are also similar to *unipuncta,* but are larger than those of the two South American races, and the long arm of bursa is somewhat stouter.

Fore wing pale yellowish gray, heavily flecked with black, a dark streak along the lower edge of discal cell, a dark oblique streak from the apex to vein 5 or a little beyond; postmedial line represented by a vague series of double dark dots; reniform and orbicular evident, pale, shaded with orange, the white spot at lower end of discal cell vague. Hind wing white with a slight fuscous cast, more pronounced toward the outer margin; veins dark and contrasting sharply; fringe pale.

Male genitalia as figured: Figures 14, 14a.

Female genitalia as figured: Figure 35.

Type: ♂, Bogota Columbia (Apollinaire). U.S.N.M. Type No. 60995.

Paratypes: 1 ♂, same data as type, 1 ♂, Columbia, S. America, both in the Collection of the United States National Museum, 2 ♂♂ and 1 ♀, Bogota, Columbia, 1 ♂, U. S. Columbia, in the collection of the American Museum of Natural History, New York.

It is possible that this series represents nothing more than another race of *unipuncta,* but I regard it for the time being as a distinct species. Perhaps when we know more about the South American fauna and when we have considerably more material, we will be able to determine correctly the relationships of this form.

Pseudaletia roraimae, new species

A rather distinctive looking moth, but obviously related to *unipuncta,* the male genitalia being superficially like that species, but more massive.

Fore wing tawny with a brown cast, with a dark gray, though not too evident, line along lower edge of discal cell; a faint shade running obliquely from the apex to vein 5; postmedial line complete and traceable, consisting of a double series of fine black points, the outermost on the veins, the innermost in the interspaces, and connected by a very fine dark line; antemedial line represented by an irregular series of dots; orbicular and reniform hardly noticeable, but represented by orange scaling. Hind wing dirty white with the marginal area fuscous, the veins dark and conspicuous. Expanse: 42 mm.

Male genitalia as figured: Figures 15, 15a.

Type: ♂, Mt. Roraima, Brazil (Summit), 1927, in the collection of the American Museum of Natural History, New York.

Pseudaletia adultera (Schaus), new combination

Leucania adultera Schaus, Trans. Amer. Ent. Soc., vol. 21, p. 232, 1894.

Type locality: "Castro, Parana," Brasil.

Location of type: United States National Museum.

This species averages smaller than any of the others, and has a more striated appearance, caused by the more prominent white scales on the veins and the tendency to develop dark streaks in the interspaces; however some females are quite plain and smooth looking. There is a tendency for the occurrence of a rather prominent dark line along the bottom of the discal cell; the reniform and orbicular are quite inconspicuous. This species ranges from southern Brasil, throughout Uruguay and Paraguay, and the northern part of Argentina.

Male genitalia as figured: Figures 16, 16a.

Female genitalia as figured: Figure 36.

The genitalia of both sexes show a similarity to *unipuncta*, but differences are at once obvious, the juxta in the male is almost twice as wide as that in *unipuncta*, the cucullus is smaller and more linear and the corona is more limited; in the female the genitalia are smaller than *unipuncta*, with the long arm of the bursa less massive and more broadly attached to the bursa proper.

Pseudaletia punctulata (Blanchard), new combination

Spaelotis punctulata Blanchard, *in* Gay, Historia Fisica y Politica de Chile, Fauna Chilena, Zoologia, vol. 7, p. 74, 1852.

Type locality: "Santa Rosa, etc. Chile."

Location of type: Museum National d'Histoire Naturelle de Paris.

Leucania trifolii Butler, Trans. Ent. Soc. London, p. 114, 1882.

Type locality: "Valparaiso."

Location of type: British Museum (Natural History).

Leucania saccharivora Butler, Trans. Ent. Soc. London, p. 115, 1882.
Type locality: "Valparaiso."
Location of type: British Museum (Natural History).

This species appears to be confined to central Chile, all the material before me coming from that particular area. The male genitalia are very distinctive, though the female genitalia are in some respects quite similar to those of *sequax*, but nevertheless abundantly distinct. The moth is generally quite reddish tawny in color, but occasional specimens are almost devoid of these reddish tints. Blanchard's type is such a specimen, as is *trifolia* Butler; however, *saccharivora* Butler applies to the reddish form.

Male genitalia as figured: Figures 17, 17a.

Female genitalia as figured: Figure 37.

Pseudaletia sequax, new species

‡*Cirphis punctulata* Draudt, *in* Seitz, Gross-schmetterlinge der Erde, vol. 7, pl. 24, fig. h5, 1924.

This is apparently the common species in the tropics of both Americas; it ranges from Cuba and Mexico City, Mexico south to the southern part of Uruguay and northern Argentina. In size it is equal to or larger than the average *unipuncta.* The genitalia of both sexes resemble those of *punctulata,* and with that species it forms a subgroup distinct from *unipuncta.*

Fore wing pale tawny, very heavily flecked with blackish; the postmedial line indicated by a double series of dots; a dark oblique shade from the apex to vein 5, not always conspicuous; reniform and orbicular pale, but inconspicuous, often with a yellowish orange cast; the white spot at end of discal cell usually with a black spot on either side of it, but not always so. Hind wing white with slight infuscation, most pronounced near the outer margin; the veins very dark and contrasting.

Male genitalia as figured: Figures 18, 18a.

Female genitalia as figured: Figure 38.

While the genitalia of both sexes resemble those of *punctulata*, the differences are striking; in the male the cucullus is massive when compared to that of *punctulata,* the clasper is larger and of a different shape, the uncus longer and the juxta narrower; in the female the differences are not quite so marked, but the long arm of the bursa is longer and heavily chitinized for more of its length.

Type: ♂, Jalapa, Mexico (Schaus), U.S.N.M. Type No. 60996.

Paratypes: 10 ♂♂ and 18 ♀♀ in the collection of the American Museum of Natural History, New York; 14 ♂♂ and 19 ♀♀ in the collection of the British Museum (Natural

History), London; 1 ♂ in the Collection of the Museum National d'Historie Naturelle, Paris; 9 ♂♂ and 8 ♀♀ in the collection of the United States National Museum. These are from the following localities: Mexico, Costa Rica, Guatemala, Columbia, Venezuela, Ecuador, Peru, Brasil, Paraguay, Uruguay and Argentina, also from the islands of Cuba and Jamaica. These last are darker and redder than the ones from the mainland.

Pseudaletia separata (Walker), new combination

Leucania separata Walker, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 32, p. 626, 1865.
Type locality: ''Shanghai, China.''
Location of type: British Museum (Natural History).
Leucania consimilis Moore, Proc. Zool. Soc. London, p. 336, pl. 37, fig. 19, 1881.
Type locality: ''Darjiling,'' India.
Location of type: ''Staudinger Collection.'' Its exact whereabouts at the present time is unknown, probably in the Berlin Museum.

This species is widespread in the eastern part of the Palaearctic and the Indo-Australian Regions; it ranges from the Amurland through China and Japan to the Philippines, through eastern India to the Dutch Indies and thence to Australia and New Zealand and to Fiji. Superficially the moth is close to *unipuncta*, but differs in the somewhat paler hind wing and the generally more flecked appearance in both sexes. This species, like most of the group, varies somewhat in the general tone of the fore wings, some specimens being quite devoid of any rusty red tints and others showing this color quite conspicuously. The genitalia of the male are striking in the possession of a very long spur from the apex of the cucullus of each valve.

Male genitalia as figured: Figures 19, 19a.

Female genitalia as figured: Figure 39.

Pseudaletia australis, new species[8]

The most distinctive feature of this species is to be found on the underside of the hind wing where there is a wide black band occupying the outer third of the wing.

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[8]*Leucania? convecta* Walker (List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 11, p. 711, 1857) described from Moreton Bay, Australia, does not belong to this group. The male genitalia look like those of *Cirphis,* but I would hesitate to refer the species to that genus until I could study it at first hand.

Fore wing yellow tawny, paler or darker, rarely reddish; the markings much as in *separata;* the postmedial line vague, often barely traceable, the dots small and not contrasting; the reniform and orbicular very vague, indicated in some specimens by an orange flush on the ground, in others not evident, no evident dark streak along the bottom of the discal cell; the white spot at end of discal cell with a dark brownish or blackish beyond it. Hind wing with the basal two thirds whitish, the outer third fuscous; the veins not particularly contrasting on the basal area. The species is known only from South Australia and Tasmania.

Male genitalia as figured: Figures 20, 20a.

Female genitalia as figured: Figure 40.

The genitalia of the male are essentially like those of *separata,* but they differ by the absence of the long spurs from the apices of the cuculli of the valves, by the more massive cuculli and the longer narrower juxta; the sacculus lobe is narrower than that of *idisana;* the female genitalia are quite similar to those of *separata* and differ like that species in being smaller than *idisana* and with the free arm of the bursa less robust and with the chitinous ridging less extensive.

Type: ♂, S. Australia, Port. Victor, II, 1897 (P. de la Garde) in the collection of the British Museum (Natural History), London.

Paratypes: 18 ♂♂ and 10 ♀♀ in the collections of the American Museum of Natural History, New York, the British Museum (Natural History), London and the United States National Museum, from Sidney, Melbourne, Victoria, New South Wales and Tasmania.

Pseudaletia idisana, new species

This is a rather distinctive species superficially; it is very contrastingly marked, and the dorsum of the abdomen is clothed with rather long, fine black hair.

The general color a very dusky tawny. The head and thorax darker than the wings; fore wings tawny with a general, fine peppering of black flecks; the orbicular oval, the reniform sub-circular, both spots bright orange tawny and very conspicuous; the ground of the discal cell, on which they lie, very dark fuscous; the claviform vague, but indicated by a rather long, narrow, ill-defined, light orange tawny mark, rounded at its outer end; a very evident, black, diagonal streak from just below apex to vein 4 (M3), the area on the outer side of the streak heavily infuscate; none of the cross lines discernible; fringe concolorous. Hind wing black with a brownish sheen in some lights, fringe pale and contrasting with the ground color. Lower surfaces of both wings heavily infuscate with black, the veins darker and contrasting; an indication of a small, pale discal mark on the fore wings. Pectus dark brownish gray.

Male genitalia somewhat larger than *separata*, and differing at once by the absence of the long spurs from the apices of the cuculli of the valves; the corona somewhat more extensive than in *separata;* the clasper with the two lobes bluntly pointed and about equal in size, not rounded and with the lower longer as in *separata*. The female genitalia more robust than *separata*, and with the chitinous ridging of the free arm of the bursa more extensive.

Male genitalia as figured: Figures 21, 21a.

Female genitalia as figured: Figure 41.

Type: ♂, Baguio, Mountain Province, Luzon, Philippine Islands, 19 May 1945 (J. G. Franclemont), in Franclemont Collection. This specimen was taken at bait on the grounds of the Brent School in the City of Baguio.

Paratypes: 3 ♀♀, Haight's Place. Pauai. subprov. Benguet. Luzon. 7000 ft. (!), (A. E. Wileman), 2 in the collection of the British Museum (Natural History), London, and 1 in the collection of the United States National Museum from the collection of the British Museum (Natural History).

Acknowledgments

I wish to express my thanks to Mr. Carl Heinrich for the loan of material from the collection of the United States National Museum while I was at Cornell University, to Dr. Frederick H. Rindge, of the American Museum of Natural History, for the loan of material from that institution, to Mr. Ernest Taylor, of the Hope Department at Oxford for the loan of authentic English and Irish specimens of *unipuncta*, to Mr. D. S. Fletcher, of the British Museum (Natural History), who in conjunction with Mr. W. H. T. Tams sent me all the material of the *unipuncta* group in their collections, to Mr. Elwood C. Zimmerman of Hawaii, now working at the British Museum (Natural History), for his many kindnesses in answering questions and furnishing photomicrographs of the genitalia of the types of this group in the collections in London, and to Monsieur Pierre E. Viette, of the Museum National d'Histoire Naturelle in Paris, for his graciousness in sending me Blanchard's type of *punctulata* for examination and study.

Explanation of Figures[9]

Figures 1 to 22 are of the male genitalia with the aedoeagi removed, figures 1a to 22a are of the corresponding aedoeagi, and figures 23 to 41 are of the female genitalia. All figures of each sex are drawn to the same scale.

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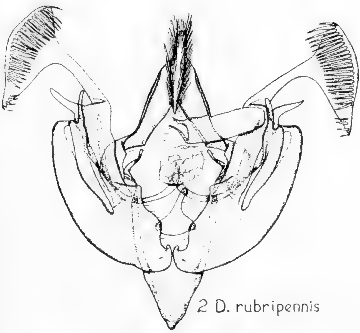
[9]All drawings are by Miss Addie Egbert, of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, and were made under the supervision of the author.

1 & 1a. *Dasygaster hollandiae* Guenée. Victoria, Australia.
2 & 2a. *Faronta rubripennis* (Grote and Robinson). Riley Collection.
3 & 3a. *Dargida procincta* (Grote). Riverside Co., California.
4 & 4a. *Leucania comma* (Linnaeus). Europe.
5 & 5a. *Persectania ewingii* (Westwood). Australia.
6 & 6a. *Mythimna turca* (Linnaeus). Europe.
7 & 7a. *Aletia albipuncta* (Schiffermüller). Europe.
8 & 8a. *Aletia vitellina* (Hübner). Europe.
9 & 9a. *Aletia oxygala* (Grote). Middle California.
10 & 10a. *Pseudaletia unipuncta* (Haworth). England.
11 & 11a. *Pseudaletia unipuncta* (Haworth). Arkansas
12 & 12a. *Pseudaletia unipuncta antica* (Walker). Guatemala, Volcan St. Maria.
13 & 13a. *Pseudaletia unipuncta quechua* Franclemont. TYPE.
14 & 14a. *Pseudaletia cunyada* Franclemont. TYPE.
15 & 15a. *Pseudaletia roraimae* Franclemont. TYPE.
16 & 16a. *Pseudaletia adultera* (Schaus). Tucuman, Argentina.
17 & 17a. *Pseudaletia punctulata* (Blanchard). Concepcion, Chile.
18 & 18a. *Pseudaletia sequax* Franclemont. Tucuman, Argentina.
19 & 19a. *Pseudaletia separata* (Walker). Baguio, Luzon, Philippine Islands.
20 & 21a. *Pseudaletia australis* Franclemont. N. E. Tasmania.
21 & 22a. *Pseudaletia idisana* Franclemont. TYPE.
22 & 22a. *Hypoteridia reversa* (Moore). Mt. Makling, Luzon, Philippine Islands.
23. *Dasygaster hollandiae* (Guenée). Victoria Australia.
24. *Persectania ewingii* (Westwood). New Zealand.
25. *Hypopteridia reversa* (Moore). Mt. Makiling, Luzon, Philippine Islands.
26. *Dargida procincta* (Grote). California.
27. *Faronta rubripennis* (Grote and Robinson). Riley Collection.
28. *Mythimna turca* (Linnaeus). Europe.
29. *Leucania comma* (Linnaeus). England.
30. *Aletia vitellina* (Hübner). Europe.
31. *Aletia albipuncta* (Schiffermüller). Europe.
32. *Aletia oxygala* (Grote). Palo Alto, California.
33. *Pseudaletia unipuncta* (Haworth). Ithaca, New York.
34. *Pseudaletia unipuncta antica* (Walker). Volcan Chiriqui, Panama.
35. *Pseudaletia cunyada* Franclemont. Bogota, Columbia.
36. *Pseudaletia adultera* (Schaus). Castro, Parana, Brasil.
37. *Pseudaletia punctulata* (Blanchard). Est. Araucana, Chile.
38. *Pseudaletia sequax* Franclemont. Merida, Venezuela.
39. *Pseudaletia separata* (Walker). Tsinana, China.
40. *Pseudaletia australis* Franclemont, New South Wales, Australia.
41. *Pseudaletia idisana* Franclemont, Benguet Subprovince, Luzon, Philippine Islands.

1 D. hollandiae

1a



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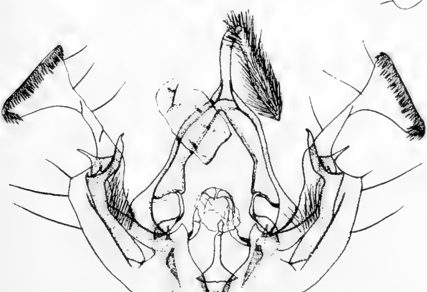
2a



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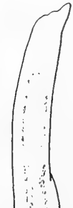

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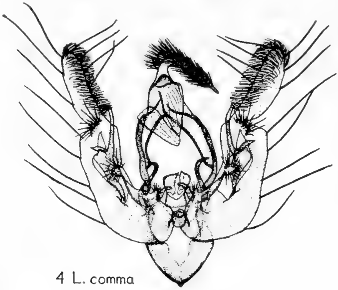
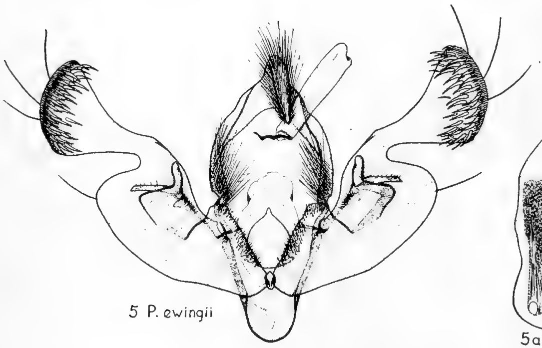


4 L. comma

4a



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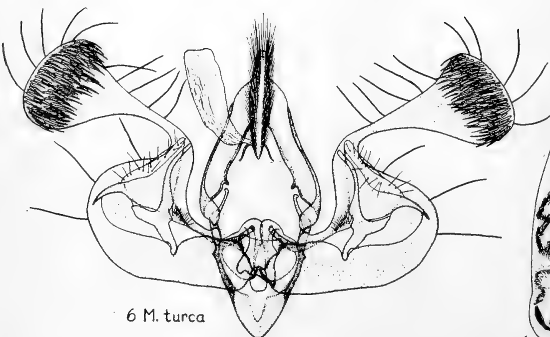
5a



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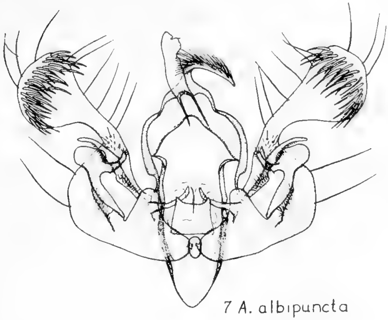
6a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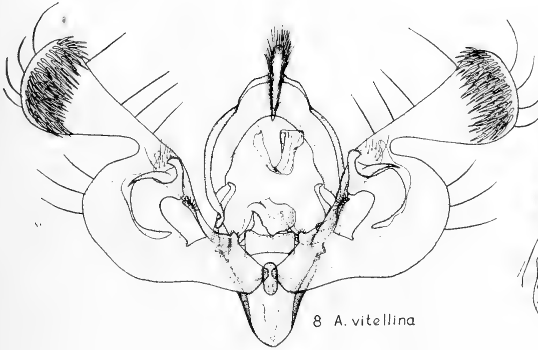
7a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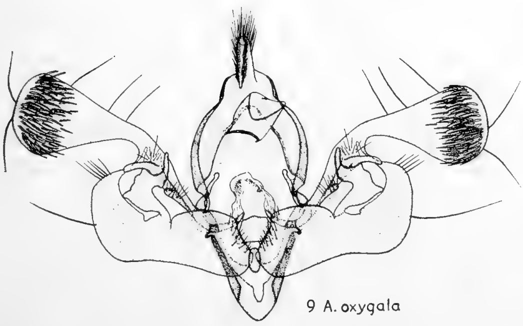
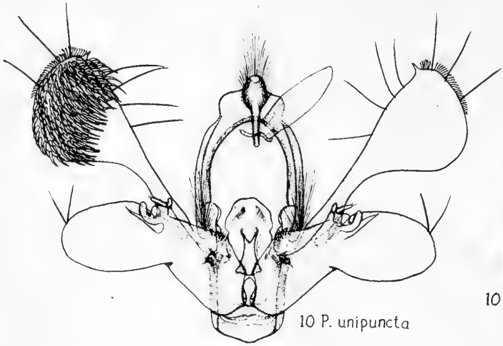
8a

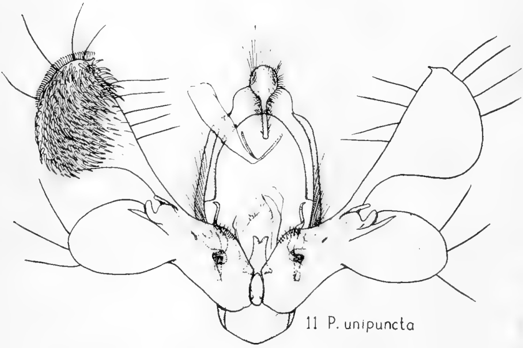

9 A. oxygala


9a



10 P. unipuncta

10 a



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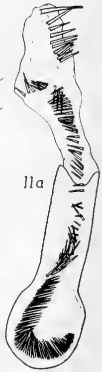

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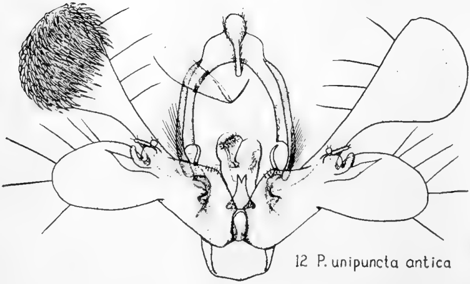

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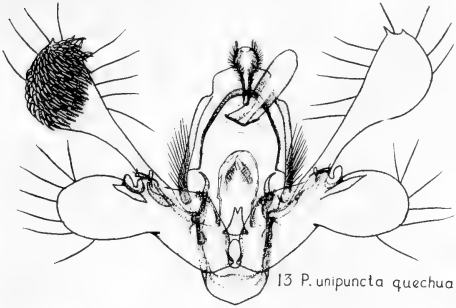
12 a



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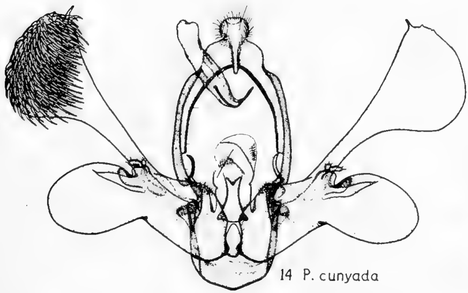

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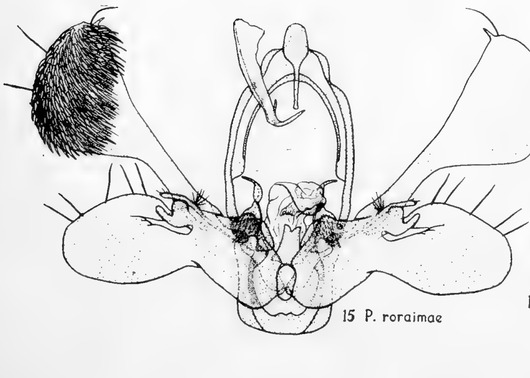
14a



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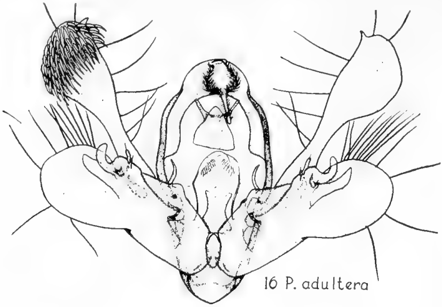

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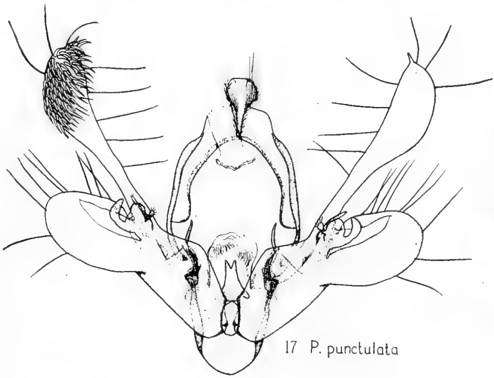

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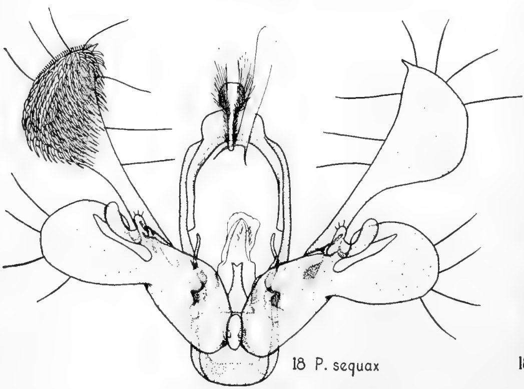

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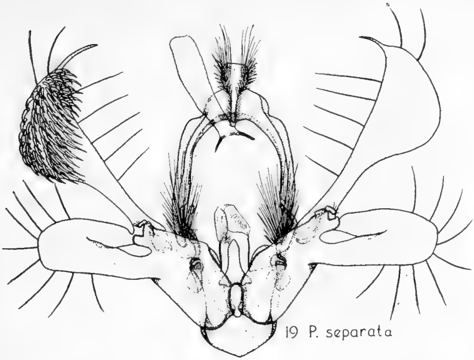

19 P. separata

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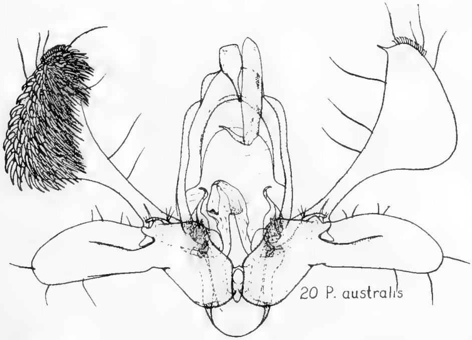

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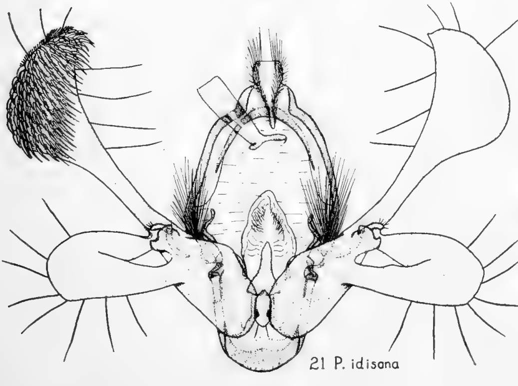
20a



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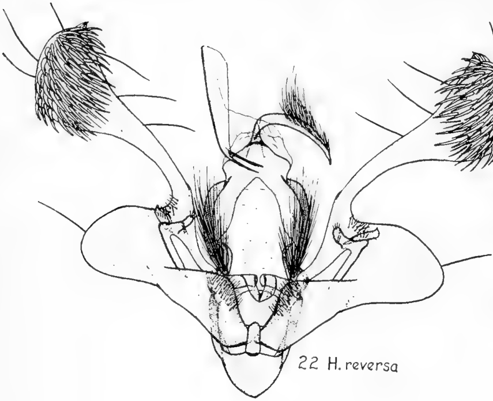
21a



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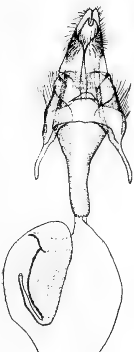
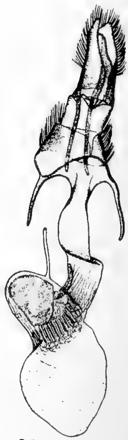
22a



23 D. hollandiae

24 P. ewingii



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26 D. procincta

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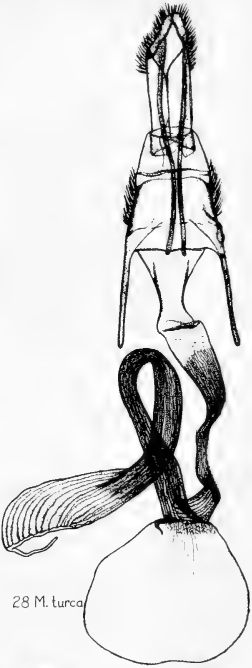
F. rubripennis

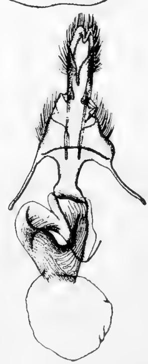


28 M. turca

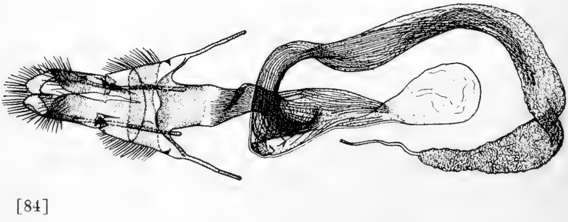
29 L. comma

30 A. vitellina

31
A. albipuncta



32 A. oxygala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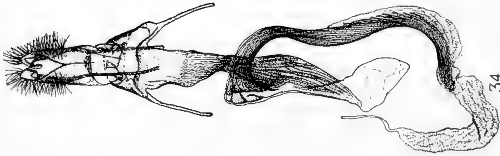
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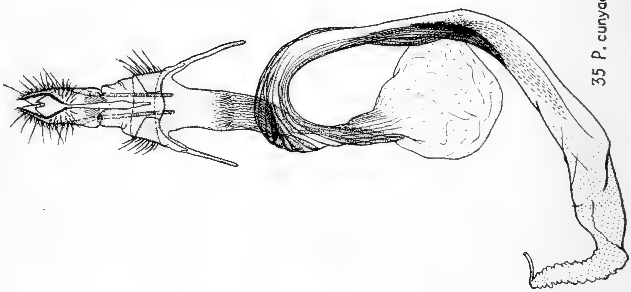
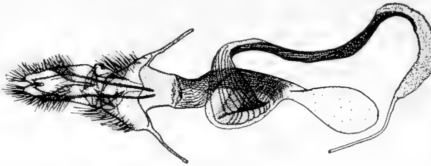
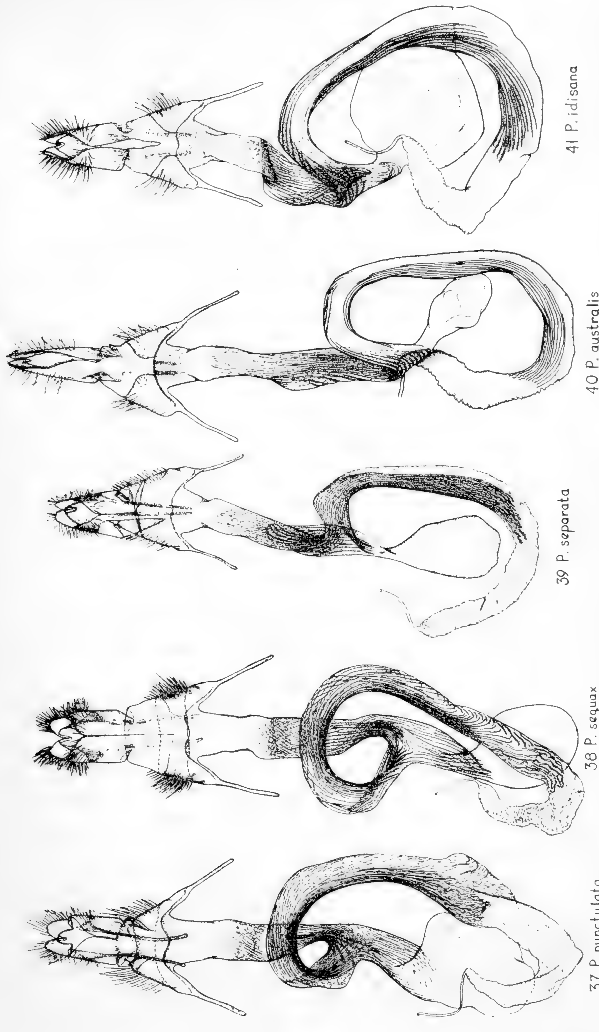

35 P. cunyada


36 P. adultera


41 P. idisana
40 P. australis
39 P. separata
38 P. sequax
37 P. punctulata

DESCRIPTIONS OF TWO NEW SPECIES OF WYEOMYIA AND THE MALE OF SABETHES TARSOPUS DYAR AND KNAB

(DIPTERA, CULICIDAE)[1,2]

By PEDRO GALINDO[3], STANLEY J. CARPENTER[4], AND HAROLD TRAPIDO[3]

In the course of a study of the forest mosquitoes of Panama, an endemic area of sylvan yellow fever, a number of undescribed species have been found. In the present paper, which is the fourth in a series reporting the results of this work, we describe two new species of *Wyeomyia* and the hitherto unknown male of *Sabethes tarsopus* Dyar and Knab.

Of the two species of *Wyeomyia*, one belongs to the subgenus *Davismyia* Lane and Cerqueira. The finding of a member of this peculiar group of sabethines in Panama is interesting, as only two species have been previously known, *petrocchiae* Shannon and Del Ponte from Argentina, Brazil and Paraguay, and *schnusei* Martini, described without a type locality. The second species described in this paper belongs to the subgenus *Wyeomyia* and appears close to *hemisagnosta* Dyar and Knab.

Wyeomyia (Davismyia) arborea, new species

MALE. Proboscis slightly shorter than fore femur, somewhat swollen toward tip, dark except for a line of yellowish scales on the underside of the apical fourth and a small light spot underneath the base. Palpi very short, barely longer than clypeus, dark. Antenna more than half the length of the proboscis, not plumose. Occiput clothed with dark greenish scales except for a triangular silvery spot on the vertex which is joined to a broad silvery patch below by an indistinct line of light scales behind the eyes.

Anterior pronotal lobes separated, clothed dorsally with scales that give a violet reflection under daylight illumination, and with a patch of grayish silvery scales underneath. Mesonotum covered with flat round scales with greenish metallic reflection, not as pronounced as in *Sabethoides*, and with a distinct patch of light bluish scales, with strong metallic reflection, above the roots of the wings. Pleura and coxae clothed with silvery scales. Pleural chaetotaxy as follows: two propleurals, no posterior pronotals, two spiraculars, four or five lower sternopleurals located below the level of the upper margin of the meron, a patch of prealars and of upper mesepimerals. Scutellum concolorous with mesonotum. Postnotum bare except for the usual tuft of hairs present in all sabethines. Legs dark except for the median pair which have the fifth tarsal segment white on one side. Wings with

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broad scales predominating on second, third, and fourth veins, those on the other veins being mostly narrow. Squamae bare. Abdomen dark greenish blue above, white below, the colors separated on the sides by a shaggy undulating line, with the dark indenting the white on the posterior end of each segment.

MALE TERMINALIA. Basistyle about two and a half times as long as its greatest width, the posterior angle produced into a short pointed horn; dorsal[5] surface clothed with short hairs and narrow ribbed scales; a basal tuft of some eleven or twelve hairs inserted in a semilunar tubercle on the ventral surface. Median plate quadrangular, sparsely clothed with short hairs. Dististyle with long stem, broadening toward tip, about ¾ the length of the basistyle. Tip of the dististyle divided into two main arms, the outer arm heavily sclerotized and broad at the base, curving sharply at a right angle toward the tip, and the apical half quite narrow and beak-like, giving the arm the appearance of a sea-gull's head; inner arm sessile, flat, fan-shaped, and clothed with two rows of short, fine hairs on its posterior border; ventro-posterior angle of the arm dark, heavily sclerotized, U-shaped. There are three appendages attached to this arm as follows: a strap-like one inserted near the tip and pointing anteriorly; a second long, tubular, U-shaped one inserted near the base of the arm and slightly expanded at tip; and a third appendage inserted at the antero-dorsal angle of the arm and pointing directly anteriorly in line with the stem of the dististyle. This third appendage is thinly membranous and leaf-like, with fine striations, and is occasionally hidden from view by the stem of the dististyle. Mesosome slightly less than twice as long as it is broad, lateral borders sinuate, ending in a heavily sclerotized upturned tip; basal opening rather narrow. Tenth sternites mostly membranous with sclerotized upper border and tip which has three or four closely appressed subequal teeth. Lobes of the ninth tergite with five hairs on each side, inserted in well defined tubercles, and decreasing in size from the center outwardly; interlobar space concave and quite narrow.

FEMALE. Similar to male. Proboscis dark above and below.

LARVA. Head rounded; antennae cylindrical, very short, glabrous; head hairs single, very short and fine. Integument of body glabrous. Lateral abdominal hairs double or triple on segment I, single or double on others. Subdorsal abdominal hairs in weak non-stellate tufts. Lateral comb of the eighth segment in a single row of some twenty spine-like scales. Air-tube three and one-half times as long as basal width, tapering sharply from the base to the tip. There are four rows (two ventral and two dorsal) of very long single hairs which extend from the base to the outer third of the air tube, and a very short and fine two-haired dorsal tuft near its tip. There is no fringe or pseudopecten. Anal segment with the dorsal plate almost ringing the segment, light colored.

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[5]The terms dorsal and ventral are used in this paper to designate definitive positions, not in the true morphological sense.

Dorsal anal hair double (1 + 1); lateral hair single, as long as dorsal; ventral tuft with two hairs, as long but slightly weaker than dorsal. Anal gills short, barely as long as the segment.

PUPA. Trumpets tubular, but slightly tapering from tip to base; meatus four times as long as the diameter of the pinna, entirely reticulate with no visible tracheoid portion. Median group of hairs of the cephalothorax with a long double and a long single hair, others represented by very small and weak two or three-haired tufts. All dorsal abdominal hairs weak and insignificant except for the following: hair 2 on segment I (terminology of Knight and Chamberlain, 1948) large and dendritic; hair 5 on segments IV, V and VI quite outstanding and longer than the segment; hair 8 on segments VII and VIII a large multiple and conspicuous tuft. Paddles triangular, slightly longer than the length of the eighth abdominal segment, weakly sclerotized; midrib broad, fading toward the tip of the paddle which is weakly fringed with short fine spicules.

TYPE MATERIAL. *Holotype* pinned male (terminalia, associated larval and pupal skins mounted on two separate slides), reared from eggs laid by a female taken while biting man in the upper canopy of the forest, 45 feet above the ground, at Bijao on the slopes of Chiriqui Volcano, 3,000 feet above sea-level, Chiriqui Province, Republic of Panama, on August 15th, 1950. *Allotype* female (with associated larval and pupal skins) reared from one larva taken from the water in a bamboo internode placed as a larval trap in the upper canopy of the forest at the type locality, July 11th, 1950. *Paratypes*: two males, same data as the holotype; one male with associated pupal case, same data as the allotype; three females taken while biting man at the type locality on June 20th, 1950; one male and one female taken with a net from the branches of a tree 30 feet above the ground on the forested slopes of Cerro Tute, near Santa Fe, Veraguas Province, at 2,200 feet above sea-level on July 11th, 1950.

Holotype, allotype and one paratype to be deposited in U.S.N.M., two paratypes in the collection of Dr. John Lane at the University of Saõ Paulo, Brazil, and the remainder of the type material in the senior author's collection.

TAXONOMIC DISCUSSION. The present species falls in the subgenus *Davismyia*, created by Lane and Cerqueira (1942) to include two species, *petrocchiae* Shannon and Del Ponte and *schnusei* Martini, which are distinguished from all other species of the genus by the strong metallic reflection of the mesonotal scales. The pleural chaetotaxy of the group and the wing scaling are, in general, quite similar to those species of the series *Cleobonnea*, subgenus *Dendromyia*, to which *Davismyia* appears closely related.

Females of *arborea* can be separated readily from other species of *Davismyia* by the less pronounced metallic reflection of the mesonotal scales as well as by the leg markings, *W. schnusei* having all the tarsi marked with white, *W. petrocchiae* having the mid-tarsi marked with white on one side.

The male of the new species can be readily separated from all other known males of the genus by the presence of a fan-shaped, 11-haired tuft inserted in a semilunar tubercle on the base of the basistyle.

We wish to express our appreciation to Dr. John Lane who examined two males of this species sent him by us, and who concurred in our belief that it was undescribed.

Wyeomyia (Wyeomyia) nigritubus, new species

MALE. Proboscis short and stout, shorter than fore femur, slightly swollen at tip, dark. Palpi small, barely longer than the clypeus. Antennae not plumose, about two-thirds the length of the proboscis. Occiput clothed with flat scales which give a dull greenish reflection, and with an indistinct line of whitish scales bordering the eyes and joining a broad patch of silvery scales below. Anterior pronotal lobes clothed with dull brownish scales above and a small patch of silvery ones below. Mesonotum covered with dull brown scales. Pleura silvery scaled. Pleural chaetotaxy as follows: no posterior pronotal, one spiracular, no post spiraculars, lower sternopleurals below upper margin of meron, a patch of upper sternopleurals and of upper mesepimerals. Scutellum clothed with scales concolorous with those of mesonotum. Postnotum bare except for the usual tuft of hairs present in all sabethines. Legs dark, mid-tarsi white on the outside of the third and fourth segments, hind-tarsi with white on one side of the fourth and fifth segments, except for the very tip of the fourth which is dark. Wing scales dark, the outstanding ones of the base of the fourth vein narrow and ligulate, those of the branches of the second, third and fourth veins broad and mostly truncate. Squamae bare. Abdomen dark above, pale yellowish below, the colors separated in a straight line.

MALE TERMINALIA. Basistyle about three and one-half times longer than its greatest width, clothed with short hairs and some ribbed scales dorsally, and with three long setae inserted in closely appressed tubercles on the ventral side near the base. Median plate quadrangular, with a long stout process projecting anteriorly, and bearing seven or eight short hairs on the surface and two stout setae on the dorso-posterior angle. Dististyle with a long and slender stem and a capitate tip which is divided into two plates. Dorsal plate small with rounded tip and about twelve hairs arising from tuberculate bases. This dorsal plate also bears a long arm from its base which points anteriorly along the stem of the dististyle for about half its length, then bends sharply back to end near its origin. Ventral plate larger, roughly quadrate, bearing numerous short hairs on its ventral border, and five or six modified rod-like setae on the anterio-ventral angle. Mesosome elongate, bulging at the middle and with rounded tip; two small wing-like processes located ventrally near the tip. Tenth sternite membranous with sclerotized upper border and two subequal teeth at the tip. Lobes of the ninth tergite each with six strong pointed hairs, progressively longer from the median line laterad; interlobar space small and straight or very slightly concave.

FEMALE. Similar to male.

LARVA. Head rounded; antennae small, cylindrical and glabrous; head hairs single, slight. Integument of body glabrous. Lateral abdominal hairs multiple and long on segments I and II, in threes or fours on segments III, IV and V, and double on others. Subdorsal abdominal hairs in long, strong tufts of four or five branches. Lateral comb of the eighth segment of ten to fourteen spine-like scales in a straggling line appearing double in some specimens. Air tube four times as long as basal diameter, heavily sclerotized and dark, bearing ventrally a long and strong two-haired tuft on basal third, and a small single hair near the tip; dorsally there is a row of four small hairs, the two basal ones being double and the two apical ones single. Anal segment wider than long with the saddle also heavily sclerotized, and not ringing the plate. Dorsal anal tuft 11 or 12-haired (8 + 3) or (8 + 4); lateral tuft long and strong, three or four haired; ventral tuft short, 8 to 10-haired.

PUPA. Trumpet tubular, narrowing slightly medianly; meatus about three or four times longer than diameter of pinna; tracheoid area absent. Dorsal abdominal hairs mostly single and weak, except the following: hair 2 on segment I the usual conspicuous palmate tuft, on segment II strong and single at the base but frayed into three or four branches at the tip; hair 5 single but long and strong, particularly on segments IV, V and VI where it is longer than the length of the segment immediately posterior; hair 7 single and very long on segment II, longer than length of segment III; hair 8 a multiple tuft on segments VII and VIII. Paddles short and acutely triangular, diverging slightly outward toward tip, longer than the length of the eighth segment, with lightly spiculate apices and pronounced midribs.

TYPE MATERIAL. *Holotype:* pinned male with terminalia and associated larval and pupal skins mounted on two slides. *Allotype*: female with associated larval and pupal skins mounted on slide. *Paratypes*: three females, five larval and three pupal skins. Type material reared from larvae taken from a bamboo internode placed as a larval trap five feet above the forest floor at La Victoria (Cerro Azul) Panama Province, Republic of Panama, at 2,100 feet above sea-level on April 27th, 1950.

Holotype, allotype and one paratype to be deposited in the U.S.N.M. One paratype in the collection of Dr. John Lane.

University of Saõ Paulo, Brazil, and the remainder in the collection of the senior author.

TAXONOMIC DISCUSSION. The presence of narrow ligulate scales on the base of the fourth vein and of broad truncate ones on the branches of veins 2, 3 and 4, places *nigritubus* close to *hemisagnosta* D. & K., the male of which is as yet undescribed. Females of the new species may be separated from those of *hemisagnosta* by the presence of white on the outside of the mid-tarsi, the latter species having the mid-tarsi entirely dark. The larvae of *nigritubus* may be separated from those of *hemisagnosta* by the following characters. *Lateral abdominal hairs:* in *nigritubus* they are multiple on segments I and II, triple or quadruple on segments III, IV and V and double on the others, while in *hemisagnosta* they are quadruple on segments I and II, double on segments III, IV and V, and single on the other segments. *Subdorsal abdominal hairs:* these hairs are quadruple or quintuple in *nigritubus* and double or triple in *hemisagnosta*. *Dorsal anal hairs:* these hairs have eleven or twelve branches in *nigritubus*, but only five branches in *hemisagnosta*. *Lateral anal hairs:* these are triple or quadruple in *nigritubus* and double in *hemisagnosta*.

It is possible that *Wyeomyia nigritubus* is conspecific with *W. hemisagnosta* D. & K., but we describe it here as a new species in view of the differences found in the tarsal markings of the females, and more particularly in the chaetotaxy of the larvae. The finding of typical males of *hemisagnosta* will definitely settle the status of the species herein described.

Sabethes (Sabethes) tarsopus, Dyar and Knab

MALE. Coloration and morphology as in the female, but somewhat smaller. Palpi short; antennae not plumose.

MALE TERMINALIA. Basistyle rather short and stout, about two and one-half times as long as it is wide, densely covered with strong, short hairs and narrow ribbed scales on the dorsal surface. There are three setae from closely appressed tuberculate bases at about the middle of the ventral border. Median plate quadrate, densely clothed with short hairs and bearing two modified long setae from the posterior dorsal corner, and a long and broad process from the posterior border, which is difficult to see unless the plates are dissected out. Dististyle with stem and capitate tip; stem short, thick and sinuate, slightly less than half as long as the basistyle. Tip complicated, divided into four main processes. The innermost process is sausage-shaped and densely covered with short hairs; this is followed laterally by a large quadrate plate bearing on its apical border a row of setae, the ones on distal half being long and notched at the tip and the ones on the proximal half being short, thick and single. The third process is divided into three arms, the dorsal one broad at the base, narrowing abruptly on the apical half to form a long, smooth beak-like process; the middle one broad and rounded at the tip, densely covered with hairs on the dorsal border; the ventral arm broadly finger shaped and smooth. The fourth process points back along the stem of the dististyle and is divided into a lower club-shaped, heavily sclerotized border bearing a long tuft of hairs at its tip, and a membranous, acutely pointed dorsal border with very fine hairs at the point. Mesosome tubular, short, with sinuate border and small basal opening. Tenth sternites mostly membranous with sclerotized upper border and tip, which bears three strong, subequal teeth and three small subapical setae. Lobes of the ninth tergite with three long, stout, pointed setae on each side; interlobar space large and convex.

This description is based on 32 speciments taken on the wing at different times of the year in the upper canopy of the forest between 40 and 75 feet above the ground at the following localities in the Republic of Panama: La Victoria (Cerro Azul), Panama Province; Buena Vista, Colon Province; Tucue, Cocle Province; Cerro Tute (Santa Fe), Veraguas Province.

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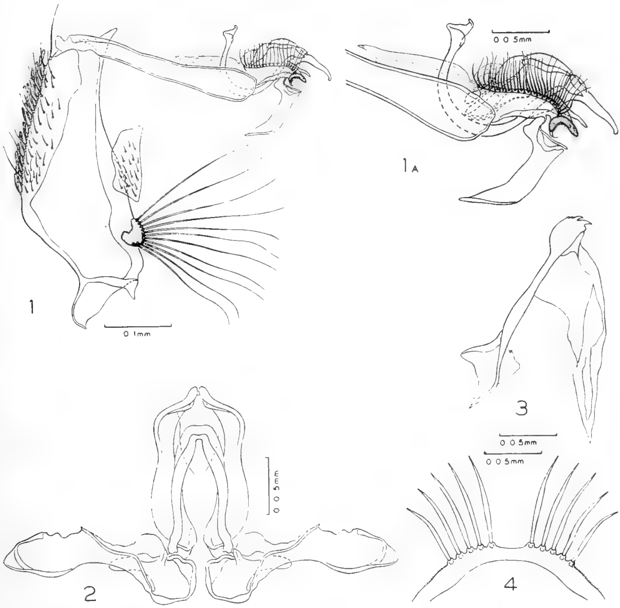

PLATE 18. MALE TERMINALIA OF WYEOMYIA (DAVISMYIA) ARBOREA

Fig. 1, style; fig. 1A, terminal part of dististyle; fig. 2, mesosome; fig. 3, tenth sternite; fig. 4, ninth tergite.

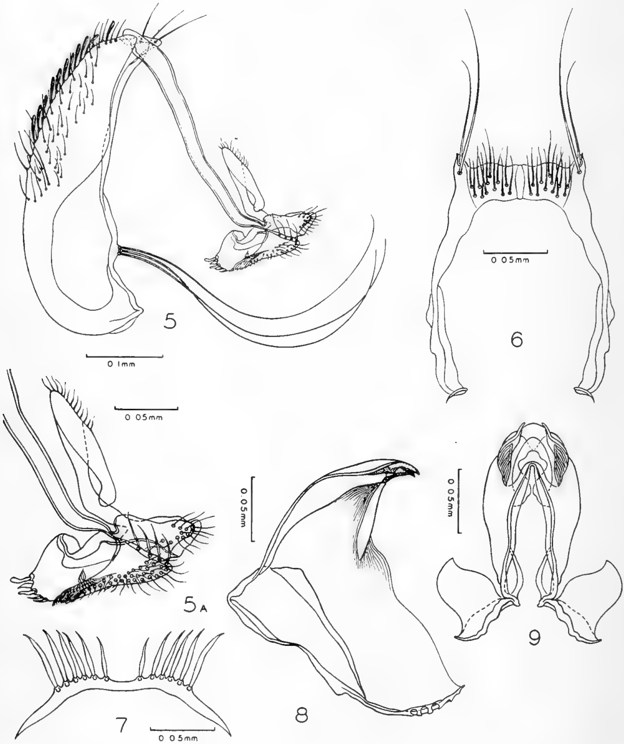

PLATE 19. MALE TERMINALIA OF WYEOMYIA (WYEOMYIA) NIGRITUBUS

Fig. 5, style; fig. 5A, terminal part of dististyle; fig. 6, median plates of basistyles; fig. 7, ninth tergite; fig. 8, tenth sternite; fig. 9, mesosome.

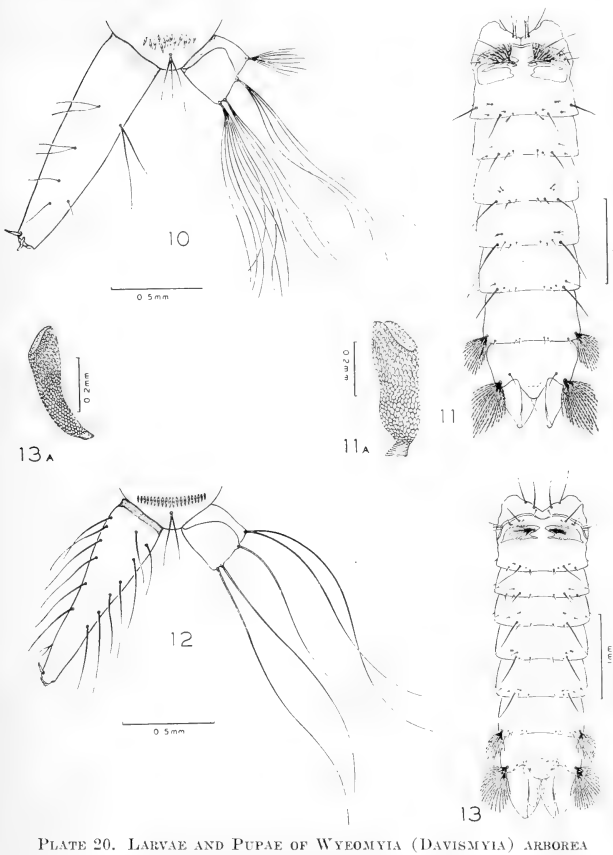

PLATE 20. LARVAE AND PUPAE OF WYEOMYIA (DAVISMYIA) ARBOREA AND WYEOMYIA (WYEOMYIA) NIGRITUBUS

Fig. 10, terminal segments of larva of *Wyeomyia (Wyeomyia) nigritubus;* fig. 11, abdomen of pupa of *Wyeomyia (Wyeomyia) nigritubus* (dorsal view); fig. 11A, respiratory trumpet of pupa of *Wyeomyia (Wyeomyia) nigritubus;* fig. 12, terminal segments of larva of *Wyeomyia (Davismyia) arborea;* fig. 13, abdomen of pupa of *Wyeomyia (Davismyia) arborea* (dorsal view); fig. 13A, respiratory trumpet of pupa of *Wyeomyia (Davismyia) arborea.*

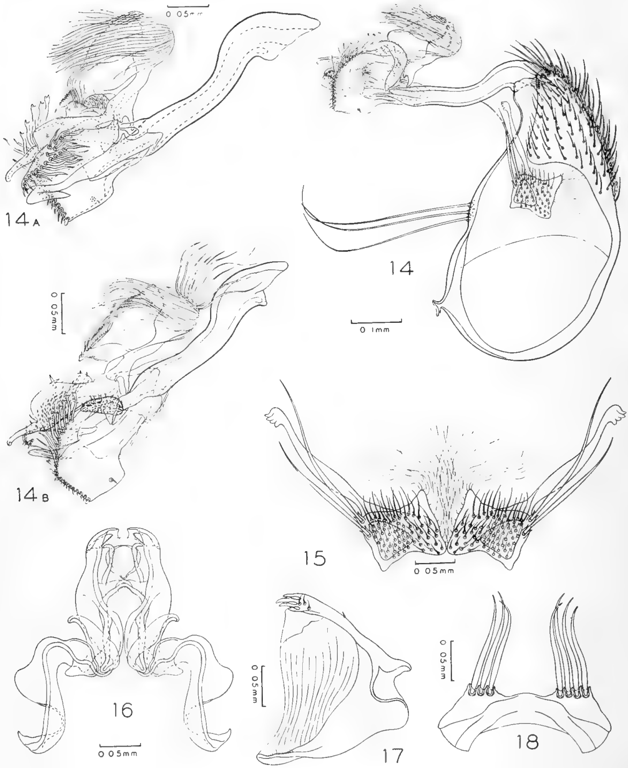

PLATE 21. MALE TERMINALIA OF SABETHES (SABETHES) TARSOPUS

Fig. 14, Style; fig. 14A, dististyle (lateral view); fig. 14B, dististyle (dorso-lateral view); fig. 15, median plates of basistyles; fig. 16, mesosome; fig. 17, tenth sternites; fig. 18, ninth tergite.

HOOGSTRAALIA TURDELLA, A NEW GENUS AND SPECIES OF FLEA FROM THE PHILIPPINES[1]

(SIPHONAPTERA, PYGIOPSYLLIDAE, PYGIOPSYLLINAE)

By ROBERT TRAUB, *Major, MSC, Department of Parasitology, Army Medical Department Research and Graduate School, Washington, D. C.*

Among the fleas collected by Mr. Harry Hoogstraal, when leader of the Chicago Natural History Museum Expedition to the Philippines in 1946-1947, is a remarkable new genus, which exhibits some very interesting modifications. Although it has no known close relatives, this new genus, described below, has definite affinities with the New Guinea fauna.

Hoogstraalia, new genus

Genotype: *Hoogstraalia turdella*, new species.

Diagnosis.—One of the very few genera of fleas in which both a genal comb and a well-developed eye are present. The only genus in the family known to possess a genal comb. The only Pygiopsyllid with a sinus on upper margin of propleuron for reception of end of first vinculum. Resembling some *Acanthopsylla* in that the distal arm of the male ninth sternum is bifid. *Description.*—Frontal tubercle absent. Genal comb large, extending from base of maxilla to eye. Labial palpi five-segmented, not extending to trochanters. Eye diameter greater than thrice width of any genal spine. Antenna symmetrical; with bristles of second segment much shorter than club. Integrecipitate. Postantennal region with three rows of bristles. Pronotal comb well-developed. Most dorsolateral tibial bristles paired. All four vincula present. Some of first abdominal terga with apical spinelets. Typical abdominal terga with three fairly complete rows of bristles. Male with two antepygidial bristles. Sensilium markedly convex. Male ninth sternum with proximal arm very long; distal arm bifid; with spiniforms. Manubrium narrow. Exopodite extremely broad as well as long; with apical spiniforms. Male eighth tergum reduced; eighth sternum very well developed, enclosing most of genitalia. The third apodemal rod arising from base of aedeagus. True crochets apparently absent. Penis rods not coiled.

The female of this genus is unknown.

Hoogstraalia turdella, new species

Holotype.—Male ex *Turdus poliocephalus kelleri*, collected by Harry Hoogstraal and Floyd Werner, 1 November 1946. Philippine Islands: Mindanao, Davao Province, East Slope of Mount McKinley, elev. 7800 ft. Deposited in Chicago Natural History Museum.

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[1]Published under the auspices of the Surgeon General, Department of the Army, who does not necessarily assume responsibility for the professional opinions expressed by the author.

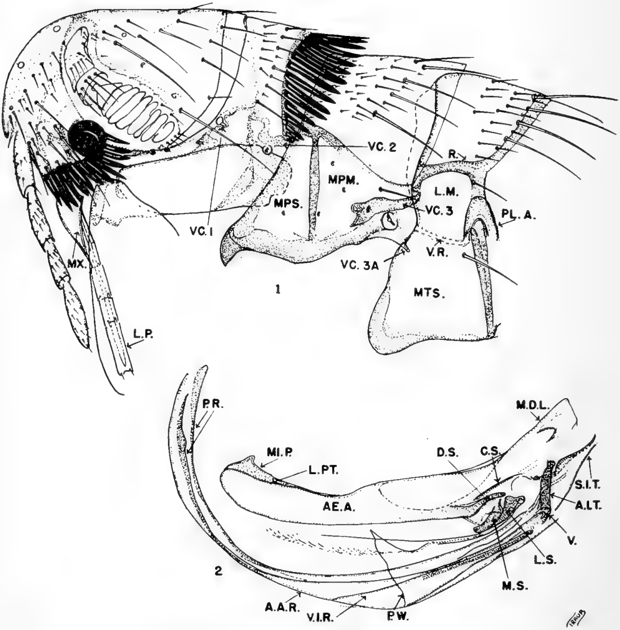

PLATE 22. HOOGSTRAALIA TURDELLA

Fig. 1, head and part of thorax; fig. 2, aedeagus.

Description. Male, Head (fig. 1). Frontoclypeal margin evenly rounded. Pores of microsetae scattered anterior and dorsal to first row of bristles. Preantennal region with an anterior row of about seven bristles, the longest near the insertion of the maxillary palpi; with about 4 more long bristles and 12 short ones not arranged in definite rows. Genal comb consisting of about 13 spines on a side. Eye much less excised ventrally than in other Pygiopsyllids, almost rounded; eye covering bases of four most dorsal genal spines. Genal process at level of second genal spine but slightly wider and extending beyond apex of spine. Maxillary lobe (*MX.*)[2] extending to about level of second segment of labial palpi (*L.P.*) which in turn extend almost to apex of forecoxae. Bristles of second antennal segment not reaching beyond basal third of club. A row of very small bristles along dorsal and caudal margin of antennal fossa. Postantennal region with three rows of bristles arranged 3-5-6, but apparently with two additional bristles near antennal groove; second bristle in posterior row much smaller than others.

Thorax. With two rows of bristles preceding the fourteen or fifteen pronotal ctenidial spines on each side. Mesonotum with three rows of bristles, not counting bristles forming one or two rows near cephalic margin; the caudal row consisting of by far the longest bristles. Mesepisternum (*MPS.*) apparently with but one bristle, and that median. Mesepimere (*MPM.*) apparently with five bristles. Metanotum with three rows of bristles. Lateral metanotal area (*L.M.*) distinct, with dorsal ridge (*R.*) well sclerotized, but with ventral ridge (*V.R.*) feeble; with a bristle at dorsocaudal angle. Pleural arch (*PL.A.*) at junction of metanotal ridge and pleural ridge strongly convex, well-developed. Metepisternum (*MTS.*) with one bristle, near dorsocaudal angle; with an accessory link or vinculum (*VC.3A*) near anterodorsal angle. Metepimere (fig. 10, *MTM.*) with eleven bristles arranged 5-4-2.

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[2]Abbreviations are as follows: *A.A.R.*, aedeagal apodemal rod; *A.B.*, antepygidial bristle; *AE.A.*, aedeagal apodeme; *A.I.T.*, armature of inner tube of aedeagus; *B.CL.*, base of clasper; *C.S.*, crescent sclerite; *D.A.9*, distal arm of 9th sternum; *D.S.*, dorsal convex lobe of apodemal strut; *F.*, exopodite of movable finger; *L.M.*, lateral metanotal area; *L.P.*, labial palpi; *L.PT.*, lateral plates of aedaegal apodeme; *L.S.*, lateral lobe of apodemal strut; *MB.*, manubrium; *M.D.L.*, median dorsal lobe; *MI.P.*, middle plate of aedeagal apodeme; *MPM.*, mesepimere; *MPS.*, mesepisternum; *M.S.*, mesal lobe of apodemal strut; *MTM.*, metepimere; *MTS.*, metepisternum; *MX.*, maxillary lobe; *P.A.9*, proximal arm of 9th sternum; *PL.A.*, pleural arch of metathorax; *P.R.*, penis rods; *P.W.*, wall of aedeagal pouch; *P^1*, process 1 of clasper; *P^2*, process 2 of clasper; *R.*, dorsal ridge of lateral metanotal area; *S.I.T.*, sclerotized inner tube; *SN.*, sensilium; *T.AP.9*, tergal apodeme of 9th tergum; *V.*, vesicle; *VC.1.*, first vinculum; *VC.2.*, second vinculum; *VC.3.*, third vinculum; *VC.3A.*, accessory link below third vinculum; *VC.4.*, fourth vinculum; *V.I.R.*, ventral intramural rod; *V.R.*, ventral ridge of lateral metanotal area; *8PR.*, process of 8th sternum; *2S.*, second abdominal sternum; *8S.*, eighth sternum; *1T.*, first tergum; *2T.*, second tergum; *8T.*, eighth tergum; *9T.*, ninth tergum.

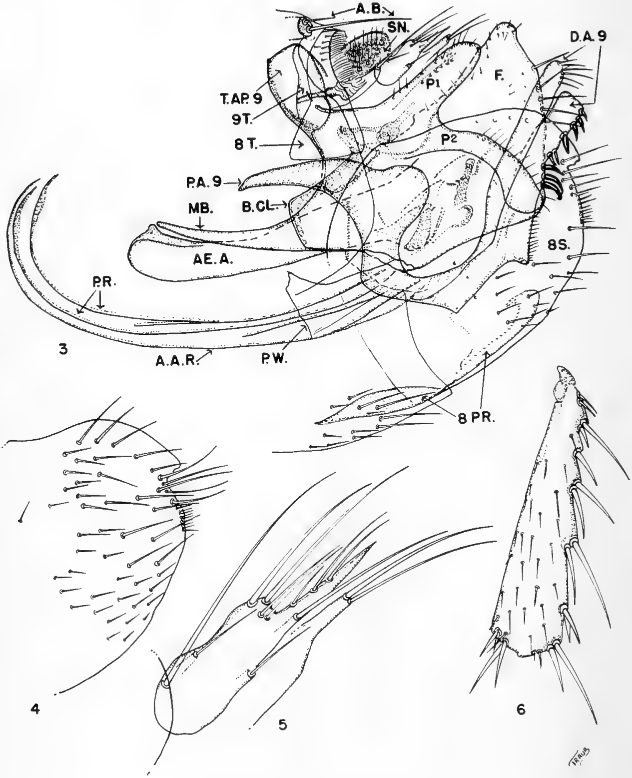

PLATE 23. HOOGSTRAALIA TURDELLA

Fig. 3, modified abdominal segments; fig. 4, eighth sternum; fig. 5, dorsal and ventral anal lobes; fig. 6, male hind tibia.

Legs. Metacoxa with a patch of mesal thin, short bristles near anteroventral angle, and with three (one very small) lateral bristles immediately above and behind insertion of trochanter. Profemur with a ventral marginal bristle at proximal fourth; a smaller one nearer apex. Mesofemur with a ventral submarginal row of about 5 small bristles and a larger one near apex. Metafemur with 9 ventromarginal bristles, the longest near each end. Metatibia (fig. 6) with but one unpaired dorsolateral large bristle and with six pairs of such bristles; with about 22 small lateral bristles. Measurements of tibiae and segments of tarsi (petiolate base deleted) shown in microns:

Leg	Tibia	Tarsal Segment 1	2	3	4	5
Pro-	165	63	63	47	33	68
Meso-	248	116	83	49	28	65
Meta-	393	187	143	89	54	88

None of tarsal bristles reaching beyond apex of following segment. Fifth segment of protarsus with seven pairs of plantar bristles; the proximal three pairs directed more towards the mid-line than the others; the fifth and sixth pairs inserted at same level, overlapping; with four subapical submesal stout bristles. Fifth segment of mesotarsus (fig. 8) similar or with but six pairs of lateral plantar bristles; fifth segment of metatarsus (fig. 9) similar but with only six pairs of lateral plantar bristles and with two or three long, thin apical bristles.

Abdomen. First tergum (fig. 10, *1T.*) with four rows of bristles, the first incomplete; the bristles in the last row the longest. With two very small apical teeth on each side of second tergum; third and fourth terga with one. Basal sternum with one ventromarginal bristle. Typical terga with three or four rows of bristles, the first row incomplete; larger bristles of the caudal row the longest; the most ventral bristle of caudal row inserted below spiracle. Sterna three to six with ventromarginal bristles arranged in two or three very short rows; with three long bristles in caudal row. With upper antepygidial bristle (fig. 3, *A.B.*) less than half the length of lower bristle.

Modified Abdominal Segments (fig. 3). Eighth tergum (*8T.*) reduced, limited to a small plate bordering its spiracle; with but a few very small bristles near the antepygidial bristles. Eighth sternum (*8S.* and fig. 4) very large, extending as far dorsad as near apex of distal arm of ninth sternum; dorsal margin slightly sinuate; caudal margin with a subdorsal sinus; with about 48 bristles, and in addition a fringe of ten or twelve very small bristles along caudal margin. Eighth sternum associated with a peculiar long, somewhat ellipsoid structure (*8PR.*) near ventral margin, and extending into seventh sternum; a somewhat membranous, slightly filamentous and spiculose process extending caudad from the ellipsoid; an element of the process connecting with the base of the distal arm of the ninth sternum. The connection with the ninth

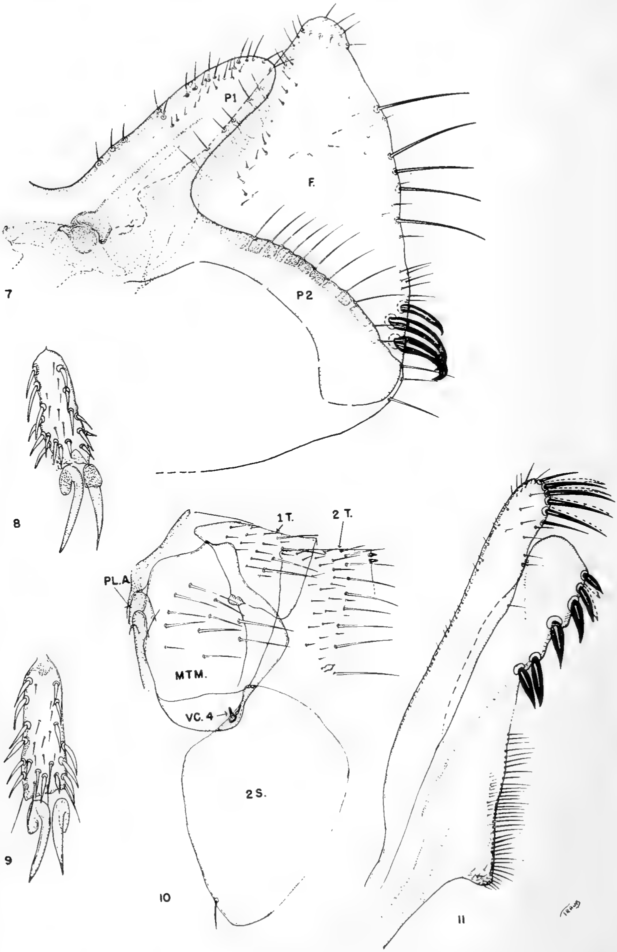

PLATE 24. HOOGSTRAALIA TURDELLA

Fig. 7, process of clasper and exopodite; fig. 8, mesotarsus V; fig. 9, metatarsus V; fig. 10, part of metathorax and part of abdomen; fig. 11, distal arm of ninth sternum.

sternum suggests that the structure is homologous with intersegmental processes arising from the membrane between the eighth and ninth segments of certain other fleas.

Immovable process of clasper very large, divided into two processes (P_1 and P_2 and fig. 7). The first process (P_1) digitoid; about three times as long as broad as measured along cephalic margin and apex. Process P_2 at right angles to P_1 and extending ventrad to ventrocaudal margin of exopodite; lightly sclerotized; dorsal and ventral margin convex; with a row of bristles along apparent caudal (morphologically dorsal) margin. Exopodite (*F.* and fig. 7) extremely large, extending distad of P_1, ventrad to near base of distal arm of ninth sternum, then cephalad in an almost straight but slightly sclerotized line to base of proximal arm of ninth sternum and then curving dorsad to the truncate base of clasper (*B.CL.*), which is broader than the manubrium. Dorsal margin and apex of exopodite with thin short bristles. Caudal margin of exopodite with five long thin bristles and with three stout curved spiniforms at ventrocaudal margin. Manubrium (*MB.*) narrow, at midpoint only about one-third width of tergal apodeme of ninth tergum (*T.AP.9*), which forms dorsoproximal portion of clasper lobe; slightly curved; apex subacuminate; ninth tergum (*9T.*) very narrow, reduced on each side to a pyriform sclerite between its apodeme and clasper lobe. Proximal arm of ninth sternum (*P.A.9*) greatly expanded apically; shaped like an inverted boot with a low rounded heel and an elongate toe. Distal arm of ninth sternum (*D.A.9* and fig. 11) bifid to near base, forming anterior and posterior appendages. Anterior appendage of distal arm long and narrow, with six apical or subapical stout long bristles on caudal margin; with three thin bristles well proximad of these; with a row of short thin bristles on cephalic margin. Posterior appendage of distal arm shorter and broader than anterior, with a row of six spiniforms extending to apex of caudal margin and with a fringe of about 36 short thin bristles on proximal half of this margin; with a row of 16 smaller mesal submarginal ones and a patch of 8 still smaller mesal ones near ventrocaudal angle.

Aedeagal apodeme (fig. 2, *AE.A.*) slightly shorter than aedeagus proper; middle plate (*MI.P.*) apparent at anterior end as a sclerotized cap-like structure. Apical appendage and proximal spur absent. Median dorsal lobe (*M.D.L.*) relatively weakly sclerotized; truncate apically; lacking distinct apical or subapical sclerites but apparently with a subapical V-shaped sclerotization. Lateral lobes and crochets apparently absent. Armature of inner tube (*A.I.T.*) well represented as a long narrow rod dorsad of vesicle (*V.*). Sclerotized inner tube (*S.I.T.*) dorsally markedly sinuate; ventral margin slightly so. Apodemal strut supporting inner tube consisting on each side of a dorsal convex lobe (*D.S.*), a narrow submedian mesal lobe (*M.S.*), and a larger apically-flared lateral lobe (*L.S.*). The relatively flat crescent sclerite (*C.S.*) immediately dorsad of apodemal strut. Base of wall of aedeagal pouch (*P.W.*) distinct. Penis rods (*P.R.*) when *in situ* extending cephalad only slightly more than aedaegal apodeme; without an indication of a coil. The third aedeagal apodemal rod (*A.A.R.*) similar in length to penis rods. Ventral intramural rod (*V.I.R.*) arising from vesicle (*V.*).

Tenth abdominal segment conspicuous because of highly convex sensilium (*SN.*) which is higher than long; with a long bristle at insertion of dorsal lobe of proctiger (fig. 5) which is biconvex dorsally and bears bristles as in figure; apically acuminate. Ventral lobe of proctiger with two apical bristles.

Remarks. Birds are parasitized by several widely separated genera of fleas, representing several families. In those forms that have pronotal combs, the number of spines in the comb is characteristically definitely greater than in near relatives, which usually parasitize rodents. No close relative of *Hoogstraalia* is yet known. In *Acanthopsylla*, an Australian and New Guinea genus with which this new genus has affinities, a total of about 20 spines is common. The comb of 29 or 30 spines suggests that *Hoogstraalia* is a true bird flea, and that *Turdus* may be a characteristic host.

Also worthy of note is that this one bird was host to *Dasypsyllus gallinulae*, a species heretofore known only from Europe and North America!

I take great pleasure in naming this genus for Mr. Harry Hoogstraal, who has, through his various expeditions and his constant zeal, contributed immensely to our knowledge of ectoparasites.

WESTWARD EXTENSION OF THE RANGE OF HAEMAGOGUS SPEGAZZINII FALCO KUMM ET AL. INTO COSTA RICA

(DIPTERA, CULICIDAE)[1,2,3]

By PEDRO GALINDO[4], STANLEY J. CARPENTER[5], AND HAROLD TRAPIDO[4]

During the past two years the writers have been engaged in a study of the forest mosquito population of the Isthmus of Panama following an outbreak of sylvan yellow fever in this area at the end of 1948. The first studies were initiated in the Canal Zone and portions of the Republic of Panama adjacent

[1]Studies on The Forest Mosquitoes of Panama. V.

[2]The authors wish to express their appreciation to the authorities who have made it possible for them to engage in this work; Dr. Herbert C. Clark, Director of the Gorgas Memorial Laboratory, Col. Francis P. Kintz, M. C., Surgeon of the U. S. Army Caribbean, and Dr. Edward I. Salisbury, Medical Director of the United Fruit Company.

[3]Publication costs paid by Gorgas Memorial Institute.

[4]Gorgas Memorial Laboratory, Apartado 1252, Panama, R. de P.

[5]Colonel, M.S.C., U. S. Army Caribbean, Fort Clayton, Canal Zone.

to it, in the general region where the yellow fever fatalities occurred, and have been reported on in part (Galindo, Trapido and Carpenter, 1950; Galindo, Carpenter and Trapido, 1951). Particular attention has been concentrated on the attempt to locate, and the study of the ecology of, the known vectors of sylvan yellow fever in South America, *Haemagogus spegazzinii falco* Kumm *et al.* and *Aedes leucocelaenus* Dyar and Shannon, to obtain a better understanding of the possibility of the spread of yellow fever westward through the Isthmus into Central America. The status of the species of the aedine subgenus *Finlaya*, which includes *leucocelaenus*, involves special problems which will be considered in a separate paper. The finding that *Haemagogus spegazzinii falco* occurs not only in Panama (Galindo, Carpenter and Trapido, 1949) but also extends into Costa Rica seems a matter of particular importance worthy of preliminary notice here.

Haemagogus spegazzinii falco is predominantly an arboreal species and this possibly explains why Kumm, Komp and Ruiz (1940) did not find it in the course of their mosquito survey of Costa Rica, as they did not collect in the forest canopy and were primarily interested in the anopheline fauna. During 1950 we set up a number of stations in western Panama and in Puntarenas Province on the Pacific coast of southern Costa Rica adjacent to Panama. At these stations human subjects were exposed on the forest floor and on platforms in the forest canopy from June to December, the rainy season months during which we knew *Haemagogus* mosquitoes would be most abundant, from our previous year-long study in the Canal Zone and central Panama. In Costa Rica we operated four tree platform stations, two of which were located in the forest near Esquinas and two near Jalaca. Two females of *H. spegazzinii falco* were captured while feeding on human bait on a platform 95 feet above the ground at the station designated as "L" in the forest about 75 feet above sea-level, near the Esquinas Experiment Station of the United Fruit Company, which is located about 20 kilometers north-northwest of Golfito. These were collected on June 26th and August 21st 1950. Three additional females were taken on a platform 64 feet above the ground at Station "N", located at an elevation of 300 feet above sea-level on the slopes of the Cordillera Brunquena, approximately 40 kilometers northwest of Golfito, on June 28th, July 19th, and August 9th, 1950. Eggs were obtained from blood engorged females captured alive, and larvae, pupae and males obtained by which the identifications were confirmed.

It might be assumed from the fact that so few specimens were taken during this six month period, that the species is rare and near the western limit of its distribution. This may or may not be true, in the light of the following considerations. First, we have learned from our experience in making forest canopy collections of tree-hole breeding mosquitoes in Panama, that these species may be exceedingly local in occurrence. Thus, at one locality in Panama where four tree platforms were located within a radius of not more than 100 yards, to capture as many *Haemagogus* mosquitoes as possible in the effort to recover virus following a human yellow fever fatality, it was found that one of the platforms, seemingly located in a situation as favorable as the others, captured less than a tenth as many *H. spegazzinii falco* as were taken at a closeby platform. Second, it is difficult to determine whether a particular area in the forest will provide abundant opportunity for the breeding of *H. spegazzinii falco,* as we are as yet uncertain of the favored breeding places of the species. Third, this area of Costa Rica is one of very high and consistent rainfall, with perhaps little opportunity for the periodic flooding and drying of tree-holes required for the hatching of *Haemagogus* eggs. Areas of more intermittant rainfall in this region might well have proven more productive of *Haemagogus* mosquitoes in general, and demonstrated larger populations of these mosquitoes. A review of the data on the other species of *Haemagogus* taken at the four Costa Rican tree stations shows that these species of the genus were also not particularly abundant in the area, with only 1.0 *H. equinus* and 2.3 *H. lucifer* and/or *iridicolor* being taken per ten man-hours of collecting on tree platforms, rates very much lower than those obtained at favorably located stations in central Panama (see Galindo, Trapido and Carpenter, 1950).

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James Chamberlain Crawford

1880-1950

Mr. James Chamberlain Crawford for many years an active member of the Entomological Society of Washington and for several years (1909-1912) its recording secretary and a member of its editorial committee, died December 20, 1950, at his home in Bethesda, Maryland. Although he had been in rather poor health for some time his death came suddenly and unexpectedly due to a heart attack. He had been retired from government service on August 31, 1950, having reached the age of 70 years.

Mr. Crawford was born at West Point, Nebraska, August 24, 1880, the son of James Chamberlain and Katherine Moore Crawford. He attended the University of Nebraska for five and one-half years and for a short time was head of the biology department of that institution. He later obtained a Master of Science degree from George Washington University.

In 1904 he came to the Bureau of Entomology as Special Field Agent in the study of cotton insects and was stationed in Texas. Previous to coming to the Bureau and later while stationed in Texas he published a number of taxonomic papers dealing with Hymenoptera. No doubt partly as a result of these papers he was brought to Washington in 1908 and appointed assistant (later associate) curator of the Division of Insects in the United States National Museum, a position which had been made vacant by the death of Dr. Wm. H. Ashmead. There, in addition to carrying on the administrative duties of the division, Crawford specialized in the taxonomy of Hymenoptera and during the next several years published numerous papers in the Proceedings of the U. S. National Museum, the Proceedings of the Entomological Society of Washington and in other scientific journals, in which he described a large number of new species of bees as well as many new species and several new genera of parasitic forms, chiefly chalcidoids.

In 1919 he left the Museum to engage in business but soon found this not to his liking and 1923 found him at Raleigh, North Carolina, engaged in research work for the North Carolina State Department of Agriculture. He remained there until 1929. He was appointed an inspector in the Plant Quarantine and Control Administration of the Bureau of Entomology in 1930 and assigned to the port of New York. In 1936 he was put in charge of the identification work of the New York office, his duties being the sorting of insects collected by the inspectors, the determination of the commoner ones and the reference to specialists of the others. While engaged in this work he became interested in the Thysanoptera and made an intensive taxonomic study of the group. In 1940 he was brought back to Washington as a specialist on Thysanoptera in the Division of Insect Identification where he remained until his retirement.

At the time of his retirement Mr. Crawford was a member of the Entomological Society of Washington, the Biological Society of Washington, the Florida Entomological Society, and the New York Entomological Society. He had been, at one time, a Fellow of the American Association for the Advancement of Science, a member of the American Association of Economic Entomologists and the Entomological Society of America. He was also for several years actively affiliated with the Washington Biological Field Club.

Mr. Crawford was endowed with a keen mind and had a good eye for taxonomic characters. His papers on bees and chalcid-flies, numbering about 75, form a very substantial contribution to the taxonomy of Hymenoptera and those dealing with thrips, of which there are 26, are less important only because less extensive. He had a pleasant personality and was well liked by all with whom he came in contact.

He is survived by his widow, the former Emily Baker of

Hyattsville, Maryland; a daughter, Mrs. Daniel Dillon, the wife of the naval port inspector at Kodiak, Alaska; and by three grandchildren.

A. B. GAHAN
LOUISE M. RUSSELL
CARL H. HEINRICH

A NEW FUNGUS-GROWING ANT FROM ARIZONA
(HYMENOPTERA, FORMICIDAE)

By L. F. BYARS, *Bureau of Entomology and Plant Quarantine, United States Department of Agriculture*

While living in Nogales, Arizona, the writer discovered several ants of the genus *Trachymyrmex* on the porch of his residence. No nest was found, only single foraging workers, until one night when a number of workers appeared from a crack between the porch and the sidewalk, so that a series of specimens was secured. M. R. Smith, of this Bureau, determined them as belonging to an undescribed species of *Trachymyrmex* near *T. arizonensis*, and suggested that they be described as a new species.

Trachymyrmex nogalensis, new species

Worker (figs. 1 and 2). Length 5.0 mm. Head hardly broader than long excluding the mandibles, subquadrate, broadest just behind the eyes, with sides nearly straight and parallel; posterior border straight, with faint median impression and bluntly rectangular corners. Mandibles with external borders making obtuse angles with sides of head; apical borders each with two large apical teeth and twelve or thirteen smaller basal teeth. Clypeus flattened, its anterior border sinuately convex, with a narrow semicircular median excision. Lobes of frontal carinae large, with bluntly angular external borders; carinae continued posteriorly as sinuate ridges which curve laterad, then turn toward posterior border of head before disappearing. Preorbital carinae curving mesad across antennal scrobes to join frontal carinae; anterior part of antennal scrobes bearing irregular striations parallel to preorbital carinae, but posterior part of antennal scrobes not well defined. A pair of faint sinuate longitudinal ridges on vertex of head. Antennal scapes very long, reaching almost half their length beyond posterior corners of the head, and slightly thickened in their distal one-third; funiculus symmetrical, without a club. Prothorax slender, with inferior spines directed forward as well as downward and outward. Pronotum with superior spines slender, tuberculate, directed laterad, slightly forward, and upward at an angle of about forty degrees; anteromedian spines obsolescent or absent. Mesonotum on each side in front with a large, stout, rounded protuberance, and behind with two progressively smaller blunt protuberances, all tuberculate. Meso-epinotal constriction prominent. Base of epinotum on each side with a distinct longitudinal ridge, terminating posteriorly in a short, slender spine which is directed upward and backward, very slightly outward. A longitudinal row of tubercles at the base of the pronotal spine on each side becomes consolidated posteriorly to form a ridge parallel and lateral to the epinotal ridge, but less distinct. Petiole with a short, slender peduncle; node from above as broad as long, with parallel sides, bearing lateral tubercles and a dorsal ridge on each side, each of the latter produced midway into a short spine or tubercle. Postpetiole more than twice as broad as petiole, broader behind than in front, its posterior border with a small lobe on each side and a broad rounded excision in the middle. Gaster oval, broadest slightly behind the middle, with a shallow longitudinal impression on the anterior one-third of the dorsum of its first segment. This impression forms the posterior unit of a marked dorsal groove which extends from pro-mesonotum to gaster. Legs and body long and slender.

Mandibles and clypeal border shining, the former finely striate, even more finely punctulate between striations, the latter punctulate only; antennal funiculus faintly shining in some aspects, subopaque in others. Remainder of body, legs, and antennal scapes opaque or subopaque, densely and finely punctate. The spines and protuberances, the front, posterior corners and occiput of the head, the thoracic pleura and dorsum (except the mid-dorsal groove from mesonotum to postpetiole), the lateral and dorsal surfaces of petiole, postpetiole, and gaster beset with numerous rather acute tubercles. These are largest on the protuberances and corners of the head, very numerous on the gaster, and small or vestigial on the legs and antennal scapes.

Hairs reddish-golden, pointed, curved, suberect, at the tips of the tubercles; on the legs and antennal scapes suberect to reclinate. Pubescence of the antennal funiculi pale golden, reclinate.

Color light ferruginous brown; teeth of mandibles black, external borders dark brown; vertex of head with a large circular infuscation; ridges and tips of tubercles dark brown.

Female (dealate). Length 6.1 mm. Similar to the worker, but larger, with sculpture coarser, more distinct; pro-mesonotum longitudinally

TEXT FIGURES, TRACHYMYRMEX NOGALENSIS. Fig. 1, worker head; fig. 2, worker, lateral view.

rugulose, without protuberances. Pronotal superior spines directed laterad or slightly upward. Meso-metanotal suture, vertex, borders of mandibles, and carinae dark brown to black, so that the female has a darker aspect than the worker.

Described from holotype No. 60411 in the U. S. National Museum, and numerous paratypes in the Museum and in the writer's collection. Type locality: Nogales, Arizona. The workers were collected at the nest entrance at night, October 1, 1946; the female was found near the nest entrance on July 10, 1947, and an alate female was taken in a nearby house August 5, 1948. The males are still unknown; the nest was under a house and could not be excavated.

In Dr. W. M. Wheeler's key to species of *Trachymyrmex* (1911), this species belongs in the *arizonensis-saussurei* complex, but is distinct from both those species. The third couplet of Dr. W. S. Creighton's key to North American species (1950) offers a choice of a pro-mesonotum with spines or with flattened cones, but the pro-mesonotum of *T. nogalensis* has a pair of large rounded protuberances, and the humeral angles of its pronotum have distinct spines. *T. nogalensis* can also be distinguished from *T. arizonensis* by the longer antennal scapes, the sinuate posterior ridges of the frontal carinae which are joined by the preorbital carinae, the pronounced dorsal groove extending from the pro-mesonotum to the gaster, and the more slender body.

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ENTOMOLOGICAL SOCIETY OF WASHINGTON 604TH REGULAR MEETING, DECEMBER 7, 1950

The 604th regular meeting of the Society was called to order at 8 P.M., Thursday, December 7, 1950, by President W. B. Wood, in Room 43 of the U. S. National Museum. Twenty members and 16 visitors were present. The minutes of the preceding meeting were read and approved.

The Society elected the following to membership:

Frederick Stansbury Haydon, 7208 Ramsgate Road, Washington 16, D. C.

Alan Stone, First Vice President of the Society took the Chair while President W. B. Wood read a summary report on the state of the Society and the activities of the officers. This report was accepted as read.

President Wood presided as the report of the Nominating Committee was presented and acted upon. The slate of officers proposed by this Committee was approved, and each of the following was unanimously elected:

President	Alan Stone
First Vice President	P. W. Oman
Second Vice President	W. Doyle Reed
Recording Secretary	G. B. Vogt
Corresponding Secretary	R. W. Sherman
Treasurer	R. H. Nelson
Editor	K. V. Krombein
Custodian	Helen Sollers
Executive Committee (new member)	W. B. Wood
Representative of the Society as Vice President of the Washington Academy of Sciences	F. W. Poos

Under miscellaneous business, four letters on the following subjects were brought to the attention of the members of the Society:

1. The establishment of a Memorial Fund to commemorate the life of the late C. F. Adams, M.D.
2. The establishment of a Percy Annand Memorial Scholarship.
3. The Festival of Britain to be held in England in 1951, and the IX International Congress of Entomology to be held in Amsterdam.
4. The formation in November 1950 of "The Entomological Society of Canada."

The first paper on the program, "The Use of Aircraft and Aerial Photography in Forest Insect Surveys," by R. C. Heller, Bureau of Entomology and Plant Quarantine, was interestingly illustrated with both color and black-and-white slides.

The airplane is becoming an increasingly more useful tool in the appraisal of insect damage in our forest lands. Heretofore, inaccessible areas have been very difficult and expensive to sample, but new techniques employing visual aerial surveying methods and aerial photography show promise for certain types of insect damage.

A unique system of line-strip sampling by visual observation was employed in northern Maine in covering 10 million acres of spruce budworm susceptible timber; four and one-half million acres of the above were delineated on maps as being infested to various degrees. A permanent record was made along these strips by an operation recorder, so that fluctuations in yearly budworm defoliation can be followed. This was accomplished in two and one-half weeks by four men in forty-four hours of flight time.

A method of plotting southern pine beetle outbreaks on existing aerial photographs was developed in east Texas so that rough estimates of acreages and ownerships could be determined preparatory to control measures.

Color aerial photography has been used experimentally in determining the percentage of weevil damage in New York State white pine plantations. By using a scale of 1:1200, 95% of the weeviled pines were correctly tallied on the color photographs. Accuracy decreased with increase in altitude (or smaller scales). Panchromatic and infrared photography at various scales and with several filter combinations proved ineffective and highly inaccurate.

Aerial photographic methods were tried in eastern Texas to determine the best film-filter-scale combination for use in detecting southern pine beetle outbreaks. Color photographs (Eastman Ektachrome Aero Film) at a scale of 1:15,840 seemed best for this purpose. The next best combination to emphasize the dying timber was panchromatic film with a red (A) filter. Color photographs have proved superior to black and white prints in detecting forest insect damage in eastern United states. This may be due to the presence of hardwood mixtures in coniferous stands and due to the fact that hardwood trees appear very similar to insect infested trees. Consequently, interpretation of color photos is simpler, more accurate, and takes less time than interpretation of the black and white prints.

The airplane surveys will need frequent ground checks to assure accuracy and will be used to supplement existing ground surveys. The timing of aerial surveys is essential so that insect damage is at a peak of observable color change. Continued trials with aerial photography to include other types of forest insect damage is anticipated as well as new types of aerial cameras and aircraft. (Author's abstract.)

Visitors introduced to the Society were: John Miller of Beltsville, Md.; H. J. MacAloney, B. E. P. Q., Beltsville, Md.; Mrs. R. C. Heller, wife of the speaker of the evening; E. J. Newcomer, B. E. P. Q., Yakima, Washington; K. A. Haines, B. E. P. Q., Boston, Mass.; and E. D. Burgess.

The meeting adjourned at 9:55 P.M.

HELEN LOUISE TREMBLEY, *Recording Secretary*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
605TH REGULAR MEETING, JANUARY 4, 1951

The 605th regular meeting of the Entomological Society of Washington was held in Room 43 of the U. S. National Museum, Thursday, January 4, 1951. President Alan Stone called the meeting to order at 8 P.M. Sixty-six members and 20 visitors were present. The minutes of the previous meeting were read and approved.

The following were elected to membership in the society:

Mrs. Amie Holloway, U.S.D.A., Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

John C. Martin, Department of Entomology, Cornell University, Ithaca, New York.

Mrs. Jeanette Oertel, U.S.D.A., Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

Committees were appointed by the Chair as follows:

Program Committee: A. B. Gurney, Chairman, John J. Pratt, Jr., Eugene B. Reagan, Kathryn M. Sommerman, Helen Louise Trembley.

Membership Committee: Barnard D. Burks, Chairman, William E. Bickley, Norman Mitlin, L. B. Reed, Louella Walkley.

Committee on Notes and Exhibition of Specimens: R. I. Sailer, Chairman, John H. Fales, Robert T. Mitchell, Louise M. Russell, W. W. Wirth.

Memoirs Committee: C. F. W. Muesebeck, Chairman, 1953 (reappointed), William H. Anderson, 1952, Ross H. Arnett, Jr., 1951, Karl V. Krombein (ex officio) .

Auditing Committee: Howard Baker, Chairman, Lyman S. Henderson.

Committee to Report on the Condition of the Reserve Stock of Publications: F. W. Poos, Chairman, R. I. Sailer.

Committee to Assist Custodian: R. I. Sailer, Alice Renk.

Committee to Prepare Obituary of J. C. Crawford: A. B. Gahan, Chairman, Carl Heinrich, Louise M. Russell.

Harry D. Pratt, who had just returned from a six months' tour of duty under auspices of E.C.A. as officer in charge of a malaria control team in French Indochina, interestingly presented Kodachrome slides which he had taken of mosquito breeding places and control methods as well as of scenery and local color of that country.

Mr. Austin H. Clark gave a report on the organization and first annual meeting of the Lepidopterists' Society held at the American Museum of Natural History in New York on December 29 and 30. Sixteen papers were presented, and there was an unusually interesting exhibit. Officers elected were: President, James H. McDunnough; Senior Vice-President, Austin H. Clark; Vice-President, Walter Forster (Germany); Vice-President, Kenneth J. Hayward (Argentina); Secretary, Frederick H. Rindge; and Treasurer, J. Benjamin Ziegler. Members of this society who attended, besides Mr. and Mrs. Clark, were Mr. Cyril F. dos Passos (who prepared the constitution and by-laws), Mr. John H. Fales, and David G. Shappirio. (Author's abstract)

The first subject of the regular program was the "Reports on the National Entomological Meetings" which took place at Denver, Colorado, December 18 through 21. F. C. Bishopp reported on the highlights of the meetings, and W. C. Baker spoke very favorably on the Field Crop Insect Control Section and on the field trips to the plant of Julius Hyman, Inc. Lyman Henderson reported on the Insecticide, Bio-Assay, and Medical Entomology Sections of the meetings and expressed his appreciation of the good quality lantern slides shown. C. W. Sabrosky commended the meetings of the Entomological Society of America as the most enjoyable he had experienced since the first ones he attended in 1935 and made particular note of the active discussions of papers that took place. B. A. Porter covered the biological control and business sessions of the American Association of Economic Entomologists.

Dr. Thomas A. Burch presented a very interesting moving picture and lecture entitled "Onchocerciasis, the Blinding Filariasis," based upon work done in Yepocapa, Guatemala at the Onchocerciasis Laboratories of the Pan American Sanitary Bureau where members of the Laboratory of Tropical Diseases, U. S. Public Health Service have been conducting researches on this disease.

This form of filariasis is caused by *Onchocerca volvulus*, the adult filarial worms living in subcutaneous nodules and microfilariae in the skin. Blindness in over one percent of the patients results from the pathological alteration in the eyes characterizing the disease.

The disease occurs in Africa, Central America, and northern South America as well as in Guatemala. In this latter country the disease is confined to sharply circumscribed areas between 2000 to 5000 feet elevation in the coffee producing regions. These areas are coextensive with the distribution of simuliid flies which transmit the disease. Dr. Burch elaborated on the etiology of the disease and stated that the species of *Onchocerca* of the Western Hemisphere, formerly considered to be *caecutiens*, is not distinct from *volvulus*.

After their escape from the onchocercomas and accumulation in the skin (to the greatest extent in the upper part of the body), microfilaria are ingested by *Similium*. Only about one percent of these flies captured in the vicinity of Yepocapa from human bait contained ingested microfilaria or developmental stages. It has not been possible to get laboratory reared flies to bite in captivity, and therefore actual transmission has not been proved. The only criteria for determining vectors are whether or not and with what frequency a species bites man and whether developmental stages of a filarid occur in a fly. *Simulium ochraceum* is considered to be the principle vector with *S. calidum* and *S. metallicum* also being important. Other *Simulium* biting man in Guatemala are *exiguum, haematopotum, veracruzanum* and *downsi*. These flies breed in small rapidly flowing streams, immature forms occurring on submerged twigs, leaves, roots and rocks. Laboratory observations show that eggs require two to three weeks for hatching, the same period for larval development, and less than one week for the pupal period. In Guatemala the flies bite in the sun, indoors, and at night in well lighted rooms, as well as in the shade during the daytime. Certain shrubs and bushes in the coffee fields provide daytime resting places and in and around grass stems at their bases serve as night resting places for the flies. Investigations to determine flight range and longevity were made by teams of men sent to central locations to collect the flies attracted to them. Accumulated flies were stained with a powdered suspension of a dye and released. Other teams of men collected stained flis at various localities around the release point for an extended period. Recovery of stained flies indicated a longevity of 85 days and a flight range of more than 9 miles. Dr. Burch discussed in some detail clinical manifestations, diagnosis, and treatment of the disease. Control of the disease by vector control is at present considered impracticable. (Extracted from author's notes).

W. D. Reed, H. D. Pratt, R. H. Foote, and E. J. Hambleton participated in an interesting discussion of flight range, occurrence, and control of *Simulium* and the comparative occurrence of onchocerciasis in the native and white populations and in other hosts. It was brought out that the flies will fly three miles in one day, control of larvae is almost impossible, control of adults is very difficult, and a smaller proportion of the white population is infected.

The next scheduled portion of the program was the annual address of the retiring President, W. B. Wood, who presented in a most pleasing manner, "The Plant Quarantine Inspector as a National Guardian."

Modern transportation with its speed and large scale operations is a real menace to our agriculture and the health of our people through the greatly increased danger it presents of introducing foreign pests. In addition to their introduction as stowaways, pests may be especially easily introduced from foreign countries with fruits and other plant material in the form of cargo, ship stores, in the mails, or as baggage of passengers or crew members.

It is the plant quarantine inspector whose duty it is to prevent the entry of foreign pests. He is required to be on the job whenever necessity arises whether it be by night or day, on weekdays or Sundays, in good weather or in bad. His work may be pleasant or it may be irksome, and sometimes dangerous. It may take him aboard an airplane, to the dark hold of a vessel, to the sorting room in a city post office, or to his own laboratory and office.

The qualifications for a good quarantine inspector are not easily met. In addition to the personality and strength of character necessary to obtain compliance with regulations and to make the public like it, there are the technical qualifications of a thorough elementary knowledge of entomology, plant pathology, bacteriology, and botany. Also of importance is an extensive knowledge of the English language, chemistry, physics, and mathematics. The experienced inspector is skillful in detecting the symptoms exhibited by plants infested with small forms such as mites and coccids as well as internal feeders and nematode infestations.

Mr. Wood discussed at length the many problems of inspecting fruits and vegetables, packing material, foreign mail, baggage, and imported nursery stock subject to Quarantine No. 37. In addition to the work of searching for insects and diseases, the inspector must be able to apply certain treatments as are called for; such as fumigation by various methods, steam sterilization, hot water treatments, and aerosol and spray applications.

Considering what a single introduction of a major pest means to our country and the part the plant quarantine inspector plays in the role of a protector, he should certainly be considered a National Guardian.

The meeting adjourned at 10:20 P.M.

GEORGE B. VOGT, *Recording Secretary*

REPORT OF THE TREASURER FOR 1950

General Funds

Disposition of funds, Jan. 1, 1950		
Credit in checking account		
Hamilton National Bank	$ 425.58	
Cash and checks on hand	30.53	
Stamps on hand (Treasurer)	2.53	
Stamped post cards on hand (Prog. Comm.)	1.02	
Credit balance at Post office	1.16	
Total on hand Jan. 1, 1950		$ 460.82
Receipts for 1950		
From exmembers		
Back dues	$ 66.00	
Initiation fee	1.00	
From members		
Back dues	118.61	
Current dues	1,105.25	
Advance dues	65.67	
Initiation fees (back)	7.00	
Initiation fees (current)	20.00	
Voluntary contributions	52.90	
From subscriptions to Proceedings		
Back subscriptions	20.45	
Current and advance subscriptions	744.87	
Subscriptions paid in error	8.50	
From sales of copies of Proceedings and collections of papers	243.94	
From overpayment	2.00	
From reimbursement for,		
Costs of engravings	287.13	
Printing costs	176.44	
Postage (includes $1.00 overpayment)	20.71	
Reprints	139.40	
Total Receipts		$3,079.87
Total amount to be accounted for		$3,540.69
Disposition of funds Dec. 31, 1950		
Credit in checking account		
Hamilton National Bank	$ 385.74	
Cash on hand	11.13	

Stamps on hand (Treasurer)	.51	
Stamps on hand (Custodian)	4.53	
Stamped post cards on hand (Prog. Comm.)	1.79	
Credit balance at Post office	3.74	
Total on hand Dec. 31, 1950		$ 407.44

Expenditures in 1950

Monumental Printing Co.		
Printing costs Vol. 51 (6) and 52 (1 thru 5)	$2,362.03	
Reprints	110.25	
Postage and insurance	11.62	
Southern and Standard Engravers		
Engravings for Proceedings	362.73	
The Sherwood Press		
Printing, cards, envelopes, etc.	128.03	
Office Supplies	6.82	
Clerical Services	5.75	
Refunds		
Subscriptions in error	8.50	
Dues of deceased member	3.00	
Overpayments	3.00	
Contribution to Science Fair	10.00	
Book Purchase (member's account)	7.50	
Stamps and post cards used (all officers)	85.75	
Mailing costs. Proceedings	7.42	
Bank Charges	17.85	
Transfer to Publication Fund	3.00	
Total Expenditures		$3,133.25
Total amount accounted for		$3,540.69

GENERAL FUNDS

Outstanding obligations		
Proceedings 52 (6) Estimated	$ 340.05	
Total outstanding obligations		340.05
Accounts receivable—Dec. 31, 1950		
Dues from members	205.80	
Dues and initiation fees from 1950 members elect	13.00	
Subscriptions from 1950 subscribers	none	
For reprints, printing costs, back numbers, etc.	217.71	
Total accounts receivable		436.51

Publication Fund

Source and Disposition of Fund, Jan. 1, 1950			
Schwarz Donation	$1,000.00		
Earnings less expenditures 1927 to 1945	480.00		
Invested in War Savings Bonds, Series F, dated 1/1/45. Deposited with Treasurer of the U. S. Purchase price		$1,480.00	
Knab Bequest. Deposited in Columbia Federal Savings and Loan Association		$1,400.00	
Income from sales of complete sets of Proceedings, Life memberships, sales of Memoirs, interest and dividends, less expenditures. Deposited in Columbia Federal Savings and Loan Association	$1,372.58		
Deposited in Hamilton National Bank. Saving account	631.38		
Deposited in Hamilton National Bank. Checking account	66.25		
Income less expenditures to Jan. 1, 1950		$2,070.21	
Total on hand Jan. 1, 1950			$4,950.21
Income for 1950			
Sale 19 copies Memoir I	$ 48.80		
Sale 30 copies Memoir II	79.65		
Sale 98 copies Memoir III	663.60		
Total from memoirs		$ 792.05	
Interest from Col. Fed. Sav. & Loan		35.21	
Life Membership		40.00	
Sale 2 complete sets of Proceedings		262.40	
Overpayment		3.00	
Total Income			$1,132.66
Total amount to be accounted for			$6,082.87

Source and Disposition of Fund, Dec. 31, 1950

Schwarz Donation	$1,000.00		
Earnings less expenditures 1927 to 1945	480.00		
Invested in War Savings Bonds Series F, dated 1/1/45. Deposited with Treasurer of U.S. Purchase price		$1,480.00	
Knab Bequest. Deposited in Columbia Federal Savings and Loan Association		1,400.00	
Income from sales of complete sets of Proceedings, Life memberships, sales of Memoirs, interest and dividends less expenditures. Deposited in Columbia Federal Savings and Loan Association		1,044.97	
Total on hand Dec. 31, 1950			$3,924.79

Expenditures in 1950

Printing costs of Memoir III	$2,155.08	
Refund of overpayment	3.00	
Total expenditures		$2,158.08
Total amount accounted for		$6,082.87

PUBLICATION FUND

Outstanding obligations		none
Accounts receivable		
6 copies of Memoir III	$ 39.20	
Total accounts receivable		$ 39.20

R. H. NELSON, *Treasurer.*

The Auditing Committee has examined the report and the accounts of the Treasurer of the Entomological Society of Washington for the calendar year ending December 31, 1950, and finds them correct and in good order.

HOWARD BAKER
L. S. HENDERSON
Auditing Committee.

Actual date of publication of Vol. 53, No. 1, was February 22, 1951.

ANNOUNCEMENT

BACK VOLUMES AND SINGLE NUMBERS

Vols. 1-19,	per volume	$2.00
	per number	.50
Vols. 20-50,	per volume	4.00
	per number	.50
Vols. 51-52,	per volume	4.00
	per number	.75
Current subscriptions		4.50
Note: No.'s 1-4 of Vol. 9 and No's 1-4 of Vol. 19 are available only as complete volumes. Per volume		2.00
COMPLETE SETS, VOLS. 1-52 (1884-1950, inclusive)		$170.00

SETS OF UNBOUND PAPERS—AT REDUCED RATES

Set 1.	Ten papers (totalling 50 pp.) on North American mites, by Banks	$1.25
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Set 3.	"A Catalogue of Aquatic and Semi-Aquatic Hemiptera," 42 pp., by Kirkaldy and Torre Bueno	65 cents
Set 4.	Coleoptera, about 57 papers (about 300 pp.), mostly by Schwarz, Fisher, Barber and Pierce	$2.75
Set 5.	Diptera, about 70 papers (about 350 pp.), mostly by Knab, Malloch, Walton, Banks, H. E. Smith and Townsend; no papers on mosquitoes included	$2.75
Set 6.	Ashmead bibliography, 30 pp.	40 cents
Set 7.	"Horismology of the Hymenopterous Wing," 56 pp., by Rohwer and Gahan	40 cents

SPECIAL. Entire 7 sets for *only* $7.50.

NOTICE

"Unusual Scalp Dermatitis in Humans Caused by the Mite Dermatophagoides," by Jay R. Traver. Proc. Ent. Soc. Wash. 53: 1-25, 3 pls., 1951. Discusses in detail symptoms, treatments and identification. Reprints with covers available at 50 cents per copy.

MEMOIRS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

No. 1. "The North American Bees of the Genus Osmia," by Grace Sandhouse. $3.00 Members' price $2.50.

No. 2. "A Classification of Larvae and Adults of the Genus Phyllophaga," by Adam G. Boving. $3.00 Members' price $2.40.

No. 3. "The Nearctic Leafhoppers, a Generic Classification and Check List," by Paul Wilson Oman. $7.00. Members' price $6.00.

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VOL. 53 JUNE, 1951 No. 3

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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

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

Annual dues for members are \$4.00, initiation fee \$1.00 (U. S. currency). Members are entitled to the Proceedings and any manuscript submitted by them is given precedence over any submitted by non-members.

OFFICERS FOR THE YEAR 1951

PROCEEDINGS

ENTOMOLOGICAL SOCIETY OF WASHINGTON

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Authors will be furnished copies of the number in which their articles appear at cost to the Society, or reprints of such articles, without covers, at the following rates, plus postage and insurance, provided a statement of the number desired accompanies the manuscript:

	2 pp.	4 pp.	8 pp.	12 pp.	16 pp.	Covers
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Illustrations or extra composition costs for tabular material in excess of the equivalent in cost of one full page line cut are to be paid for by the author. Photo engravings may be obtained at a nominal cost through an order placed with the Editor within 90 days after publication. Immediate publication may be obtained at author's expense. All manuscripts should be sent to the Editor, care Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

The Corresponding Secretary, Custodian and Treasurer should be addressed similarly.

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 53 JUNE, 1951 No. 3

DESCRIPTIONS OF EIGHT NEW SPECIES OF CULEX SUBGENUS MELANOCONION[1]

(DIPTERA, CULICIDAE)

BY WILLIAM H. W. KOMP[2] AND LLOYD E. ROZEBOOM[3]

The writers recently published figures of the male terminalia and keys to the species of *Culex* subgenus *Melanoconion* (Rozeboom and Komp, 1950). During the preparation of the present article, several undescribed species were found among material in the collection of the U. S. National Museum; others were in the collections of the authors, and one specimen was submitted to the senior author for description.

Six of the eight new species here described belong to the section *Choeroporpa;* the other two belong to the section *Mochlostyrax.* The larva of only one of the new species is known. We have not mentioned the tenth sternites in the formal descriptions which follow, as in all cases these structures are similar in form, and of no diagnostic value. The two new species belonging to the section *Mochlostyrax* will be described first.

Culex (Melanoconion) foliafer, new species

Female, unknown.

Male, adult unknown.

Male terminalia: (Fig. 1) Sidepiece rather short, stout, strongly curved on outer surface, concave within. Clasper as in *C. alogistus* and related species: the head expanded, foot-shaped, with one large and one small eye-seta; outer distal surface of expanded head very finely striate. Terminal appendicle large, curved. Inner division of lobe of sidepiece with arms divaricate, the upper arm apparently slightly curved, the lower arm straight, and about as long as the upper. Both arms bear slender, slightly curved rods with capitate tips. Outer division of lobe columnar, with the usual long, hook-tipped filament from inner angle,

[1]The studies here reported were supported in part by a grant from the Rockefeller Foundation. As in our previous work, we are greatly indebted to Dr. Alan Stone, in charge of the Culicidae at the U. S. National Museum, for helpful advice, and to Mr. C. F. W. Muesebeck for permission to use the material in the United States National Museum.

[2]Laboratory of Tropical Diseases, National Institutes of Health, Bethesda, Maryland.

[3]Johns Hopkins School of Hygiene and Public Health, Baltimore, Maryland.

and its accompanying shorter curved filament. Outer angle with a group of three or four distorted, appressed filaments. A large, striate, apparently ovate leaf arises from near the base of the column of the outer division. Inner plate of mesosome of the usual *Mochlostyrax* type, the apex with three radiating points, the posterior and middle ones long and slender, the anterior point somewhat rounded and striate; a fourth posterior point on plate near base, short and pointed, just above the basal hook. Lobes of ninth tergite much like those of *C. alogistus;* the outer portion bears many long, curved hairs from prominent tubercles; the inner portion is produced, and projects upward farther than the outer portion, and is bladelike, thin, almost hyaline, and bare.

The mount is in poor condition, and much distorted. However, the shape of the lobes of the ninth tergite can be easily discerned, and the striate leaf from the base of the outer division of the lobe (a unique character among the known species of *Mochlostyrax*) is very evident.

Taxonomic discussion. In the key of Rozeboom and Komp (1950), *C. foliafer* runs to couplet 82, as it is the "Species A" noted there and on page 93, and shown in figure 54 on page 107.

The terminalia are those of a typical *Mochlostyrax,* but differ from those of all other species of this section in having a large, rounded, striate leaf near the base of the column of the outer division of the lobe of the sidepiece.

The name *multispinosus* B.-W. & B., 1919 was applied to our *foliafer* by Dyar in 1924, as he believed that the terminalia of a specimen sent by Dr. Bonne from Surinam was *multispinosus.* This was one of a series of five specimens, E, F, G, H, and a female labeled BB950. These were described by Dyar (1918) as *Culex alogistus* ("Types, No. 21914, U. S. Nat. Mus., four males and one female . . . . Surinam"). Later Dyar stated: "I have no authentic male of this species [*multispinosus*], the cotype left by Dr. Bonne being a female. However, one of the specimens [sent by the Bonnes and classified] under *alogistus* differs, and I am supposing this to be *multispinosus.*" Dyar so labeled the slide [# H, one of the types of *C. alogistus* from Surinam].

Dyar's assumption proved incorrect, but as the Bonnes did not send him an authentic male of *multispinosus,* he apparently pursued the matter no further.

As the association of Dyar's male [# H] with the male specimen from which the Bonnes originally described *multispinosus* was not certain, the senior author requested information from Mrs. Bonne, who kindly sent him the slide of the male terminalia of the type of *multispinosus* B.-W. & B. This slide bears the label: "*Culex* (*Mochlostyrax*) *multispinosus,* N. Sp. G f 41/22 TYPE," without date or locality.

The terminalia on this slide are of *Culex caudelli* Dyar & Knab. Therefore the name *multispinosus* is a synonym of *caudelli*. Apparently the male terminalia on slide # II, which Dyar erroneously believed to be those of *multispinosus*, have never been described. They form the basis of the description of the new species here called *foliafer,* because of the peculiar and unique leaf on the column of the outer division of the lobe. The terminalia somewhat resemble those of *C. alogistus*, the lobes of the ninth tergite being similar in shape, but the presence of the large leaf on the column of the outer division of the lobe immediately separates it from all other species of the section *Mochlostyrax*.

Type. Male terminalia mounted on a slide, bearing two labels, one a red co-type label with the number 21914, and the penciled notation "= *multispinosus*"; the other a white label bearing the data "*Culex* (*Mochlostyrax*) *alogistus* Dyar. Type. Surinam 1918. Bonne-Webster H." Type No. 59869, U. S. National Museum.

Culex (Melanoconion) lacertosus, new species

Female, unknown.

Male, adult unknown.

Male terminalia: (Fig. 2) Sidepiece somewhat longer than is usual in *Mochlostyrax;* strongly curved on outer surface, the inner margin concave. Clasper as in other closely related species: the head expanded, foot-shaped, with one large and one small eye seta. Terminal appendiculate spine small, curved. Outer distal surface of expanded head finely serrate, not pilose; head somewhat striate. Outer division of lobe of sidepiece columnar, with a short inner arm bearing a long, hook-tipped filament, which is widened and angled upward at middle, and somewhat narrowed before terminal hook; and a shorter, broad, curved filament at base of longer filament. Outer angle of column with a group of four or five closely appressed, flattened filaments; between these and the inner arm is a flattened, somewhat spoon-shaped striate leaf, about three-quarters as long as the hook-tipped filament. Inner division of lobe of sidepiece with arms divaricate, the upper arm curved, and about twice as long as the lower. Lower arm nearly sessile, straight. Upper rod from upper arm curved downward, angled and much thickened at middle, then curved upward to the more slender apex. Lower rod strongly sinuate, thickened, elbowed upward before middle, then tapering to slender apex. Inner plate of mesosome with three radiating arms at apex, the posterior and middle ones pointed, the dorsal arm short, truncate. A very long, acute, sclerotized point at base of inner plate, just above basal hook. Lobes of ninth tergite almost as in *C. alogistus;* very large, the outer portion produced, and bearing very many long, thin wavy hairs from prominent tubercles; inner portion produced upwards into a thin, acutely angled, blunt point, almost hyaline, and bare.

Larva, unknown.

Taxonomic discussion. *C. lacertosus* belongs to the Section *Mochlostyrax*, and in the key in a recent review of the subgenus *Melancoconion* by Rozeboom and Komp (1950) it runs through couplets 1, 8, 9, 10, to 80 and 81. The key may be modified to include *C. lacertosus* as follows, beginning with couplet 81:

81. "Upper ventral point of mesosome . . . ." etc. .... *caudelli*
Upper ventral point of mesosome about equal to the two upper dorsal points; lobes of ninth tergite constricted at middle, but outer portion not globular 82

82. "A large obovate leaf . . . ." etc. .... Species A (= *foliafer*)
Leaf absent in this position 82A

82A. Rods of inner division of lobe of sidepiece thickened, widened and sinuate; upper dorsal process of mesosome short and abruptly truncate .... *lacertosus*
Rods of inner division of lobe of sidepiece slender; the lower rod not sharply angled at middle; upper arms of mesosome all sharp-pointed 83

C. lacertosus is quite similar to *C. alogistus* in the male terminalia, so much so that we would not have described it from one specimen. But a second slide of the male terminalia, with the same peculiar thickened and sinuate rods of the inner division of the lobe of the sidepiece, was found in the U. S. National Museum collection, and is designated the paratype. In *C. alogistus* the rods of the inner division are slender and normal, and the hairs from the outer portion of the ninth tergite lobes are shorter than those of *lacertosus*.

Types. Holotype male terminalia mounted on a slide; adult captured at Almirante, Bocas Province, Panama, July 19, 1934 (W. H. W. Komp); deposited in U. S. National Museum, type No. 59870.

Paratype. Male terminalia mounted on a slide; adult captured at same locality, Feb. 11, 1928 (W. H. W. Komp). Slide No. 2380, U. S. N. M.

We have named this species *lacertosus*, which in Latin means "strong-limbed," referring to the thickened rods of the inner division of the sidepiece

Culex (Melanoconion) mistura, new species

Female: a small, dark, unmarked mosquito. Head: Proboscis slightly swollen at tip, dark brown. Palpi about one-sixth the length of the proboscis, dark brown. Occiput with erect, forked, black scales, mixed with flattened, decumbent, silvery-white scales on posterior margins on on each side, behind the eyes. Thorax: Scutum dark brown, with lines of strong curved black setae; a denser patch of setae anterior to wing-base. Scutellum with tufts of long brown setae on each lobe. Midlobe of scutellum and antescutellar space with some pale scales. Pleura dark.

Coxae and trochanters grayish; femora dark above, white below. Tibiae and tarsi all dark. Abdomen: Dark-scaled above, all segments with baso-lateral pale spots.

Male: Coloration similar to that of female. Palpi exceed the proboscis by the length of the last two segments. Abdomen without white markings.

Male terminalia: (Fig. 3) Sidepiece conical, about twice as long as wide, with a patch of short, fine setae on inner surface; a long, prominent seta at apex on inner surface. Clasper about half the length of the sidepiece, narrowed at the middle, then sharply angled, widened, and tapering to an upturned snout; upper surface of distal portion finely setose; expanded portion with two short eye-setae; terminal appendiculate spine expanded and cleft distally. Outer division of lobe of sidepiece a short, broad column; the inner angle with the usual long hook-tipped filament, and shorter stout filament; outer angle with a group of appressed broad filaments. Between the outer and inner angles arises a large, short-stemmed, striate, expanded leaf and an associated filament; a long slender seta is inserted at the middle of the outer surface of the column. Inner division of lobe of sidepiece with a long stout upper arm, bearing a long stout rod with a T-shaped tip; lower arm sessile, the rod arising from the middle of the upper arm; this rod more slender than that of upper arm, but extending to about the tip of the latter. Inner plate of mesosome angled at middle into an L-shaped plate, with a long curved horn at the angle of the L. The distal arm terminates in two points, the margin of the plate between the points concave; the distance from the base of the plate to the angle of the L exceeds the distance from this angle to the tip of the terminal points. Lobes of ninth tergite broad outwardly, tapering inwardly, the inner narrowed portion upturned, bearing several long, erect setae; other similar setae scattered sparsely over the inner two-thirds of the surface of the lobe. Sclerotized ring of ninth tergite densely villose.

Larva: (Fig. 3A) Head: Antenna about as long as head, the upper and outer surface with stout spines; a multiple-haired tuft inserted at outer third, the individual hairs thickly branched; the shaft beyond more slender. Two long subterminal and and one long and one short terminal setae, and a short spine-like papilla at tip. Preclypeal spines stout. Frontal hairs 4, 5, 6 and 7 inserted posterior to base of antenna; hair 4 very small, single; hair 5 fine, double or triple, extending beyond the tip of hair 4; hair 6 single, stout, very finely spiculate, extending beyond the clypeus; hair 7 heavy, multiple, the branches with many lateral hairs, and extending to insertion of antennal tuft. Occipital hairs 8 and 9 triple, very small and fine. Hair 14 small, double. Thorax: Skin finely spiculose. Prothoracic pleural hair-group with one long and two short, fine, single hairs, and one minute hair. Mesothoracic pleural group with two long single, one long triple, and one minute hairs. Metathoracic pleural group with one hair long, multiple, one long, single, one short, single, and one minute. *Abdomen*: Skin glabrous on segments I to VII, finely pilose on segment VIII. Long lateral hairs 6 of segments I and II double, 3- to 5-branched on segments III and VI. Comb of eighth segment with seven or eight stout, pointed teeth in an irregular row. Siphon six times the width at base, sub-cylindrical, narrower on apical half; pecten on basal third consisting of about nine untoothed spines, very small towards base but progressively larger towards apex; the apical spines large, stout; five pairs of long multiple ventral hair-tufts, larger basally. Two pairs of multiple dorsal hairs, one subapical, the other at two-thirds the distance from base of siphon; terminal hook bifid. Anal segment ringed by the plate. Posterior margin finely spiculose. Inner caudal hair consisting of a long single hair, with three short branches at base. Outer caudal hair long, single.

Taxonomic discussion. *C. mistura* has a mesosome similar in form to those of *C. educator* and *C. theobaldi*. The shape apparently varies according to the angle from which it is viewed. *C. mistura* differs from these two species in the shape of the lobes of the sidepiece and of the ninth tergite. In the key of Rozeboom and Komp (1950) it would fall in the following couplets: 1, 8, 9, 10, 11, 12, 14, 17, 28 and 29. The presence of the prominent seta at the middle of the outer division of the lobe of the sidepiece places *C. mistura* in the first part of couplet 29. The key may be modified as follows:

29. Outer division of lobe of sidepiece with a large, flattened, striate filament, or long prominent seta arising from the base or middle 30
    Outer division without such a filament or seta at base 32
30. Inner plate of mesosome with a narrow, erect upper point, and two subapical points .... *mutator*
    Inner plate of mesosome with two subequal apical points, the third point long, about midway on the stem; or L-shaped, the third point at the angle of the L 30A
30A. Lobes of 9th tergite with inner angle narrowed and upturned; outer division of lobe with a slender seta arising at about the middle .... *mistura*
    Lobes of 9th tergite not so formed; the filament on the column of the outer division of the lobe ribbon-like, striate (in *C. alcocci*, at least) 31

Couplet 31 of the key separates *alcocci* from *nicceriensis*. *C. alcocci* is very distinct, with its broad, striate filament arising from the base of the outer division of the lobe of the sidepiece. No material of *nicceriensis* is available for comparison. The description given by Bonne-Wepster (1925) indicates that it differs from *C. mistura* in the shape of the leaf on the outer division of the lobe, which is said to be very long in *nicceriensis;* in the presence in *nicceriensis* of a long filament on the base of the outer division of the lobe, absent in *mistura;* and in the larger, more setose lobes of the ninth tergite in *C. mistura*. However, it must be recognized that a carelessly mounted preparation of the terminalia of *mistura* could be described in much the same manner as that given by the Bonnes for *nicceriensis*. For the present we have no alternative but to consider *mistura* distinct from *nicceriensis*, and are so treating it.

Types. Holotype male, with terminalia mounted on a slide, and associated larval and pupal skins; Laguna de la Palmita, Villavicencio, (Meta) Colombia, May 12, 1947 (L. E. Rozeboom); deposited in the U. S. National Museum, type No. 59871. Paratypes: one female with associated larval and pupal skin; one male with mounted terminalia, deposited in the Department of Parasitology, Johns Hopkins University; collection data for paratypes the same as for holotype male.

A slide containing mounted terminalia of this species was found among unidentified specimens in the collection of the Department of Parasitology, Johns Hopkins University, collected by F. M. Root in Guasipata, State of Bolívar, Venezuela, May 1929.

Another specimen, determined tentatively as this species, was collected at Amapa, Pará, Brazil, by Donald MacCreary, March 23, 1944. The terminalia are on a slide labeled 44.X6.c, which is in the U. S. N. M. collection.

Culex (Melanoconion) wepsteri, new species

Female, unknown.

Male, adult unknown.

Male terminalia: (Fig. 4) Sidepiece a little over twice as long as wide, strongly curved on outer surface, the inner margin concave; a patch of short curved setae centrally on ventral surface. Clasper about half the length of the sidepiece, narrowed at middle, the apical third widened and tapering to the upturned snoutshaped tip; upper surface of distal portion finely setose; expanded portion with two short eyesetae; terminal appendiculate spine small, broader and divided at apex. Outer division of lobe of sidepiece columnar, with a short inner arm bearing a long hook-tipped filament and a shorter, broad, curved filament; outer angle with a group of four or more closely appressed broad filaments; between these and the inner arm is a long stout middle filament with rounded tip; arising below the insertions of the outer filaments is a broad, short-stemmed, ovoid leaf; a long, slender seta is inserted at the extreme base of the column. Inner division of lobe of sidepiece with arms divaricate, each with a stout rod with a T-shaped apex; the lower rod is nearly sessile, straight to apical fourth, then sharply upturned; the lower rod is longer, sinuate. Inner plate of mesosome rectangular, about three times longer than broad, the wide erect upper portion with a convexly rounded, serrate margin; the dorsal margin with a short, pointed subapical process; ventral surface with a short, curved horn at the middle of the plate. Lobes of the ninth tergite elliptical, the outer two-thirds densely clothed with long, slender setae, the inner portions bare.

Larva, unknown.

Taxonomic discussion. This species will run through the following couplets of the key of Rozeboom and Komp (1950): 1, 8, 9, 10, 11, 12, 14, 17, 18, 20, 21, 22, 23, 24 and 25, and ends in couplet 27 with *phlogistus* and *inhibitator*. It may be inserted in the key as follows:

27. Lobes of 9th tergite ovoid, with a long hairless basal projection; the long setae on upper two-thirds only ....*phlogistus*
Lobes of ninth tergite elliptical in outline, without a long bare basal projection 27A

27A. Leaf of outer division triangular in outline, and inserted in a prominent tubercle; a slender seta inserted near the base of this tubercle ....*inhibitator*
This leaf ovoid in outline, not inserted in such a prominent tubercle; column of outer division with a slender seta inserted near the base ....*wepsteri*

C. wepsteri seems to be very closely related to *C. inhibitator* D. & K. but the differences given in the key, though small, appear to be constant. In addition to these differences, a comparison of the mesosome with that of *inhibitator* (see fig. 41 in Rozeboom & Komp 1950), will show the difference in lateral outline between the two. Unfortunately, because of scarcity of material, we are not certain of the extent of variation in the shape of the mesosome in C. *wepsteri, inhibitator, phlogistus, plectoporpe, carcinophilus, kummi, oedipus* and *albinensis.*

Types. Holotype, male terminalia mounted on slide No. BB 366 in the U. S. National Museum; type no. 59872. Collected by Bonne and Bonne-Wepster as a pupa from a "pool with Pistia plants and other vegetation" near Paramaribo, Surinam, Dec. 5, 1918. (Bonne correspondence with Dyar, U. S. N. M. files.)

The species is named in honor of Mrs. J. Bonne-Wepster.

Culex (Melanoconion) jocasta, new species

Female, unknown.

Male, unknown.

Male terminalia: (Fig. 5) Sidepiece strongly curved outwardly, the inner margin concave. Clasper half as long as sidepiece, narrowed at middle, then widened and abruptly narrowed to form the upturned snout; upper distal surface of head of clasper with closely appressed lamellae; the usual two small eye-setae present; terminal spine widened and appendiculate. Outer division of lobe of sidepiece columnar, with a continuing inner arm bearing the usual long hook-tipped filament and the associated shorter, stout, curved filament; upper margin of the outer division with four broad filaments arising from well-separated tubercles; a short, slightly expanded striate leaf inserted with these filaments. A prominent seta is on the sidepiece at the base of the outer division of the lobe. Inner division of lobe with a stout upper arm, wrinkled longitudinally and swollen distally, bearing a short, thick, pointed rod; lower arm arises as a short offset from base of upper arm, and bears a long slender rod, with apical portion somewhat swollen, and terminating in a short, curved point. Inner plate of mesosome rectangular in outline, with a broad, erect upper arm, serrate along upper margin, and with a single long, pointed dorsal process above the middle. Lobes of ninth tergite somewhat obovate, with rather sparse long slender setae.

Larva unknown.

Taxonomic discussion. *C. jocasta* resembles *C. oedipus* Root in the swelling of the upper arm of the inner division of the lobe, and *C. elevator* in the shape of the mesosome. In the key of Rozeboom and Komp (1950) it will run through the following couplets: 1, 8, 9, 10, 11, 12, 14, 17, 18, and 19. The species may be placed in the key as follows:

19 Clasper with a deep, parallel-sided sulcus on dorsal curvature at middle; outer division of lobe of sidepiece with a leaf and two stout flattened filaments .... *madininensis*
Clasper normal, without sulcus; outer division of lobe with a lower arm bearing the usual hook-tipped filament and the shorter associated filament; upper arm with a leaf and four flattened filaments 19A
19A Upper arm of inner division of lobe of sidepiece stout, swollen distally, much larger than inner arm, and bearing a short, stout, hook-tipped rod .... *jocasta*
Arms of inner division of lobe of sidepiece subequal, both bearing long slender rods with T-shaped ends; upper arm not swollen distally .... *elevator*

Types. Holotype male, terminalia mounted on a slide, deposited in U. S. National Museum, Type No. 59873: collected by F. M. Root ''from a small dirty pool in roadside ditch,'' near Grenville, Grenada, B. W. I., July 4, 1929. No. 4-1. Paratypes; two slides with mounted male terminalia, collected by F. M. Root ''from side pools of Grand Roy River,'' Grenada, August 22, 1929, deposited in the Department of Parasitology, the Johns Hopkins University; one slide, containing four male terminalia, from adults caught by Root near Hermitage and Belair Schools, Grenada, July 8, 1929, deposited in the U. S. National Museum. No. 14-15.

We have named this species *jocasta* to indicate its close resemblance to *C. oedipus* Root, 1927. Jocasta was the wife (and mother) of Oedipus.

Culex (Melanoconion) kummi, new species

Female, unknown.

Male, unknown.

Male terminalia: (Fig. 6) Sidepiece conical, the outer surface rounded. Clasper about one half the length of the sidepiece, narrowed before middle, then moderately expanded to form a snout-shaped head, tapering gradually to the upturned tip; dorsal surface before the apex finely setose; the two usual small eye-setae inserted in expanded head; terminal appendage widened and appendiculate. Outer division of lobe of sidepiece with a long inner arm terminating in a hook-tipped filament and the accompanying shorter, curved, pointed filament; the outer angle with four closely appressed, broad filaments; between these and the inner arm there arises a slender, striate leaf and a long, stout middle appendage with blunt tip. At the base of the column of the outer division is a long slender seta; another long prominent seta arises near apex of sidepiece on ventral surface. Inner division of lobe with arms rather widely divaricate, the rods moderate, hook-tipped. Inner plate of mesosome rectangular in outline, the upper portion broad, erect, somewhat more heavily sclerotized, and finely serrate along the slightly convex dorsal margin; two subapical arms present on opposite sides of the plate, the dorsal one short, bluntly pointed, the ventral one very long, curved, tapering to a point. Lobes of ninth tergite sub-triangular, the upper surfaces flat, sloping inwardly towards midline; these surfaces evenly clothed with long, curved setae, the dorsolateral portions with fewer straight, laterally directed setae.

Taxonomic discussion. The shape of the mesosome of *C. kummi* resembles that of *C. plectoporpe*, *C. carcinophilus*, *C. phlogistus*, and *C. inhibitator*, but *kummi* differs from all these in the shape of the lobes of the ninth tergite and in the shape and position of the leaf of the outer division of the lobe. In the species mentioned, the leaf is broad, somewhat triangular, and arises from a prominent tubercle near the base of the outer division. In *kummi* the leaf is narrow, and arises near the inner arm. In the key of Rozeboom and Komp (1950) the species would run through couplets 1, 8, 9, 10, 11, 12, 14, 17, 18, 20, 21, 22, and the second part of couplet 23. It will not fit in couplet 24, because of the position of the leaf in *C. kummi*. The key may be recast as follows, beginning with couplet 24:

24. Lobes of 9th tergite subquadrate, the inner angle produced into a short upward projection; the upper denticulate margin of the inner plate of the mesosome concave .... *C. amitis*
    Lobes of 9th tergite oval, elliptical, or subtriangular in outline; the denticulate upper margin of the mesosome straight or convex 24A

24A Leaf of outer division of the lobe narrow, inserted with the middle filament along distal margin of the lobe .... *C. kummi*
    Leaf of outer division broad, inserted near base or middle of column 25

Because its leaf is narrow, *kummi* may be keyed out erroneously with the species lacking a leaf. In this case it will run from couplet 12 to couplets 44, 45, 46, 47, 49 and will end in couplet 50 with *C. oedipus* and *C. albinensis.* The swollen upper arm of the inner division of the lobe of *oedipus* readily separates it from *kummi.* In *albinensis* the outer division of the lobe has a broad middle filament, possibly homologous with the narrow striate leaf of *kummi*, but in the former the middle filament is associated with a slender seta. In *kummi* the appendage accompanying the leaf is a broad filament. The shape of the lobes of the ninth tergite differs in the two species; those of *kummi* are difficult to portray in two dimensions, but are unmistakable when seen under the microscope.

Type. Holotype male terminalia, mounted on a slide; ("Chino Swamp"), Almirante, Bocas Province, Panama, July 14, 1934, captured adult (W. H. W. Komp); deposited in U. S. National Museum, Type No. 59874. Paratype: male terminalia mounted on a slide; ("Changuinola Country Club") Guabito, Bocas Province, Panama, Jan. 19, 1929, captured adult (W. H. W. Komp); deposited in U. S. National Museum. This species is named in honor of Dr. Henry W. Kumm of the International Health Division of the Rockefeller Foundation.

Culex (Melanoconion) galindoi, new species

Female, unknown.

Male, unknown.

Male terminalia: (Fig. 7) Sidepiece conical, one and one-half times longer than broad. Clasper two-thirds the length of the sidepiece, widened and angled at outer third, then tapering to the snout-shaped tip; the usual two eye-setae present beneath at angle; upper distal margin before the tip lamellate; the subterminal spine widened and appendiculate. Outer division of lobe with an inner arm bearing a stout, hook-tipped filament, the associated filament reduced to a slender seta; outer angle with a triangular, striate leaf and a broad filament arising from ventral surface, and a group of three or four broad appressed filaments arising from dorsal surface. A prominent seta inserted in sidepiece near base of column of outer division of lobe. Inner division of lobe not divided, but with the lower arm arising as a short, parallel offset at middle of column, each arm bearing a stout rod with a T-shaped tip. Inner plate of mesosome shaped like an inverted L, as seen in lateral view; the upper arm divided at apex into two stout points, the margin between them concave; a short, curved third point at the angle of the L; vertical arm of the L stout, and distinctively armed near base with a patch of stout upwardly projecting spines. Lobes of ninth tergite ovoid, the upper inner margin slightly excavated; dorsal surface with sparse short setae.

Taxonomic discussion. *C. galindoi* will run through the following couplets of the key of Rozeboom and Komp (1950): 1, 8, 9, 10, 11 (the lower arm of the outer division is considered to be an offset from the column), 12, 14, 17, 28, 29, 32 and 33. It will fit into the upper half of couplet 33, which should then proceed to couplet 33A, as follows:

33. Inner plate of mesosome angled near middle into an inverted L; the third point on the upper margin produced from the angle, and thus placed at midstem near the base 33A
Inner plate of mesosome not angled, erect; with an upper arm and two subapical points on each side below 40

33A Base of mesosome with a patch of stout, upwardly-projecting spines .... *galindoi*
Mesosome without this patch of spines 34

C. galindoi is unique in having the peculiar spines on the base of the inner plate of the mesosome.

Type. Holotype male terminalia, mounted on a slide. Adult captured at Quebrada Escondida, Rio Pequeni, Colon Province, Panama, March 26, 1949 (Pedro Galindo V. and Harold Trapido). "In rock crevices along a stream." Slide deposited in U. S. National Museum, Type No. 59875.

This species is named in honor of the excellent culicidologist, Pedro Galindo, who kindly presented the specimen to the senior author for description.

Culex (Melanoconion) confundior, new species

Female, unknown.

Male, unknown.

Male terminalia. (Fig. 8) Clasper rather long, constricted before middle, then expanded into a rather wide, snout-shaped head, with upturned tip. The usual two eye-setae present. Terminal appendiculate spine curved, cleft at apex. The outer distal portion of the head of the clasper bears a few short lamellae before the apex.

Outer division of the lobe of the sidepiece with inner arm bearing the usual long, hook-tipped filament and shorter upturned flattened filament. Outer angle of column with three or four (or more?) flattened, appressed filaments. Between these and the hook-tipped filament from the inner arm is a short middle filament.

Inner division of lobe of sidepiece with the two arms slightly separated, the upper arm slender and curved, with a downcurving slender rod ending in a T-shaped tip; lower arm rather long, straight, with slender straight rod.

Inner plate of mesosome with three arms, the upper arm with one or two points, the anterior lateral arm rounded, the space between these arms concave. Posterior arm a pointed hook on the plate, somewhat below the anterior arm.

Lobes of the ninth tergite large, ovate, the upper surface rounded, with many long setae arising from prominent tubercules rather evenly placed on the upper surface.

Taxonomic discussion. This species will run through the following couplets in the key of Rozeboom and Komp (1950): 1, 8, 9, 10, 11 and 12 and 44. It may be placed in the key as follows:

44. Mesosome with the broad upper arm rounded posteriorly, with one or two sharp points at upper dorsal angle the subterminal dorsal arm stout, bluntly rounded .... *confundior*
    Mesosome not so formed 44A
44A. Upper arm of mesosome serrate or denticulate 45
    Upper arm of mesosome not serrate or denticulate 53

The shape of the mesosome is probably like that of *C. corentynensis* or *C. evansae*, but is so oriented in the poor mount that it is difficult to see. The lobes of the ninth tergite are large and ovate, almost as large as those of *C. erraticus*, but are rounded on the upper surface, not flattened, as in *erraticus*. The tubercles from which the setae arise are also large and numerous.

This new species was discussed briefly on pages 87 and 88 of Rozeboom and Komp's review of the *Melanoconion* species (1950). The label on the slide of the male terminalia of one of the two cotypes of "*vapulans*" reads "Surinam BB 330, Mrs. J. Bonne-Wepster." This specimen the senior author determined as *bastagarius* D. & K. 1906 (Komp 1935). The other cotype of "*vapulans*" has a label on the slide of the male terminalia which reads "J. Bonne-Wepster, Surinam, M 94 (P 2)." This latter specimen is the type of the new species, *C. confundior*. The adult material of both cotypes was reared from larvae, but the larval skins were not preserved.

Type, male terminalia mounted on a slide, No. M 94 (P 2) U. S. National Museum. The adult male was reared from "larvae in a pool near Paramaribo," Surinam, by Mrs. J. Bonne-Wepster, probably in 1918, but date not specified. Type Number 59876, U. S. N. M.

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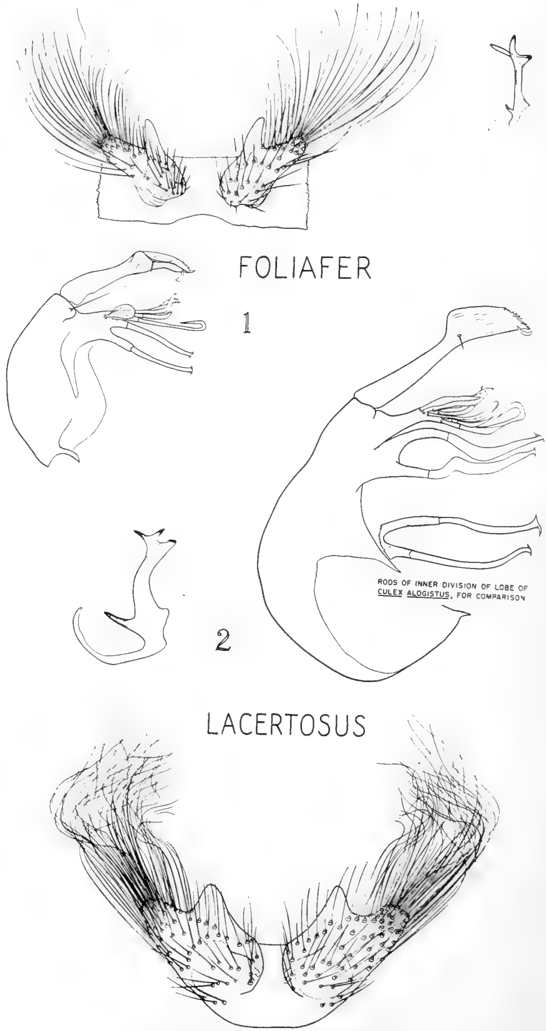


PLATE 25. MALE GENITALIA AND NINTH TERGITE OF CULEX.

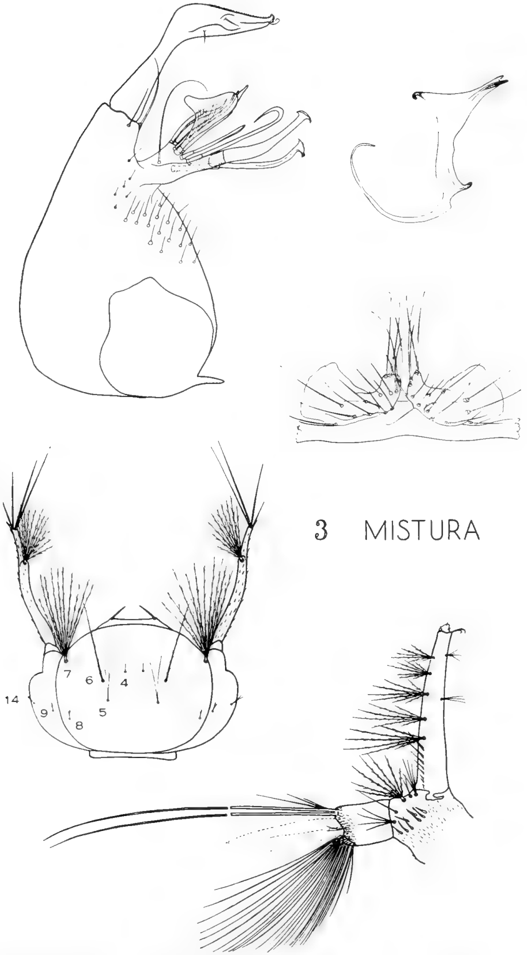
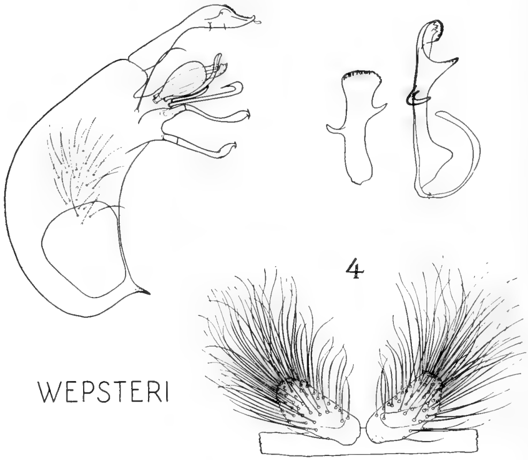


PLATE 26. MALE GENITALIA, NINTH TERGITE AND LARVA OF CULEX.



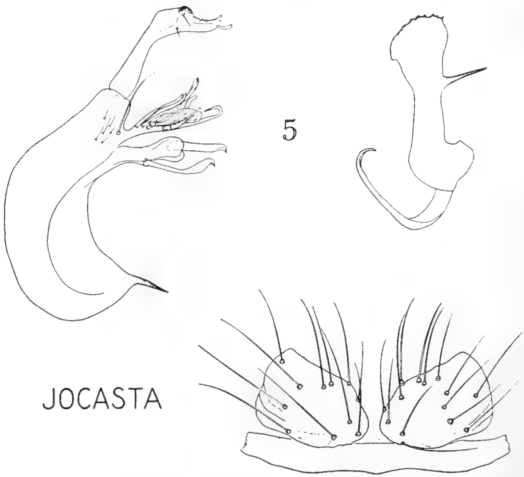


PLATE 27. MALE GENITALIA AND NINTH TERGITE OF CULEX.

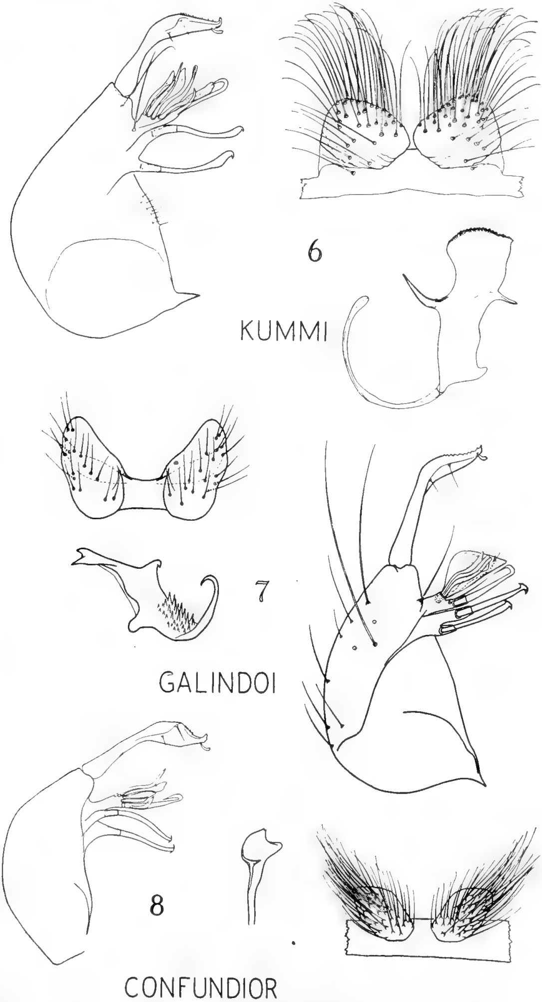


PLATE 28. MALE GENITALIA AND NINTH TERGITE OF CULEX.

SYNONYMIES AND NEW SPECIES OF FLEA-BEETLES

(COLEOPTERA, CHRYSOMELIDAE)

BY DORIS H. BLAKE, *Washington, D. C.*

During a short stay in the summer of 1950 in several European museums I came upon a number of cases in which entomologists had redescribed species or even genera, and this paper deals in part with such synonymies. The rest of it is concerned with half a dozen new species of flea-beetles that have come to my attention.

Prasona exclamationis (Boheman)

Figs. 2 and 5.

Baly[1] described the genus *Prasona* as "near *Crepidodera* but separated by the different form of the antennae and the irregularly punctured elytra." Actually the genus is closer to *Systena* except for being broader, with a prothorax that is half again as wide as long and with a slight basal depression that is faintly limited on the sides. Jacoby has written that *Prasona* differed from *Systena* in having more robust antennae and that the tibiae as in *Systena* all have a single short spur, not, as Baly wrote, two spurs on the hind tibae. According to the Junk Catalogue, the genus contains 4 species: (1) *P. viridis* Baly from Mexico which is the type of the genus (he made a curious mistake in naming as the type of the genus *Prasona prasina*, although on the next page he described the species as *Prasona viridis*); (2) *P. balyi* Harold[2] from Colombia; Harold himself was doubtful whether this really belonged to Baly's genus and I am convinced that it does not, because of its pubescent and striately punctate elytra; (3) *P. haroldi* Baly[3] from Paraguay; (4) *P. peruviana* Jacoby,[4] which is large and green like the rest. There is a fifth species, hitherto not referred to the genus but described under two genera, first by Boheman[5] as *Systena exclamationis* from Argentina and secondly by Clark[6] as *Disonycha viridipennis* from Brazil. I have examined the types of both and found them the same. This species bears such a close relationship to *P. haroldi* that H. S. Barber has written on the label, "*Systena exclamationis* ? equals *Prasona haroldi.*" and G. E. Bryant on a label of *Prasona haroldi* "probably

[1]Baly, Journ. Ent., vol. 1, 1861, p. 300.
[2]Harold, Col. Hefte, vol. 14, 1875, p. 32 .
[3]Baly, Ann. Mag. Nat. Hist., (5) II, 1878, p. 230.
[4]Jacoby, Proc. Zool. Soc. London, 1904, p. 407.
[5]Boheman, Eugen. Resa, Coleoptera, 1859, p. 192.
[6]Clark, Journ. Ent., vol. 2, 1865, p. 402.

equals *Disonycha viridipennis.*" As shown by the figures of the aedeagi (Figs. 2 and 5) *P. haroldi* is quite distinct from *exclamationis;* in addition it is somewhat larger with slightly different elytral markings and a wider prothorax. As in some species of *Systena, viz. S. S-littera* (L.), there is a color difference in the sexes; in both *haroldi* and *exclamationis* the males have dark legs and undersurface and often darker markings above, while the females have yellow or reddish brown legs and undersurface. But the most striking difference is in the enlargement of the basal joint of the antennae in the male into a sort of hook projecting under the second joint, of which there is little trace in the female. There is a large series of *P. exclamationis* in the U.S. National Museum collected by H. L. Parker on sunflower and thistle at Colonia Suiza, Uruguay.

Nephrica Harold

The description of the genus *Nephrica* appeared in a paper[7] on Peruvian beetles in 1877 with one species, *N. kirschi.* Von Harold's description of the profoundly emarginate, reniform eyes caused Baly[8] in describing the genus *Cyclophysa* to write that his genus agreed with *Nephrica* in regard to the eyes and many other characters but differed in the form of the body which was circular and closely resembled that of *Sphaeroderma.* Since then *Cyclophysa* has been synonymized with *Nephrica* and Jacoby has described 14 more species which he wrote might be *Disonycha* or *Asphaera* but for the reniform eyes. Bryant, in fact, has transferred two of Clark's species of *Asphaera* to *Nephrica,* presumably because of the reniform eyes.

I have found in the British Museum two specimens of still another genus described by Clark[9] as *Pedilia* (*P. rufa*) that are congeneric with *Nephrica* and most closely related to *Cyclophysa albicornis* Baly and *Nephrica globosa* (Fabricius). In fact all three species are so close to each other that only the color of the antennae and slight differences in punctation distinguish them. They are all of a circular shape, and all are pale yellow. *Pedilia rufa* Clark from Para has distinctly punctate elytra with faint traces of ribbing and the surface is shiny and uneven. The antennae have brownish outer joints. *Cyclophysa albicornis* Baly from Peru has the elytra as distinctly punctate as *rufa* but not rugose or with any traces of costae, and the antennae are entirely pale. *Nephrica globosa* (Fabricius) from "America meridionalis" has black antennae

[7]Harold, Deut. Ent. Zeit., vol. 21, 1877, p. 132.
[8]Baly, Trans. Ent. Soc. London, 1879, p. 241.
[9]Clark, Journn. Ent., vol. 2, 1865, p. 384.

and distinctly punctate elytra. I have examined the types of all these species at the British Museum and at Copenhagen. Besides these, there are specimens in the British Museum collected by Cockerell in British Guiana with smooth, not punctate elytra and black antennae that may be still a fourth species of this group of pale yellow, circular beetles. Clark's generic name *Pedilia* is the earliest and should supplant the name *Nephrica* for these species of this character. Possibly *Nephrica* can be retained for the oblong species that Jacoby wrote were so close to *Disonycha* and *Asphaera*. I have not examined the type of *kirschi*, upon which Harold based his genus, *Nephrica*, but it is an oblong oval beetle according to his description.

Apraea jansoni Baly

Apraea jansoni Baly, Trans. Ent. Soc. London, 1877, p. 294.
Glyptobregma orphninum Blake, Proc. Ent. Soc. Wash., vol. 50, 1948, p. 123.

Apraea jansoni Baly, the type of which I examined at the British Museum, is an earlier name for *Glyptobregma orphninum* Blake and that monotypic generic name must replace *Glyptobregma* and all the species described under *Glyptobregma* be transferred to the genus, namely, *Glyptobregma clathratum* (Suffrian), *G. pyritosum* (Suffrian), *G. robustum* (Suffrian), *G. interstitiale* (Suffrian) and *G. turquinense*, *G. portoricense*, *G. bruneri*, *G. aeneum*, *G. cyanellum*, all described by the author.

Systena basalis Jacq. Duval

Systena basalis Jacq. Duval, in Ramon de Sagra's Hist. fis. Cuba, vol. 7, 1856, p. 129.
Systena ornata Baly, Trans. Ent. Soc. London, 1877, p. 288.

A single female in the British Museum, the type of *S. ornata* Baly, with a faint trace of a pale spot near the base of the elytra and another near the apex, is clearly merely the female of *Systena basalis* Jacq. Duval, which differs somewhat in coloring from the male with its entire pale elytral vitta. Baly's specimen came from Jamaica. This species is a well known pest on cotton, tobacco and many vegetables in Cuba, Puerto Rico, Hispaniola and Jamaica.

Halticidea dichroa (Suffrian)

Haltica dichroa Suffrian, Archiv für Naturg., vol. 34, 1868, p. 203.
Asbecesta violacea Allard, Ann. Soc. Ent. Belg., vol. 34, 1890, p. LXXXVII.

There seems to be little doubt that Allard was describing the same species that Suffrian had many years previously.

The inclusion of the West Indian species in an African genus composed of species twice its size simply on account of its parallel form and the transverse groove on the prothorax, without regard to the lack of spurs on the legs and the presence of nearly bifid claws, is entirely out of place. Horn,[10] when describing the genus *Halticidea*, compared Suffrian's description of *H. dichroa* from Cuba with his species from Florida and Texas and came to the conclusion that they were probably congeneric. Although I have seen no material of Suffrian's species, I am convinced that it is properly placed in *Halticidea*.

In 1946 and in 1948 I described two species rather doubtfully under the genus *Dicoelotrachelus*, viz. *D. glaber* Blake[11] from Haiti and *D. violaceus* Blake[12] from Puerto Rico. They are, in fact, closely related to *Halticidea modesta* Horn from Florida, and should not have been placed with the pubescent species having quite differently shaped heads and open coxal cavities upon which the description of the genus *Dicoelotrachelus*[13] was based. *H. dichroa* (Suffrian), according to Suffrian's and Allard's descriptions, has finely punctate elytra, thereby differing from both the Haitian and Puerto Rican species. Since my specific name *violaceus* although applied to the different Puerto Rican species is a homonym of Allard's I hereby propose the name *Halticidea barberi* for the Puerto Rican *Dicoelotrachelus violaceus* in view of the fact that H. S. Barber had partially worked out this synonymy himself, as shown by specimens in the collection. The Haitian species becomes *Halticidea glabra* (Blake).

Distigmoptera orchidophila, new species

Fig. 6

Nearly 3 mm. in length, oblong oval, densely punctate, black with the antennae pale except for joints 7-10 which are black; legs except at base and hind femora pale; covered with long, fine, erect, golden brown hairs, prothorax uneven with 2 tubercles in middle and the elytra with a pit near the suture before the middle, and striately punctate.

Head dark brown, coarsely and densely punctate throughout and with yellow-brown erect hairs; antennal sockets closely placed with a fine carina between extending down the front. Antennae not extending much below humeri, the first two or three joints pale brownish, joints 4-6 yellow, 7-10 much thicker and black, apical joint pale. Prothorax almost as long as broad with nearly straight sides and a

[10]Horn, Trans. Am. Ent. Soc., vol. 20, 1893, p. 61.
[11]Blake, Proc. Ent. Soc. Wash., vol. 48, 1946, p. 113.
[12]Blake, Proc. Ent. Soc. Wash., vol. 50, 1948, p. 121.
[13]Blake, Proc. Ent. Soc. Wash., vol. 43, 1941, p. 171.

sharp apical tooth, convex and uneven on surface with two small gibbosities anterior to the middle, coarsely and shallowly and contiguously punctate, with long erect yellow hairs. Scutellum covered with flatly appressed, shining yellow hairs. Elytra wider than prothorax, densely and coarsely striate punctate with interstitial raised lines, and with a pronounced sulcus from within the humerus down to near the suture ending in a pit; covered rather sparsely with fine erect hairs and beneath with shorter, denser and appressed hairs, the latter varying in color, with some irregular patches of white hairs especially on apical half, and coppery hairs along the suture especially near the pit. Body beneath shining deep brown, the prosternum coarsely punctate. Anterior femora at base and hind femora entirely dark, tibiae pale with a brown streak. Length 2.7 mm.; width 1.5 mm.

Type male, U.S.N.M. Type No. 60944, taken on an orchid from Charvarillo (Vera Cruz), Mexico, at Laredo, Texas, May 28, 1946.

Remarks. This is the fourth species of *Distigmoptera* to be described from Mexico and Central America, and is distinguished from *D. brevihirta* Blake by having long hairs, and from *D. capillosa* Blake by being deep piceous, not brown, and with varicolored pubescence instead of uniformly brown. It differs from *D. suturalis* (Jac.) by not being "sparingly pubescent."

Distigmoptera chrysodaedala, new species

Fig. 4

About 3 mm. in length, elongate oblong, densely and coarsely punctate, deep piceous with pale yellow brown antennae having joints 7-10 black, and bicolored anterior legs, the hind tibiae darker and covered with long brown and white pubescence; the upper surface covered by fine, erect, denser, shorter and closely appressed hairs, being along the suture especially golden.

Head dull piceous, densely and coarsely punctate with an irregular raised median line down front to tubercles, tubercles shiny and somewhat raised, from tubercles down covered by short erect golden hairs; antennal sockets not so closely placed as in *D. orchidophila* and the space between not keel-shaped but flat and coarsely punctate. Antennae not extending much below the humeri, very hairy, the four basal joints brownish with the third one longest, joints 5, 6 and 11 pale yellow brown, joints 7-10 black, apical joints much thickened. Prothorax as long as wide, with sides nearly straight and a small tooth at apex; surface dull, coarsely and contiguously punctate with short golden pubescence and longer, darker and less dense, erect hairs; two gibbosities anterior to the middle. Scutellum covered with appressed golden hairs. Elytra considerably wider than prothorax with prominent humeri and a long incurving sulcus ending near the suture in a pit; coarsely and striately punctate but not so densely as in *D. orchidophila,* the interspaces between the striate rows being flat and nearly as wide as the punctures, not adjacent as in *D. orchidophila;* covered rather sparsely with erect, fine, long, dark hairs and beneath these a closely appressed, short pubescence varying in color, but along suture being golden brown and near apex with many white patches. Body beneath shining chestnut brown, the prosternum coarsely punctate and with dense golden pubescence. Anterior legs pale with the femora dark brown at base and a little dark shading on tibiae; hind femora dark and densely clothed above with brown and white hairs. Length 3 mm.; width 2.5 mm.

Type male, U.S.N.M. Type No. 60945, taken on an orchid from the Federal District, Mexico, Feb. 17, 1947, the exact locality of capture unknown.

Remarks. Like the previous species, this single male specimen was taken on an orchid from Mexico. It is quite distinct from the other four Central American and Mexican species in being more elongate and shaped like the larger species from North America, such as *D. apicalis* and *texana.* The elytral punctation is less dense than in the other Central American species that I have described and it is not "sparingly pubescent" as in Jacoby's *D. suturalis.*

Hermaeophaga cuprea, new species

Fig. 1

About 2 mm. in length, oval, with lustrous black head, prothorax, and legs, and polished coppery elytra; the stout dark antennae with the four distal joints pale yellow, the body beneath brownish.

Head entirely dark, polished and smoothly rounded over occiput down to frontal tubercles without depressions or grooving, tubercles deeply marked, and a slightly produced narrow keel between the rather closely placed antennal sockets, eyes widely separated and entire. Antennae stout, conspicuously hairy, the basal four joints deep brown, joints 5-7 black and 8-11 pale yellow. Prothorax half again as wide as long, rather convex, with a groove extending across base and disappearing on either side without a limiting sulcus, entirely black and mirror smooth. Scutellum black. Elytra convex and rounded, a beautiful shining coppery brown, almost mirror smooth but with very indistinct fine obsolete punctures that seem to be striate. Body beneath deep shining brown with lustrous piceous black femora, the anterior coxal cavities open, the hind legs with thickened femora, the tibiae without channelling and the hind ones with an apical spur, the claws appendiculate. Length 2-2.4 mm.; width 1.2-1.4 mm.

Type male, U.S.N.M. Type No. 60949, and 3 paratypes, collected by H. G. Hubbard in Jamaica.

Other material. One specimen collected by E. A. Chapin at Ferry River, Jamaica, May 5, 1941; two specimens in Bowditch collection, M.C.Z., from Jamaica, labeled 1st Jacoby collection, 1858, J. Gray, and placed among the unidentified species of *Hermaeophaga*.

Remarks. I am following Jacoby, who has described most of the New World species of *Hermaeophaga*, in placing this and the following species in that genus, although I do not believe that the American species are very closely related to the European *H. cicatrix* Illiger, the type of the genus. The two new species here described, unlike the European ones, do not have the basal sulcus of the prothorax limited at the ends by any groove running at right angles to the basal sulcus, and the elytra appear striate punctate, not confusedly so.

Hermaeophaga nigrorubra, new species

Fig. 3

About 2 mm. in length, oval, shining, the head, prothorax and upper third of elytra, legs and undersurface, except the reddish brown abdomen, black. Antennae black with the four basal and two distal joints pale yellow, elytra striately punctate.

Head smoothly rounded over occiput, impunctate and without grooves or depressions down to tubercles, these small and distinctly marked by shallow grooves, a small carina between antennal sockets. Antennae robust, hairy and black, the four basal and two apical joints pale. Prothorax nearly half again wider than long, with nearly straight sides and obliquely cut anterior angles, convex, with a well-marked basal sulcus disappearing at the sides as in *H. cuprea;* surface shining black, densely and moderately coarsely punctate. Scutellum black. Elytra convex, deeply striate punctate on basal half, becoming fainter but still distinct at apex, shining black on basal third and bright reddish brown on remainder. Body beneath and legs shining black, except the reddish brown abdomen, the prosternum coarsely and shallowly punctate in the middle. Length 2.2 mm.; width 1.2 mm.

Type female, U.S.N.M. Type No. 60948, collected at Palma Mocha, Sierra Maestra, Cuba, July 10-20, 1922 by C. H. Ballou and S. C. Bruner.

Remarks. This species is very similar in shape and coloring to *H. cuprea* but has much more distinct striate punctures on the elytra and the basal part of the elytra is dark.

Cyrsylus trinitatis, new species

Fig. 7

From 2-2.5 mm. in length, oblong oval, shining, varying from pale yellow brown and dark brown with a bluish lustre to deep blue elytra with deep reddish brown head, prothorax and legs, elytra distinctly striate punctate.

Head shining mirror smooth from occiput down to frontal tubercles, pale yellow brown to deep brown, tubercles distinctly marked with a groove from above them to eye; antennal sockets closely set with a little carina between, lower front short. Antennae not reaching the middle of the elytra, brownish with joints 3-11 subequal. Prothorax not quite twice as broad as long with sides slightly arcuate and oblique anterior angles, surface shining, very finely and not densely punctate; varying from pale yellow to deep piceous. Scutellum large, triangular. Elytra wider than prothorax with moderately prominent humeri and distinct striate punctures not becoming confused or indistinct at apex; color varying from pale yellow brown to deep metallic blue. Body beneath varying in color from pale to dark, the anterior coxal cavities narrowly closed, hind tibiae with a tiny spur at apex, first tarsal joint nearly as long as the others together. Length 2-2.6 mm.; width 1-1.5 mm.

Type male and 16 paratypes in British Museum, 2 paratypes retained for the U.S.N.M., Type No. 60946, and 2 for the M.C.Z. Collected in Trinidad, B.W.I., in 1903 by G. E. Bryant.

Other material. One specimen collected on the Arima Blanchisuisse Rd., 8th m., Trinidad, Oct. 29, 1918 by Harold Morrison.

Remarks. The variability in coloring in this species is similar to that occurring in *C. recticollis* Jac. from Central America. It also resembles that species in having entirely striate punctate elytra instead of having the punctures confused after the middle as in the West Indian species. But in the shape of the aedeagus with its peculiar split tip, this resembles the West Indian species and thus seems to connect the West Indian species with the Central American ones that it resembles more externally.

Argopistes coronatus, new species

Fig. 8

Between 3 and 4 mm. in length, globose, shining, usually pale yellow brown with a broad piceous ring about the elytra leaving the lateral and apical margins pale, occasionally entirely pale yellow or entirely piceous.

Head with the lower front deflexed, the mouthparts resting slightly above the space between the front coxae, the large eyes approaching each other on the occiput with a fovea near each, and below this the antennal sockets closely set, eyes slightly emarginate, and below the antennal sockets the lower front long with a median slightly raised line, otherwise smooth to the labrum. Antennae filiform, entirely pale, a long basal joint, second and third joints short and equal, the fourth longer. Prothorax twice as broad as long at base, convex, basal margin sinuate, apical angle curved out about side of eye;

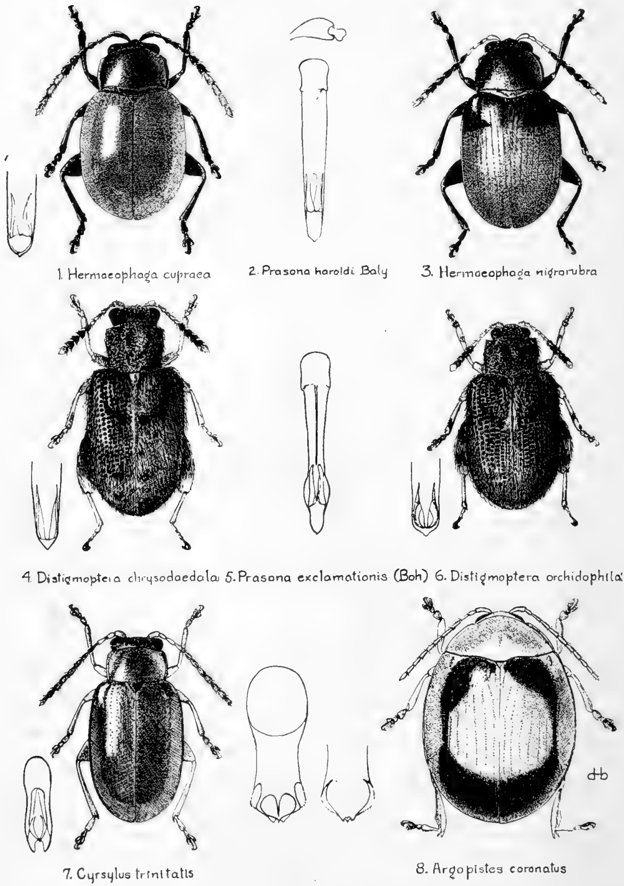


PLATE 29. NEW CHRYSOMELIDAE.

pale yellow brown sometimes with indefinite darker median area, surface alutaceous and finely and densely puntate. Scutellum triangular, usually pale. Elytra shiny, convex and well rounded, with very fine dense punctures (granular) and below the surface, visible only on the pale yellow median area, rows of striate punctures that do not puncture the surface; color varying from entirely pale yellow brown to piceous but usually pale yellow brown with a broad deep brown or piceous ring on elytra about a pale centre, leaving apex and sides but not basal margin pale. Body beneath and legs usually entirely pale. Length 2.8-3.7 mm.; width 2.4-2.7 mm.

Type male and 10 paratypes, U.S.N.M. Type No. 60947, 2 paratypes in M.C.Z. and 2 in British Museum, collected on *Mayepea domingensis* at Guanica, Puerto Rico, July 30 and Oct. 17, 1934 by R. G. Oakley.

Remarks. This is the fourth species of *Argopistes* to be described from the Western Hemisphere, the others being *A. scyrtoides* Lec. from Florida, *A. coccinelloides* (Suffrian) from Cuba, and *A. rubicundus* Blake from Mexico. As in the case of the species from Florida and Cuba, and two South African species described by Bryant, this species also feeds on a plant of the olive family. This series of specimens was among a lot that H. S. Barber had set aside to describe as new.

HENRY ELLSWORTH EWING
1883-1951

Henry Ellsworth Ewing was born in Arcola, Illinois, February 11, 1883, and died in Washington, D. C., January 5, 1951. He was early interested in biology and originally studied medicine, but changed later to entomology. He came from a large family, many of the members apparently with exceptional abilities, and numbering among them physicians, lawyers and ministers. Dr. Ewing attended Knox College from 1902 to 1904 and transferred to the University of Illinois to obtain his A.B. in 1906, and M.A. in 1908. He also studied at the University of Chicago. In 1909 he went to Iowa State College. A Schuyler Fellowship sent him to Cornell in 1910 where he studied under Professor Comstock and received his Ph.D. in 1911. From Cornell Dr. Ewing went to the Oregon Agricultural Experiment Station, and stayed there until 1914 when he transferred back to Iowa as Assistant Professor and became Associate Professor in 1916. He was brought to Washington in 1919 as a Presidential Appointee to work as a specialist in the Arachnida, and he remained here until his death.

Dr. Ewing's first publication on mites was in 1907, based on specimens collected in Illinois. His descriptions of the Illinois oribatid mites constitute a large percentage of the known North American fauna. At the Experiment Station in Oregon he became interested in ectoparasitic arthropods, and published on the parasites of fowls and domestic animals, as well as on the common spider mite, a plant-feeding species. A short note on western oribatid mites appeared at this time too. His interest in the parasitic mites and insects increased after he came to Washington, and early in the 1920's he became interested in the chigger mites or larval Trombiculidae. His knowledge of this medically important group was drawn upon in his informal teaching of service entomologists during World War II. From 1920 until the war Dr. Ewing carried practically the entire load of mite identification for this country, at the same time doing work on other groups.

A naturalist of the old school, Dr. Ewing had broad interests and a deep fund of knowledge. Doubtless his interests in obscure arthropods and fundamental morphology were partly engendered by early association with some of entomology's great teachers, including Folsom, Comstock, and W. A. Riley. Later, his long friendship with Snodgrass helped keep those interests alive. Although mites were the field of his greatest contributions, with over 105 papers on that group alone, his work with the Ricinulei, Protura, Japygidae, lice and fleas was considerable, and much of it comprehensive. He published in the *National Geographic Magazine* a widely read, semipopular article on spiders. Several articles were prepared for the Encyclopedia Britannica. In 1929 he published the *Manual of Ectoparasites.* Work on the chiggers infesting reptiles and amphibians led him to observe box turtles, and he maintained a colony in his back yard for years and published several papers on their biology. At one time he even worked on parthenogenesis in aphids.

Many of Dr. Ewing's mite researches were done during a period when he, Nathan Banks, Ruth Marshall, A. P. Jacot and E. A. McGregor were the only workers in America. He was a prodigious reader and had a retentive memory for what he saw in the contributions of others. At times he was brilliant, always he was deeply sincere and hard-working. Many of his notes remain unfinished and unpublished. During the last decade his health was failing him at a time when he was striving to bring his final works to completion, and the demands associated with the general quickening of interest in mites required extensive correspondence and other cooperation. He had always enjoyed close contacts with a few younger workers once he learned to know them, and certain of these benefitted greatly from his friendly guidance. With the great influx of students to the mite field during the war, however, it was increasingly difficult for him to maintain an active cooperation with workers outside of Washington on the intimate plane in which the student came to know him at his best.

Dr. Ewing was a member of the Entomological Society of Washington for 31 years, and was President in 1941. He was on the Executive Committee more than 10 years and was active both as Treasurer and in the revision of the Constitution and By-Laws ratified in December 1936. He helped found the Helminthological Society of Washington, and in 1944 was President of the American Society of Parasitologists. An excellent portrait was published in The Journal of Parasitology (vol. 30, no. 6, Dec. 1944).

Although his intimate acquaintances outside of scientific circles were apparently of a limited number, he was by nature civic-minded, and was active in his church and with the Boy Scouts. For years he assisted boys in qualifying for Scout merit badges. Current public affairs, both on a national and world level, always brought out considered, thought-provoking discussions from him.

In 1939, shortly before the realization occurred that his health was breaking, he took his last extended field trip with R. E. Snodgrass and Anthony Downes to the Dismal Swamp and to portions of West Virginia. In 1938 he accompanied a younger entomologist, A. B. Gurney, to Mt. Rogers, the Peaks of Otter, and other localities in southwestern Virginia. Association with him on these leisurely collecting trips demonstrated not only his wide interests and ability, but also the warm human qualities which few people had an opportunity to appreciate.

After suffering from a heart attack he continued working for a number of years, but gradually had to slow down until he retired on disability in 1945. He continued to work at home, however, until shortly before his death, reviewing his notes and publishing on the higher categories of chiggers. His private library and a type collection of mites studied prior to coming to Washington were left to the National Museum, with minor collections going to the Museum of Comparative Zoology and to Oregon State College. A mimeographed list of Dr. Ewing's mite papers will be prepared for distribution to Acarologists.

Dr. Ewing is survived by his wife, Bertha Riley Ewing, a son, Paul M. Ewing, a daughter, Mrs. Lydia Frances Grover of Los Alamos, New Mexico, a grandson, and by four brothers and a sister.

EDWARD W. BAKER, *Chairman*
ASHLEY B. GURNEY

LIST OF ANOPLURA FROM TEXAS

By G. C. Menzies, R. B. Eads and B. G. Hightower, *State Department of Health, Austin, Texas*

Sucking lice taken during Texas ectoparasite studies relative to typhus, plague and Q fever are specifically listed in this paper. Many of the species representing new host or locality records have been verified or identified by Dr. G. F. Ferris and are retained in the Texas State Department of Health collection.

Enderleinellus suturalis (Osborn). Two specimens ex *Citellus mexicanus*, April 10, 1950, Uvalde Co., coll. C. W. Johnson and O. L. Walker; 11 ex *C. spilosoma*, May 4, 1948, Gaines Co., coll. V. I. Miles.

Fahrenholzia zacatecae Ferris. Four specimens ex *Perognathus hispidus*, July 7, 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker; 1 specimen ex *P. hispidus*, Sept. 23, 1947, Dawson Co., coll. Halyard; 1 specimen ex *P. hispidus*, June 9, 1948, Gaines Co., coll. V. I. Miles; 1 specimen ex *P. hispidus*, Aug. 10, 1949, Atascosa Co.

Fahrenholzia microcephala Ferris. Twelve specimens ex *Liomys irroratus*, April 17, 1949, Hidalgo Co., coll. R. B. Eads and G. C. Menzies.

Fahrenholzia pinnata Kellogg and Ferris. Two specimens ex *Dipodomys ordii*, March 15, 1949, Yoakum Co., coll. Everett; 1 ex *D. ordii*, April 14, 1949, Terry Co., coll. George; 1 ex *D. ordii*, Jan. 7, 1949, Yoakum Co., coll. George; 2 ex *D. ordii*, March 5, 1948, Dawson Co., coll. V. I. Miles; 1 ex *D. ordii*, April 20, 1946, Cochran Co., coll. Scoggins; 1 ex *Onychomys leucogaster*, April 15, 1948, Gaines Co., coll. Carpenter.

Haematopinus suis adventicius (Neumann). Two specimens ex dog, April 23, 1943, Menard Co., coll. D. C. Thurman.

Haematopinus eurysternus (Nitzsch). Five specimens ex cow, Aug. 13, 1945, Jackson Co., coll. N. M. Randolph; 2 ex cow, Feb. 8, 1943, Travis Co., coll. R. B. Eads; 17 plus ex cow, May 8, 1950, Uvalde Co., Texas, coll. C. W. Johnson and O. L. Walker.

Hoplopleura hesperomydis (Osborn). One specimen ex *Peromyscus* sp., Dec. 7, 1948, Howard Co., coll. V. I. Miles; 1 ex *Onychomys leucogaster*, April 14, 1948, Gaines Co., coll. V. I. Miles; 1 ex *O. leucogaster*, Jan. 6, 1948, Terry Co., coll. V. I. Miles; 1 ex *Peromyscus*, sp., June 24, 1948, Presidio Co., coll. J. L. Reagan.

Hoplopleura hirsuta Ferris. Three specimens ex 3 *Sigmodon hispidus*, April 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker; 4 ex 4 *S. hispidus*, May 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker; 24 ex 10 *S. hispidus*, June, 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker; 10 ex *S. hispidus*, July, 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker; 96 ex 32 *S. hispidus*, Aug., 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker; 4 ex *Tayassu angulatum*, Aug. 23, 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker;

2 ex *Sylvilagus auduboni*, June 21, 1950, Zavala Co., coll. C. W. Johnson and O. L. Walker; 1 ex *S. hispidus*, July 2, 1950, Hutchinson Co., coll. R. B. Eads and B. G. Hightower; 14 ex *S. hispidus*, Oct. 10, 1947, Travis Co., coll. G. C. Menzies; 14 ex *S. hispidus*, Nov. 17, 1945, Lavaca Co., coll. E. L. Batte; 2 ex *S. hispidus*, Oct. 14, 1945, Lavaca Co., coll. E. L. Batte; 3 ex *S. hispidus*, Dec. 8, 1945, Lavaca Co., coll. L. J. Ogden; 25 ex *S. hispidus*, March 19, 1946, Lavaca Co., coll. R. B. Eads; 2 ex *S. hispidus*, April 18, 1946, Lavaca Co., coll. R. B. Eads; 25 ex *S. hispidus*, Oct. 10, 1947, Brazos Co., coll. R. B. Eads.

Hoplopleura oenomydis Ferris. Twenty-five plus ex *Rattus norvegicus*, Sept. 15, 1945, Galveston Co., coll. R. W. Strandtmann; 10 plus ex *Rattus* sp., Feb. 8, 1947, Tarrant Co., coll. B. G. Uzzel; 50 plus ex *R. norvegicus*, March 11, 1947, Harris Co., coll. Riley.

Hoplopleura sciuricola Ferris. One specimen ex *Sciurus niger*, Sept. 28, 1949, Coryell Co., coll. D. Eben.

Linognathus setosus (Olfers). Five plus specimens ex dog, Aug. 2, 1944, Dallas Co., coll. G. C. Menzies; 1 plus ex dog, Oct. 11, 1949, Dallas Co., coll. G. C. Menzies; 1 ex *Mus musculus*, Feb. 8, 1947, Lavaca Co., coll. G. Halyard.

Linognathus africanus Kellogg and Paine. One thousand plus specimens ex 75 goats Aug. 16, 1950, Zavala Co., coll. B. G. Hightower.

Neohaematopinus sp. (near *citellinus* Ferris). Two specimens ex *Citellus spilosoma*, April 22, 1948, Dawson Co., coll. George; 2 ex *C. spilosoma*, May 4, 1948, Dawson Co., coll. George; 4 ex *C. spilosoma*, May 8, 1948, Dawson Co., coll. George; 1 ex *C. spilosoma*, April 26, 1949, Dawson Co., coll. George; 2 ex *C. spilosoma*, April 23, 1948, Gaines Co., coll. V. I. Miles; 1 ex *C. spilosoma*, May 28, 1948, Gaines Co., coll. Carpenter; 1 ex *C. spilosoma*, May 4, 1948, Gaines Co., coll. Williams; 3 ex *C. spilosoma*, May 7, 1948, Gaines Co., coll. Carpenter; 11 ex *C. spilosoma*, May 17, 1948, Gaines Co., coll. George; 1 ex *C. spilosoma*, June 3, 1948, Gaines Co., coll. George; 10 ex *C. spilosoma*, Sept. 8, 1947, Dawson Co., coll. Williams; 20 ex *Cynomys ludovicianus*, June 12, 1947, Terry Co., coll. G. C. Menzies and R. W. Strandtmann.

Neohaematopinus laeviusculus (Grube). One specimen ex *Citellus variegatus*, June 30, 1949, Terrell Co., coll. B. G. Hightower.

Neohaematopinus marmotae Ferris. One specimen ex *Citellus spilosoma*, June 16, 1948, Gaines Co., coll. Carpenter; 5 ex *Cynonyms ludovicianus*, April 22, 1948, Dawson Co., coll. George; 9 ex *C. ludovicianus*, March 8, 1948, Dawson Co., coll. V. I. Miles.

Neohaematopinus neotomae Ferris. Six specimens ex *Neotoma micropus*, April 6, 1948, Gaines Co., coll. Carpenter; 2 ex *N. micropus*, April 13, 1948, Gaines Co., coll. George; 1 ex *N. micropus*, Jan. 20, 1949, Gaines Co., coll. Everett; 3 ex *N. micropus*, April 2, 1948, Dawson Co., coll. Carpenter; 3 ex *N. micropus*, April 6, 1948, Dawson Co., coll. Williams; 4 ex *N. micropus*, April 14, 1948, Dawson Co., coll. Williams; 3 ex 2 *N. micropus*, May 21, 1948, Dawson Co., coll. Williams; 4 ex 2 *N. micropus*, Feb. 10, 1948, Dawson Co., coll. Carpenter; 30 ex 6 *N.*

micropus, Feb. 19, 1948, Dawson Co., coll. Carpenter; 86 ex 7 *N. micropus*, Feb. 27, 1948, Dawson Co., coll. Carpenter; 13 ex 10 *N. micropus*, March 2, 1948, Dawson Co., coll. Carpenter; 39 ex 3 *N. micropus*, April 1, 1948, Dawson Co., coll. Williams; 2 ex 2 *N. micropus*, April 20, 1948, Cochran Co., coll. Williams; 5 ex *N. micropus*, April 28, Cochran Co., coll. Williams; 1 ex *N. micropus*, Dec. 28, 1948, Yoakum Co., coll. George; 1 ex *N. micropus*, Feb. 1, 1949, Dawson Co., coll. George; 1 ex *N. micropus*, Dec. 2, 1948, Garza Co., coll. Everett; 1 ex *N. micropus*, April 19, 1949, Midland Co., coll. Johnson.

Neohaematopinus sciurinus (Mjoberg). Eighteen specimens ex *Sciurus niger*, June 24, 1949, Terrell Co., coll. B. G. Hightower; 12 ex *S. niger*, Dec. 15, 1945, Lavaca Co., coll. G. Halyard; 14 ex *S. niger*, Oct. 10, 1947, Brazos Co., coll. R. B. Eads.

Pecaroecus javalli Babcock and Ewing. Twenty-five specimens ex *Tayassu angulatum*, June 15, 1949, Terrell Co., coll. B. G. Hightower.

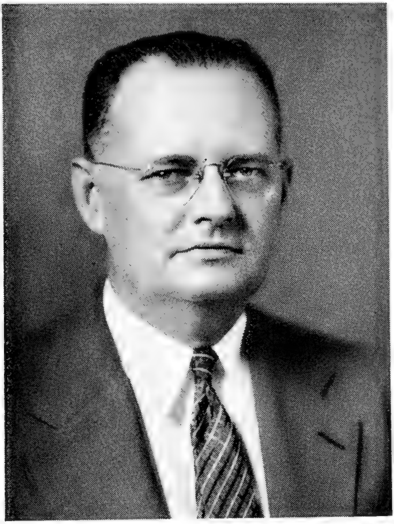
Pediculus humanus Linnaeus. This cosmopolitan parasite of man is common in the state; the head louse is particularly prevalent in the lower Rio Grande Valley. Selected records are: 10 plus ex man, May 5, 1943, Travis Co., coll. D. C. Thurman; 100 plus ex school children, Feb., 1946, Hidalgo Co., coll. F. A. Cowan, T. McGregor and N. M. Randolph; 4 ex man, May 3, 1945, Harris Co., coll. J. C. Manteris.

Phthirus pubis (Linnaeus). Selected records are: 1 ex man, Nov. 6, 1942, McLennan Co., coll. A. R. Hopkins; 5 ex man, April 30, 1950, Eastland Co., coll. J. C. Manteris; 100 plus ex man, June 13, 1943, Nueces Co., coll. R. B. Eads; 15 ex man, Sept. 4, 1944, Travis Co., coll. D. C. Thurman.

Polyplax auricularis Kellogg and Ferris. Three specimens ex *Onychomys leucogaster*, April 23, 1948, Gaines Co., coll. V. I. Miles; 1 ex *O. leucogaster*, April 21, 1948, Cochran Co., coll. Williams; 2 ex *O. leucogaster*, Jan. 1, 1948, Terry Co., coll. Williams; 1 ex *O. leucogaster*, Jan. 6, 1948, Terry Co., coll. V. I. Miles.

Polyplax serrata (Burmeister). One specimen ex *Mus musculus*, Jan. 30, 1947, Travis Co., coll. G. C. Menzies.

Polyplax spinulosa (Burmeister). Very common in the state. Selected records are: 6 ex *Rattus rattus*, Feb. 12, 1945, Travis Co., coll. N. M. Randolph; 40 ex *R. rattus*, Feb. 5, 1946, Lavaca Co., coll. G. Halyard; 4 ex *R. norvegicus*, Nov. 15, 1946, Cochran Co., coll. T. S. Scoggins; 7 ex *R. norvegicus*, Feb. 4, 1947, Yoakum Co., coll. T. S. Scoggins; 2 ex *R. norvegicus*, Feb. 27, 1947, Terry Co., coll. T. S. Scoggins; 3 ex *R. norvegicus*, Feb. 27, 1947, Gaines Co., coll. T. S. Scoggins; 1 ex *R. norvegicus*, Marsh 12, 1947, Hockley Co., coll. Donica; 3 ex *R. norvegicus*, June 25, 1947, Lamb Co., coll. Donica.



PERCY NICOL ANNAND
1898-1950

With the untimely death of Percy N. Annand on March 29, 1950, the Bureau of Entomology and Plant Quarantine lost the leader, who as Chief of the Bureau led it through the activities and responsibilities brought by World War II. The Entomological Society of Washington lost an active member and past president. Its members lost a friend who will long be remembered because of his interest in the varied phases of entomology in which that membership is engaged. The Department of Agriculture lost an able administrator, a forthright and capable official, and a good cooperator. The country lost a well-trained and conscientious public servant.

Dr. Annand entered Government Service in 1929 to make a comprehensive study of the beet leafhopper, an insect vector of curly top disease. This disease had throttled the sugar beet industry of the Intermountain Region and other parts of the West and was affecting seriously the production of other food crops. This problem challenged the young entomologist because it involved ecological aspects such as the effect of climate and soil surface conditions on the leafhopper's hibernation, desert hosts, succession of weeds in relation to seasonal activity of the insect, and the determination of the host weeds which accelerated the development of the leafhopper and the curly top disease. Wintertime breeding areas had to be studied, also migration and the physiology of the insect in relation to its migratory habits. Studies on the utilization of parasites and the use of chemicals as means of controlling the leafhopper were a part of this problem. Cooperative work involving the development of sugar beets and tomatoes resistant to the curly top disease was closely associated with these leafhopper investigations.

His accomplishments in this assignment brought him to Washington in 1932 to serve as Assistant Division Leader in the Division of Truck Crop and Garden Insect Investigations, from which position he was chosen in 1934 as Leader of the Division of Cereal and Forage Insect Investigations. His success in the leadership of this Division brought his appointment in 1938 as special research assistant to the Chief of the Bureau as coordinator of all research work. In 1939 he was appointed Assistant Chief of the Bureau in charge of the research phases of the work of the Bureau. The knowledge he acquired of the research work in this capacity gave him the experience and vision required to head the Bureau with distinction when he was called to that position in 1941 only a few months before the entry of the United States into World War II. Actual participation of this country in that conflict brought the need to protect the armed forces from insect plagues and insect-borne diseases. The emergency found Dr. Annand ready and qualified to accept his responsibilities. During his tenure as Chief of the Bureau many important advances in the control of insect pests were made, such as the development of the insecticidal use of DDT, aerosols for household, greenhouse and field use, and the practical dispersal of liquid insecticides from aircraft.

His unusual knowledge of entomology was the result of natural inclination, good training and broad though comparatively brief experience. After his graduation from Colorado Agricultural College in 1920, he was employed by the Great Western Sugar Company to conduct studies on insects affecting sugar beets. In 1921 he obtained an appointment as an assistant in the Biology Department of Leland Stanford University and pursued studies which led to an M.A. degree in 1922. In that year he was appointed head of the Biology Department of San Mateo Junior College, California. A few years later he matriculated at Stanford and worked toward a Ph.D. degree, presenting as a thesis as part of the requirements for the degree a paper entitled "A Contribution Towards a Monograph of the Adelginae (Phylloxeridae) of North America."

Dr. Annand made his mark in entomology. It will be in evidence for years to come. His many friends and associates believe that his stature as an administrator and as an entomologist would have continued to grow with the years. They will always remember his devotion to his chosen field and the energy and enthusiasm with which he supported all phases of the science of entomology.

He is survived by his wife, Ruth Lovett Annand, a daughter, Doris M. Annand, a son, Richard J. Annand, and by two brothers.

A. S. HOYT, *Chairman*
W. H. WHITE

BOOK REVIEW

PLANT PATHOLOGY, by John Charles Walker, Professor of Plant Pathology in University of Wisconsin. McGraw-Hill Publications in the Agricultural Sciences. R. A. Brink, Consulting Editor. 8 vo., cloth, 699 pp., 194 illus., First ed., N. Y., McGraw-Hill Book Co., 1950. $7.50.

Space is given in our Proceedings for brief notice of this non-entomological work for the reason that it not only forms an excellent companion volume to accompany the recently issued ''Principles of Insect Pathology,'' by Steinhaus, (Proc. Ent. Soc. Wash., 52(5)272-274, 1950) but it also contains much down to date information, useful to entomologists, concerning problems in which many are deeply interested, notably, Dutch elm disease, blister rust, citrus canker, black stem rust, as well as the whole field of insect transmission of plant diseases. After a brief introduction, and a short chapter on the historical background, the plan of the book follows a logical sequence of diseases from the nonparasitic, proceeding through the parasitic, beginning in the latter with the simplest forms, proceeding up the scale of fungi, then to the parasitic higher plants and to nematodes. The virus diseases are next treated, then general chapters on environment, host-parasite relations and disease control follow. The chapter on virus diseases is of particular interest since there are discussed the newest trends in fungicidal materials for spraying and seed treatment, as well as the most recent techniques for development of disease resisting varieties. Complete life histories, illustrations of many disease organisms, and comprehensive lists of references to source material add greatly to the practical usefulness of the book.

J. S. WADE

A NEW SPECIES OF STENAMMA FROM NORTH CAROLINA
(Hymenoptera, Formicidae)

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

The genus *Stenamma*, which no doubt occurs over all the United States except the extreme southern portion and our hot, arid regions, has workers which are characterized by their slender body and small size (approximately 2-4 mm.), bicarinate clypeus, very small or vestigial eyes, 12-segmented antenna with the last 4 segments forming an indistinct club, scape failing to reach the posterior border of the head, distinct mesoepinotal constriction, pedunculate petiole, and the usually rugulose to ruguloso-reticulate sculpturing of the head and thorax. The ants live in small colonies (a few dozen to two or three hundred individuals) in rotten wood and in the soil beneath objects. One of their preferred habitats is wooded areas. Workers are subterranean in habit and thought to be strictly carnivorous.

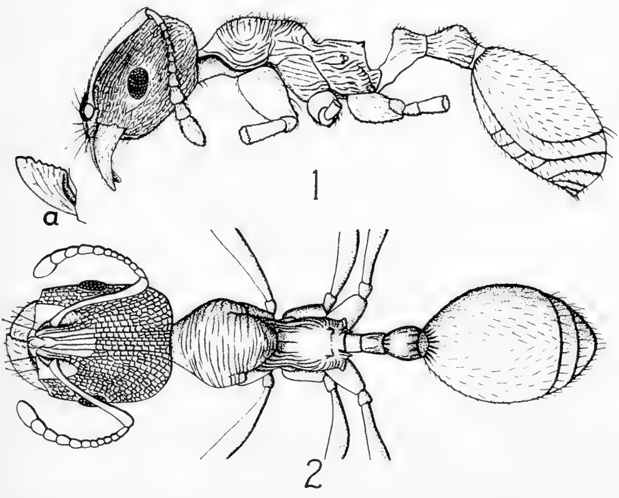
According to Creighton, 1950 (Ants of North America), nine forms have been described—*brevicorne* (Mayr), *diecki* Em., *diecki sequoiarum* Whlr., *fovolocephalum* M. R. Sm., *heathi* Whlr., *impar* For., *impressum* Em., *nearcticum* Mayr, and *schmittii* Whlr.

It is unfortunate that no winged castes of *carolinense* and *fovolocephalum* have been collected, as it would be interesting to know whether the castes of these two forms have anterior wings with venation similar to that of *brevicorne* (with the inner branch of the cubital vein arising from the middle of the cubital cell) or to that of *nearcticum* (with the inner branch of the cubital cell arising from the cross vein).

Stenamma carolinense, new species

Worker. Length 4 mm. Head, exclusive of the mandibles and eyes, approximately 1¼ times as long as broad, with almost imperceptibly emarginate posterior border, rounded posterior corners and weakly convex sides. Eye oval, extremely large for a *Stenamma*, with approximately 11-12 ommatidia in its greatest diameter. Scape when fully extended failing by approximately one-fifth its length of reaching the posterior border of the head. All funicular segments approximately as long as, or longer than, broad, the last four segments forming a rather indistinct club. Frontal area subtriangular, impressed, but not distinct from all aspects. Clypeus very weakly bicarinate, almost imperceptibly so; the median anterior border subtruncate. Mandible well developed, subtriangular, with two prominent apical and four or five small, rather indistinct basal teeth. Dorsal surface of pronotum and mesonotum in profile rather uniformly convex up to the point where the posterior part of the mesonotum forms a more or less straight incline into the distinct mesoepinotal constriction. Mesoepinotal impression strongly developed but very clearly longer than deep. Epinotum in profile with a weakly sloping, somewhat subhorizontal, straight base, which is separated from the declivity by a pair of extremely short, broad and rather blunt tubercles. Petiole from above and behind with a sharply defined anterposterior, angular node, the node widest at the base and tapering apically, and with a straight or very weakly rounded, transverse superior border. Postpetiole from above longer than broad, subcampanulate. Gaster oval, with poorly defined humeri. Longitudinal rugulae at the base of the gaster not as long as the greatest diameter of the post-petiolar node.

Cheeks and front of head with longitudinal rugulae. Much of the posterior dorsal surface of the head and the posterior sides of the head with ruguloso-reticulate, umbilical-like punctures. Pronotum and mesonotum largely smooth and shining but also with fine transverse rugulae. Mesopleuron and side of epinotum with coarse, longitudinal rugulae interspersed with some reticulae. Petiolar node mostly punctulate, also with a few fine rugulae. Postpetiolar node above largely smooth and shining.



Stenamma carolinense, new species. Fig. 1, profile of worker. Fig. 2, dorsal view of worker. Fig. a, left mandible of worker. Most of the legs omitted from the figures and also pilosity on certain parts of the body. (Illustrations by Miss Addie Egbert.)

Body and appendages clothed with abundant, suberect to erect hairs, those on the head and appendages apparently shorter and more reclinate than elsewhere. Clypeus with a number of unusually long hairs.

Body light brown or reddish brown with paler legs. Vertex of head with an infuscated area.

Type locality. On U. S. Highway 1, approximately one mile north of Hoffman in Richmond County, North Carolina.

Described from a holotype and a paratype worker collected by Wm. F. Turner from sparsely vegetated, sandy soil in a peach orchard. The holotype which was collected on February 10, 1937 bears the number T-2640 and the paratype collected on February 11, 1937 bears the number T-2714. Both specimens have been assigned U. S. N. M. Type No. 60922 and placed in the United States National Museum.

The paratype is very similar to the holotype differing from it in its slightly smaller size (3.8 mm.), scape when fully extended failing by one-eighth its length of reaching the posterior border of the head, and the petiolar node when viewed from above and behind, with almost subparallel sides.

This new species can be clearly distinguished from other North American forms by the following characters: Large size (3.8-4 mm.); eye with 11-12 ommatidia in the greatest diameter, clypeus with very poorly developed carinae; epinotum viewed in profile, with rather straight, subhorizontal base, and bearing a pair of extremely short, broad and rather blunt tubercles; pronotum and mesonotum largely smooth and shining but also with fine transverse rugulae; and the postpetiole when viewed from above and behind, longer than broad, subcampanulate.

S. fovolocephalum is very closely related to *carolinense* but differs from that form in its smaller eye (approximately seven ommatidia in its greatest diameter) and by the coarsely sculptured thorax, petiole and postpetiole. The pronotum and mesonotum of *fovolocephalum* is coarsely and transversely rugulose reticulate and the petiole and postpetiole irregularly rugulose-reticulate.

BOOK REVIEW

A FIELD GUIDE TO THE BUTTERFLIES OF NORTH AMERICA, EAST OF THE GREAT PLAINS, by Alexander B. Klots, Assistant Professor of Biology at the City College of New York. The Peterson Field Guide Series, Houghton Mifflin Co., Boston, xvi + 349 pp., 16 col. pls., 24 halftone pls., clothbound, 1951. $3.75.

This pocket volume is a welcome addition to the series initiated by Peterson's "Field Guide to the Birds." Like its predecessors it is based on the system of field identification perfected by Peterson, which consists of numerous accurately colored paintings or black and white photographs of the subjects of the guide with the "catch" characters for rapid field identification indicated by black dashes. The present guide figures 417 of the 600 forms occurring in the area treated, according to the text all of the important ones. The explanations facing the plates are much more detailed and useful than in the companion work on birds, for in addition to a brief description and cross-reference to the page of text discussing each species more fully, there are given the range, sex, reduction of plate figure and locality data for the specimen figured, all very useful items of information. The illustrations are interspersed with the text in which the following information is given for each species or subspecies so far as practicable: common and scientific names, cross-reference to the page or pages on which the form is figured, a more extended description and statement of range and preferred habitat, a brief description of the larva and list of food plants where known, a list of similarly marked species, and a brief statement of the range and markings of other subspecies. Supplementary keys are given for some of the more difficult genera or higher groups. Much of the information on food plants and geographic range has not been recorded previously. Strays and dubious records are included in a separate section.

An introductory section of some 60 pages presents enough information on collecting and preserving specimens, the butterfly and its environment, life history, adult characters and classification to give the beginner a sound foundation for pursuing this hobby. Of particular value to naturalists in general are the inclusion in the chapter on the butterfly and its envoronment, of delineations of the life and rainfall zones in North America east of the 100th meridian, and environments and habitats illustrated by photographs.

The concluding section has appendices on principles of classification, butterfly literature and collections, and a checklist of the species occurring in the area treated. Separate indices are given for technical terms, larval food plants and the adult butterflies.

The following errors have been called to my attention by J. G. Franclemont who is contributing a review to another journal: on Plate 14, Figure 14 should be 12, and Figures 12 and 13 should be 13 and 14; in the explanation of Plate 28 the legends for Figures 10 and 11 should be reversed; and in the explanation of Plate 35 the legend for Figure 7 is lacking—it is a male of *Poanes hobomok*.

This guide should be a real boon to the myriad of enthusiastic butterfly collectors. Those of us who began our entomological careers as butterfly hunters with only the cumbersome Holland as a guide may be justly envious of our successors who have this compact, information-crammed manual available for field use.

Karl V. Krombein,
Bureau of Entomology and Plant Quarantine.

A NEW RECORD AND TWO NEW SPECIES OF NORTH AMERICAN HISPINAE

(COLEOPTERA CHRYSOMELIDAE)

By MILTON W. SANDERSON, *Illinois Natural History Survey, Urbana, Illinois*

The hispine genus *Chalepus* Thunberg, as at present restricted, contains two previously recorded species in the United States, *bicolor* Oliv. and *walshi* Crotch. Two additional species have been found in the southern states, one a Central American species which was recently collected in Texas, and the other an undescribed species from Florida. All four species agree in that the antennae are 11-segmented, there are 10 rows of elytral punctures, the scutellar row of punctures is absent, and some of the elytral intervals are entirely or in part carinate. *C. bicolor* and *walshi* differ from the two species described here by having the elytra uniformly black or blue. *C. bellulus* Chapuis and *hebalus*, n. sp., have the elytra yellow or reddish in the basal region.

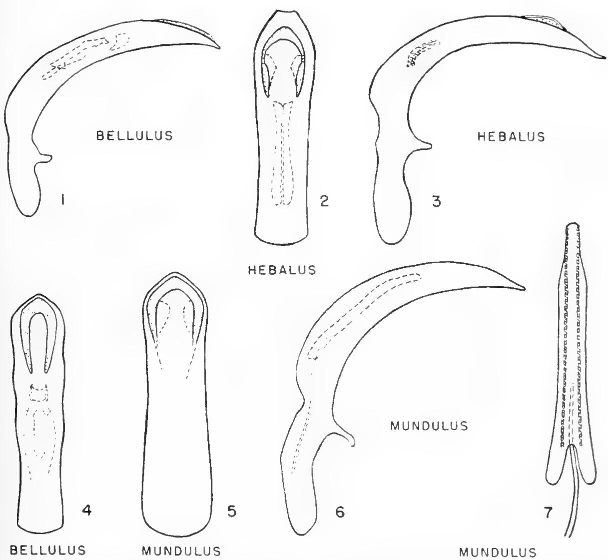
Chalepus bellulus Chapuis

This species has previously been recorded from Nicaragua, Guatemala, and Mexico. Three adults, agreeing with the figure and description of *bellulus* Chapuis by Baly (Biol. Cent. Amer. 6(2): plate 3, 1894), have been studied from Brownsville, Texas. They were collected December 27, 1946 by R. H. Beamer, and are in the collection of the University of Kansas.

Male. Length 6 mm.; width 2 mm. Carinae of 2nd, 4th, and 8th elytral intervals distinct; elytral rows 5, 6, 7 and 8 constricted at middle of disc with some of the punctures obliterated. Elytra with apical third blue-black, the black area extending narrowly along suture to scutellum, extending more widely along lateral margin of elytron, and a little enlarged on humerus. Basal discal area of elytra with a broad longitudinal yellow stripe. Pronotum reddish. Venter red. Legs largely black, the basal half of each femur and each coxa yellow. Male genitalia as in figs. 1 and 4.

Chalepus hebalus, new species

Male. Length, 7 mm.; width, 2 mm. Head black, the vertex with a deep median longitudinal groove and a shallower groove close to upper margin of each eye; head between eyes very finely granulate and dull, less granulate and very shining behind each eye on side; area very narrow between antennal bases, sharply carinate, then suddenly enlarged to form a narrow front, slightly constricted at middle; antenna black, finely granulate, dull, 3rd segment very slightly longer than 4th, 6th slightly shorter than 5th. Pronotum entirely red, granulate and dull, the anterior margin above dusky; width of pronotum about one-fourth greater than extreme median length, the sides on basal three-fifths parallel then converging anteriorly and constricted, then straight to apex; pronotum coarsely and deeply punctured, the punctures a little larger in median area and nearly all separated by very narrow carinate ridges. Elytron entirely shining red in basal region, the lighter area extending diagonally from the suture about one scutellar length behind the scutellum to the lateral elytral margin about one-third its length from apex; apical region of elytron blue-black, duller than basal area; intervals between 2nd and 3rd, and 4th and 5th rows of punctures distinctly raised into convex shining carinae; basal part of carina between 6th and 7th rows of punctures a little more distinct than apical part of carina; elytral rows 5, 6, 7 and 8 together constricted at middle of their length, the punctures confused and reduced to about three



TEXT FIGURE. MALE GENITALIA OF HISPINAE. Fig. 1, *Chalepus bellulus*, lateral view. Fig. 2, *C. hebalus*, dorsal view. Fig. 3, *C. hebalus*, lateral view. Fig. 4, *C. bellulus*, dorsal view. Fig. 5, *Xenochalepus mundulus*, dorsal view. Fig. 6, *X. mundulus*, lateral view. Fig. 7, *X. mundulus*, enlarged internal process on aedeagus.

rows; carina between rows 8 and 9 a little sharper than 1st and 2nd carinae; side margin of elytron serrate, the spines in the apical region varying in length from one-half to equal the width of the elytral flange. Mesosternum red, its side pieces, the entire metasternal area and the abdomen black; last sternite very narrowly pale at side margin. Legs entirely blue-black; the anterior and middle coxae in part reddish. Male genitalia (figs. 2 and 3) with the apex subtruncate.

Holotype male. Homestead, Florida, January 25, 1946, C. O. Esselbaugh. Type in the collection of the Illinois Natural History Survey.

This species may be distinguished from *bellulus* Chapuis, the only other species in the United States with maculate elytra, by the entirely black legs, instead of having the basal half of each femur yellow. In *hebalus* the venter, except the prosternal area and mesosternum, is entirely black, and in *bellulus* the entire venter of the body is reddish. The apex of the male genitalia (fig. 4) in *bellulus* is distinctly angulate and not subtruncate as in *hebalus* (fig. 2).

Xenochalepus mundulus, new species

Male. Length 5.5 mm.; width 2.5 mm. Head black, vertex with an anterior narrow median longitudinal carina becoming suddenly wider on a point above antennal bases; vertex behind carina flattened in median region with short elongate punctures between this area and eye; base of head with a narrow median longitudinal groove; antenna black, three basal segments a little more shining than the apical ones, 3rd segment about one-third longer than 2nd or 4th. Pronotum bicolored, a large median black spot widest at base and narrowing to a point behind anterior pronotal margin; lateral margin of pronotum broadly black, the dark area narrowing to anterior and posterior angles of pronotum; remaining area of pronotum uniformly orange red; pronotum one-half wider than long, the lateral margin parallel on basal three-fifths then narrowed to apical margin; punctures coarse, deep, generally elongate, closely placed but more widely spaced on the median area, the inner spaces smooth and shining. Elytra black, the basal one-fifth of each with an elongate yellow triangular area extending from the base of the inner costa to the lateral elytral margin; three well developed costae extending nearly full length of elytron; punctures of elytra generally round, but distinctly elongate toward apex, especially in first two rows near suture. Venter and legs entirely black. Male genitalia (figs. 5, 6 and 7) with internal basal sclerotized piece on copulatory sac about one-half the length of genitalia beyond basal constriction, and without a terminal curved tube.

Female. Indistinguishable from male except by dissection.

Holotype male—Oglesby, Illinois, May 20, 1946, F. G. Werner. Allotype female—Savanna, Ill., July 29, 1892, McElfresh. Paratypes as follows: Savanna, Ill., July 29, 1892, McElfresh, 9 specimens; Savanna, Ill., July 23, 1892, McElfresh, 8 specimens; Ravinia, Ill., July 9, 1907, A. B. Wolcott, 1 specimen; Funks Grove, Ill., June 2, 1883, 1 specimen; Starved Rock State Park, Ill., July 11, 1941, Ross & Ries, 1 specimen; Starved Rock State Park, Ill., Sept. 3, 1930, T. H. Frison, 1 specimen; Plummers Id., Md., June 17, 1913, J. D. Hood, 3 specimens, ♂ and ♀ in copula; Glencarlyn, Va., May 30, 1906, F. Knab, 2 specimens. Types in the collection of the Illinois Natural History Survey.

The series of individuals ranges in length from 5 mm. to 6.3 mm. and in width from 2.2 mm. to 2.5 mm. There is also some variation in the dark pronotal spots. In a few individuals the median and lateral dark areas have become fused at the middle and base to form a continuous but irregular transverse band from one lateral margin to the other.

From *scapularis* Olivier, with which it has been mixed in collections, it differs in its average smaller size, the venter and legs being entirely black and not in part red as in *scapularis*, the elytral punctures in the two inner rows being elongate toward apex instead of rounded, and there are differences in the male genitalia. In *mundulus* (fig. 6) the heavily sclerotized structure of the internal aedeagus is about one-half the length of the terminal portion of the genitalia, but in *scapularis* this structure is about one-third the length of the terminal part and bears a long curved cylindrical process at its apex.

A CHANGE OF SPECIFIC NAME IN THE GENUS CULICOIDES

(Diptera, Heleidae)

By F. A. Simoes Barbosa, *University of Recife, Brasil*

Culicoides wokei Barbosa was proposed as a specific name for specimens collected in Central America, and it was named in honor of Dr. Paul Woke of the U. S. Public Health Service (An. Soc. Biol. Per., 7 (1): 3-30, 1947).

In the same year I. Fox described a new species with the same name, *C. wokei* (Kuba 3: 90-91, 1947). So a homonym was created, and a new name is needed for one of the species.

Since my paper was published in November 1947 and Dr. Fox' paper was published in June of the same year, I must change my specific name. I propose *Culicoides diminutus*, nom. nov. (syn. *Culicoides wokei* Barbosa, not Fox), and I choose the male labeled in my paper (Plate 7, fig. 1) as lectotype. It is deposited in the U. S. National Museum.

REPORT OF THE CUSTODIAN FOR 1950

Report on Memoirs

Memoir 1. Original issue—300; sold in 1950—16; on hand—127
Memoir 2. Original issue—300; sold in 1950—25; on hand—82
Memoir 3. Original issue—510; sold in 1950—69; on hand—395

Receipts from sale of Memoirs (Several recent bills outstanding):
1. \$48.80; 2. \$79.65; 3. 663.60; Total \$792.05

Report on Sales and Costs

Receipts from the sale of back numbers of Proceedings, back volumes, and miscellaneous separates: \$506.34. Theoretical total receipts: \$946.42. (This last figure is the total for all literature sold including the Memoirs.) Costs: Postage: \$35.50.

During the year 2 complete sets of the Proceedings were sold. The amount for these 2 items alone totaled \$262.40 of the above figure. The Society is exceedingly grateful to those members who continue to donate copies of the Proceedings. About 125 copies were received this year. Of the 69 copies of Memoir 3 sold, one copy was given free to the Commonwealth Institute of Entomology of London for book reviews in the Review of Applied Entomology and the Insecta part of the Zoological Record.

HELEN SOLLERS, *Custodian*

REPORT OF THE CORRESPONDING SECRETARY FOR 1950

Membership—Jan. 1, 1950—455 (adjusted figure)

Deductions:		
Resigned	9	
Dropped	2	
Deceased	6	17
		438
Added:		
Elected to membership	23	
Reinstated	1	24
Membership Dec. 31, 1950		462
Net gain in membership during year		7

Classes of Membership

Active, dues paying	447
Retired	11
Honorary	1
Life (includes 1 effective Jan. 1, 1951)	3
	462

Circulation of Proceedings:

Via Mail:	
States, poundage rate	347
Hawaii, Puerto Rico, and Canal Zone, poundage rate	16
Canada, stamped	11
District of Columbia, stamped	37
Foreign, stamped	60
South America, poundage rate	36
Via Chain Mail	129
	636

Distribution:

To Members	450
To Subscribers (1949—181)	186
	636

RALPH W. SHERMAN, *Corresponding Secretary*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
606TH REGULAR MEETING, FEBRUARY 1, 1951

The 606th regular meeting of the Society was held at 8 P.M., Thursday, February 1, 1951, in Room 43 of the U. S. National Museum. President Stone presided and 31 members and 17 visitors were present. The minutes of the previous meeting were read and approved.

R. H. Nelson, Treasurer, presented his annual report for 1950. This report was accepted and approved as read.

Corresponding Secretary R. W. Sherman presented his 1950 report whch was accepted and approved as read.

R. I. Sailer reported on the condition of the reserve stock of publications.

The Recording Secretary read the Annual Report of the Editor, K. V. Krombein.

Members elected to the Society were: Wilson F. Dawson, Dr. Engel Gilbert, Lt. Cynthia M. Gray, Dr. Don M. Rees, and Lt. Vernon L. Tipton.

Dr. Stone announced that the Executive Committee had approved the appropriation of $10.00 to the Science Fair.

T. E. Snyder, on behalf of the Executive Committee, nominated Dr. C. L. Marlatt for the Society's third Honorary President, succeeding Dr. L. O. Howard (1929-1950) and Dr. E. A. Schwarz (1917-1928). Following hearty approvals and commendations by W. D. Reed and F. C. Bishopp the motion was approved.

Helen Sollers presented her report for 1950 as Custodian.

William E. Bickley described the recent meeting of the Virginia Mosquito Control Association at Norfolk, and introduced Richard F. Philpitt, a student at the University of Maryland, who commented on woolly-bear caterpillars in relation to weather. A legend from Colonial days predicts a severe winter to come if the brown band around the the middle of the caterpillars is narrow and a warm winter if the band is wide. Dr. C. H. Curran has made observations at Bear Mountain, N. Y. since 1947 which tend to validate the legend. Although only two caterpillars had narrow bands out of forty-one collected in the College Park area in the fall of 1950, weather data for the winter of 1950-51 show that up to February the temperature at College Park has been within three degrees of the average, so that as yet the winter is not mild as predicted by the woolly-bears.

Don J. Pletsch exhibited two large pieces of lead telephone cable sheathing which had been extensively damaged in Japan by subterranean larvae of the cerambycid *Batocera lineolata* Chevr.

C. F. W. Muesebeck added that prionid larvae recently sent in for identification, had damaged lead cables in the Baltimore area in the vicinity of pine thickets.

A. B. Gurney announced that the Program Committee had arranged a special joint meeting with the Biological Society of Washington, to be held March 10. He also presented two brief notes about crickets, the first on the finding of a specimen of the bush cricket, *Hapithus agitator* Uhler, parasitized by the larva of a wasp, *Rhopalosoma nearcticum* Brues. Information on the larval morphology and life history of the parasite additional to that presented by Hood (Proc. Ent. Soc. Wash. 15: 145-147, (1913) 1914) has been assembled and will be published elsewhere. Dr. Gurney also discussed recent studies bearing on the name of the field cricket, *Acheta assimilis* F. He referred in particular to the change in the generic name from *Gryllus* to *Acheta* (Gurney, Jour. Wash. Acad. Sci. 40:412, 1950) and to the observations of B. B. Fulton (Jour. Elisha Mitchell Sci. Soc. 65: 204, 1949) which indicate that four distinct races of *assimilis* occur in North Carolina.

R. I. Sailer exhibited living examples of six species of stink bugs be-belonging to four genera, as well as a burrowing bug, a negro bug, and a coreid. He briefly described his rearing technic, which involved the use of fruit jars, toweling paper and string beans. With these readily available materials and a minimum of attention *Euschistus servus* (Say) has been carried through four generations in 10 months. Dr. Sailer suggested that stink bugs be considered as laboratory animals by workers interested in using insects for experimentation. Additional details of rearing technic and biology will be published elsewhere.

Willis W. Wirth presented, in a most interesting manner and with beautiful kodachrome slides, the feature paper of the evening, entitled: "Insect Evolution in the Hawaiian Islands." Dr. Wirth pointed out that insect evolution in oceanic islands differs greatly from that on continents due to the dominant role of isolation as opposed to competition. The advantages of these islands as a natural laboratory for the study of most of the basic principles of evolution were discussed. A brief resume was given of the geological, geographical and ecological features of Hawaii which were of special significance in the development of its fauna. The peculiar features of the endemic animals were listed and their probable development from a very limited number of immigrants was pointed out. It was stated that marine drift, winds during storms, and probably birds were the principal agents promoting the dispersal of these immigrants across the scattered island groups from the southwest. Usinger's study of the Hawaiian Orsillini, a tribe of plant bugs, was discussed as one of the best analyses of speciation on oceanic islands. The speaker then dicussed his own studies on the marine midges in Hawaii. He explained his concept of the process by which the freshwater species of *Telmatogeton* were derived from a marine ancestor, and discussed the development of species on different islands of the Hawaiian group. (Author's abstract.)

F. C. Bishopp presented a series of additional colored slides which he had taken while he and Mrs. Bishopp were visiting the Hawaiian Islands this past summer.

Dr. Stone introduced Dr. Luis Vargas, a member of the Society who is resident in Mexico. Dr. Bishopp introduced Dr. Ziand Dean.

The meeting adjourned at 10:00 P.M.

G. B. VOGT, *Recording Secretary.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
607TH REGULAR MEETING, MARCH 1, 1951

The 607th regular meeting of the Entomological Society of Washington was held in Room 43 of the U. S. National Museum, Thursday, March 1, 1951. Forty-two members and 17 visitors were present. President Stone called the meeting to order at 8 P.M., and announced the departure from the Washington area of two officers of the Society, Vice President P. W. Oman and Recording Secretary G. B. Vogt, and the appointment of Miss Kellie O'Neill by the Executive Committee to fill Mr. Vogt's unexpired term. The minutes of the previous meeting were then read and approved.

The Society elected to membership Mr. Ellis B. Hayden, Jr. [2981 St. Clair Avenue, Detroit 14, Michigan] and Mr. Garn Tom Stanworth [2174 So. 3rd East, Salt Lake City, Utah].

President Stone read a letter from Dr. C. L. Marlatt accepting with pleasure his election to Honorary President of the Society, and noted that Mrs. Marlatt also sent a letter of appreciation.

The death of Dr. Henry E. Ewing was announced by Dr. Stone, who reviewed briefly the life and work of Dr. Ewing, and appointed A. B. Gurney and E. W. Baker, chairman, as the committee to prepare his obituary.

The death of Dr. S. A. Rohwer was announced by Dr. Stone. Dr. Rohwer's long career and service in various offices of the Society were mentioned, and a committee of A. B. Gahan, E. R. Sasscer and C. F. W. Muesebeck, chairman, was appointed to write his obituary.

R. I. Sailer told of the celebration to be held March 19th on the 95th birthday of Herbert Osborn, Honorary Member of the Society and one of the oldest members. The Society voted to send good wishes to Dr. Osborn on the occasion.

R. H. Nelson circulated a picture he found of early entomologists and asked if anyone could furnish the names of some he could not identify. Mr. Nelson read letters of greeting to the Society from James Zetek and from W. D. Pierce, who described his present research and other work.

Mr. R. Tucker Abbott of the U. S. National Museum, introduced by A. B. Gurney, gave a note on the giant African snail, *Achatina*. A resume of the history of the spread of this agricultural pest was given, with notes on recent biological control experiments now being conducted in the Pacific. In the discussion following Mr. Abbott's note R. E. Snodgrass called attention to his article on the snail appearing in the Smithsonian Yearbook for last year.

After an introductory remark by R. I. Sailer on the impressiveness of the cockroach room maintained by Price G. Piquett of the Division of Control Investigations of the B.E.P.Q., a note on roaches was given by Mr. Piquett, who described the life history and demonstrated specimens of *Supella supellectilium* (Serv.), an introduced pest reared in enormous numbers for insecticide tests, and also exhibited examples of the largest species maintained, the exotic *Blaberus giganteus* (L.), found in tropical Africa and Central and South America.

The principal speaker of the evening was Dr. Vincent G. Dethier, of Johns Hopkins University, who talked on studies of chemoreceptors in the blowfly *Phormia regina* Meigen.

The blowfly, *Phormia regina* Meigen, is an ideal organism for the study of chemoreception in insects. Organs of taste are located on the labellum and on the tarsi. Olfactory organs are located on the antennae and labellum. After removing the olfactory organs one may study the taste response of *Phormia* to a variety of organic compounds. Correlations have been found between the chemical and physical properties of aliphatic compounds and their ability to stimulate the tarsal contact chemoreceptors. The olfactory responses may be studied by means of an olfactometer. Preliminary experiments indicate that correlations also exist between chemical structures and the ability of aliphatic compounds to stimulate the olfactory sense. Thresholds of rejection and thresholds for attraction for a variety of compounds have been determined with this technique. Results have been recorded photographically. (Author's abstract.)

After the ensuing discussion, opened by W. A. McIndoo, Dr. Dethier acknowledged the gratitude due Dr. McIndoo and other early workers in the field.

Visitors introduced were Ernestine B. Thurman (a non-resident member), and Deed C. Thurman, Jr., who are en route to Thailand with the U. S. Public Health Service, and Phyllis T. Johnson.

The meeting adjourned at 10:00 P.M.

KELLIE O'NEILL, *Recording Secretary.*

Actual date of publication of Vol. 53, No. 2, was April 12, 1951.

Unusual Scalp Dermatitis in Humans caused by the Mite *Dermatophagoides* by Jay Traver. This article covers in detail symptoms, treatments and identification of a skin-infesting mite which causes serious damage to the human host. Reprint with cover........................50 cents.

MEMOIRS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

No. 1. "The North American Bees of the Genus Osmia," by Grace Sandhouse. \$3.00. Members' price \$2.50.

No. 2. "A Classification of Larvae and Adults of the Genus Phyllophaga," by Adam G. Boving. \$3.00. Members' price \$2.40.

No. 3. "The Nearctic Leafhoppers, a Generic Classification and Check List," by Paul Wilson Oman, \$7.00. Members' price \$6.00.

For prices on back numbers of the Proceedings and sets of unbound papers, please see the April 1951 issue.

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VOL. 53 AUGUST, 1951 No. 4

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of the

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OF WASHINGTON

PUBLISHED BIMONTHLY BEGINNING WITH FEBRUARY

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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

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

Anuual dues for members are $4.00, initiation fee $1.00 (U. S. currency). Members are entitled to the Proceedings and any manuscript submitted by them is given precedence over any submitted by non-members.

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PROCEEDINGS
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The Corresponding Secretary, Custodian and Treasurer should be addressed similarly.

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 53 AUGUST, 1951 No. 4

THE ANT LARVAE OF THE SUBFAMILY DOLICHODERINAE[1] (HYMENOPTERA, FORMICIDAE)

By GEORGE C. WHEELER and JEANETTE WHEELER, *Department of Biology, University of North Dakota*

The Dolichoderinae are one of the highly specialized subfamilies of Formicidae, surpassed only by the Formicinae. But they have become specialized mostly through reductions and losses rather than by elaborations. For example: no stridulating organ; no cocoon; sting vestigial; poison gland reduced; integument thinner and more pliable (and hence less opportunity for spines and sculpture).

Even their larvae show this same type of specialization: body length is reduced; mobility is almost lost; hairs are few, short and simple; labrum and mandibles are reduced in size and the latter are practically vestigial; the trophorhinium is poorly developed; palps and galea are little more than clusters of sensilla. About the only specializations by elaboration are the hooked hairs in *Azteca* and the bosses on the body in several other genera. The former are common among the Myrmicinae; the latter are simpler and show less variety than do the tubercles in the higher Ponerinae.

Myrmecologists have apparently never shown much enthusiasm for the Dolichoderinae. They have seemingly considered the ants of this subfamily from a sense of duty and usually as a part of some more inclusive study. This is rather to be expected, since the dolichoderines, with few exceptions, have little to offer in the way of interesting structures and habits. Their economic importance is generally slight, with the notable exception of the Argentine ant (*Iridomyrmex humilis*). They are primarily a tropical group, with few species ranging into temperate regions. And finally, the subfamily is a rather small one, though not one of the smallest.

In this article we have described the larvae of 35 species representing 12 of the genera. References from the literature are cited for 11 additional species, making a total of 46 species considered.

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[1]The research on which this article is based was aided by a grant-in-aid from the Sigma Xi Research Fund.

Subfamily **DOLICHODERINAE** Forel

Plump, chunky and turgid; straight or slightly curved; mostly subellipsoidal, with both ends broadly and equally rounded; anterior end formed by the enlarged dorsal portion of the prothorax; head ventral, near the anterior end; no neck. Anus ventral. Leg vestiges present. Segmentation indistinct. Spiracles small, but not uniform in size; the first abdominal is the largest and the last abdominal the smallest. Body and head practically naked; hairs typically very few and widely scattered; exceedingly minute to short; simple, straight or slightly curved; base stout, tapering to a fine sharp-pointed apex. Head hairs generally like body hairs in size, shape and abundance. Labrum usually small, short and broad; breadth 2-6$\times$ the length; shape varied; anterior surface with sensilla and/or minute hairs; posterior surface with 6-12 sensilla near the middle; posterior surface usually spinulose, the spinules minute and inconspicuous, but generally arranged in rows. Mandibles small, short and feebly sclerotized; ratio of head width to mandible length = 4-10; ratio of mandible length to its width at the base = 0.8-1.7; basal portion inflated; distal portion slender, acuminate and usually appearing as an apical tooth; no teeth on the mesal border; surfaces rarely spinulose or denticulate; spinules (when present) few. Maxillae and labium rarely spinulose; spinules, if present, few and minute; palps and galea never paxilliform but represented merely by clusters of sensilla which are usually somewhat elevated; palps with 3-5 sensilla, galea two. Opening of sericteries small. Hypopharynx conspicuously spinulose, the spinules arranged in subtransverse rows, the rows grouped in two subtriangles which have their bases near the middle. Food liquid; almost always of vegetable origin, regurgitated by the workers. Practically immobile when mature.

To most of the characters in the foregoing definition there are exceptions. *Leptomyrmex* is decidedly aberrant in the shape of body and head and in the uniformity in size of spiracles. Body hairs are rather numerous in *Leptomyrmex*, *Dorymyrmex*, *Araucomyrmex* and *Azteca instabilis.* Head hairs are very abundant in *Dolichoderus s. str.* We have found bifid hairs in only one species, (*Dolichoderus* (*Hypoclinea*) *plagiatus*), and oncochaetae only in *Azteca.* The labrum is narrow (breadth less than twice the length) in *Leptomyrmex* and *Bothriomyrmex.* The mandibles of *Leptomyrmex* are moderately large; those of *Liometopum*, *Araucomyrmex* and *Iridomyrmex nitidus* have a small tooth on the mesal border.

Athias-Henriot, 1947:— "Les larves de *Dolichodérinés* sont les plus immobiles et les plus simplifiées" (p. 253). Internal anatomy is discussed very briefly (pp. 259 and 263). "Il y a concordance de classement anatomique entre larves et adultes. Mais les Dolichodérinés possèdent des larves très évoluées, alors que les adultes sont plus primitifs que ceux des Formicinés" (p. 268).

Bischoff, 1927, p. 81:— "Die Larven von . . . der Dolichoderinen, besonders *Tapinoma,* sind . . . so weit auf die Kropffütterung durch ihre Pflegerinnen eingestellt, dass ihre Mandibeln so gut wie funktionlos und unbeweglich geworden sind.'' The larvae are fed the fluid contents of the workers' crops (p. 384).

Brun, 1924, p. 95:— ''Die Fütterung wird nun bei den höheren Ameisen (Camponotinen, Dolichoderinen und Myrmicinen) gewöhnlich in der Weise vorgenommen, dass die fütternde Arbeiterin einen Tropfen Nahrungsflüssigkeit aus ihrem Kropfe ausbricht und denselben auf den Mund der Larve fallen lässt.''

Emery, 1899, p. 7:— Dolichoderine larvae do not spin cocoons.

Forel, 1921, p. 138:— ''Nymphes constamment dépourvues de cocon; larves en général immobiles.'' (=1928, Vol. I, p. 133: ''Nymphs consistently deprived of cocoons; larvae generally immobile.'')

Forel, 1922, p. 136:— ''Enfin les larves . . . sont nourries directement par leurs ☿, qui leur dégorgent le contenu de leur jabot.'' (=1928, Vol. I, p. 517: ''Lastly, the larvae . . . are directly fed by their ☿, which disgorge to them the contents of their crops.'')

Gantes, 1949:— ''Les *Dolichoderidés* ont des larves évoluées, immobiles'' (p. 84). ''Chez les *Dolichoderidés* les larves sont très évoluées avec encore une progression: *Bothriomyrmex* est plus primitif que *Tapinoma.*'' (p. 89).

Wheeler, 1922, p. 200:— ''The larvae are fed with liquid food, almost always of vegetable origin regurgitated from the nurse's crop; the *Aztecae* are mostly insectivorous.''

Wheeler, 1937, p. 38:— The larvae are fed by ''a careful administration *per os* of liquid food regurgitated from the nurse's crop.''

Key to the Genera of Mature Dolichoderine Larvae in our Collection

1. Body hairs of two types: (1) simple and (2) spiral with hooked tip (oncochaetae) .... *Azteca,* p. 192
   No hooked hairs 2
2. Body elongate and stout; dorsal profile strongly curved, ventral profile nearly straight; head guitar-shaped .... *Leptomyrmex* p. 178
   Body and head not as above 3
3. Posterior end of body with a knob or cone 4
   Posterior end of body broadly rounded; without knob or cone 8
4. Low paired bosses on the dorsa of the anterior somites .... *Engramma* p. 194
   Dorsa of somites without bosses 5
5. Posterior projection a cone pointing posteroventrally .... *Dorymyrmex* p. 182
   Posterior projection a knob 6
6. Head hairs about 30 in number and about 0.036 mm long .... *Araucomyrmex* p. 183
   Head hairs fewer and up to 0.018 mm long 7

7. Terminal segments turned dorsally and produced into a conspicuous knob; anus terminal .... *Technomyrmex* p. 201
   Knob a low swelling; anus ventral .... *Tapinoma* p. 195
8. With six low rounded middorsal bosses, one each on the mesothorax, metathorax and abdominal somites I-IV .... *Froggattella* p. 182
   Without such bosses on the dorsal surface 9
9. With numerous (about 300) hairs on the head .... *Dolichoderus* (*Dolichoderus*) p. 177
   With fewer (not over 100) hairs on head 10
10. With lateral longitudinal welts continued over the anterior end of the body as a hood .... *Dolichoderus* (*Monacis*) p. 176
    Without lateral longitudinal welts continued into a hood 11
11. Slender distal portion of mandible about a third or less of the total length .... *Iridomyrmex* p. 184
    Slender distal portion of mandible about half the total length 12
12. Maxillae with a lateral patch of spinules between the palp and galea .... *Liometopum* p. 181
    Maxillae without spinules 13
13. Labrum with breadth 3-4X the length; bosses on prothorax low, not connected by a shelf .... *Dolichoderus* (*Hypoclinea*) p. 172
    Labrum with breadth only slightly greater than length; bosses on prothorax prominent and frequently connected by a shelf .... *Bothriomyrmex* p. 189

Tribe **DOLICHODERINI** Emery

Genus **Dolichoderus** Lund

Subellipsoidal and nearly straight. A pair of ventrolateral bosses on the prothorax. Mandibles very small; base moderately dilated and relatively short, distal part slender, curved, sharp-pointed and relatively long. Palps represented by clusters of sensilla; galea by two sensilla.

This genus is particularly difficult to define. The common characters are subfamilial. Perhaps this is equivalent to saying that the genus is generalized. The subgenera are also troublesome. *Hypoclinea* is especially so because of the marked specific differences and because we lack mature larvae of most of the species.

Dolichoderus subgenus **Hypoclinea** Mayr

With lateral longitudinal welts, which are distinct in young larvae but inconspicuous when mature. Leg vestiges large. Body hairs few; minute to short; scattered but somewhat more abundant on the prothorax. Cranium subcordate in anterior view. Posterior surface of labrum spinulose. Galea represented by a cluster of two sensilla, which in some species is slightly elevated. Labial palp represented by a cluster of 3-5 sensilla, which is usually on a low elevation.

Dolichoderus (Hypoclinea) taschenbergi (Mayr)
(Pl. I, figs. 1-6)

Plump, chunky and turgid; subellipsoidal; anterior end formed by the enlarged dorsal portion of the prothorax; head ventral but near the anterior end; a pair of low ventrolateral bosses near the anterior margin of the prothorax; lateral longitudinal welts inconspicuous. Anus ventral. Leg vestiges large and protruding. Segmentation indistinct. Spiracles small, but not uniform in size; first abdominal the largest, eighth abdominal the smallest. Integument very thin; spinulose, except on the welts and around the hair-bases on the prothorax; spinules in transverse rows of 2-5. Body hairs exceedingly few; minute (0.006-0.018 mm long); simple; slightly curved or flexuous; widely scattered, except for a cluster of the longest hairs on the anterior portion of the ventral surface of the prothorax. Head subcordate in anterior view; maximum breadth equal to length; dorsolateral borders depressed; mouth parts small. Head hairs few; irregularly scattered; more numerous below the antennal level; short (0.006-0.036 mm); slightly curved or flexuous; basal half stout, distal half fine and lash-like. Each antenna with three minute discoidal sensilla, each of which bears a spinule. Labrum not distinctly marked off from clypeus; short and thick, breadth 3× length; bilobed due to a wide shallow impression of the ventral surface; eight sensilla on anterior surface near ventral border and five on each half of posterior surface near the middle; posterior surface sparsely spinulose, the spinules minute and in short rows running obliquely upward and outward from the middle. Mandibles very small and feebly sclerotized; acuminate; base moderately dilated; distal half very slender, curved, sharp-pointed; sometimes with a few small denticles on the medial surface. Maxillae feebly developed; apex paraboloidal, with a few scattered sensilla; palp represented by two or three sensilla in a cluster, which is sometimes on a slight elevation; galea represented by two sensilla. Labium very short and broad; palp a cluster of three minute sensilla; opening of sericteries a transverse slit. Hypopharynx with a few subtransverse rows of spinules, the rows grouped in two subtriangles which have their bases near the middle. (Material studied: numerous larvae from North Dakota.)

Queen larvae are similiar to worker larvae except for the larger body size and hence the relatively smaller head and hairs.

Wheeler, G. C., 1938, p. 141:—"In the sexual larva . . . the wing rudiments have a complicated internal cuticular structure."

Dolichoderus (Hypoclinea) bidens (Linnaeus)

Similar to *taschenbergi* except in the following characters: Body hairs short (0.018-0.072 mm); longest near the head; thick at base but tapering evenly and rapidly to a slender tip. Head hairs longer (0.018-0.072 mm). Labrum 4X as broad as long; not bilobed; six sensilla low on the anterior surface posterior surface more densely spinulose. Maxillary palp a low elevation bearing 4 or 5 sensilla; galea represented by two elevated sensilla. Hypopharynx with a few minute spinules which are isolated or in short rows. (Material studied: four damaged integuments from British Guiana.)

Dolichoderus (Hypoclinea) bituberculatus (Mayr)

Apparently similar to *taschenbergi* except as follows:—Body hairs few and exceedingly minute. Head hairs very few and exceedingly minute (about 0.009 mm.) Antenna small; each with three or four sensilla, each of which bears a spinule. Labrum 5½X as broad as long; subtrapezoidal in anterior view, narrowed below; ventral border nearly straight; anterior surface with about six sensilla and/or minute hairs; posterior surface with about eight sensilla near the middle and with minute spinules in short to long transverse subparallel rows; spinules continued onto the ventral surface. Mandibles with the base greatly inflated; distal half slender, acuminate, with needle-like point. Maxillae bulging laterally; with two sensilla and one minute hair between palp and galea; palp represented by three sensilla (one button-like) in a loose cluster; galea represented by two sensilla. Labrum with about six scattered sensilla and/or minute hairs; palp represented by a cluster of three sensilla (one button-like). (Material studied: two damaged integuments from Borneo.)

Goot, 1917 (translated from the Dutch original):—"The just hatched larva may be distinguished from the eggs by the somewhat pointed anterior end and sometimes by the indistinct segmentation of the anterior portion. The body is nearly naked; only the head and thorax show a number of short scattered erect hairs. The length is about 0.48 mm and the breadth 0.30 mm. During its later development the young larva keeps its place against the wall of the nest; it is practically immobile and is wholly dependent upon the care of the workers, which supply it regularly with liquid food and in case of danger remove it to safety. In captivity the workers feed the older larvae in part with freshly laid eggs from the same nest . . . As the larva grows it changes more and more into an unwieldy sausage-shaped blob[2] with rounded ends from which only the mouth parts on the under side of the head project as a small pellet. . . . The color of the growing larva changes gradually; at first almost watery transparent, it becomes by degrees a more opaque white. The full-grown larva is immobile and cylindrical, with equally rounded ends; its length is 2.3 mm, its breadth 1.1 mm. . . .The semipupa shows a constriction between the thorax and abdomen; its color is an opaque white but the thorax is always more glassy-transparent; its length is 2.5-2.6 mm. . . . The sexual larvae may be distinguished by their larger size in the latter part of their development. Apparently there are no other external morphological differences between the larvae of the several castes" (pp. 5-7). Life cycle (pp. 5-8): egg 12-16 days, average 14 days; larva 9-20 days, average 15 days; worker pupa 12-16

[2]The Dutch is quite intriguing at this point: *een plomp worstvormig klompje*.

days, average 14 days; total 37-52 days, average 43 days. Table 2 (p. 116) gives the duration of the larval periods of 29 larvae. Pl. I, fig. 2, a photograph of larvae and pupae of workers and queens.

Dolichoderus (Hypoclinea) championi Forel
(Pl. I, fig. 12)

Plump and chunky; nearly straight; not attentuated toward either end; ends round; enlarged dorsal portion of the prothorax forming a prominent welt across the anterior end; this welt continued along each side of the body to the posterior end. Anus ventral, with a conspicuous posterior lip. Other characters apparently as in the mature *taschenbergi* except as follows:—Labrum 6X as broad as long; subtrapezoidal, narrowed below; ventral border nearly straight; two minute hairs near the middle of the anterior surface. Distal portion of mandible shorter and less sharp at the tip. Maxillary palp a conoidal projection bearing four sensilla (one of which is apical); galea a low elevation bearing two sensilla. Labial palp a low elevation bearing four sensilla. (Material studied: four immature larvae from Panama.)

Dolichoderus (Hypoclinea) plagiatus (Mayr)
(Pl. I, figs. 7-11)

Plump and chunky; nearly straight; ends round; lateral longitudinal welts prominent. Head on anterior end. Anus ventral, with conspicuous anterior and posterior lips. Thirteen differentiated somites. Spiracles small, but not uniform in size; first abdominal the largest, eighth abdominal the smallest. Integument thin; spinulose, the spinules minute and isolated or in short rows anteriorly but larger, more numerous and in longer rows posteriorly. Body hairs few, most abundant on prothorax diminishing progressively toward the posterior end; short (about 0.035 mm); simple; slightly curved, with stout base, gradually attenuated to a very slender sharp tip; a few are bifid. Head a fourth broader than long; lateral borders and dorsal corners broadly rounded; occipital border concave; mouth parts small. Antennae large, elliptical, each with three sensilla, each of which bears a minute spinule. Head hairs numerous and uniformly distributed; short (about 0.036 mm); the majority have a stout base and taper rapidly to a long lash; a few are bifid. Labrum short and thick; breadth 3½X length; mostly concealed behind clypeus; bilobed due to a wide shallow impression of the ventral surface; about eight sensilla on the ventral surface; posterior surface of each half bearing a cluster of three sensilla near the middle, one or two sensilla near the ventral border and a few minute spinules in short oblique rows. Mandibles very small and feebly sclerotized; acuminate; base moderately dilated; distal half rather slender, slightly curved; sharp-pointed; median surface with minute denticles, a few lines (rows of spinules?) on the anterior surface. Maxillary palp a cluster of three sensilla on a low convexity; galea represented by two elevated sensilla. Labium short and broad; palp a discrete elevation bearing three sensilla;

opening of sericteries a transverse slit. Hypopharynx with subtransverse rows of spinules, the rows grouped in two subtriangles which have their bases near the middle. (Material studied: five immature larvae from Michigan.)

Dolichoderus (Hypoclinea) scabridus Roger

Apparently similar to *taschenbergi* but differing in the following particulars: Integument beset with long (about 0.027 mm) hair-like spinules on the prothorax and on the mesothorax (but not on their lateral welts); elsewhere the spinules are exceedingly minute or lacking. Labrum 4X as broad as long; posterior surface more densely spinulose. Maxillae roughened with spinules in groups of two or three; palp a cluster of five elevated sensilla; galea two sensilla on a low elevation. Labium spinulose, the spinules in transverse rows of four or five; palp a cluster of five elevated sensilla. (Material studied: several damaged integuments from New South Wales.)

Dolichoderus subgenus **Monacis** Roger

With lateral longitudinal welts, which are distinct in young larvae but inconspicuous when mature. Prothorax as a whole forming a rounded collar about the head. Body practically naked; hairs few, exceedingly minute and widely scattered. Head practically naked; hairs very few and exceedingly minute. Cranium transversely subelliptical in anterior view. Labrum small; its posterior surface spinulose. Maxillae transversely subelliptical; palp represented by a cluster of 3-7 sensilla; galea by two sensilla. Labium small; palp represented by a cluster of three sensilla. Hypopharynx sparsely spinulose, the spinules arranged in rows.

Dolichoderus (Monacis) debilis Emery
(Pl. I, figs. 13-16)

Plump, chunky and turgid; subellipsodial; anterior end formed by the enlarged dorsal portion of the prothorax; head ventral but near the anterior end; a pair of ventrolateral bosses near the anterior margin of the prothorax; lateral longitudinal welts inconspicuous. Prothorax as a whole forming a rounded collar about the head. Anus ventral. Leg vestiges present. Segmentation indistinct. Spiracles small but not uniform in size; first abdominal the largest, eighth the smallest. Integument thin and sparsely spinulose; spinules minute and isolated or in short rows, most conspicuous on the terminal somite. Body hairs few, exceedingly minute (0.006-0.009 mm long), simple, slightly curved, scattered. Cranium transversely subelliptical. Antennae small; each with three minute sensilla, each of which bears a spinule. Head hairs very few, exceedingly minute (0.005-0.018 mm long), widely scattered, simple, slightly curved. Labrum very small; subtrapezoidal in anterior view, narrowed ventrally; breadth 4½X length; ventral border feebly impressed; anterior surface bearing six sensilla and two minute hairs;

posterior surface with about nine sensilla near the middle; posterior surface spinlose, the spinules minute and arranged in short transverse rows. Mandibles very small and feebly sclerotized; basal half moderately enlarged; distal half slender, acuminate, sharp-pointed and slightly curved near the tip. Maxillae transversely subelliptical in anterior view; palp consisting of three sensilla on a slight elevation, two small and bearing each a spinule, and one larger; galea represented by two sensilla, each of which bears a spinule, and one larger; galea represented by two sensilla, each of which bears a spinule. Labium small; palp a cluster of three sensilla, two of which are minute and bear each a spinule, the other larger and conoidal; opening of sericteries a transverse slit inside the mouth. Hypopharynx sparsely spinulose, the spinules minute and in rows. (Material studied: numerous larvae from Panama Canal Zone.)

In the young larva the enlarged dorsal portion of the prothorax forms a prominent welt across the anterior end; this welt continues along each side of the body to the posterior end.

Queen larvae are generally similar to worker larvae, except for the larger body size and hence the relatively smaller size of head and hairs. The body, however, is extremely smooth: there are no welts or bosses and there is no evidence of segmentation.

Dolichoderus (Monacis) bispinosus (Olivier)

Similar to *debilis* but differing in the following respects: Antennae large. Labrum with spinules on the ventral surface and with the posterior surface more densely spinulose. Mandibles with apical half stouter. Maxillae spinulose, the spinules isolated laterally but in short rows medially; palp a cluster of five sensilla on a slight elevation. Labium with the posterior surface spinulose; palp a cluster of five sensilla, two of which bear each a spinule. (Material studied: twelve larvae from Panama Canal Zone.)

Dolichoderus (Monacis) laminatus (Mayr)

Apparently similar to *debilis* except as follows: Body hairs very few and widely scattered except for about a dozen around the anus. Head with depressed dorsolateral areas. Antennae large. Mandibles roughened with short transverse rows of minute spinules. Maxillary palp represented by 5-7 sensilla, three or four of which are agglomerated. Labial palp a cluster of four or five sensilla. (Material studied: numerous damaged larvae from Panama Canal Zone.)

Dolichoderus subgenus **Dolichoderus** Lund

Body practically naked; hairs few, exceedingly minute and widely scattered. Cranium suboctagonal in anterior view; broader than long; integument granular; head hairs short and very numerous. No spinules on posterior surface of labrum. Maxillae with conoidal apex and a large hairy paraboloidal ventrolateral lobe. Labium large.

Dolichoderus (Dolichoderus) attelaboides (Fabricius)
(Pl. I, figs. 17-19)

Plump, chunky and turgid; subellipsoidal; anterior end formed by the enlarged dorsal portion of the prothorax; head ventral but near the anterior end; a pair of low ventrolateral bosses near the anterior margin of the prothorax. Anus ventral, with conspicuous lips. Leg, wing and gonopod vestiges present. Segmentation indistinct. Integument spinulose, the spinules minute and isolated or in short transverse rows; more prominent on ventral surfaces of prothorax and abdominal somites VIII-X. Body hairs very few; exceedingly minute (about 0.009 mm long); widely scattered; curved; basal third stout, the rest slender. Cranium suboctagonal in anterior view; broader than long; integument granular. Head hairs short (0.004-0.045 mm); slender and slightly curved; very numerous (about 350); more abundant below the antennal level; several hairs between the antennae. Each antenna a low circular convexity arising from the center of a larger circular glabrous area; bearing three minute sensilla. Labrum short and thick; breadth 4X length; ventral border widely concave; anterior surface with 6-8 minute hairs and with six sensilla near the ventral border; posterior surface with eight sensilla near the center. Mandibles very small and feebly sclerotized; basal half somewhat dilated, but its width is only half the total length; apex acuminate, slightly curved, sharp-pointed. Maxillae with the apex conoidal and small; with a much larger hairy paraboloidal ventrolateral lobe; two sensilla between palp and palea; palp represented by a cluster of three sensilla, galea by two sensilla. Labium large, prominent, bilobed; palp a low convexity bearing three sensilla; opening of sericteries a transverse slit within the mouth. Hypopharynx spinulose, the spinules arranged in subtransverse rows, the rows grouped in two subtriangles which have their bases near the middle. (Material studied: four integuments from British Guiana.)

Dolichoderus (Dolichoderus) decollatus F. Smith

Similar to *attelaboides* but differing as follows: Body hairs more numerous and longer (0.036 mm). Head hairs longer (0.018-0.072 mm). Labrum subtrapezoidal, narrowed below; breadth 3X length; anterior surface with four minute hairs near each dorsal corner and about eight sensilla near the ventral border; posterior surface with 12 sensilla in a central cluster. Mandibles shorter and stouter; surface irregularly denticulate. Labial palp a low convexity bearing three sensilla. (Material studied: four integuments from British Guiana.)

Tribe **LEPTOMYRMICINI** Emery
Genus **Leptomyrmex** Mayr

Elongate, stout and slightly curved; diameter greatest at the third and fourth abdominal somites, decreasing rapidly toward either end. The three posterior somites small and directed ventrally. Prothorax differentiated into two parts, the anterior part very short above, longer below. Head placed low on the anterior end. Segmentation distinct. Spiracles minute and nearly uniform in size. Body hairs numerous, minute and uniformly distributed; basal half stout, distal half slender and flexible. Head hairs few and short. Head guitar-shaped, due to the fact that the mouth parts are elongated ventrally and constricted at the base; cranium subcircular in anterior view; mouth parts large and conspicuous, except the labrum. Labrum small and relatively narrow; anterior surface with numerous (12-20) sensilla and/or minute hairs; near the middle of the posterior surface are two rows of about five sensilla each, from which short arcuate rows of spinules extend obliquely outward and upward. Mandibles with a few short rows of spinules on the anterior surface of the basal half. Maxillae large, inflated, lobose; galea a short conoid bearing two apical sensilla. Young larvae extremely long and slender and terminating in a slender subconical postanal tail; head on the anterior end.

Wheeler (1915, p. 260) characterizes the larvae of this genus as "very peculiar," which is certainly no exaggeration.

Leptomyrmex erythrocephalus (Fabricius)
(Pl. II, figs. 1-3 and 6)

Elongate and stout; diameter greatest at the third and fourth abdominal somites, decreasing rapidly toward either end. Slightly curved; dorsal profile strongly curved, ventral nearly straight, except at posterior end where the three small terminal segments are directed ventrally. Prothorax differentiated into two parts; the anterior part wedge-shaped, very short above and produced posteroventrally into a prominent boss. Head placed low on the anterior end, the mouth parts directed forward. A broad low welt along either side of the body. Anus ventral. Leg vestiges present. Thirteen differentiated somites. Spiracles minute, approximately uniform in size; first abdominal the largest, eighth the smallest. Body hairs numerous, uniformly distributed, minute (about 0.08 mm long); with stout base and slender flexible apical half. Head guitar-shaped, due to the fact that the mouth parts are elongated ventrally and constricted at the base; cranium subcircular in anterior view; mouth parts large and conspicuous. Antennae oval and slightly raised; each with three minute sensilla. Head hairs few, scattered, short (0.018-0.036 mm); with stout base and slenderer tip. Labrum small and narrow; breadth 1.5X length; subrectangular; lateral borders sinuate; ventral border feebly impressed; anterior surface with about 20 sensilla and/or minute hairs. Near the middle of the posterior surface of the labrum are two rows of about five sensilla each; from these, short arcuate rows of minute spinules run obliquely upward and outward. Mandibles moderately large (for a dolichoderine) and a feebly sclerotized; basal half inflated; apical half slender, acuminate and sharp-pointed; anterior surface of basal half with a few short transverse rows of minute spinules. Maxillae large, inflated, lobose; palp a cluster of three irregularly shaped sensilla and two isolated sensilla all mounted on a low knob-like projection; galea a short conoid bearing two apical sensilla. Labium large and prominent; palp a low convexity bearing five sensilla; opening of sericteries a conspicuous hole between the galeae. Hypopharynx spinulose, the spinules minute and arranged in subtransverse rows; the rows on each half forming a somewhat fan-shaped pattern, converging laterally. (Material studied: numerous larvae from Australia.)

The very young larva of *erythrocephalus* is extremely long and slender and terminates in a slender subconical postanal tail. The head is on the anterior end.

Leptomyrmex nigriventris (Guérin)

Similar to *erythrocephalus* but differing in the following characters: Ventral profile curved. No ventral boss on the prothorax. Labrum subtrapezoidal, narrow ventrally. Anterior surface of labium produced into a pair of large bosses. (Material studied: ten larvae from New South Wales.)

Wheeler, 1915, pp. 260-261: "The head is violin-shaped, with very small, pointed, vestigal mandibles, showing that the food of the larva is purely liquid and imbibed directly from the regurgitating workers. The sensory papillae on the maxillae and labium are well-developed. The body shows three well-marked thoracic and five or six abdominal segments. It is covered with extremely short hairs." Fig. 4 on p. 261 shows a larva in side view and a head in anterior view.

Leptomyrmex unicolor Emery
(Pl. II, figs. 4 and 5)

Apparently similar to *erythrocephalus* but differing in the following characters: Head ventral, near the anterior end. No ventral boss on prothorax. Integumentary spinules few and isolated. Head not guitar-shaped; cranium transversally subelliptical, but only slightly broader than long. Labrum subtrapezoidal, narrowed ventrally; breadth 2X length ; ventral border trilobed; anterior surface with about 16 sensilla and/or minute hairs; posterior surface with about eight sensilla, which are not in rows. Maxillary palp a distinct elevation bearing five sensilla. [Material studied: two integuments—apparently of semipupae—from Queensland; there are the specimens studied by Dr. W. M. Wheeler (see below).]

Wheeler, 1915, p. 261: "The larva of *L. unicolor* has a short rounded head, much like that of other ant larvae, though the mandibles are very feebly developed. The body is covered with hairs which are somewhat sparser and stiffer than in *nigriventris*." Fig. 4*c* on p. 261 shows the head in anterior view.

We are inclined to suspect that our *unicolor* specimens are semipupae which may account for the marked differences between this and the other species of *Leptomyrmex*.

Leptomyrmex varians ruficeps Emery

Apparently similar to *erythrocephalus*, except as follows: Body hairs most abundant on the ventral surface of the prothorax. Integument sparsely spinulose, the spinules minute and either isolated or in short rows. Anterior surface of labrum with 12 sensilla and/or minute hairs. More spinules on the mandibles. On the anterior surface of the labium near its base there is a pair of mammiform projections each bearing an apical sensillum. Labial palps a pair of irregular raised areas each bearing about four sensilla. (Material studied: three damaged integuments from Queensland.)

According to Wheeler (1915, p. 261), this larva is similar to that of *nigriventris*, "but the skin is entirely naked."

Tribe **TAPINOMINI** Emery
Genus **Liometopum** Mayr

Body and head practically naked; body hairs exceedingly few; short and widely scattered. Head hairs very few, exceeding minute, widely scattered. Antennae rather large. Posterior surface of labrum with two subvertical rows of sensilla near the middle and near the ventral border short transverse rows of minute spinules. Mandibles small. Maxillae with a lateral patch of isolated spinules between palp and galea; spinules with stout base and needle-like apex; palp a low convexity bearing one large and three small sensilla. Labium with spinules and a few sensilla on the anterior surface; palp a low convexity bearing one large and three small sensilla.

Liometopum apiculatum Mayr
(Pl. I, figs. 23 and 24)

Plump and chunky; nearly straight; subellipsoidal; anterior end formed by the enlarged dorsal portion of the prothorax; head ventral near the anterior end. Anus ventral. Leg and gonopod vestiges present. Spiracles small but not uniform in size; first abdominal the largest, eighth abdominal the smallest. Body practically naked; hairs exceedingly few, widely scattered, stout, slightly curved, short (0.018-0.027 mm). Head hairs very few, widely scattered, exceedingly minute (about 0.003 mm long). Antennae rather large; each with three minute sensilla. Labrum short and broad; ventral border feebly impressed; anterior surface with four scattered sensilla and two minute hairs; posterior surface with two subvertical rows of four sensilla each near the middle and near the ventral border short transverse rows of minute spinules. Mandibles small and feebly sclerotized; basal half moderately enlarged; distal half narrowed, slightly curved medially, sharp-pointed. Maxillae with a lateral patch of isolated spinules between palp and galea; spinules with stout base and needle-like apex; palp a low convexity bearing one large and three small sensilla; galea represented by two sensilla. Labium with spinules and a few sensilla on the anterior surface; palp a low convexity bearing one large and three small sensilla. Hypopharynx spinulose, the spinules arranged in subtransverse rows grouped in two narrow subtriangles which have their bases near the middle. (Material studied: four unsatisfactory specimens from California.)

Genus **Froggattella** Forel

Six low unpaired middorsal bosses, one each on mesothorax, metathorax and abdominal somites I-IV. Body practically naked; body hairs and head hairs very few, widely scattered, exceedingly minute. Cranium subpentagonal in anterior view; narrowed ventrally. Antennae very small. Labrum small, narrow and bilobed; no spinules on posterior surface. Maxillae bulging. Labium small, short and narrow.

Froggattella kirbyi (Lowne)
(Pl. II, figs. 7-10)

Plump, chunky and turgid; subellipsoidal; ventral profile nearly straight; six low unpaired middorsal bosses, one each on mesothorax, metathorax and abdominal somites I-IV; anterior end formed by the enlarged dorsal portion of the prothorax. Head rather thin (anteroposteriorly) and applied to the ventral surface about a fourth of the body length from the anterior end. Anus ventral. Leg vestiges present. Segmentation indistinct. Spiracles small but not uniform in size; largest on the first abdominal somite, smallest on the eighth. Body hairs and head hairs exceedingly minute (length 0.009 mm); very few; widely scattered; straight, stout at the base, tapering rapidly to a sharp point. Cranium subpentagonal in anterior view; narrowed ventrally. Antennae very small; each with three minute sensilla. Labrum small and short; breadth 2X length; bilobed, due to a median incision of the ventral border; anterior surface with four hairs near the base and one near the center of each lobe, and with a sensillum near the ventral border of each lobe; posterior surface with a median cluster of 6-8 sensilla. Mandibles feebly sclerotized; basal 2/3 inflated, with several coarse denticles on its anterior surface; distal third slender, acuminate, sharp-pointed, with two or three denticles on its mesal surface. Maxillae bulging; palp a low knob bearing five sensilla; galea a small conoid bearing two apical sensilla. Labium small, short and narrow; palp a low knob bearing three sensilla; opening of sericteries a transverse slit within the mouth. Hypopharynx spinulose, the spinules arranged in subtransverse rows grouped in two subtriangles which have their bases near the middle. (Material studied: numerous larvae from New South Wales.)

Genus **Dorymyrmex** Mayr

Body slightly curved. Anterior portion of prothorax forming a short stout neck. Posterior end terminating in a small subcone which points posteroventrally. Body hairs and head hairs short, moderately abundant, uniformly distributed; straight and rather stout but with the tip slightly curved and tapering rapidly to a sharp point. Cranium suboctagonal in anterior view; as long as broad. Antennae small. Labrum small, narrow and bilobed, with subparallel lines (rows of spinules?) on the posterior surface. Young larva slender and elongate; head on anterior end; thorax swollen; abdomen constricted at its anterior end and produced posteriorly into a slender subconical tail.

Dorymyrmex pyramicus (Roger)
(Pl. II, figs. 11-18)

Plump, chunky and turgid; slightly curved; not attenuated toward either end; ends broadly rounded; anterior end formed from dorsa of prothorax and mesothorax. Head ventral, near anterior end; anterior portion of prothorax forming a short stout neck. At the posterior end a small terminal subcone pointing posteroventrally. Anus ventral. Leg vestiges present. Segmentation indistinct. Spiracles small, but not uniform in size; first abdominal the largest, eighth the smallest. Hairs moderately abundant and uniformly distributed; short (length 0.012-0.057 mm); straight and rather stout but with the tip slightly curved and tapering rapidly to a sharp point. Cranium suboctagonal; length equal to breadth. Head hairs moderately numerous; uniformly distributed; short (about 0.036 mm); straight and rather stout but with the tip slightly curved and tapering rapidly to a sharp point. Antennae small and elliptical; each with three minute sensilla, each of which bears a spinule. Labrum small; breadth twice the length; bilobed due to a median incision of the ventral border; anterior surface with two minute hairs near the base and two or three sensilla near the ventral border of each lobe; posterior surface with a median cluster of about eight sensilla and with transverse subparallel lines (rows of spinules?). Mandibles feebly sclerotized; width (at base) equal to length; basal 2/3 subparabolic in anterior view; apical third a narrow sharp-pointed cone. Maxillary palp a low knob bearing five sensilla; galea a low knob with two apical sensilla. Labial palp a low knob bearing five sensilla, one of which has a transparent cap; opening of sericteries concealed inside the mouth. Hypopharynx spinulose, the spinules arranged in subtransverse rows, the rows grouped in two subtriangles which have their bases near the middle. (Material studied: numerous larvae from Oklahoma and Texas.)

Young larva elongate and very slender; thorax swollen and bent ventrally; head on anterior end; abdomen constricted at the anterior end and produced posteriorly into a slender subconical postanal tail.

Wheeler, G. C., 1938, p. 141: reference to wing rudiments.

Genus **Araucomyrmex** Gallardo

Body slightly curved. With a rather large postanal knob, which is directed posteroventrally. Body hairs short and moderately abundant; uniformly distributed on thorax and abdominal somites I-V; a few on VI and on the ventral surface of the remainder; straight and rather stout but with the tip slightly curved and tapering rapidly to a sharp point. Cranium subhexagonal in anterior view; broader than long. Antennae small. Head hairs short and few, shaped like body hairs. Labrum small, narrow and bilobed; posterior surface with a few spinules in short transverse rows. Mandibles short and stout; slightly wider (at base) than long; subtriangular in anterior view; mesal border with a rounded subapical notch which causes the distal sixth to resemble a short slightly curved tooth; dorsal to the notch a small tooth on the mesal face; a few rows of minute spinules on the anterior surface. Maxillae bulging; a few longitudinal rows of minute spinules on the mesal surface. Middle of anterior surface of labium with minute spinules in short transverse rows.

Araucomyrmex tener (Mayr)
(Pl. I, figs. 20-22)

Plump and chunky; slightly curved; ends broadly rounded; not attenuated toward either end. Head applied to the ventral surface about a fourth of the body length from the anterior end. At the posterior end a rather large postanal knob which points posteroventrally. Anus ventral. Leg and wing vestiges present. Segmentation indistinct. Spiracles small, but not uniform in size; first abdominal the largest, eighth abdominal the smallest. Hairs moderately abundant; uniformly distributed on thorax and abdominal somites I-V; a few on VI and on the ventral surface of the remainder; short (0.018-0.036 mm); straight and rather stout but with the tip slightly curved and tapering rapidly to a sharp point. A few minute integumentary spinules on the posterior somites and on the ventral surface of the prothorax. Cranium subhexagonal in anterior view; slightly broader than long; narrowed ventrally. Head hairs few; short (about 0.036 mm); shaped like body hairs. Antennae small, each with three minute sensilla, each of which bears a spinule. Labrum small; breadth 2½X the length; narrowed ventrally; bilobed due to a median impression of the ventral border; anterior surface with four sensilla (near the ventral border) and two minute hairs; posterior surface with a median cluster of about eight sensilla and with a few minute spinules arranged in short transverse rows. Mandibles short and stout; slightly wider (at base) than long; feebly sclerotized; subtriangular in anterior view; mesal border with a rounded subapical notch which causes the distal sixth to resemble a short slightly curved tooth; dorsal to the notch there is a small tooth on the mesal face; anterior surface with a few rows of minute spinules. Maxillae bulging; mesal surface with a few longitudinal rows of minute spinules; palp a low knob bearing four sensilla; galea a low conoid bearing two apical sensilla. Anterior surface of labium with a small median anterior convexity bearing short transverse rows of minute spinules; palp a low knob bearing four sensilla. Hypopharynx spinulose, the spinules arranged in subtransverse rows grouped in two subtriangles which have their bases near the middle. (Material studied: seven damaged integuments from Argentina.)

Genus **Iridomyrmex** Mayr

Body slightly curved. Anus ventral. Only nine pairs of spiracles. Body nearly naked; body hairs and head hairs exceedingly few and widely scattered; minute, straight and acuminate. Head moderately large. Cranium subpentagonal in anterior view; narrowed ventrally. Antennae small. Anterior surface of labrum with two minute hairs. Maxillae small, narrow and curved. Labium short, broad and rounded.

Iridomyrmex pruinosus (Roger)
(Pl. III, figs. 1-6)

Plump, chunky and turgid; slightly curved; not attentuated toward either end; ends broadly rounded; dorsal part of prothorax forming the anterior end. Head ventral, near anterior end. Anus ventral. Leg vestiges present. Segmentation indistinct. Spiracles small, but not uniform in size; first abdominal the largest, seventh the smallest, eighth apparently wanting. Body hairs exceedingly few; widely scattered except for a slight concentration on the ventral surface of the prothorax; straight and acuminate; minute (0.012-0.018 mm long). Head moderately large; cranium subpentagonal in anterior view; narrowed ventrally; somewhat broader than long. Head hairs very few (about 14) and widely scattered; minute (0.012-0.18 mm long); straight and acuminate. Antennae small; circular; each bearing three minute sensilla. Labrum short and broad; breadth 6X length; ventral border straight; lateral borders convex; anterior surface with two minute hairs; posterior surface with a median cluster of about nine sensilla. Mandibles feebly sclerotized; inflated; subtriangular in anterior view; breadth at base about 1½X length; apex forming a minute acuminate tooth. Maxillae small, narrow, curved; palp a discrete elevation bearing five sensilla, most of which are mounted on minute projections; galea a small indefinite swelling bearing two sensilla. Labium short and broad, rounded ventrally; anterior surface with a median elevation near the base, below which is the slit-like opening of the sericteries, palp a discrete elevation bearing five sensilla, most of which are mounted on minute projections. Hypopharynx spinulose, the spinules arranged in subtransverse rows grouped in two subtriangles which have their bases near the middle. (Material studied: numerous larvae from Oklahoma and Texas).

Queen larvae are similar to worker larvae, except for the larger body size and hence the relatively smaller head and hairs.

Iridomyrmex itoi Forel
(Pl. III, figs. 7 and 8)

Generally similar to *pruinosus* but differing in the following respects: Integument spinulose, the spinules minute and in short rows. Head narrower and longer. Anterior surface of labrum with six minute hairs and/or sensilla. Mandibles narrower, the apical tooth longer. Maxillary palp represented by a cluster of three sensilla; galea by two elevated sensilla. The median elevation on the anterior surface of the labium is spinulose. The young larva has on the metathorax and on each of the four anterior abdominal somites a low rounded middorsal tubercle. (Material studied: eight young larvae from Japan; courtesy of Mr. Cho Teranishi.)

Teranishi, 1927 (translated from the Japanese by two university students):—"The glutinous dorsal tubercles occur on abdominal somites I-V. They are not paired; each somite bears only one which is near its anterior border. The shape differs from that of the tubercles of Ponerinae in that the end is rounded off. These tubercles are very distinct in the early instars but gradually diminish as the larva matures and finally in the last instar are only slight elevations. All five of the tubercles are of the same size and shape at any given stage and all change simultaneously. There are no other tubercles. The body of the larva is short and plump; it does not have a neck. The head is very small. The mandibles are poorly developed and indistinct; the maxillae are well developed. The segmentation of the thorax is indistinct'' (p. 299). ''The function of the glutinous dorsal tubercles is to attach the larva to the walls or ceiling of the nest'' (p. 297). ''The larvae are fed by regurgitation by the workers and do not need to stretch and seek their own food'' (p. 300). Fig. 6, first-instar larva in side view; Fig. 7, second-instar larva, part of dorsal profile to show tubercles; fig. 8, same for third-instar larva; all figures on page 299.

Iridomyrmex nitidus Mayr
(Pl. III, fig. 9)

Generally similar to *pruinosus* but differing in the following characters: A cluster of hairs around the largest spiracle. Head hairs few (about 24). Labrum bilobed due to a deep median incision of the ventral border; anterior surface with four sensilla and two minute hairs; posterior surface with a few rows of minute spinules. Manibles short and very stout; width at base slightly greater than length; apical fourth forming a stout blunt tooth, which has a denticle on its mesal face; anterior (?) surface with numerous ridges (rows of exceedingly minute spinules?). (Material studied: five damaged integuments from New South Wales.)

Iridomyrmex geinitzi (Mayr)

Wheeler (1914, p. 87) recorded 12 larvae and pupae in Baltic amber ''in all probability belonging to this species.'' Fig. 41a on page 87 shows a larva in side view.

Iridomyrmex goepperti (Mayr)

Wheeler, 1914, p. 91:— ''In the Geolog. Inst. Koenigsberg Coll. there is one block of amber (without a number) containing a worker *I. goepperti* with its larvae.''

Iridomyrmex humilis (Mayr)

Essig (1926) gives the life cycle (p. 866): egg 18-55 days; larva about 31 days; pupa 15 days; total 78 days. He reproduces Woodworth's (1910) Fig. 3 as Fig. 730 on p. 865.

Goetsch (1937, p. 137) gives the life cycle: egg 11-20 days, larva 8-29 days, pupa 8-35 days.

Hertzer (1930) has reported that the larvae are kept in the dampest part of the nest, where the temperature ranges from 70°-83° (F., presumably), with 80° preferred; that the queen took an active part in the care of the brood, even when workers were present; that "larvae will likely eat solid matter." A queen "held her mouth to the mouthparts of two larvae after which she put the larval skin partly in the mouth of the large larva. When she left, movement of the larval mouthparts was observed. Evidently the skin was being chewed" (p. 602).

Newell (1908, p. 31) gives a brief account of the larva. It was incorporated in the longer account of Newell and Barber (1913), except for this sentence:— "The larva is pure white, but with a dark color sometimes appearing in the abdominal region, as if it had been fed with some black or dark-colored food."

Newell (1909, pp. 185-187): essentially the same as Newell and Barber (1913), including Pl. 7 (=Pl. IV in 1913).

Newell and Rosenfeld (1909) repeats Pl. 7B of Newell (1909).

Newell and Barber (1913).—"The larva when first hatched is not distinguishable from the egg without the assistance of a magnifying glass. For a time after hatching the body is considerably curved, the cephalic end being almost in touch with the caudal end, but as development progresses the larva assumes more and more of a straight form. The curvature is not entirely lost, however.

"A recently hatched larva, measured with the compound microscope and eyepiece micrometer, was 0.49 mm. long by 0.32 wide. The fully grown larvae (workers) average 1.7 mm. long by 0.66 mm. wide. The largest one under our observation measured 1.87 mm. by 0.765 mm.

"With the exception of slight constrictions of the body, the larvae are incapable of motion, thus being entirely helpless and relying altogether upon the ministrations of the attendant workers. The latter, however, perform their duties faithfully, and care for their charges with the greatest solicitude. They feed and groom the young larvae continually and transport them from place to place whenever necessary. In case of danger their first instinct appears to be to remove the young to a place of safety, and they readily sacrifice their own lives in order to accomplish this.

"The larvae are fed often by the attending workers upon reguritated and presumably predigested food. There is nothing in the appearance or actions of the workers which do the feeding to indicate that they are different from those which perform other duties, or that they are assigned to the particular and exclusive duty of being nurses. The feeding of the larvae has several times been observed under a magnifying glass, and is as follows: The larva ordinarily lies upon its side or back. The attending worker approaches from any convenient direction, usually from one side or from the direction in which the head of the larva lies, and, spreading her mandibles, places them over the mouth parts of the larva, which are slightly extruded. The tongue of the worker is also in contact with the larval mouth. While the worker holds the body and mandibles stationary a drop of light-colored, almost transparent fluid appears upon her tongue. This fluid disappears within the mouth of the larva, but it can not be ascertained to what extent the larval mouth parts are moved during the operation, as they are obscured from view by the mandibles and head of the attending worker. Slight constrictions of the larval abdomen during feeding are sometimes noticeable, at other times not. The time required for feeding a single larva varies from 3 to 30 seconds, depending doubtless on the hunger of the 'baby.' The workers proffer food to, or at least inspect, each larva, for the worker doing the feeding will place her mandibles to the mouth of one larva after another, feeding those which seem to require it.

"Both larvae and pupae are groomed or licked with the tongues of the workers; thus they are ever kept in a state of absolute cleanliness.

"The most pronounced increase in size of the larvae occurs during the first five days after hatching. As in the case with other ants, nothing is voided from the alimentary canal during the larval period, the undigested portions of the food being retained in the stomach, the latter having no open connection with the intestine. As the larva reaches its full growth this meconium, or mass of undigested material, becomes quite large and is distinctly visible as a dark object in the posterior portion of the body. At about this time communication is established between stomach and intestine and the meconium is voided. The larva then enters the prepupal or semipupal stage. While the insect in this stage is not very different in appearance from a full-grown larva, close examination shows a number of slight differences. Aside from the absence of the meconium, the cephalic and thoracic regions become markedly smooth and shining, with segmentation very indistinct, while the segmentation in the abdominal region is, if anything, more pronounced than before. The line of demarkation between abdomen and thorax is now in evidence, but without any very noticeable constriction. The mouth parts are protruded more than in the larva. The difference in appearance between larval and prepupal stages is not great but is sufficient to enable one to predict, with reasonable accuracy, the approaching transformation to the pupal stage proper.

"In the later portion of the larval stage we have first been able to distinguish between the males and workers. The male larvae grow to a somewhat larger size than do the worker larvae, and it is thus possible to predict with some degree of certainty which of grown larvae will transform to males and which to workers. In all other respects, however, they are apparently alike. The larval stage of the queen is unknown to us" (pp. 40-41).

The duration of the larval stage varied from 11 to 61 days; the average was 31.4 days. The average for the egg stage was 27.8 days; pupal stage average 15 days. Pl. IV B is a photograph of larvae and worker pupea; C, of larvae, more enlarged.

Marlatt, 1916: Fig. 3*b* on p. 6 shows a young larva in side view; *c*, full-grown larva in side view. (Repeated: Marlatt, 1930; Back, 1937; Back, 1946; Essig, 1942; Fernald, 1921; Williams, 1937; and probably others.)

Wheeler and Bailey (1920, p. 251) quote Newell's (1909) account of the feeding of the larvae.

Woodworth, 1910, p. 54: Fig. 2, a very young larva; Fig. 3, a full-grown larva. (Repeated: Eckert and Mallis, 1937 and 1941; Fig. 3 by Essig, 1926.)

Iridomyrmex iniquus nigellus Emery

''Glistening white larvae'' (Wheeler, 1929, p. 89).

Iridomyrmex sanguineus Forel

''The caterpillar [of *Cyclotorna monocentra* Meyr] subsists in the second stage solely upon the ant grubs by sucking out their juices. A grub is first felt or examined, then the very movable claws grasp it more firmly and the small head becomes quite still, and tremors pass through the caterpillar, ending in slight upward jerks of the terminal segments, soon it is seen that the poor grub is collapsing, then when its skin has fallen in considerably it is abandoned and another one sought out and tackled. I have witnessed three grubs disposed of in succession in a few minutes by a large larva.'' (Dodd, 1912, p. 584.) Referred to by Wheeler (1928, p. 259) and Brues 1946, p. 340).

Genus **Bothriomyrmex** Emery

Prothorax swollen ventrally and furnished with a pair of anteroventrolateral conoidal bosses, which are united across the venter by a narrow ''shelf.'' Head anteroventral. Spiracles minute; only eight pairs. Body hairs short, very few; most numerous on prothorax. Head moderately large, cranium subheptagonal in anterior view. Mouth parts small. Head hairs short and few; mostly below the level of the antennae. Labrum small and narrow; bilobed. Galea a frustum bearing two apical sensilla. Labial palp a large irregular elevation bearing five sensilla. In the young larva the prothoracic bosses are produced into finger-like projections.

Bothriomyrmex (Chronoxenus) pusillus (Mayr)
(Pl. III, figs. 10 and 12-14)

Plump and chunky; subellipsoidal; anterior end formed by the enlarged dorsal portion of the prothorax. Prothorax swollen ventrally and furnished with a pair of anteroventrolateral conoidal bosses, which are united across the venter by a narrow ''shelf.'' Head anteroventral. Anus ventral. Leg vestiges present. Segmentation indistinct, especially in the posterior half. Only eight pairs of spiracles found; all minute; size decreasing posteriorly. Body hairs very few; most numerous on the prothorax; short (0.018-0.024 mm); base stout, tapering to a slender apex; simple and slightly curved. Head moderately large; cranium subheptagonal in anterior view. Mouth parts small. Head hairs few; mostly below the level of the antennae; short (0.01-0.023 mm); simple and slightly curved; base stout, tapering to a slender apex. Each antenna with three (occasionally two) minute sensilla. Labrum small; bilobed due to a wide and deep median notch in the ventral border; narrowed ventrally; breadth at base a third greater than length; anterior surface with four sensilla near the ventral border and two hairs near the base. Mandibles feebly sclerotized; somewhat broader (at base) than long; basal half dilated; narrowed abruptly so that the apical half is rather slender and acuminate. Maxillary palp an irregular elevation bearing 5-6 sensilla; galea a frustum bearing two apical sensilla. Labial palp a large irregular elevation bearing five sensilla; opening of sericteries a transverse slit within the mouth. Hypopharynx spinulose, the spinules arranged in subtransverse rows grouped in two subtriangles which have their bases near the middle. (Material studied: numerous larvae from New South Wales.)

Bothriomyrmex (B.) meridionalis (Roger)
(Pl. III, fig. 11)

Young larva plump; diameter greatest at the middle, attenuated slightly toward either end. Head on the anterior end; prothorax swollen ventrally and furnished with a pair of finger-like ventrolateral projections. Body straight except for the posterior end, which is abruptly bent downward to form a stubby "tail"; anus on the anterior surface of this tail. Body hairs minute (about 0.009 mm long). Head hairs exceedingly minute (about 0.006 mm long) and extremely few (about eight). Each antenna a small frustum bearing three minute apical sensilla. Other characters apparently similar to those of *pusillus*. (Material studies: a single young larva—0.64 mm long,—and two damaged integuments—0.68 mm and 1.1 mm—from Switzerland.)

Bothriomyrmex (B.) inquilinus Santschi
(Pl. III, fig. 15)

Similar in general to *meridionalis*. (Material studied: two young larvae—1.25 mm and 1.35 mm long—from Tunis.)

Bothriomyrmex (B.) corsicus ligurica Emery

"La larva dell'operaia è lunga mm. 1,5-1,8 e larga al massimo mm. 0,8, completamente glabra, di forma subcilindrica, poco curvata in avanti, composta apparentemente di 10 segmenti, non compreso il capo, alquanto ristretta anteriormente in corrispondenza dei segmenti del torace, mentre gli uriti sono gradatamente più allargati e l'ultimo porta l'apertura anale in forma di fessura trasversa. Il sistema tracheale è di tipo olopneustico, con un paio di spiracoli al mesotorace e al metatorace e 6 all'addome. Il *capo* è di forma ovale, piuttosto piccolo, coll'epicranio fornito di tre paia di peli collocati sulla linea submediana longitudinale e di un altro paio collocati nel mezzo della linea trasverso-basale delle mandibole e pertinenti probabilmente al labbro superiore. Le *mandibole*, di forma triangolare, sono poco sviluppate, leggermente chitinizzate ed appuntite all'estremità anteriore. Il *labbro superiore*, non delimitato posteriormente e malamente distinguibile, è membranoso, col margine anteriore apparentemente troncato. Le *mascelle* sono subrettangolari, più o meno arrotondate all'apice ed ivi strettamente incise in modo che ognuna sembra essere formata da due lobi sovrapposti, di cui il primo (superiore) porta quattro sensilli circoscritti da un'area alquanto più trasparente del restante tegumento, mentre il secondo (inferiore), che è un poco sporgente dal primo, è fornito di un unico sensillo. Il *labbro inferiore* è formato da un solo pezzo quadrangolare, col margine anteriore leggermente ma largamente incavato e limitato lateralmente da due piccoli lobi provvisti ciascuno di due sensilli conici; inoltre nel mezzo della sua faccia dorsale si scorgono per trasparenza un gruppo di sei sensilli placoidi rotondi. Il primo segmento del *torace* è il più lungo ed anche il più stretto dei tre che formano questa parte del corpo, ed è caratterizzato per avere al ventre, in ciascuno dei lati, una piccola appendice subcilindrica che probabilmente ha una funzione escretoria come è supposto per altre consimili appendici di cui sono fornite diverse larve di Formiche. Il secondo segmento è un poco più lungo del successivo ed alquanto più stretto. Negli *uriti* non ho notata nessuna particolarità degna di nota. La *larva* della *femmina* è del tutto simile a quella dell'operaia ora descritta; si distingue soltanto per essere di statura più grande, mm. 2-2,3.'' (Menozzi, 1933, pp. 10-11). Fig. II on p. 10 shows a larva in side view and a head (enlarged) in anterior view.

''*Bothriomyrmex decapitans* (parasite temporaire chez *Tapinoma*) a une larve qui ressemble à celle de l'hôte, mais elle ne compte que six segments abdominaux. La tête est mieux différenciée. On peut y distinguer une lobulation (labre, maxilles et labium) et deux petites mandibules. Dans le cas de ces deux genres, les caractères de morphologie externe des larves s'accordent avec les caractères des adultes, puisque le genre *Bothriomyrmex* est considéré comme plus primitif que le genre *Tapinoma*.'' (Athias-Henriot, 1947, pp. 252-253.) On p. 260 the food of the larva is said to be *substances sucrées*. References to internal anatomy: pp. 259, 260 and 264.

Gantes, 1949 (referring to *B.* (*B.*) *decapitans*.)—''☿ 2 mm. Ces larves sont massives, subcylindriques, avec une tête petite mais bien différenciée cependant. Elles n'ont que 10 segments post-céphaliques. Elles sont remarquables par leur *exsudatoires prothoraciques*. Le corps est complètement nu. La tête, légèrement recourbée vers la face ventrale, comprend toutes les pièces buccales. Elle porte quatre poils simples sur la partie postérieure. Le labre, d'une seule pièce, porte sur sa face ventrale trois sensilles en file. Les mandibules sont de simples petits triangles de 0 mm. 058. Les maxilles, assez proéminents, ont de légères saillies qui sont le palpe distal à deux sensilles et le palpe proximal à cinq sensilles, dont trois plus grosses. Entre les deux palpes se trouve un minuscule poil. Le labium porte ses deux palpes, á côté desquels sont plantés deux poils'' (pp. 83-84). Pl. VI, fig. 1 shows a larva in side view, an ''exudate organ,'' a mandible, an antenna, a maxillary palp and a labial palp. "La croissance est uniformément faible á peine plus marquée au stade V" (p. 85). Data on the rate of growth are given in a table on p. 86. "*Bothriomyrmex* n'a de poils à aucun stade" (p. 87). Only nine pairs of spiracles (p. 88). Among the Dolichoderinae "les larves sont très évoluées avec encore une progression: *Bothriomyrmex* est plus primitif que *Tapinoma*" (p. 89).

Genus **Azteca** Forel

Relatively elongate and rather slender (for a dolichoderine); straight; ends narrowly rounded; dorsal profile nearly straight, ventral more convex. Prothorax with a ventrolateral swelling on each side. Anus subterminal. Leg vestiges large. Body hairs of two types: (1) short, simple and slightly curved; (2) oncochaetae. The latter are long and consist of a long stout terminal hook and a more slender spiral stem; restricted to dorsa of metathorax and abdominal somites I-V, two pairs on each somite. Head moderately large and subhexagonal. Antennae large. Head hairs few and scattered. Labrum very small; ventral border with 2-4 protruding sensilla and a few minute spinules; posterior surface with several short rows of minute spinules near each lateral border. Mandibles small; subtriangular in anterior view; slightly broader (at base) than long.

Wheeler, 1922, p. 200: ". . . the *Aztecae* are mostly insectivorous."

Azteca alfari Emery

(Pl. III, Figs. 16-21, 23 and 24)

Plump; relatively elongate and rather slender (for a dolichoderine); straight; subellipsoidal; prothorax with a ventrolateral swelling on each side; ends narrowly rounded; anterior end formed from the swollen dorsal portion of the prothorax. Dorsal profile nearly straight, ventral more convex. Head ventral, but near the anterior end. Anus subterminal. Leg vestiges large; wing and gonopod vestiges present. Segmentation moderately distinct; 13 somites. Spiracles small but not uniform; mesothoracic and first abdominal largest, eighth abdominal smallest. Integument rather densely spinulose, the spinules minute and arranged in transverse rows of 2-9. Body hairs few and restricted to dorsal and ventral surfaces; more abundant on the dorsal surface; of two types—(1) simple, slender, slightly curved, short (0.036-0.054 mm) and (2) oncochaetae. The latter are longer (about 0.18 mm) and have a long stout terminal hook and a more slender stem, which is spirally coiled, with one to three turns; restricted to dorsum of metathorax and abdominal somites I-V, two pairs on each somite. Head moderately large, subhexagonal in anterior view; cranium transversely subelliptical, breadth 1½× length. Head hairs few, scattered slender, slightly curved, short (0.018-0.036 mm). Antennae large; each with three minute sensilla. Labrum very small; breadth 3× length; narrowed ventrally; bilobed due to a wide shallow impression of the ventral border; ventral border with 2-4 protruding sensilla and a few minute spinules; anterior surface apparently devoid of sensilla and hairs; posterior surface with about 12 sensilla near the middle, and (lateral to these) several short oblique rows of minute spinules. Mandibles small and feebly sclerotized; subtriangular in anterior view; slightly broader (at base) than long; apex forming a moderately stout round-pointed tooth; anterior and mesal surfaces with oblique rows of minute spinules. Maxillae lobose; apex with a few short rows of minute spinules; palp an elevated cluster of about five sensilla; galea a slight elevation bearing two sensilla. Labium with a few short rows of minute spinulès on the basal half of the anterior surface; palp represented by a cluster of four or five sensilla; opening of sericteries small, on the anterior surface between the maxillae. Hypopharynx spinulose, the spinules arranged in subtransverse rows grouped in two subtriangles which have their bases near the middle. (Material studied: numerous larvae from Panama Canal Zone.)

Azteca instabilis (F. Smith)

Generally similar to *alfari*, except in the following particulars: Segmentation indistinct. Body hairs moderately numerous; lateral surfaces not naked. Head hairs minute (0.009-0.012 mm). Antennae smaller. Labrum twice as broad (at base) as long; anterior surface with about 10 sensilla and/or minute hairs; posterior surface with six sensilla. Apical tooth of mandibles twice as long and with a sharper point. No spinules on maxillae. Queen larvae have large and conspicuous vestiges of legs, wings, and gonopods; the integumentary spinules are longer than those of the worker larvae; the body is, of course, much larger than in the worker, but head and hairs are of approximately the same size. (Material studied: ten semipupae—six queens and four workers—from Panama Canal Zone.)

Azteca longiceps Emery
(Pl. III, fig. 22)

Similar to *alfari*, but differing as follows: Segmentation less distinct. Simple body hairs shorter (0.011-0.022 mm). Labrum with the ventral border feebly impressed; anterior surface with four sensilla near the ventral border. No spinules on mandible; apical tooth not so sharply differentiated but with a sharper point. No spinules on maxillae. (Material studied: numerous larvae from Panama Canal Zone.)

Azteca xanthochroa (Roger)

Similar to *alfari*, but differing in the following characters: Segmentation less distinct. Simple body hairs shorter (0.018-0.027 mm); none on ventrolateral surface of abdomen; those on thorax moderately numerous and uniformly distributed. Breadth of labrum 2⅓ times the length; ventral border slightly impressed; anterior surface with four sensilla near the ventral border; posterior surface with about eight sensilla. Apical tooth of mandibles longer and sharper. No spinules on maxillae. (Material studied: 13 integuments from Guatemala.)

Genus **Engramma** Forel

Straight and subcylindrical; posterior end somewhat attenuated and terminating in a conspicuous knob, which is constricted at its junction with the body. Dorsa of the anterior somites bearing each a pair of low indistinct bosses, which are largest on the prothorax and fade out posteriorly. Segmentation moderately distinct. Only nine pairs of spiracles. Body practically naked; hairs very few, widely scattered and minute. Head moderately large; cranium subrectangular in anterior view; broader than long. Antennae small; each with two sensilla. Head hairs few, short, mostly below the level of the antennae. Labrum crescentic; with two minute hairs (or sensilla?) on the anterior surface; no spinules on the posterior surface. Young larva short, broad and flat; a dorsoventrally elongated lateral boss on each side of each somite; paired dorsal bosses large and conspicuous; prothoracic bosses form a conspicuous collar; segmentation distinct.

Engramma lujae Forel
(Pl. IV, figs. 1-7)

Plump and chunky; straight and subcylindrical; not attenuated toward the anterior end which is formed from the dorsal part of the prothorax. Posterior end somewhat attenuated and terminating in a conspicuous knob, which is constricted at its junction with the body. The dorsa of the anterior somites bear each a pair of low indistinct bosses; they are largest on the prothorax and fade out posteriorly. Prothorax anteroventral. Head ventral, but near the anterior end. Anus ventral. Leg vestiges lens-shaped, rather widely separated; gonopod vestiges present. Segmentation relatively distinct; eleven differentiated somites. Spiracles

Text Figure 1. *Engramma lujae* Forel. Sagittal section through the posterior end of the larva showing the thickening of the body wall of the caudal knob, X181; *a*, anus.

not uniform; first abdominal the largest, seventh the smallest; eighth apparently wanting. Body hairs very few and widely scattered; simple and slightly curved; minute (0.004-0.012 mm long), scarcely noticeable among the spinules. Integument spinulose, except on the posterior knob and in the intersegmental furrows; spinules coarse and mostly isolated. Head moderately large; cranium subrectangular, its breadth 1½× the length; gula inflated. Head hairs few; mostly below the antennal level; simple, slender, curved; short (about 0.027 mm). Antennae small; each with two minute sensilla. Labrum short, breadth more than 3× length; crescentic; anterior surface with two minute sensilla and/or hairs; posterior surface with about six sensilla near the middle. Mandibles feebly sclerotized; basal ⅔ subtriangular in anterior view; distal third a slender sharp-pointed cone; a few streaks (ridges?) on the mesal face near the base of the apical cone. Maxillary palp consisting of three or four sensilla on an indistinct elevation; galea represented by two sensilla on a slight elevation. Labial palp a cluster of about three sensilla on a low elevation; opening of sericteries a curved slit. Hypopharynx spinulose, the spinules arranged in subtransverse rows grouped in two subtriangles which have their bases near the middle. (Material studied: six integuments—three of them damaged—from the Belgian Congo.)

A sagittal section of a larva (Text fig. 1) reveals something of the nature of the caudal knob: it is an evagination of the body wall—both hypodermis and cuticula. The hypodermis is somewhat thickened, but the cuticula is enormously hypertrophied.

The young larva (length 1.5 mm) is shorter, broader and flatter than the mature larva (2.4 mm long); the greatest breadth (at the metathorax) is twice the depth; this excess of breadth is partly due to the dorsoventrally elongate lateral bosses, one pair on each somite. The paired dorsal bosses are large and conspicuous. On the prothorax each dorsal boss is united with a lateral boss; these two dorsolateral bosses form a conspicuous collar. Segmentation distinct.

Genus **Tapinoma** Förster

Body slightly curved. Posterior end flattened and provided with an indistinct knob, which is directed posterodorsally. Only nine parts of spiracles. Body hairs very few, short and widely scattered. Head moderately large; cranium subpentagonal in anterior view; with scattered spinules below the antennae and on the gula. Antennae minute; each with two or three exceedingly minute sensilla. Head hairs short and very few; all below the antennal level. Labrum very small; parabolic; anterior surface with two minute hairs near the base and two sensilla near the apex; posterior surface without spinules but with eight sensilla near the apex. Maxillae indistinct. Young larva more slender; head and posterodorsal knob relatively larger; diameter greatest at the prothorax, diminishing toward the posterior end; segmentation distinct.

Bischoff, 1927:— "Die Larven . . . sind . . . so weit auf die Kropffütterung durch ihre Pflegerinnen eingestellt, dass ihre Mandibeln so gut wie functionlos und unbeweglich geworden sind'' (p. 81). On p. 384 he states that the larvae of this genus occasionally take solid food; Escherich (1917, p. 98) makes a similar assertion.

Tapinoma sessile (Say)

(Pl. IV, figs. 8-12)

Salmon-colored. Plump, chunky and turgid; slightly curved; not attenuated toward the anterior end, which is broadly rounded and formed from the enlarged dorsal portion of the prothorax; posterior end flattened and provided with an indistinct knob, which is directed posterodorsally. Head thin (anteroposteriorly) and applied to the ventral surface about a fourth of the body length from the anterior end. Anus ventral. Leg vestiges present. Segmentation indistinct. Spiracles small but not uniform in size; first abdominal the largest, seventh the smallest; eighth apparently wanting. Integument beset with minute spinules. Body hairs very few; irregularly distributed, more numerous on the dorsal surface; simple and slightly curved; short (0.004-0.027 mm). Head moderately large; subpentagonal, with definite dorsolateral corners; narrowed ventrally; integument (below the antennae) with scattered spinules, some isolated, others in short rows; gula coarsely spinulose. Head hairs very few (about 10); all below the antennal level; simple and slightly curved; short (about 0.018 mm). Antennae situated rather high on the head; minute; each with two or three exceedingly minute sensilla. Labrum very small; parabolic in anterior view; anterior surface with two minute hairs near the base and two sensilla near the apex; posterior surface with a cluster of about eight sensilla near the apex. Mandibles feebly sclerotized; basal ⅔ enlarged and subtriangular in anterior view, its surface roughened with ridges (?); distal third a slender cone. Maxillae indistinct; palp a cluster of one large and three small sensilla; galea a small knob bearing two sensilla. Labium with a median anterior projection bearing two sensilla; palp a low rounded elevation bearing one large and three small sensilla; opening of sericteries a transverse slit between the tips of the maxillae. Hypopharynx spinulose, the spinules arranged in subtransverse rows, the rows grouped in two subtriangles which have their bases near the middle. (Material studied: numerous larvae from Minnesota, New York and West Virginia.)

The young larva is more slender and the head and posterodorsal knob are relatively larger. The diameter is greatest at the prothorax and diminishes somewhat toward the posterior end. Segmentation is distinct.

Queen larvae are similar to worker larvae, except for the larger body size and hence the relatively smaller size of head and hairs. The posterodorsal knob, however, is absolutely smaller than in the worker.

In our artificial formicary the young larvae were usually standing on the end of their posterodorsal knob (which is relatively quite large at this age) with the body inclined at 45° to the plaster floor or glass ceiling. Attachment seemed to be effected by adhesion of the temporarily flattened part of the surface of the knob rather than by any sticky secretion. Workers were observed to lick assiduously the bodies of the larvae; the posterior end was apparently preferred. Whenever a larva was strongly stimulated a drop of clear fluid exuded from the anus and sometimes from the mouth also.

Smith, M. R., 1928:— "The freshly hatched larva is scarcely larger than the egg. As the larva grows its head becomes recurved ventrally, and a peculiar protuberance can be noted on the superior surface of the caudal end of the body. The body of the larva is distinctly segmented and also somewhat yellowish in color. Beneath the integument are small, scattered, white particles, probably excretory products. When full grown the larva is rather plump, being less distinctly segmented dorsally. The meconium is now quite apparent. The head of the larva appears even more recurved than formerly, and the caudal protuberance is very clearly evident. The larva now measures .72 by 1.74 mm. . . . The prepupa is an almost exact replica of the full grown larva except that the meconium is not evident, it having been cast out just before the larva went into this stage. The body is robust and very plump. The integument soon acquires a much wrinkled, dry appearance. The prepupa measures about 1.8 mm in length." (p. 315). Fig. 2 on p. 314 is a photograph which includes worker larvae. Life cycle starting with the April-June eggs: egg 12-20 days, larva and prepupa 13-29 days, pupa 6-18 days, total 31-67 days; averages—15, 22, 13, 50. Life cycle starting with the July-September eggs: egg 11-16 days, larva 14-16 days, prepupa 2-3 days, pupa 8-25 days, total 35-60 days; averages—12, 15, 2, 13, 42. (Page 316.)

Tapinoma melanocephalum (Fabricius)

Scarcely distinguishable from *sessile*. The head hairs appear to be fewer (6-8) and shorter (0.009 mm). The distal cone of the mandibles is smaller. The labium lacks the median anterior projection. (Material studied: numerous larvae from Panama.)

Tapinoma erraticum (Latreille)

Ern. André (1881-1886, Pl. V) labels Fig. 2 a larva of this species; it is more likely, however, that Fig. 5 is Tapinoma and Fig. 2 Tetramorium. Figs. 3 and 4 are probably hairs of Tetramorium, not Tapinoma, as labelled.

Berlese, 1901, p. 517 and 1909, pp. 521, 789, 790; internal anatomy.

Berlese, 1902:— "La larva di Tapinoma . . . ha forma obconica, essendo più larga all'innanzi che all'indietro, dove è anzi attenuata per gradi ed è alquanto curvata ad arco sul ventre; essa misura circa 800 μ di lunghezza. Il capo, grandetto, è apicale, non sporgendo troppo, per ora, anzi punto sul capo stesso il prima anello del corpo, al dorso. La testa, ovale, è provvista di un labbro superiore carnoso, spesso e tagliato ad arco; di due minute mandibole acutissime, gracili e dure, di un paio di mascelle larghe alla base, acute all'apice e sulla loro faccia esterna provviste di due papille, della quali una potrà rappresentare il palpo, l'altra il lobo esterno, (mentre l'interno è significato dall'apice stesso delle mascelle) e dal labbro inferiore triangolare, acuto all'apice, con due pappille, una per lato, rappresentanti i palpi labiali. Queste papille e quelle mascellari sono brevi tubercoli tronco-conici, rivestiti di cuticola spessa, gialla con due o tre peluzzi minutissimi, apicali, sorgenti da brevi areole di cuticola meno spessa, ialina. Il resto del corpo è diviso in dodici anelli, decrescenti di diametro ed anche alquanto di altezza, mentre il primo è molto largo ed alto, più del secondo, questo più del terzo etc. L'ultimo segmento porta l'apertura anale in forma di fessura trasversa, e decisamente ventrale'' (pp. 233-234). The rest (pp. 234-241) deals with internal anatomy. Fig. 55 on p. 234, a very young larva in side view showing internal organs; most of peripheral musculature omitted. Fig. 56 on p. 235, same showing especially the peripheral musculature, the principal tracheal trunks and the groups of oenocytes (repeated: Berlese, 1909, Fig. 978 on p. 789). Fig. 57 on p. 237, same to show the principal internal organs (repeated: Berlese 1909, Fig. 594 on p. 521).

Donisthorpe, 1915: ''Yellowish white, narrow and pointed anteriorly and posteriorly, with the segments clearly defined. The ventral surface is sharply angled from the first abdominal segment to the pointed apex; the dorsal surface is broadly rounded, the prothoracic segment more prominent. The smaller larvae are almost glabrous, but under a high power short bristles can be seen, chiefly on the ventral surface. The larger larvae are quite glabrous, shining, and more 'sausage' shaped'' (p. 180). Pl. III shows photographs of young and mature larvae. (Repeated: Donisthorpe, 1927, p. 201 and Pl. III.)

Emery (1899, p. 7) characterizes the larva of this species as ''manifestamente ipocefale.''

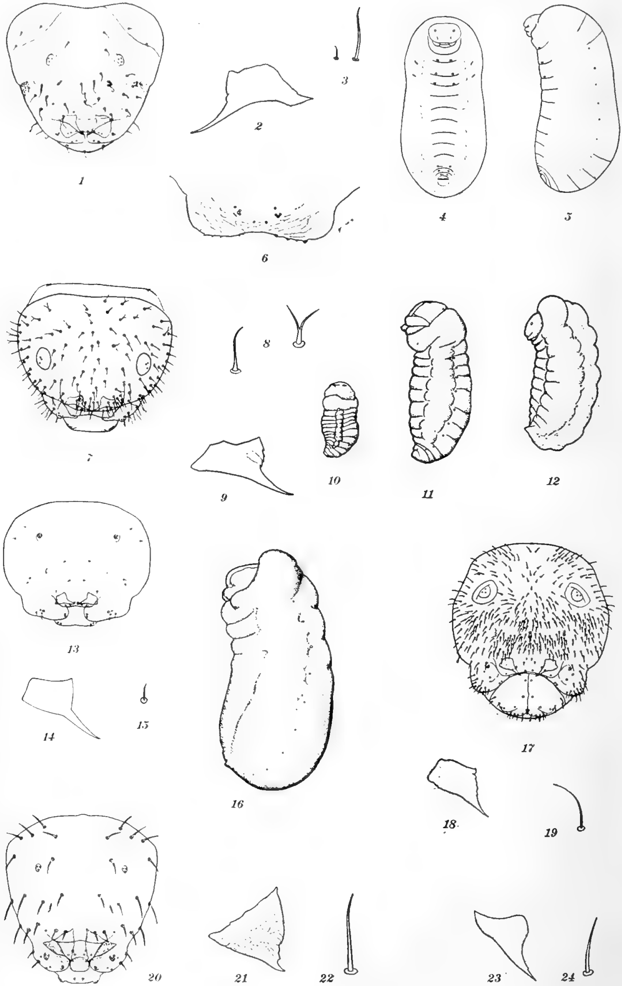
Forel (1874) characterizes the larvae of *erraticum* as ''très courtes, épaisses aux deux bouts, raides et indistinctement annelées'' (p. 388) [1920 edition: ''très courtes, épaisses aux deux bouts, entièrement raides, surtout chez les *Tapinoma,* où elles ne peuvent se mouvoir, et indistinctement annelées'' (p. 265)] and also as ''extrêmement raides, presque incapables de remuer même leur tête'' (p. 388 = p. 266 in 1920). ''Les larves qui croissent le plus vite sont, je crois, celles de *Tapinoma*; les premières sortent de l'oeuf vers le commencement d'avril, et l'on trouve déjà des nymphes avant la fin de mai'' (p. 389 = p. 266 in 1920).

Forel, 1921:— ''Ici la larve courte et épaisse . . . est entièrement immobile et raide, incapable de rien manger, ni même de sucer seule; sa tête blanche et indistincte ne montre aucune mobilité perceptible des mandibules. Bref la larve des *Tapinoma* paraît être réduite à la merci complète du dégorgement des ☿ qui la soignent du reste d'autant mieux'' (p. 24) [''Here the short, thick larva . . . is entirely stiff and motionless, incapable of eating or even sucking on its own account. Its white, indistinct head shows no perceptible mobility in the mandibles. In short, the larvae of *Tapinoma* appear to be entirely at the mercy of the regurgitation of the ☿ which accordingly take all the more care of them.'' (Forel, 1928, vol. I, p. 24)]. Fig. 1C on p. 23 shows a larva in side view (= 1928, Fig. 1C on p. 23).

Tapinoma nigerrimum (Nylander)

Athias-Henriot, 1947:— ''Le corps est trapu, légèrement arqué, parfaitement cylindrique parce que les segments ne sont pas séparés par des constrictions, mais seulement par un petit pli de la cuticule qui est visible sous forme d'une ligne et même souvent difficile à discerner. A première vue, rien ne distingue le pôle anal du pôle buccal. Sur le premier l'anus est bien visible. Le second porte ventralement un tout petit mamelon buccal, muni de deux minuscules mandibules. Il y a dix segments post-céphaliques. La chitine est parfaitement lisse et dépourvue de toute pilosité. Elle laisse voir par transparence les disques des ailes et des pattes. A un fort grossissement et dans les cas favorables, on peut voir une fine ornementation polygonale de la cuticule, correspondant au dessin des cellules hypodermiques qui l'ont sécrétée. La larve vivante est très blanche'' (p. 252). ''Une pilosité nulle'' (p. 269). Fig. 1 on p. 251 shows a larva in side view. Internal anatomy: pp. 254, 257, 259, 260, 261, 263, 264, 266, 267, 269 and Fig. 5 on p. 265.

Gantes, 1949:— ''a) *Ouvrières*: le corps est massif, subcylindrique, légèrement arqué; le pôle anal et buccal se distinguent facilement; les segments se voient assez nettement: nous en avons 10. On trouve quelques poils simples, épars sur le corps. La tête comprend toutes les pièces buccales, mais peu proéminentes. Je n'ai pu voir les antennes chez une larve d'ouvrière. Le labre est petit et arqué. Les mandibules sont des triangles, plus étroits et plus petits que celles de *Bothriomyrmex*: 0 mm. 040. Le palpe distal de la maxille est exactement à son extrémité au bout duquel il y a deux grosses sensilles à soies; le palpe proximal n'a que quatre sensilles dont deux plus grosses sans soie. Le labium, complètement découvert, laisse voir ses deux palpes à quatre sensilles, dont une seule est sans soie. La partie postérieure de la tête est garnie de huit poils. Chez la larve néonate on voit un seul stigmate, énorme, mésothoracique. Le corps est complètement nu. b) *Sexués*: ils sont beaucoup plus gros, 5mm. Le corps est blanc laiteux, cylindrique, légèrement arqué, la tête sur un petit mamelon et l'anus entre deux lèvres. Les segments sont séparés par des lignes blanches et le corps est complètement nu. Ici j'ai pu voir les antennes, légère saillie à peine visible à un fort grossissement'' (p. 84). Pl. VI, fig. 2: a larva in side view, mandible, maxillary palp, labial palp. The larvae are fed by regurgitation (p. 73). ''Les larves des Formicidés sont des larves apodes ayant toutes à peu près la même forme, sauf chez les larves de sexués où l'on voit des types très différents, exemple: *Pheidole*, *Tapinoma*, *Solenopsis*. D'autres larves de sexués sont simplement plus grosses'' (p. 88). Only nine pairs of spiracles (p. 88). ''La jeune larve de *Tapinoma* a une seule paire de stigmates énormes; ils sont mésothoraciques et restent plus gros chez la larve adulte'' (p. 88). Maxillary and labial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palps have each four sensilla (p. 88). "Chez les larves très évoluées, immobiles, les mandibules sont minuscules. Ces larves évoluées n'ont pas besoin de mandibules tranchantes, car les ouvrières les nourrissent par régurgitation. Ainsi, pour *Tapinoma*, que j'ai observé vivant, les ouvrières lèchent très souvent le mamelon buccal des larves; ces dernières rentrent et sortent leur mamelon et agitent les mandibules. Je n'ai jamais vu de boulette de nourriture près des larves" (p. 88). The larvae are fed by regurgitation (p. 73). "Chez les *Dolichoderidés* les larves sont très évoluées avec encore une progression: *Bothriomyrmex* est plus primitif que *Tapinoma*" (p. 89).

Genus **Technomyrmex** Mayr

Somewhat attenuated toward the posterior end, which terminates in a large hemispherical posterodorsal knob. Ventral profile mostly straight but strongly curved dorsally at the posterior end. Anus posterior. Head and prothorax anteroventral. Only nine pairs of spiracles. Body practically naked; hairs exceedingly few, exceedingly minute and widely scattered. Head large, subhexagonal and practically naked; hairs very few and exceedingly minute. Labrum very small, short and broad; posterior surface with spinules in short oblique rows near each lateral border. Mandibles very small; breadth (at base) equal to length. Palps and galea represented by small clusters of minute sensilla—three in each for the palps and two for the galea.

Technomyrmex sp.

(Pl. IV, fig. 13-16)

Plump and chunky; straight; not attenuated toward the anterior end,

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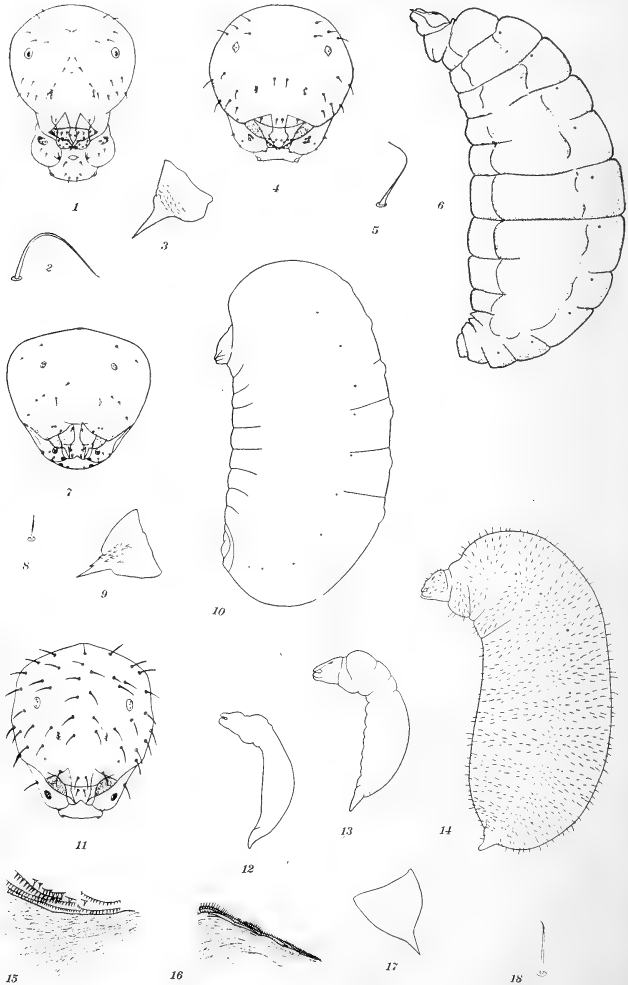
PLATE 30. LARVAE OF DOLICHODERINAE

Dolichoderus (*Hypoclinea*) *taschenbergi* (Mayr), Figs. 1-6—1, head in anterior view, X67; 2, left mandible in anterior view, X237; 3, two body hairs, X237; 4, mature larva in ventral view, X11; 5, larva in side view, X11; 6, labrum in posterior view, X185. *Dolichoderus* (*Hypoclinea*) *plagiatus* (Mayr), Figs. 7-11—7, head of young larva in anterior view, X67; 8, two body hairs, X237; 9, right mandible in anterior view, X237; 10, very young larva in side view, X22; 11, young larva in side view, X22. *Dolichoderus* (*Hypoclinea*) *championi* Forel, Fig 12, young larva in side view, X11. *Dolichoderus* (*Monacis*) *debilis* Emery, Figs. 13-16—13, head in anterior view, X60; 14, right mandible in anterior view, X237; 15, body hair, X467; 16, larva in side view, X22. *Dolichoderus* (*Dolichoderus*) *attelaboides* (Fabricius), Figs. 17-19—17, head in anterior view, X44; 18, right mandible in anterior view, X121; 19, body hair X467. *Araucomyrmex tener* (Mayr), Figs. 20-22—20, head in anterior view, X95; 21, right mandible in anterior view, X235; 22, body hair, X367. *Liometopum apiculatum* Mayr, Figs. 23 and 24—23, right mandible in anterior view, X235; 24, body hair, X467.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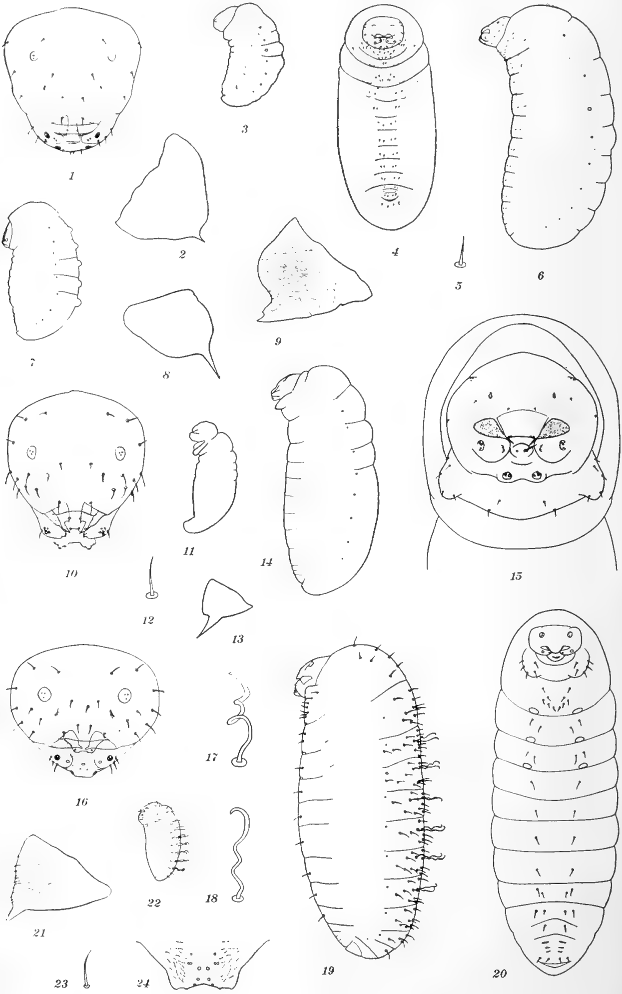
which is broadly rounded and formed from the enlarged dorsal portion of the prothorax; somewhat attenuated toward the posterior end which terminates in a large hemispherical posterodorsal knob. Ventral profile mostly straight, but strongly curved dorsally at the posterior end. Prothorax and head anteroventral. Anus posterior. Leg, wing and gonopod vestiges present. Segmentation indistinct. Spiracles of abdominal somite I enormous; other spiracles small and diminishing posteriorly; spiracles of abdominal somite VIII apparently wanting. Integument spinulose; the spinules coarse and either arranged in short transverse rows or isolated. Body practically naked; hairs exceedingly few, exceedingly minute (length about 0.003 mm) and widely scattered. Head large; subhexagonal in anterior view; narrowed ventrally; slightly broader than long; practically naked; hairs very few and exceedingly minute (about 0.003 mm long.) Antennae small; each with three exceedingly minute sensilla; situated low on the head. Labrum very small, broad and short; breadth about 4$\times$ length; ventral border nearly straight and furnished with four minute sensilla; posterior surface with a median cluster of about eight sensilla, from which a few short rows of minute spinules extend obliquely upward toward either side. Mandibles very small and feebly sclerotized; breadth (at base) equal to length; distal half narrowed, slightly curved and sharp-pointed. Maxillae swollen and indistinctly outlined; palp represented by a cluster of three minute sensilla; the galea by a cluster of two sensilla. Labium short; palp represented by a cluster of three minute sensilla; opening of sericteries a short transverse slit. Hypopharynx spinulose, the spinules arranged in subtransverse rows, the rows grouped in two subtriangles which have their bases near the middle. (Material studied: four integuments from the Philippine Islands.)

Technomyrmex sp.

Apparently similar to the Philippine species described above, except as follows: the integumentary spinules are exceedingly minute and limited to the prothorax; the maxillae have distinct outlines and are not swollen. (Material studied: six integuments from Singapore.)

PLATE 31. LARVAE OF DOLICHODERINAE

Leptomyrmex erythrocephalus (Fabricius), Figs. 1-3 and 6—1, head in anterior view, X44; 2, body hair, X242; 3, right mandible in anterior view, X118; 6, larva in side view, X11. *Leptomyrmex unicolor* Emery, Figs. 4 and 5—4, head (of semipupa?) in anterior view, X57; 5, body hair (of semipupa?), X242. *Froggattella kirbyi* (Lowne), Figs. 7-10—7, head in anterior view, X95; 8, body hair, X467; 9, left mandible in anterior view, X235; 10, larva in side view, X28. *Dorymyrmex pyramicus* (Roger), Figs. 11-18—11, head in anterior view, X95; 12, profile of very young larva, X22; 13, young larve in side view, X22; 14, mature larva in side view, X22; 15, left half of hypopharynx in anterior view, X333; 16, left half of hypopharynx in ventral view, X333; 17, right mandible in anterior view, X235; 18, body hair, X235.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Technomyrmex albipes (F. Smith)

Apparently similar to the Singapore species described above, except as follows:— Body and head hairs longer (0.006 mm). Integumentary spinules as long as body hairs, coarse and isolated or grouped in short transverse rows; most abundant on mesothorax and metathorax; none on ventral surface of prothorax. Six hairs or sensilla on the anterior surface of the labrum; none on the ventral border. (Material studied: two damaged integuments from the Society Islands.)

Technomyrmex bicolor textor Forel

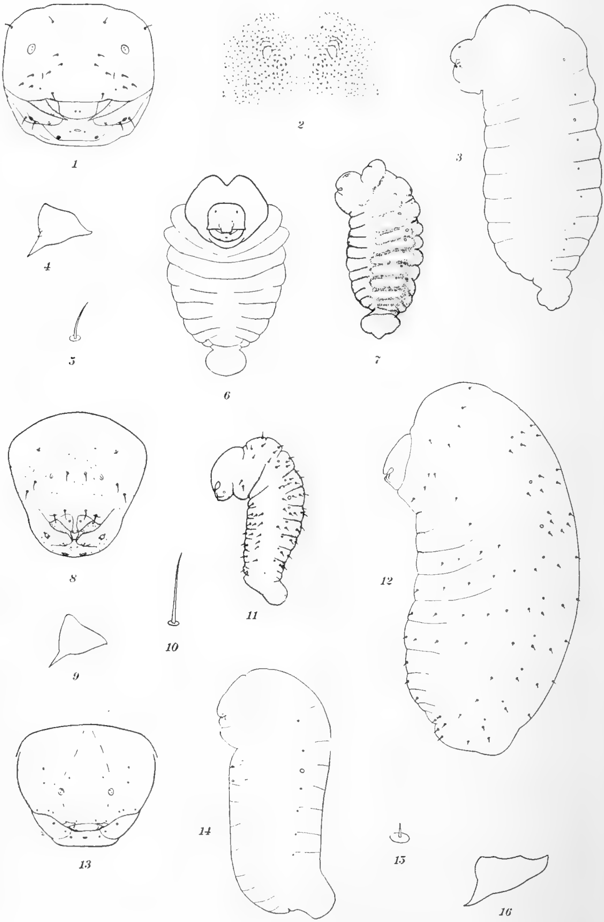
According to Forel (1923, p. 103 = 1928, Vol. 2, p. 285) Jacobson found this ant in Java living in small woven nests (''tissés et mimétiques des lichens''). (Referred to by Athias-Henriot, 1947, p. 259: ''Des larves fileuses, dont la soie est utilisée par les ouvrières''; also by Bischoff, 1927, p. 304.)

Technomyrmex gibbosus Wheeler

Teranishi, 1927 (translated from the Japanese by two university students):— ''There is only one glutinous dorsal tubercle, which is on the last segment. It is directed dorsally and posteriorly. There are a few hairs on the head but none on the body. There is no neck and the body tapers toward the posterior end. The thoracic segments are very large and quite indistinct. The head is slightly larger than in *Iridomyrmex itoi.* The lips are similar, the labrum being indistinct and the labium well developed. The tubercle persists as the larva matures'' (p. 299). Fig. 5, full-grown larva; Fig. 9, second-instar larva (p. 299). ''The function of the glutinous dorsal tubercles is to attach the larva to the walls or ceiling of the nest'' (p. 297). ''The larvae are fed by regurgitation by the workers'' (p. 300).

PLATE 32. LARVAE OF DOLICHODERINAE

Iridomyrmex pruinosus (Roger), Figs. 1-6—1, head in anterior view, X95; 2, right mandible in anterior view, X367; 3, young larva in side view, X22; 4, larva in ventral view, X22; 5, body hair, X367; 6, larva in side view, X22. *Iridomyrmex itoi* Forel, Figs. 7 and 8—7, young larva in side view, X22; 8, right mandible in anterior view, X367. *Iridomyrmex nitidus* Mayr, Fig. 9, left mandible in anterior view, X235. *Bothriomyrmex pusillus* (Mayr), Figs. 10 and 12-14—10, head in anterior view, X118; 12, body hair, X235; 13, left mandible in anterior view, X235; 14, larva in side view, X28. *Bothriomyrmex meridionalis* (Roger), Fig. 11, young larva in side view, X28. *Bothriomyrmex inquilinus* Santschi, Fig. 15, head and prothorax of young larva in ventral view, X118. *Azteca alfari* Emery, Figs. 16-21, 23 and 24—16, head in anterior view, X60; 17 and 18, two views of oncochaetae, X95; 19, larva in side view, X22; 20, larva in ventral view, X22; 21, left mandible in anterior view, X235; 23, simple hair, X95, 24, labrum in posteior view, X185. *Azteca longiceps* Emery, Fig. 22, very young larva in side view, X22.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Discussion

The larvae of the Dolichoderinae—like their adults—constitute a well defined and homogeneous group. They are readily distinguishable from the larvae of other subfamilies by the shape of the body; the position of the head; the indistinct segmentation; the variation in the size of the spiracles of different somites; the paucity and small size of the hairs; the reduced labrum and mandibles; the lack of teeth on the mesal border of the mandibles; the reduction of palps and galea; the scarcity of spinules on the mouth parts; the abundance and arrangement of spinules on the hypopharynx. None of these characters would alone serve to differentiate the larvae from all the genera of other subfamilies, but as a group they define the Dolichoderinae very well.

In general larval taxonomy parallels adult taxonomy. Genera are rather easily separated but the characters are less striking than those which separate ponerine genera. As far as our collection goes, species are distinguishable in *Dolichoderus*, *Leptomyrmex*, *Iridomyrmex*, *Bothriomyrmex* and *Azteca* but not in *Tapinoma*.

The larvae of the Dolichoderinae—again like their adults—are highly specialized. This specialization is manifest in every character in the definition given at the beginning of this paper, except possibly the spinulation of the hypopharynx. Furthermore a phylogenetic tree based on larvae would parallel very closely that based on adults. *Dolichoderus* is probably the most generalized dolichoderine genus we have studied. *Leptomyrmex* is a highly aberrant side-branch. *Liometopum* is probably the most generalized of the Tapinomini; the most specialized genera are *Engramma*, *Tapinoma* and *Technomyrmex*.

Plate 33. Larvae of Dolichoderinae

Engramma lujae Forel, Figs. 1-7—1, head of immature larva in anterior view, X86; 2, bosses on dorsum of prothorax of mature larva in dorsal view, X95; 3, larva in side view, X22; 4, left mandible in anterior view, X235; 5, body hair, X467; 6, young larva in ventral view, X22; 7, young larva in side view, X22. *Tapinoma sessile* (Say), Figs. 8-12—8, head in anterior view, X121; 9, left mandible in anterior view, X235; 10, body hair, X367; 11, young larva in side view, X44; 12, larva in side view, X44. *Technomyrmex* sp. (from the Philippine Islands), Figs. 13-16—13, head in anterior view, X44; 14, larva in side view, X20; 15, body hair, X867; 16, left mandible in anterior view, X235.

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CORRECTION ON ACAULONA PERUVIANA TOWNSEND

(Diptera, Larvaevoridae)

In the Journal of the Washington Academy of Sciences 40 (11): 369-370 (Nov. 15, 1950), I stated that the cotton stainer parasite, *Acaulona peruviana* Tns., had not been formally described, although validated for nomenclatural purposes in a bulletin published in 1928. Accordingly, I described the species from Townsend material, and selected a neotype. However, Dr. Claude Dupuis of Paris has kindly called my attention to the serious oversight of the original description (Townsend, 1913, Psyche 20: 93). Fortunately, this error of cataloguing in no way affects the zoological conclusions of the paper or the status of the new species of *Acaulona* from Puerto Rico.

Inasmuch as the two "male and female . . . types" cited by Townsend as intended for deposit in the U. S. National Museum have not been found in his material, they are presumed lost, and the neotype designation is still pertinent.

Curtis W. Sabrosky,
Bureau of Entomology and Plant Quarantine

RAYMOND CORBETT SHANNON

1894-1945

The fact that two entomologists, John R. Malloch and Frederick Knab, had lodgings in the home of his foster mother and guardian, Mrs. Susan McCormick, may have been the factor that turned Shannon's interests to entomology. Not much is known of his early life, but he left school in 1912 and entered government work as a student assistant in Knab's office. He was a born naturalist, bright, eager, and appreciative, and everyone was glad to aid him.

Although he specialized then and for life in the Diptera, two of his most helpful friends were the coleopterists, Eugene A. Schwarz and Herbert S. Barber. They took him to Plummers Island, Maryland, home of the Washington Biologists' Field Club (to which he was elected in 1914), where he reveled in the opportunities for collecting. He was adept in that direction and seemed instinctively to recognize the local and seasonal niches that would yield additions to knowledge. Thus by collecting in early spring, he turned up the flower-fly, *Merapioidus villosus*, which had been recorded only once since its original description in 1879. In magnolia bogs near Beltsville, Maryland, he found the clear-winged deer-fly (*Chrysops vitripennis*) and the azalea bee-fly (*Bombylius azaleae*), both of which he described as new. To him as to others of that day, it was a great stimulus to realize that undescribed species of insects could be found in territory that had been collected over so long and so thoroughly as the District of Columbia region. The collecting of the blood-sucking moth-fly, *Phlebotomus vexator*, on Plummers Island, the first record of the genus in the United States, may have been the factor that determined his career. Flies of this group transmit the dread verruga fever upon which Shannon later worked in South America. He was especially interested in biting flies, including the Culicidae, Tabanidae, and the genus *Symphoromyia*.

The U. S. Bureau of Entomology participated in the fostering of Shannon, appointing him as Student Assistant, July 1912, and as Entomological Preparator in July 1913. He was on the rolls at a materially increased salary in 1916, and his resignation in October of that year marked his departure for college.

It was evident to all that Shannon's talent should be given every encouragement, and there was practically a concerted effort to get this orphan youth into university training. This took the form of smoothing the entrance way and getting him employment through friends at Cornell, and of financial aid mostly from the venerable Doctor Schwarz. Still Shannon did much to support himself at college with the not surprising result that some studies were neglected and some courses were not completed. Service in the Army (1917-1919), during which he became a Sergeant (1st class) in the Sanitary Corps, broke into his university career, but he came back after discharge, did two summers' extra work, and got the degree of Bachelor of Science in 1923. A degree is the formal voucher that certain courses have been passably accomplished, but the real education comes from association with men eminent in one's chosen field. Cornell had many such inspirers and Shannon benefitted not only from the scholarly regime of their laboratories but was associated with some of them in field endeavor.

A significant instance was the Cornell Field Expedition of 1917 (see an article by J. Chester Bradley in the Scientific Monthly, April, May, and June 1919) which interrupted the final term of his Freshman year. The party included Dr. and Mrs. A. H. Wright, J. Chester Bradley, Joseph Bequaert, William Morton Wheeler, Harry H. Knight, Anne H. Morgan, and others, making almost a university in itself so far as the training of our young entomologist was concerned. The expedition went by a southern route through the Carolinas, Gulf States, and the southwest to California, breaking up at Berkeley.

Shannon was employed as cook on this tour, being trained for the task of preparing meals for thirteen people by Mrs. A. H. Wright. Although he must have been daily and strongly tempted to collect, Dr. Wright informs us that he never shirked the job but collected only when there was spare time, which, however, the leaders made for him whenever they could. He was well behaved and won recognition as a valuable member of the party. When the expedition was stalled in the Dragoon Mountains in Arizona because of down bridges, Shannon reported that a wood-borer, *Crioporosopus magnificus* LeConte, available there, was not in the National Museum. Acting on the hint, the party collected enough of them to sell for $70, thus notably recouping their finances. Shannon returned from California, end of the trail, by way of the Colorado mountains where he spent a period collecting for the University.

During his Army service, Shannon was stationed at Camp Meade, Maryland, where, as conditions permitted, Washington friends visited him, and whence he maintained contacts in the National Museum. After discharge, he was employed in the summer of 1920 as Assistant Entomologist in the Agricultural Experiment Station at Pullman, Washington, on cooperative wireworm investigations. He then returned to the Bureau of Entomology as Laboratory Assistant for a period, and to Cornell where he had an appointment as Assistant in Entomology, 1921-1922, and completed qualifications for the Bachelor's degree.

The impressions he made upon college associates may be summarized from letters from one of the students and one of the faculty. Dr. Charles Sibley, now of the Burroughs School in St. Louis, writes: "Ray and I took care of the old Insectary at Cornell and we went on camping trips together. He was one of my closest friends. I respected and admired him for his enthusiasm for, and knowledge of, certain fields of entomology. He was an ardent and skilful collector and a hard worker. He was a good companion, cheerful, talkative, gregarious." Dr. Glenn W. Herrick, Emeritus Professor of Entomology, kindly contributed the following statement: "Mr. Shannon had ability, devotion to careful hard work and a tenacity of purpose toward the goal of his efforts. . . . We at Cornell are proud of him and of the fine work he did in Brazil."

In the period 1923-1925, he was again employed by the U. S. Bureau of Entomology, in the first of those years making an entomological expedition to Panama chiefly for the study of mosquitoes. The next year, 1925-1926, he was Instructor in Entomology at George Washington University, where he also engaged in post-graduate studies.

Then began the work on insects in relation to public health that was to occupy the remainder of his life. In 1926-1928, he was in Argentina and Patagonia, first under the Argentine Government, and from December 1, 1927 as a special member of the International Health Division of The Rockefeller Foundation—his employer thenceforth. Assignments followed to: Peru in 1928; Brazil, 1928-1931; Greece, 1932-1936; Brazil again, 1936-1941; and Trinidad, 1941 to his death.

Before undertaking the work in Peru on verruga fever, he spent two months at the National Museum in Washington, informing himself on the blood-sucking insects known from that country. Other periods he managed to spend in seeing collections and getting data fundamental to his medico-entomological studies were spent in Europe in 1925 (his honeymoon year) and 1928; in the latter year he also attended the International Entomological Congress in Ithaca, N. Y. The boy, whom fate had pretty well restricted to Washington, in time ranged over half of the world.

As his early field work in the District of Columbia region yielded results that deserved recording in print, so with his later foreign employment. Nearly every year saw one or more scientific papers, from his pen alone, or in collaboration with others. The bibliography (of 129 titles) shows the scope of the investigations reported on, but in summary it may be said that he never forgot the faunal aspects of entomology and collecting for its own sake; in evidence are general papers on the mosquitoes of Brazil and on the Tabanidae of Greece. Environmental studies related to: an *Anopheles* of the swamps of Argentina, dispersion of the yellow-fever mosquito, *Stegomyia*; habitat and behavior of Brazilian mosquitoes; Grecian mosquitoes that breed in tree-holes; and the hibernation of a butterfly (*Nymphalis polychloros*) in Greece. Technical reports directly in the field of medical entomology were numerous and some of them were of outstanding importance.

Through the kindness of Dr. Henry Dietrich of Cornell University, we have a personal letter from Shannon written when he was on his second tour of duty in Brazil (April 1940). Quoted briefly, Shannon said: "We have two big problems in Brazil-jungle yellow fever and malaria (transmitted by the African Anopheline, *gambiae*) and I've been dividing my time between them. . . . We (myself, wife, and youngster) spent part of our holiday in the States last year in the Adirondacks and had a swell time climbing mountains and collecting Syrphids. This vacation was made ahead of time owing to a severe case of amoebiasis I picked up in the interior. Since returning I made another trip and now have amoebiasis again, also hookworm, schizostomiasis, round worms, and Giardia. This business of wading around for *gambiae* larvae gets into your blood in more ways than one."

Doctor Wilbur G. Downs, representative of the International Health Division in Mexico City, who was associated with Shannon in malaria investigations in Trinidad, writes that the highest compliment he could receive would be to be considered a disciple of Shannon's. Excerpts from a letter by Dr. Downs giving valuable information about Shannon follow:

"One Sunday afternoon in March 1930, outside of working hours . . . quite characteristically he was in the field doing a little exploring on his own, in Natal, Brazil. He picked up a new anopheline which caused him some difficulty in identification, until he went into world literature, when he was able to place it as [the African] *Anopheles gambiae*. Shortly after this, he recommended to his superiors that it would be easy to exterminate the species since it was apparently localized to a small zone near Natal. His suggestions were not heeded, and considerable extension of breeding range occurred after the first rainy season, and more later. Some years afterward, a multi-million dollar program, attended by much fanfare and publicity, was adopted to rid Brazil of *A. gambiae*, a feat which after much effort was successful."

"When he was working in Greece . . . he did an excellent, significant study of the ecology of Greek anophelines. He later became more and more interested in ecology and by the time he arrived in Trinidad, his interest in taxonomy . . . was decidedly secondary to [that on] . . . adult and larval ecology . . . indicative of the sound lines along which his mind worked. He had read of Park Ross's efforts in South Africa, and of [P. F.] Russell's later work in India, controlling malaria by spray-killing of adult mosquitoes, and had fully accepted this work as contributing a most significant advance in malariology. This was well before DDT came into the picture and turned attention . . . to the necessity of working on adult ecology. Shannon in his last year . . . devoted much attention to working out a method of trapping *A. aquasalis* and devised a trap which . . . has become known in Trinidad, Brazil, Mexico, and elsewhere as the Shannon Dawn Trap. It is a device which [takes advantage of] the natural impulse of *A. aquasalis* . . . to fly toward light at the break of dawn and permits the species to be trapped in . . . at times fantastic numbers."

Doctor Fred L. Soper, Director of the Pan American Sanitary Bureau of Washington, D. C., adds:

"In 1938 Shannon was, for the first time in history, able to get yellow fever virus from wild-caught mosquitoes in jungle areas and showed that *Haemagogus*, *Aëdes leucocelaenus*, and one or more of the Sabethinae were able to transmit yellow fever. The demonstration of the infectivity of *Haemagogus* was most important at the time since this mosquito had been accepted as one of the principal culprits in the transmission of yellow fever in South America since 1935. The studies of other workers all over South America have confirmed the importance of this finding."

In resolutions unanimously approved by the Board of Scientific Directors of the International Health Division in March 1945 (kindly furnished us by Doctor George K. Strode), Shannon was recognized as "a valued and productive member of the . . . staff [who] brought brilliance to its record of achievements."

Further in a biographical way, it may be added that Shannon was born at Washington, D. C., October 4, 1894. He was educated in the public schools and at a preparatory establishment known as Emerson Institute. Data on his later education and career having been given in preceding paragraphs, it may be added that he was a member of the American Association for the Advancement of Science, Entomological Society of America, Entomological Society of Washington, and of the Washington Biologists' Field Club in which he was transferred to the Honorary roll in 1940. He was rather below medium height, had a quick, charming smile, and a muscular handclasp.

In Shannon's death, a predisposing factor apparently was an attack of the mosquito-borne dengue or break-bone fever.

As the latter name indicates, this was anything but a pleasant experience. Subsequently, but not as a consequence it is believed, a tumor developed in an arm. This was removed, but intractable pain developed causing severe insomnia. There was also some paranoid affliction. The whole complex led to heavy use, and finally to an overdose, of sedative drugs (March 7, 1945).

Though the instance is not as clear-cut as some, in the opinion of the present writers, Shannon was a martyr to the hazards of medical entomology, and his name should be added to the honored roll of those who have sacrificed themselves for the welfare of mankind. He was buried in the main cemetery of Port of Spain, Trinidad, far from home but not beyond reach of the kindest thoughts of those who loved him.

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1915. Captures of the Syrphid fly, Merapioidus villosus Bigot. Proc. Ent. Soc. Wash., 17(3):147-148. Sept.

1915. An eastern Chilosia with hairy eyes (Diptera, Syrphidae). Proc. Ent. Soc. Wash., 17(3):168. Sept. [*C. primoveris* n. sp.]

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1915. A new eastern Brachyopa. Insecutor Inscitiae Menstruus, 3(11-12):144-145. Dec. 31. [*B. flavescens* n. sp.]

1916. District of Columbia Diptera: Syrphidae. Proc. Biol. Soc. Wash., XXIX, pp. 173-203. Sept. 22. [Joint paper by Nathan Banks, C. T. Greene and W. L. McAtee with Shannon as junior author.] An appendix, ''Systematic and Synonymic Notes,'' is by Shannon alone. It contains descriptions of three new species and one new variety: *Chrysogaster greenei*, *Chilosia similis*, *Syrphus knabi*, and *Syrphus ribesii vittafrons*.
His acknowledgment to Knab is: ''I desire to express my sincere appreciation of the deep interest taken and helpful suggestions made by Mr. Frederick Knab in the work I have undertaken. Through his critical readings of all the papers I have prepared many important changes have been made and faults corrected.''

1916. Ganypezidae in the United States. Ins. Insc. Mens., 4:33-36. [Joint paper with F. Knab as junior author.]

1916. Two new North American Diptera. Ins. Insc. Mens., 4(4-6):69-72. Apr.-June. [*Chrysops vitripennis* n. sp.; *Bombylius azaleae*, n. sp.]

1916. Notes on some genera of Syrphidae with descriptions of new species. Proc. Ent. Soc. Wash., 18(2):101-113. [*Chrysogaster stigmata* Will.; *C. robusta* n. sp.; *C. parva* n. sp.; *C. pacifica* n. sp.; *C. unicolor* n. sp.; *C. inflatifrons* n. sp.; *C. texana* n. sp.; *Caliprobola opacus* n. sp.; *C. aldrichi* n. sp.; *C. crawfordi* n. sp. Also contains tables of species of *Chrysogaster* and *Caliprobola*.]

1919. Notes on the Insect Fauna of bank swallows' nests in Virginia.

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1923. The Anophelines of Northeastern America (Diptera, Culicidae). Ins. Insc. Mens., 11(4-6):57-64, pls. 3-4. Apr.-June. [Joint paper with R. Matheson as senior author.]

1923. A new Microdon from Bolivia. Ins. Insc. Mens., 11(4-6):80-81. Apr.-June. [*Mocrodon manni* n. sp.]

1923. Genera of Nearctic Calliphoridae, blowflies, with revision of the Calliphorini (Diptera). Ins. Insc. Mens., 11(7-9):101-118. July-Sept.

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1924. The American species of Thaumalidae (Orphnephilidae, Diptera). Wash. Acad. of Sciences Jour., 14(18):432-434. Nov. 4. [Joint paper with H. G. Dyar as junior author.]

1924. The subfamilies, tribes and genera of North American Culicidae. Wash. Acad. of Sciences Jour., 14(20):472-486, illus. Dec. 4. [Joint paper with H. G. Dyar as senior author.]

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1924. Another new Culex from Panama (Diptera, Culicidae). Ins. Insc. Mens., 12(7-9):143-144. July-Sept. [*Culex* (*Melanoconion*) *ruf-finis* n. sp.] [Joint paper with H. G. Dyar as senior author.]

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There is a one-page obituary of Shannon, with portrait, in the Annual Report of the International Health Division of the Rockefeller Foundation for 1945 [p. x] and facing pl.); and a partial bibliography in Index, Collected Papers (of the same organization) 1924-1943 (New York 1944).

W. L. McAtee and J. S. Wade

NEW EUCOILINAE

(Hymenoptera, Cynipoidea)

By Lewis H. Weld, *East Falls Church, Virginia*

Two new genera are here proposed in the group with carinae on the mesoscutum, also one new subgeneric name, together with some changes in preoccupied specific names.

Lopheucoila, new genus

This genus differs from *Tropideucoila* and *Dettmeria* in having the wing clear, without a basal cloud and in having a short tooth on the upper surface of the cup overhanging the central pit. The cup is not as large as in *Rhabdeucoela* but is well-elevated and ridges radiate from its base out on to the disk which is truncate and quadrangular behind. The truncation of prothorax is two-thirds the width of the head with (from in front) three emarginations; in dorsal view the pronotum shows two prominent smooth areas back of the wide, shallow, lateral emarginations. Mesoscutum high-arched in profile, the median and lateral ridges bare as are the two ridges above each wing seen in side view. Head as broad as thorax, cheeks narrowed behind eyes and sharply margined. Malar groove present. Antenna of female moniliform, 13-segmented, the flagellum gradually stouter to last which is conical, the apical nine segments finely ridged, almost bare and slightly compressed. Mesopleuron bare and shining. Scutellum almost as long as mesoscutum, quadrangular, lateral bars smooth, extending back half-way, foveae longer than broad, cup not reaching back as far as the disk. Wing hyaline bare, ciliate only on outer margin, veins colorless, radial cell open on margin and partly so at base, cubitus wanting. Carinae on propodeum strongly angled. Abdomen longer than high, tergite II occupying almost the whole of abdomen, punctate posteriorly with a girdle of hairs at base. Species black with mandibles and legs red, antennae darker. Name from the Greek word *lophos*, a ridge, referring to the median dorsal carina.

Type. Diglyphosema anastrephae Rohwer.

1. Cup truncate behind, .42 the width of the disk .... *truncicola, new species*
   Cup rounded behind, narrower 2
2. Abdomen of female 1.6 times as long as high, the lower half of tergite II punctate behind and with a longitudinally ridged groove at base on each side .... *anastrephae* (Rohwer)
   Abdomen of female 1.4 times as long as high, the lower posterior third of tergite II punctate and its base smooth .... *mexicana*, new species

Lopheucoila truncicola, new species

Female. Abdomen 1.7 times as long as high in side view, the lower posterior half punctate. Tergite II with a broad, longitudinally ridged groove on each side at base. Last two segments of antenna as 14:24. Length 2.65 mm.

Type. U.S.N.M. No. 60980.

Described from one specimen taken November 16, 1931 ovipositing in a hole in a pear-shaped Valencia orange on the Oliveara Estate, Nova Iguassu, Brazil (Kisliuk and Cooley).

Lopheucoila anastrephae (Rohwer), new combination

Diglyphosema anastrephae Rohwer, 1919. Proc. Ent. Soc. Wash. 21: 156.

The types of *anastrephae* are in the U. S. National Museum (fig. 1). The median carina on mesoscutum does not quite reach the scutellum, the parapsidal ridges are incomplete, hardly more than distinct changes in slope. Cup .4 the width of the disk. Last two segments of antenna of female as 13:21. In the male the third is longest and strongly bent.

Determined as this species are: one male reared March 3, 1930 from *Lonchaea* in guava, Casa Vouk, Saõ Paulo, Brazil (M. Carvalho); one female from Balboa Heights, C.Z., reared June 1928 from *Anastrepha fraterculus* (J. Zetek-3080); one male Dept. Piura, Peru (C. H. Townsend); one male S. Lucrecia, Vera Cruz, Mexico (Crawford).

Lopheucoila mexicana, new species

Female. Differs from *anastrephae* in that the median carina on mesoscutum reaches the scutellum, there is a group of punctures between the median and each lateral ocellus and the last two segments of the antenna are as 9:13. The posterior third of tergite II is punctate and it is smooth anteriorly without a sulcate depression. Using the width of the head as a base the length of mesonotum ratio is 1.22; antenna 1.8; wing 3.1. Length 1.9 mm.

Type. U.S.N.M. No. 60981.

Described from one specimen from Cordoba, Mexico (Crawford). Male unknown. Host unknown.

Penteucoila, new genus

Head broader than thorax. Cheeks sharply margined. Antenna of female 13-segmented, last seven of flagellum forming a club, last segment longest. Truncation of pronotum broad, with three shallow emarginations. Mesoscutum with a percurrent median carina between two deep, smooth grooves closed anteriorly. Parapsidal ridges broad, pubescent, percurrent; lateral ridges bare with smooth grooves above and below each. Scutellum quadrate, disk reticulate, truncate with a short blunt tooth at each corner behind as in *Dicerataspis;* cup reaching back almost as far as disk, a short tooth overhanging the pit on depressed rear portion. Mesopleuron bare and polished. Wing dusky at base, sparingly pubescent, ciliate, radial cell open, veins distinct, cubitus wanting. Carinae on propodeum angled. Abdomen truncate, slightly longer than high. Differs from *Rhabdeucoela* and *Lopheucoila* in having the wing dusky at the base; from *Dettmeria* and *Tropideucoila* in having a tooth on the cup of the scutellum overhanging the little pit. Male unknown.

Type. Penteucoila triloris, new species.

Penteucoila triloris, new species

Female. (Fig. 2). Robust. Black with mandibles and legs light brown, antennae darker brown. Cheeks narrowed behind eyes. Occiput smooth. Head from in front broader than high, front polished, almost bare, a fine groove close to eye margin from antennae to malar groove. Malar space the .23 eye height. Pubescent areas between and below lateral ocelli. Antennae 13-segmented, twice as long as width of head, segments 7-13 forming a slight club. Truncation of pronotum .57 the width of the head, with a median and two broader shallow emarginations. Mesoscutum smooth with a bare percurrent median carina on each side of which is a deep smooth groove and a pubescent parapsidal ridge; the lateral ridges are shorter, bare and have broader smooth grooves above and below each. Scutellum .8 as long as mesoscutum, disk reticulate, truncate, with a short blunt tooth at each posterior angle. Cup well-elevated, broadly rounded behind; tapering in front into a carina between the two deep smooth fovae, a short sharp tooth overhanging the central pit on the sloping rear portion, lateral bars smooth. Mesopleuron bare, smooth. Wing hyaline beyond the dusky base, pubescent and ciliate, veins clear, radial cell open on margin and partially so at base, cubitus absent. Area on either side of and between the angled carinae pubescent, neck of propodeum short, sulcate. Abdomen slightly longer than high, truncate behind, only tergite II visible, faintly punctate behind, with a ring of hairs at base. Described from three specimens measuring 1.6, 1.6, and 1.8 mm. Host unknown.

Types. U.S.N.M. No. 60982. Type, Jalapa, Mexico (Crawford). Paratypes in British Museum: Trinidad, February 22, 1929, J. G. Meyers, No. 1199; British Guiana, 3.8.46, H. C. James, No. 801. The paratypes were loaned through the kindness of Mr. G. J. Kerrich of the Commonwealth Institute of Entomology.

Tropideucoila rufipedata, new name

Trisseucoela rufipes Kieffer (1908 Ann. Soc. sci. Bruxelles 32: 45) from Nicaragua is transferred to *Tropideucoila*, where the name *rufipes* is preoccupied by *rufipes* Ashmead 1903, so *rufipedata* is here proposed.

Kleidotoma subgenus **Pentakleidota,** new subgenus

As the species of *Kleidotoma* with a 5-segmented club were left without a name when *Pentacrita* Foerster was found to be a synonym of *Rhynchacis* Foerster, the name *Pentakleidota* is here proposed with *Kleidotoma elegans* Cameron as the type.

Kleidotoma pilosalis, new name

Kleidotoma pilosa Dettmer (1926, Zool. Anz. 66: 85), is preoccupied by *Kleidotoma pilosum* Kieffer (1907, Ent. Ztschr. Stuttgart, 21: 131) and *pilosalis* is here proposed for Dettmer's species.

Trybliographa subgenus **Pentaplastidia** Weld

As the genotype of *Pentarhoptra* Kieffer possesses a striate disk, a narrow cup and abbreviated wings, it is now regarded as a synonym of *Aphiloptera* Foerster. This left the species of *Trybliographa* with a 5-segmented club without a subgeneric name and *Pentaplastidia* was proposed with *Cothonaspis* (*Pentarhoptra*) *clarimontis* Kieffer as the type in the Synoptic Catalog of North American Hymenoptera (U. S. Dept. Agr. Monogr. 2: 603, 1951).

Pseudeucoila brasiliana, new name

Eucoila (*Eucoila*) *brasiliensis,* Kieffer (1909, Bull. Soc. Hist. Metz 26: 75) from Para, Brazil is preoccupied in *Pseudeucoila* by *Hexamerocera brasiliensis* R. v. Ihering, 1905, and *brasiliana* is here proposed for Kieffer's species.

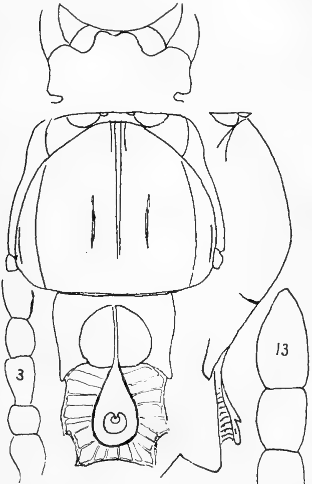

Fig. 1

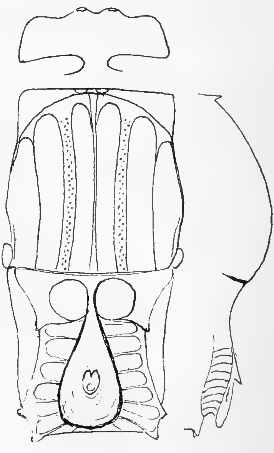

Fig. 2

Fig. 1, *Lopheucoila anastrephae* (Rohwer): Mesonotum, dorsal and profile views; pronotum from in front and segments of antenna of female. Fig. 2, *Penteucoila triloris,* new species: Mesonotum, dorsal and profile views, and pronotum from in front.

SIEVERT ALLEN ROHWER

1888 - 1951

The sudden death of Dr. S. A. Rohwer, which occurred February 12, 1951, in the Agricultural Department Building in Washington, was a profound shock, not only to his family but also to a very wide circle of associates, friends and acquaintances. He had appeared to be vigorous and in good health, and, as he often did, he had stayed on at the office after official hours. Death was due to a heart attack.

Sievert Allen Rohwer was born at Telluride, Colorado, December 22, 1888. His father, George Rohwer, had come to America as a boy in 1865, from Schleswig-Holstein, then a part of Denmark, and had become a mining engineer. His mother was Lucretia Billingsly Rohwer, a native of Letonia, Ohio. Sievert's early life was spent amid the environments of mining camps in Colorado, and while in high school he spent a number of summers working in the mines. From 1907 to 1909 he attended the University of Colorado where he was a student of the late Professor T. D. A. Cockerell. Naturally endowed with abundant energy and an exceptionally keen mind, he absorbed much of Professor Cockerell's enthusiasm for insect taxonomy and became a specialist on the sawflies even before leaving college. Actually he entered the U. S. Bureau of Entomology in 1909 without having completed his undergraduate work, and throughout most of his long and distinguished career he was without an academic degree. In 1948, however, the University of Colorado conferred upon him the honorary degree of Doctor of Science.

Dr. Rohwer's original appointment in the Bureau of Entomology was as a specialist in sawflies in the Division of Forest Insect Investigations; he was stationed at the National Museum in Washington. In 1913 he was placed in charge of the Forest Insect Laboratory at Falls Church, Virginia, but he continued to spend most of his time at the National Museum on the taxonomy of the sawflies and certain other groups of Hymenoptera; and when the Bureau's Division of Taxonomic Investigations was finally organized in 1923, he was very logically selected to take charge. He continued in this capacity until April 1927, when he was transferred to the Chief's office to assume active control of the fiscal and administrative functions of the Bureau as Business Manager. July 1, 1928, he was named Assistant Chief of the Plant Quarantine and Control Administration. This appointment virtually marked the end of his extremely productive years in the taxonomy of the Hymenoptera, for after that the pressure of administrative duties left him no time for taxonomic work although he continued to follow developments in that field with the keenest interest. During the brief period he spent in the Plant Quarantine and Control Administration there were numerous troublesome problems to be dealt with. One of the most serious was that involving eradication of the Mediterranean fruit fly in Florida. Dr. Rohwer played an important part in the over-all direction of this effort.

In 1931 he came back to the Bureau of Entomology as Assistant Chief, and he continued to serve in that capacity after this Bureau and the Plant Quarantine and Control Administration were amalgamated in 1934 to form the present Bureau of Entomology and Plant Quarantine. In a reorganization of the Chief's office in 1941 he was designated Assistant Chief in charge of Regulatory Work, but he had little opportunity to function in that limited capacity. World War II brought new problems resulting from increased recognition of the importance of insect control, and Dr. Rohwer's assignments were expanded to include activities associated with the participation of industry in developing, providing and distributing materials needed for insect control. He served as the Bureau liaison officer with industry and trade associations in connection with such problems and as Bureau liaison with other governmental agencies on matters pertaining to large-scale control programs. He was also responsible for work associated with the preparation and processing of applications for patents to protect inventions by Bureau employees a considerable number of which were developed during the war years; and for directing the distribution of the limited quantities of insecticides available for combatting the principal insect pests. In recognition of his exceptional contributions during this period, he was awarded the Superior Service Certificate and Medal of the Department of Agriculture in 1947. Finally, less than two months before his death he was selected to assume the duties of a new position in the Agricultural Research Administration of the Department of Agriculture. These involved representation of the Administration in the numerous activities relating to national defense in which the ARA participated.

During his long period of service in the Bureau, Dr. Rohwer had an important and vigorous part in a large variety of entomological activities, but apparently nothing he did gave him more personal satisfaction than his taxonomic work on sawflies, wasps and parasitic Hymenoptera. Between 1908 and 1928 he published approximately 180 papers on the classification of these groups, including descriptions of more than 80 new genera and 1100 new species. During most of this period he also directed the work of the other Bureau taxonomists who were associated with him at the National Museum; and he always had time for beginning workers in this field who needed encouragement and advice. Moreover, as a keen thinker on questions of scientific nomenclature his views on particularly intricate and troublesome problems were often sought by the former Secretary of the International Commission on Zoological Nomenclature.

In spite of the heavy demands of his official duties upon his time and energy he took an active part in many scientific organizations and in the affairs of his home community. From 1912 to 1934 he served as Secretary-Treasurer of the Entomological Society of Washington and in 1932 as president. It was largely through his efforts while he was Secretary-Treasurer that the permanent publication fund of this Society was established. In 1925 he was president of the Biological Society of Washington and in 1948 president of the American Association of Economic Entomologists. He was a Fellow of the Entomological Society of America, and a member of the Entomological Society of Washington, the American Association for the Advancement of Science, the American Phytopathological Society, the American Association of Economic Entomologists, the National Pest Control Association, the

Committee on Pesticides of the American Medical Association, the Biological Society of Washington, the Insecticide Society of Washington, the American Chemical Society, and the Cosmos Club. In his home community he had served as a member of the School Board and of the Parent Teachers Association, and as Chairman of the local chapter of the American Red Cross.

Dr. Rohwer is survived by his wife, Portia Brown Rohwer; four sons, Karl S., Donald D., G. Gregor and Rolf D., and a daughter, Mrs. Portia R. Agadjanian. His death is mourned by a host of friends, and particularly by the older members of the Entomological Society of Washington who remember the prominent part he had in the Society's affairs over a long period of years.

C. F. W. MUESEBECK, *Chairman*
A. B. GAHAN
E. R. SASSCER

BOOK REVIEWS

ROCKY MOUNTAIN NATURALISTS, by Joseph Ewan. 8 vo., cloth, 358 pp., illus., Denver Colorado, University of Denver Press, 1950, $5.00.

This little book is another welcome and noteworthy addition to our source material on the historical background of natural science in America, and is particularly strong on biographies of entomologists, ornithologists, botanists and others. It is worthy of a place on the bookshelf along with Geiser's "Naturalists of the Frontier," (Proc. Ent. Soc. Wash., 50(8):225-226, Nov. 1948). Following an interesting historical preview, (pp. 1-12) the book is divided into two general sections: The first of these, (pp. 13-116) contains detailed biographical sketches, with full notes on, and with portraits of, nine leading naturalists of the Rocky Mountain area, one of these being that of Dr. Theo. D. A. Cockerell. Then follows (pp. 118-137) a chapter of explanatory notes and an excellent bibliography. The second section, (pp. 138-143) is a roster in biographical dictionary form of 798 natural history collectors, from 1682 to 1932 inclusive, of whom 61 represent entomologists. In addition to biographical sketches of earlier workers in various entomological fields, it is a pleasure to note that there are also included those of a considerable number of our present-day colleagues and fellow-members of our Society. Among the more outstanding of the entomological fraternity, contemporary or otherwise, it is of interest to find biographical matter on such persons as: J. M. Aldrich, C. F. Baker, E. D. Ball, F. C. Bishopp, L. Bruner, John Burroughs, A. N. Caudell, R. A. Cooley, E. T. Cresson, C. R. Dodge, H. G. Dyar, C. L. Fluke, C. P. Gillette, M. Hebard, A. B. Klots, H. H Knight, G S. Langford, J. L. Leconte, G. M. List, F. E. Lutz, A. C. Maxon, H. C. McCook, J. H.

McDunnough, A. S. Packard, M. A. Palmer, J. A. G. Rehn, L. G. Ricksecker, S. A. Rohwer, G. A. Sandhouse, S. H. Scudder, Roger C. Smith, F. H. Snow, T. U. Spalding, V. M. Tanner, Cyrus Thomas, C. H. T. Townsend, J. R. Watson, W. M. Wheeler, H. F. Wickham and E. V. Wilcox. The book has been very minutely indexed, which feature adds greatly to its usefulness as a reference work, and the end papers reproduce a letter from Eugene Penard to Francis Ramaley, dated May 18th, 1908 from Geneva, Switzerland, on the pleasures of mountain collecting.

J. S. Wade

INSECTS IN YOUR LIFE, by C. H. Curran, American Museum of Natural History. Cloth, 8vo., 316 pp., illus., Sheridan House, 1951, $3.50.

Dr. Curran has presented an engagingly written volume for the layman dealing with the life histories or behavior of a variety of insects, many of them familiar to the average person. Accounts are also included of his investigations on the flight of flies and the old prophecy that the width of the colored bands on the woolly bear caterpillar predict the severity of the coming winter, and on his experiences with the control of household insects. The author's cautions to his readers concerning unethical insect exterminators and the indiscriminate use of DDT and other insecticides are praiseworthy. On the other hand, there are certain aspects of the book which should be criticized. In the technical reports of our studies we should be accurate. This axiom is no less true for popularized accounts presented for the lay reader. In the chapters on insects most familiar to me are such inaccuracies or misstatements as the following: the face of a giant hornet (Pl. 6) is stated to be that of a cicada killer; the statement (p. 119) that the giant hornet has not gained a foothold much over a hundred miles from the site of its original introduction (New York City)—it now breeds as far south as North Carolina (*teste* Wing, 1949); the statement (p. 125) that the cicada killer captures mostly male cicadas which are located by their songs—several investigators as early as Davis (1921) have stated that the cicadas are not located by song but probably by sight and frequently more females are caught than males; the statements (p. 128) that eight to more than a dozen cicadas are placed in one brood chamber and the cicada killer deposits an egg on certain of these give an entirely erroneous impression—the wasp constructs several cells separated by partitions of earth at the end of her burrow, but stores only one or two cicadas in each cell which serve as the larval food for one individual. The unfortunate part is that most of these inaccuracies could have been caught by critical pre-publication reading of pertinent sections by some of the author's colleagues.

Karl V. Krombein,
Bureau of Entomology and Plant Quarantine.

C. F. W. MUESEBECK (LEFT) RECEIVES U. S. DEPARTMENT OF AGRICULTURE'S HIGHEST AWARD FROM SECRETARY CHARLES F. BRANNAN

Carl Muesebeck, In Charge of the Bureau of Entomology and Plant Quarantine's Division of Insect Identification, was honored May 15, 1951, for Distinguished Service in the U. S. Department of Agriculture, on the 89th Anniversary of President Lincoln's order creating a Federal Department of Agriculture, "For his contributions to science and public welfare as an internationally-recognized insect taxonomist; for his ability to inspire and guide his associates in entomology throughout the world in the acquisition and dissemination of information on destructive and beneficial insects; and his devotion to duty."

Thus, entomology became recognized for its fundamental value in the fields of science and public welfare through identification of insects—taxonomy.

"Honors such as these depend upon the personnel one is fortunate enough to work with," Carl said characteristically upon being congratulated after receiving this award. His congratulating friend retorted, "A working unit is almost never better than its leadership—besides, devotion to duty has nothing to do with cooperating personnel."

DATE OF PUBLICATION, SYNOPTIC CATALOG OF NORTH AMERICAN HYMENOPTERA

The first copies of "Hymenoptera of America North of Mexico—Synoptic Catalog" (U. S. Dept. Agr., Agr. Monogr. 2, 1420 pp.), with contributions from a score of American Hymenopterists, were distributed to personnel in the Division of Insect Identification in Washington, D. C. on July 11, 1951. The publication date on the title page, "April 1951," is erroneous.

C. F. W. MUESEBECK, KARL V. KROMBEIN AND HENRY TOWNES

Actual date of publication of Vol. 53, No. 3, was June 15, 1951.

Unusual Scalp Dermatitis in Humans caused by the Mite *Dermatophagoides* by Jay Traver. This article covers in detail symptoms, treatments and identification of a skin-infesting mite which causes serious damage to the human host. Reprint with cover..............................50 cents.

MEMOIRS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

No. 1. "The North American Bees of the Genus Osmia," by Grace Sandhouse. $3.00. Members' price $2.50.

No. 2. "A Classification of Larvae and Adults of the Genus Phyllophaga," by Adam G. Boving. $3.00. Members' price $2.40.

No. 3. "The Nearctic Leafhoppers, a Generic Classification and Check List," by Paul Wilson Oman, $7.00. Members' price $6.00.

For prices on back numbers of the Proceedings and sets of unbound papers, please see the April 1951 issue.

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VOL. 53 OCTOBER, 1951 No. 5

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THE

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OF WASHINGTON

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

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PROCEEDINGS
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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 53 OCTOBER, 1951 No. 5

MORPHOLOGY OF THE TERMINALIA AND INTERNAL REPRODUCTIVE ORGANS, AND COPULATION IN THE MOSQUITO, CULISETA INORNATA (WILLISTON)

(DIPTERA, CULICIDAE)

By DON M. REES and KOICHI ONISHI, *Department of Invertebrate Zoology and Entomology, University of Utah, Salt Lake City, Utah*

This report presents information obtained from a detailed study of the morphological structures involved and the mechanics and behavioristic patterns observed, in the copulation of *Culiseta inornata* (Williston). The study was undertaken as information pertaining to the copulation of mosquitoes is relatively brief and indefinite when compared with other phases of mosquito bionomics. To provide a more comprehensive understanding of the mechanics of copulation it was necessary to investigate in greater detail the morphology of the terminalia and internal reproductive organs. *Culiseta inornata* was selected for this study as this species can be successfully reared and specimens copulate readily under laboratory conditions.

A review of available information pertaining to reproduction structures and methods of copulation of mosquitoes, prior to 1912, was adequately summarized by Howard, Dyar and Knab (1912-17). According to this account the earliest report of the copulation of mosquitoes was published by Riviglias in 1737, concerning members of the genus *Culex*. This review also refers to the work of Knab in which he compares the positions assumed in copulation by *Anopheles* and *Culex*. In this publication the first information concerning copulation of *Culiseta inornata*, also referred to as *Culiseta consobrinus*, was reported by Dyar. Gerry (1932), Gjullin (1937) and Roth (1946), describe in some detail the female genitalia of mosquitoes. Some of this information is applicable to the female genitalia of *C. inornata*. Numerous investigators have reported on studies of the male genitalia of mosquitoes including Freeborn (1926), Dyar (1928), and Matheson (1944). The most extensive study on the biology of *C. inornata*, including comments on copulatory behavior, was reported by Owens (1942).

MATERIALS AND METHODS

Specimens of *C. inornata* used in this study were collected in the vicinity of Salt Lake City, Utah. All larval instars and pupae were secured from breeding areas by means of a dipper and transferred directly to glass jars. These specimens were then taken to the laboratory for identification and study. Glass lamp chimneys covered at one end with mosquito netting were placed over the glass jars to capture the emerging adults. As they emerged they were taken from the lamp chimneys by means of a sucking tube and transferred to rearing cages to provide laboratory colonies. Cages 1.5 feet square were used for rearing. Each was screened at the sides and the front, and covered with a glass top. A small opening, to which was attached a cheese cloth sleeve, was provided on the front of each cage. Turkish towels were placed over the screened areas, and were kept constantly moist to provide sufficient humidity within the cage. A photographic pan 8.5 by 6.5 inches, filled with water and vegetation was placed inside of each cage for oviposition. Slices of apple placed in the cages were readily accepted as food by both males and females.

Since this species does not readily feed upon man, a successful method had to be devised of feeding the females with blood. About three days before a blood meal was to be given, the slices of apples were removed from the cage. Blood feedings were then readily accomplished in a dark room with these hungry mosquitoes. To provide the blood, the arm of the junior author was placed through the cheese cloth sleeve of the cage and the hand was held near the glass roof. A small beam of light was then directed through the glass and onto the hand. Both males and females were attracted to the light, and being prevented from alighting on the under side of the glass by the slow movement of the hand, they alighted on the exposed hand. Soon afterward, the females generally engorged themselves with blood.

From three to six days after a blood meal, the females oviposited on the surface of the water contained in the developing pans. Each egg raft was taken from the pans soon after oviposition and transferred to separate containers where, after hatching, the larvae were reared according to accepted laboratory methods.

To facilitate the study of the rotation of the male terminalia and copulation, the sexes were segregated as soon as possible. The males could be readily identified in the fourth larval instar by the paired testes lying laterally within the sixth and seventh abdominal segments. The sexes were also distinguishable in the pupal stage, the females being generally larger than the males. Determination of sex in the pupal stage was not always as accurate as in the larval stage, due to variation in the size of the pupae.

Emergence was considered complete when the adults had

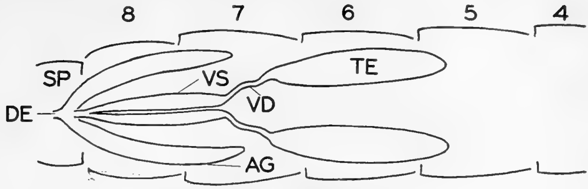


FIG. 1 - MALE

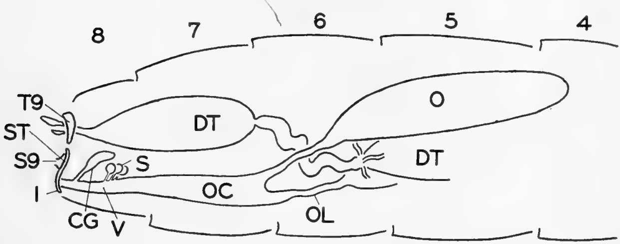


FIG. 2 - FEMALE

Text Figures 1 and 2. Internal reproductive organs of *Culiseta inornata.*

completely freed themselves from their pupal skin. It was assumed that rotation of the male terminalia started when emergence was complete and terminated after a 180 degree rotation. For the purpose of observing the rotation of the terminalia, the specimens were placed in vials and examined under a stereoscopic microscope. Studies of behavior, mechanics, and length of time of copulation were made of copulating pairs confined in vials, bottles, and rearing cages.

Acid fuchsin stain was used in staining external genital structures. Dissection was accomplished in normal saline solution.

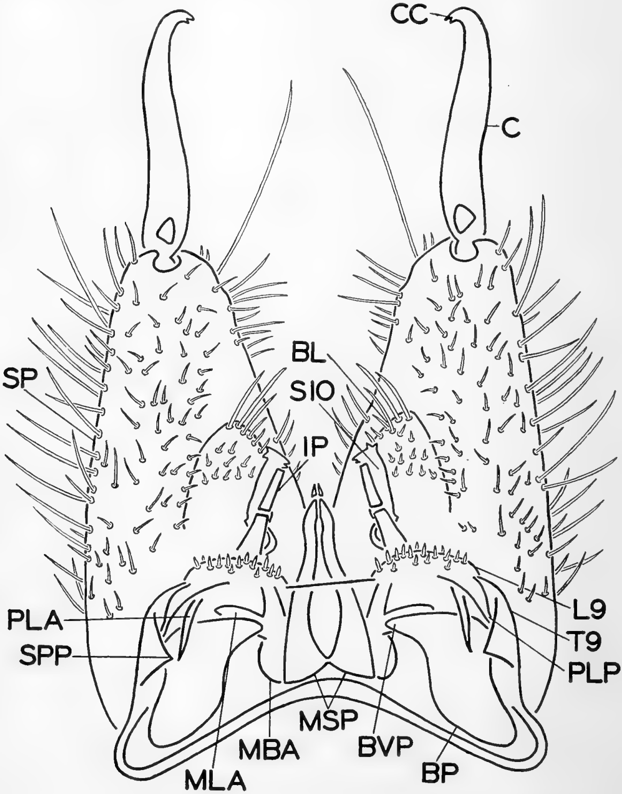
Morphology of Male[1]

The internal reproductive organ of the adult male *C. inornata* consist of two testes (TE), two vasa deferentia (VD), two vesiculae seminalis (VS), one ductus ejaculatorius (DE), and two accessory glands (AG), (Text Fig. 1). The greater part of each testis is laterad of the digestive tract within the sixth abdominal segment. The testes are connected to the vesiculae seminalis by a short vasa deferentia. The accessory

[1]All structures and directions, such as dorsal and ventral are given in their true morphological meaning, *i.e.,* before rotation of 180 degrees of the male terminalia.

glands are laterad of the vesiculae seminalis and unite at the base to form a continuous passage for the sperm through the ductus ejaculatorius, which terminates with the external genitalia. The terminalia consist of all abdominal segments posterior to the seventh. The genitalia are located on segments posterior to the eighth.

The eighth segment of the male bears no appendages and is not directly concerned with the genitalia proper, but this segment is of primary interest because it is involved in the rotation of the tip of the abdomen which occurs following emergence of the adult male. In this



Text Figure 3. Male genitalia of *Culiseta inornata.*

species, the tergite of the eighth abdominal segment bears rows, or tufts, of stout bristles on the apical edge.

The ninth segment of the male consists of a complete chitinous ring, (Text Fig. 3 and Pl. 34). The lobes of the ninth tergite (L9), arise from the tergite of this segment (T9) and bear short stout spines. The sternite of the ninth segment (S9) is connected to the tergite by narrow pleura (P9).

The primitive appendages of the ninth segment are modified into external genital armatures. The exopodite of this appendage is divided into a basal portion, the side piece (SP), and a distal portion, the clasper (C). The clasper terminates in the spine or claw of the clasper (CC). The dorso-medial portion of each side piece bears, near its base, the basal lobe (BL), which is crowned with several stout spines on the apex and small setae on the side. In this species an apical lobe is negligible or absent.

The mesosome is composed of two long "sclerotized plates" (MSP) having a slender, membranous tip, and a pair of arms directed ventrocaudad and slightly laterad. Each arm consists of two parts, the "basal arm" (MBA) and the "lateral arm" (MLA) which projects laterally from the "basal arm." The "lateral arm" articulates with the "ventral projection" of the basal plate (BVP). The apex of the "basal arm," in its normal position, does not seem to articulate with any other structure, and is probably modified for muscle attachment. The ductus ejaculatorius extends dorsally over the ventral bridge (MVB), which is at the base of the "sclerotized plates."

Each paramere is a furcated structure directed dorso-laterad with a lateral arm (PLA) and a dorsal arm (PDA). The proximal portion of the paramere articulates with the basal arm of the tenth sternite (BA 10). The distal part of the lateral arm articulates with the medial side of the basal plate (BP), between the "ventral" and "dorsal" projections (BDP). This distal part articulates nearer the latter projection. Distally, the dorsal arm of the paramere widens, forming somewhat of a triangle, the two apices forming processes, the "dorsal" (PDP) and "lateral" (PLP) processes. The "dorsal process" lies ventral to the lobes of the ninth tergite and serves as an attachment for the base of the "interbasal plate" (IP). The "lateral process" is in close proximity to the "dorsal projection" of the basal plate.

The basal plates extend cephalad to the lateral arms of the parameres. The "ventral projection" of the basal plate articulates with the "lateral arm" of the mesosome, and the dorsal border of the basal portion (BB) with the process of the side piece (SPP).

The interbasal fold (IF) forms a ring around the genital opening Within this fold and lateral to the anal opening there is a pair of chitinized plates, the "interbasal plates," which extend from the "dorsal projection" of the paramere to near the apex of the tenth sternit Each of the "interbasal plates" is divided into two parts and connected by membranous-like tissue at the junction.

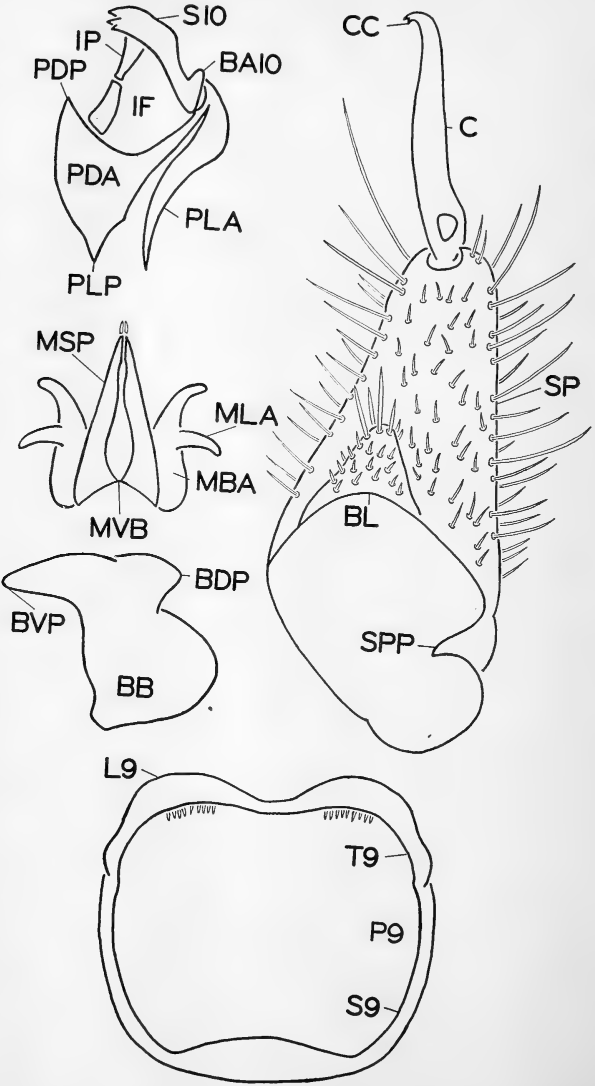
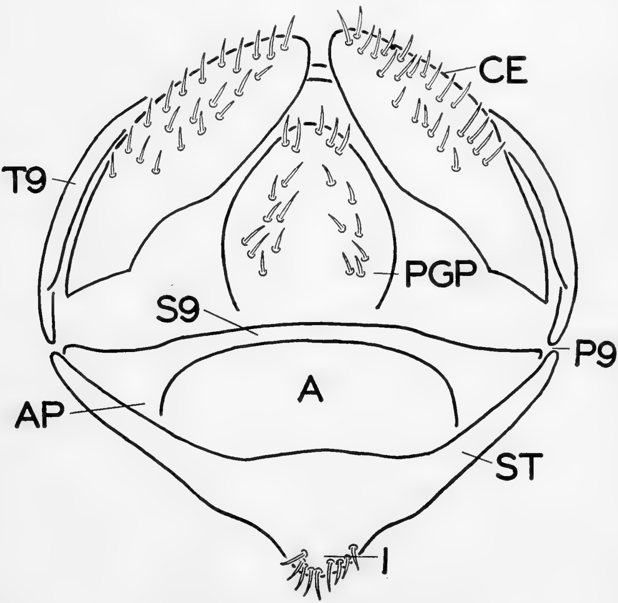


PLATE 34. MALE GENITALIA, CULISETA INORNATA

The tenth segment forms the anal portion of the terminalia and, theoretically, is composed of the combined tenth and eleventh segments and the telson. This entire structure is called the proctiger. Each tenth sternite (S 10) has a short projection, the basal arm, which articulates with the paramere. The lobes of the tenth sternite terminate apically in a few sharp teeth.

Morphology of Female

The internal reproductive organ of the adult female *C. inornata* consists of two ovaries (O), two oviductus lateralis (OL), one oviductus communis (OC), one vagina (V) or genital chamber, three spermathecae (S), and a colleterial gland (CG), (Text Fig. 2). The ovaries are located dorso-laterally to the digestive tract, mostly within the fifth abdominal segment. The base of each ovary is attached to an oviductus lateralis, and in turn each oviductus lateralis unites with the oviductus communis. The terminal portion of the latter structure is the vagina. Spermathecae open into the dorsal end of the vagina by narrow ducts.



Text Figure 4. Female genitalia of *Culiseta inornata*.

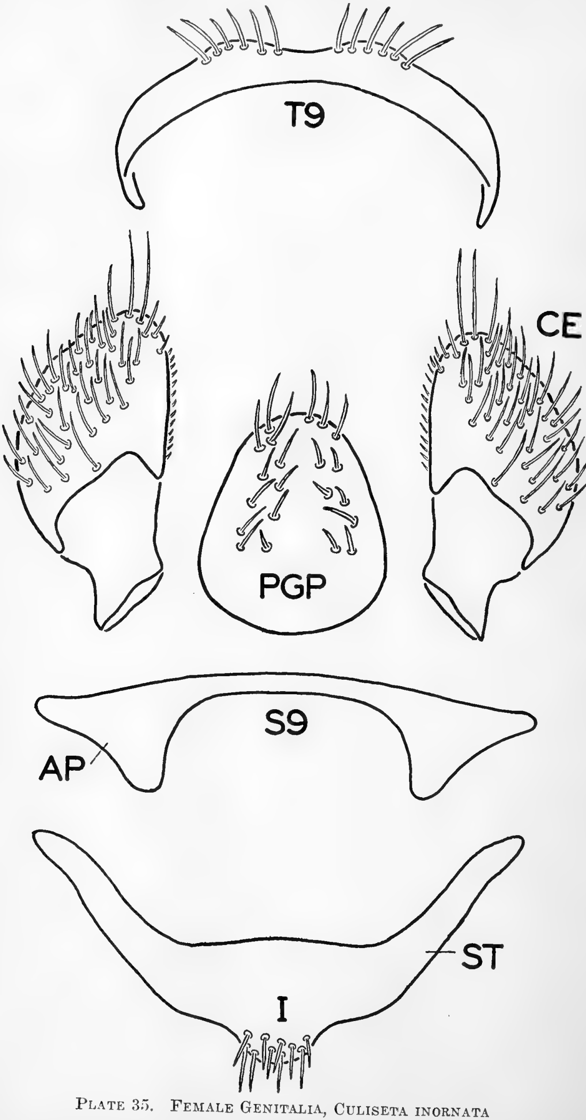


Plate 35. Female Genitalia, Culiseta inornata

Posterior to the opening of the spermathecae, the duct of the colleterial gland opens into the vagina. The vulva, which is the external opening of the genital tract, is located ventral to the anal opening in a depression of the ninth sternite known as the atrium.

As in the case of the male, the external genitalia of the female consist of the segments posterior to the eighth abdominal segment, (Text Fig. 4 and Pl. 35). The ninth tergite (T9) surrounds the dorso-anterior circumference of the female genitalia. It bears two small lobes, which in turn bear setae on the apical edge. The ninth sternite (S9) is connected to the tergite by membranous pleurae (P9). The ninth sternite has processes called atrial plates (AP).

The stigmata (ST) are attached by a membrane near the juncture of the ninth tergite and sternite on each side and extended somewhat ventrally around the ninth sternite. Medially to the stigmata, the expanded portion is called the insula (I). Between the above structures and the ninth sternite is the atrium (A).

The tenth tergite is represented by two small chitinized plates near the base of the cerci (CE). The tenth sternite is a membranous, reduced structure in most mosquitoes designated as the cowl.

The post-genital plate (PGP) is the structure located ventral to the anal opening. Evidence seems to indicate this structure is formed from a fusion of part of the tenth and eleventh sternites.

The cerci are located dorso-laterally to the post-genital plate and above the anal opening. Evidence seems to indicate that they are appendages of the eleventh segment.

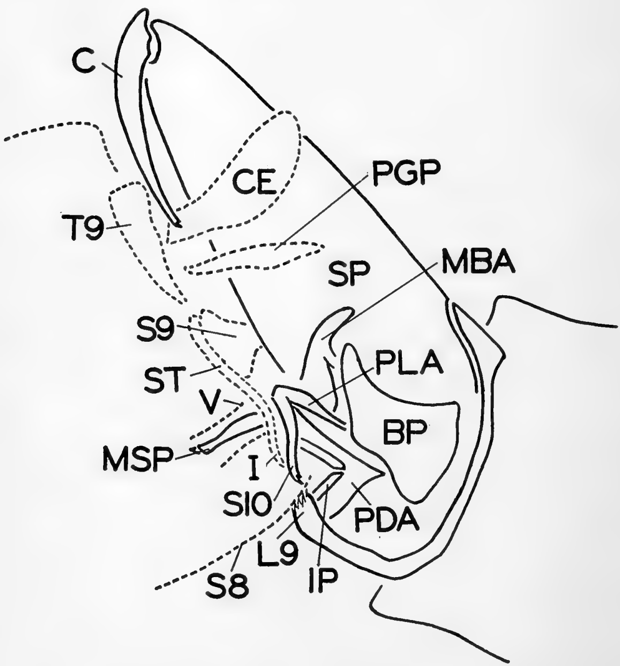
The anal segment lies primarily between the two cerci. Because of the small amount of sclerotization, this structure is only slightly discernable.

Copulation

In this species the male seeks the female for copulation in from 6 to 12 hours after emergence. During this interval the male terminalia rotate approximately 180 degrees, which is necessary before copulation can take place. The males usually emerge about this length of time before the females from the same egg raft and are therefore ready for copulation when the females emerge. The females may copulate within 1 or 2 minutes after eclosion as the female terminalia do not rotate.

Swarming does not occur in this species. The males initiate copulation by hovering over the dorsum of the recently emerged female. If the females are not receptive they keep the males away by beating their wings, pushing with their metatarsal legs, or changing body positions. Older females are more selective in accepting a mate than are the more submissive younger individuals. If receptive the female remains motionless while the male hovers over her. While in this position, the male bends his abdomen around the underside of the wings of the female and attaches the claws of the claspers on the membrane between the bases of the cerci near the tenth tergite of the female. The claspers bend ventrally and medially to facilitate this attachment. The male then turns to its right or left, and copulation occurs end to end, with the male and female facing opposite directions.

Other structures used by the male as a means of attachment to the female (Text Fig. 5) are the spines on the lobes of the ninth tergite (L9) and the teeth on the tenth sternite (S10). The spines attach on the posterior-ventral side of the eighth sternite of the female (S8). The paired tenth sternites are able to bend approximately 90 degrees, from a horizontal to a ventral position. These structures are attached to the inner



Text Figure 5. Position of male and female *Culiseta inornata* during copulation. Male ———, female — — — —.

posterior portion of the eighth sternite of the female. The "sclerotized plates" of the mesosome (MSP) are inserted into the vagina (V) during copulation. During copulation, the male genitalia are appressed to genital structures of the female, but the cerci and the post-genital plate are visible dorsally, extending between the paired side pieces.

The mesosome is moved during copulation. The center of articulation that provides for this movement is between the lateral arms and the ventral projections of the basal plates.

During copulation the sclerotized plates of the mesosome are moved outward and inward. This is possible as the basal portions of the basal arms and the sclerotized plates of the mesosome are connected by membranous-like tissue, which acts as a flexible joint between these two parts.

The movement of the sclerotized plates can be readily demonstrated. Some of the males, which were killed, had this structure extended. When the genitalia of these specimens were examined, the extent of outward movement of this structure was visible. Also it was demonstrated by slightly anesthetizing pairs in copulation and observing the detached males under a stereoscopic microscope. By gently stimulating the inner side of the side piece with a minuten pin manipulator, the sclerotized plates were observed moving outward and inward. This stimulus, as far as could be determined, caused the movement. No amount of stimulation would produce movement 10 minutes after copulation.

From observations made in the field and in the laboratory, the usual position of copulation is end to end on a near vertical plane, with the female terminalia above the male and both facing in opposite directions. In the field, pairs were also copulating on the vegetation in this manner. In the laboratory numerous positions were observed. In one, the male was observed hanging in mid-air while the female was attached to the underside of an object. In another, copulation occurred while the pair was at a 90 degree angle, with the legs of the female attached to the side of a rearing jar and the male on the surface of the water. Many positions can be attained by moving the vial in which a pair is copulating. When not disturbed, however, the pair will generally adjust to an end to end position on a vertical plane. Unless disturbed, there is little movement from one place to another while pairs are copulating. When a copulating pair is disturbed by placing it in an abnormal position so that the abdomen must turn, this turning occurs primarily in the male. It occurs mainly between the seventh and eighth abdominal segments, but some torsion may occur along the abdomen anterior to the seventh.

The longest time interval recorded for complete copulation of undisturbed pairs was 6 hours and 40 minutes, the shortest, 3 hours and 27 minutes. Care was taken not to disturb the pairs while in copulation, for they frequently disengage when even slightly disturbed, especially after the first hour of attachment.

Constant observations were not made of all copulating pairs. However, observations indicated that some pairs in copulation for a period of 4 hours or longer separated approximately mid-way, remaining unattached for approximately 30 minutes then copulated again.

The terminalia of the adult male start rotating either to the right or to the left about 45 to 60 minutes after eclosion. In the males observed, which were obtained from laboratory stock and collected as larvae in the field, the terminalia rotated to the right and the left in about equal numbers. Males having torsion either to the left or right copulated and both seemed to be equally capable of copulation.

There was no apparent correlation between the initial direction of rotation of the male terminalia and the direction in which the male turned after attachment to the female. Observations indicated that the direction taken was probably a result of the initial position taken when the male genitalia attached to that of the female. If the male genitalia were guided around the right side of the female abdomen, the male turned to the right after attachment to assume the end to end position, and visa versa.

The time required for a 180 degrees rotation of the male terminalia is variable, but generally required 6 to 12 hours for completion. The rotation through the initial 90 degrees occurs more rapidly than the final 90 degrees. It was found that a complete rotation of the male terminalia was not necessary for successful copulation. The minimum time required by the male after emergence and before copulation was 3 hours and 50 minutes. Observations showed that the terminalia in this case had not completely rotated but had progressed more than 90 degrees.

One male emerged in the laboratory in which the terminalia failed to rotate. Females were placed singly into the vial with this male. The male repeatedly attempted to copulate, but was unsuccessful. To make certain that the females were compatible, they were mated to other males. This suggests that copulation in the male is not necessarily stimulated by the turning of the terminalia but may be caused by other undetermined factors.

Males attempt to copulate repeatedly, but females generally submit only once. A male will mate with a female and after a short interval attempt to copulate again with the same female. Sometimes the second attempt is successful. If other females are introduced, the males will attempt to copulate with them. Males will attempt to copulate with other males when confined to a small area and even attempt copulation with pairs already attached. In a few instances males were observed that could not be induced to copulate.

Summary and Conclusions

1. The structures used by the male to attach to the female during copulation were found to be the claws of the claspers, spines on the lobes of the ninth tergite, and the teeth of the tenth sternite.

2. The bases of the "sclerotized plates" and the "basal arm" of the mesosome are connected by membranous-like tissue, which acts as the movable joint between the two parts. The center of articulation for the movement of the mesosome is at its "lateral arm." The ductus ejaculatorius extends dorsally over the ventral bridge of the mesosome. These structures are used to inseminate the female during copulation.

3. The usual position of copulation was observed to be end to end on a near vertical plane with the female terminalia above that of the male and the pair facing in opposite directions. Many different positions of copulation can be attained when pairs were disturbed during copulation.

4. The time required for a 180 degrees rotation of the male terminalia is variable but generally requires 6 to 12 hours. The rotation of the initial 90 degrees occurs more rapidly than the second 90 degrees.

5. A complete rotation of the male terminalia is not necessary for copulation, but apparently it must rotate beyond 90 degrees before copulation can take place.

6. After rotation of the terminalia through approximately 180 degrees, the males are more aggressive and actively seek the females. The females will copulate soon after emergence and in some cases, less than two minutes after eclosion.

7. It was determined from specimens observed that approximately 50 per cent of the male terminalia rotated in one direction and the other one-half in the opposite direction.

8. There is no relationship between the direction in which the male terminalia rotated and the direction the male will turn to assume the end to end position of copulation after attachment to the female. Evidence indicates that it depends on the initial position in which the male becomes attached to the female rather than upon the direction in which the terminalia rotated.

9. Evidence suggests that copulation is not stimulated in the male by the rotation of the terminalia but rather by other undetermined factors.

10. Males will repeatedly attempt copulation, even with other males, when confined in a small area.

11. When pairs are disturbed so that an abnormal position is attained in which turning of the body is necessary, the turning primarily occurs in the male. Most of the turning occurs between the seventh and eighth segments, however, some torsion occurs along the abdomen anterior to the seventh segment.

12. Length of time of copulation is variable, the longest period observed for an undisturbed pair was 6 hours and 40 minutes and the shortest, 3 hours and 27 minutes. Some pairs observed copulating longer than 4 hours become unattached approximately mid-way and after a few minutes copulate again.

Abbreviations

A, atrium; AG, accessory gland; AP, atrial plate; BA 10, basal arm of tenth sternite; BB, base of basal plate; BDP, dorsal projection of basal plate; BL, basal lobe; BP, basal plate; BVP, ventral projection of basal plate; C, clasper; CC, claw of clasper; CE, cercus; CG, colleterial gland; DE, ductus ejaculatorius; DT, digestive tract; I, insula; IF, interbasal fold; IP, interbasal plate; L 9, lobe of ninth tergite; M, mesosome; MBA, basal arm of mesosome; MLA, lateral arm of mesosome; MSP, sclerotized plate of mesosome; MT, Malpighian tubule; MVB, ventral bridge of mesosome; O, ovary; OC, oviductus communis; OL, oviductus lateralis; P, paramere; PDA, dorsal arm of paramere; PDP, dorsal process of paramere; PGP, post-genital plate; PLA, lateral arm of paramere; PLP, lateral process of paramere; P 9, ninth pleuron; S, spermatheca; SP, side piece; SPP, process of side piece; ST, stigma; S 9, ninth sternite; S10, tenth sternite; TE, testis; T 9, ninth tergite; V, vagina; VD, vasa deferentia; VS, vesiculae seminalis.

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THE NYMPH OF LIBELLULA SEMIFASCIATA BURMEISTER

(ODONATA, LIBELLULIDAE)

By GEORGE H. BICK, *Zoology Department, Tulane University, New Orleans, Louisiana*

On February 24, 1950 a *Libellula* nymph collected from a pineland ditch at Hickory (St. Tammany Parish), Louisiana, by Dr. George H. Penn, Miss E. W. Smith and Mr. E. N. Lambremont was taken to the laboratory and reared to transformation. The adult was a male *semifasciata*, the nymphal stage of which has hitherto been undescribed. The last instar exuvium and the associated adult have been placed in the collections of the Zoology Department, Tulane University and are labelled 1799-4. The following description of the last instar skin reduces the number of undescribed *Libellula* nymphs in eastern North America to two (*vibrans* and *needhami*). Only *axillena* and *flavida* are described by supposition.

Measurements: Total length-21.2 mm, length of abdomen-12.2, of head-2.1, of hind femur-5.6, width of head-5.6, of abdomen-7.0.

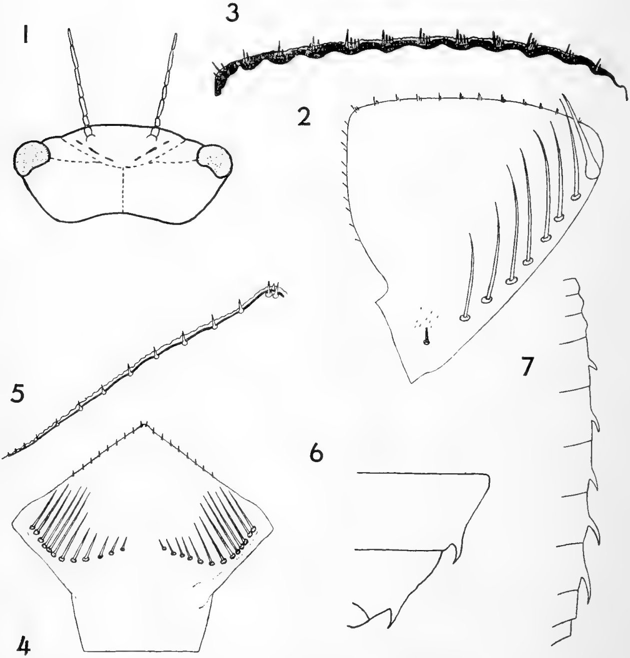
Rather small, dark, dull dirty brown. Head considerably wider than long; abdomen ovate, somewhat flattened laterally and with slightly divergent lateral abdominal spines.

Head: Widest at eyes; width at eyes 2.7 times mid dorsal length, sloping gently posteriorly, slightly concave at posterior border (fig. 1). Interrupted black streaks are present just anterior to the frontal sutures. Conspicuous long hairs at anterior border between antennae and also just behind eyes extending to the posterior border. Shorter and much less conspicuous hairs near mid line between eyes and also near mid line posterior to eyes. Posterior border hairy.

Antennae 7-segmented, relative lengths of segments from base outward: 1.1: 1.2: 1.6: 1.0: 1.2: 1.7: 1.5. First segment with short hairs, others with long, scattered hairs somewhat concentrated distally on each segment.

Lateral setae 7 (fig. 2). A much smaller seta and a patch of about 10 very minute setae near base. Distal border of lateral lobe (fig. 3) with 12 very shallow crenulations, each with a group of 2-4 setae, 4 being the most common. A well defined black band follows each marginal curve. The actual edge is not straight but bears very minute blunt teeth. Median border with about 22 short setae; latero-ventral border hairy. Mentum about three times as broad at juncture with lateral lobe as at hinge. Mental setae 12 (left), 13 (right), in either case the 5th from the lateral margin is the longest and the outer 8 form a longer series while the inner 5 (right) or 4 (left) form shorter and more widely spaced series (fig. 4). Median lobe (fig. 5) pointed, with about 12 uniformly spaced single setae on either side of the mid line. These become quite small laterally. The actual edge is not straight but bears very minute blunt teeth and is margined by a narrow black band. The median projection is not prominent.

Thorax: Wing buds extend to distal fourth of segment 5. Hind femur is as long as head is wide and extends to base of segment 6. A black band extends across pronotum from anterior margins of either coxa. Posterior to this is a similar but much shorter dark band in center of pronotum just anterior to the spiracles. Lateral margins of the pronotum are blunt triangular projections and bear dense tufts of



TEXT FIGURES 1-7, Nymph of *Libellula semifasciata.* Fig. 1, head; fig. 2, lateral lobe; fig. 3, enlargement of distal margin of lateral lobe; fig. 4, mentum; fig. 5, enlargement of median lobe; fig. 6, lateral abdominal spines; fig. 7, dorsal abdominal spines.

hairs. Supracoxal processes are small, triangular and bear long hairs. Propleural processes prominent, rounded at base and drawn out into blunt tips. Legs with few short hairs proximally, long scattered hairs on tibia, but few on tarsus. Coxa, trochanter and femur darker than tibia and tarsus but extreme tip of tarsus is black.

Abdomen: Ovate, somewhat flattened laterally, widest at segment 6. Segment 9 on the ventral side (1.5 mm) is but slightly longer than segment 9 plus 10 (1.2 mm) on the dorsal side. Long hairs at lateral margins. There are very long hairs adjacent to the dorsal spines on segments 5 through 8 which become shorter laterally. Distal border of sternum of segment 9 with a fringe of long hairs.

Dorsal spines (fig. 7) on segments 4 through 8 increase in size and become more pointed posteriorly. Those on 7, 8 and 9 are dark and shiny. They are approximately ⅓ the length of the segments bearing them on 4, 5, and 6 and approximately ½ the length of the segments on 7 and 8. On segment 4 the spine reaches only a little beyond the middle of that segment; on 5 it does not quite reach the posterior margin; on 6 and 7 the spines extend just beyond the posterior margins; on 8 the spine extends approximately ⅓ the length of segment 9. In profile the spine of 4 is rather blunt and more or less upright, but the others are distinctly pointed and declined at the tips.

Lateral abdominal spines on 8 and 9 are slightly divergent (fig. 6), those on 9 somewhat less so than on 8. The tips of those on 8 are strikingly incurved, those on 9 less so. They are approximately equal (.37 mm) in length and subequal to the mid dorsal length of segment 10 (.31 mm).

Superior and inferior abdominal appendages are dark tipped and hairy. They are equal in length (1.7 mm), slightly shorter than abdominal segments 8 plus 9 (2.0 mm) but distinctly longer than segments 9 plus 10 (1.2 mm). Laterals are slightly more than half (.95 mm) the length of the others and are reddish brown at the tips.

Semifasciata runs to rubric 5 in Byers (1927). It may be differentiated by a slight modification as follows:

5\. Lateral setae 5 6
   Lateral setae 6, mental 8 .... *cyanea*
   Lateral setae 8, mental 12-13 .... *flavida*?
   Lateral setae 7 .... 5a
5a. Mental setae 10-11 .... *luctuosa*
   Mental setae 12-13 .... *semifasciata*

Semifasciata further differs from Needham's (1901) description of *flavida* by supposition in that the dorsal spines on abdominal segments 6 to 8 are straight on the superior margins in *flavida* but are declined at the tips in *semifasciata*. None of the following markings described by Needham for *flavida* were noted for *semifasciata:* (1) anvil shaped black mark on either side of median ocellus, (2) abdominal segments 2-8 with a pair of large oblique spots on sides, (3) outer row of dots on abdominal segments 4-9.

Semifasciata further differs from *luctuosa* as described by Needham (1901) in that the dorsal abdominal spines on both 7 and 8 are considerably longer than on 6 whereas in *luctuosa* the spine on 6 is the longest. In addition, specimens of *luctuosa* which I have studied have the spine on 8 relatively small, whereas in *semifasciata* the spine on 8 is the largest of the series.

Garman (1927) stated that in *cyanea* the dorsal abdominal spines on segments 4-8 extend to or beyond the margins of the segments; in *semifasciata* the spines on 4 and 5 do not reach to the posterior margins of the segments.

Students keying *semifasciata* to genus in Wright and Peterson (1944) will undoubtedly experience difficulty with rubric 12. I believe that if portions of Dr. Needham's (1901) key be used in explanation of rubric 12, a basis for a decision will be available. Thus:

12. Eyes lateral, their hind margins behind middle of the head—13
 Eyes capping the cephalo-lateral angles of the head, their hind margins generally before the middle of the head..................17

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THE SETIVENTRIS-COMPLEX IN THE GENUS HYLEMYA ROB. DESV., WITH DESCRIPTIONS OF NEW SPECIES AND SUBSPECIES FROM NORTH AMERICA

(Diptera, Muscidae)

By H. C. Huckett, *Riverhead, New York*

The species *Hylemya setiventris* was described by Stein (1898)[1] in his first notable contribution to the anthomyid fauna of North America from specimens taken at Moscow, Idaho, by Dr. J. M. Aldrich. The types are deposited in the United States National Museum. The male is distinguished readily from its congeners by the striking character of the fourth abdominal sternum.[2] The integument comprising the inner caudal region of this sclerite is membranous and is sunken or collapsed, thus forming a broad rounded emargination with lamella-like processes protruding caudal from each side. The lamellae have at their caudal extremity a dense assemblage of long slender bristles that extend caudad and curve mesad at tips beneath the hypopygium (fig. 3). Thus formed the parts appear to function as an additional pair of copulatory appendages. The female possesses no single character of such distinction. The tibiae are yellow and the prealar bristle is long as in the male; the ovipositor has recurrent spinules on terminal sclerites, and unlike the male the apical posteroventral bristle of fore tibia is not bluntly capped.

During the course of years many male specimens have come to my attention which may be considered thus characterized. At first the differences evident in the structure and bristling of the fourth abdominal sternum of various specimens were considered as possible aberrations or variations within a single species, but recently as more material became available for study the so-called variations were found to adhere to definite patterns, so that individuals could be grouped in accordance with their conformation. Two segregates thus associated possessed additional characters that in my opinion warranted their separation as distinct species. The remainder were arranged into five groupings as subspecies of *setiventris*.

The different forms seem to coexist over much of the same territory, being distributed along mountain ranges of western North America and their adjacent terrain. The records reach as far north as Alaska and the North West Territories and south to Colorado, Nevada and middle California.

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[1]Refers to literature cited in the references as indicated by year of publication.

[2]Stein in his original description refers to the second segment, and Malloch (1920) in his key refers mistakenly to the third abdominal sclerite.

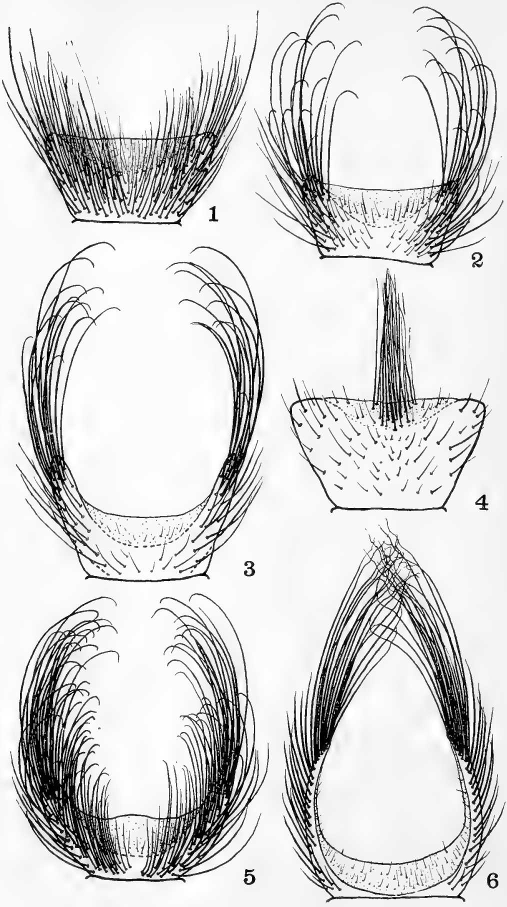

PLATE 36. FOURTH STERNITE OF MALE HYLEMYA

Fig. 1, *Hylemya* (*Delia*) *setiventris sobrians;* fig. 2, *Hylemya* (*Delia*) *setiventris alternata;* fig. 3, *Hylemya* (*Delia*) *setiventris setiventris;* fig. 4, *Hylemya* (*Delia*) *setiventris reliquens;* fig. 5, *Hylemya* (*Delia*) *setiventris rainieri;* fig. 6, *Hylemya* (*Delia*) *setiventris extensa.* (Drawings made from dried specimens.)

All that is known of the habits of the group, so far as I am aware, is contained on labels attached to certain specimens reared from *Lupinus*.

Key to Species and Subspecies of the Setiventris-Complex Males

1. Frons bristled and eyes broadly separated as in female; arista subplumose; hind tibia with a robust apical posterodorsal bristle 2
   Frons not bristled and eyes not as widely separated as in female; arista pubescent; hind tibia with a weak setulose apical posterodorsal bristle 3
2. Lamellae of fourth abdominal sternum with a caudal tuft of long bristles, flagellate at tips, remaining bristles short; hind tibia without a robust apical posteroventral bristle .... *ineptifrons*, new species
   Lamellae fringed along entire length with a marginal series of long slender bristles, which are directed ventrad; hind tibia with a robust apical posteroventral bristle .... *setifirma*, new species
3. Fourth abdominal sternum deeply emarginate and extended laterocaudad as lobes or lamellae (figs. 3, 6), the latter partly overlapping fifth sternum 4
   Fourth sternum shallowly emarginate or not deeply depressed caudad, laterocaudal angles scarcely extended beyond caudal margin of fourth sternum (figs. 1, 2), and thus not partly overlapping fifth sternum 6
4. Lamellae of fourth abdominal sternum fringed for greater part of their length with a loose marginal series of long slender bristles that are directed ventrad (fig. 5) .... *setiventris rainieri*, new subspecies
   Lamellae not thus fringed, longer bristles grouped caudad and are directed caudad 5
5. Lamellae extending to or caudad of a level with caudal margin of fourth abdominal tergum, tips of bristles flagellate and reaching beyond apex abdomen .... *setiventris extensa*, new subspecies
   Lamellae not extending caudad to a level with caudal margin of fourth tergum, tips of bristles curving mesad and not reaching beyond apex of abdomen .... *setiventris setiventris* (Stein)
6. Bristles of fourth abdominal sternum limited to a median caudal tuft, remainder of sclerite having short sparse setae (fig. 4) .... *setiventris reliquens*, new subspecies
   Bristles of fourth sternum not arranged in a median caudal tuft, the sclerite having numerous long bristles 7

7. Fourth abdominal sternum with longish bristles arranged laterad, the median area bare or only with short setulae (fig. 2) .... *setiventris alternata*, new subspecies
   Fourth sternum with erect bristles on median and lateral areas, in no separated groups (fig. 1) .... *setiventris sobrians*, new subspecies

FEMALES

1. Hind tibia with a robust apical posterodorsal and posteroventral bristle .... *setifirma*, new species
   Hind tibia with a robust apical posterodorsal bristle, weak apical posteroventral .... *ineptifrons*, new species
   Hind tibia with weak apical posterodorsal and posteroventral bristles, neither equal to apical mid dorsal bristle 2
2. Ovipositor without recurrent spinules on terminal sclerites, the setulae stiffish and fine; notopleural callosity with one or more setulae .... *setiventris extensa*, new subspecies
   Ovipositor with coarse recurrent spinules on terminal sclerites 3
3. Fore tibia usually with one median posteroventral bristle .... *setiventris alternata*, new subspecies
   Fore tibia usually with two median posteroventral bristles 4
4. Notopleural callosity usually with one or more setulae .... *setiventris rainieri*, new subspecies
   Notopleural callosity usually without setulae ....
   .... *setiventris setiventris* (Stein)
   .... *setiventris sobrians*, new subspecies
   .... *setiventris reliquens*, new subspecies

Hylemya (Delia) setiventris setiventris (Stein)

Hylemyia setiventris Stein, 1898. Berl. Ent. Ztschr., (1897) 42 (3-4): 216-218.

The species has been so fully described by Stein that there seems little need for additional remarks. The structure and bristling of the fourth abdominal sternum of male has been noted in greater detail at the beginning of this paper, and is also illustrated for purposes of comparison (fig. 3). Although the female tibiae are always yellow in *setiventris* and its subspecies the femoral coloration is not so consistent, mid and hind pairs frequently being partly infuscated. So far I have failed to find any tangible characters in this sex for the separation of *setiventris, sobrians* and *reliquens*.

ALASKA: ♂, Camp 327, Alaska Eng. Comm., July 12, 1921 (J. M. Aldrich) [U. S. N. M.].

ALBERTA: ♀, Waterton, July 9, 1923 (H. L. Seamans) [C. N. C.].

BRITISH COLUMBIA: ♂, Keremeos, August 2, 1923, ♂, ♀, Hedley, August 29, 1923 (C. B. Garrett) [C. N. C.].

IDAHO: ♂, 2 ♀, Moscow, cotypes, ♂, Lake Waha, July 22, 1927 (J. M. Aldrich) [U. S. N. M.]. ♂, 3 ♀, Mountains, Moscow, July 25, 1930 (R. C. Shannon).

MONTANA: 2 ♂, Beaver Creek, 6300 ft. alt., August, 1913 (S. J. Hunter) [Univ. Kans.]. ♂, Florence, June 1, 1912 (Mont. Exp. Sta.).

UTAH: ♂, ♀, Logan Canyon, July 30, 1940 (Stains & Hall) [Utah State Coll.].

WASHINGTON: ♂, Spokane, June 24, 1930 (J. M. Aldrich), ♂, Pullman, June. [U. S. N. M.]. ♂, Field Springs State Park, near Anatone, June 12, 1949, ♂, Lewiston Grade, 1800 ft. alt., June 2, 1949. ♀, Tipsoo Lakes, Chinook Pass, August 27 1949 (M. T. James) [State Coll. Wash.].

Hylemya (Delia) setiventris alternata, new subspecies

Male differing essentially from those of other subspecies in structure and bristling of fourth abdominal sternum as illustrated in figure 2. The lateral lobes are less pronounced and do not extend caudad of a level with the depressed caudal border of fourth sternum; bristles are arranged in two groups along lateral borders of sternum, and are all longish and have their tips curved inward, those on cephalic half erect and directed ventrad when viewed from the side, those on caudal half gradually becoming recumbent and directed caudad.

Mesonotum with distinct sheen, more so than in *setiventris*, and with significantly fewer setulae along lateral declivities and planes of dorsocentral bristles. Abdomen more densely and extensively yellowish gray, with the dorsocentral vitta restricted to narrower proportions than in *setiventris*. Fore tibia with one median posteroventral bristle. Wing veins mostly yellowish brown. Length, 7 mm.

Female, with mesonotum as in male; mesopleura with a weak but well marked bristle below anterior notopleural bristle. Abdominal pruinescence as in male, dorsocentral marking weakly apparent or undeveloped. Wings more extensively yellowish tinged than in *setiventris*, and with a stronger costal series of setulae. Fore tibia with one median posteroventral bristle. Length, 8 mm.

Holotype: ♂, Silverton Hills, Marion County, Oregon, June 5, 1940 (R. E. Rieder) [U. S. N. M.]. Allotype: ♀, Yale, Idaho, September 10, 1912 [U. S. N. M.]. Paratypes: ♂, Consort, Alberta, July 18, 1947 (E. H. Strickland), ♀, Rockyford, Alberta, August 15, 1941 (W. R. Mason) [C. N. C.].

ALASKA: ♀, Camp 327, Alaska Eng. Comm., July 13, 1921 (J. M. Aldrich) [U. S. N. M.].

ALBERTA: ♂, Vermilion, June 23, 1938 (E. H. Strickland); ♀, Waterton, July 9, 1923 (H. L. Seamans) [C. N. C.].

COLORADO: ♀, Pingree Park, (V. M. Tanner). ♀, Poudre Canyon, August 23, 1940 (Knowlton & Nye) [Utah State Coll.].

IDAHO: 3 ♀, Yale, September 10, 1912 (J. M. Aldrich) [U. S. N. M.]. ♀, Mts., Moscow, July 25, 1920 (R. C. Shannon).

OREGON: ♂, Eagle Creek, Post Office, July 4, 1940 (Gray & Schuh),

♀, Crater Lake, South rim, 7100 ft. alt., July 30, (H. A. Scullen) [Ore. State Coll.].

SOUTH DAKOTA: 2 ♀, Custer, July 22, 1924.

UTAH: ♀, Garden City, August 25, 1938 (Knowlton & Hardy), ♀, Mt. Home, July 19, 1949 (G. F. Knowlton), ♂, Fish Lake, July 10, 1943 (Knowlton & Telford) [Utah State Coll.].

WYOMING: ♂, near Leander, 5000-8000 ft. alt., July, ♂, ♀, 12 mi. N. W. Lusk, July, 1895 [Univ. Kans.]. ♀, Summit, Albany County, 8500 ft. alt., August 10, 1950 (R. R. Dreisbach).

Hylemya (Delia) setiventris sobrians, new subspecies

Male differing essentially from those of other subspecies in structure and bristling of fourth abdominal sternum as illustrated in figure 1. In structure the sternum most closely resembles that of *alternata*, but differs in that it is entirely covered with bristles. In other respects the subspecies agrees with *setiventris*. Length 7.5 mm.

Holotype: ♂, Mount Moscow, Idaho, June 6, 1930 (J. M. Aldrich) [U. S. N. M.].

COLORADO: ♂, Brainherd Lake, Ward, August 8, 1950 (Dreisbach & Schwab).

IDAHO: ♂, Mount Moscow, June 10, 1930 (J. M. Aldrich) [U. S. N. M.]. 3 ♂, Mts., Moscow, June 15, 1920 (R. C. Shannon).

UTAH: ♂, Eureka, June 24, 1933 (G. F. Knowlton), ♂, Logan, June 13, 1933, ♂, Trenton, June 11, 1938 (Knowlton & Nye).

WASHINGTON: ♀, Sprague, June 20, 1920 (R. C. Shannon).

Hylemya (Delia) setiventris reliquens, new subspecies

Male, readily distinguished from those of other subspecies by the comparatively simple development of fourth abdominal sternum, and by the peculiar arrangement of bristles. The latter are confined to a median fascicle of slender bristles caudad, the remaining vestiture being weak and sparse (fig. 4). In other respects the subspecies is similiar to *setiventris*. Length, 7.5 mm.

Holotype: ♂, Mountains, Moscow, Idaho, July 15, 1920 (R. C. Shannon) [U. S. N. M.].

Hylemya (Delia) setiventris rainieri, new subspecies

Male differs superficially from that of *setiventris* in being distinctly blackish, abdomen with broader dorsocentral marking and wider anterior tergal incisures, femora and tibiae blackish, or hind tibiae rufous, knees reddish, wings fuscous tinged and blackish basad, calyptrae brownish, halteres yellow.

Fourth abdominal sternum deeply emarginate caudad, constricting the remainder of the sclerite, lateral lobes or lamellae well developed, as in *setiventris*. The lamellae are fringed along their entire length with a dense series of erect slender bristles, which tend to become recumbent caudad when viewed from the side. Tips of bristles curving mesad and not reaching beyond apex of abdomen.

Bristling of thorax and legs as in *setiventris*, except that notopleural callosity has invariably one or more setulae. Length, 6.5 mm.

Female paler grayish brown or grayish as in *setiventris*, with mid and hind femora at least partly reddish yellow and all tibiae entirely so. Wings clear or lightly tinged. In structure slightly more robust than *setiventris*, parafacials in profile being well maintained ventrad, at narrowest width exceeding breadth of third antennal segment, notopleural callosity with one or more setulae. Length, 7 mm.

Among the following specimens of *rainieri* there are two males from the Big Horn Mountains which differ notably in their paler grayish appearance, clear wings, successively more yellowish mid and hind tibiae, and in the absence of setulae on notopleural callosity. They agree however with other males in the character of the fourth abdominal sternum, the only apparent difference in my opinion being that the bristles are slightly denser and longer. I have regarded these specimens as variants of *rainieri*.

Holotype: ♂, Mt. Rainier, Summerland Trail, Washington, July 24, 1924 (A. L. Melander) [U. S. N. M.]. Allotype: ♀, Mt. Rainier, Sunrise Trail, 6400 ft. alt., Washington, July 29, 1933 (J. Wilcox) [U. S. N. M.]. Paratypes: ♂, St. Marys, British Columbia, July 12, 1926 (A. A. Dennys), ♀, Hedley, British Columbia, July 20, 1923 (C. B. Garrett) [C. N. C.].

British Columbia: ♂, Barkerville, August 2, (N. Criddle), ♂, Revelstoke Mountain, 6000 ft. alt., August 12, 1923 (E. R. Buckell) [C. N. C.].

California: ♂, Giant Forest, 6800 ft. alt., July 1, 1928 (E. A. McGregor) [U. S. N. M.].

Montana: ♂, ♀, Big Horn Mountains, August 20, 1926 (G. Cady).

North West Territories: ♂, Reliance, June, 1937 (W. J. G. Stewart).

Oregon: ♂, Larch Mountain, July 18, 1940 (Gray & Schuh) [Ore. State Coll.].

Washington: ♀, Mt. Rainier, Tipsoo Lake, September 10, 1935 (J. Wilcox), 2 ♀, Paradise Inn, August 17, 1930.

Wyoming: ♂, Big Horn Mountains, August 23, 1934 (C. P. Alexander).

Hylemya (Delia) setiventris extensa, new subspecies

Male, black, markings as in *rainieri*; legs black, mid and hind tibiae blackish or reddish, wings blackish basad; notopleural callosity with one or more setulae; fourth abdominal sternum deeply emarginate caudad and with longer lateral lamellae than in *rainieri*, each bearing an apical tuft of slender bristles, the tips of which are flagellate and reach beyond apex of abdomen, remaining bristles shorter, tips fine (fig. 6). Bristling of thorax and legs similar to that of *setiventris*, mid metatarsus with a coarse series of longer setulae along dorsum.

Female paler, mesonotum brownish and abdomen densely yellowish gray; femora partly or wholly yellowish, tibiae yellowish; wings slightly yellowish tinged. Notopleural callosity usually with one or more setulae; terminal sclerites of ovipositor with spinules nonrecurrent, fine and erect as stiffish setulae. Bristling of throax and legs as in *setiventris*. Length, 7.5 mm.

The males listed below from Hood River and Mount Rainier differ notably from remaining males in their paler grayish appearance and clear wings, and in having all tibiae reddish yellow and mid and hind femora yellowish on distal region. The structure and bristling of fourth abdominal sternum agrees with that of *extensa*, and mainly on this account I have tentatively regarded them as variants of *extensa* rather than subspecifically distinct.

Holotype and Allotype: ♂, ♀, Anchorage, Alaska, July 20, 1921 (J. M. Aldrich) [U. S. N. M.]. Paratypes: ♂, ♀, Multnomah, Oregon, pupae around Russell Lupine crowns, May 8, 1941; emerged in laboratory May 19, 1941, J. Schuh) [Ore. State Coll.].

ALASKA: ♂, Seward, July 24, 1921 (J. M. Aldrich) [U. S. N. M.]. 3 ♂, 3 ♀, Katmai, August September, 1917 (J. S. Hine).

CALIFORNIA: ♀, Yosemite National Park, August 1, 1940, ♂, Bishop, July 28, 1940 (R. H. Beamer([Univ. Kans.].

IDAHO: ♀, Yale, September 10, 1912 (J. M. Aldrich) [U. S. N. M.].

MONTANA: ♀, Gallatin Mountains, August 24, 1917.

OREGON: ♂, Hood River, August 1, 1917 (Childs), ♀, Silver Creek Falls, Marion County, October 8, 1940 (R. E. Rieder) [Ore. State Coll.]. ♀, Lick Creek RS., Wallowa National Forest, 4600 ft. alt., August 16, 1937 (Bolinger-Jewett). ♂, 4 ♀, Portland, May 13, 1944, *ex* lupine, (Anderson), ♂, Forest Grove, June 13, 1919, *ex Lupinus leucophilus*, (L. P. Rockwood) [U. S. N. M.].

WASHINGTON: ♂, ♀, Mt. Rainier, Yakima Park, July 22, 1924 (A. L. Melander).

Hylemya (Delia) ineptifrons, new species

Male; parafrontals, parafacials and cheeks seal brown with more or less reddish ground color, interfrontalia reddish cephalad; face, occiput, thorax and abdomen pale gray. Antennae blackish, second segment reddish distad, palpi reddish brown, darker at apex. Mesonotum with poorly defined streaks along planes of dorsocentral bristles; abdomen with a weak dorsocentral vitta; fore femora blackish, mid and hind femora largely or entirely yellowish, all tibiae yellowish, tarsi brownish. Wings and calyptrae hyaline, halteres yellow.

Eyes widely separated apart, frons and vertex of head bristled as in female, parafacials at base of antennae and cheeks as wide and high respectively as width of third antennal segment, the former narrower at middle, arista densely subplumose on proximal half and shorter haired distad, longer hairs nearly equal to width of third antennal segment.

Mesonotum sparsely setulose along lateral declivities and also on scutellum, with a robust pair of presutural acrostical bristles, remaining acrosticals lacking except for caudal pair, prealar bristle long, notopleural callosity devoid of accessory setulae, sternopleural bristles arranged 1:2. Abdomen subovate, largely depressed, fourth sternum deeply emarginate and strongly constricted at middle, lateral lamellae extended caudad to reach a level with caudal margin of tergum 4, and armed at apex with a tuft of long bristles, the tips of which are flagellate and reach beyond apex of abdomen.

Fore tibia with 2 posteroventral bristles, apical posteroventral robust and blunt, mid tibia with 1 or 2 fine anterodorsal and 2 fine posteroventral bristles, 2 robust posterodorsal bristles, the proximal bristle being notably the longer, hind femur with anteroventral bristles confined to distal half of femur, posteroventral bristles absent, hind tibia with 3 anteroventral, 4 anterodorsal, 3 posterodorsal bristles, posteroventral series of setulae lacking, apical posterodorsal robust, equal to apical mid dorsal bristle, mid metatarsus with a dorsal series of coarse longer setulae (most noticeable in paratype). Costal thorn as long as *r-m* cross vein, *m-cu* cross vein semierect and slightly sinuate. Length, 6 mm.

Female, similar to male except for sexual characters, parafacials at base of antennae and cheeks wider and higher respectively than breadth of third antennal segment, aristal hairs shorter, longer hairs being about equal to half width of third antennal segment. Terminal sclerites of ovipositor armed with several weak recurrent spinules. Fore tibia with a mid anterodorsal and 2 posteroventral bristles, apical posteroventral pointed apicad, mid tibia with 2 anterodorsal, 2 posterodorsal and 2 posteroventral bristles, distal anterodorsal being notably robust, hind femur with anteroventral bristles extending to proximal half of femur, hind tibia with 2 to 4 anteroventral, 4 and 5 anterodorsal, 3 to 5 posterodorsal bristles. Wings and calyptrae slightly yellowish tinged. Length, 7 mm.

This species and the following possess the inhabitus of *setiventris* and its subspecies despite the distinctive bristling on hind tibiae and the dichoptic character of male head. The plastic nature of the characters developed in these forms is further suggested by the anomalous differences in length of aristal hairing between the sexes, being longer in male than in female.

Holotype: ♂, Asotin, Washington, June 27, 1932 (J. M. Aldrich) [U. S. N. M.]. Allotype: ♀, Waha, Idaho, August 12, 1923 (A. L. Melander) [U. S. N. M.]. Paratypes: ♂, Angel Creek, Wells, Nevada, June 23, 1927 (J. M. Aldrich) [U. S. N. M.]. ♀, Laketown, Utah, September 21, 1938 (Knowlton & Harmston) [Utah State Coll.].

Hylemya (Delia) setifirma, new species

Male; similar to that of *ineptifrons,* differing essentially in the following respects: Fourth abdominal sternum more extensively emarginate caudad, caudal membrane lining the lamellae with several delicate hairs, inner (ventral) border of lamellae completely fringed with a dense series of slender erect bristles, which become longer and coarser apicad, bristles curving mesad and becoming recumbent. Mid tibia with or without a mid anterodorsal bristle, hind tibia with a robust apical posterodorsal and posteroventral bristle, and with a sparse series of posteroventral setulae, mid tarsus spatulate, segments 3 and 4 slightly broadened, hind metatarsus with a prominent series of spinulose setulae on anteroventral surface. Length, 6 mm.

Female similar to male except for sexual characters, longer aristal hairs nearly equal to width of third antennal segment, palpi yellowish to reddish brown, ovipositor with recurrent spinules on terminal sclerites. Mid tibia in allotype has a mid anterior bristle, hind tibia with apical posteroventral and posterodorsal bristles robust, mid tarsal segments 3 and 4 not so distinctly broadened. Length, 7.5 mm.

Holotype: ♂, Wallowalk, Oregon, September 9, 1932 (Itol Wilcox) [U. S. N. M.]. Allotype: ♀, Logan Canyon, Utah, July 30, 1940 (Stains & Hall) [U. S. N. M.]. Paratypes: ♂, Viola, Idaho, June 26, 1912 (J. M. Aldrich) [U. S. N. M.]. ♀, Grand Teton National Park, Wyoming, August 18, 1931 (R. H. Beamer) [Univ. Kans.]. 2 ♂, Aneroid Lake, Oregon, August 1, 1941 (R. E. Rieder), ♂, ♀, Bighorn Mountains, Montana, August 20, 1926 (G. Cady), ♂, Rocky Mountain National Park, Colorado, August 25, 1934 (C. P. Alexander), ♀, Maybell, Colorado, June 30, 1931 (L. D. Anderson), 2 ♀, Tahoe Lake, Nevada, October 5, 1935 (A. J. Basinger).

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BOOK NOTICE

RECENT ADVANCES IN THE STUDY OF THE ORIENTATION OF THE HONEY BEE, by K. von Frisch. *In* Bul. Animal Behavior, vol. 1, no. 9, pp. 1-33, 1951 (England).

This number of the Bulletin contains translations by Dr. Ilse of von Frisch's three most recent papers (1948-1950) on the senses and language of the honey bee. The information has been summarized in the recently published "Bees, Their Vision, Chemical Senses and Language."

KARL V. KROMBEIN,
Bureau of Entomology and Plant Quarantine.

SYNONYMY OF SEMELASPIDUS ARTOCARPI (GREEN)

(Homoptera, Coccidae)

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Semelaspidus artocarpi (Green), new combination

Aspidiotus artocarpi Green, 1896. Ent. Mo. Mag. (2) 7: 200 (description based on immature specimens).

Targionia artocarpi (Green), Leonardi, 1901. Riv. Pat. Veg. 8: 315-316.

Aspidiotus (*Chrysomphalus*) *cistuloides* Green, 1905. Jour. Bombay Nat. Hist. Soc. 16: 342. NEW SYNONYMY.

Aspidiotus triglandulosus Green, 1908. Mem. Dept. Agr. India, Ent. 2: 33. NEW SYNONYMY.

Semelaspidus cistuloides (Green), MacGillivray, 1921. The Coccidae, Urbana, Ill., pp. 393, 451.

Partargionia artocarpi (Green), MacGillivray, 1921. The Coccidae, Urbana, Ill., pp. 394, 458.

Semelaspidus triglandulosa (Green), MacGillivray, 1921. The Coccidae, Urbana, Ill., p. 451.

In 1896, Green described *Aspidiotus artocarpi* obtained on leaves of *Artocarpus integrifolia* at Bombay, India. In 1901, Leonardi transferred the species to the genus *Targionia*. In 1905, Green described *Aspidiotus* (*Chrysomphalus*) *cistuloides* from leaves of *Cinnamomum* at Peredeniya, Ceylon. In 1921, MacGillivray, depending on the available descriptions, erected the new genera *Partargionia* and *Semelaspidus* to include these species respectively. Specimens from the type material of *artocarpi* and *cistuloides* which were examined by Ferris (2) in 1938 made him consider that the former species was based upon immature specimens of *cistuloides* or some other similar species. As neither of these species had been rediscovered at that time and as he had no second stage females of *cistuloides* for comparison with the type material of *artocarpi*, the status of the two genera could not be settled by him, but he opined that *Semelaspidus* is probably a valid genus.

Specimens of scale insects on *Artocarpus integrifolia* collected at Fraserpet in Coorg, India, in the possession of the author have proved to be *Semelaspidus cistuloides* (Green). Second stage females of this insect which are also available have been found to be identical with *artocarpi*. There is, therefore, no doubt that the description of *artocarpi* was based upon second stage females of *Semelaspidus cistuloides* and the suspicions of Ferris were correct.

The author during a recent short stay in London, had the opportunity of examining the type slide of *Aspidiotus triglandulosus* Green in the British Museum of Natural History. This species was first described by Green from specimens collected at Mahabaleshwar, Bombay on an undetermined tree. According to Ayyar (1) this species was also recorded on *Artocarpus integrifolia* at Bangalore, from material collected by Fletcher. The type slide of the species was found to have a few highly sclerotised specimens in which the lobes were found to be slightly damaged but on which the original description was based. A single unsclerotized specimen in good condition, in which the pygidium was especially suitable for study, was apparently not made use of by Green. It was very apparent from the study of this specimen that the species is none other than *Aspidiotus artocarpi* Green. MacGillivray included it under the genus *Semelaspidus*, basing his observations on the original description of the insect by Green.

In the light of the present evidence *Aspidiotus artocarpi* Green should be known as *Semelaspidus artocarpi* (Green), because the genus *Semelaspidus* has page preference over *Partargionia*. *Partargionia* should be considered a synonym of *Semelaspidus* because of the identity of genotypes. The specific name *artocarpi* should be retained under Article 27, subparagraph (b) of the International Rules of Zoological Nomenclature.

Acknowledgements

The author is deeply indebted to Mr. F. Laing, Assistant Keeper and the Trustees of the British Museum of Natural History, London for kindly permitting him to examine the type slides of the species discussed in this paper.

The author is also very much indebted to Dr. Harold Morrison of the U. S. Bureau of Entomology and Plant Quarantine; Dr. W. J. Hall, Director, Commonwealth Institute of Entomology, London, for reading through the manuscript of this paper, checking the observations, and suggesting a few minor but useful alterations in improving the same. Thanks are also due to Dr. Hall and to Mr. Francis Hemming, Secretary of the International Commission on Zoological Nomenclature for confirming the author's opinion regarding the correct name of the species.

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SEQUEL TO "HIPPELATES (EYE GNAT) INVESTIGATIONS IN THE SOUTHEASTERN STATES" BY JOHN T. BIGHAM[1]

(DIPTERA, CHLOROPIDAE)

By RICHARD P. DOW,[2] JOHN T. BIGHAM,[3] AND CURTIS W. SABROSKY[4]

When it becomes advisable to review biological observations in the light of later taxonomic revisions, all too frequently the specimens on which the results were originally based are found to have been misplaced or destroyed. Though such is now the case in respect to most of the *Hippelates* studied by J. T. Bigham in 1937-1939, much of his material was subsequently reviewed by C. W. Sabrosky who returned most of the specimens (now lost), but carefully preserved the determination records. By themselves, these identifications had no biological meaning, but quarterly reports on the experimental studies were also available, and since the field work had been reported in great detail, it seemed possible to coordinate the two sets of data.

Bigham's investigations had been completed before Sabrosky described *Hippelates bishoppi* as a new species,[5] based in part on Bigham's material. Because the collections studied by Sabrosky, which included a total of 40,463 Chloropidae, contained 8,018 specimens of *H. bishoppi* together with 31,726 of *H. pusio*, it seemed advisable to find out whether Bigham's conclusions regarding *pusio* were to any degree compromised by such a large number of a previously unrecognized species, and whether a complete analysis of all the data would provide any new biological information on either *pusio* or *bishoppi*.

Of the 1,035 lots of Chloropidae identified by Sabrosky, it has been necessary to omit from this study a total of 16. Twelve of these lots, which consisted of specimens removed from whole trap catches, represented biased samples; two were the results of a special experiment; and two had questionable or insufficient data. The remaining 40,207 specimens were obtained by one of three methods: hand collecting, trapping with a bait of decayed liver, or setting recovery cages to secure adults which had bred in the ground or other material beneath them.

It appears that a fair proportion of the hand-collected specimens were sent to Sabrosky, but only a small number of

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the very numerous and often gigantic trap collections were included in this material. On the other hand, Sabrosky received practically all of the very important collections obtained from the recovery cages. A summary of Sabrosky's identifications arranged by type of collection (Table 1) provides unexpected data regarding the biology of various Chloropidae. Whereas *Hippelates pusio*, *H. bishoppi*, *H. plebejus*, and *Oscinella triorbiculata* were all reared from the soil as well as attracted to decayed liver, the following species occurred only in trap or hand collections: *Hippelates nobilis*, *H. pallipes*, *H. particeps*, *H. proboscideus*, *Oscinella carbonaria*, and *O. grisescens*. Moreover, *Hippelates dissidens* (with one exception), *Madiza cinerea*, and *Elachiptera umbrosa* were collected only from recovery cages. These statements are all based on specimens taken on at least three occasions.

TABLE 1

Summary of specimens of Chloropidae, compared by type of collection, with genera, also species within genera, listed in order of decreasing frequency

	Hand	Baited trap	Recovery cage
Hippelates pusio Loew	472	22,504	8,524
H. bishoppi Sabr.	7	6,419	1,591
H. particeps (Becker)	----	106	
H. proboscideus Will.	3	85	----
H. dissidens (Tucker)	----	1	56
H. plebejus Loew	2	14	35
H. pallipes (Loew)	14	16	----
H. nobilis Loew	7	15	----
H. dorsalis Loew	3	1	----
H. flaviceps (Loew)	----	1	----
H. sp.	3	19	5
Oscinella carbonaria (Loew)	----	60	----
O. triorbiculata Sabr.	----	8	9
O. grisescens Sabr.	4	11	----
O. coxendix (Fitch)	----	----	1
O. sp.	1	104	1
O. or H. sp.	----	----	1
Madiza cinerea (Loew)	----	----	50
M. trigramma (Loew)	----	4	1
M. parva (Adams)	----	----	1
M. sp.	----	----	2
Elachiptera umbrosa (Loew)	----	----	29
Rhodesiella brimleyi Sabr.	----	----	16
Ceratobarys eulophus (Loew)	----	----	1
	516	29,368	10,323

It should be noted, however, that some of the recovery cage material was collected from settings which at the present time are not known to have been made on cultivated or otherwise disturbed ground. These lots may be summarized as follows:

over pile of grass in corner of grove, Orlando, Fla.: 5 *Hippelates dissidens*, 16 *Rhodesiella brimleyi*, 1 *Ceratobarys eulophus;*

over celery scraps left in field, Sanford, Fla.: 3 *H. dissidens*, 27 *Elachiptera umbrosa;*

over muck soil (perhaps disturbed), Oviedo, Fla.: 1 *H. dissidens;*

over surface for which no data are available, Orlando, Fla.: 1 *H. dissidens*, 4 *Oscinella triorbiculata*, 1 *Madiza trigramma.*

These records indicate that the mere collection of a species of chloropid from a recovery cage does not in itself establish the soil proper as the site of larval development. On the other hand, the recovery of *pusio* and *bishoppi* from strip after strip of plowed land indicates that, whatever the actual food, the soil is the natural habitat of these species, and the same may be true of *H. plebejus.*

Collections Made by Hand

Among the 50 lots of hand-collected specimens, 17 which are associated with biological data seem important enough to report in detail. Fifteen of these involve only *H. pusio.* It is noteworthy, but perhaps not of significance, that *H. bishoppi*, which could be expected to occur in the same localities, is completely absent in the following records. The numbers of *pusio* are included in parentheses.

Mendenhall, Miss., September 17, 1937: from horse with eruption on shoulder (5).

McGee, Miss., September 17, 1937; from eyes of calf with pinkeye (9).

Laurel, Miss., September 18, 1937: from eyes of calf with pinkeye (3, 4, 20, 6).

Cairo, Ga., September 28, 1937: from yearling calf with screwworm infestation on leg (3).

Thomasville, Ga., September 28, 1937: from cow with wound on side (7); from cow (18); from cow with skin disease (8).

Valdosta, Ga., October 4, 1937: from wound on sheep (77); from cut on dog's leg (9); from wound on goat (65).

Albany, Ga., October 6, 1937: from steer with pinkeye, shipped from Texas (14, and one *Oscinella* sp.); from heifer with pinkeye, shipped from Texas (12).

Winter Park, Fla., May 18, 1938: caught in schoolhouse (4).

Ormond, Fla., May 22, 1939: around eyes of man in marsh (7 *Hippelates nobilis*, 3 *H. proboscideus*, 2 *H. plebejus*, 4 *Oscinella grisescens*).

The remainder of the hand-collected material includes nothing of special interest except that *pusio* was present in 30 out of 33 lots from Texas, Louisiana, Mississippi, Alabama, Georgia, and Florida, and *bishoppi* occurred in only three lots (twice with *pusio*) from Mississippi and Alabama.

Collections from Traps

The 117 trap collections which were sent to Sabrosky represent not only a small fraction of all the catches from the status or prevalence traps, as already stated, but the lots are extremely scattered as to both locality and season. It is therefore impossible to obtain from this material any satisfactory picture of the seasonal distribution or relative abundance of *bishoppi* and *pusio*. In individual trap collections, however, *bishoppi* frequently outnumbered *pusio*. This occurred in several lots from Zellwood, near Orlando in central Florida, and at various other localities both north and south of that region. The lots from central Florida, including Orlando, Sanford, and Zellwood, were selected mostly from collections made in November, and those from the areas to the north and south mostly from collections made in August and June, respectively (Table 2). In spite of the fact that the records are unequally distributed by locality and season, it appears that *bishoppi* was more common at Zellwood than at Orlando and Sanford, also relatively more common there in relation to *pusio*.

Table 2

Summary of trap collections containing *Hippelates pusio* and *bishoppi*, by locality

Locality	Months represented in collections[1]	Total lots	No. of *pusio*	No. of *bishoppi*	Percent of *bishoppi*
Orlando, Florida	*Jan., Aug.-Nov.,* Dec.	61	12,152	73	0.6
Sanford, Florida	Jan., *Aug.*, Nov., Dec.	9	3,509	6	0.2
Zellwood, Florida	*Jan., Sept., Nov., Dec.*	15	1,892	243	11.4
Northern Florida, southern Georgia, southern Alabama	Jan., *Febr., Aug.*	17	2,797	2,761	49.7
Southern Florida	*Jan., Febr., June, Aug.*	13	2,154	3,336	60.8

[1]Italics indicate months when *bishoppi* was trapped in addition to *pusio*.

Collections from Recovery Cages

The discussion of the breeding habits of *pusio* presented in the original article was based on the work with recovery cages. Besides the miscellaneous settings, which produced *pusio* or *bishoppi* only where the soil had been disturbed, there were three other series of observations: the *experimental* settings, to determine the length of time that *pusio* would continue to breed in turned soil, the breeding activity at different seasons, and the possible effect of the cages on the normal development of the larvae; the *seasonal* settings, to determine the most practical time for cultivating land to control breeding; and the *cultural* settings, to determine the effect on breeding of different methods of preparing soil (Table 3).

Excepting the miscellaneous settings and part of the experimental settings, the tables in Bigham's quarterly reports give weekly totals of all gnats obtained from the recovery cages, whereas the lots studied by Sabrosky consisted of the separate collections. Less than ten of the weekly totals were not represented in Sabrosky's material, but there are numerous cases in which the numbers of specimens recorded by Sabrosky fail to tally with Bigham's figures. Sabrosky's identifications include 9,568 specimens out of a total of 9,891 reported from the experimental, seasonal, and cultural settings. The difference of 323 specimens (less than 3.3%) is quite evenly distributed throughout the settings, and in only two of the separate plowed strips does the difference exceed 10% (10.4 and 16.7). The minor nature of the discrepancies is well shown by the following changes which Sabrosky's records would make in Table 1 of the original paper (page 442). All of Sabrosky's specimens were *pusio* except the single individual, a *plebejus*, which was collected at Zellwood in the third week from the first cage set on October 4; apparently 6 *pusio* instead of 4 were obtained in the third week from the second cage set at Orlando on September 7; and in the recoveries of the fourth week at Zellwood, only 7 *pusio* instead of 11 and 5 instead of 6 could be accounted for. All in

Table 3

Summary of recovery cage collections containing *Hippelates pusio* and *bishoppi*, by series of cage settings

Series of settings	Dates of settings	Localities	No. of *pusio*	No. of *bishoppi*
Miscellaneous	1937-1939	(various)	620	61
Experimental	Aug.-Dec., 1938	Orlando, Zellwood	498	1
Seasonal	Mar.-Aug., 1939	Zellwood, Sanford	6,175	1,529
Cultural	July 1939	Sanford	1,231	0

all, the irregularities are probably of no importance because they are widely scattered.

Though it is clear from Table 3 that the ratio of *bishoppi* to *pusio* varies under different circumstances, it is also apparent that the conclusions regarding *pusio* (at least those based on the experimental and cultural settings) remain unchanged It was desirable to show, however, that the numbers of *bishoppi* did not affect the results of the seasonal settings. These tests, mentioned briefly on page 443 of the original article, were conducted as follows. On one plot of land at Zellwood in a region characteristic of the "ridge" citrus-growing section with a soil of deep, loose sand, and on another plot of land at Sanford in a typical trucking area, where the soil was also sandy, ten strips were plowed at regular intervals, two each month, from March to July inclusive. Eight recovery cages were set on each of these 20 strips from 9-16 days after the plowing, and collections of gnats were usually made from them at approximately weekly intervals.

The distribution of *pusio* was remarkably uniform within the seasonal plots, occurring in all the cages set at Zellwood and in all but two at Sanford. Moreover, *bishoppi* was collected from 66 of the 80 cages at Zellwood, being absent from only 4 cages up to those set on the two strips last plowed. At Sanford, however, where *bishoppi* was found in only 37 of the 80 cages, it more obviously became less frequent as the season progressed, occurring in 5, 8, 6, 5, 2, 4, 3, 3, 1, and 0 cages in the successive strips.

Because of the comparatively infrequent collection of gnats from the recovery cages as well as the climatic factors concerned, it is impossible to determine accurately from the seasonal settings an average time of development for either *pusio* or *bishoppi*. From date of plowing to date of collection, the average for *pusio* in the separate strips ranged from 55 to 23 days at Zellwood and 42 to 22 days at Sanford. Comparable figures for *bishoppi* are 49 to 21 days at Zellwood and 36 to 20 days at Sanford. The maximum period of development for both species occurred in the first strips plowed at Zellwood and Sanford on March 11 and March 14, respectively. There is a possibility that some of the gnats recovered belonged to a second generation which had bred under the recovery cages, but this seems rather unlikely because there is a continuous decrease in the average time of development for both species in the first five strips plowed at successively later dates in the spring. The slight difference in the figures for the two species is of questionable significance.

When the seasonal recoveries from the strips which were plowed in the same month were grouped together by locality, there was found to be considerable fluctuation in the actual numbers of *pusio* and *bishoppi*, but the percentage of *bishoppi* at Zellwood decreased from March to July as follows: 42.0, 34.6, 31.3, 11.4, 2.3. At Sanford also, the percentage decreased regularly during the same months except in May: 6.7, 3.1, 14.4, 2.7, 0.7. When the recoveries were grouped by *month of collection*, there was a similar over-all decrease in the percentage of *bishoppi* in both localities (Table 4).

It is unfortunate that the seasonal settings at Zellwood and Sanford did not cover an entire year, but they confirm the previous statements about *pusio*, and also contain sufficient evidence to show that *bishoppi* resembles *pusio* in its breeding habits. From the similar period of development and its wide distribution in the plowed strips, *bishoppi* also appears to lay its eggs in freshly turned soil and to breed mainly in cultivated ground. This statement is further supported by evidence from the rest of the cage settings.

Discussion

It has been possible to show that the conclusions of the previous article regarding *Hippelates pusio* have not been affected by the discovery of a large percentage of *H. bishoppi* in the most critical material. Moreover, *bishoppi* has been found to have similar breeding habits. It remains to be found whether the available data establish any difference in the seasonal or other distribution of the two species. A summary of all the cage collections arranged by locality (Table 5) shows that *pusio* has been recovered in the Orlando region, which includes Sanford, Zellwood, and Oviedo, in all months of the year, but that *bishoppi* has been taken only in the period from February to September. This is contradicted in part by the

Table 4

Recoveries of *Hippelates pusio* and *bishoppi* by month from the seasonal settings at Zellwood and Sanford, Florida

	Zellwood			Sanford		
Month	No. of *pusio*	No. of *bishoppi*	Percent of *bishoppi*	No. of *pusio*	No. of *bishoppi*	Percent of *bishoppi*
April	145	132	47.6	405	32	7.3
May	1,403	767	35.3	757	31	3.9
June	1,214	493	28.9	295	23	7.2
July	260	19	6.8	1,110	27	2.4
August	351	5	1.4	235	0	0.0
	3,373	1,416		2,802	113	

trap collections from the same region (Table 2) which include no catches made from February through July but have records for both species in all the months represented. More detailed examination of the trap catches shows that the percentage of *bishoppi* at Orlando decreased regularly from August (3.7%) to December (0.0%) and then rose (to 2.6%), the species appearing in one of three catches taken in January. When these indications are considered in relation to the over-all decrease of *bishoppi* found in the seasonal settings, it appears that in the Orlando region during the periods represented by the collections, *pusio* was more or less abundant and bred throughout the year, whereas *bishoppi*, though taken as an adult in each month of the year, bred mostly in the spring from March through May. Regarding the occurrence of the two species by locality, both trap and cage collections indicate that *bishoppi* was relatively more common in the places sampled at Zellwood than at either Sanford or Orlando. It is felt that this apparent distribution is real and that it bears a possible relation to different types of soil.

Summary

Over 40,000 of the Chloropidae collected by J. T. Bigham in the course of his investigations on *Hippelates pusio* in 1937-1939 were subsequently studied by C. W. Sabrosky and found to contain a large percentage of *H. bishoppi* Sabrosky, a new species of *Hippelates*. An analysis of these identifica-

Table 5

Summary of all recovery cage collections containing *Hippelates pusio* and *bishoppi*, by locality

Locality	Months represented in collections[1]	Total cages[2]	No. of *pusio*	No. of *bishoppi*	Percent of *bishoppi*
Orlando, Florida	Jan., Febr., *Mar.*, Apr., Aug.-Dec.	51	376	5	1.3
Sanford, Florida	*Febr.-July*, Aug.-Dec.	131	4,430	128	2.8
Zellwood, Florida	Jan., Febr., *Mar.-Sept.*, Oct.-Dec.	107	3,556	1,419	28.5
Oviedo, Florida	Mar., Sept., Nov.	5	11	0	0.0
N. Fla., S. Ga.	*July, Aug.*	4	151	39	20.5

[1]Italics indicate months when *bishoppi* was recovered in addition to *pusio*.

[2]Based, in the miscellaneous settings, mainly on the numbering of the settings, which in only one instance are known to have included more than one cage.

tions leaves Bigham's conclusions regarding *pusio* unchanged and shows that *bishoppi* also breeds in cultivated or otherwise disturbed soil. Observations made in the region of Orlando, Florida, suggest that *bishoppi* bred more commonly in the spring, and was more abundant at Zellwood in a citrus-growing area than at Sanford where most of the land was in truck.

Each of 15 collections of gnats associated with various animals contained *pusio* but not *bishoppi*.

A NEW SPECIES OF ACNEUS
(COLEOPTERA, DASCILLIDAE)

By KENNETH M. FENDER, *McMinnville, Oregon*

The genus *Acneus* was erected in 1880 by Dr. George H. Horn to receive his new species *quadrimaculatus*. The original description was based on a female from California. In 1881, Horn described the male from a specimen sent him by Ulke and presumed to have been collected in Oregon.

In describing and illustrating the male of the genus, Horn showed the third antennal segment to be longer than the first two combined, slender and slightly broader externally. Our males of the species fit all but this section of the description. In our series, the males have the third antennal segment longer than the first two combined but the segment is apically widened and flattened into an elongate triangular plate. An edge-on view of this segment resembles Horn's illustration, indicating that he used such a view in the description. For these reasons, I am assigning our specimens to the genus and all but one to his *A. quadrimaculatus.*

Our collection contains four representatives of Horn's species. One, a female, was collected at Boyer, Oregon, July 11, 1939. Three, two males and a female, were taken at Gunaldo Falls, Yamhill County, Oregon, June 30, 1949. These were taken flying above the creek a short distance below the falls. No additional notes are available on the Boyer specimen. A fifth specimen represents a new species which may be described as follows.

Acneus oregonensis, new species

Head piceous, the apical half of the labrum and the palpi testaceous, antennae piceous with the bases of segments 6 to 11 pale, pronotum flavous with the anterior marginal bead and a large median spot piceous, scutellum flavous, elytra flavous, each with seven blackish spots arranged as follows: three elongate spots laterally along the base; a rather obscure spot at about the middle; an elongate one interior to this and at the apical third; a marginal spot at the apical fourth and a narrow sutural spot that extends from the apical fifth to the tip. the elytral sutura and epipleura largely pale; body beneath piceous black with all sutures, the thorax and all coxae and legs flavous. Length 3.5 mm.

Male. Head much narrower than the pronotum, finely rugulose and sparsely punctured behind the antennae; antennae typical of the male of the genus, the third segment longer than the first two combined, apically widened and flattened into an elongate triangular plate, the fourth short and bearing a short branch, segments 5 to 11 flabellate. Pronotum widely transverse, widest at the base, arcuately narrowed to the apical angles which are anteriorly produced and rounded, strongly depressed then becoming explanate at the sides, more strongly so at the anterior angles; the basal margin serrulate as are the bases of the elytra and scutellum; disc shining, impunctate, a moderately deep, diagonally elongate impression at each side of the middle and near the base. Scutellum finely sparsely punctured, triangular. Elytra widest at the apical third, arcuate to the tips which are angulate, shallowly, moderately coarsely, confusedly punctured, feebly tricostate; a subsutural costa arising near the sutural third of the elytra, converging slightly to the apical third where it parallels the suture to near the elytral apex; a discal costa, arising near the humerus, diagonally converging on and connate with the sutural costa at the elytral apical fifth; a submarginal costa arising near the basal fourth, paralleling the curvature of the elytral margin till it attains the apex of the sutural costa with which it is connected; margin guttered basally, this gutter narrowing to a stria at the middle. Body beneath finely punctured, the mesosternal process widely, moderately deeply concave. Male genitalia, eighth sternite forked, the arms of the furcation straight, converging to the tips where they touch, the tips slightly enlarged.

Female. Unknown.

Holotype, male, Multnomah Falls, Oregon, July 19, 1947, K. M. Fender, in the Fender collection.

Several characters separate the two species, the only known members of the genus. *A. quadrimaculatus* is slightly larger and darker; the black areas of the elytra are not broken up; the scutellum, and elytral suture and epipleura are dark. The impression of the mesosternal process instead of being widely concave, has a longitudinal median impressed line that nearly attains the apex of the process. The forks of the eighth sternite are parallel to near the tips where they are curved in, the tips touching.

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A NEW SPECIES OF EUPARYPHUS FROM ONTARIO
(Diptera, Stratiomyidae)

By George C. Steyskal, *Grosse Ile, Michigan*

An apparently new fly was captured in the vegetation at the foot of a little trickle of water which issues from the rocks where the road north of the town of Wiarton climbs the cliff. The series was somewhat teneral but the following description is drawn from specimens which are believed to be well colored.

Euparyphus brucensis, new species

Distinguished from related species by the largely yellow scutellum, the lack of yellow lateral mesonotal stripe between humerus and notopleuron, the yellow femora, and wholly black fore tarsi. The long and approximate scutellar spines, separated by half their length, and the small body size place it in *Euparyphus* s. str., rather than in the subgenus *Caloparyphus* James.

Antennae black, sometimes yellowish basimedially, 0.9 the head length, the scape a little longer than the first joint, the last two flagellar joints somewhat flattened and together in length equal to the scape. Proboscis and mouth yellow.

Body black. Mesonotum with a pair of yellow parallel dorsocentral stripes extending nearly the whole length and swollen mesally to about twice their anterior width at transverse sutures, which end in the stripes. Notopleura usually with a small yellow spot in the mesal corner. Humeri yellow, the color continued as a moderately wide upper pleural border to upper corner of hind coxae, the pteropleura thus yellow except a moderately large anteroventral corner. The broad upper border of the sternopleura also yellow. Scutellum and spines yellow except on each side, where a wedge of black extends two-thirds the distance to the base of the spines. Halteres yellow. Wings hyaline, the veins yellowish, the third vein simple and extending a little less than halfway from the base of the discal cell to the apex of the wing.

Legs, including coxae, yellow, only the entire fore tarsi, the last four joints of the middle and hind tarsi, and the hind tibiae, except a narrow dorsal, a similar ventral stripe, and a small band slightly basad of the middle, black. Claws black. Lower propleura, anterior to base of fore coxae, yellow.

Abdomen largely black, venter with varying amounts of black mesally.

All hairs moderate in length, white, except on dorsum of thorax, where they are yellow as noted below. Hairs of scutellum short, sparse, and black. Eyes bare.

FEMALE. Length, 4.1 mm. Occiput black, the orbits broad, yellow practically to eyes below middle, above yellow in posterior half only, leaving distinct black stripe along eyes. The front nearly parallel-sided, a little narrower than face, at antennae 0.5 the head width. Ocellar tubercle slightly longer than broad, black, a little raised. Vertex with a broad yellow zone extending an equal distance on all sides of the ocellar triangle, divided from the yellow occipital stripe by the black vertical sutures, extending a short distance onto back of head, and only narrowly separated from eyes. The yellow color extends downward nearly to the antennal level, but is narrowly divided by a black or brownish point extending from shortly above the antennae to two-thirds the distance to the anterior ocellus and is invaded by two large black spots on each orbit. These spots are situated midway between antennae and ocelli, each occupy one-third of the front, are a little longer than wide, are roughly flattish above, and have the shape of a quadrant of an ellipse. They are matt black, except on their shining posterior and posteromesal borders.

The face is black, except a yellow stripe surrounding antennal bases, which stripe extends to oral margin and bears in its middle a longitudinal black bar. The stripe is rather less than one-third the width of the face. There is also a yellowish cloud in the center of the lower facial orbits. The lower posterior and the facial orbits nearly to the central yellow stripe are heavily white pruinose, the pruinosity strongly narrowed at antennal level, but extending narrowly along the eyes to the black frontal spots.

The appressed anteromedial hairs of the mesonotum are a little yellowish and the yellow integumental color is somewhat more extensive than in the male, except on the abdomen, which in well-colored examples is largely black, yellow only around the edge and in the posterior corners of tergites two, three, and four, conspicuously so only on tergite three.

MALE. Length, 3.8 mm. Eyes holoptic, when fresh purple above antennal level, greenish and with much smaller ommatidia below. A row of hairs extends from the ocelli almost to the small frontal triangle, which latter is yellow in large part, as is also the antennal base and two narrow divergent stripes from the antennae almost to the mouth. The lower orbits are densely white pruinose, as in the female. The mesonotal hairs are largely golden yellow. The abdomen has large yellow posterior corners on the third and fourth tergites and a wide yellow margin on the fifth tergite. The genitalia are blackish, the cerci yellow.

Holotype, male; *allotype*, female; and several *paratypes* of both sexes, Wiarton, Bruce Peninsula, Ontario, July 4, 1947 (Geo. Steyskal). Holotype and allotype in United States National Museum (No. 60997). Paratypes in Canadian National Collection, in that of Maurice T. James, and in that of the author.

SOME NEW SPECIES OF WESTERN MYCETOPHILIDAE

(DIPTERA)

By FRANK R. SHAW, *Department of Entomology, University of Massachusetts*

In a lot of material sent to me for identification by Dr. D. G. Denning I have found a considerable number of new species. Part of these have been described already in the June 1951 issue of the Brooklyn Entomological Society, (vol. 46: 65-70).

The new species described herein represent five genera, *Exechia, Mycetophila, Platyura, Rhymosia* and *Trichonta.* Most of the material was taken in Wyoming at fairly high altitudes. The number of new species taken was large in proportion to the total number of specimens sent to me. It may be that the area will prove to be rich in new species when it is more thoroughly worked.

The types of the new species are retained in my collection. Paratypes are distributed as stated later in the paper.

Exechia bilobata, new species

Male: length, 4 mm.

Head: vertex and occiput dark brown, frons and mouthparts lighter. First two and basal half of third segment of antennae yellow, remainder dark brown.

Thorax: lateral margins and humeri of mesonotum yellow, three dark brown areas separated by a **Y**-shaped fine yellow line. Scutellum dark brown with two marginal setae. Prothorax yellow, mesopleura brown, metapleura lighter. Wing 3½ mm. long. Curvature of R_s conspicuous. Ratio of a:b = 0.66. Petiole of M about 4/7 length or r-m crossvein. Cu forks under origin of R_s. Halteres with yellow pedicels and brown knobs. Legs—yellow, mesothoracic coxae with brownish marking posteriorly, trochanters with small dark brown mark anteriorly, all femora with narrow brown apical stripe. Tibiae and tarsi appear brown due to presence of brown setulae. Fore basitarsi about 1⅛ as long as tibiae.

Abdomen: dark brown. Hypopygium (Fig. 1) somewhat lighter. Diststyles are scissors-like. A prominent bilobed ventral plate is characteristic of this species.

In Johannsen's key, this species would run to the couplet containing *E. umbratica* Aldrich and *E. nugax* Joh. It can be recognized by differences in the hypopygium, venation and color. In some respects it resembles *E. bifurcata* Fisher but differs in the details of the diststyles.

Described from one male collected at a light trap Aug. 16-18, 1949 by J. Simon at Jackson, Wyoming.

Mycetophila carruthi, new species

Male: length 3½ mm.

Head: uniformly dark brown, palpi somewhat lighter, basal two segments of antennae yellow, remainder yellowish brown.

Thorax: dark brown, humeri faintly tinged with yellow, pro- and meso-pleura brown. Metapleura yellow. Scutellum dark brown with four bristles. Wing 3 mm. long. A brown spot covers origin of R_s, *r-m* crossvein and petiole of *M*. *M* forks under origin of R_s. Petiole of *M* about 0.84 as long as *r-m* crossvein. *Cu* forks slightly distad of fork of *M*. Halteres yellow. Legs yellow, tarsi and tibiae appear dark due to presence of numerous setulae. Two rows of setae on extensor surface of hind tibiae. No setae on flexor surface of mesothoracic tibiae.

Abdomen: uniformly dark brown except for hypopygium (Fig. 2) which is yellowish brown.

In Johannsen's key this species would run to *M. falcata* Joh. It can be distinguished by the structure of the dististyles.

Described from one male collected at the junction of Elkhorn Creek and Poudre River, Colorado on August 16, 1947 by D. G. Denning. I take pleasure in naming this insect for Dr. L. A. Carruth of the University of Arizona, Tucson. Arizona.

Mycetophila ghanii, new species

Male: length 3½ mm.

Head: uniformly dark brown except for palpi which are somewhat lighter. Second and basal half of third antennal segments yellow, remainder dark brown with white pile.

Thorax: dark brown except for humeri and lateral margins of mesonotum which are chestnut colored. Scutellum dark brown with four marginal setae. Wing 4 mm. long. A dark brown spot covers origin of R_s, the *r-m* crossvein, the petiole and fork of *M*. A second brown spot occupies the tips of the costal cells and cell R_{1+2} extending to vein M_{1+2}. A faint band extends from R_{4+5} to beyond Cu_2. Media forks under the origin of R_s, petiole of *M* subequal to the *r-m* crossvein. Fork of *Cu* proximad of the base of the *r-m* crossvein. Halteres yellow. Legs—coxae and trochanters yellow, all femora yellow with brown stripe posteriorly and apices likewise colored. Tibiae brown at apices, tarsi brown. Fore basitarsi about 0.80 as long as tibiae. Hind tibiae with two rows of spines on extensor surface. Mesothoracic tibiae with one seta on flexor surface.

Abdomen: uniformly dark brown except for hypopygium (Fig. 3) which is paler.

In Johannsen's key this species would run to *M. fenestrata* Coq. It can be distinguished by the structure of the hypopygium and by the wing pattern.

Described from two males, the type from Snowy Range

Mountains, Albany, Wyoming, Sept. 25, 1947 and a paratype from Centennial, Wyoming, August 2-3, 1947. Both specimens were collected by D. G. Denning. I take pleasure in naming this insect for Dr. M. A. Ghani of Lyallpur, Pakistan.

Platyura palmi, new species

Male: length 5½ mm.

Head: vertex and occiput dark brown, mouthparts a little lighter. Basal half of 3rd antennal segment yellow, remainder of antenna dark brown.

Thorax: uniformly dark brown except for small pale area on humeri. Prothoracic spiracle yellow. Wing 4½ mm. long. No distinct markings but apex is slightly infuscated. Costa extends about ⅓ distance from R_{4+5} to M_{1+2}. *Sc* long, ending beyond origin of R_s. Sc_2 near humeral crossvein. R_3 ends in costa and is at an angle to R_{4+5}. Petiole of *M* is short, about as long as R_3. *Cu* forks beyond origin of R_s. Two distinct anal veins of which the first does not quite reach the margin of the wing. Halteres pale yellowish-brown. Legs—yellow. Trochanters have small black stripe on anterior outer surface. Tibiae and tarsi appear dark brown due to presence of numerous dark setulae. Fore basitarsi about ⅝ the length of the tibiae.

Abdomen: uniformly dark brown. Hypopygium (Fig. 4) dark brown.

In Johannsen's key, this species would run to *P. inops* Coq. from which it can be distinguished by having the basitarsi shorter than the tibiae, by color differences and by the structure of the hypopygium.

Described from one male from Snowy Range Mountains, Albany County, Wyoming, collected by D. G. Denning. I take pleasure in naming this insect for Dr. C. E. Palm of Cornell University.

Rhymosia coheri, new species

Male: length 4 mm.

Head: dark brown, mouthparts and palpi yellowish brown. First two and basal half of third segment of antennae yellow, remainder dark brown covered with whitish pile.

Thorax: dark brown except for prothorax which is yellow and for a triangular yellow spot on the dorsal posterior region of the mesothoracic katepisternum. Scuttellum dark brown with two marginal setae. Wing 3 mm. long. Petiole of *M* subequal to the *r-m* crossvein in length. Fork of *Cu* slightly distad of origin of the *r-m* crossvein. Halteres yellow. Legs yellow, fore basitarsi subequal in length to tibiae.

Abdomen: All segments dark brown above, first, third, seventh and eighth tergites completely brown. The remaining tergites have the anterior lateral portions largely yellow. Sternites yellow. Hypopygium (Fig. 5) yellow.

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

PLATE 37. HYPOPYGIA OF NEW MYCETOPHILIDAE

Fig. 1, dorsal view of right half of hypopygium, *Exechia bilobata*. Fig. 2, lateral view of right dististyle, *Mycetophila carruthi*. Fig. 3, internal view of right dististyle, *Mycetophila ghanii*. Fig. 4, lateral view of right basistyle and dististyle, *Platyura palmi*. Fig. 5, lateral view of right dististyle, *Rhymosia coheri*. Fig. 6, lateral view of right dististyle, *Trichonta chaoi*.

In Johannsen's key, this species would appear to run to his species "a" described from a female from California. Since no male has been described for Johannsen's species "a" I consider my species is new.

Described from one male collected July 21, 1947 at Laramie, Wyoming by Dr. D. G. Denning. I take pleasure in naming this insect for Edward Coher.

Rhymosia dietrichi, new species

Male: length 4½ mm.

Head: dark brown, somewhat paler above the compound eyes. Mouthparts and palpi yellow. First three segments of antennae yellow, remainder brown covered with thick pile.

Thorax: mesonotum dark brown with two faint, longitudinal yellow stripes converging posteriorly. Prothorax yellow. A yellow area extends along suture between katepisternum and epimeron of mesopleuron. A small yellow area just below hind margin of wing on mesoepimeron. Lateral margins of scutellum, postnotum and lower portion of pleurotergites yellow. Metapleura yellow, bearing 3 conspicuous setae and about 10 smaller ones. Scutellum with two marginal setae. Wing 3½ mm. long with a yellowish tinge. Petiole of *M* about 0.55 as long as *r-m* crossvein. *Cu* forks about length of the petiole of *M* before the origin of the *r-m* crossvein. Halteres with white bases and yellow knobs. Legs—yellow, tibiae and tarsi about 1.14 longer than tibiae.

Abdomen: dark brown, lateral portions of tergites paler. Hypopygium light brown, closely resembles that of *R. beckeri* Shaw.

In Johannsen's key, this species would run *R. inflata* Joh. On the basis of the structure of the hypopygium it would be close to *R. beckeri* Shaw. It can be distinguished from *R. inflata* Joh. by the structure of the hypopygium and from *R. beckeri* by the venation, color pattern and thoracic chaetotaxy.

Described from one male collected in Mt. Rainier National Park, Washington on June 19, 1948 by D. G. Denning. I take pleasure in naming this insect for Dr. Henry Dietrich of the Department of Entomology of Cornell University.

Trichonta chaoi, new species

Male: length 3 mm.

Head: uniformly dark brown except for last two segments of the palpi which are yellow.

Thorax: uniformly dark brown except for small area on humeri which are light brown and anterior pronotum and prothoracic spiracular region which are yellow. Wing 3½ mm. long. Costa does not extend beyond tip of R_s. Sc_1 missing, Sc_2 ends in *R* about 0.75 of the length of cell R_1. *M* forks beyond origin of R_s. Petiole of *M* about 1.75 as long as the *r-m* crossvein. Fork of *Cu* before fork of *M* but beyond origin of *r-m* crossvein. Halteres yellow. Legs—yellowish brown. Tibiae and tarsi darker. Fore basitarsi subequal in length to tibiae.

Abdomen: dark brown including hypopygium (Fig. 6).

In Johannsen's key, this species would run to *T. foeda* Loew, which was described from a female. It can be distinguished by color pattern from this species.

Described from one male collected on the Snowy Range Mountains, Albany County, Wyoming on July 17, 1948 by D. G. Denning. I take pleasure in naming this insect for H. F. Chao who has assisted me in the preparation of some of my drawings.

THE NESTING HABITS OF MIMESA (MIMUMESA) NIGRA (PACKARD)

(HYMENOPTERA, SPHECIDAE)

While repairing a picket fence in an area of small lawns and backyards in Falls Church, Va., June 2, 1951, I found the cells of some insect in a decaying "2 x 4" about one foot above the ground. A section about 6 inches long was infested at one end of the piece of fencing, where the paint had weathered away. A dozen or more cells were present, from some of which the occupants had already emerged. Two intact cocoons were secured, and about June 15 there emerged a black male wasp about 6 millimeters long, later identified by K. V. Krombein as *Mimesa* (*Mimumesa*) *nigra* (Pack.). No published data on the nesting habits or prey of the North American species of the subgenus *Mimumesa* have previously appeared.[1] The second cocoon was opened July 5 and a white larva 4 millimeters long was found and preserved. Its identity as *nigra* was confirmed by comparison with the larval skin removed from the first cocoon after adult emergence. Each cocoon shows a dried deposit of dark meconium at one end. Cocoons are about 7 millimeters long, pale brown and composed of tightly woven silk. They are not capped, but the wasp chews an opening at one end when emerging. All of the cells of *nigra* examined were stocked with female leafhoppers, many of the latter remaining intact, evidently in excess of the larval food requirements. All the leafhoppers belonged to a single species of *Agallia* (det. D. A. Young).

ASHLEY B. GURNEY,
Bureau of Entomology and Plant Quarantine.

[1]K. V. Krombein, *in* Muesebeck, et al, 1951, Hymenoptera of America North of Mexico, Syn. Cat. U. S. Dept. Agric., Agric. Monograph No. 2, p. 958.

A NEW BITING MIDGE OF THE GENUS LEPTOCONOPS FROM FLORIDA, WITH NEW RECORDS OF OTHER AMERICAN SPECIES

(DIPTERA, HELEIDAE)

By WILLIS W. WIRTH, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture*

In the western United States two species of *Leptoconops* are well known as severe pests of man and animals because of their blood-sucking habits. East of the Rockies this genus seems to be rare, although *torrens* (Townsend) has been taken occasionally in Texas and a few *kerteszi* Kieffer have been collected at Laramie, Wyoming, and Paxton, Nebraska. Boesel's (1948) description of *catawbae* from a single female taken biting man near Lake Erie in Ohio has been the only known record of this genus east of the Mississippi. *L. bequaerti* (Kieffer), described from Honduras, has also been reported from Trinidad and Cuba. The present new records of *catawbae* from Michigan, of *bequaerti* from Florida and Mississippi as well as elsewhere around the Caribbean, and of a new species related to *brasiliensis* (Lutz) from Florida are especially significant and in line with our expanding knowledge of these tiny biting midges.

The description of a new species intermediate between *Leptoconops* and the Australasian *Styloconops* in a paper on California Heleidae, now in press, led to a revision of our generic concepts in the subfamily Leptoconopinae. Since it is distinct only in the number of antennal segments in the female, *Holoconops* definitely cannot be given more than subgeneric rank, and with the new California species bridging the gap, *Styloconops* can also be regarded as not more than a subgenus of *Leptoconops*. In these considerations I have been guided most strongly by Carter's (1921) revision of the genus, for although his paper is not recent, his analysis and presentation of characters seem to be far stronger and more penetrating than any other work which has appeared before or since.

Leptoconops (Holoconops) bequaerti *(Kieffer), new combination*

Holoconops bequaerti Kieffer, 1925, Ann. Inst. Pasteur Algerie 3:405; Mayer, 1934, Arch. Naturg. 3:256; Johannsen, 1943, Ann. Ent. Soc. Amer. 36:776.

Leptoconops (Holoconops) hondurensis Hoffman, 1926, Bull. Ent. Res. 17:135.

Holoconops hondurensis, Macfie, 1937, Ann. Mag. Nat. Hist. (10)20:2; Adamson, 1939, Tropical Agr. 16:81.

The following are new distribution records, those from Florida and Mississippi being the first for the United States:

FLORIDA: Biscayne Bay, A. T. Slosson, 1 ♀. Lake Worth, A. T. Slosson, 3 ♀♀. Fort Walton, Sept. 6, 1943, M. Wright, 1 ♀.

MISSISSIPPI: Horn Island, Aug. 25, 1944, E. A. Richmond, 2 ♀♀.

DOMINICAN REPUBLIC: Monte Cristi Beach, March 6, 1949, J. M. Brennan, 1 ♀.

JAMAICA: Fort Simonds, Aug. 6, 1942, C. B. Philip, 4 ♀♀. Rest and Milk Rivers, Aug. 5, 1942, C .B. Philip, 8 ♀♀.

VENEZUELA: La Salina, Zulia, I. Ortiz-C., 1 ♀.

The small size (wing 0.86 mm.) and yellowish legs and abdomen are distinctive.

Leptoconops (Holoconops) catawbae (Boesel), new combination
Holoconops catawbae Boesel, 1948, Ohio Jour. Sci., 48:69.

Three female specimens from Douglas Lake, Cheboygan County, Michigan, collected July 18, 1939, by R. I. Sailer, agree with Boesel's description of *catawbae*. This species differs from *kerteszi* Kieffer and *bequaerti* (Kieffer) mainly in its smaller size (wing 0.8 mm.), uniform reddish brown color, wing without darkened stigma, and palpus with pit of third segment beyond middle, the fourth segment clavate.

Leptoconops (Leptoconops) floridensis, new species
(Figures 1-7)

A large, uniformly dull, pollinose, grayish-black species with milky white wings and brownish halteres; tarsal claws long and slender, simple; last antennal segment greatly tapered with sharp apex; third palpal segment with long open sensory area on entire inner side.

Female. Length 2.0 mm., wing 1.5 mm. by 0.7 mm.

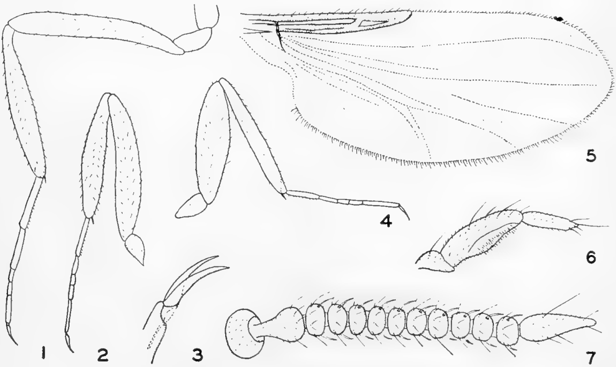
Head black, with coarse gray pollen; a few fine brown hairs around eye margin; eyes separated by a space about a fifth of greatest width of head, the space between with a few fine brown hairs. Antenna (figure 7) 14-segmented, basal segment ring-like, second enlarged, third flask-shaped, 4-13 moniliform, last segment greatly tapered from base, apex pointed, slightly longer than preceeding three segments combined; flagellar segments in proportion of 30:12:13:13:13:13:14:14:15:15:15:50; with uniform, dense vestiture of short, fine, whitish hairs and sensoria. Palpus (figure 6) with first and second segments very short, indistinctly separated, third slightly swollen, inner side with long, open, sensory area with long, spoon-shaped sensillae, pit absent; fourth segment half as long as third, slender and tapered.

Thorax dull black, with dense, coarse, scale-like pollen with distinct backward projecting grain appearing much lighter gray when viewed from in front. Mesonotum very convex, a large, concave prescutellar area with a median, slightly raised tubercle with a pair of minute, polished, black, narrow, sensory areas; humeral depressions with three, minute, polished, black, round sensory areas in line; vestiture of sparse, short, fine, brown hairs. Scutellum very convex, almost globular, nearly as long as broad at base, with about ten fine marginal hairs. Postscutellum and pleura dull pollinose black, brown around wing base and on pronotal lobes, bare except a few fine hairs on pronotal lobes and on posterior margin of mesepisternum. Legs (figures 1, 2, 4) dull pollinose black; trochanters, narrow bases of femora and apices of tibiae brown, tarsi yellow, with sparse vestiture of short fine brown hairs. Femora and tibiae rather stout, tarsi very slender and unarmed. Segments of hind leg in proportion of 25:15:70:60:22:17:5:5:12; claws black, long and very slender, over half as long as fifth segment, simple, lacking even basal bristle (figure 3).

Wing milky white, including stigma; macrotrichiae absent but with strong microtrichiae; venation as in figure 5. Halteres dull yellowish brown.

Abdomen dull, pollinose black above, brown below, lamellae of ovipositor yellow, long and slender, a fourth as long as rest of abdomen. Spermathecae two, subspherical, the duct sclerotized very shortly at base.

Holotype ♀, Santa Rosa Island, Escambia County, Florida, June 7, 1949, Butler (Type No. 60954, U. S. National Museum). Paratypes: 1 ♀, same data as type; 1 ♀, same except July 29, 1949. These specimens were sorted from light trap collections kindly furnished by Mrs. Elisabeth Beck and Mr. J. A. Mulrennan of the Florida State Department of Health.



Leptoconops floridensis n. sp. Figure 1, hind leg; 2, mid leg; 3, claws of mid leg; 4, fore leg; 5, wing; 6, palpus; 7, antennae, basal ring-like segment not shown.

This species is probably most closely related to *brasiliensis* (Lutz). The 14-segmented antennae, unarmed tarsi and long lamellae place it in the subgenus *Leptoconops*. The third palpal segment is very distinctive, with the pit absent and a long inner concave sensory area present similar to that found in several Australasian species including the genotype, *stygius* Skuse. The extremely long, slender, tarsal claws with basal bristle lacking are unlike those of any other known species. The sharply tapering last antennal segment is also characteristic.

Literature Cited

Boesel, M. W., 1948. *Holoconops* in the western Lake Erie region (Diptera: Heleidae). Ohio Jour. Sci. 48:69-72.

Carter, H. F., 1921. A revision of the genus *Leptoconops*, Skuse. Bul. Ent. Res. 12:1-28.

PSOROPHORA (JANTHINOSOMA) TOTONACI, A NEW SPECIES FROM MEXICO

(Diptera, Culicidae)

By Guenther W. Lassmann, *Entomologist, Public Health Services, Jalapa, Veracruz, Mexico*

While working on an anopheline survey of the State of Veracruz carried out under the auspices of the Rockefeller Foundation and the State Public Health Services a number of mosquito pupae were collected in Paso de San Juan, Municipality of Veracruz, State of Veracruz, Mexico, from which emerged a male and a female of what appeared to be a new species of *Psorophora*. Unfortunately the adult specimens were destroyed leaving only the mount of the male terminalia as evidence of the discovery. The date of the collection was August 17, 1945, which in all probability marked the end of this mosquito's reproductive season, since it was never again collected from the same ditch. The rainy season in Paso de San Juan begins about the middle of June. The following year we were fortunate again to secure new material on June 19th in rain water puddles shaded by a big mango tree near a village called Cerro Guzman, and near Vargas on the 20th of the same month. Cerro Guzman lies about 15 kilometers distant from the original site of capture, while Vargas is located only 2 kilometers away from Paso de San Juan. Together with the new *Psorophora* we found breeding *Psorophora howardii*, *P. confinnis* and *P. cyanescens*. For the next four years we have been making periodic trips to the original collecting spots in order to secure larval material and to complete the study, but without success. Some of the breeding sites have suffered changes, since the trees which shaded them were felled, and we assume that this accounted for the absence of the *Psorophora*. In the second place the rainy seasons during the past years have been very irregular, bordering on drought conditions, and our trips just never coincided with the exact moment of the appearance of the mosquito. Not wanting to wait any longer for the publication of a description of this new species we will attempt to give as full an account as possible under the circumstances.

Psorophora (Janthinosoma) totonaci, new species

The type locality for this new species will have to be designated as Cerro Guzman, Municipality of Veracruz, State of Veracruz, Mexico, since the type material deposited in the U. S. National Museum belongs to the series secured there June 19, 1946. The entire region around Cerro Guzman is covered with Indian ruins which antedate the conquest of Mexico by the Spaniards and was populated by a tribe known as the Totonacas, and following the custom of Dyar and Knab who named *Psorophora tolteca* after an Indian tribe I will christen another representative of this genus with the name of another Indian tribe.

The adult of this new *Psorophora* has the same general purplish coloration found in other members of this genus such as *P. ferox*, *P. forceps*, *P. albipes*, *P. lutzi*, etc. In the living male the tips of the palpi are curved upward. The proboscis extends to the apical third of the penultimate palpal segment; the last two palpal segments are slightly more swollen than the basal segments. The mesothorax bears whitish scales along the lateral margins forming a horse-shoe shaped design which ends in two whitish stripes which touch the scutellum. A patch of whitish scales is also found on the central lobe of the scutellum, while the outer ones bear only bristles. Further patches of whitish scales are found between the front coxae; the first pair of coxae themselves are completely covered, as well as the propleura. The biggest one is found on the sternopleura and is shaped like an upside down tuning fork. The second coxae have but a few white scales as cover and the third coxae lack them altogether. The mesepimeron also bears a little patch of white scales. Both male and female have the last two hind tarsal segments completely white, while some of the recently captured ones have a few white scales also on the very tips of the third tarsal segment, the rest of the leg has a purplish sheen excepting the inner aspect of the femur which is yellowish, the same as on legs one and two. The abdomen has the same violaceous reflection as the rest of the body. A wing from a male from Cerro Guzman measures 3.88 mm., while the length of a female wing is 4.25 mm. The male terminalia show several distinctive features which make this species easy to distinguish from all other

Psorophora so far described. A figure of the original mount is presented in figure 1.

The dististyle shows two unique characteristics, first, a complete cover on both internal and external surfaces of small hairs besides eight to a dozen heavier hairs, each set on a small tubercle, and, secondly, a very heavily chitinized terminal spine which in all mounts shows a double point. A lateral view of the dististyle shows it to be roughly triangular in outline (fig. 1a).

The claspette (fig. 1b) is composed of a brush-shaped structure upon a petiole not soldered to the side-piece. The hairy part of the brush is made up of simple setae; setae with microscopically feathered tips (resembling similar elements found in *P. forceps*); a series of nine elongated, pointed, poorly chitinized, broader oblanceolate filaments and setae which are set on and around a prominence; a subterminal, bent and pointed filament which arises from a distinct tubercle in focus at about the same level as the prominence with the broader leaflets; and finally a pair of strongly chitinized leaflets arising from a prominence on the interior portion of the claspette. The petiole portion of the claspette is completely covered with microscopic hairs.

The basistyle is longer than broad and shows no distinct peculiarities. The phallosome, strongly chitinized at the tip, is a slender and long cone (slightly resembling a Coca-Cola bottle) without serrated edges nor lateral projections, thus contrasting with the short and stout ones found in most of the other *Psorophora*. The tenth sternite is prominent and heavily sclerotized and the ninth tergite has its lobes widely separated, broadly rounded, each bearing several scattered setae.

Holotype, male, Cerro Guzman, Veracruz, Mexico, June 19, 1946 (U. S. National Museum No. 61293). Paratypes, same data, 5 males with genitalia mounted on slides, 1 female, 2 male genitalia on slides (U. S. National Museum and collection of author).

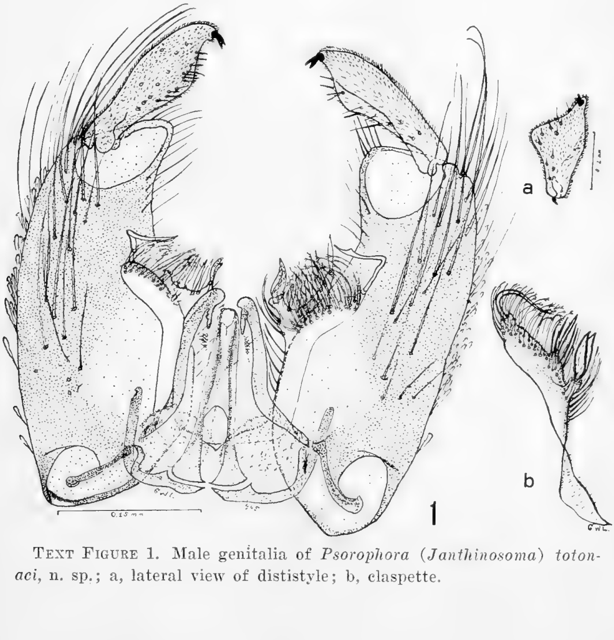
Taxonomic Status

Cerqueira in 1939 (1) speaks of a "serie lutzi" and includes in it three species, namely *Psorophora* (*J.*) *lutzi*; *P.* (*J.*) *albipes* and *P.* (*J.*) *forceps*. He bases his series principally upon the common characteristic of the members of this series of the fourth and fifth hind tarsal segments being completely white. Since *P.* (*J.*) *totonaci* also has the fourth and fifth tarsal segments of the hind legs white, I am including it in this series. The shape of the clasper of *P. totonaci* conforms more with the general shape of the claspers of species of the subgenus *Psorophora*, and in this feature comes closer to *P. lutzi* and *P. albipes* of the series. As far as the claspette is concerned *P. totonaci* comes closer to *P. forceps*, since it possesses the filaments with microscopic branchings at the tips, as well as an external filament, although this is curved in *totonaci* and straight in *forceps*. The internal leaf-like appendages are double and not twisted in *totonaci* and its counterpart in *forceps* is a single twisted leaflet. The more ventrally located rim of the claspette with its oblanceolate appendages is unique for *P. totonaci*, and has no described counterpart in the other members of the series.

The white legged *Psorophora* from North America and Mexico include *P. ferox*, *P. horrida*, *P. longipalpus* and *P. pisces*, which all can be distinguished from the newly described species by the differences in the clasper and claspette of the male terminalia.

REFERENCES

(1) Cerqueira, N., 1939. Sobre *Psorophora lutzii* Theobald, *Psorophora albipes* Theobald e *Psorophora forceps* n. sp. Rev. Ent. 10: 78-85.



TEXT FIGURE 1. Male genitalia of *Psorophora* (*Janthinosoma*) *totonaci*, n. sp.; a, lateral view of dististyle; b, claspette.

TWO NEW AMBRYSI FROM SOUTH AMERICA

(HEMIPTERA, NAUCORIDAE)

By IRA LA RIVERS, *University of Nevada, Reno*

Ambrysus planus,[1] new species

General appearance: the most angulate species in the entire genus, of moderate slimness. Size 9.0-10.25 mm. long and 5.0-6.0 mm. wide. Dorsum quite remarkably unicolorous, varying from very light yellow to yellowish-brown, the embolia and scutellum usually slightly lighter in color than remainder. Venter bright-to-dull yellowish, with no conspicuous mottling.

Head: grossly punctuate but shining; long and narrow due to pronounced penetration of posterior part into anterior edge of pronotum; vertex distinctly protuberant in front of eyes. Eyes slightly protuberant above general plane surface of head; outer and posterior sides blending smoothly into each other without a break, forming a continuous, curving surface. Labrum with a slight suggestion of a point at tip, ratio of length-to-width 17::34 (50%), uniform in color; mouthparts similar to head in color. Head ratios are:

(1) total length to width (including eyes) 64::84 (76%)
(2) anterior distance between eyes to posterior distance 32::49 (65%)
(3) anterior distance between eyes to inner eye length 32::37 (86%)
(4) posterior distance between eyes to greatest length of head posterior to this line 49::22 (45%).

Pronotum: markedly angulate in general form, no smooth curvatures except for anterior indentation for head-reception; unicolorous, bright-to-dirty yellow; in very light specimens, faint, fine mottling is weakly present, appearing subdermal; surface glistening, but coarsely and shallowly punctuate; punctures becoming somewhat transversely elongate in anterior central part behind point of deepest head penetration, but not actually achieving a rugulose condition; lateral edges almost absolutely straight, the straightest in the entire genus, quite markedly serrate in the anterior half; posterior angles not reflexed, very sharp, considerably more than right angles (varying between 115° and 130°); a line connecting posterior angles would lie just anterior to the posterior, thin, transverse black line. Venter unicolorous, sparsely clothed with thin, yellow hairs; keel grooved posteriorly, rising to a thin, sharp ridge occupying anterior half of keel. Dorsal ratios:

(1) width between anterior angles to width between posterior angles 45::101 (44%)
(2) median length to greatest width 28::101 (28%)

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[1]The name *Ambrysus planus*, and the use of *planus* as a group of *Ambrysus*, appear in the author's 1951 revision of the genus *Ambrysus* in the United States (p. 286). Both are used as *nomina nuda* to facilitate a general discussion of phylogenetics within the genus, and the present paper is the first in which the species and group *planus* is formally characterized; on this basis, there should be no confusion concerning the origin of the terms.

(3) distance between anterior and posterior angles on same side to perpendicular distance between anterior angle and baseline of pronotum 44::48 (92%).

Scutellum: same color as hemelytra except occasionally in very light specimens, it is distinctly lighter than surrounding dorsum in color; roughly, shallowly punctuate, glistening; ratio of the three sides, anterior and two laterals, is 62::44::45.

Hemelytra: surface glistening, unicolorous, but roughened with coarse, shallow, impunctations almost suggestive of incipient reiticulations, base of each impunctation whitish, giving the effect of a very thickly and closely spotted hemelytra when viewed from directly above, at which angle the impunctations are invisible; conspicuously lighter along outer emboliar edge, particularly in pale specimens; embolia narrow, length-to-width 119::37 (31%), distinctly bicolored in all but the darkest specimens, the anterior two-thirds or more light, the remainder dark—the line of color-change is not perpendicular to long axis of body, as is usual in the genus, but rather more nearly parallel to it, and quite indistinct; hemelytra rather broadly exposing connexival edges which are strongly spined at postero-lateral angles; exposed part of connexiva pale along edges (usually paler than hemelytra), and darker next to hemelytral edge; connexival edges weakly but distinctly serrate, particularly the posterior segments; in the specimens at my disposal, the wings are all distinctly shorter than abdomen, not attaining the tip of the latter.

Venter: the prothoracic venter has been discussed above. Abdomen quite consipcuously covered with a solid hydrofuge pelt of short, yellow hairs, while patches of the thorax are irregular in this respect, and vary from hairless to the possession of patches of moderately long, yellow hair, particularly in the center. Connexival spines well-developed, prominent on all segments except segment I, which is entirely devoid of any indication of a spine (= postero-lateral angle); there is no noticeable tendency for the spines of segments II-IV to increase progressively in size anterior-to-posterior; the angle of curvature along connexival edge from spine to anterior angle is an even one, with no tendency to abruptly deflect inward in the shadow of the spine of the preceding segment, but rather with a slight tendency to curve outward, most noticeable in the posterior connexiva. Female subgenital plate smoothly rounded, with a small, shallow concavity at tip; ratio of length-to-basal width 63::64 (= subequal); male tergite V lacking a genital process.

Legs: Forelegs—coxa and trochanter usual for the genus. Femoral ratio of length to greatest width 96::55 (57%), measured over the ventral surface; tibia usual for the genus, combined tibia-tarsus, when closed, distinctly overlapping union of femur and trochanter.

Midlegs—coxa and trochanter usual for the genus. Ratio of femoral length to median width of ventral surface 123::12 (10%)—length 2.60 mm; tibia with usual spination for the subgenus *Ambrysus*—distal end ventrally with two transverse rows of spines set solidly across width of apex, proximal row overlapping distal row, which latter is set in extreme tip of tibia—ratio of length to median ventral width 82::6 (7%); tarsus usual.

Hindlegs—coxa and trochanter usual for the genus. Ratio of femoral length to median width 118::15 (13%)—3.0 mm long; tibia characteristic of the subgenus *Ambrysus*—terminal transverse spination as in midtibia—ratio of length to median ventral width 130::8 (6%); tarsus usual.

Distribution: see types.

Type locality data: Peru—Vicinity of Sani Beni (840 m.s.s.l. River Sani Beni and adjacent pools), 5(viii)35, F. Woytkowski (Univ. Kansas).

Location of types: Holotypic male, allotype and several paratypes in the Snow Museum, University of Kansas, Lawrence; one paratype each in the collections of Robert L. Usinger, Berkeley, California and the writer, Reno, Nevada.

Ambrysus planus represents a monotypic group (*planus* group) of the subgenus *Ambrysus*, and seems a somewhat isolated one, although it does not represent a departure of subgeneric importance. It is an additional example of the greater qualitative diversity of the South American *Ambrysus* fauna, as compared with that north of the Panamanian Isthmus, and adds weight to the hypothesis that South America may be the ancestral home of the genus. A comparative key for this and the following species will be found at the end of the discussion of *A. teutonius*, below.

Ambrysus teutonius, new species

General appearance: slightly less than medium-sized for the genus, slim, streamlined. Size 9.0-10.0 mm long and 5.0-6.0 mm wide. Dorsum weakly bicolored, head and pronotum somewhat lighter or redder than remainder of dorsum; entire surface minutely punctulate, shiny, with no color mottling. Venter quite variable in color, from yellow to yellowish-brown; in some specimens, abdomen distinctly darker than thorax, the reverse being true generally of other species of this section (*oblongulus* group).

Head: shining, distinctly punctuate, to weakly, coarsely rugulose, yellow-to-reddish brown, strongly inset into anterior pronotal margin, distinctly but smoothly protuberant between eyes. Eyes very slightly but distinctly protuberant above plane surface of head; outer and posterior margins blending smoothly into each other without an angle forming a continuous curvature. Labrum yellowish in light specimens, dark red-brown in darker individuals, ratio of length-to-width 14::35 (40%); mouthparts either slightly lighter than labrum, or same color. Head ratios are:

(1) total length to width (including eyes) 29::40 (73%)

(2) anterior distance between eyes to posterior distance 18::25 (72%)

(3) anterior distance between eyes to inner eye length 18::18
(4) posterior distance between eyes to greatest length of head posterior to this line 25:10 (40%).

Pronotum: shiny, densely, shallowly punctuate, punctures becoming markedly transverse in anterior central portion, particularly in darker, rougher specimens, in which the condition approaches a minor regulosity; yellow to deep reddish-brown in color, with small darker dots which appear subdermal, and are difficult to see, but still present, in very dark individuals; lateral edges distinctly, but not boldly, serrate, evenly and weakly curved from front to hind angles—percent of curvature 9-11% (av. 90::9), postero-lateral angles very weak, nearly disappearing by rounding out in some individuals. Venter uniformly yellow, dark band along lateral edges, conspicuously haired along posterior edge, and sides of keel ridge; keel ridged anteriorly for slightly more than half its length, falling off to a moderately steep plane surface—ratio of length of ridge to total keel-length, 17::45 (38%). Pronotal ratios:

(1) width between anterior angles to width between posterior angles 40::89 (45%)
(2) median length to greatest width, 30::89 (34%)
(3) distance between anterior and posterior angles on same side to perpendicular distance between anterior angle and baseline of pronotum 45::47.

Scutellum: same color as hemelytra, in lighter individuals, reddish-brown with thin yellow lateral borders, angles also yellow; ratio of three sides, anterior and two laterals, 62::46::45.

Hemelytra: shiny, punctuate, each puncture with a white spot, unicolorously reddish-black, slightly paler along emboliar edges; embolium long, narrow, length-to-width 113::33 (29%); emboliar fossa small, reduced to extreme anterior end, where it is in the nature of a very deep and distinct crease, deepest anteriorly, becoming shallower caudally, disappearing entirely considerably before the mid-point of embolium is reached, being traceable for slightly more than one-third of emboliar length—embolium faintly lighter externally than internally. Hemelytra moderately exposing connexival lateral edges, whose postero-lateral angles are spinous on posterior connexiva, spineless on segments I-II; hemelytra attaining abdominal tip.

Venter: the prothoracic venter has been discussed above. Emboliar venter slightly darker than thoracic venter. Connexival segments I-II spineless, the small angle of segment I weakly right-angulate, angle of II markedly rounded; angles III-IV in the male, and III-V in the female, strongly spined, the change from the spineless condition of II to the very prominent spines of III being an abrupt one; this spinal formula is characteristic of a distinct segment of the genus; lateral connexival edges microscopically serrate on posterior segments; connexival curvature weak, no sudden inward dip of the edge in the shadow of the adjoining segment's spine or angle; female with a subterminal lateral connexival spine developed in posterior third of segment V near postero-lateral spine (= the latero-caudal spine; has also been referred to as the "secondary postero-lateral" spine or angle); in the male, this occurs on segment IV, and is not so pronounced, merely being a slight sinuosity near the posterior spine. Female subgenital plate weakly notched at apex, which is rather narrow, not broadly rounded; male genital process absent.

Legs: Forelegs—coxa and trochanter usual for the genus. Ratio of femoral length to greatest median width 88::51 (58%); tibia usual for the genus, as described in *A. planus.*

Midlegs—coxa and trochanter usual for the genus. Ratio of femoral length to greatest median width 94::13 (14%)—length 2.20 mm; tibia with usual spination for the subgenus *Ambrysus*—distal end ventrally with two prominent transverse rows of spines set solidly across width of tibia, the last row at extreme tip—ratio of length to median ventral width 116::10 (9%)—length 2.0 mm; tarsus usual.

Hindlegs—coxa and trochanter usual for the genus. Ratio of femoral length to median width 108::16 (15%)—length 2.65 mm; tibia characteristic of the subgenus *Ambrysus*—terminal transverse spination as in midtibia—ratio of length to median width 122::8 (7%)—length 3.0 mm; tarsus usual.

Distribution: see types.

Type locality data: Brazil:—Nova Teutonia, 1(iv)35, 2(i)36, 11(iii)36, F. Plaumann (Univ. of Kansas).

Location of types: Holotypic male, allotype and one paratype in the Snow Museum, University of Kansas, Lawrence; one paratype each in the collections of Robert L. Usinger, Berkeley, California, and the writer, Reno, Nevada.

The following portion of the key to major groups within *Ambrysus* will establish the relationships of the two above-described species as nearly as present information can place them:

1. Metatibia ventrally with more than 3 distal, transverse rows of spines, the terminal row longest, each row decreasing in length proximally .... (Subgenus *Picrops*)
   Metatibia ventrally with 3 or less such rows (Subgenus *Ambrysus*) 2
2 (1). Prosternum fused to propleura 3
   Prosternum free from propleura .... (remainder of genus)
3 (2). Posterior pronotal angles sharply right-angulate; posterior slope of prosternum longitudinally grooved (*planus* group) .... *planus*
   Posterior pronotal "angles" well-rounded; posterior slope of prosternum flat, ungrooved (*oblongulus* group) 4
4 (3). Males lacking a genital process .... *teutonius*
   Males with a well-developed genital process .... (remainder of group)

While *Ambrysus planus* constitutes a monotypic group in the present structure of the genus, *A. teutonius* fits satisfactorily into the *oblongulus* group, being its fourth species; however, the loss of the male genital process in this species indicates some divergence from the basic plan of the group, and sets it somewhat apart from the other three species.

Reference

La Rivers, Ira, 1951. A revision of the genus Ambrysus in the United States (Hemiptera: Naucoridae). Univ. Calif. Publ. Entom. 8(7): 277-338, illus.

————. In press. A new subgenus of *Ambrysus* from South America (Hemiptera: Naucoridae). Ent. News.

————. In press. The *Ambrysus* of Mexico. Univ. of Kans. Bull.

BOOK REVIEW

THE CHEMISTRY AND ACTION OF INSECTICIDES, by Harold H. Shepard, Chief, Entomological Section, Insecticide Division, Livestock Branch, Production and Marketing Administration, U. S. Department of Agriculture; formerly Assistant Professor of Entomology, University of Minnesota and Associate Professor of Entomology, Cornell University. 8 vo., cloth, 504 pp., 22 illus., tables, bibliog., appendix and index. N. Y., McGraw-Hill Book Co., 1951, $7.00.

Becoming acquainted with an interesting new book is always a pleasant experience, and is especially so, when, as in this instance, such book has been written by a well known authority on the subject, and when it represents work of a long-time personal friend and the completion of a particularly gruelling, long-continued task, in the progress of which one has had a friendly and sympathetic interest. The study of a book of this character tends to make much more vivid a realization of the very large part that insecticides now play in the whole insect economy, and their truly gigantic role in the maintenance of the insect population at a sufficiently low level as to permit the existence of a useful plant and animal life as we know it today.

This book should not be confused with a previous work by the same author published in 1939 and entitled "THE CHEMISTRY AND TOXICOLOGY OF INSECTICIDES." Although the present work is an outcome of the former, the subject matter has been rearranged and almost entirely rewritten, and although certain pests are indicated in the discussion of the principal uses of the various materials, yet the book as a whole deals primarily with the properties of insecticides rather than with details of insect control. Therefore mention of particular usage should not be construed either as indications of practical value or as recommendations for use. It is now becoming more and more clearly realized that particular insecticides and formulations must be developed for various types of specific injury. The long continued search in the past for multipurpose materials has not been successful. The convenience in use of custom-made formulations prepared on a large scale and the large savings effected from their use tend to make investemnt in insecticides and fungicides as definitely a part of the crop insurance as the purchase of fertilizer.

An excellent idea of the general scope and contents of the book may be obtained by a brief survey of its subject subdivisions: In addition to the Preface and Introduction, these include Arsenical Compounds, (pp. 10-41). Fluorine Compounds, (pp. 42-53). Sulphur and its Compounds, (pp. 54-71). Copper Compounds, (pp. 72-91). Miscellaneous Inorganic and Metal-organic Substances, (pp. 92-114). Plant Products: Nicotine and other Alkaloids, (pp. 115-143). Pyrethrins, Rotenone, and Miscellaneous Plant Extractives, (pp. 144-190). Petroleum, Animal and Vegetable Oils, Soaps and Creosotes, (pp. 191-232). Synthetic Organic Insecticides, I & II, (pp. 233-335). Chemical Control of Insects: General Aspects, (pp. 336-412). Relative Toxicity and Mode of Action of Insecticides, (pp. 413-457). Attractants and Repellents, (pp. 458-474). Appendix, (pp. 475-486) and Index, (pp. 487-504). Illustrative data have been presented in the form of numerous tables, and a convenient resume of equivalents is arranged especially for its practical use under actual field conditions. It will be noted that in this general arrangement, the materials have been grouped according to their chemical relationships rather than on a basis of the manner in which a given insect has been exposed.

As would be expected in a down-to-date work of this kind, particularly comprehensive and gratifying treatment is given to the exploration for and subsequent use of various phases of the organic compounds which have figured large within the past few years as new insecticides, particularly the introduction of toxic groups into available basic chemicals to produce insecticides, such as DDT, which have little resemblance to materials previously known to be poisonous. In this, the author has endeavored to include discussion of these new insecticides down to time of completion of the manuscript, but at same time has tried very hard not to overemphasize recent discoveries which later on may not become of lasting importance, pointing out that workers in the field are still at a crude empirical stage in many respects, in correlating chemical constitution with physiological action on all too many types of living organisms. The chemical treatment of the subject is couched in terms to be easily understood by entomologists whose chemistry may have become a bit dusty. On the other hand, those chemists who have a scanty knowledge of entomology will find useful the mention of important uses for insect control in the discussions of the different insecticides.

Our fellow member may well be congratulated by his colleagues in our Society upon successful completion of this long, difficult and important work. It will have a wide usefulness.

J. S. WADE.

A NEW NEOICHORONYSSUS FROM THE PACK RAT, NEOTOMA MICROPUS

(ACARINA, LAELAPTIDAE)

By R. B. EADS AND B. G. HIGHTOWER, *State Department of Health, Austin, Texas*

The description of a new *Neoichoronyssus* which follows adds another species to the impressive number of ectoparasites associated with the various species of *Neotoma*, the pack or wood rats.

Neoichoronyssus (Hirstionyssus) neotomae, new species

Female: Body oval in outline, pale brown in color. The measurements indicate the average of the holotype and 7 paratypes. Total length, in microns, exclusive of gnathosoma, 446; width of body at widest point, 280; length of dorsal plate, 407; width of dorsal plate, 206; length of genitoventral plate, measured from posterior margin of sternal plate to the tip of the genitoventral plate, 210; distance from posterior margin of genitoventral plate to anterior margin of anal plate, 24.

Dorsal plate entire, extending almost the length of the dorsum, narrowed posteriorly to a bluntly rounded tip, provided with about 26 pairs of setae. A pair of slit-like pores below and angled toward the anterior pair of setae on the dorsal plate. About 14 pairs of slender setae on the unsclerotized portion of the dorsum. Peritreme extending from the anterior margin of coxa IV almost to the middle of coxa I.

Sternal plate about 3 times as wide as long, concave caudally, with 3 pairs of setae, the first and second pair sub-equal in size and larger than the third pair. Genitoventral plate widest slightly below insertion of genitoventral pair of setae, with posterior margin bluntly rounded. Genitoventral plate separated from the anal plate by a distance less than the length of the anus. Anal plate ovoid; anal setae of equal size. Unsclerotized portion of venter with about 20 pairs of setae.

Coxa I with a ventral and a sub-marginal seta. Coxa II with an anterior marginal and a posterior submarginal seta, an acute cephalo-dorsal spur and a short, acute, ventral spur. Coxa III with setae as on coxa II and two short acute spurs, the larger ventral, the smaller near the posterior margin. Coxa IV with a submarginal seta and a small, acute spur near the posterior margin. Tarsus II without modified setae.

Chela shear-like, arms equal. Four pairs of typical hypostomal setae; hypostomal teeth in two alternate rows, about 12 teeth in all. Epistome rounded distally with no discernible teeth on apex.

Male: The measurements indicate the average of the allotype and 2 paratypes. Total length, exclusive of the gnathosoma, 336; width of body at widest point, 202; length of dorsal plate, 329; width of dorsal plate, 178; length of holoventral plate, 256. Dorsal plate entire, almost completely covering the dorsum and with 11 pairs of setae. Peritreme as in female. Holoventral plate constricted behind coxa IV and strongly

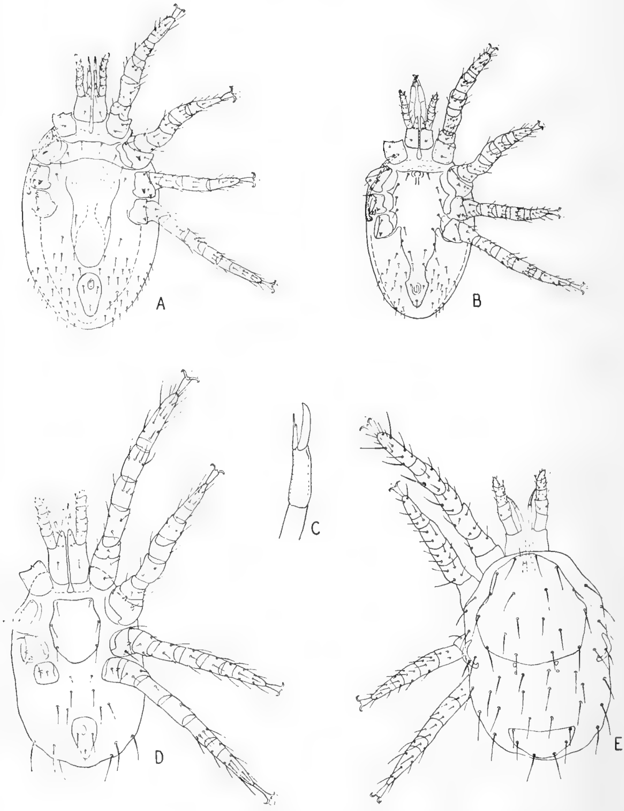

PLATE 38. NEOICHORONYSSUS (HIRSTIONYSSUS) NEOTOMAE

Fig. A, female; B, male; C, male chelicera; D, ventral view of protonymph; E, dorsal view of protonymph.

constricted above the anus; with 8 pairs of setae in addition to the anal setae. About 17 pairs of short, slender setae on the unsclerotized portion.

Coxa I with a ventral and a submarginal seta. Coxa II with an anterior marginal and a posterior submarginal seta plus a long, acute, cephalo dorsal spur and a short, acute ventral spur. Coxa III with setae as on coxa II, posterior submarginal seta flanked by two acute spurs. Coxa IV with a submarginal seta and a small, acute spur near the posterior margin. Tarsus II without modified setae.

Gnathosoma similar to female except for modified chela, fixed arm shorter and more pointed than the movable arm. Epistome rounded distally with minute teeth on apex.

Protonymph: The measurements of the immature form are an average of 4 specimens. Total length, exclusive of gnathosoma, 373; width of body at widest point, 234. There appears to be a wide variation in size among the protonymphs. Dorsal plates consist of an anterior shield, a posterior shield and 2 pairs of small plates immediately behind the anterior shield. The anterior shield bears 10 pairs of setae. Posterior shield with 3 pairs of setae, of which the caudal pair is the longest. Unsclerotized portion of dorsum with 14 pairs of setae. Peritreme short, extending from the anterior margin of coxa IV to slightly beyond the middle of coxa III. Sternal plate truncate anteriorly with a slight central concavity, posterior end bluntly rounded. The 3 pairs of sternal setae are subequal in size. Anal plate elongate-oval, narrowed to a rounded point posteriorly. Paired anal setae situated near the caudal border of the anus, slightly shorter than the unpaired setae. Unsclerotized portion of venter with 7 pairs of setae.

Coxa I with a ventral and a submarginal seta. Coxa II and III with an anterior marginal and a posterior submarginal seta, submarginal seta situated on small lobe-like processes. Coxa IV with a single ventral seta. Legs without modified setae.

Gnathosoma similar to that of female. Arms of chela equal and without processes. Hypostomal teeth arranged in a single row of about 10 teeth.

Types: Holotype female and 7 paratypes (females) from nesting material of the Baird wood rat, *Neotoma micropus* Baird; 9 October, 1950; Zavala County, Texas. Allotype male, 2 paratypes (males) and 3 protonymphs with the same data as the female type. Holotype female and allotype male are deposited in U. S. National Museum. Additional specimens seen are 1 female from *Neotoma micropus* Baird; 19 May, 1949; Ector County, Texas; coll. V. I. Miles, and 1 protonymph from *Perognathus hispidus* Baird; 25 April, 1950; Zavala County, Texas; coll. C. W. Johnson and O. L. Walker.

Remarks: In Jameson's key to the species of North American *Neoichoronyssus* (1950), *N. neotomae* will run to *N. obsoletus* Jameson. *N. neotomae* differs from this species in the possession of a ventral spine on coxa IV and in the shape of the ventral and anal plates. Dr. Strandtmann has been very helpful with constructive criticism and advice. He has given the opinion that *N. neotomae* resembles *N. otomys* (Radford) but differs from it in the absence of a pair of modified setae near the apex of tarsus II.

Literature Cited

Jameson, E. W., Jr., 1950. Notes on Mites of the Genus *Neoichoronyssus*, with the Description of a New Subgenus and Three New Species of the Subgenus *Hirstionyssus*. Proc. Ent. Soc. Wash., 52(4):161-172.

ENTOMOLOGICAL SOCIETY OF WASHINGTON
SPECIAL MEETING, MARCH 10, 1951

A joint meeting of the Entomological Society of Washington and the Biological Society of Washington was called to order by President Lincoln of the Biological Society at 8 P.M., Saturday, March 10, 1951 in Room 43 of the U. S. National Museum.

Major W. A. Anderson, presented by J. H. Fales, showed moving pictures on the life of the Monarch butterfly which stimulated much interest. Major Anderson introduced Mrs. Anderson, who had worked with him in producing the picture.

The principal speakers of the evening were introduced by President Stone of the Entomological Society. The first was Dr. Don J. Pletsch of the International Health Division of the U. S. Public Health Service, who showed moving pictures he had made on a survey of the biological research stations of Japan. Dr. Pletsch's picture showed the various stations suffering from disrepair and war damage, and he told of the diffusion of effort and scholastic inbreeding in the schools which further hindered work.

Major Robert Traub of the Army Medical Center followed, illustrating with kodachromes his talk on "New Data from Malaya on the Epidemiology of Scrub Typhus." The effects of antibiotics in treating the disease and the habits and incidence of the principal vectors were discussed. Because of the late hour there was not time for discussion of either paper, and the meeting was adjourned at 10:30 P.M.

Kellie O'Neill, *Recording Secretary.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
608TH REGULAR MEETING, APRIL 5, 1951

The 608th regular meeting of the Entomological Society of Washington was held in Room 43 of the U. S. National Museum, Thursday, April 5, 1951. President Stone called the meeting to order at 8:00 P. M. Sixty-three members and 25 visitors were present. The minutes of the previous meeting were read and approved.

The Society elected the following to membership:

Phyllis T. Johnson, University of California

Price G. Piquett, Division of Control Investigations, Bldg. A, Beltsville, Maryland

Lt. Commander Richard T. Holway, Entomologist, Bureau of Medicine & Surgery, U. S. Navy, Washington 25, D. C.

Dr. Harvey J. MacAloney, Forest Insect Investigations, Bldg. C, Beltsville, Maryland

Edward C. Becker, 316 Natural Resources Bldg., Urbana, Illinois

George F. Edmunds, Jr., Dept. of Invertebrate Zoology and Entomology, University of Utah, Salt Lake City, Utah

Lewis T. Nielson, Instructor, Department of Invertebrate Zoology and Entomology, University of Utah, Salt Lake City, Utah

Dr. Stone announced the death March 14th of W. H. White, head of the Division of Truck Crop and Garden Insect Investigations, who had been a member of the Society since 1914, when he joined the Bureau of Entomology and Plant Quarantine. The committee appointed to prepare an obituary for Mr. White included B. A. Porter and L. B. Reed as chairman.

The letter sent by the Society congratulating Dr. Herbert Osborn on his 95th birthday was read by the President.

Dr. Stone stated that one of the 40 winners of the Tenth Annual Science Talent Search, to which the Society donated $10, was Mary Ellen Martin, a student of a Society member, Mr. Howard B. Owens, teacher of biology at Hyattsville High School.

The president of the American Association of Economic Entomology, Roy E. Campbell, was introduced to the Society.

E. N. Cory announced that the University of Maryland would like to entertain the Society at the June meeting in accustomed style. Dr. Cory stated that the University would furnish coffee and ice cream and that the Insecticide Society of Washington was also invited. The Society promptly voted to accept the invitation for a joint picnic.

A note was presented by William N. Sullivan, Jr., a former student of the principal speaker of the evening. Mr. Sullivan spoke on a method of dispersing lindane vapor in air, sketching the background of work with lindane since Faraday first prepared benzene hexachloride in 1825 and Van der Lindane established the presence of four isomers in 1912, to the most recent work in the Bureau. Mr. Sullivan exhibited a "fiberglas" filter which is dipped in or sprayed with an acetone solution of lindane and mounted on a household fan. Evaporation of the acetone leaves a coating of crystals on a surface greatly increased by the glass fibers. The stream of air through the filter rapidly distributes the lindane vapor throughout an enclosed area and gives a concentration which is sufficient to kill some insects. Results obtained from work with lindane on flies, mosquitoes, roaches, grasshoppers, and confused flour beetles are promising, and aldrin and chlordane were also found to be highly effective in killing insects by this method. Materials like DDT and methoxychlor with a low vapor pressure showed little or no effect. Mr. Sullivan concluded with the warning that the effect of lindane on humans and animals had not been completely determined.

The main speaker was Prof. Charles P. Alexander, Head of the Department of Entomology, University of Massachusetts, Amherst, Mass., who gave an extremely interesting talk, "Crane-flies, Past and Present." Dr. Alexander first mentioned his having addressed the Society 37 years and one month before, on March 5, 1914. He described how he developed a serious interest in crane-flies in 1906, when he learned how few species were then identifiable. Since then he has concentrated his investigational studies on that group, with the result that of approximately 10,000 known species about three-fourths were described by him. He feels, however, that the crane-flies probably number at least 25,000, possibly as many as 50,000 species. The basic biology shown by these flies and the wide variety of habitats occupied were discussed.

Dr. Alexander outlined the nature of fossil crane-flies, giving particular attention to those preserved in Baltic amber. Practically all fossil crane-flies belong to modern genera. The few genera known only as fossils are questionably distinct from modern ones. Many facts of zoogeography were brought out by discussing situations occurring in the Tipuloidea, and, by way of example, special comments were made regarding the faunas of Japan, New Zealand and Chile. The several faunal elements well represented in Japan were mentioned, and Formosa was indicated as showing affinities with the Himalayas rather than with Japan or Luzon. The richness of the New Zealand crane-fly fauna, and the striking manner in which Australian and New Zealand elements appear in Chile were emphasized. Finally, Dr. Alexander presented highly scenic kodachrome pictures taken in western North America, each picture with its own story of collecting, camping or other personal experience. He and Mrs. Alexander have made eight western trips, totalling 75,000 miles, and have a close acquaintance with crane-fly habitats in nearly every state.

Lively interest in various aspects of Dr. Alexander's talk was shown by the numerous participants in the discussion which followed.

B. D. Burks introduced a visitor, Oswald Peck of the Canadian Division of Entomology at Ottawa. The meeting adjourned at 10:00 P. M.

KELLIE O'NEILL, *Recording Secretary*

Actual date of publication of Vol. 53, No. 4, was August 28, 1951.

Unusual Scalp Dermatitis in Humans caused by the Mite *Dermatophagoides* by Jay Traver. This article covers in detail symptoms, treatments and identification of a skin-infesting mite which causes serious damage to the human host. Reprint with cover..............................50 cents.

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No. 3. "The Nearctic Leafhoppers, a Generic Classification and Check List," by Paul Wilson Oman, $7.00. Members' price $6.00.

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PROCEEDINGS OF THE

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VOL. 53 DECEMBER, 1951 No. 6

A REVISION OF THE GENERA AND OF THE NEARCTIC SPECIES OF GRYPOCENTRINI[1]

(HYMENOPTERA, ICHNEUMONIDAE)

BY HENRY AND MARJORIE TOWNES, *North Carolina State College, Raleigh*

The Grypocentrini are small, rather delicate ichneumonids of the subfamily Tryphoninae. The tribe contains three genera which have in common an oblique areolet characteristically (but not always) sessile above and the occipital carina going directly to the base of the mandible without joining the hypostomal carina, or joining the hypostomal carina on its outward extension to the hind mandibular condyle. The clypeus is wide. The fore wing is from 2.5 to 4.2 mm. long. Figures of members of the three genera (Figs. 1-6) are given to show the type of insects treated here and to aid in the generic recognitions. A characterization of the subfamily Tryphoninae and a key to its tribes has recently been published (Townes and Townes, 1949. Ann. Ent. Soc. Amer. 42: 323) which may be consulted if more recognition characters are needed. That key to tribes should be amended slightly to note that a few species of *Grypocentrus* have the areolet open.

The three genera of the Grypocentrini are *Grypocentrus*, *Idiogramma*, and *Earobia*. The latter is Nearctic in distribution, the former two Holarctic. All three are apparently near the tribe Tryphonini but have a few characters which associate them together and at the same time separate them from the genera of Tryphonini. The diversity of their other characteristics makes questionable the correctness of placing them together in one tribe, but no better arrangement is apparent.

The species of *Grypocentrus* occur in deciduous woods, most frequently in moist woods with dense undergrowth. Probably all or most of them are parasites of small leaf-mining sawflies of the genus *Fenusa*. The genus *Earobia* is known from a single species collected at Ithaca, New York early in the spring. *Idiogramma* is a parasite of sawflies of the genus *Xyela* whose larvae live in the staminate cones of *Pinus*. Both sexes of this peculiar and rare (in collections) ichneumonid may be taken in numbers by sweeping branches of *Pinus* with staminate cones within two weeks before the time the pollen is shed. After the pollen is shed there is little chance of finding *Idiogramma*.

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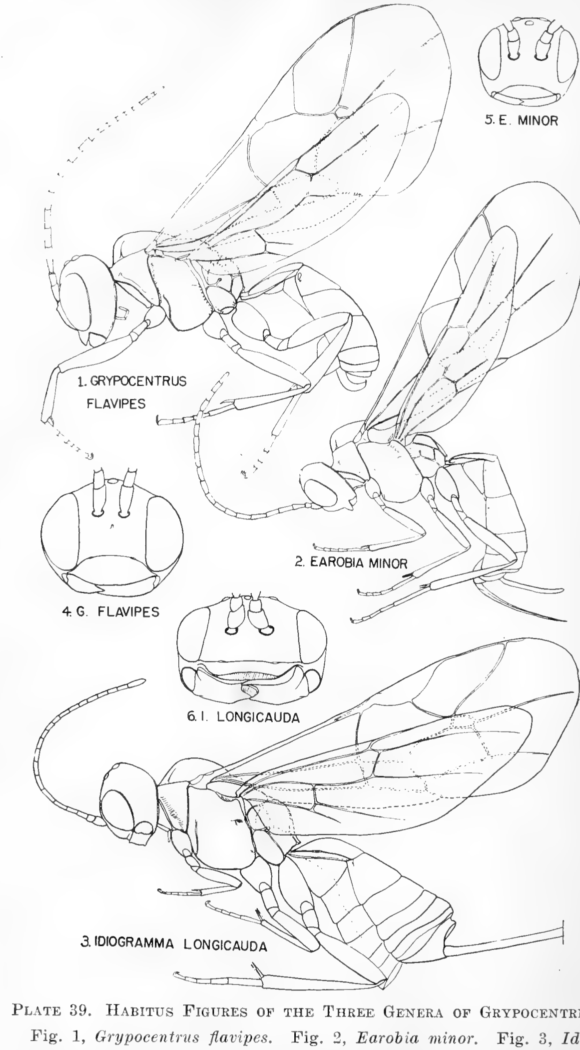

PLATE 39. HABITUS FIGURES OF THE THREE GENERA OF GRYPOCENTRINI

Fig. 1, *Grypocentrus flavipes.* Fig. 2, *Earobia minor.* Fig. 3, *Idiogramma longicauda.* Fig. 4, *Grypocentrus flavipes,* face view of head. Fig. 5, *Earobia minor,* face view of head. Fig. 6, *Idiogramma longicauda,* face view of head.

All known specimens and all pertinent types in North American collections have been studied. The specimens collected by the authors in Colorado, Utah, California, and Arizona in 1947 and 1948 were caught on trips made with the aid of grants from the American Philosophical Society. Two of the new species and an important percentage of the rest of the material studied were collected on these trips.

KEY TO THE GENERA OF GRYPOCENTRINI

1. Clypeus about 10 times as broad as long (Fig. 6); teeth of mandible slightly outcurved (Fig. 6); ovipositor longer than the abdomen; costula absent .... C. *Idiogramma*
 Clypeus not more than 5 times as broad as long (Figs. 4 & 5); teeth of mandible incurved (Figs. 4 & 5), as normal; ovipositor shorter than the abdomen (Figs. 1 & 2) 2
2. Costula strong; ovipositor with the apical part hooked upward, the rest straight (Fig. 1) .... A. *Grypocentrus*
 Costula lacking; ovipositor evenly and gently upcurved (Fig. 2) .... B. *Earobia*

A. Genus **Grypocentrus** Ruthe

(Figures 1 and 4)

Grypocentrus Ruthe, 1855. Stettin. ent. Ztg. 16:52.
 Type: *Grypocentrus incisulus* Ruthe. Designated by Viereck, 1912.
Apimeles Foerster, 1868. Verh. naturh. Ver. preuss. Rheinlande 25:205.
 Type: (*Apimeles lusorious* Davis) = *flavipes* Provancher. Included by Davis, 1898.
Crytocentrus Provancher, 1883. Nat. Canad. 14:6; Faune p. 794.
 Type: (*Crytocentrus quebecensis* Provancher) = *flavipes* Provancher. Monobasic.

Costula present.

Areolet oblique but sessile above (absent in a few European species); clypeus large, broad, and flat in profile; costula present; ovipositor straight on at least the basal half and hooked upward at the tip. These characters and the habitus figure (Fig. 1) should make recognition of the genus easy. The ovipositor shape occurs in no other ichneumonids familiar to us.

The generic distribution is Holarctic, with a few more species in Eurasia than in North America. The species occur in woods. Three of the European species have been reared from larvae of *Fenusa,* a genus of small, leaf-mining sawflies.

KEY TO THE NEARCTIC SPECIES OF GRYPOCENTRUS

1. Hair on central part of face down-curved, rather dense; basal half of mandible and under side of scape and flagellum yellowish white; abdomen black.
 1. *barbatus,* new species

Hair on central part of face up-curved, sparser; color combination not as above. 2
2. Coxae piceous or black; disc of mesoscutum with distinct medium-sized punctures 3
Coxae pale; disc of mesoscutum with less distinct fine punctures, or impunctate 4
3. Scutellum normal, rounded apically; punctures on second tergite very weak; second trochanters pale.
2. *crassidens*, new species
Scutellum with a projecting spatulate apical process; punctures on second tergite strong; second trochanters piceous.
3. *spatulatus*, new species
4. Second and third tergites ferruginous; clypeus pale orange.
4. *truncatus*, new species
Second and third tergites blackish; clypeus black.
5. *flavipes* Provancher

1. Grypocentrus barbatus, new species

Hair on central part of face down-curved.

Fore wing about 3.8 mm. long; clypeus with sparse, medium-sized punctures, weakly convex in profile, about 3.1 as wide as long; hair on central part of face decumbent (pointing downward), rather dense; ocell-ocular space about 0.9 as great as the ocellar diameter; head and thorax impunctate, or in some places with weak fine punctures; middle part of mesocutum impunctate; scutellum rounded apically, its lateral carinae not extending beyond its basal third; second tergite weakly mat, impunctate; apex of squama of male rounded, more prominent above than below; apical half of ovipositor strongly up-curved.

Blackish brown. Palpi, mandible (brownish towards its apex), underside of antenna (more extensively toward the base and less so toward the apex), tegula, postero-lateral corner of pronotum, and most of the legs whitish or pale stramineous; basal 0.75 of hind coxa blackish; bases of fore and middle coxae infuscate; most of femora and fore and middle coxae pale ferruginous; hind tarsi and apex of hind tibia pale brownish.

Type: ♀, Dardanelle, Calif., VII-5-48, Townes family (Townes). Collected in Kennedy Meadow, in a large alder thicket with abundant herbaceous vegetation.

Paratypes: ALBERTA: ♂, Calgary, V-25-23, G. Salt (Townes). CALIFORNIA: ♂, Davis, IV-17-49, E. Schlinger (Townes).

2. Grypocentrus crassidens, new species

Coxae blackish; scape blackish; scutellum normal.

Fore wing about 3.5 mm. long; clypeus with coarse, rather sparse punctures, rather flat in profile, about 3.4 as wide as long; hair on central part of face reflexed, rather sparse; ocell-ocular space about 1.2 as wide as the ocellar diameter in the male and about 1.8 as wide as the ocellar diameter in the female; antenna shorter than in the other Nearctic species of the genus; head and thorax with small, weak, rather sparse punctures, the mesoscutum with rather coarse punctures; scutellum rounded, its lateral carinae not extending beyond its basal third; second tergite polished, with very weak fine punctures; apex of squama of male rounded, more prominent above than below; ovipositor apically dilated, blunt, and upcurved; ovipositor sheath weakly upcurved.

Black. Mandible and antenna brown; tegula pale brown; legs fulvous, the coxae piceous, the hind femur infuscate, and the hind tibia slightly dusky except at the base.

Type: ♂, near Estes Park, Colo., VI-15-48, Townes family (Townes). Collected in Roosevelt National Forest at 6500 ft., on the road to Lyons.

Paratypes: IDAHO: ♀, Moscow Mt., VI-19-16, A. L. Melander (Cambridge). ♂, Moscow Mt., July 9, A. L. Melander (Cambridge).

3. **Grypocentrus spatulatus,** new species

Scutellum spatulate apically.

Fore wing about 3.8 mm. long; clypeus with coarse, rather sparse punctures, nearly flat in profile, about 2.7 as wide as long; hair on central part of face reflexed, rather sparse; ocell-ocular space about 1.8 as great as ocellar diameter; head and thorax with distinct, rather coarse punctures; central part of mesoscutum with dense, rather coarse punctures; second tergite strongly mat and with dense indistinct punctuation on its basal 0.7, the sculpture obsolete on its apical 0.3; scutellum with an apical dorsal spatulate process that is from 0.25 to 0.35 as long as the rest of the scutellum; lateral scutellar carinae complete, extending to and around the apex of the apical process; squama of male with a strong dorsal apical acute tooth; ovipositor and its sheath with a strong apical curve, not quite as strongly curved as in *G. flavipes.*

Black, the abdomen blackish brown. Palpi dark brown; mandible, tegula, postero-lateral corner of pronotum, apical margin of second and following tergites, and genitalia brown; coxae and first trochanters blackish brown; second trochanters blackish to light brown; femora basally, especially the hind femur, infuscate; middle and hind tarsi and apices of their tibiae infuscate; the rest of the legs are brownish ferruginous.

Type: ♂, Smoky Jack Camp, Yosemite National Park, Calif., VII-21-48, Townes family (Townes).

Paratypes: CALIFORNIA: ♀, Cazadero, Apr. 12 to 14, 1918, J. C. Bradley (Ithaca). 4 ♂♂, collected on grass, Ulkiah, III-31-31, C. C. Wilson (Washington and Townes).

4. **Grypocentrus truncatus,** new species

Abdomen largely ferruginous.

Fore wing about 3.8 mm. long; clypeus with numerous medium-sized punctures, strongly convex in profile, about 2.6 as wide as long; hair on central part of face reflexed, rather sparse; ocell-ocular space about 2.0 as great as the ocellar diameter; head and thorax impunctate, or in some places with weak fine punctures; middle part of mesoscutum with rather weak punctures; scutellum rounded apically, its lateral carinae not extending beyond its basal third; second tergite weakly mat, impunctate; squama of male with its apex evenly rounded; ovipositor sheath short-oval; ovipositor widened and slightly up-curved apically.

Black, the legs and abdomen ferruginous. Clypeus, mandible, palpi, and tegula pale ferruginous; basal part of antenna ferruginous, passing into blackish toward the apex; postero-lateral corner of pronotum, scutellum, and metanotum dusky ferruginous; first tergite basally and apical tergites more or less blackish.

Type: ♀, Ithaca, N. Y., V-17-39, H. K. Townes (Townes). Paratypes: NEW YORK: ♂, ♀, Patterson, V-19-35, H. Dietrich (Ithaca). ♀, Syracuse, V-22-38, H. & M. Townes (Townes).

5. **Grypocentrus flavipes** Provancher

(Figures 1 and 4)

Mesosetnus flavipes Provancher, 1882. Nat. Canad. 13: 363; Faune, p. 785.

Type: ♂, Cap Rouge, Que. (Quebec).

Cyrtocentrus Quebecensis Provancher, 1883. Nat. Canad. 14: 6; Faune p. 794.

Type: ♀, Quebec (Quebec).

Apimeles lusorious Davis, 1898. Trans. Amer. Ent. Soc. 24: 283.

Type: ♀, eastern Canada (Philadelphia).

Hind coxa pale; abdomen blackish.

Fore wing about 3.8 mm. long; clypeus with medium-sized sparse punctures, weakly convex in profile, about 2.4 as wide as long; hair on central part of face reflexed, rather sparse; ocell-ocular space about 2.5 as great as ocellar diameter; head and thorax impunctate, or in some places with weak fine punctures; middle part of mesoscutum impunctate; scutellum rounded apically, its lateral carinae not extending beyond its basal third; second tergite impunctate, polished or very weakly mat; apex of squama of male rounded; ovipositor sheath strongly curved or bent; ovipositor with a strong apical up-curve.

Blackish brown. Mandible, scape, pedicel, tegula, postero-lateral corner of pronotum, apical margins of second and following tergites, and genitalia light brown; palpi and legs pale stramineous with the hind tarsus, the apical 0.25± of hind tibia, and apical part of the last segment of the fore and middle tarsi influscate.

This species is very similar to *G. albipes* Ruthe 1855, of

Eurasia, which differs from *flavipes* only in having the inner side of the second lateral proposal area distinctly shorter, reduced almost to a point.

Specimens: CALIFORNIA: ♂, Dardanelle, VII-4-48, Townes family (Townes); ♀, Smoky Jack Camp, Yosemite National Park, VII-23-48, H., M., & G. Townes (Townes). IDAHO: ♀, Moscow Mt., Aug. 10, A. L. Melander (Cambridge). IOWA: ♀, Iowa City, VIII-28-44, H. Swift (Swift). MAINE: ♀, Liberty, IX-13-13, C. W. Johnson (Cambridge); ♀, Old Town, VI-15-37, M. W. Wing (Washington). MARYLAND: ♂, Takoma Park, VI-3-45, H. & M. Townes (Townes). MASSACHUSETTS: ♂, South Hadley, IX-23-36, M. Townes (Townes). NEW YORK: ♂, Ithaca, IX-11-35, H. K. Townes (Washington). NORTH CAROLINA: ♀, Clingmans Dome at 6,600 ft., VIII-29-39, H. & M. Townes (Townes); 2 ♂♂, Mt. Mitchell at 6,400 ft., Aug. 20 & 27, 1950, Townes family (Townes); ♂, Pisgah Mt. at 5,000-5,749 ft., IX-5-39, H. & M. Townes (Townes). OHIO: 2 ♀♀, Puritas Springs, VIII-15-31, F. DeGant (Washington). OREGON: ♀, Seaside, VIII-10-40, H. & M. Townes (Townes). QUEBEC: ♀, Queen's Park, Aylmer, IX-26-24, A. R. Graham (Ottawa). WASHINGTON: 2 ♀♀, Ashford, VIII-18-40, H. & M. Townes (Townes and Washington); ♀, Mt. Rainier at 2,700 ft., VIII-13-40, H. & M. Townes (Townes). ♀, Mt. Rainier at 2,900 ft., VII-20-40, H. & M. Townes (Townes).

This species is transcontinental in the Transitional and Canadian zones. Adults occur mostly in the last half of summer, in the rank undergrowth of moist woods.

B. Genus **Earobia**, new genus
(Figures 2 and 5)

Costula absent; clypeus about 3.2 as wide as long.

Areolet oblique, sessile above; clypeus about 3.2 as wide as long; costula absent; ovipositor gently upcurved, about 0.65 as long as the abdomen. There are no unique characters, as in the case of *Grypocentrus* and *Idiogramma*, to distinguish this genus from all others in the family yet within its tribe it can not be confused. Only one species is known.

Type: *Earobia minor*, new species.

Earobia minor, new species
(Figures 2 and 5)

Fore wing about 2.5 mm. long; head and body with moderately dense hairs; head and thorax mat, impunctate; abdomen impunctate, the first tergite longitudinally, irregularly, and finely aciculate.

Dark brown. Mouth parts, clypeus, and basal part of antenna light brown; legs pale orange-brown.

Type: ♀, Ithaca, N. Y., V-15-35, H. K. Townes (Townes).

Paratypes: NEW YORK: ♂ (lacks abdomen), Ithaca, V-8-34, H. K. Townes (Townes). ♀, same data as the type (Townes).

C. Genus **Idiogramma** Foerster
(Figures 3 and 6)

Idiogramma Foerster, 1868. Verh. naturh. Ver. preuss. Rheinlande 25: 163.

Type: *Idiogramma euryops* Foerster. Included by Schmiedeknecht, 1888.

Macrochasmus Thomson, 1888. Opusc. ent. 12: 1279.

Type: (*Macrochasmus alysiina* Thomson) = *euryops* Foerster. Monobasic.

Lysiognatha Ashmead, 1895. Proc. Ent. Soc. Wash. 3: 276.

Type: *Lysiognatha comstockii* Ashmead. Monobasic.

Clypeus about 10.0 *as wide as long.*

Areolet oblique, sessile or pointed above (variable in each of the species); clypeus about ten times as wide as long; mandible with the teeth somewhat outcurved (as in the Alysiinae) and with a semicircular articular membraneous area in the temple; costula absent; ovipositor longer than the abdomen. The peculiar mandible and very short wide clypeus occur in no other ichneumonid.

This is an aberrant genus considered by Ashmead and others to represent a distinct family, the "Lysiognathidae." To us, it appears to be a member of the Tryphoninae, related through *Earobia* to *Grypocentrus*. The generic distribution is Holarctic. Though represented in North America by several common and widespread species, in Eurasia only a single species (*euryops* Foerster) is known, and this has been rarley collected. The apparent scarcity in Eurasia may be due to lack of knowledge as to where and when the genus may be collected.

Species of *Idiogramma* parasitize the larvae of *Xyela*. The larvae of *Xyela* feed either in the staminate cones or in twig galls of *Pinus*. *Idiogramma* seems to attack only the species in the staminate cones. These *Xyela* larvae become mature and drop from the cones for pupation in the spring just before the cones elongate and dry out during the time the pollen is shed. Adults of *Idiogramma* fly around pine branches with staminate cones for about two weeks before the pollen is shed, the males being on the wing a little earlier than most females. Both sexes disappear abruptly when the pollen begins to shed, the time varying with the locality and species of *Pinus*. R. A. Cushman has reported (1937. Jour. Wash. Acad. Sci. 27: 439-440) observations on the immature stages by Mr. J. C. Bridwell and himself. Eggs, laid on the head and neck of the *Xyela* larvae, are of the typical tryphonine type, large and attached by a stalk inserted into the host. In the vicinity of Washington, D. C., the eggs hatch early in July, some two months after the host larvae have entered the ground for concooning. The earliest full-grown parasite larva was found August 6 and soon afterward many were found in their thin, shining, transparent concoons within the cocoons of the hosts. The larva is similar to those of other Tryphoninae. The first pupa was found September 20, and by September 26 most *Idiogramma* larvae had pupated. Only pupae were found through the fall until December 17, and presumably the winter is passed in that stage.

Key to the Nearctic Species of Idiogramma

1. Top of head with a sharp longitudinal groove extending from between the hind ocelli to the back of the head; mandible as wide at the base of the teeth as at its middle, the teeth weakly divergent and distinctly recurved 2

   Top of head with a faint to distinct longitudinal impression extending from between the hind ocelli to the back of the head; mandible a little narrower at the base of the teeth than at its middle, the teeth weakly convergent and indistinctly recurved (Fig. 6) 3

2. Lateral 0.2± of frons yellow; male hind coxa with the basal 0.3± pale brownish, the rest yellow; female middle and hind coxae yellowish to pale brown.

   1. *comstockii* Ashmead

   Lateral 0.15± of frons yellow; male hind coxa with the basal 0.8± blackish, the rest yellow; female middle and hind coxae dark brown; hind femur brown.

   2. *contortae*, new species

3. Eye above the antennal socket not margined internally with yellow, the frons therefore entirely blackish.

   5. *fraternus*, new species

   Eye above the antennal socket broadly margined internally with yellow, the frons therefore yellow laterally 4

4. Ovipositor sheath about 1.0 as long as the fore wing; ground color of female brownish buff to blackish.

   3. *longicauda* Cushman

   Ovipositor sheath about 0.5 as long as the fore wing; ground color of female buff.

   4. *bridwelli* Cushman

1. **Idiogramma comstockii** Ashmead

Lysiognatha comstockii Ashmead, 1895. Proc. Ent. Soc. Wash. 3: 276. ♀.

Type: ♀, Nortons Landing, Cayuga Lake, N. Y. (Washington).

Lysiognatha comstockii Cushman, 1937. Jour. Wash. Acad. Sci. 27: 442. Redescription.

Lysiognatha sulcata Cushman, 1937. Jour. Wash. Acad. Sci. 27:442. Type: ♀, Clifton, Va. (Washington).

Mandible not narrowed apically; hind coxa mostly or entirely pale.

Fore wing about 3.0 mm. long; a sharp longitudinal groove extending from between the posterior ocelli to the back of the head; occipital carina interrupted medially; mandible as wide at base of teeth as at middle, its teeth weakly divergent and distinctly recurved; male squama larger than in the other Nearctic species except *I. contortae;* ovipositor sheath about 0.7 as long as the fore wing.

Colored as in *I. longicauda* except that only the lower 0.25 of the temple is yellow.

Specimens: DISTRICT OF COLUMBIA: 2 ♂♂ (paratypes of *sulcata*), Dalecarlia, V-1-34, J. C. Bridwell (Washington). MARYLAND: 6 ♂♂, Takoma Park, IV-25-42, H. & M. Townes (Townes). NEW YORK: 2 ♀♀ (types of *comstockii*), swept from foliage in woods at Nortons Landing on Cayuga Lake, VI-26-72, H. H. Smith (Washington). VIRGINIA: ♂ (paratype of *sulcata*), Alexandria, IV-28-34, J. C. Bridwell (Washington). 2♀♀ (type and paratype of *sulcata*), Clifton, Apr. 26 to May 3, 1933, J. C. Bridwell (Washington). All the specimens except the types of *comstockii* were swept from *Pinus virginiana.*

2. **Idiogramma contortae,** new species

Mandible not narrowed apically; hind coxa mostly or entirely blackish or dark brown.

Fore wing about 3.3 mm. long; ovipositor sheath about 0.85 as long as the fore wing. Otherwise structurally similar to *I. comstockii.*

Male: Blackish. Mouth parts, face, lateral 0.15± of frons, lower 0.2 of temple, scape except above, tegula, sometimes the hind corner of pronotum, front and middle coxae and femora, trochanters, indefinite apical margins of tergites, and apex of squama yellow. The mandibular teeth are brown, the face often with pale brown stains, the basal part of the middle coxa usually brown, and the hind trochanters often stained with brown. Antenna beyond scape yellowish on the basal part beneath; fore and middle tibiae stramineous, their tarsi pale brown; hind coxa blackish, its apical 0.25± yellow; hind femur brown, its apex yellow; hind tibia and tarsus brown.

Female: Colored like the male except that the ground color is dark brown rather than blackish, the yellow markings a little more diffuse, and the leg colors tend to be a little darker and less sharply defined. The middle and hind coxae are always entirely brown and the fore coxa is often more or less brown.

It is difficult to decide whether this should be considered a distinct species or a subspecies of *I. comstockii.*

Type: ♀, swept from *Pinus contorta,* Strawberry Daniel Pass, Utah, VI-19-48, Townes family (Townes).

Paratypes: ARIZONA: 4 ♂♂, Workman Creek, Sierra Ancha, IV-28-47, and V-6-47, H. & M. Townes (Townes). CALIFORNIA: ♂, ♀, near Sonora Pass at 8,500 ft., VII-4-48, Townes family (Townes). ♀, May Lake, Yosemite Park at 10,500 ft., Calif., VII-26-48, Townes family (Townes). ♀, near Glacier Point, Yosemite Park, VII-16-48, Townes family Townes). ♀, Snow Flat at 8700 ft., Yosemite Park, VII-23-48, Townes family (Townes). ♀, Tamarack Flat, Yosemite Park, VII-24-48, Townes family (Townes). UTAH: 3 ♂♂, Strawberry Daniel Pass, VI-18 and 19-48, Townes family (Townes). The specimens from Workman Creek, Ariz., were taken in an area where *P. ponderosa* was the only *Pinus* present. Three of the four specimens were from honey dew on a small *Juniperus* under *Pinus ponderosa.* All the other collections were from *Pinus contorta* with ripening staminate cones.

This species occurs in the Canadian Zone of the mountains of the western states, where it has been collected most frequently on *Pinus contorta.*

3. **Idiogramma longicauda** Cushman

(Figures 3 and 6)

Lysiognatha longicauda Cushman, 1937. Jour. Wash. Acad. Sci. 27: 441, 443.

Type: ♀, Alexandria, Va. (Washington).

Mandible narrowed apically; ground color of female blackish; frons yellow laterally; ovipositor sheath about 1.0 *as long as the fore wing.*

Fore wing about 3.0 mm. long; a faint to distinct longitudinal impression extending from between the posterior ocelli to the back of the head; occipital carina usually not interrupted medially; mandible a little narrower at base of teeth than at middle, the teeth weakly convergent and indistinctly recurved; male squama smaller than in *I. comstockii;* ovipositor sheath about 1.0 as long as the fore wing.

Male: Blackish brown. Face, broad upper anterior orbits, lower 0.4 of temple; clypeus, mouth parts except teeth of mandible, under side of scape and pedicel, tegula, trochanters, and front and middle coxae pale yellow; front and middle femora and tibiae, apical part of hind coxa, more or less of the under side of hind femur, under side of abdomen, and a narrow apical band on second and following tergites (almost interrupted sublaterally) yellowish buff; lower central part of frons, hind corner of pronotum, pleura near wing bases, and hind femur except below pale brown; hind coxa except apically brown to blackish; femora and tibiae often pale yellowish like the trochanters; tarsi and hind tibia more or less infuscate.

Female: Colored rather like the male but the ground color brownish buff to blackish, the apical part of the abdomen yellowish buff, the hind coxa except apically pale brown, and the femora and tibiae never paler yellow like the trochanters.

Specimens: Many females collected on *Pinus virginiana* in the vicinity of Washington, D. C. from April 22 to May 6 by J. C. Bridwell, the authors, and R. A. Cushman (Washington and Townes). The localities represented by these are Hughesville and Takoma Park in Maryland and Alexandria, Barcroft, Clifton, and Falls Church in Virginia. Many males were taken with the females, usually in the ratio of 2 or 3 males to each female, but possibly part of them belong to *I. bridwelli*, whose females occurred on the same trees. Other specimens are: ♀, Takoma Park, Md., Apr. 1, 1945, H. & M. Townes (Townes); 37 ♂♂, 13 ♀♀, on *Pinus taeda*, Montgomery, Ala., March 29, 1947, H. Townes (Townes). The record for April 1, 1945 at Takoma Park is explainable by the unusually early spring of that year.

4. **Idiogramma bridwelli** Cushman

Lysiognatha bridwelli Cushman, 1937. Jour. Wash. Acad. Sci. 27: 444. Type: ♀, Alexandria, Va. (Washington).

Ground color of female buff.

Male: Not known with certainty, but apparently indistinguishable from that of *I. longicauda*.

Female: Fore wing about 2.8 mm. long; ovipositor sheath about 0.5 as long as fore wing. Otherwise structurally similar to *I. longicauda*. Colored like *I. longicauda* but the ground color buff.

Many males were taken with the females recorded below, but since females of *I. longicauda* were present on the same trees, some or possibly all males belong to that species. In describing *bridwelli* Cushman reported and distinguished males. His specimens and the proposed distinguishing characters have been studied, but to us the male of *bridwelli*, if present in the material, is not distinguishable from that of *longicauda*.

Specimens: In addition to 39 females from several localities in the vicinity of Washington, D. C. taken between April 28 and May 6 and recorded by Cushman, we have four females from Hughesville, Md., IV-22-42, H. & M. Townes (Townes).

5. **Idiogramma fraternus,** new species

Frons entirely blackish.

Fore wing about 3 mm. long. Structurally similar to *I. longicauda*.

Male: Blackish. Face to upper edge of antennal sockets, clypeus, mouth parts except teeth of mandible, lower 0.2 of temple, underside of scape and pedicel, tegula, hind corner of pronotum, trochanters, fore and middle coxae, femora, front and middle tibiae, a short band at the apex of the first tergite, and a narrow apical band on the second and following tergites (interrupted sublaterally) pale yellow; hind coxa blackish or dark brown, its apical 0.3 yellow; hind tibia and tarsus pale brown; fore and middle tarsi yellowish basally, shading to pale brown apically.

Female: Colored essentially like the male but the ground color a little paler and the pale markings in large part a little less clear and less definitely bounded. Legs except for the trochanters brown, the fore leg pale brown, the middle leg a little darker, and the hind leg medium brown.

Type: ♀, swept from *Pinus contorta* bearing ripening staminate cones, strawberry Daniel Pass, Utah, VI-19-48, G. F. Townes (Townes).

Paratypes: UTAH: 1 ♂, 2 ♀♀, collected with the type (Townes). ARIZONA: ♂, collected from *Pinus ponderosa,* Workman Creek, Sierra Ancha, IV-28-47, H. & M. Townes (Townes).

NEW SPECIES AND RECORDS OF VIRGINIA HELEIDAE

(DIPTERA)

BY WILLIS W. WIRTH, *Bureau of Entomology and Plant Quarantine, United States Department of Agriculture*

Little do we ordinarily realize that unusual opportunities for insect collecting may still exist within a stone's throw of our back doors and often in areas where we believe that thorough collecting and reporting have been done. It became apparent during the summer of 1950, when I was making frequent collecting trips for biting midges in the nearby areas of Virginia, that a great portion of the material coming to hand was not only new to the National Museum collection, but also undescribed. Such an array of new records and new species was discovered that it seemed desirable to pubish them as a unit.

Probably the most interesting record was a new species of the striking, predaceous genus *Echinohelea*, which had previously been known only from four species from British Guiana and Brazil. A distinctive new species of the genus *Forcipomyia* with adorned wings and legs, and bearing abundant scales in addition to the usual hairy vestiture, also serves to emphasize the important Neotropical affinities of the Heleidae of the southeastern United States.

Unless otherwise stated, all material discussed in this paper was collected by me, principally at two locations. The first was a strip of swampy woods about a hundred yards long and several yards wide along a small permanent stream tributary to Holmes Run about two miles southwest of Falls Church in Fairfax County, Virginia. This stream, which had just emerged from some low hills, was from one to two feet wide, with a moderate current, a sandy bottom, and low margins with frequent shallow swampy puddles overgrown with rank herbaceous vegetation. Several species of Heleidae were bred from pupae taken from the moist sand at the margins of the stream, while most were swept from the marginal vegetation. The second location, on the eastern border of the Shenandoah Mountains near Mount Solon in Augusta County, consisted of an area adjacent to Camp May Flather, a Girl Scout camp, located at the forks of the North and Little Rivers. Collecting there was done principally with light traps, three of which were operated within a few miles of each other near the river on three consecutive nights. A few collections were also made by sweeping along the river and its small tributaries within a few miles of the camp. I am particularly indebted to H. H. Stage, of the Bureau of Entomology and Plant Quarantine, for the opportunity to make the trips to Mount Solon.

Atrichopogon levis (Coquillett)

1 ♀, Mount Solon, June 21, 1950.

Atrichopogon species

A large number of specimens were collected at Falls Church by sweeping, but in view of the present unsatisfactory taxonomic condition of this genus in North America, no serious attempt was made to name them.

Forcipomyia (Forcipomyia) pluvialis Malloch

(Figure 2)

This is a tiny, whitish yellow species with dark brown, vittate mesonotum and two black spots on the costa. Malloch's brief description of external characters adequately characterizes the present material. Female tarsal ratio (length of basitarsus divided by length of second segment, hereafter abbreviated as TR) 1.0; antennal segments 3-10 each about twice as long as broad, urn-shaped, the last five about three times as long as broad, long tapering, last segment with a slender termnial style a sixth of total length of segment, all segments with quite long yellow verticils; spermathecae two, subspherical, the ducts not sclerotized. Male genitalia as in figure 2.

Ten ♂ ♂, 4 ♀ ♀, Falls Church, July 29, 1950; 3 ♂ ♂, 3 ♀ ♀, Mount Solon, July 11, 1950. Additional specimens seen: 1 ♂, 1 ♀, Baton Rouge, Louisiana, May, 1947, W. Wirth (light trap); 1 ♂, Trinidad River, Panama, June 9, 1912, A Busck.

Forcipomyia (Forcipomyia) solonensis, new species

(Figure 1)

A rather large, dark brown, dull species with unmarked wings, yellowish hairy legs and infuscated halteres; TR 0.6.

Female. Length 2.2 mm., wing 2.0 mm by 0.7 mm.

Head brown, vertex with long, brown hairs; antennae long, basal segments elongate vasiform, unusually long for genus, with prominent whorls of hairs twice as long as segments; the five distal segments long tapering; palpi with third segment slender, only slightly swollen at bases.

Thorax pruinose dark brown, humeri and wing bases yellowish, mesonotum and scutellum concolorous, with long, semierect, yellow hairs. Legs dull yellow, with mixed yellow and brown very long erect hairs. Wings uniformly covered with long, brown marcotrichiae. Halteres dull grayish brown. Abdomen uniform dark brown, with long brown hairs.

Male. Similar to the female, with usual sexual differences; legs somewhat paler yellow, with very long, erect hairs. Genitalia (figure 1). Ninth sternite about half again as broad as long, posterior margin bilobed mesad. Basistyles about twice as long as broad; dististyles over 0.9 as long as basistyles, distinctly sinuate with slender tips. Aedeagus strongly sclerotized, as long as basal width, the anterior arch reduced to a slightly concave anterior margin, posterior margin with a distinct sharp median point flanked by a pair of rounded sublateral lobes not nearly so long. Parameres broad and flattened, about half again as long as aedeagus, bases contiguous but not fused, gradually expanded to obliquely truncated apices about twice as broad as basal width.

Holotype ♂, allotype, Mount Solon, Virginia, July 13, 1950, W. W. Wirth (light trap) (Type no. 60970, USNM.).

The uniform brown color, with yellowish, hairy legs and dusky halteres and sinuate male dististyles is very distinctive, closely allying *solonensis* with an as yet undescribed species from California and New Mexico which differs in having shorter female antennae, TR 0.8, less sinuate dististyles, a broader bilobed aedeagus, and parameres fused at base, with attenuated tips.

Forcipomyia (Euforcipomyia) calcarata (Coquillett)

1 ♂, Falls Church, July 8, 1950.

Forcipomyia (Euforcipomyia) splendida, new species

(Figure 4)

A large black and yellow species with adorned wings, banded legs with appressed scales, and greenish abdomen; TR 1.6.

Female. Length 2.1 mm., wing 1.5 mm. by 0.6 mm.

Head brown, vertex with long, brown, bristly hairs and short, appressed, yellow hairs; antennae long, flagellar segments in proportion of 15:15:16:16:16:16:16:16:22:22:22:22:30, segments 3-10 ten-pin shaped, 11-15 long tapering, last with long termnial style. Palpal segments in proportion of 6:10:25:12:12, third segment slender, scarcely swollen at base, pit absent, long sensillae scattered along inner side.

Thorax dull brown; mesonotum and scutellum with abundant, long, suberect hairs. Legs yellowish, femora and tibiae broadly brown in middle, tarsi brown, the joints yellowish, the brown color due in large part to abundant vestiture of closely appressed brown scales; legs with strong bristles, especially on dorsal sides of tibiae. Proportions of hind leg 25:10:60:70:33:20:15:10:8.

Each wing with a prominent black costal spot over radial cells due to clump of long black hairs, anterior half of wing proximad of this spot yellowish; a prominent white costal spot with whitish macrotrichiae just beyond black spot and about of same size, other faintly indicated, light spots broadly over extreme apex in anal cell, remainder of wing grayish with fine, appressed, black macrotrichiae. Halteres whitish.

Abdomen greenish, with semi-appressed yellow hairs. Spermathecae two, large and ovoid, but very slightly sclerotized.

Male. Similar to the female, with usual sexual differences, antennal plumes black at base, distal third yellowish; bristles of legs very strong and erect; wing more extensively whitish, in some specimens creamy white except for single black costal spot. Genitalia (figure 4). Ninth sternite about half again as broad as long, posterior margin with semicircular, mesal excavation. Basistyles about twice as long as broad; dististyles as long as basistyles, slender and nearly straight. Aedeagus heavily sclerotized, with rather long basal arms, the arterior arch over half as deep as broad, distal half of aedeagus a long, slender, distally pointed, sclerotized blade with apex curved ventrad. Parameres a narrow, ribbonlike structure arched cephalad within ninth segment, posterior sclerites absent.

Holotype ♂, allotype ♀, Mount Solon, Virginia, July 13, 1950, W. W. Wirth (light trap) (Type no. 60969, USNM). Paratypes: VIRGINIA: 16 ♂♂, 6 ♀♀, same data as type; 7 ♂♂, 13 ♀♀, Falls Church, July 8, 1950; 10 ♂♂, 2 ♀♀, Mountain Lake, July 23, 1940, L. J. and M. J. Milne. MARYland: 1 ♂, Plummer's Island, Sept. 24, 1902, Barber and Schwarz. SOUTH CAROLINA: 1 ♂, Myrtle Beach, July 30, 1943, W. W. Middlekauff.

This splendidly marked species is most closely related to the squamose Neotropical species, keying out to *annulatipes* Macfie in Macfie's (1939) key. However, the structure of the male genitalia of *splendida* is quite different from that of any of the described Neotropical speecies. The third palpal segment is slender, without a pit, much as in *nigrescens* Macfie (l. c.).

Forcipomyia (Euforcipomyia) fairfaxensis, new species
(Figure 3)

A small shining black species with yellow halteres, yellowish legs, and moderately long antennae; TR 2.2.

Female. Length 1.2 mm., wing 1.1 mm. by 3.9 mm.

Head black; antannae and palpi brown, antenna moderately long, basal segments moniliform, distal segments long tapering, last segment with long distal peg; flagellar segments in proportion of 12:10:10:10:10:10:10:12:26:30:30:30:40. Papal segments in proportion of 8:12:18:8:10, third segment swollen, ovoid, with large, shallow, sensory area on inner side.

Thorax brownish black, mesonotum subshining black, with sparse, short, black hairs. Legs dull brownish yellow, hairs moderate, segments of hind leg in proportion of 15:7:38:38:22:10:7:6:5, empodium well developed. Claws simple, curved, and stout. Wings rather narrow for the genus, clothed rather sparsely with long black hairs. Halteres with stem brown, the knob white.

Abdomen pruinose, brownish black, with short, appressed, brown hairs. Spermatheca one, large, oval in outline.

Male. Similar to the female, with usual sexual differences. Genitalia (figure 3). Ninth sternite about half again as broad as long, posterior margin slightly bilobed; basistyles very narrow and sub-parallel, over twice as long as broad; dististyles about as long as basistyles, very slender and only slightly curved. Aedeagus about three fourths as long as basal width, the basal arms long with lateral apices, anterior arch low but distinct; posterior portion cleft mesad nearly to base, forming a pair of submedian valves with very slender tips abruptly bent laterad at about distal fourth. Sclerotized portion of parameres reduced to a very narrow ribbonlike band extending bridge-like cephaled from bases of basistyles within basal portion of ninth segment.

Holotype ♂, allotype ♀, 10 ♂♂, 4 ♀♀ paratypes, Falls Church, Fairfax County, Virginia, July, August, 1950, W. W. Wirth (Type No. 60971, USNM).

The female of *fairfaxensis* is almost identical with that of *johannseni* Thomsen, which differs notably in having different antennal proportions, segments 2-9 being 1.3 times as long as 10-14 combined. However, the male genitalia of *johannseni* are quite different, with a deeply emarginate ninth sternite, short globular basistyles, an aedeagus more like that of *Forcipomyia* s. str. and posterior sclerites of the parameres present. *F. calcarata* (Coquillett) has similar parameres, but is a larger, hairier species, dull grayish brown in color, the TR 1.5, with two spermathecae, a bell-shaped aedeagus, and short stout dististyles. *F. hirtipennis* (Malloch) has yellow body hairs and a 1.5 tarsal ratio

Dasyhelea oppressa Thomsen

4 ♂♂, 8 ♀♀, Falls Church, July 4, (hovering near tree ooze), July 29, Aug. 6, 1950.

Genus **Culicoides** Latreille

The following table shows the relative abundance of the species taken in light traps at Mount Solon, the values in the first column being the total numbers of each species taken in nine trap-nights collecting on July 11-13, 1950.

Culicoides biguttatus (Coquillett)	238	8.3%
Culicoides crepuscularis Malloch	30	1.1%
Culicoides guttipennis (Coquillett)	571	20.0%
Culicoides haematopotus Malloch	6	0.2%
Culicoides obsoletus (Meigen)	1787	62.6%
Culicoides travisi Vargas	7	0.2%
Culicoides stellifer (Coquillett)	181	6.3%
Culicoides villosipennis Root and Hoffman	37	1.3%

At Falls Church, *haematopotus* and *biguttatus* were reared from pupae taken from moist sand at the margin of the small stream, *stellifer* was swept in adjacent vegetation, and *travisi* was reared from a tree hole in the woods nearby.

Helea (Isohelea) virginiana, new species

(Figure 5)

A small, black species with brown antennae, yellow halteres and legs, and slightly infuscated wings with M_2 interrupted at base.

Female. Length 1.3 mm., wing 1.1 mm. by 0.4 mm.

Head dark brown, antennae and palpi brown; antennal flagellar segments slightly longer than broad, oval last segment not markedly tapering.

Thorax subshining brownish black, with sparse, long, light brown hairs; scutellum with four, long, fine, light brown hairs. Coxae brown, remainder of legs yellow; femora slender, proportions of segments of hind legs 20:10:55:50:20:10:5:4:6, claws apparently equal, moderately long on fore and mid legs, shorter on hind legs. Wings brownish semitranslucent, all veins brown; macrotrichiae absent; first radial cell greatly narrowed, apparently obsolete, second radial cell long and narrow, length subequal to first; costa to two-thirds wing length; r-m crossvein oblique; M_2 interrupted on basal third. Halteres yellowish white. Abdomen velvety, deep brownish black.

Male. Similar to the female with usual sexual differences; antennal plumes dark brown. Genitalia (figure 5) short and broad; ninth sternite twice as broad as long, spiculate; ninth tergite tapered, apicolateral processes very prominent, exceeding basistyles, tapered to slender apices.

Basistyles curved, over twice as long as broad; dististyles bowed slightly, slender, as long as basistyles, pointed at apices. Aedeagus about as long as basal width, shield-shaped, with rounded basal arch to a third total length; apex rounded, the lateral margins strongly sclerotized and somewhat folded. Parameres fused at bases, with notch on anterior side between bases; posterior portions consisting of a pair of nearly straight, stout, apicolaterally directed arms with bluntly pointed tips.

Holotype ♂, allotype ♀, Mount Solon, Virginia, July 11, 1950, W. W. Wirth (Type no. 60972, USNM). Paratypes: 1 ♂, Falls Church, July 8, 1950; 1 ♀, Plummer's Island, Maryland, May 14, 1914, R. C. Shannon.

The bright yellow legs, brownish wings and characteristic male genitalia will distinguish *virginiana* from all other known Nearctic *Helea* with interrupted M_2.

Serromyia crassifemorata Malloch

8 ♀♀, Falls Church, May 21, 1950. This series agrees well structurally with Malloch's description and with specimens from Illinois determined by him, but the coloration is much darker than in typical *crassifemorata*. The body and hind legs in the present material are shining jet black, while the antennae and fore and mid legs are brownish and the wings are deeply infuscated, especially on the anterior margins.

Echinohelea lanei, new species

(Figure 6)

A strikingly marked, spiny species; mesonotum orange yellow with four silvery patches; pleura with transverse brown band; legs yellow, with many long spines, in male with extremely long, wavy hairs; wings unmarked, abdomen blackish.

Female. Length 1.8 mm., wing 1.8 mm. by 0.5 mm.

Head orange yellow including antennal scape, palpi and antennal flagellum brown, the segments of the latter in proportion of 22:13:15:15:15:15:18:18:27:27:25:25:20, verticils about as long as penultimate segment. Clypeus dark amber, with four long fine brown setae, proboscis brown, as long as clypeus. Palpi slender, segments in proportion of 4:6:12:8:10, third segment, not swollen, with a very small shallow circular pit.

Mesonotum orange yellow, two pairs of lateral silvery areas, one on humeral angle, other just in front of wing bases, two submedian rows of fine, black setae and scattered, long, black setae along lateral margins; about ten in a clump above wing and 5-8 in an irregular, transverse row in front of scutellum. Scutellum yellowish, with marginal row of about ten, long, black hairs. Postscutellum and pleura dull yellow, the latter with a black, transverse line just above coaxae. Legs dull yellowish, hind tibia broadly dark in middle; with numerous, long black spines, 4 ventral and 3 anterior on fore femur; 10 ventral on mid femur; 4 ventral, 4 anterior and 1 dorso-apical on posterior femur; 6-7 antero-dorsal on mid tibia, and 4 dorsal, 5 anterior and 4 ventral on posterior tibia; mid basitarsus with a long sub-basal and shorter, subapical ventral spines; in addition many scattered long, fine hairs on legs. Proportion of segments of hind legs 40:15:70:80:32:12:10:7:13, fore and hind femora rather stout, but not swollen, claws long and toothed, equal on fore legs, very unequal, the inner about three times as long as outer, on mid and hind legs.

Wings brownish hyaline, anterior veins and membrane between them brownish infuscated, especially at first radial cell which is 0.37 as long as second, the latter ending 0.8 way to wing tip. Halteres dull brown, ends of knobs lighter.

Abdomen dull yellowish, lateral and posterior margins of segments dark brown, each segment with a transverse row of long, brown hairs. Abdomen broad and flattened dorsoventrally, normally curved down under body, last segment prominent, strongly sclerotized; spermathecae one, subspherical, with a very slender, sclerotized duct half as long as diameter of spermatheca.

Male. Similar to female in coloration, but differing markedly in structure. Antennae not plumose, the verticils arranged as in the female but the longest about twice as long as penultimate segment; flagellar segments in proportion of 20:12:12:13:15:16:18:18:20:20:25:25:20. Legs with spines as in the female, but the pilose hairs strikingly elongated to over twice the diameter of a femur, with apices distinctly wavy or curled. Tarsal claws toothed and equal on all legs.

Genitalia (figure 6). Very prominent and globular, abruptly bent under abdomen. Ninth segment reduced, the basistyles fused together at bases and entirely separating the reduced sternite and tergite. Sternite crescentic, the posterior margin indented half-way to base; tergite extremely narrow, over twice as long as broad, with a few distal bristles and a pair of triangular, apicolateral lobes. Basistyles very regularly oval, disistyles about two-thirds as long as basistyles, saber-shaped, inner margins of each with long fine hairs and a single minute distal tooth. Aedeagus (figure 6a) a mirror image of ninth sternite at base, but apex conically attenuated to a pair of very fine contiguous recurved points. Parameres (figure 6b) a pair of small sclerotized rods with lateral basal tooth, apices abrutly expanded and recurved ventro-laterad in the form of a broad, rounded, beak-like blade.

Holotype ♂, allotype ♀, Falls Church, Virginia, July 8, 1950, W. W. Wirth (Type no. 60973, USNM). Paratypes: 26 ♂♂, 38 ♀♀, same data as type, dates from July 4 to July 29, 1950; 1 ♂, 4 ♀♀, Mount Solon, July 11, 1950.

The genotype, *ornatipennis* Macfie, is similar to *lanei* in the markings of the body and the structure of the antennae and claws, but differs in its well-marked wings, short hairs on the legs of the male, and in the male genitalia, with a more complex aedeagus and fused parameres without curved tips. *E. richardsi* Macfie, known only from the female, has unmarked wings and claws as in *lanei*, but is smaller and darker with fewer spines. *E. smarti* Macfie has the female claws equal on all legs and the legs of the male have short hairs. *E. macfiei* Lane is nearest *lanei*, but has fewer hairs and spines, and the clypeus is darker. I take great pleasure in naming this striking Virginia species in honor of my good friend, Dr. John Lane of the University of Sao Paulo, Brazil, the foremost authority on Neotropical Heleidae.

Stilobezzia mallochi Hoffman

20 ♂♂, 25 ♀♀, Falls Church, July, Aug., 1950. This species was found in large numbers together with *Echinohelea lanei*, which it superficially resembles in size, proportions, and color.

Stilobezzia bulla Thomsen

18 ♂♂, 21 ♀♀, Falls Church, July, Aug., 1950.

Clinohelea bimaculata (Loew)

(Figures 9, 10, 11)

11 ♂♂, 22 ♀♀, Falls Church, July, Aug., 1950. Apparently the pupa of *Clinohelea* has not previously been described. A pupa from which this species was reared was collected from the sandy margin of the small stream at Falls Church. *Pupa* 3.5 mm. long, color light brown; respiratory organ (figure 11) moderately long and slender, about five times as long as apical width, with ten spiracles at apex; operculum (figure 10) narrow, 0.9 times as broad as long, with a pair of round tubercles bearing a long seta, surface with very coarse shagreening, especially at distal margins and between the tubercles; body segments with low, crescentic tubercles, those of lateral margins sharp and setose; anal segment (figure 9) about twice as long as broad, finely shagreened, the apicolateral processes about a third total length, with subapical shagreening and sharp sclerotized apices.

Clinohelea species 1

Two females from Falls Church, July 4, 1950, differ considerably from any described North American species, although falling closest to *nubifera* (Coquillett) from Florida and *dimidiata* (Adams) from Arizona. In view of the unsolved problems of variation in the Nearctic species of this genus it is not advisable to name the limited material available. The legs are very dark, but not so much as in *dimidiata;* coxae brown, yellowish toward apices, legs, yellow, mid femur brown on distal fourth, hind femur black on distal three-fourths, fore tibia brown, mid black except on distal fourth, hind entirely black. Wings suffusedly smoky brown, two darker spots over cross vein and at end of third vein, connected along costa; other veins bordered with dark brown.

Palpomyia plebeia (Loew)

12 ♂♂, 24 ♀♀, Falls Church, July 29, Aug. 6, 1950; 4 ♂♂, 2 ♀♀, Mount Solon, July 11, 1950.

Palpomyia stonei, new species

A large species with shining black mesonotum; legs, abdomen, scutellum, halteres and base of antenna yellow; fore femora slender, each with seven ventral spines.

Female. Length 2.8 mm., wing 2.8 mm. by 0.9 mm.

Head brown; basal flagellar segments yellow at base; last five segments black, palpi yellow. Mesonotum shining black, with fine yellowish hairs, scutellum yellow with eight, fine, yellow, marginal hairs; postscutellum and pleura shining dark brown, coxae brown, legs yellow, knees and apex of fourth trasal segment black. Femora slender, on fore legs scarcely swollen with seven, stout, black, ventral spines; proportions of segments of hind leg 40:12::110:100:45:20:10:5:10, fifth tarsal segment bare, claws a third as long as segment, black, curved, each with minute inner tooth. Wings whitish hyaline, anterior veins whitish. Halteres white. Abdomen yellowish, slender at base.

Holotype ♀, Mount Solon, Virginia. July 11, 1950, W. W. Wirth (light trap) (Type no. 60974, USNM).

Most closely resembling *plebeia* (Loew), in the shining black mesonotum, yellow legs and halteres, but the allied species has the scutellum black, distal half of the abdomen brown, and the fore femora greatly swollen with sixteen or more spines. I am happy to name this fine species after my good friend and co-worker at the National Museum, Dr. Alan Stone, who was along on the first trip to Mount Solon.

Palpomyia rufa (Loew)

10 ♀♀, Falls Church, July 8, 1950: 1 ♀, Mount Solon, July 11, 1950.

Bezzia (Pseudobezzia) dentata Malloch

(Figure 8)

6 ♂♂, 3 ♀♀, Falls Church, July 4, 8, 1950; 1 ♀, Mount Solon, July 11, 1950.

Female shining black; mesonotum with whitish pollinose area covering most of humeral depressions leaving only a narrow median shining stripe on anterior portion; all legs spiny. *Male* genitalia (figure 8). Ninth sternite about one and a quarter times as broad as long, spiculate on posterior half, with a deep, mesal notch on posterior margin to a third of total length, in which the aedeagus normally rests when turned cephalad; ninth tergite narrow, flap-like. Basistyles globular, a fourth longer than broad, mesal margin without lobes; dististyles triangular, setose, about a third as long as basistyles. Aedeagus a long straight slender sclerotized tube half as long as basistyle, protruding ventrad from a hat-shaped transverse basal sclerite between bases of basistyles. Parameres fused in a thick, transversely flattened, bar-like sclerite protruding perpendicularly dorsad between bases of basistyles, and pushing up the narrow flap-like tergite; the basal, wing-like sclerites broad within bases of basistyles, separated and narrowed cephalad, as long as cleft of ninth sternite.

Bezzia (Pseudobezzia) flavitarsis Malloch

1 ♂, 3 ♀ ♀, Falls Church, July 4, 8, 29, 1950.

Bezzia (Pseudobezzia) mallochi, new species

(Figure 7)

A small, shining black, spinose species with black spinose legs, black halteres, white tarsi; male with ninth sternite entire, basistyles not lobed.

Female. Length 2.2 mm., wing 1.8 mm. by 0.6 mm.

Head black, palpi and bases of antennae brown. Thorax shining black, including humeri; mesonotum with fine appressed black hairs; 4-6 long black spines above wing base and 8-10 on margin of scutellum. Legs shining black; fore femora with subapical and fore tibiae with sub-basal and subapical narrow yellowish rings; tarsi white. Fore and hind femora each with 5-7 ventral spines; hind tibiae with strong spinose bristles above, other femora and tibiae with dense strong setae; claws strong, black, half as long as fifth segment, each with minute tooth on inner side near base. Wings grayish hyaline, anterior veins brown, first vein to half the length of radial cell, media forking slightly beyond r-m crossvein. Halteres dark brown. Abdomen shining black, with appressed, sparse, brown hairs.

Male. Similar to the female, with usual sexual differences; antennal plumes golden, distal flagellar segments black; legs with many strong spines. Genitalia (figure 7). Ninth sternite about a fourth broader than long, posterior margin entire, spiculose on posterior half; ninth tergite flap-like. Basistyles simple, about half again as long as broad; dististyles setose, triangular. Aedeagus with very broad, basal arms and a straight, median, tube-like sclerite as long as basistyles, protruding ventrad. Parameres distinctive, the basal sclerites wing-like, but compressed laterad, the median sclerite in dorsal view narrower, ten-pin shaped with rounded tip, but very much stouter in side view with obliquely truncated tip, protruding dorsad between bases of basistyles, and pushing back the flap-like tergite.

Holotype ♂, allotype ♀, Mount Solon, Virginia, July 11, 1950, W. W. Wirth (light trap) (Type no. 60975, USNM).

Paratypes: 2 ♂♂, same data as type; 1 ♂, Great Falls, Virginia, June 12, 1940, W. W. Wirth; 1 ♂, Glencarlyn, Virginia, June 7, 1925, J. R. Malloch; 3 ♂♂, Falls Church, July 8, 29, 1950.

Malloch (1915) erected the genus *Pseudobezzia* for *expolita* (Coquillett), a shining black species with petiolate media, very spiny legs, enlarged genitalia with long rod-like aedeagus and parameres in juxtaposition. Malloch's only character for the genus was the petiolate media, and since this character as well as the others given above may merge in different species into those of *Bezzia* s. str., it appears that the two genera cannot be maintained as separate. The female of *expolita*, which was described as *johnsoni* by Coquillett from a specimen collected at the same time and place as the male type of *expolita*, has the media very narrowly sessile. However, the above mentioned characters of the genotype are common to a group of closely related species for which it may be desirable to preserve the subgeneric name *Pseudobezzia*. These species may be separated as follows:

1. Male genitalia with lobe on basistyle 2
   .. Male genitalia without lobe on basistyle; femora and tibiae of fore legs broadly yellow-banded; male antennal plumes yellow 3
2. Lobe on dorsomesal side near apex of basistyle; femora and tibiae of fore legs broadly yellow-banded .... *expolita* (Coquillett)
   . Lobe on ventro-mesal side at about midlength of basistyle; femora and tibiae entirely black .... *flavitarsis* Malloch
3. Ninth sternite of male with prominent mesal notch; shoulders of mesonotum pruinose .... *dentata* Malloch
   . Ninth sternite of male entire; mesonotum uniformly glossy black .... *mallochi*, new species

Bezzia varicolor (Coquillett)

1 ♀, Mount Solon, July 13, 1950. This species appears to have the halteres occasionally dark, and the extent of the dark leg bands is also somewhat variable.

Bezzia media (Coquillett)

5 ♀♀, Falls Church, July 4, 8, 29, 1950.

Bezzia opaca (Loew)

9 ♀♀, Mount Solon, July 11, 1950, (swarming by the river).

Bezzia (Bezzia) pseudobscura, new species

A large, pruinose, grayish species with banded legs, two spines on fore femur, halteres white, abdomen whitish above.

Female. Length 3.1 mm., wing 2.5 mm. by 0.9 mm.

Head dark brown, densely gray pollinose; antennal scape light brown, segments 3-10 yellowish at bases; flagellar segments in proportion of 15:10:10:10:10:10:10:10:45:40:40:40:40. Palpal segments slender, proportions 4:10:15:10:8, third not swollen, pit absent.

Thorax dark brown, with very dense pearly gray pollen, minutely dark punctate at bases of the fine hairy vestiture; integument of scutellum slightly yellowish brown; 3-4 black spinose setae above each wing base, scutellum with four very fine, brown, marginal hairs. Legs yellow; coxae, broad subapical bands on fore mid femora, all except extreme bases of hind femora and narrow apices of bitiae black, with long gray pubescence. Femora moderately strong, fore femur with 2-3 black ventral spines at distal third; claws half as long as fifth segment, each with minute basal tooth; proportions of segments of hind legs 35:15:110:105: 65:25:8:6:15.

Wings grayish hyaline, anterior veins yellowish, costa to 0.8 wing length. Halteres white.

Abdomen whitish above, venter and last tergite brownish. Spermathecae two, small slightly ovoid, with ducts sclerotized about a fourth length of spermatheca. Two pairs of long hyaline internal gland rods present.

Holotype ♀, 5 ♀ paratypes, Falls Church, Virginia, July, Aug., 1950, W. W. Wirth (Type No. 60976, USNM).

Closely allied to *Bezzia obscura* (Malloch) from New York, which however is not so markedly grayish pruinose, more as in *opaca* (Loew), the abdomen is pale only on basal half above, the fore and mid femura not darkened, the halteres brownish and the mesonotum and scutellum with strong dark hairs. *B. varicolor* (Coquillett) is also very similar, but has the hind femur dark, with dark, narrow, preapical bands on fore and mid femora and broad sub-basal and narrow, subapical dark bands on all tibiae, and the mesonotal pruinescence is lighter and sub-shining. Malloch's type of *obscura* in the Illinois Natural History Survey has been examined and possesses two distinct strong black spines on the under side of the fore femur, which Malloch must have overlooked.

In addition to the species listed here, at the Falls Church locality, I collected one new species each of *Dasyhelea* and *Alluaudomyia*, two each of *Stilobezzia* and *Monohelea*, and at Mount Solon two new speces of *Alluaudomyia*, and one each of *Stilobezzia* and *Probezzia*. These new species are being described elsewhere, more appropriately, in generic revisions.

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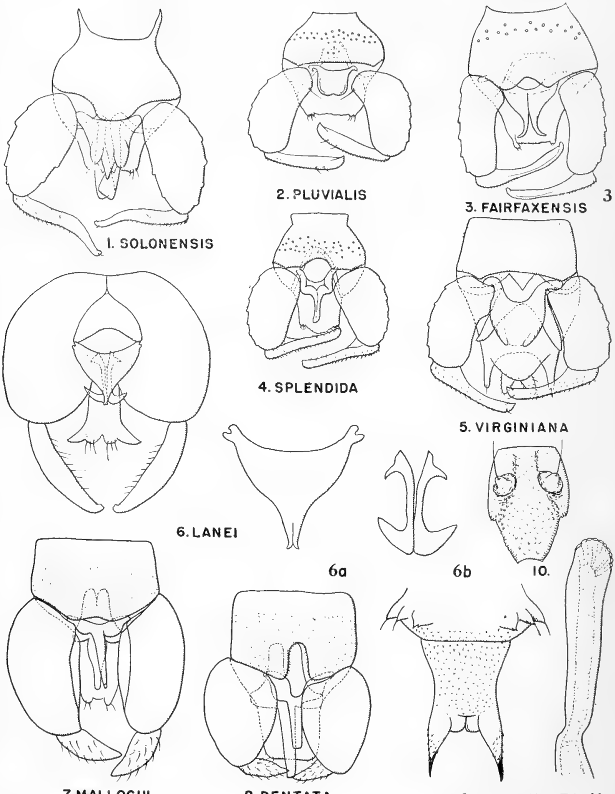

PLATE 40. MALE GENITALIA AND PUPA OF HELEIDAE

Figures 1-8, male genitalia; 1, *Forcipomyia solonensis;* 2, *F. pluvialis;* 3, *F. fairfaxensis;* 4, *F. splendida;* 5, *Helea virginiana;* 6, *Echinohelea lanei;* 7, *Bezzia mallochi;* 8, *B. dentata.* Figures 9-11, *Clinohelea bimaculata,* pupa; 9, anal segment; 10, operculum; 11, respiratory organ.

NEW SPECIES OF UTAH MAYFLIES. I. OLIGONEURIIDAE
(EPHEMEROPTERA)

BY GEORGE F. EDMUNDS, JR.,* *Department of Invertebrate Zoology and Entomology, University of Utah*

During the course of a study of Utah mayflies the writer has encountered several species which are apparently undescribed. The present paper presents the description of the first species of the family Oligoneuriidae to be discovered in Western North America.

Lachlania powelli, new species

Lachlania sp.? Edmunds, Ent. News 59:43, 1948; Proc. Biol. Soc. Wash. 61:143, 1948.

Male imago. Length: body 8-10; wing 8-10; tails 22-30 mm.

Head dark brown above antennae, lighter below; antennae dark brown; eyes black, separated by one-third the distance of their greatest diameter. Prothorax brownish black with a pale median stripe widest at the anterior end. Mesonotum shiny black, a pair of large paramedian pale spots at the anterior margin; inner parapsidal furrows pale; about two-thirds of the distance from the anterior margin a pale stripe arises from each parapsidal furrow and curves mesad and cephalad to where the two stripes meet at the median line, thus forming a pale open flaring V-shaped mark with its apex cephalad; the pale furrows and V together forming a pale roughly H-shaped mark on the mesonotum as in *L. saskatchewanensis* Ide. At the posterior end of the parapsidal furrows a pale stripe proceeds antero-laterad along the postero-lateral margin of the mesonotum. Meso- and metanotal humps brownish-black. Pleura deep brown, the extensive membranous areas yellowish white. Venter brownish black. Fore legs *shorter* than middle or hind legs; tarsi apparently three segmented; first two segments very short, the third about three and one-half times as long as the first; coxae brown; femora and tibiae with a narrow dark brown dorsal stripe; tarsi pale; claws large and bulb-like, similar, pale. Coxae of middle and hind legs brown, femora paler; tibiae and tarsi yellowish white; femoro-tibial joints marked with brown; claws bulb-like, pale (see figures). Wings with a faint blue reflection in dried specimens. Venation as in figure, pale brown; the concave veins generally lying beneath the convex veins.

Abdominal segments deep brown, alternating with a hyaline "intersegmental" area nearly as long as the brown portion on the first segment but diminishing posteriorly until the hyaline area is normally obscured on segments 8-10; lateral margins of tergites with a dark pleural stripe (see figure); paired paramedian markings on the brown portion of each

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*Contribution from the Dept. of Entomology, University of Massachusetts. I am grateful to Dr. J. R. Traver and Dr. C. P. Alexander for aid during the preparation of this paper. Collections were made possible through a grant by the University of Utah Research Fund.

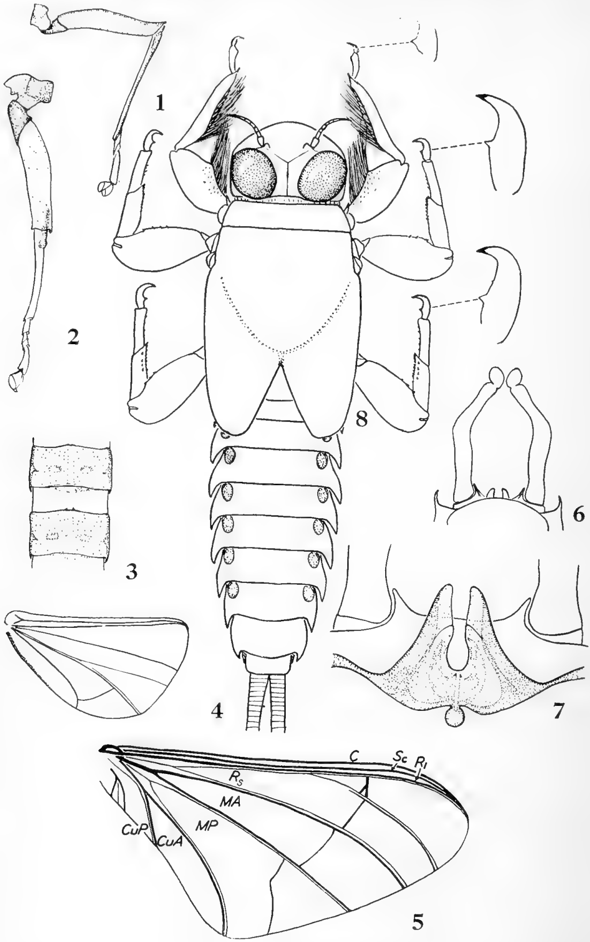

PLATE 41. LACHLANIA POWELLI

Figures 1-7, male imago. Fig. 1, fore leg; fig. 2, hind leg; fig. 3, tergites 3 and 4; fig. 4, hind wing, same scale as fore wing; fig. 5, fore wing, slightly flattened to expose concave veins; fig. 6, terminalia, ventral view; fig. 7, penes, dorsal view. Figure 8, nymph, dorsal view; enlargements of claws.

tergite; traces of a pale median stripe evident in most specimens. Postero-lateral angles of segments 3-8 with variously curved extensions. Each abdominal sternite with paired paramedian dark arc-shaped marks on anterior portion and paired paramedian dark spots on the posterior portion. Genitalia as figured; forceps pale. Tails two and one-half times as long as body, white, pilose.

Female imago. Length: body 6-9; wing 7-9; tails 3.5-5 mm.

Head deep brown, paler behind ocelli and between eyes along posterior margin. Thorax similar to that of male. Legs similar to male in coloration but shriveled, twisted, and much shorter. Wings as in male.

Abdominal segments as in male, except that there are no hyaline "intersegmental" areas, the segments are darker, and the markings are obscure. Abdominal sternites similar to those of male. Subanal plate with a broad, shallow, median excavation. Tails slightly more than half the length of the body.

Nymph. Length: body 8-10; tails 6-9 mm.

Form as in figure 5. Coloration of nymph so variable as to be of little taxonomic value, generally brown to black. All general features such as mouthparts, body shape, legs and gills are similar to those of the nymph figured by Needham and Murphy (Bull. Lloyd Libr. 24, Ent. Series 4: plate VI, 1924) for *Lachlania* sp.? (possibly *L. lucida* Eaton) from Guatemala. It differs from that nymph in having a relatively smaller but more strongly curved claw on the foreleg and apparently also in the shapes of the lateral margins of the abdominal segments.

Nymph associated with adult by rearing.

Holotype ♂. Green River at Hideout Canyon, elev. 5800 feet, Daggett Co., Utah, 4-IX-47. *Allotype* ♀. Same data. *Paratypes.* About 300 males, 50 females, 50 nymphs, same data and 3-IX-47; additional nymphs 5-IX-48, 11-IX-50; 1 ♀, several nymphs 9-VIII-47. Holotype, allotype, and paratypes deposited at University of Utah. Additional paratypes have been, or will be, distributed to collections of J. R. Traver, W. C. Day, H. T. Spieth, University of Massachusetts, Illinois Natural History Survey, Cornell University, California Academy of Sciences, American Museum of Natural History, U. S. National Museum, University of Florida, and Canadian National Collection.

This species is dedicated to Major J. W. Powell who explored the type locality area in the year 1868.

Taxonomy

Lachlania powelli males will key to *L. lucida* Eaton (Guatemala and Panama) in Ulmer's key (Stett. Ent. Zeit. 104:36; 1943) to the species of *Lachlania* (*sensu lato*, including *Noya* and *Noyopsis*), but can be distinguished from *L. lucida* by the presence of the pale roughly H-shaped mark on the mesonotum. In addition to the mesonotal markings, the black tails of the female distinguish it from *L. lucida* Eaton and *L. abnormis* Hagen. Its nearest relative, *L. saskatchewanensis* Ide, known only from a single female, shares the character of the pale H-shaped mesonotal marking and black tails. *Lachlania powelli* differs from *L. saskatchewanensis* by having a pair of large paramedian pale spots on the anterior margin of the mesonotum rather than a continuous pale band, by the lesser curvature in the veins of the forewing, and by the relatively broader hind wing.

Biology

The Green River at Hideout Canyon has been described briefly by the writer elsewhere (Proc. Biol. Soc. Wash. 61: 143; 1948). Nymphs of *L. powelli* were found mainly clinging to small sticks lodged in the interstices of rocks in a long rapid, although a number were taken from the undersides of rocks. When the nymphs were disturbed they acted much in the manner of *Ephemerella* nymphs, tipping the tail up over the back. They are very slow moving and cling to the sticks with great tenacity.

The nuptial flight of *Lachlania powelli* is especially interesting. Observations began at 7:45 a.m. when small companies of mayflies were already swarming wherever the morning sun shone. The subimaginal stage apparently lasts only a few minutes. The subimaginal skin is shed from all parts of the body except the wings *while the insects are in flight.* A great number were observed to cast the skin and at no time were the insects seen to alight or leave the air above the river. It is interesting to note that the tails of the males are smooth in the subimaginal stage but pilose in the imago, a reversal of the normal ephemerid condition. The males and females flew very rapidly, with a speed comparable to that of the swiftest dragonfly, and actually followed the contour of the rapids as they patrolled up and down only an inch or two above the water. Whenever a male pursued a female she would rise one to four feet above the water; this action usually resulted in several more males giving chase. Many copulating pairs alighted on the water, but usually they continued in normal flight while copulation took place. Several pairs were captured and it was seen that the copulation position is similar to that for other genera except that the short forelegs attach to the thorax of the female just ahead of the wing bases.

Many of the pairs were flying tandem with the male grasping the female between the second and third abdominal segment and flying dorso-caudad and parallel to the female. Several of these tandem pairs were seen to alight on the water and it may be that this is an oviposition flight. Many single females, however, were seen to oviposit by dipping their abdomens to the water while flying, the normal oviposition behavior in ephemerids. At 11:00 a.m. the air temperature reached 75° F. and was rising rapidly. Coincident with this increase in temperature, the mayflies died and great numbers soon were seen floating on the surface of the river.

The observations on swarming behavior were made September 3, 1947. A return trip was made September 5, 1948, but only a few males were seen patrolling over the water. Another visit was made September 11, 1950 during which no adults were seen but a few nymphs were obtained. It is possible that this species becomes abundant only on certain years, for on the three September visits to the area the relative abundance of all species found in the river has been strikingly different.

THE BITING SNIPE FLY IN ALASKA[1]

(Diptera, Rhagionidae)

By R. I. Sailer, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture*

During 1948 the biting snipe fly, *Symphoromyia atripes* Bigot[2] was present in Alaska in the vicinity of Valdez. Members of the Alaska Insect Project who were present in this area from July 2 to 15 encountered these flies during several visits to the glacial till plain behind the city. No specimens were seen in the city or on the adjacent tidal flats.

The flies were generally observed in open areas between clumps of higher vegetation. They acted very much like certain horse flies of the family Tabanidae, but were slower moving and more easily caught. Their activity was greatest when the sun was bright, the wind velocity below 3 miles per hour, and the temperature around 70° F. Under favorable conditions three or four of these flies could be seen at any given time, and they were more aggressive than any of the horse flies encountered in Alaska during 1948.

Judging from the reports of Hearle (1929), Knowlton & Maddock (1944), and Ross (1940), *Symphoromyia atripes* may at times be a very serious pest of man, horses, cattle, and large game animals in the mountains of British Columbia, Washington, Utah, and Colorado. All authors agree that the bites are painful, usually draw blood, and result in some

[1]The observations reported here were made during the course of studies concerned with the biology of Alaskan biting flies. These and associated investigations were conducted by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, under a transfer of funds from the Department of Defense.

[2]Identified by Alan Stone, Division of Insect Identification, Bureau of Entomology and Plant Quarantine.

swelling. Horses are said to be unmanageable when large numbers of the flies are encountered.

The only previous Alaskan record for *atripes* seems to be one for Douglas published by Aldrich in 1915. In addition to the Valdez record reported here, specimens in the U. S. National Museum collection show the species to have also been taken at the following localities: Juneau, Aug. 20, 1945, J. C. Chamberlain; Gold Creek, Juneau, July 20, 1948, R. B. Williams; Seward, July 24, 1921, J. M. Aldrich; Anchorage, July 7, 1947, A. Stone; Eklutna Lake, July 11, 1947, D. W. Jenkins; 20 miles west Chitina, July 11, 1948, R. I. Sailer. Other records show *atripes* to have a range of distribution which extends south to northern California, Utah and Colorado.

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SYNONYMY OF NEOTROPICAL CULICIDAE[1]

(DIPTERA)

By J. LANE, *Universidade de Saõ Paulo, Brazil*

The opportunity of examining types of Neotropical *Culicidae* in the collections of the British Museum (Natural History) in London and the United States National Museum in Washington, D. C. have enabled the author of this paper to establish some synonymies in this group, made through comparison of type material and notes taken at the time.

He feels that, in the majority of cases, such synonymies are correct and would be glad to receive suggestions from those who do not agree with some of them so that further study can be undertaken.

He wishes to thank all those who have helped him, especially Drs. Alan Stone of the Bureau of Entomology and Plant Quarantine in Washington and P. F. Mattingly of the British Museum (Natural History) in London who have helped him in every way possible, giving him valuable suggestions.

In the following lists the valid species, and those which have hitherto been considered as synonyms but are now revalidated, are given in one column, while their corresponding synonyms are given in the other column.

Valid species	Synonyms
Corethrella ananacola Dyar, 1926.	*Corethrella inca* Lane, 1939.
Corethrella appendiculata Grabham, 1906.	*Corethrella arborealis* Snn. & Del Ponte, 1927.
Lutzomiops amazonica (Lane, 1939).	*Lutzomiops coutinhoi* (Lane, 1942).
Lutzomiops davisi (Snn. & Del P.), 1927.	*Corethrella* (*Lutzomiops*) *nigra* Lane, 1939.
Toxorhynchites (*Toxorhynchites*) *quadeloupensis* (Dyar & Knab, 1906).	*Toxorhynchites* (*Toxorhynchites*) *horei* (Gordon & Evans, 1922) and *Toxorhynchites* (*Toxorhynchites*) *tucumanus* (Brethés, 1926).
Toxorhynchites (*Toxorhynchites*) *theobaldi* (Dyar & Knab, 1906).	*Toxorhynchites* (*Toxorhynchites*) *hypoptes* (Knab, 1907).
Anopheles (*Arribalzagia*) *mediopunctatus* (Theobald, 1903).	*Anopheles* (*Arribalzagia*) *costalimai* Fonseca & Ramos, 1943 (in Coutinho).[2]

[1]The present paper was made possible through a grant from the John Simon Guggenheim Memorial Foundation, New York, U.S.A.

[2]The type is a male. The fourth hind tarsal has a single ring. The ninth tergite of male genitalia has two tapering prolongations which are not strongly curved. The inner lobe of claspette has three setae, the outer one two differentiated setae. As can be seen it shows characters of both *mediopunctatus* and *costalimai*. We deem that the characters given for the separation of these two species are not fixed but show variation within the species. For this reason we consider them synonyms.

Valid species	Synonyms
Culex (Lutzia) bigoti Bellardi, 1862.	*Culex (Lutzia) pattersoni* Shannon & Del Ponte, 1928.
Culex (Culex) delys Howard, Dyar & Knab, 1915. Here revalidated.	
Culex (Culex) dolosus (Arribalzaga, 1891).	*Culex (Culex) bilineatus* Theobald, 1903.
Culex (Culex) coronator Dyar & Knab, 1906.	*Culex (Culex) albertoi* Anduze, 1943.
Culex (Culex) apicinus Philippi, 1865.	*Culex (Phalangomyia) alticola* Martini, 1931.
Culex (Culex) articularis Philippi, 1865.	*Culex (Phalangomyia) archegus* Dyar, 1929.
Culex (Culex) corniger Theobald, 1903.	*Culex (Culex) rigidus* Senevet & Abonnenc, 1939 and *Culex (Culex) pseudojanthinosoma* Senevet and Abonnenc, 1946.
Culex (Culex) virgultus Theobald, 1901.	*Culex (Culex) declarator* Dyar & Knab, 1906.
Culex (Micraedes) conservator Dyar & Knab, 1906.	*Culex divisor* Dyar & Knab, 1906.
Culex (Melanoconion) nigrimacula Lane & Whitman, 1943.	*Culex (Melanoconion) punctiscapularis* Senevet & Abonnenc, 1946.
Culex (Melanoconion) fur Dyar & Knab, 1907. Here revalidated.	
Culex (Melanoconion) spissipes (Theobald, 1903).	*Culex (Melanoconion) chrysonotum* Dyar & Knab, 1908 and *Culex (Melanoconion) theobaldi* Lutz, 1904.
Culex (Melanoconion) albinensis Bonne-Wepster & Bonne, 1920.	*Culex (Choeroporpa) maroniensis* Bonne-Wepster & Bonne, 1920.
Culex (Melanoconion) pilosus (Dyar & Knab, 1906).	*Culex (Melanoconion) hesitator* Dyar & Knab, 1907.
Culex (Melanoconion) comminutor Dyar, 1920.	*Culex (Melanoconion) distinguendus* Dyar, 1928.
Culex (Melanoconion) thomasi Evans, 1924.	*Culex (Melanoconion) tournieri* Senevet & Abonnenc, 1939.
Culex (Melanoconion) clarki Evans, 1924. Here revalidated.	
Culex (Melanoconion) iolambdis Dyar, 1918.	*Culex (Melanoconion) equinoxialis* Floch & Abonnenc, 1945.
Culex (Melanoconion) nigrescens Theobald, 1907.	*Culex (Melanoconion) implicatus* Senevet & Abonnenc, 1939.
Culex (Melanoconion) vomerifer Komp, 1932.	*Culex (Melanoconion) portesi* Senevet & Abonnenc, 1941.
Uranotaenia pulcherrima Arribalgaza, 1891.	*Uranotaenia urania* Shannon & Del Ponte, 1928.

Valid species	Synonyms
Mansonia (Rhynchotaenia) nigricans (Coquillett, 1904).	*Mansonia (Rhynchotaenia) neivai* Lane & Coutinho, 1940.
Orthopodomyia fascipes (Coquillett, 1905).	*Orthopodomyia townsendi* Lima, 1935.
Psorophora (Psorophora) lineata (Humboldt, 1820).	*Psorophora (Psorophora) genumaculata*, Cruz, 1907.
Psorophora (Psorophora) howardii Coquillett, 1901	*Psorophora (Psorophora) simplex* Martini, 1935.
Psorophora (Janthinosoma) champerico (Dyar & Knab, 1906).	*Psorophora (?) pisces* Lassman, 1944.
Psorophora (Janthinosoma) ferox (Humboldt, 1820).	*Psorophora (Janthinosoma) fiebrigi* Edwards, 1922.
Aedes (Ochlerotatus) scapularis (Rondani, 1848).	*Aedes (Ochlerotatus) euplocamus* Dyar & Knab, 1906.
Aedes (Ochlerotatus) crinifer Theobald, 1903.	*Aedes (Ochlerotatus) iguazu* Shannon & Del Ponte, 1928.
Aedes (Ochlerotatus) milleri Dyar, 1922.	*Aedes (Ochlerotatus) oroecetor* Martini, 1931.
Aedes (Finlaya) argyrothorax Bonne & Bonne-Wepster, 1920.	*Aedes (Finlaya) terrens homeopus* Dyar, 1922.
Aedes (Howardina) fulvithorax (Lutz, 1904).	*Aedes (Howardina) tachirensis* Anduze, 1947.
Wyeomyia (Dendromyia) argenteorostris (Bonne-Wepster & Bonne, 1920).	*Wyeomyia albocaerulea* Senevet & Abonnenc, 1939.
Wyeomyia (Dendromyia) chalcocephala Dyar & Knab, 1906.	*Wyeomyia (Dendromyia) luciae* Senevet, Chabelard & Abonnenc, 1942.
Wyeomyia (Dendromyia) melanocephala Dyar & Knab, 1906.	*Wyeomyia (Dendromyia) grenadensis* Edwards, 1916.
Wyeomyia (Dendromyia) clasoleuca (Dyar & Knab, 1908).	*Wyeomyia (Dendromyia) agyrtes* Dyar & Knab, 1909.
Wyeomyia (Dendromyia) confusa (Lutz, 1905).	*Wyeomyia (Dendromyia) flui* Bonne & Bonne-Wepster, 1920.
Wyeomyia (Dendromyia) pseudopecten Dyar & Knab, 1906.	*Wyeomyia (Dendromyia) rorotae* Senevet, Chabelard & Abonnenc, 1942.
Sabethes (Sabethoides) chloropterus (Humboldt, 1820).	*Sabethes (Sabethoides) imperfectus* (Bonne-Wepster & Bonne, 1920).
Sabethes (Sabethinus) identicus Dyar & Knab, 1907.	*Sabethes (Sabethinus) lutzianus* Lane & Cerqueira, 1942.

The type material of the following species is unrecognizable: *Culex (Melanoconion) alcocci* Bonne-Wepster & Bonne, 1920; *Culex (Melanoconion) macaronensis* Dyar & Ñũnez-Tovar, 1927; and *Culex (Melanoconion) phlabistus* Dyar, 1920.

We have relegated to subspecific status the following species: *Toxorhynchites superbus* Dyar & Knab, 1906, and *Toxorhynchites separatus* Arribalzága, 1891, as subspecies of *Toxorhynchites haemorrhoidalis* (Fabricius, 1794; and *Anopheles* (*Kerteszia*) *laneanus* Corrêa & Cerqueira, 1944, as a subspecies of *Anopheles* (*Kerteszia*) *cruzi* Dyar & Knab, 1909.

The following subgenera are, by us, here placed as genera: *Lutzomiops* Lane, 1942, *Sayomyia* Coquillett, 1903, *Edwardsops* Lane, 1942, *Schadonophasma* Dyar & Shannon, 1924 and *Neochaoborus* Edwards, 1930.

We consider *Paradixa* Tonnoir, 1924 a synonym of *Dixella* Dyar & Shannon, 1924, *Isostomyia* Coquillett, 1906 a synonym of *Micraedes* Coquillett, 1905, and *Shannoniezia* Fonseca & Ramos, 1940 a synonym of *Arribalzagia* Theobald, 1903.

A NEW BUTTERFLY FROM CUBA

(Lepidoptera, Nymphalidae)

By Salvador Luis de la Torre y Callejas, *Matanzas, Cuba*

In their paper on the genus *Anaea* (Journ. N. Y. Ent. Soc., vol. XLIX, No. 4, pp. 328-329) Frank Johnson and Wm. P. Comstock fail to describe the winter form of *A. echemus* (West. & Hewit.), although they note that "there is a difference in the forewing shape noticeable in our series of specimens which suggests that this species also develops seasonal forms." The present writer has obtained numerous specimens collected in the month of January which differ greatly in the shape and coloring of the four wings from the specimens (of both sexes) collected in the same places during the summer months.

I shall, therefore, proceed to describe this new form of *Anaea* belonging to the Cuban fauna.

Anaea echemus form **aguayoi**, new form

(Text figures 1 and 2)

Holotype. Specimen number 3345 in the author's collection, from Ciudamar, Santiago de Cuba, Oriente, January 18, 1948, collected by Pastor Alayo Dalmau.

Paratype. A specimen in the collection of the American Museum of Natural History, collected by Brother Clemente on the road to the Laguna, Santiago de Cuba, Oriente, January 30, 1944. Several specimens belonging to the collection of the author, collected from Ciudamar and from the road to the Laguna in Santiago de Cuba, all collected by Pastor Alayo in the month of December in 1944 and in 1948. A specimen collected by the author at Punta de Sabanilla, on the north coast of Matanzas, January 1, 1951.

Distinctive characteristics. The forewings are angular toward the apex and not straight as in *echemus* proper, the summer form of this species. On the upper side the rust color of the wing base is generally paler than in the summer form and the tail of the M_3 vein of the hindwings is larger and somewhat flattened.

The brown striation characteristic of typical *echemus* is missing on the underside and there is a brown mark that extends from the middle of the costal margin to the middle of the inner margin of the forewings, presenting a salient angle toward the M_3. We find the same design on the underside of the hindwings.

The wing length is generally greater than in the summer form.

Considering the time of year in which this new form has been collected we esteem that it represents the winter form of this species, and dedicate it to Dr. Carlos Guillermo Aguayo, our revered Professor of Zoology at the University of Havana, in token of our regard and in recognition of his fruitful work there.

Text fig. 1, *Anaea echemus* f. *aguayoi* S. L. Torre, new form, Holotype, Ciudamar, Santiago de Cuba, Oriente, January 18, 1948, P. Alayo coll. (X½). Text fig. 2, *Anaea echemus* (West. & Hewit.), summer form, Los Practicos, Matanzas, July 23, 1942, S. L. de la Torre coll. (X½).

NEW WATER-STRIDERS FROM INSULAR AMERICA

(Hemiptera, Veliidae)

By Carl J. Drake, *Ames, Iowa*

This paper contains the description of two new species of water-striders of the genus *Velia* Latreille from Trinidad, British West Indies. The types of the new species are in the collection of the author.

Velia placida, new species

Winged form: Small, slender, brownish, moderately hairy, the posterior part of pronotum and hemelytral markings testateous. Head brown with hairs yellowish, the median impressed line almost concealed by pubescence and hairs; width across eyes, 0.60 mm. Antennae brown, shortly pilose, the basal segment with scattered long hairs; segment I longest, stoutest, moderately bowed; II much slenderer; III and IV slenderer than II, equal in both length and thickness; proportion—I, 33; II, 25; III, 27; IV, 27. Rostrum whitish testaceous, becoming darker apically, extending to middle of mesosternum.

Pronotum brown, coarsely pitted, the hind part testaceous and very coarsely pitted, the front lobe (save median area) clothed with silvery hairs; pubescence pale golden; disc considerably raised, convex; humeral angles with a moderately high, subcylindrical, erect protuberance on each side; posterior projection low, flat, not raised, testaceous, rounded at apex, very coarsely pitted; median longitudinal length slightly greater than width across humeri (51:45). Legs brown with coxae, trochanters and basal portion of femora pale testaceous, rather densely clothed with long pale brown hairs. Anterior femora with a pale testaceous band between middle and apex, armed beneath with two rows of closely-set brownish spinules; tibiae with subbasal and postmedian pale bands, beneath armed with numerous short teeth not arranged in very regular rows; second and third tarsal segments subequal in length in middle and hind legs of both sexes. Body beneath black-fuscous, clothed with writish or silvery hairs; connexiva brown with testaceous patches on segments broadly deeply roundly excavated behind; last ventral segment of female scarcely longer than the penultimate segment, about two-thirds as long as the penultimate in the male. Male parameres thin, curved downward apically, bladelike, the surface flattened.

Type (male), *allotype* (female) and one paratype (male), Trinidad, B. W. I., Oct. 27-29, 1938, C. J. Drake.

This pretty little species is distinctly shorter and has shorter appendages than *V. virgata* B.-White. The pits on the posterior lobe of the pronotum are unusually large and form large round holes, one row on each side and four deep behind at the middle. Although of similar shape and appearance, the parameres in *virgata* are longer and narrower apically. The very large pits on posterior part of pronotal lobe and male parameres also distinguish *V. placida* from *V. watsoni* Drake and *V. stagnalis* Burmeister.

Velia permista, new species

Small, moderately broad, brownish, pronotum largely testaceous, the legs testaceous with dark brown or dark fuscous bands. Head reddish brown with a median, impressed, longitudinal line. Eyes dark fuscous. Antennae brown, shortly pilose; segment I stoutest, long, curved, beset with scattered long hairs; II much slenderer, about one-fourth shorter; III and IV very long and slender (lost while studying specimen).

Pronotum almost entirely testaceous with brownish patches in front, without long hairs, deeply pitted, the pits larger and plainly visible back of humeri; humeri feebly raised, without protuberances, scarcely elevated between humeral angles; hind lobe testaceous, gradually almost obliquely narrowed posteriorly with apex rather broadly rounded, the pits numerous, very distinct but not very large; pronotum slowly narrowed anteriorly, broad in front. Legs moderately slender, testaceous, clothed with moderately long pale hairs, the dark brown or dark fuscous bands arranged as in *V. placida.* Abdomen thicker and slightly wider than in *placida,* dark fuscous with short golden pubescence; connexiva dark fuscous with testaceous patches behind sutures of segments, rounded apically, the sides testaceous.

Male genital segments broad, testaceous; basal segment short, deeply constricted near base, roundly produced behind, roundly excavated on each side. Parameres blade-like, rather short, narrowed apically, the lower edge concave, the upper side convex.

Type (male), Trinidad, B. W. I., Oct. 27-29, 1938, C. J. Drake.

This neat little species may be separated at once from *V. virgata* and *V. permista* by the almost flat pronotum with small pits and absence of humeral protuberances. The pronotum is hairy in *placida.* The male parameres are also different in all three species.

Velia virgata Buchanan-White

Velia virgata Buchanan-White, Journ. Linn. Soc. Lond., Zool. 14:484. 1879.

This species was described from Brasil. Specimens are at hand from Paraguay and Argentina. It is distinctly larger than either of the two species described above. The appendages are also longer, and the humeral knobs are smaller than in *placida.* Only macropterous specimens of *virgata* and the two species described above have been examined. All three of these species belong to the *V. stagnalis* Burmeister Group.

Specimens of *Velia stagnalis* Burm. have been examined from Ohio, Pennsylvania, Maryland, District of Columbia and Virginia. *V. watsoni* Drake occurs in Georgia, Florida and

Mississippi. The latter differs from *stagnalis* by the longer basal segment of antenna, more swollen pronotal disc, larger humeral protuberances and darker color. The male parameres of the five species of the *Velia stagnalis* Group are all blade-like in shape, but differ a little in the shape of the blade. The two new species described above show considerable difference in the shape of the blade as well as pronotal characters.

BOOK REVIEW

AMERICAN SOCIAL INSECTS, by Charles D. Michener and Mary H. Michener, University of Kansas. Cloth, 8 vo., 267 pp., 30 color figures, 71 halftone figures, Van Nostrand, 1951, $6.00.

This is the second book on insects or close relatives in "The New Illustrated Naturalist" series. Like its predecessor, Gertsch's "American Spiders," it maintains consistently high standards of readability and scientific exactitude coupled with a multitude of excellent illustrations from photographs in color and in black and white. The book is written on a level, and with sufficient introductory explanatory matter, to interest the educated layman and to answer many of his questions on the behavior and life history of social insects.

An introductory section of several chapters defines the various levels of social behavior in insects, and discusses such subjects as senses and learning in relation to behavior, sex and caste determination, and the origin of social life in the insects. Four succeeding parts, each of two or more chapters, discuss the biology of various kinds of social wasps, bees, ants and termites of the Americas in some detail. A final section contains one chapter on parasites and guests of social insects, and another pointing out similarities and differences between human and insect societies. The remaining pages consist of an appendix giving the reader a brief, elementary background of the morphology and classification of insects particularly of the Hymenoptera, a selected bibliography of some of the more important books or shorter papers on social insects, a glossary, and an index. Very few inaccuracies were noted in the book, the principal ones being the reversal of castes in figure 49, and the omission of the egg in figure 48.

Social insects excite perennial interest because of the similarities to our human society, and, of course, because of the very striking divergences from it. Many inquiries are received by the Bureau each year for information on social insects, and it is a boon to have so accurate and concise a book to recommend as this one by the Micheners.

KARL V. KROMBEIN
Bureau of Entomology & Plant Quarantine

THE OCCURRENCE OF CERTAIN PALAEARCTIC SPECIES OF MUSCOID DIPTERA IN THE UNITED STATES

By HAROLD R. DODGE, *Scientist (R), Communicable Disease Center, U. S. Public Health Service, Atlanta, Georgia*

Examination of 1948-49 trap collections from the Communicable Disease Center fly control project at Troy, N. Y., has revealed the presence of four species of flies which are commonly palaearctic in their occurrence. Two of these species, *Ophyra capensis* and *Muscina pabulorum*, have not been previously recorded from North America. The writer is indebted to C. W. Sabrosky, of the U. S. National Museum, for identification or verification of these species.

Ophyra capensis (Wiedemann). One male, Troy, N. Y., Sept. 1, 1949. This species is differentiated from *O. leucostoma* and *aenescens* by its greenish-black body color, and white squamae.

Muscina (*Pararicia*) *pabulorum* (Fall.). Numerous specimens from Troy, N. Y., May 6 to October 22, and Cecil, Ohio (H. R. Dodge, Oct. 10-11, 1950); 1 male, Vineyard Haven, Mass. (F. M. Jones, Rummel trap); 1 male, Hamilton, Mont., Aug. 18, 1949 (C. B. Philip, fly trap); 1 female, Phoenix, Ariz., April 6, 1950 (R. B. Parker, fly trap).

Muscina (*Pararicia*) *pascuorum* (Meigen). Numerous specimens from Troy, N. Y., May 3 to Nov. 11. This species was first discovered in the Nearctic Region by C. W. Johnson in 1922, and numerous specimens were recorded by him (1, 2, 3) from Maine, Quebec, Ontario, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, and Maryland. Subsequently, its spread appears to have been quite slow, and the following new records of single specimens are noteworthy: Nashville, Tenn., Aug. 1947 (H. R. Dodge, fly trap); Montgomery, Ala., July 25, 1947 (H. R. Dodge, fly trap); and Brookings, S. D., Oct. 1, 1943 (H. C. Severin, light trap). Both this species and *pabulorum* are keyed by Dr. M. T. James (4).

Sarcophaga melanura Meigen. Numerous specimens of both sexes taken at Troy, N. Y., May 4 to October 12. This species has also been recorded from Newfoundland by D. G. Hall (5). The male is recognized from the other species of Aldrich's "Group A" by the forceps which in lateral view are neither broad nor toothed, but slender and tapering to an acute apex. *S. melanura* is the genotype of *Bellieria* Robineau-Desvoidy, a generic name seldom recognized.

Fannia difficilis (Stein) is another interesting new North American record; two pairs were taken by a Rummel trap at Vineyard Haven, Mass., and submitted by Dr. F. M. Jones. The identification of this species was made by Dr. F. M. Snyder. *F. difficilis* is a close relative of *F. canicularis;* the females examined differed from that species by the much greater extent of the reddish-yellow coloration of the abdomen.

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THE STRATIOMYIDAE OF ALASKA

(DIPTERA)

BY MAURICE T. JAMES, *The State College of Washington, Pullman*

According to my records, only one species of Stratiomyidae has previously been reported from Alaska, namely *Beris annulifera* (Bigot), recorded by Coquillett (Proc. Wash. Acad. Sci., 2:406, 1900) from Sitka, Kukak Bay, and Popof Island. Any additional records from that area are, therefore, noteworthy. The specimens on which the new records are based were collected by entomologists of the Arctic Health Research Center at Anchorage, Alaska, and the Agricultural Experiment Station at Palmer, Alaska.

Beris annulifera (Bigot)

Oplacantha annulifera Bigot, 1887. Ann. Soc. Ent. France (6), 7:21

There is quite a little variation in the coloration in this species. The males of the Alaska specimens before me have the pile of the mesonotum and of the head predominantly black; consequently, they will trace to *californica* James in my key to the genus (Ann. Ent. Soc. Amer. 32:546, 1939). The genitalia of the two species, however, are quite different; in *annulifera* the terminal male tergite is truncate with the posterior angles strongly produced into spine-like processes which bend ventrally below the cerci; in *californica* these spine-like projections are lacking. The head pile of *californica* is longer, coarser, and more bushy; that surrounding the antennae is at least as long as the first antennal segment, and that on the lower part of the face is as long as the first two antennal segments combined. The face in *californica* is somewhat broader. The female of *californica* has not yet been discovered.

Because of the color variations, there seems to be little justification for accepting Johnson's varieties based on leg coloration as anything more than ecological or possibly Mendelian variants.

ALASKA. Previously recorded by Coquillett from Sitka, Kukak Bay, and Popof Island. Matanuska Valley, June 22 and 27, July 1, 1950 (C. O. Berg), 3♀♀, 3♂♂; Palmer, July 5, 1950 (R. H. Washburn), 1♀.

Sargus decorus alaskensis, new subspecies

Structurally, as in the typical form, but differing as follows. Antennae black. Ivory-colored spots on front usually separated by a distance as great as the diameter of an individual spot. Pile of front anterior to anterior ocellus mostly black in female, wholly black in male. Body more blackish than in the typical form; the thorax blackish-green dorsally, predominantly black laterally except along the notopleural suture and below the wing bases; abdomen black dorsally and ventrally. Wing distinctly clouded across the stigma and discal cell, this clouding only slightly evident in the male. Size variable, but in the specimens at hand averaging somewhat larger than in the typical form. Length, 7-10 mm.

Types. Holotype, female, Palmer, Alaska, July 5, 1950 (R. H. Washburn). Allotype, male, Matanuska Valley, Alaska, June 23, 1950 (C. O. Berg). Paratypes, 4 females, Palmer, Alaska, July 5 and 10, 1950 (Washburn); 4 females, Matanuska Valley, June 23, 28, and July 8, 15 1950 (Berg). Holotype and allotype in author's collection.

In coloration, except for the yellow legs, this subspecies resembles *S. cuprarius* more closely than typical *S. decorus.* The wing clouding is similar though not so distinct as in *cuprarius.* Structurally, however, it is clearly *decorus.* This applies particularly to the head structure of the female, which is quite different in the two species. In *decorus*, the frontal orbits posteriorly, that is, behind the anterior ocellus, are broad (one-fourth width of front at anterior ocellus), parallel-sided, and almost wholly glabrous; in *cuprarius* the orbits, though glabrous, are narrow (at their broadest not more than one-sixth to one-seventh width of front at anterior ocellus), but broaden somewhat toward the posterior ocelli and then become narrow again somewhat behind that plane. The front consequently presents a more strongly convex appearance posteriorly in *cuprarius.*

I believe *alaskensis* should be considered more than merely a melanic form of *decorus.* In the United States the species, according to my records, does not occur above 7,000 ft. altitude (Colorado) and higher altitude forms do not show the melanic characteristics of the Alaskan form.

Nemotelus (Melanonemotelus) nigrinus Fallén

1817. Diptera Suecica, Stratiomyidae, p. 6.

Final determination of the taxonomic status of the Nearctic species of *Melanonemotelus* depends on a thorough study of the forms involved. However, the following series seems to be conspecific with the European *nigrinus* and with Nearctic specimens which I have referred there.

ALASKA. Matanuska Valley, June 28, July 1, 8, and 15, 1950 (C. O. Berg), 12 ♂♂ ♀♀.

BOOK REVIEWS

INSECT NATURAL HISTORY, by A. D. Imms. Cloth, 8vo., 317 pp., 40 color plates, 32 black and white plates. Blakiston, 1951. $5.00.

The present volume is one in "The New Naturalist" series which has as its purpose . . . "to interest the general reader in the wild life of Britain by recapturing the inquiring spirit of the old naturalists." The late Dr. Imms was one of Entomology's able and inspiring teachers, and well-qualified to present the fundamentals of insect natural history to the lay public. He has done this in a very lucid and engaging manner, and the excellence of the text is complemented by the many superb illustrations in color and black and white. The thirteen chapters deal with such subjects as structure and metamorphosis, classification, flight, senses, feeding habits, biological control, galls, protective devices, reproduction, aquatic insects, and social life. The concluding pages contain a brief documentary appendix, distribution maps of eight insects in the British Isles, and an index.

This is an American reprinting of the English edition which was published in 1947. While the book deals almost exclusively with British insects, it should be of considerable use to the American reader—the fundamentals of entomology are the same the world over [only our interpretations of the facts vary], and most British insects have very close relatives in this country from the standpoint of both structure and behavior.

PARASITIC ANIMALS, by Geoffrey Lapage, Cambridge University. Cloth, 8 vo., 351 pp., 113 figs. Cambridge University Press, 1951, $4.00.

This book deals principally with the parasites of man and domesticated animals. The introductory chapters define the kinds of parasitic animals and discuss the different methods of host penetration and movement within the host. Succeeding chapters discuss in considerable detail representative life histories proceeding from the simple to the more complex; the effects of parasitic life on the parasite with emphasis on structural and physiological modifications; the effects of the parasites on their hosts as exemplified by tissue reactions and resistance, and secondary effect caused by loss of food or host tissue, intereference with physiological processes of the host and introduction of secondary pathogenic organisms; and the avoidance of parasitic animals by their hosts. A glossary is not included, but most scientific terms are defined the first time used, and page references to the definitions are included in the index. The many excellent text figures, some of them halftones, illustrate a number of parasites and diagram representative life histories.

The book is well written and should be useful to both the general reader and biologist. The only serious criticism we have is that it contains no documentation or terminal bibliography.

KARL V. KROMBEIN
Bureau of Entomology & Plant Quarantine

ENTOMOLOGICAL SOCIETY OF WASHINGTON 609TH REGULAR MEETING, MAY 3, 1951

The 609th regular meeting of the Entomological Society of Washington, held in room 43 of the U. S. National Museum Thursday, May 3, 1951 at 8:00 P.M., was attended by 40 members and 14 visitors. After the meeting was called to order by President Stone the following were elected to membership in the society:

Mr. Wm. C. Bargren, 2344—A Lindmont Circle N. E., Atlanta, Georgia.

Dr. Oswald Peck, Division of Entomology, Department of Agriculture, Ottawa, Canada.

Dr. Stone announced that the first Distinguished Service Award to be given an entomologist by the U. S. Department of Agriculture was to be awarded to C. F. W. Muesebeck on May 15th.

Curtis Sabrosky spoke on the death of William Procter, whom he described as retiring after early success in business to pursue his studies on insects and other interests. Dr. Procter is known for his work on the flora and fauna of Mount Desert Island and his contribution to the support of the Annals of the Entomological Society of America.

A. B. Gurney exhibited Oriental replicas of arthropods made from wire with thread covering, which he assumed to be of Japanese origin, and described little metal images of insects made by the former sword makers of Japan. Live tenebrionids covered with cloth are tied to coats as a decoration in Mexico, he said.

A note on the western dry-wood termite *Kalotermes minor* Hagen was presented by T. E. Snyder who received dealated adults, shed wings and pellets of increment of this species April 9th from a building at Niagara Falls, New York. It was reported that these termites had had flights in this building over a six-year period. *K. minor* occurs in California, Arizona and Mexico. Recently, 1948, this termite was found infesting the flooring of a church building at Cleveland, Ohio. In this latter case, there was evidence that the termite had been introduced in wooden chests from Mexico. This is another instance proving that dry-wood termites can live far outside of their natural range in furniture and the woodwork of heated buildings.

The first paper on the regular program was given by William H. W. Komp of the National Institutes of Health, Public Health Service, Bethesda, Maryland; it was entitled "A simple method of microdissection applicable to insect terminalia." Stainless steel insect-pins (No. 0) are inserted into wooden applicator sticks. The pins are ground to a fine point or a cutting blade by holding them against a suitable stone revolved at high speed by a small electric motor held in the hand. The grinding is done under visual control, under the low power of a binocular dissecting microscope. The resulting point may be finer than the diameter of a human hair. The applicator sticks with the inserted needles are imbedded in pyramids of modeling-clay placed one on each side of the stage of a dissecting microscope. The mounds of modeling-clay serve to support and steady the needles, but permit fine motion in any direction. The material to be dissected is macerated in NAOH solution, stained, dehydrated, and cleared in clove oil. Dissection is done in clove oil in the depression of a hollow-ground slide, against a white background. Powerful incident light is used for illumination. The method is applicable to any minute object or organism which requires microdissection. Primarily developed for dissecting the male terminalia of mosquitoes, it has been used for dissection of fleas, copepods, and similar small organisms. (Author's abstract.)

Richard H. Smith followed with a paper, "Some Notes on the Biology of *Lyctus planicollis* Leconte."

A technique has been developed which enables the egg of *Lyctus* to be studied more easily and with greater accuracy. Wood is cut to expose several pores longitudinally then covered with a thin cover of glass. A female may then be handled so that her oviposition activities are restricted to the glass-covered pores. The method of oviposition, the development of the egg, and the habits of the first instar larva have been observed and photographed by the use of this technique. A few studies of the habits of the beetle have resulted in the development of a procedure for rearing and collecting the beetle in large numbers. The use of freshly cut and seasoned oak or hickory limbwood as a culture medium seems best suited for rearing the beetle in large numbers. By placing similar wood on top of old infested culture wood from which emergence is taking place, the beetles can be collected very easily since they are attracted to the fresh wood. (Author's abstract.)

C. W. Sabrosky showed color pictures he took in Egypt on a trip to study fly identification there. He stated that there are 10 to 15 species of houseflies there instead of one as there is here.

The program concluded with a motion picture on grasshoppers prepared by the Bureau of Entomology and Plant Quarantine.

E. N. Cory presented several students who attended the meeting: Harry P. Cherigos, Wiliam S. Murray and T. M. Ezzat, visitors; Michele Williams and F. G. Favorite, who are members of the Society.

The meeting adjourned at 9:50 PM.

KELLIE O'NEILL, *Recording Secretary*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
610TH REGULAR MEETING, JUNE 7, 1951

The University of Maryland was host to the 610th regular meeting of the Entomological Society of Washington, held as a joint picnic with the Insecticide Society of Washington, 6:30 P. M. Thursday, June 7, 1951, on the campus at College Park. Approximately 150 members and visitors enjoyed the program of moving pictures and the ball game in which the Town Terrors swatted the Beltsville Bugs 16-10.

KELLIE O'NEILL, *Recording Secretary*

Actual date of publication of Vol. 53, No. 5, was October 26, 1951.

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PROCEEDINGS OF THE
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RECORDS AND DESCRIPTIONS OF FLEAS FROM PERU

(SIPHONAPTERA)[1]

BY ROBERT TRAUB, *Lt. Col., MSC, Department of Entomology, Army Medical Service Graduate School, Washington, D. C.*

Since the discovery of sylvatic plague in South America, considerable interest has been expressed in the flea fauna of the indigenous rodents. Macchiavello (1948) reported the occurrence of thirty-seven species of fleas in Peru, including three species previously reported by Fuller (1942). Jordan (1950), working on a collection of Peruvian fleas submitted as a result of a plague survey conducted by Dr. Macchiavello, listed five species not previously reported and, in addition, described four new species. The present paper lists records of nine species. Descriptions of three new species of *Agastopsylla* J. & R., 1923 are included, as is the description of the male of *Tetrapsyllus bleptus* (J. & R., 1923). As a result, the total number of species of fleas now known to occur in Peru is fifty.

The descriptions are presented first; the list of records follows, arranged according to a phylogenetic classification of the fleas involved. Most of these fleas were collected by O. P. Pearson and were received for study through the cooperation of Dr. Joseph Bequaert, of the Museum of Comparative Zoology, Harvard University, and Dr. H. S. Fuller, of the Harvard University Medical School. For purposes of convenience, pertinent records of fleas collected by C. C. Sanborn, of the Chicago Natural History Museum, are included at the present time.

Family HYSTHICHOPSYLLIDAE

Subfamily CTENOPHTHALMINAE

Agastopsylla pearsoni, new species

Figs. 1-10.

Types.—Holotype male and allotype female ex "*Chinchillula sahamae, Akodon pulcherrimus cruceri* or *Phyllotis pictus;*" PERU: Puno, Picotani, 15 Sept. 1941, coll. C. C. San-

[1]Published under the auspices of the Surgeon General, Department of the Army, who does not necessarily assume responsibility for the professional opinions expressed by the author.

born for the Chicago Natural History Museum; deposited in collections of that museum. A pair of paratypes with same data deposited in the British Museum (Natural History), Tring. A paratype male with same data in the author's collection.

Diagnosis.—Near *A. boxi* J. & R. 1923, from Argentina (the only species heretofore known in the genus), but readily separable as follows: Male seventh tergum with bristles above antepygidial bristle simple, in two and a half rows, undifferentiated from those of preceding rows, whereas in *A. boxi* the seventh tergum bears numerous closely-packed bristles. In the new species the distal arm of the male ninth sternum (fig. 5, *D.A.9*)[2] is definitely narrower, its breadth being distinctly smaller than the longest axis of the sensilium, instead of being markedly greater. The digitoid (fig. 4, *F.*) is also relatively narrower, i.e., more than three times as long (measured from insertion at base to apex) as broad, instead of but slightly more than twice as long as broad. The bursa copulatrix (fig. 7, *B.C.*) has its apex slightly curved caudad, whereas in *A. boxi* the apex is curved sharply forward as in the symbol for a question mark. In both sexes the preantennal region of the head (figs. 1 and 10) bears three or four ventromarginal bristles, not two.

Description. Male.—Head (fig. 1). Frontoclypeal margin evenly rounded. (Much less rounded in female, fig. 10.) With an anterior row of approximately four small bristles; a long bristle near antennal groove shortly behind this row; a longer bristle above vestigial eye. Ventral margin of head with two to four fairly long bristles, all an-

---

[2]Abbreviations: *A.A.R.*, Aedeagal apodemal rod. *A.B.*, Antepygidial bristle. *AE.A.*, aedeagal apodeme. *A.I.T.*, Armature of inner tube. *A.M.S.*, Apico-median sclerite of aedeagus. *AP.S.*, Apodemal strut of aedeagus. *A.S.*, Anal stylet. *B.C.*, Bursa copulatrix. *BV.S.*, Bivalve sclerite. *CR.*, Crochet. *C.S.*, Crescent sclerite of aedeagus. *D.A.L.*, Dorsal anal lobe of proctiger. *D.A.9*, Distal arm of ninth strenum. *D.L.P.*, Dorsal lobe of proctiger. *D.S.*, Dorsal lobe of apodemal strut. *F.*, Digitoid or movable finger. *H.F.*, Hoodflaps of aedeagus. *HL.*, Heel at base of aedeagal pouch. *L.L.*, Lateral lobes of aedeagus. *L.M.*, Lateral metanotal area. *L.S.*, Lateral ventral lobe of apodemal strut. *MB.*, Manubrium. *M.D.L.*, Median dorsal lobe of aedeagus. *MPM.*, Mesepimere. *MPS.*, Mesepisternum. *M.S.*, Submedian mesal lobe of apodemal strut of aedeagus. *MSN.*, Mesonotum. *MST.*, Mesosternum. *MTM.*, Metepimere. *MTN.*, Metanotum. *MTS.*, Metepisternum. *P.*, Immovable process of clasper. *P.A.9*, Proximal arm of ninth sternum. *PL.A.*, Pleural arch of metathorax. *P.R.*, Penis rods. *P.S.*, Proximal spur. *P.W.*, Wall of aedeagal pouch. *R.*, Dorsal ridge of lateral metanotal area. *S.I.T.*, Sclerotized inner tube. *SN.*, Sensilium. *SP.*, Spermatheca. *SPR.*, Ventral spur of aedeagus. *7S.*, Seventh sternum. *8S.*, Eighth sternum. *1T.*, First tergum. *8T.*, Eighth tergum. *9T.*, Ninth tergum. *T.AP.9*, Apodeme of ninth tergum. *TR.A.*, Trough of aedeagus. *V.*, Vesicle. *V.A.L.*, Ventral anal lobe. *V.L.P.*, Ventral lobe of proctiger. *V.R.*, Ventral ridge of lateral metanotal area.

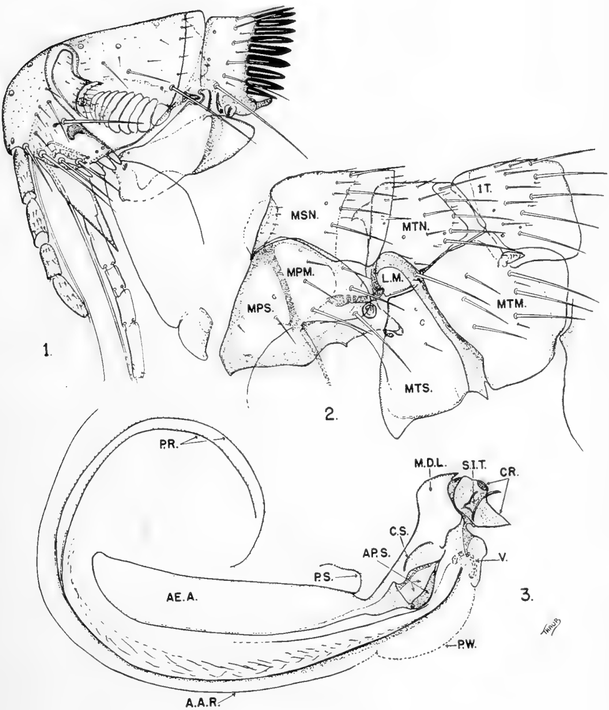

PLATE I. AGASTOPSYLLA PEARSONI

Fig. 1, head, male; fig. 2, thorax; fig. 3, aedeagus.

terior to genal ctenidium. Ctenidium of three to five (usually four) pale short spines, often difficult to see (four on one side and five on other in one specimen!). Maxillary lobe extending almost to apex of third segment of maxillary palpus. First maxillary palpal segment slightly longer than second. Labial palpi five-segmented, extending to near apex of foretrochanters. Scape of antenna with a few short proximal, median and apical bristles. Second antennal segment with bristles short, scarcely longer than the segment itself. Posterior margin of antennal groove distally bordered by a thin row of short hairs. Postantennal region with three long bristles above antennal groove (only two in one female); with one or two short bristles extending obliquely dorsad from the first of these; one or two similar small ones extending above the second; the marginal row complete, though all bristles small.

Thorax.—Pronotum with one row of bristles and a comb of about ten spines on a side; the longest spines about as long as pronotum. Mesonotum (fig. 2, *MSN.*) with two rows of bristles, the first much abbreviated and its bristles smaller. Mesonotal flange on each side with four pseudosetae. Mesepisternum (*MPS.*) with two caudal bristles and two very small ones near anterior margin. Mesepimere (*MPM.*) typically with six bristles arranged 3-3. Metanotum (*MTN.*) with two rows of bristles. Metepisternum (*MTS.*) apparently with three bristles. Lateral metanotal area (*L.M.*) distinct, about one and one-half times as high as broad; dorsal margin strongly convex; its ventral border not fused with metepisternum; with a long bristle at region where metanotum joins *L.M.* Lacking a pleural arch at junction of lateral metanotal ridge and pleural ridge (cf. fig. 23, *PLA.*). Metepimere (*MTM.*) of male usually with six long bristles arranged 3-3; in female with four long bristles (arranged 1-3).

Legs.—Procoxa with many lateral bristles scattered over entire length of segment. Meso- and metacoxae with relatively few such bristles and these marginal or submarginal. Coxae lacking mesal bristles. Profemora with one subapical ventral bristle and one submedian subproximal mesal small thin bristle. Meso- and metafemora with two or three subapical ventral bristles and one or two subproximal mesal bristles. Meso- and metatibiae (fig. 9, metatibia) with six dorsal notches bearing a pair of bristles, but apical (sixth) pair immediately above a third, inner, bristle; with a single dorsal bristle between the proximal second and third pairs, this flanked by a row of two subdorsal bristles; and, in addition, with ten to twelve lateral subdorsal bristles and with two or three small mesal median bristles.

Measurements of tibiae and segments of tarsi (petiolate base deleted) shown in microns for holotype:

		Tarsal Segments				
Leg	Tibia	I	II	III	IV	V
Pro-	120	39	43	32	28	76
Meso-	193	51	58	46	37	83
Meta-	244	174	115	66	42	85

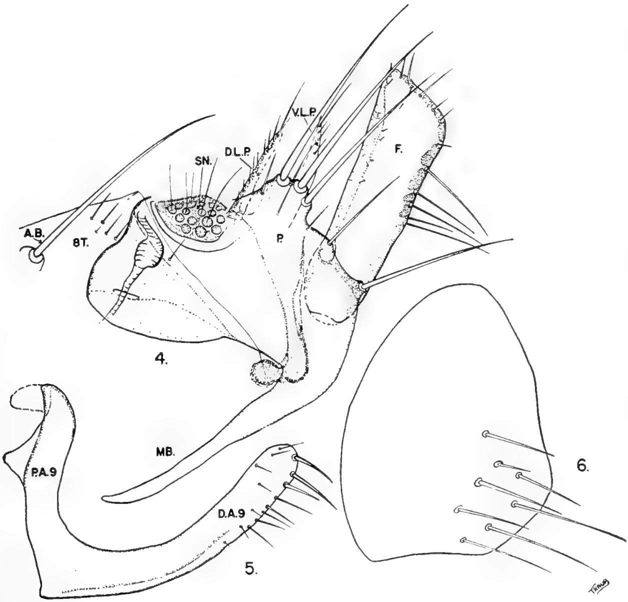

Plate II. Agastopsylla pearsoni

Fig. 4, claspers and tenth segment; fig. 5, ninth sternum; fig. 6, eighth sternum.

All apical tarsal bristles relatively short; only in hindtarsal segment II and at times in III does one extend beyond apex of next segment. Last segment of all tarsi with four pairs of lateral plantar bristles and a median small pair between those of first pair.

Abdomen.—First tergum (fig. 2, *1T.*) with two rows of bristles; a third row represented by but one or two bristles on a side. No lateral bristles on basal sternum. With an almost vestigial subdorsal tooth on each side of terga II. Typical terga with two complete rows of bristles (second extending to about level of lanceolate spiracles); with two or three anterior subdorsal bristles representing third row. Typical sterna with two or three subventral bristles on a side.

Modified Abdominal Segments. Male.—Eighth tergum (fig. 4, *8T.*) dorsally reduced to an area between antepygidial bristle (*A.B.*) and sensilium (*SN.*); with a few small thin bristles near fairly large spiracle. Eighth sternum (fig. 6) subovate, large, extending dorsad to about level of unmodified spiracles; with about eight bristles, all on ventrocaudal third or quarter.

Immovable process of clasper (fig. 4, *P.*) short, broad, rounded; caudal margin sinuate; with three long apical bristles preceded by two or three small ones (only two apical bristles in one paratype); with a single acetabular bristle near caudal margin of digitoid at point of insertion. On only *one* side, in both holotype and one paratype, with an additional marginal bristle between apical three and acetabular bristle. Digitoid or movable finger (*F.*) elongate-oblong, nearly four times as long as broad at maximum; obliquely truncate at apex; proximally somewhat narrowed, especially in one paratype; anterior upper angle extending farther distad than posterior upper angle, the latter more rounded; apical margin with six small bristles, that at midpoint longest; caudal margin usually with five or six longish bristles, uppermost near four-fifths mark.

Ninth sternum (fig. 5) boomerang-shaped; proximal arm (*P.A.9*) slightly shorter than distal arm, of approximately same width; with a prominent, lightly sclerotized lateral triangular expansion on apical half; proximal arm about three and one-half times as long as broad at triangle. Distal arm of ninth sternum (*D.A.9*) rounded distally; with a ventral row of about seven bristles, of which distal one or two are quite stout; an additional stout bristle at apex; with a few scattered smaller thinner bristles, of which about two are subapical, near dorsal margin.

Aedeagal apodeme (fig. 3, *AE.A.*) long, the portion between apex of apodeme and the well-developed proximal spur (*P.S.*) about five times as long as broad; apex subrounded. Wall of aedeagal pouch (*P.W.*) lightly sclerotized but apparent. Median dorsal lobe (*M.D.L.*) strongly arched subapically. Sclerotized inner tube (*S.I.T.*) short, relatively unmodified, oblique, ventral lip extending apicad of dorsal, and curving ventrad. Crochets (*CR.*) quite large, flanking the sclerotized inner tube and extending well above it to near median dorsal lobe and as far below it; the ventral extension subacuminate. What may be the homologue of peglike sclerotization of more typical crochets (as in Ceratophyllids) is

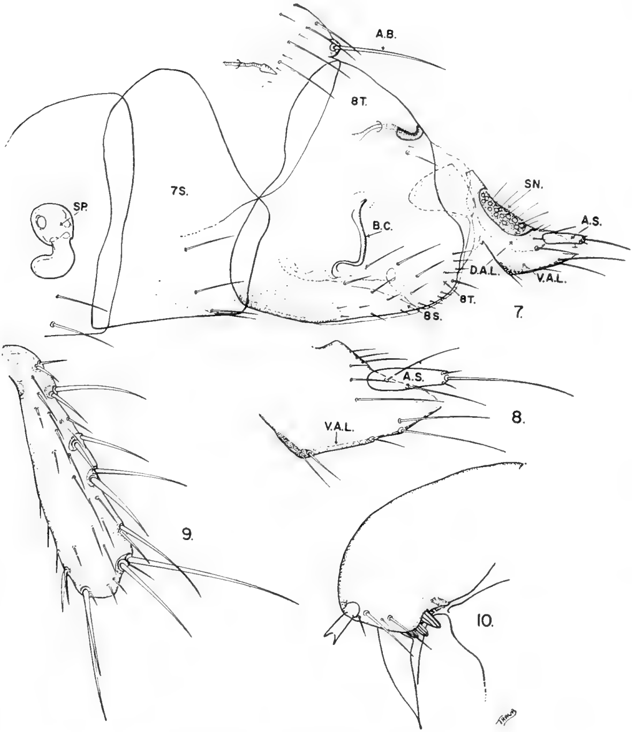

PLATE III. AGASTOPSYLLA PEARSONI

Fig. 7, modified abdominal segments, female; fig. 8, ventral anal lobe and anal stylet; fig. 9, metatibia, male; fig. 10, outline of head, female.

in this case apical, at apex of sclerotized inner tube. Crescent sclerite (*C.S.*) conspicuous above well-developed apodemal strut (*A.P.S.*). Penis rods (*P.R.*) uncoiled, fairly long. Aedeagal apodemal rod (*A.A.R.*) present, arising from base of aedeagus. Vesicle (*V.*) apparent at apex of penis rods (when *in situ*), but weakly sclerotized.

Tenth abdominal segment with dorsal lobe of proctiger (fig. 4, *D.L.P.*) very long and narrow; with dorsal portion fairly well sclerotized and with a dorsomarginal fringe of bristles, of which the apical one is relatively long; ventral lobe of proctiger (*V.L.P.*) subparallel to dorsal and equally long and narrow, with ventromarginal subapical and apical bristles; sensilium (*SN.*) fairly flat, with about sixteen sensory pits on a side.

Female (fig. 7).—Seventh sternum (*7S.*) with ventral half of caudal margin slightly convex dorsally and ventrally, its major portion fairly straight, ventral margin thickened. Seventh sternum apparently with but four bristles, of which two are ventromarginal. Eighth tergum (*8T.*) very long; ventral margin anteriorly thickened; with two bristles (one greatly reduced) beneath the vermiform, curved spiracle; subventral portion with six relatively small bristles and, in addition, three much smaller ones; a ventromarginal row of six equally short bristles; caudal margin with four or five fairly small bristles. Eighth sternum (*8S.*) weakly sclerotized, fairly long, somewhat narrowed apically; without bristles. Anal segment well separated from eighth tergum. Dorsal anal lobe of proctiger (*D.A.L.*) weakly sclerotized, with two or three small thin dorsomarginal bristles, a longer one mesad to stylet, one or two short median ones and a longer ventral bristle. Anal stylet (*A.S.* and fig. 8) about four times as long as broad; with a long apical bristle flanked by a short dorsal and ventral bristle. Ventral anal lobe (*V.A.L.*) weakly sclerotized, except for ventral margin; angled; with two relatively short bristles at angle, two longer subapical bristles, and a shorter marginal one between the two sets; the paratype with three more marginal bristles and also with three apical long bristles (lacking in allotype). Spermatheca (*SP.*) lying in an abnormal, turned position but with a relatively rounded large head, which probably bears a dorsal hump, and with tail somewhat longer than head. Bursa copulatrix (*B.C.*) in the main shaped like a slightly crooked finger.

Remarks.—The species is named for O. P. Pearson, to whom I am indebted for collecting much of the material discussed in this paper.

The species is apparently highly variable, as can be seen from the description.

Agastopsylla nylota, new species

Figs. 11-16.

Type. — Holotype, male, ex "*Eligmodontia* sp., *Akodon jelskii* or *Phyllotis darwini.*" PERU: Dept. Junin, Carhuamayo, elev. 14,500 ft., 22 Feb. 1946, coll. C. C. Sanborn for

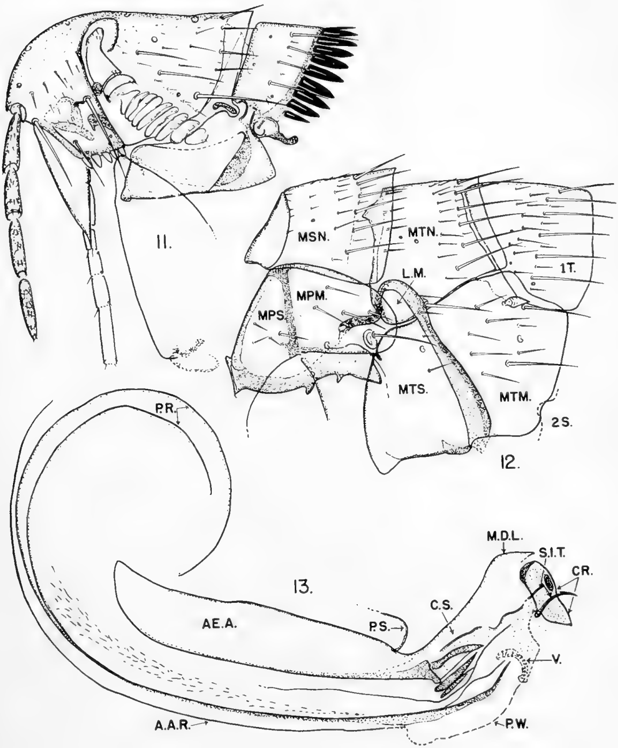

PLATE IV. AGASTOPSYLLA NYLOTA

Fig. 11, head, male; fig. 12, thorax; fig. 13, aedeagus.

the Chicago Natural History Museum. (No other specimen known.) Deposited in collections of the Chicago Natural History Museum.

Diagnosis.—Near *A. pearsoni* sp. nov., but readily separated as follows: Digitoid *F.* (fig. 14) longer, apically upturned and somewhat pointed, not truncate (fig. 4, *F.*). Crochet of aedeagus (fig. 13, *CR.*) about three times as long as broad, not twice (fig. 3, *CR.*). Male eighth sternum (fig. 16) with eleven bristles, not eight (fig. 6). The shape of the digitoid and the absence of the patch of bristles on the seventh tergum serve to distinguish this species from *A. boxi* J. & R. 1923.

The following description stresses only differences from *A. pearsoni.* Head (fig. 11) with preantennal region bearing an anterior row of six very small bristles, two large ventromarginal bristles, and a long bristle inserted above the vestigial eye. Vestigial genal ctenidium consisting of four or five very pale spines. Postantennal rows of bristles arranged 2-4-5, the ventralmost the longest in each instance. Mesonotum (fig. 12, *MSN.*) with three rows of bristles, the first very incomplete. Mesepisternum (*MPS.*) with three small bristles and a somewhat larger fourth near ventrocaudal angle. Metepimere (*MTM.*) with bristles arranged 5-5, of which apparently second and fourth bristles in last row smaller than others. Meso- and metatibia with five dorsal notches bearing a pair of bristles; with a single short dorsal bristle between the second and third pairs; and two single bristles between the fourth and fifth (apical) pairs, the ventralmost of these single bristles much longer than the uppermost; with fourteen or fifteen small lateral bristles near this dorsal margin; with five such lateral bristles near ventral (apparent anterior) margin, all distad of midpoint.

Measurements of tibiae and segments of tarsi (petiolate base deleted) shown in microns:

		Tarsal Segments				
Leg	Tibia	I	II	III	IV	V
Pro-	138	46	42	37	32	78
Meso-	230	74	64	51	37	83
Meta-	295	207	124	75	46	83

First tergum (fig. 12, *1T.*) with three rows of bristles. Typical terga with three rows of bristles, the first row incomplete. Eighth sternum (fig. 16) with eleven bristles, all on ventrocaudal third. Immovable process of clasper (fig. 14, *P.*) with two long apical bristles, between which a smaller intermediate marginal bristle and an equally small submarginal one. Digitoid or movable finger *F.* nearly five times as long as broad; apex somewhat crooked, inclined cephalad; caudal margin with a longish bristle near midpoint and an equally long bristle above and below it, with one or no shorter proximal birstle and about four short, more distal bristles; subapically with about three bristles, one of which may be long (the two sides varying somewhat regarding chaetotaxy).

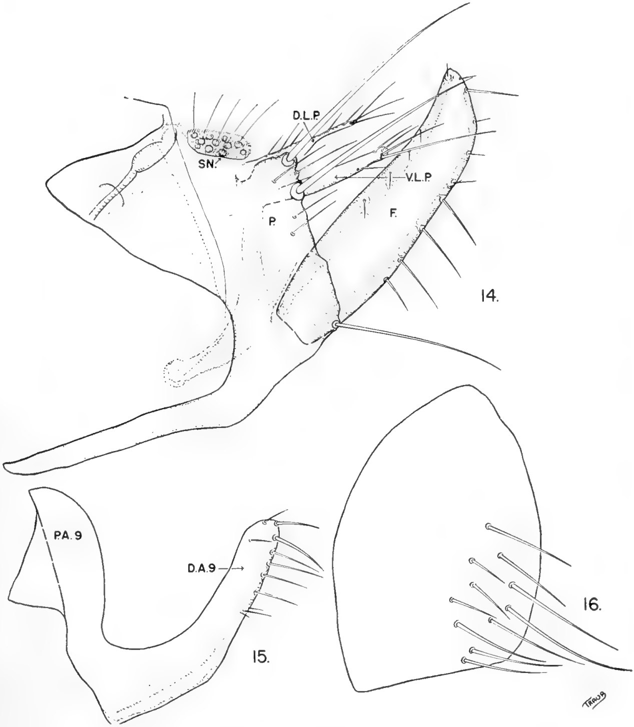

PLATE V. AGASTOPSYLLA NYLOTA

Fig. 14, claspers and tenth segment; fig. 15, ninth sternum; fig. 16, eighth sternum.

Ninth sternum (fig. 15) with proximal arm (*P.A.9*) slightly longer than distal arm; proximal arm only about two and one-half times as long as broad at lateral subapical angulate expansion. Distal arm of ninth sternum with about eight or nine fairly long marginal bristles, of which apical one or two are slightly thicker than the others. Aedeagus (fig. 13) essentially of same type as in *A. pearsoni* new species, but with crochet (*CR.*) with longitudinal axis fairly straight and nearly three and one-half times as long as broad.

Agastopsylla hirsutior, new species

Figs. 17-21.

Type.—Holotype, female, ex *Akodon* (*Chroeomys*) *pulcherrimus.* PERU: Caccachara, 50 miles southwest of Ilave, elev. 16,000 ft., 5 Oct. 1946, coll. O. P. Pearson. (No other specimen known.) Deposited in collections of Chicago Natural History Museum.

Diagnosis.—Separated from all known species by the fact that the metatibia (fig. 20) bears a total of about twenty-two lateral and/or subdorsal bristles (in addition to the marginal dorsolateral bristles, which are usually large and paired) instead of a maximum of fifteen (fig. 9). Also unique in the presence of three and one-half rows of bristles on the typical abdominal terga. In *A. boxi* J. & R. 1923 there are three rows on the abdominal terga, although the anteriormost have a few extra bristles, while the three other species known have but two and one-half rows of bristles. Further distinctive in that the ventral portion of the eighth tergum (fig. 21, *8T.*) bears ten or twelve long bristles (excluding marginals), not a maximum of five or six (fig. 7). The upward sweep of these long bristles, on the ventral portion of the eighth tergum, is also diagnostic. The caudad-directed crook of the bursa copulatrix (fig. 21, *B.C.*) readily distinguishes this new species from *A. boxi.*

Description.—(Only differences from *A. pearsoni* are included). Head (fig. 17) with two small bristles at base of maxillary palpus. Preantennal region with only two long ventromarginal bristles, one of these near anterior portion of insertion of maxillary lobe, the other near insertion of labium. Genal ctenidum of five spines, the fifth, nearest the genal lobe, even paler than the others and very difficult to see. Mesonotum (fig. 19, *MSN.*) with four rows of bristles, the first two of which are incomplete. Mesonotal flange with five pseudosetae on each side. Mesepisternum (*MPS.*) with five or six bristles. Mesepimere (*MPM.*) with seven or eight bristles. Metanotum (*MTN.*) with three rows of bristles; a fourth row represented by about two bristles. Metepisternum (*MTS.*) apparently with about seven bristles near upper caudal margin, most small. Metepimere (*MTM.*) with about ten or eleven bristles, three or four of which are small. Metatibia with about twenty-two bristles scat-

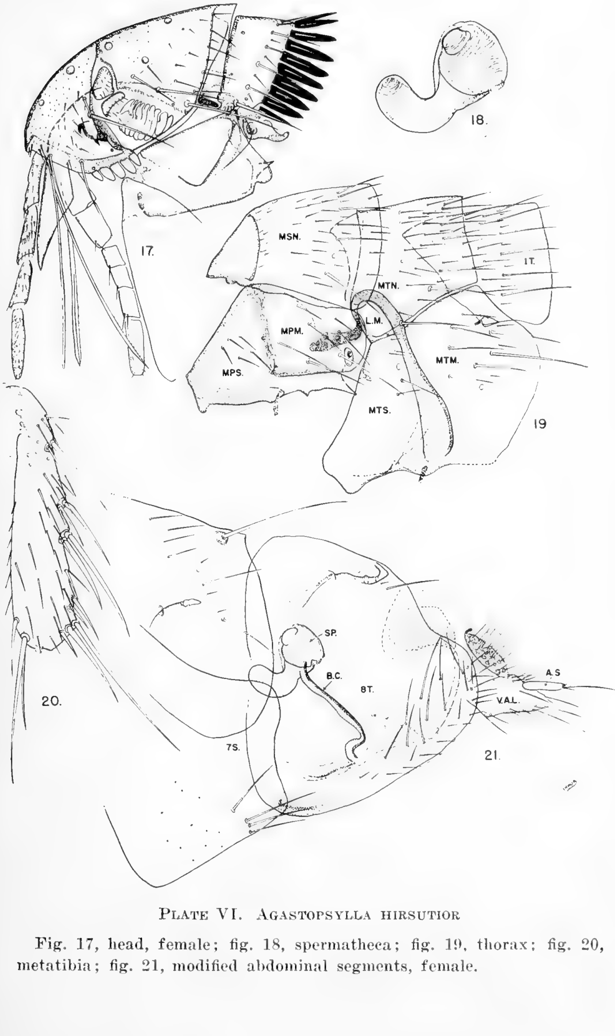

PLATE VI. AGASTOPSYLLA HIRSUTIOR

Fig. 17, head, female; fig. 18, spermatheca; fig. 19, thorax; fig. 20, metatibia; fig. 21, modified abdominal segments, female.

tered over the lateral surface, but proximo-anterior bare. Measurements of tibiae and segments of tarsi (petiolate base deleted) shown in microns:

		Tarsal Segments				
Leg	Tibia	I	II	III	IV	V
Pro-	138	47	51	37	33	78
Meso-	253	87	83	55	37	87
Meta-	320	220	138	96	51	96

First tergum (*1T.*) with three rows of bristles; a fourth row indicated by a few additional bristles. With seven to eleven bristles per side in third row of bristles on typical terga. Typical sterna with six to eight bristles, of which two or three are usually quite small and inserted cephalad to the larger ones. Seventh sternum (fig. 21, *7S.*) with dorsal half of caudal margin concave; ventral half with a short dorsal lobe, remainder of margin slightly concave. Seventh sternum with three or four fairly long bristles in a row near ventral margin. The ten or twelve fairly long subventral bristles on the eighth tergum (*8T.*) roughly arranged in two longitudinal rows. Ventral anal lobe (*V.A.L.*) with marginal bristles arranged as follows: one at anterior angle, one fairly adjacent, one at midpoint, one at three-fourths mark, one subapical (the longest); with a submarginal bristle above that at midpoint and that near apex. Spermatheca (*SP.* and fig. 18) with a distinct broad dorsal hump; the head slightly subovate, broadest subdorsally; tail somewhat longer than head, upturned, but not appreciably extending further dorsad than head.

The name was suggested by the fact that this species is characterized by possessing a relatively greater number of bristles than do the other known forms.

Comment on the Genus Agastopsylla J. & R., 1923.

Although in the original description, *Agastopsylla* Jordan & Rothschild (1923) was stated to be near *Neotyphloceras* Roths., 1909, it is felt that the genus is closer to *Ctenophthalmus* Kolenati, 1856. In both genera the lateral metanotal area is comparatively tall and is convex dorsally; the female eighth tergum is comparatively very long; the anal segments of the female are essentially similar; the male claspers and ninth sternum are of the same type, even as to the insertion of the digitoid; the eighth sternum is relatively unmodified, and is rather broad. The aedeagus of *Agastopsylla* resembles that of *Ctenophthalmus*, which has been described and figured by Traub (1950). Thus, the sclerotized inner tube is hardly armored, is only somewhat oblique in position, its sides subparallel and flanked by large crochets which are broader than long, the crochets not projecting distad of the endchamber. In *Agastopsylla*, however, the dorsal rib of the aedeagal apodeme projects caudad as a proximal spur, instead of the lateral plates being dorsally arched and fused into a sail. The genal ctenidium of *Agastopsylla* also reminds one of *Ctenophthalmus,* although in the former genus it is more oblique and contains four or five spines, not just three. The fact that in *Agastopsylla* the spines are very short and pale and are variable in number, at times differing on opposite sides of an individual, suggests that there is an evolutionary tendency in the genus towards complete reduction of the comb. The key published by Jordan (1948) was not meant to include all the New World genera; nevertheless *Agastopsylla* therein can be readily run down to what is designated as the family Ctenophthalmidae, subfamily Ctenophthalminae. It is emphasized that Jordan did not mention any of the above characters in the key. Dr. Jordan (*in litt.*) has kindly stated that he considers these genera to be in the same subfamily (Ctenophthalminae), but in different tribes.

In many respects the thorax of *Agastopsylla* closely resembles that of *Anomiopsyllus* Baker, 1904, and its allies (*Conorhinopsylla* Stewart, 1930, *Megarthroglossus* Jordan and Rothschild, 1915, *Callistopsyllus* Jordan and Rothschild, 1915, and *Stenistomera* Rothschild, 1915). In the Anomiopsyllini the metepimere is partially fused with the metanotal collar, and this is also usually the case with *Agastopsylla*. As in the Anomiopsyllini, in *Agastopsylla* there is a reduction in the number of bristles and spines, and in the size of the eye, as compared with many other genera in the family. The labial palpi and mouthparts, on the other hand, are relatively elongate. These features are considered as examples of convergent evolution rather than as indicative of close relationship with *Anomiopsyllus* and allies, and it is believed that all of these fleas are forms that characteristically inhabit the nests of the hosts, and are adapted accordingly.

Tetrapsyllus bleptus (Jordan and Rothschild, 1923)

Figs. 22-27.

Parapsyllus bleptus Jordan and Rothschild, 1923, Ectoparasites 1: 368-369, 370, fig. 383. Dalla Torre, 1924, Catal.: 18.

Tetrapsyllus bleptus Jordan, 1931, Novit. Zool. 37: 135. Jordan, 1942, Eos. 18: 10. Jordan, 1942, Rev. Inst. Bacteriology, Malbran, 10 (4): 421. Costa Lima and Hathaway, 1946, Monog. Inst. Oswaldo Cruz, No. 4: 148.

Although five species of *Tetrapsyllus* Jordan 1942 have been described, the males of only two are known. The male of *T. bleptus* is here described and figured for the first time.

Type.—Allotype, male, ex *Phyllotis arenarius;* PERU: Caccachara, 50 miles southwest of Ilave, elev. 16,000 ft., coll. O. P. Pearson, 5 Oct. 1946. Deposited in collections of Chicago Natural History Museum.

Description.—*Head* (fig. 22).—Clypeal tubercle vertical, acutely triangular; apex hardly projecting beyond margin, its groove well sclerotized. Micropunctations thinly scattered over most of preantennal region above eye and over virtually all of postantennal region except near ventrocaudal angle. Preantennal region with a row of about nine ventromarginal bristles extending from base of maxillary lobe to apex of gena; that near maxillary lobe by far the longest—reaching well beyond apex of second segment of maxillary palp. With two small bristles at anteroventral angle of head, below labrum. With a long bristle along antennal groove, above eye; a slightly shorter bristle at anterior angle of eye; this last one accompanied by two or three much smaller bristles. Labial palpi extending slightly beyond apex of forecoxae. Pigmented portion of eye with an excised median ventral portion; upper anterior margin slightly concave or straight. Scape of antenna with a row of anteromarginal or submarginal small thin bristles, one or two such bristles submedian; another row along apical margin. Second antennal segment with some bristles which reach beyond center of club. Postantennal region with a long bristle just above center of fringe of row of bristles bordering antennal fossa; a longer bristle near ventrocaudal angle; a row of bristles along caudal margin of head, the row including small intercalary bristles. Pronotum with a row of six or seven long bristles and intercalaries; ratio of length to height 7:9 (including flange); with a subdorsal mesal pseudoseta on each side. Mesonotum (fig. 23, *MSN.*) with three rows of bristles, those in last row the longest and accompanied by intercalaries; the first two rows abbreviated: flange with five or six mesal pseudosetae on each side. Mesepisternum (*MPS.*) with two bristles, one much larger than other, near ventrocaudal corner. Mespimere (*MPM.*) with two long bristles near ventral margin; one of these adjacent to subovate spiracle. Mesosternum (*MST.*) with a relatively large unsclerotized area immediately below mesepisternum. Metanotum (*MTN.*) with two rows of bristles, the first row quite short. The second with intercalary small bristles between the long ones. Lateral metanotal area (*L.M.*) more than one and one-half times as long as broad; its longest diameter vertical; slightly narrowing ventrally; its dorsal ridge (*R.*) well sclerotized: its ventral ridge (*V.R.*) weak but distinct; metepisternum (*MTS.*) lacking the internal tubercle or squamulum present in so many fleas; with a single submedian bristle. Pleural arch (*PL.A.*) strongly and somewhat acutely convex, forming a socket-like arrangement for the rod separating the metepisternum and metepimere. With three to seven bristles on metepimere (*MTM.*) (three and five in holotype), excluding one or two very small ones near cordate-shaped spiracle in Junin male but not in allotype. Measurements of tibiae and segments of tarsi of allotype (petiolate base deleted) shown in microns:

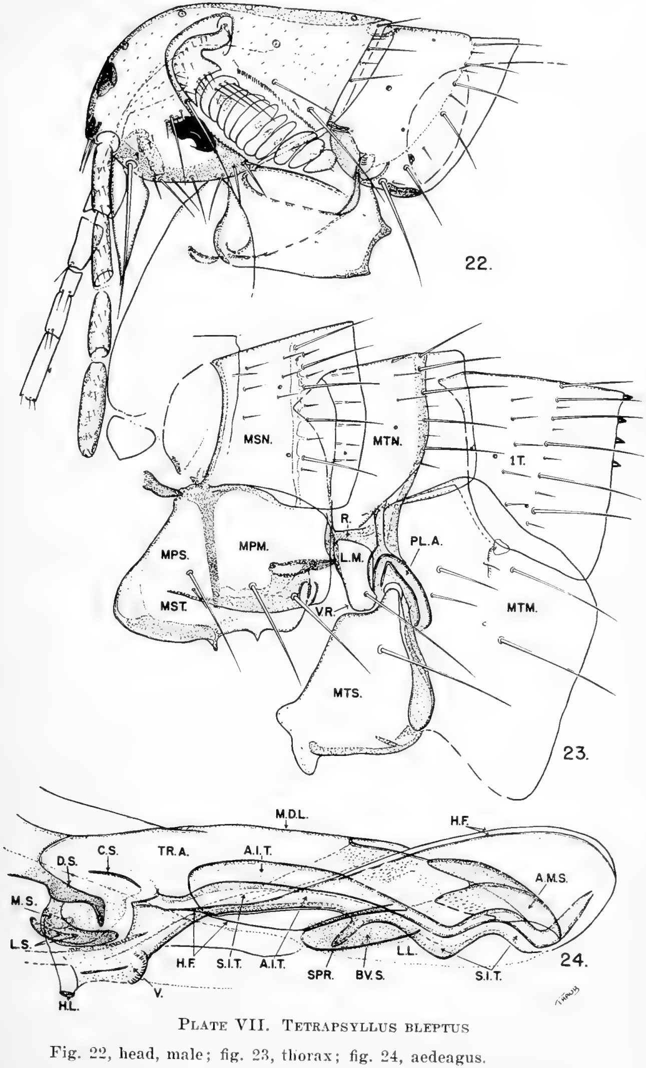

PLATE VII. TETRAPSYLLUS BLEPTUS

Fig. 22, head, male; fig. 23, thorax; fig. 24, aedeagus.

		Tarsal Segments				
Leg	Tibia	I	II	III	IV	V
Pro-	161	51	59	42	37	83
Meso-	220	92	92	55	42	87
Meta-	300	207	138	78	46	92

Abdomen.—First tergum (fig. 23, *1T.*) with two rows of bristles and four small apical teeth on each side. Basal sternum with seven to eleven small thin bristles per side. Typical terga with both rows of bristles extending ventrad slightly below level of spiracle; the bristles of second row long and slender. Typical sterna apparently with a row of three to six or seven bristles, with a few small bristles in front of the row. With a single long antepygidial bristle (fig. 25, *A.B.*).

Modified Abdominal Segments (fig. 25).—Eighth tergum (*8T.*) relatively small (as compared with Ceratophyllids), extending caudad to level of center of the fairly straight sensilium (*SN.*) and ventrad to level of subglobular seventh spiracle. Eighth sternum (*8S.*) large, unmodified, extending caudad to beyond angle of ninth sternum and dorsad to about level of seventh spiracle; with apparently at least twelve bristles, of which the caudalmost four or five are longer than the others; most bristles on ventral fifth of segment, and only one as far dorsad as near base of manubrium.

Immovable process of clasper (*P.* and fig. 27) broad, somewhat rounded; with two subapical long bristles, two slightly longer marginal bristles above base of digitoid, probably representing the acetabular bristles (in mesal aspect of Junin male, these bristles well separated, as drawn, but on other side and in allotype, they are separated only by a distance equal to diameter of their bases); with three to five long thin marginal bristles below these, and a row of five smaller bristles along margin, at base of manubrim; with about four dorsomarginal and three or four submarginal or subdorsal bristles; with two small apical bristles; with two or three submedian bristles below the above and and with a few scattered small bristles near the sclerotized notch at apical third of caudal margin. Movable finger or digitoid (*F.* and fig. 27) subconical, very slightly crooked apicad; nearly four times as long as broad at midpoint; anterior margin somewhat sinuate, posterior margin with a row of about eight thin bristles, widely spaced except for the two or three subapical; with about five or six mesal and two or three lateral smaller, median bristles. Manubrium (*MB.*) gently curved, apex broadly rounded. Ninth tergum (*9T.*) quite reduced, but broader than its apodeme (*T.AP.9*).

Ninth sternum roughly boomerang-shaped; its proximal arm (*P.A.9*) narrowed near base, but apically broadened and somewhat bifid, the upper branch broad, the lower subacuminate. Distal arm of ninth sternum (*D.A.9* and fig. 26) long and narrow, gradually narrowing apically from midpoint on, with a ventral (apparently caudal) marginal row of fairly long thin bristles; apical half with dorsomarginal and median small thin lateral bristles.

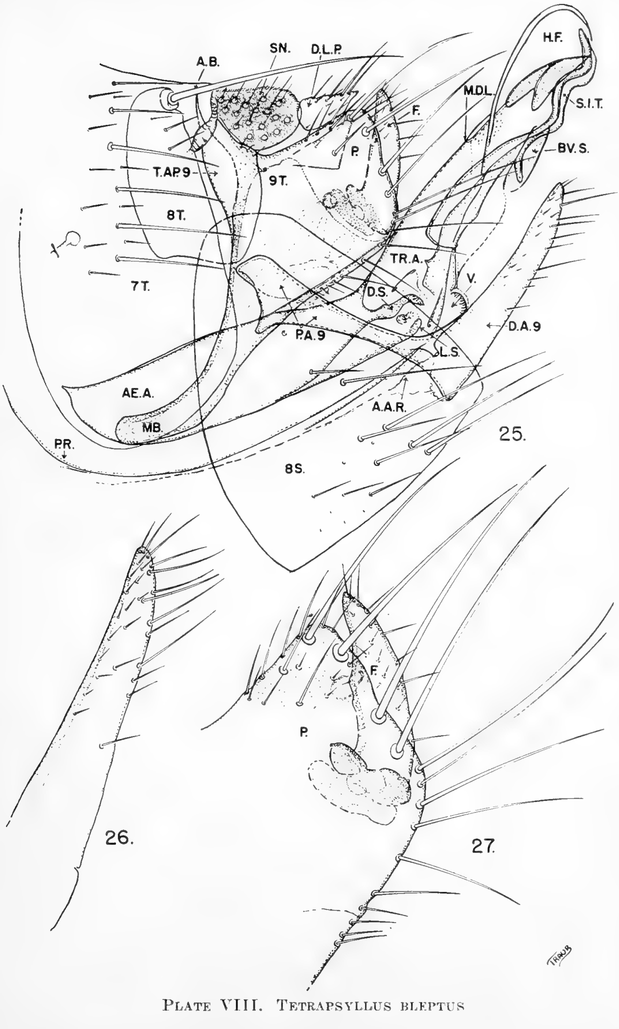

PLATE VIII. TETRAPSYLLUS BLEPTUS

Fig. 25, modified abdominal segments; fig. 26, distal arm of ninth sternum; fig. 27, process and digitoid of clasper.

The aedeagus is so unlike that of described fleas that it is best discussed by considering the organ as being a highly modified type but one that can be nevertheless homologized to a certain extent with *Polygenis* (vide Traub, 1950, pp. 65 and 105, plate 38, fig. 5 and plate 39, fig. 1). Aedeagus proper greatly elongated, the portion distad of the apodemal strut (*L.S.*, *D.S.*, and fig. 24) as long as the aedeagal apodeme (*AE.A.*). Trough (*TR.A.*) of endchamber broad and distinct as it extends proximad of narrow crescent sclerite (*C.S.*). Lateral lobes (*L.L.*) so weakly sclerotized as to be virtually inapparent. Median dorsal lobe (*M.D.L.*) almost straight, not strongly arched apically, bifid subapically and distally produced on each side as a long stout saggitate sclerite, the apico-median sclerite (*A.M.S.*), which is somewhat talon-shaped and downcurved, its apex flanking the sclerotized inner tube. Crochets apparently lacking. The endchamber covered by a conspicuous pair of hoodflaps (*H.F.*) which extend on each side apicad and far dorsad of the apex of the sclerotized inner tube (*S.I.T.*), the dorsal arch of the flap suggesting in appearance the median dorsal lobe of true Ceratophyllid fleas. The flaps extend far proximad to near base of inner tube on each side as an acuminate lobe. Sclerotized inner tube remarkable, serpentine; apical half doubly sinuate; extending virtually entire length of endchamber; dorsal margin extending beyond *A.M.S.*, with apex upturned; ventral margin apparently stops short of this sclerite, with a ventral spur (*SPR.*) proximad of midpoint and pointing ventrocephalad. Armature of inner tube (*A.I.T.*) flanking and paralleling inner tube for most of its length; dorsal margin of armature extending above inner tube for a distance subequal to diameter of tube, coiling with tube and produced apicad as far as dorsal part of tube; ventral margin approximating that of tube, indistinct apicad of spur. On each side, laterad to spur of inner tube, a conspicuous structure suggesting a partially-opened mussel as viewed from the front, herein designated as the bivalve sclerite (*BV.S.*). This sclerite broader than spur, with margins well sclerotized, enclosing a multitude of densely packed conspicuous spicules or granules. A patch of similar spicules dorsad of the bivalve sclerite, near dorsal margin of aedeagus at separation of branches of median dorsal lobe. With a well-developed vesicle (*V.*) just apicad and ventrad of apodemal strut. Base of aedeagal pouch wall indicated by a distinct thumblike sclerotization (*HL.*) below apodemal strut; probably homologous with heel of *Polygenis*. Apodemal strut consisting of the usual stout lateroventral sclerite (*L.S.*), a mesal, more dorsal, less densely sclerotized portion (*M.S.*) and a dorsal downward projecting stout sclerite (*D.S.*). Penis rods (P.R.) short, uncoiled. Aedeagal apodemal rod (Fig. 25, *A.A.R.*) reduced, but apparent, arising from heel of aedeagus, but also with weak elements connecting to base of ninth sternum.

Tenth abdominal segment with dorsal lobe of proctiger (*D.L.P.*) triangular in lateral aspect; with median and marginal bristles. Ventral lobe of proctiger feebly sclerotized, indistinct.

Comment of the Genus Tetrapsyllus Jordan

Inasmuch as the only other known males in the genus (*T. amplus* J. & R. 1923 and *T. corfidii* R. 1904) also have a serpentine sclerotized inner tube, as well as a ventral spur, it is probable that these are characteristic of the genus.

Records

Among the material collected by O. P. Pearson were a very few specimens of the genera *Hectopsylla, Ectinorus* and *Parapsyllus* s. lat. which could not be properly assigned to species because either only females were represented or the specimens were severely damaged. Records for the three species of *Agastopsylla* have been given above. Data for six additional species are as follows:

Cleopsylla townsendi Rothschild, 1914, Ex *Chroeomys pulcherrimus,* Peru: Caccachara, 50 miles southwest of Ilave, elev. 16,000 ft., 5 Oct. 1946, coll. O. P. Pearson, 4 ♂, 7 ♀.

Dysmicus viscachae Wagner, 1937, Ex *Lagidium peruanum,* loc. cit., 14 Sept. 1946, 1 ♂, 5 ♀. Ex *Lagidium peruanum,* Peru: Puno Province, Santa Rose, elev. 14,000 ft., 31 July 1946, coll. O. P. Pearson, 4 ♂, 5 ♀.

Neotyphloceras c. crassispina Roths., 1914, Ex *Abrocoma,* Peru: Caccachara, 50 miles southwest of Ilave, elev. 16,000 ft., 11 Oct. 1946, coll. O. P. Pearson, 1 ♂. Ibid., but 5 Dec. 1946, 3 ♂, 2 ♀. Ex *Auliscomys boliviensis,* ibid., 1 ♂. Ex *Chinchillula sahamae,* loc. cit., 7 Oct. 1946, 1 ♀. Ex *Chroeomys pulcherrimus,* ibid., 2 ♂, 6 ♀. Ex *Phyllotis arenarius,* loc. cit., 5 Oct. 1946, 1 ♂.

Plocopsylla sp. nov. (being described elsewhere).

Rhopalopsyllus cacicus Jordan & Rothschild, 1908, Ex *Phyllotis amicus,* Peru: Matucana, March 1940, collector unspecified, 1 ♀.

Tetrapsyllus bleptus (Jordan & Rothschild, 1923), (Allotype data above.) Ex *Abrocoma,* Peru: Caccachara, 50 miles southwest of Ilave, elev. 16,000 ft., 11 Oct. 1946, coll. O. P. Pearson, 1 ♂, 1 ♀. Ibid., but 5 Dec. 1946, 1 ♂. Ex *Chinchillula sahamae,* loc. cit., 7 Oct. 1946, 2 ♀. Ex *Chroeomys pulcherrimus,* loc. cit., 10 Oct. 1946, 3 ♀, Ex *Chroeomys pulcherrimus,* loc. cit., 5 Oct. 1946, 1 ♂. Ex *Ctenomys opimus,* loc. cit., 30 Sept. 1946, 1 ♀. Ex *Punomys lemminus,* ibid., 1 ♂, 4 ♀. Ex *Eligmodontia* sp., *Akodon jelskii* or *Phyllotis darwini,* Peru: Dept. Junin, Carhuamayo, elev. 14,500 ft., 22 Feb. 1946, coll. C. C. Sanborn, 1 ♂.

Acknowledgments.—Thanks are due to Miss Phyllis Johnson, of the Army Medical Service Graduate School, Washington, for having criticized the manuscript. Dr. Karl Jordan, F.R.S., of the British Museum, Tring, who has so considerately helped other workers on innumerable occasions, again gave up some of his valuable time to verify the status of *A. pearsoni,* new species.

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THE STATUS OF THE GENUS PARABEZZIA MALLOCH

(DIPTERA, HELEIDAE)

By WILLIS W. WIRTH, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

Malloch proposed the genus *Parabezzia* for three Nearctic species, *petiolata* n. sp., which he made the genotype, *Ceratopogon inermis* Coquillett, and *Bezzia elegantula* Johannsen. He distinguished these species from *Probezzia* Kieffer by their petiolate media, a character which is now known to exhibit variation in other related genera. Unfortunately the generic classification of the Heleidae rests largely on female characters. Since the female of *petiolata* has not been known, it has been impossible to do more than guess at the generic relationships of *Parabezzia.* Moreover, the male genitalia, which usually offer good generic characters, have never been described for *petiolata.*

The male lectotype and a male paratype of *petiolata* have been borrowed from the Illinois Natural History Survey through the kindness of H. H. Ross, and the female holotype of *Stilobezzia uncinata* Johannsen was borrowed from Cornell University through the courtesy of Henry Dietrich. The synonymy presented here is primarily a result of the study of this type material.

The genitalia of *petiolata,* which are here figured and described, indicate that *Parabezzia* is not closely related to *Stilobezzia,* as has been believed by recent workers, and that several species that have been assigned to *Parabezzia* do not belong there. Malloch's inclusion of *elegantula* was erroneous, this species falling within the subgenus *Eukraiohelea* of *Stilobez-*

zia. Parabezzia poikiloptera Ingram and Macfie, from West Africa, is also an *Eukraiohelea. Palpomyia fuscivenosa* Lutz from Brazil, which Lane (1945, Rev. Ent. 16:370) assigned to *Parabezzia,* appears to belong to the subgenus *Isohelea* of *Helea.* On the other hand, Malloch's inclusion of *inermis* in *Parabezzia* was well founded, if the present association of *Stilobezzia uncinata* Johannsen as the female of petiolata is correct. Ingram and Macfie's *Diaphanobezzia pellucida,* from Argentina, has genitalia strikingly similar to those of *petiolata,* and it is believed that the two species are congeneric.

Genus **Parabezzia** Malloch

Parabezzia Malloch, 1915, Bull. Ill. St. Lab. Nat. Hist. 10: 358; Kieffer, 1919, Bull. Soc. Ent. France, p. 193; Johannsen, 1934, Jour. N. Y. Ent. Soc. 42: 344; de Meillon, 1938, Proc. R. Ent. Soc. London (B) 7: 266; Johannsen, 1943, Ann. Ent. Soc. Amer. 36: 782; 1946, Bull. B. P. Bishop Mus. 189: 191 (Genotype: *Parabezzia petiolata* Malloch, by orig. desig.).

Diaphanobezzia Ingram and Macfie, 1931, Dipt. Pat. & S. Chile, pt. 2, fasc. 4, p. 223 (Genotype: *Diaphanobezzia pellucida* Ingram and Macfie, monobasic). NEW SYNONYMY.

Diagnosis.—Body rather stout, nearly bare. Eyes bare. Female antennae with segments 3-10 oval, 11-15 long and cylindrical; male antennae with well developed plumes. Mesonotal pits absent. Mesonotum without anterior spine or tubercle, with some strong erect bristles in addition to short pubescence. Legs all slender, with or without spines; tarsi with or without ventral spines; fourth segment cordate; fifth segment stout and laterally compressed; empodium absent; claws of female long and curved, equal or slightly unequal, of male small and equal. Wing broad in female, narrower in male, surface with or without microtrichiae; macrotrichiae absent. In female a single long radial cell nearly to wing tip, costa prolonged to wing tip halfway between ends of R_5 and M_1; in male ending at 0.6 wing length; r-m slightly oblique, tip placed slightly past base of R_1; media petiolate, the petiole about as long as crossvein; fringe on anterior margin very short or absent before middle of wing. Male genitalia with aedeagus large and conical, parameres fused in a small, pointed, triangular, median sclerite hidden by aedeagus.

Parabezzia should be removed from the Stilobezziini and placed in the *Bezzia* Group of the Stenoxenini where it is probably closest to *Probezzia* (= *Dicrobezzia* auct.). The following species are currently considered as members of this genus.

Parabezzia petiolata Malloch

(Text Figure)

Parabezzia petiolata Malloch, 1915, Bull. Ill. St. Lab. Nat. Hist. 10: 359 (♂, Ill.); Johannsen, 1934, Jour. N. Y. Ent. Soc. 42: 344; 1943, Ann. Ent. Soc. Amer. 36: 782.

Stilobezzia uncinata Johannsen, 1943, Ann. Ent. Soc. Amer. 36:761 (♀, Ala.). NEW SYNONYMY.

Female.—Length 1.4 mm., wing 1.2 mm. by 0.5 mm. Color black including head, thorax, abdomen, coxae, antennae and palpi; vertex grayish pruinose; thorax polished black; legs brownish, tarsi yellowish; wing hyaline, anterior veins brown, halteres reddish brown.

Mesonotum very broad, convex, with sparse, black, erect bristles in rows; scutellum with four black, marginal bristles. Proportions of segments of hind leg 20:10:50:45:22:8:4:3:10; legs with sparse, fine hairs; basitarsi unspined; fifth segment unspined, rather swollen in side view and compressed in dorsal view, with dense ventral fringe of long, whitish pubescence; claws slender, curved and unequal, longer claw nearly as long as fifth segment, other about three-fourths as long.

Wing with one long radial cell, R_1 ending at 0.55 way to wing tip, R_s curving parallel to costa and meeting it nearly at wing tip, the costa prolonged to apex halfway between apices of R_s and M_1; r-m crossvein nearly vertical; radius forking just before crossvein; R_1 about twice as long as crossvein; petiole of media about as long as crossvein; vein M_1 bowed upward in middle.

Male.—Length 1.25-1.5 mm., wing 1.2 mm. Head and thorax shining black; legs brownish, tarsi yellow; wings hyaline, halteres white; antennal plumes brownish, with apices white. Mesonotum with sparse, black, erect bristles in rows; scutellum with four strong black marginal bristles. Hairs of legs fine and dark; proportions of segments of hind leg 20:10:45:40:18:9:4:3:5; basitarsi unspined, fifth segment short, stout, unspined, with short equal claws. Radial cell of wing very short, vein R_1 ending at 0.55 wing length, R_s ending at half its length beyond which is at 0.6 wing length; radial veins nearly parallel beyond junction of r-m crossvein.

Genitalia (*see* figure). Ninth sternite about four times as broad as long, with broad, shallow, posterior excavation, the posterior membrane spiculate; ninth tergite long and rounded caudad with inconspicuous, setigerous, apicolateral lobes. Basistyles short and oval, about twice as long as broad; dististyles slightly longer than basistyles, slender and curved, with apices pointed and each bearing a transverse, subapical row of three setigerous tubercles. Aedeagus conical, half again as long as broad at base; a straight, transverse, sclerotized bar at base; apex with open ventral channel and extreme tip rounded. Parameres forming a narrow, transverse, sclerotized band bearing a median, sharp-pointed, triangular sclerite a third as long, and with same proportions as aedeagus, behind which it is hidden in natural position.

Material examined: ILLINOIS: Muncie, July 5, 1914, C. A. Hart & J. R. Malloch, 2 ♂♂ (holotype and paratype of *petiolata*). ARKANSAS: Little Rock, July 13, 1904, H. S. Barber, 1 ♀. ALABAMA: La Place, June 9, 1917, J. C. Bradley, 1 ♀ (holotype of *uncinata*).

JAMAICA: Bath St. Thomas, Chapin and Blackwelder, 1 ♀. Spa Town, February 3, 1937, Chapin and Blackwelder, 1 ♀.

The Jamaica females, which had been pinned after preservation in alcohol, have the halter knobs white as in the male paratype.

I strongly believe, after carefully comparing the original descriptions as well as my specimens of *petiolata* and *uncinata,* that the two represent the male and female respectively of the same species, for which the name *petiolata* has priority. There is no way of knowing positively without definitely associated sexes from the same collection, that this synonymy is valid. However, except for the usual sexual differences, the body proportions including the proportions of the segments of the legs, details of coloration, the well-developed, erect, mesonotal bristles as in *Probezzia*, and the wing venation, are practically identical in the two. The lengths and angles of the crossvein r-m and the anterior branch of the radius correspond especially well. In the known species of *Probezzia*, where the radial sector is prolonged to the wing tip in the females, the males show a similar dimorphism with a very short, straight R_s as in *Parabezzia.* The female tarsal claws of *petiolata* are nearly equal, not at all as in typical *Stilobezzia*, and the structure of the fifth tarsal segment is much as in *inermis* (Coquillett), in which the claws are long and equal.

Parabezzia inermis (Coquillett)

Ceratopogon inermis Coquillett, 1902, Proc. U.S. Natl. Mus. 25: 86 (♀ Ariz.).

Bezzia inermis, Kieffer, 1906, Gen. Insectorum, fasc. 42: 58.

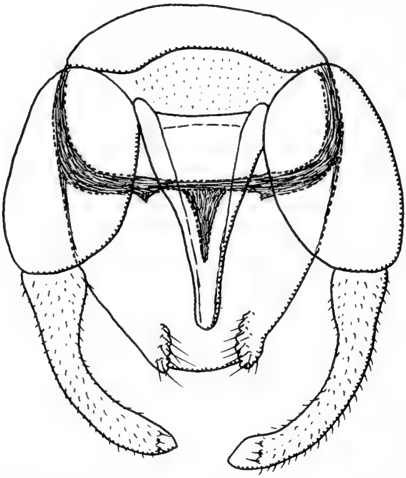
Probezzia inermis, Malloch, 1914, Proc. Biol. Soc. Wash. 27: 137.

Parabezzia inermis, Malloch, 1915, Bull. Ill. St. Nat. Hist. 10: 359; Johannsen, 1943, Ann. Ent. Soc. Amer., 36: 782 (? *Probezzia*).

Allobezzia inermis, Kieffer, 1917, Ann. Mus. Nat. Hung. 15: 328.

Female.—Length 1.0 mm., wing 1.2 by 0.4 mm. Dark pollinose brown, vertex and humeral corners of mesonotum silvery pruinose; antennae and legs brown; palpi and tarsi yellowish; scutellum dull yellow with four marginal bristles; halteres white. Legs moderately slender, without spines, only fine hairs; proportions of segments of hind leg 20:10:40:-35:18:8:5:2:8: basitarsi unspined, fourth segment cordate; fifth rather stout and laterally compressed, with fringe of fine pubescence below; claws long, and equal, slender and curved, without basal tooth, nearly as long as fifth segment. Wing grayish hyaline, anterior veins brownish, no macrotrichiae, fringe on anterior margin very fine, apparently absent from basal fourth to half; crossvein r-m nearly perpendicular, ending in R_s just past fork of radius, R_1 to a fourth the length of R_s, latter to over 0.9 wing length, closely following anterior margin of wing forming a narrow radial cell; costa prolonged past tip of R_s to wing tip; petiole of media about as long as crossvein r-m.

Material examined.—ARIZONA: Hot Springs, Yavapai Co., June 27, H. S. Barber, 1 ♀ (type).



Parabezzia petiolata Malloch, male genitalia, ventral view.

The dull pollinose mesonotum, with yellow scutellum and equal tarsal claws, will separate this species from *petiolata* Malloch, which it closely resembles in wing venation.

Parabezzia pellucida (Ingram and Macfie), new combination
Diaphanobezzia pellucida Ingram and Macfie, 1931, Dipt. Pat. & S. Chile, pt. 2, fasc. 4, p. 223 (♂, Argentina).

The wing venation and male genitalia of the single known specimen are nearly identical with those of *petiolata* Malloch. The only apparent differences between the two species are the sharper-pointed male aedeagus, absence of microtrichiae from the wing, pruinose thorax, femora each with a distal spine and tibiae with long scattered spines, and basitarsi with ventral spines, in *pellucida*. These differences seem to me to be more on a specific level, and *Diaphanobezzia* may be regarded as a synonym of *Parabezzia*.

THE OCCURRENCE OF CULEX IOLAMBDIS DYAR IN FLORIDA AND PUERTO RICO, WITH A DESCRIPTION OF THE LARVA

(Diptera, Culicidae)

By Harry D. Pratt[1] and E. L. Seabrook[2]

Adults of *Culex iolambdis* Dyar have been known from Panama, the type locality, since 1918. Larvae of this species were first collected at Key Largo, Florida in April 1944. Larvae and adults reared from this and subsequent collections were reported by Wirth (1945) as *Culex elevator* Dyar and Knab. However, the senior author has reexamined these specimens with Dr. W. W. Wirth, who concurs in the belief that these are actually *Culex iolambdis*. The upper arm of the phallosome of these Florida specimens has two small denticles at the upper distal angle as in the type slide of *iolambdis* in the U. S. National Museum collection. Figure 12 of the phallosome plate of *elevator* in Wirth's (1945) paper appears to be identical with figure 32 in Rozeboom and Komp's (1950) paper and may have been drawn from the same slide based on material from Central America. *Culex elevator* is therefore known from Central and South America, but records of this species from Florida pertain to *Culex iolambdis*. Notes are added here on the biology and distribution of *iolambdis*, the range of which is now known to extend practically to the northeastern limits of the Neotropical Region. Detailed figures of the larva, pupa, and male terminalia are given based on specimens collected in Puerto Rico and Florida.

Grateful acknowledgment is made to Lloyd E. Rozeboom of the Department of Parasitology, Johns Hopkins University, for identifying this species. Alan Stone of the U. S. National Museum and W. H. W. Komp and G. H. Bradley of the U. S. Public Health Service have made many helpful suggestions during the preparation of this paper.

Biology and Distribution

Puerto Rico.—The late Dr. William A. Hoffman and Harry D. Pratt found larvae of this species in crab holes in May 1942, with larvae of *Culex habilitator* Dyar and Knab and *Deinocerites cancer* Theobald in the mangrove swamp between Laguna Torrecila and Laguna San Jose at Kilometer 8.4 on the road between Boca de Cangrejos and Carolina, Puerto Rico. Later collections were made by J. Maldonado Capriles

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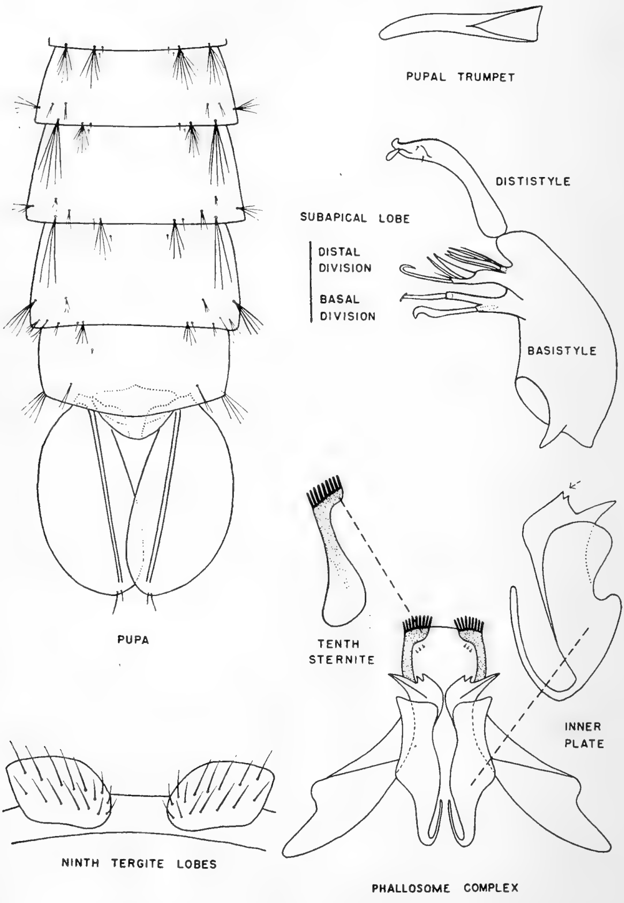

PLATE I. CULEX IOLAMBDIS, MALE TERMINALIA & PUPA and Harry D. Pratt in the densely shaded brackish water mangrove swamp at the mouth of the Rio Palmas, south of Fort Bundy, in Naguabo, Puerto Rico, in September 1943. Here larvae and pupae were found, associated with *Culex habilitator* Dyar and Knab and *C. atratus* Theobald, in densely shaded areas around the tangled roots of white mangrove (*Laguncularia racemosa Gaertner*) and mangrove fern (*Acrostichum aureum* Linnaeus).

United States.—The first larvae were collected at Key Largo, Florida and reported by Wirth (1945) as *C. elevator*. Later, larvae and pupae of *iolambdis* were found in a collection made on February 11, 1946 by E. L. Seabrook in Martin County from a mangrove swamp which was in the process of being filled near Jensen Beach, Florida. The larvae and pupae were associated with *Anopheles crucians* Wiedemann and *Culex nigripalpus* Theobald. On February 14, 1946, T. E. Duffey[3] and E. L. Seabrook collected additional specimens including adults from the Jensen area. Other adults were reared by Mr. Duffey from these collections. R. C. Ridgway[3] assisted with further collections made from the Dubois swamp at Jupiter, Florida, on March 18 and March 25, 1946. Additional specimens were taken from the Prosperity Farm area near Lake Park, Florida, on April 11, 1946, and also from other areas in Palm Beach County, which were not recorded.

The collections of *C. iolambdis* in Florida were made in areas in which the black mangrove (*Avicennia nitida* Jacq.) grew intermixed with white mangrove (*Laguncularia racemosa* Gaertner). The larva and pupae were taken from rims of small ponds or from standing water in the aerial roots of the black mangrove. The adults were caught in aspirators after being made to fly from their nesting places around tree trunks and decaying branches.

Taxonomy

The adult males and females are small, dark *Culex* (*Melanoconion*) with dark legs, and are similar to *pilosus* in general color and adult structure. The occiput and vertex are covered by broad, appressed pale scales from eye to eye with many erect, black, forked scales scattered throughout. The mesoscutum has a sparse covering of short, bronzy hairs and a few longer, black hairs. The abdomen is almost entirely dark, and the posterior segments have a few white scales at the bases of the segments laterally.

Male Terminalia.—(Plate I). Dististyle (clasper) with apical half enlarged with a prominent snout, bearing a groove, a terminal claw, and a thickened subterminal appendage. Basistyle (sidepiece) about

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[3]Palm Beach County Anti-Mosquito District.

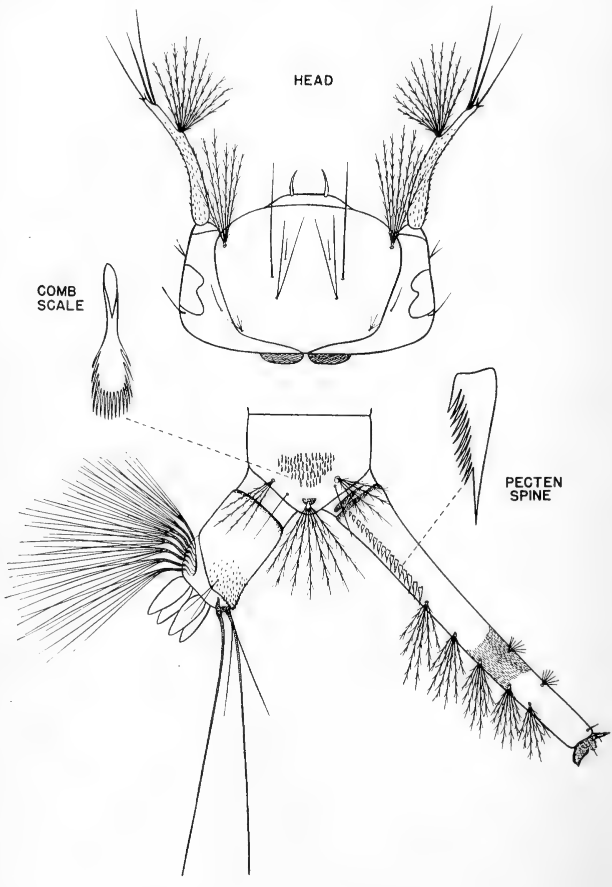

PLATE II. CULEX IOLAMBDIS, LARVA

twice as long as wide, with a subapical lobe divided into basal and apical divisions. Basal (inner) division unequally divided, consisting of a very short inner arm sessile at basal third of long outer limb, each limb bearing a long, crooked-tipped filament. Distal (outer) division with an inner arm continuing the shaft bearing a short filament and a long filament with a recurved tip, 1 or 2 large middle filaments, approximated to an outer group of 2 or 3 bent, somewhat flattened filaments, but no leaf. Comb of tenth sternite with 8 or 9 stout teeth, stem comparatively short, base somewhat pear-shaped. Inner plate of phallosome (mesosome) stout, heavily sclerotized, with a long curved basal hook, and a broad triangular tip with a smooth apical margin bearing two or three blunt teeth in addition to the long lateral tooth. Lobes of the ninth tergites rather membranous, irregularly elliptical, with 10-15 long, scattered hairs.

Larvae.—(Plate II). Very similar to *Culex elevator* Dyar and Knab. Head transverse, clypeal setae (No. 1) stout, black, peg-like. Upper head hair (No. 5) double, stout, about three-fourths as long as lower head hair (No. 6) which is single, long, and stout. Postclypeal hairs (No. 4) very short, delicate, single. Preantennal hair (No. 7) large, multiple. Antenna stout, whitish in middle of shaft, with the multiple antennal hair at distal third, the part beyond the tuft noticeably more slender than spicular basal portion, tip with three long stout spines, a short spine. Mental plate with seven teeth on either side of strong, median tooth, the basal ones except the last larger and more remote. Anterior submedian prothoracic group composed of 2 long, single hairs (Nos. 1 and 2) and a shorter, more delicate, many branched hair (No. 3). Thoracic integument with sparse covering of minute black spicules. Long lateral hairs on abdomen with following arrangement on each side: Segment I, one single and one double, long, stout hair; segment II, a long, stout, double hair; segments III to VI, more delicate, shorter, 3-branched or multiple hairs. Comb of eighth segment of many scales in a triangular patch 4 to 5 rows deep. Individual comb scale long, rounded, with many fine denticles. Pentad group of hairs with *alpha, gamma,* and *epsilon* hairs multiple, *beta* and *delta* hairs single. Air tube about five times as long as basal width, with a rather conspicuous dark band in middle third, as in many specimens of *Culex peccator,* five pairs of long, multiple ventrolateral tufts and 2 pairs of subdorsal tufts, all beyond the pecten, the basal tufts about twice as long as diameter of air tube at point of insertion. Pecten extending about one-third distance from base to tip of air tube, individual pecten tooth fringed on one side. Anal segment completely encircled by a chitinous ring which is sparsely spicular particularly on posterior half. Dorsal tuft composed of a pair of long, single and a pair of shorter double or triple hairs. Lateral hair of anal segment 2-branched. Anal gills four, short, bud-like, not as long as chitinous plate encircling anal segment.

Pupa.—(Plate I). The trumpet has the tiny notch at the base of the apical truncation characteristic of the subgenus (*Melanoconion*). It is close to *Culex* (*Mel.*) *pilosus* Dyar and Knab in being very short, about four times as long as the apical width. The abdominal chaetotoxy is shown in Plate II.

Culex iolambdis is related to the true *Culex elevator* Dyar and Knab and *Culex educator* from Central and South America. The writers know of no definite characters to separate the larvae of *iolambdis* and *elevator* at the present time. However, the mental plate of the larva of *C. educator* has five teeth on either side of the strong central tooth, while that of *iolambdis* has seven. *Educator* has a huge gill near the base of the antenna according to Komp (1935) while such a structure is absent in *iolambdis*. In Panama *educator* larvae always are found in fresh water, while *iolambdis* larvae have been collected only in brackish water.

The male terminalia recently have been figured by Rozeboom and Komp (1950) in their comprehensive review of the male *Culex* (*Melanoconion*) mosquitoes. The characters for separating *iolambdis* from other species in the subgenus are appreciated best by a study of their key and drawings.

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A NEW MITE OF THE GENUS NEOICHORONYSSUS

(Acarina, Laelaptidae)

By R. B. Eads and B. G. Hightower, *State Department of Health, Austin, Texas*

A new species of mite referable to the genus *Neoichoronyssus* is described in this paper. Several specimens were taken from kangaroo rats, *Dipodomys ordii*, during west Texas plague studies which were conducted jointly by the U. S. Public Health Service (Communicable Disease Center) and this Department.

Neoichoronyssus (Hirstionyssus) incomptus, new species

Female.—Body broadly oval in outline, widest behind coxa IV. The measurements given below are in microns and indicate the average of the holotype and 2 paratypes. Total length, exclusive of gnathosoma, 579; width of body at widest point, 406; length of dorsal plate, 481; width of dorsal plate, 240; length of genitoventral plate, measured from posterior margin of sternal plate to the tip of the genitoventral plate, 239; distance from posterior margin of genitoventral plate to anterior margin of anal plate, 96.

Dorsal plate almost covering dorsum anteriorly, but evenly tapered to a blunt point posteriorly, with about 25 pairs of setae which tend to be longer on the anterior half of plate. Unsclerotized portion of dorsum with about 17 pairs of subequal setae which are slightly shorter than the setae on the posterior portion of the dorsal plate.

The peritremal tube extends from the anterior part of coxa IV to the middle of coxa I.

Sternal plate about 8 times as wide as long, 3 pairs of sternal setae present, the first and second pair subequal and longer than the third pair. Genitoventral plate rounded posteriorly, widest midway between insertion of genitoventral pair of setae and caudal margin. Distance between the genitoventral and anal plates approximately equal the length of the anal plate. Anal plate oval, sides convex; anal setae subequal in size. Unsclerotized portion of venter with about 17 pairs of subequal setae which are slightly longer than the corresponding dorsal setae.

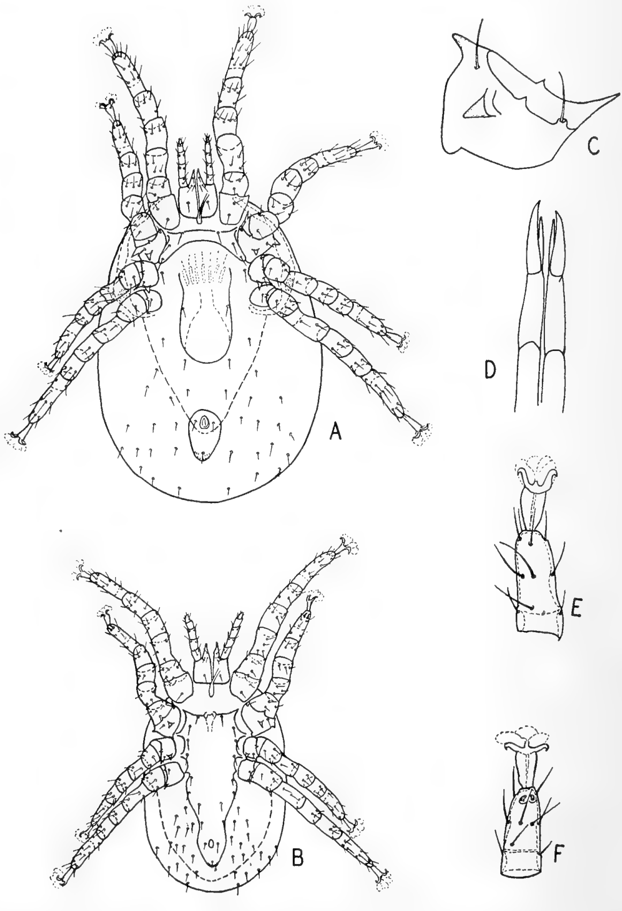
Coxa I with a ventral and a submarginal seta. Coxa II with anteriodorsal spur, a caudo-dorsal and a rounded ventral spur, also a marginal seta, and a seta flanked by the 2 latter spurs. Coxa III with a seta on the anterior margin, a large ventral spur, a smaller spur on the posterior margin, and a seta situated between the spurs. Coxa IV with a submarginal seta. Tarsus II without modified setae.

Chela shear-like, fixed arm slightly longer than movable arm. Hypostome with 4 pairs of typical setae. Capitular teeth about 20, in two rows.

Male.—The measurements indicate the average of the allotype and 2 paratypes. Total length, exclusive of gnathosoma, 429; width of body at widest point, 274; length of dorsal plate, 396; width of dorsal plate, 211; length of holoventral plate, 301.

Dorsal plate covering the dorsum anteriorly, but slightly narrowed laterally, with 26 pairs of setae which tend to be longer anteriorly. About 12 pairs of subequal setae on the unsclerotized portion of the dorsum, these as in the female, are slightly shorter than the setae on the posterior portion of the dorsal plate. Peritreme as in female.

Holoventral plate as illustrated, slightly expanded behind coxa IV, and constricted before the anus, with 8 pairs of setae in addition to the 3 anal setae. The paired setae on the holoventral plate are longer anteriorly. Unsclerotized portion of the venter with about 15 pairs of setae which are subequal in length to the setae on the posterior portion of the holoventral plate and slightly longer than the corresponding setae on the dorsum.



Neoichoronyssus (*Hirstionyssus*) *incomptus*, new species. Fig. A, female venter; fig. B, male venter; fig. C, female coxa II; fig. D, female chelicera; fig. E, female tarsus II; fig. F, male tarsus II.

Coxa I with a ventral and a submarginal seta. Coxa II with a marginal (anterior) and a submarginal (posterior) seta, an acute anterior-dorsal spur, a short ventral spur, and a short, stout caudo-dorsal spur. Coxa III with a marginal (anterior) and a submarginal (posterior) seta, an acute spur on the posterior margin, and a ventral spur. Coxa IV with a submarginal seta ventrally, and an acute, marginal spur near the caudal edge. Tarsus II with a subapical pair of modified setae.

Gnathosoma similar to female. Chela with movable arm longer and stouter than fixed arm. Capitular teeth about 22, in 2 rows.

Types.—All from Texas: Holotype female from kangaroo rat, *Dipodomys ordii,* 16 January, 1947, Terry County, V. I. Miles. Paratype female, same host, 5 March, 1948, Dawson County, V. I. Miles. Paratype female, same host, 21 April, 1948, Cochran County, W. H. Williams & T. Crossland. Allotype male from *Dipodomys ordii,* 3 March, 1948, Dawson County, V. I. Miles. Paratype male, same host, 11 March 1949, Gaines County, V. I. Miles. Paratype male from *Perognathus* sp., 15 January, 1947, Gaines County, T. S. Scoggins. Holotype female and allotype male deposited in U. S. National Museum, number 1976.

Remarks.—In Jameson's key (1950) to the female of North American species of *Neoichoronyssus, N. incomptus* runs to the couplet containing *N. hilli* (Jameson) and *N. triacanthus* (Jameson). *N. triacanthus* possesses heavy body setae and thick peritremal tubes, while in *hilli* and *incomptus* the body setae are short and slender, and the peritremal tubes relatively narrow. *N. incomptus* is distinctive in that its peritremal tubes extend forward to coxae I, and the sternal plate is almost 8 times as wide as long; in *hilli* the peritremal tubes extend only to coxae II and the sternal plate is about 5 times as wide as long. It is worthy of note that the male of *N. incomptus* possesses stout, ventral setae on tarsus II, while in the female these are lacking.

Acknowledgments are due Dr. R. W. Strandtmann for his helpful advice and loan of a paratype of *N. hilli*.

Reference

Jameson, E. W. 1950. Notes on mites of the geuns *Neoichoronyssus,* with the description of a new subgenus and three new species of the subgenus *Hirstionyssus.* Proc. Ent. Soc. Wash. 52(4): 161-172.

A NEW MEGASOMA FROM ARIZONA

(COLEOPTERA, SCARABAEIDAE)

BY O. L. CARTWRIGHT,[1] *United States National Museum, Washington, D. C.*

The discovery of a new *Megasoma* in the United States is surprising since our only other species of these large beetles, *Megasoma thersites*, was described by Leconte in 1861, over ninety years ago. It is remarkable that so large a beetle has remained undiscovered for so long a time.

The first specimens submitted for determination were collected by Dr. Floyd Werner at night in an Arizona desert area having a shrub cover of mesquite and a sprinkling of Oak, Acacia, and Mimosa. Dr. Werner stated a second pair of the same species had been taken by Mr. F. H. Parker of Globe, Arizona. Mr. Parker generously loaned his specimens and wrote as follows concerning their capture, "Mine were collected on the same night, the male at dusk, on the three-inch trunk of an *Acacia greggii* to which I was fastening one side of my sheet, the female about midnight, about two feet from the sheet, walking on the ground towards my lanterns. This was about one-half mile from the mouth of Browns Canyon (in the canyon) which lies directly east of Baboquivari Peak. We were within one-quarter mile of the adobe building in which O. C. Poling (lepidopterist) lived during the summers that he collected in the Baboquivaris. There is a good deal of mesquite there, but many other trees and shrubs, too, including oak, sycamore, hackberry, *Acacia constricta* and *greggii*, *Condalia*, *Lycium*, ocatillo, many Agave and Opuntia." I am grateful to Mr. Parker for his letter and loan of specimens. and wish especially to thank Dr. Werner both for submitting the first specimens and for his permission to describe and retain the holotype in the U. S. National Museum collection.

A search for possible additional specimens in various museum collections has resulted in the finding of a badly broken male in the U. S. National Museum and a broken female in the Museum of Comparative Zoology at Harvard. A description of the new species follows.

Megasoma punctulatus, new species

Male holotype.—Length 26 mm., width 15 mm. Oblong, dull brownish black, the lack of luster due to the fine, dense punctation, upper surface without pubescence. Head about half as wide as pronotum, frontal horn half as long as head, strongly arcuate backward, deeply bifurcate, the

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[1]Published with the permission of the Secretary of the Smithsonian Institution.

prongs slender, divergent; surface throughout densely, finely, deeply, somewhat roughly, punctate; clypeus thicker anteriorly, the upper edge carinate and nearly straight between two strong prominent, erect, widely-placed, triangular teeth, side margins elevated and strongly arcuate; labrum obscured by a fringe of dense, yellowish hair, through which protrude the sharp tips of the maxillae and the rounded teeth of the bidentate mandibles.

Pronotum convex, twice as wide as long, widest at middle where sides are bluntly angulate; from this point sides extend nearly straight back to the bluntly-rounded, posterior angles and forward to the noticeably-elevated, sharp, right-angled anterior angles, the anterior angles separated by a distance two-sevenths greater than the basal width of the head; pronotal base weakly, evenly arcurate, not margined, lateral bead fine and complete, surface uneven, being depressed inside the anterior angles, weakly explanate laterally and less so basally, more noticeably convex across base at basal fourth and centrally over basal two-thirds; viewed from side in outline, median line of pronotum appears evenly convex from base over basal two-thirds, then concave to anterior margin, surface densely, finely, deeply punctate throughout except for a small, smooth area near edge at middle of lateral margin.

Elytra one-sixth longer than wide, slightly constricted at basal fourth, very slightly wider at middle, surface finely, densely punctate throughout except for the shining, coarse, shallow punctures of the striae and intervals, five costae barely discernible. Scutellum finely punctate.

Undersurface and legs finely, densely punctate and, excepting a small central and two smaller lateral metathoracic spots and the middle of the abdomen and legs, covered by moderately-dense, decumbent whitish hair. Pygidium thinly, sparsely covered with semi-erect, whitish hair.

Tarsi long and slender, noticeably longer than tibiae which are subequal or slightly shorter than femora. Anterior tibiae strongly tridentate, second tooth about one-third closer to anterior than to medianly-placed, posterior tooth. Anterior spurs acuminate, strongly arcuate, two or three short heavy setae each side basally.

Female allotype.—Length 29 mm., width 16 mm. Similar to male, but much more shining and with different sculpture. Head as in male, but with horn replaced by a low, quite sharply rounded tubercle, surface somewhat more confused punctate-rugose behind tubercle, especially laterally, and with a median, smooth, basal area. Pronotum of usual shape, anterior angles somewhat depressed and not remote from head, surface with close, very coarse, deep punctures throughout, punctures separated by one to two diameters over most of disc, slightly smaller anteriorly and at sides where they tend to merge into groups and lines. Elytra shining and smooth, but with three types of punctures, basal disc with larger punctures of striae and intervals only very moderate in size, separated by three, four, or more diameters, these interspersed with very distinct, fine punctures; finally, more noticeably outward toward the sides and apex, with very close, faint, shallow, minute punctation. Larger punctures become obsolete outwardly as minute punctation becomes more noticeable; costae barely traceable through shallow, outer striae of each elytron. Scutellum smooth. Pygidium transversely, strongly convex over basal third, strongly concave over remainder; basal third closely, finely punctate, less closely over middle third, and apically with increasingly very close, minute punctures; basal third with moderately close, semi-erect yellowish hair, apical two-thirds with a very few, scattered, erect hairs. Pubescence of underside yellowish and not so closely decumbent.

Paratypes.—Paratypes differ in that one male specimen is heavier and more fully developed than holotype, frontal horn being about as long as length of head, bifurcation about one-third its total length; pronotum at anterior third bearing a sharp, median, anteriorly-directed horn or tubercle, behind this, at basal third, a small, smooth, impunctate area, and lateral margin having a slight, depressed emargination before middle. Length of this specimen 33 mm., width 19 mm. Female paratypes vary from 27 to 31 mm. long and 16 to 17 mm. wide.

Holotype, U. S. National Museum No. 61078. Santa Rita Range Reserve, Pima Co., Arizona, 4000 ft., mesquite-desert grassland, 13 Aug. 1949, at light, F. Werner & W. Nutting Allotype female, 2 mi. SW of Patagonia, Santa Cruz Co., Arizona, rich willow-cottonwood bottom, 4050 ft., 30 July 1948, at light, F. Werner & W. Nutting. Paratypes: ARIZONA: one female same data as holotype; one female, Phoenix, Liebeck Collection, in Museum of Comparative Zoology at Harvard; one male, Tucson, H. H. Brown, in USNM; one male and one female, Baboquivari Mts., 23 July 1949, F. H. Parker, in Parker Collection.

Megasoma punctulatus is quite near *M. thersites Lec.*, but averages smaller in size, lacks the upper surface pubescence of that species, the median pronotal tubercle is not bifurcate in the specimens at hand as in *thersites,* and the median pronotal tubercle of the female is not binodose.

THE CALIFORNIA SPECIES OF MITE-BEARING STENODYNERUS

(HYMENOPTERA, VESPIDAE)

BY RICHARD M. BOHART, *University of California, Davis*

The subgenus *Parancistrocerus* was established by J. C. Bequaert in 1925 (Trans. Amer. Ent. Soc. 51: 64) for the American and African species of solitary vespids with a mite chamber under the hind margin of the first abdominal tergite. The originally designated type was the well known eastern species, *Odynerus fulvipes* Saussure. With the nine described below, thirty-five species and subspecies are now known from the United States, and some of these are among the commonest small wasps.

The acarinaria are usually packed with mites and appear to be specially constructed for their convenient transportation. The mites belong to the genus *Ensliniella* Vitzthum[1] and are similar but not identical to the type of the genus, *E. parasitica* Vitzthum which was described from the mite chamber of an "Odynerus."[2] The mites are in the non-feeding hypopal stage and do not seem to affect the host adversely. Infestation of the host must take place in the nest, and probably at the time the pupal skin is shed. Specimens of both sexes of *S. minimoferus* R. Bohart, newly emerged in the laboratory from renovated cells in *Sceliphron* mud nests, have been observed with a full complement of mites.

The presence of the acarinarium can usually be detected by the broad and somewhat apically prolonged shape of the first abdominal tergite. However, in doubtful cases it may be necessary to relax the specimens and bend the abdomen so as to separate the tergites and, thus, expose the normally-covered base of the second tergite.

Thirteen species and subspecies from California are included in this paper, but only four of these have been described previously unless some of Peter Cameron's unrecognized species eventually are found to fall in this subgenus. Most of the California species have a rather wide distribution, particularly in the Pacific coast and intermountain states as well as the arid southwest.

Nesting habits are unknown for the California forms except *minimoferus* as mentioned above and *acarophorus*, new species, which nests in twigs. A few of the species of eastern United States also utilize twigs, especially those used the previous year by other wasps.

Holotypes have been deposited in the California Academy of Sciences collection, and paratypes, as far as available, in the collections of the U. S. National Museum, University of California, University of Kansas, Cornell University, and Museum of Comparative Zoology at Harvard.

Collectors of the holotypes are given under each description. Paratype material of the new forms was mostly collected by the following individuals: R. H. Beamer, G. E. Bohart, J. C. Bradley, C. L. Fox, P. D. Hurd, E. G. Linsley, J. W. MacSwain, A. T. McClay, C. D. Michener, P. H. Timberlake, H. and M. Townes, E. P. Van Duzee, and E. C. Van Dyke.

The key given below to the described North American species is preliminary in nature as additional species will no

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[1]Information on the mites was furnished by F. M. Summers.

[2]"Auf Odynerus-Arten, versteckt unter den übereinander griefenden abdominalen Tergiten"—from Vitzthum, H. G., 1929, in Brohmer, P., Die Tierwelt Mitteleuropas 7: 93.

doubt be named. However, it should be useful to compare all of the known forms at this time. In addition to external features, distinguishing characters are also found in the male genitalia. These are illustrated for the California species and a key is given for their separation.

Key to the Subgenus Parancistrocerus in North America

1. Second sternite angled or sharply rounded at basal one-third to one-fourth as seen in lateral view 2
   Second sternite evenly rounded in lateral view 8
2. Second tergite with its median length about 1.5 times as great as that of second sternite, strongly reflexed apically and with a subapical transverse aciculate channel 3
   Second tergite only slightly longer than second sternite, not appreciably reflexed nor channeled 4
3. Second tergite with free spots (Calif., Ore.) .... *rectangulis frazieri*, new subspecies
   Second tergite without free spots (Ariz., N. Mex., Mex.) .... *rectangulis rectangulis* (Viereck)
4. Hind margin of pronotum yellowish or reddish (Ariz., Mex.) .... *chiricahuae* R. Bohart
   Hind margin of pronotum dark 5
5. Second tergite finely punctured toward base (Calif., Ore., Wash.) .... *acarophorus*, new species
   Second tergite coarsely punctured toward base 6
6. Punctures of first tergite about as large as those on pronotum (Calif., Baja Calif.) .... *declivatus* R. Bohart
   Punctures of first tergite much larger than those of pronotum 7
7. Markings of first tergite predominantly red (Fla., Ga., N. C., La.) .... *perennis anacardivora* (Rohwer)
   Markings of first tergite not predominantly red (eastern U. S.) .... *perennis perennis* (Saussure)
8. Apical outline of tergite II noticeably convex toward middle as tergite is viewed directly from above 9
   Apical outline of tergite II practically straight or somewhat concave toward middle as tergite is viewed directly from above 16
9. First tergite with a distinct shelf-like suture across its summit followed by a row of very large and shallow pits; tergite II without free spots 10
   First tergite not as above; tergite II often with free spots 11
10. Markings mostly yellow, flagellum mostly black (eastern U. S.) .... *fulvipes fulvipes* (Saussure)
    Markings mostly red, flagellum broadly red on basal one-half (southern U. S.) .... *fulvipes rufovestis* R. Bohart

11. Interocellar tubercles bulging and separated merely by a line; tergite II coarsely punctured throughout and reflexed apically four to five median ocellus diameters (Ariz., Utah, N. Mex., Colo., Tex.) .... *coronado* R. Bohart
Interocellar tubercles narrow, not strongly bulging 12
12. Costa and stigma reddish (western U. S.) .... *acarigaster*, new species
Costa except basally, and stigma dark brown 13
13. Male flagellum dark or dull red beneath, male clypeus often black-spotted and apex usually black-rimmed, female clypeus not all black 14
Male flagellum extensively pale beneath, male clypeus not black-spotted, apex not black-rimmed, female clypeus all black or nearly so 15
14. Markings mostly yellow (eastern U. S. and midwest) .... *pedestris pedestris* (Saussure)
Markings mostly red (Fla., Ga.) *pedestris bifurcus* (Robertson)
15. Markings yellow (eastern U. S. and midwest) .... *pensylvanicus pensylvanicus* (Saussure)
Markings whitish (Canada, northern U. S., western mountains) .... *pensylvanicus ignotatus* new subspecies
16. Tergites II and III conspicuously and equally thickened apically as seen in posterior view; apical outline of sternite III strongly convex, legs mostly red (western U. S.) .... *minimoferus* R. Bohart
Tergites II and III not equally thickened apically as seen in posterior view 17
17. Interocellar tubercles bridged behind front ocellus 18
Interocellar tubercles divided all the way forward to front ocellus 20
18. Markings of thorax and abdomen orange to reddish (Fla.) .... *bicornis bicornis* (Robertson)
Markings of thorax and abdomen yellow 19
19. Tergite II with a deep transverse subapical channel, markings ivory yellow (Tex., N. Mex., Ariz.) .... *bicornis cushmani* R. Bohart
Tergite II without a deep transverse channel, markings deep yellow (eastern U. S.) .... *bicornis ceanothi* (Rohwer)
20. Acarinarium with a median entrance seen when tergite II is bent downward, male clypeus with a deep apical incision be-spine-like teeth 21
Acarinarium without a special entrance, apical teeth of male clypeus not spine-like 22
21. Markings mainly yellow (eastern U. S. and midwest) .... *vagus vagus* (Saussure)
Markings mainly red (Fla.) .... *vagus slossonae* R. Bohart

22. Tergite II thickened apically more than one median ocellus diameter 23
Tergite II thickened apically not more than one ocellus diameter 26
23. Tergite I with erect hair of 1 to 3 ocellus diameters in length extending from summit about to middle of tergite 24
Tergite I without such hair 25
24. Markings mainly yellow (U. S. except Pacific coast) .... *colon colon* (Cresson
Markings mainly whitish (Tex., N. Mex., Ariz., Colo.) .... *colon yumus* (Viereck)
25. Tergite I with a distinct suture across its summit, tergite II without free spots, male vertex well punctured (Ariz., N. Mex.) .... *polingi* R. Bohart
Tergite I without a distinct suture across its summit, tergite II usually with free spots, male vertex sparsely punctured (western U. S. east to Idaho and Tex.) .... *toltecus* (Saussure)
26. As seen in dorsal view, postscutellum sharply separated from vertical surface of propodeum at middle by a rough horizontal area; wing membrane almost unicolorous brown (Va. to Fla., La.) .... *histrio* (Lepeletier)
As seen in dorsal view, postscutellum separated from vertical surface of propodeum at middle by at most a roughly rounded area 27
27. Body unusually hairy, erect hair of one-half to one ocellus diameter in length usually thick on posterior half of tergite I; interocellar area not strongly raised, shiny and with scattered large punctures 28
Body not unusually hairy 29
28. Markings yellow (eastern U. S.) .... *saecularis saecularis* (Saussure)
Markins extensively reddish (Fla.) .... *saecularis rufulus* R. Bohart
29. Legs mostly red (Tex., Okla., Kans., N. Mex.) .... *austrinus* (Cresson)
Legs mostly brown and yellow or whitish 30
30. Radius of forewing reddish (northern Calif., Ore.) .... *cotti*, new species
Radius of forewing brown 31
31. Tergite I distinctly narrower than II, abdomen moderately slender with tergite III all dark or with a broken pale band 32
Tergite I almost as broad as II, abdomen moderately stout 33
32. Markings yellow (Calif.) .... *parapedestris parapedestris*, new species
Markings whitish (Calif., Nev., Ariz.) .... *parapedestris arenosus*, new subspecies
33. Tergite III all dark, tergite II rarely with free spots (Calif., Ariz., N. Mex., Tex.) .... *lacunus* (Fox)

Tergite III with apical pale spots or a band, tergite II with free spots 34

34. Markings usually sulphur yellow, apical margin of tergite II not appreciably thicker than that of III (Calif., Idaho, N. Mex.) .... *mcclayi*, new species

Markings, at least of clypeus, whitish; apical margin of tergite II usually appreciably thicker than that of III (Ariz., Calif.) .... *siccus*, new species

KEY TO THE CALIFORNIA SPECIES OF PARANCISTROCERUS BASED ON MALE GENITALIA

1. Median expansion of aedeagus[3] distinctly broader than subbasal one (figs. 9-12) 2

Median expansion, if developed, not broader than subbasal one (figs. 1-8) 5

2. Median expansion of aedeagus curving toward apex of aedeagus (fig. 12) .... *toltecus* Saussure

Median expansion curving toward base of aedeagus 3

3. Median expansion of aedeagus 1.5 times as wide as subbasal one (fig. 11) .... *cotti*, new species

Median expansion only slightly wider than subbasal one 4

4. Aedeagus length about 3 times as great as breadth of median expansion (fig. 10) .... *mcclayi*, new species

Aedeagus length about 3.5 times as great as breadth of median expansion (fig. 9) .... *siccus*, new species

5. Median expansion of aedeagus weakly developed, broadly rounded, not projecting sharply (figs. 1-4) 6

Median expansion of aedeagus well developed and projecting sharply (figs. 5-8) 9

6. Median expansion of aedeagus nearly as broad as basal expansion; basal extension of volsella with a serrated crest (fig. 4) .... *pensylvanicus ignotatus*, new subspecies

Median expansion of aedeagus much narrower than basal expansion, basal extension of volsella with crest not serrated 7

7. Aedeagus almost straight-sided from subbasal expansion to apex (fig. 2) .... *acarophorus*, new species

Aedeagus constricted distad of subbasal expansion 8

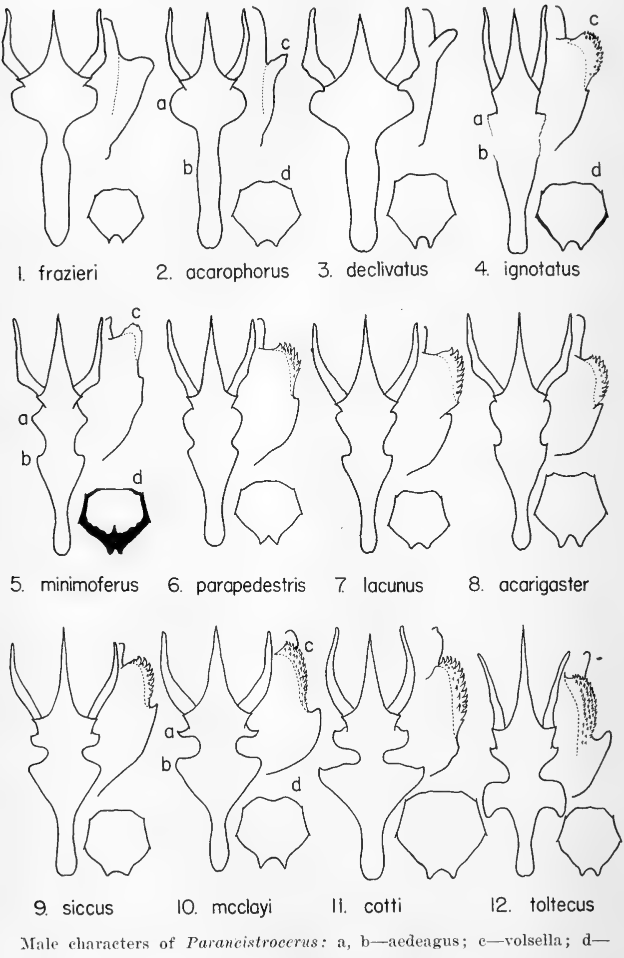
8. Crest of basal expansion of volsella narrow, fingerlike (fig. 3) .... *declivatus* R. Bohart

Crest of basal extension of volsella broad (fig. 1) .... *rectangulis frazieri*, new subspecies

9. Median expansion of aedeagus projecting sharply backwards (fig. 8) .... *acarigaster*, new species

Median expansion of aedeagus not projecting sharply backwards 10

[3]Mounted in a dorso-ventrally flattened position.



Male characters of *Parancistrocerus:* a, b—aedeagus; c—volsella; d—clypeus.

10. Subbasal expansion of aedeagus broadly rounded (fig. 6) .... *parapedestris*, new species
    Subbasal expansion of aedeagus narrowly rounded (figs. 5. 7).... 11
11. Basal extension of volsella with a strongly serrated crest (fig. 7) .... *lacunus* Fox
    Basal extension of volsella with a weakly serrated crest (fig. 5) .... *minimoferus* R. Bohart

Stenodynerus (Parancistrocerus) rectangulis frazieri, new subspecies

Similar to *rectangulis Viereck* (1908, Trans. Amer. Ent. Soc. 33: 393) but with a free lateral spot on tergite II and a lateral widening of the apical yellow band on tergite I. Size slightly smaller, length to apex of tergite II, male 6.5 mm., female 7.0 to 7.5 mm. Details of male genitalia and clypeus shown in figure 1.

Holotype, male (Calif. Acad. Sci.), Panamint Mountains, Inyo Co., California, May 30, 1937 (N. W. Frazier). Paratypes, 8 males and 14 females from the following CALIFORNIA counties: Eldorado (Camino, Snowline), Mono (Benton Station), Inyo (Carroll Canyon, Big Pine), Contra Costa (Mt. Diablo), San Mateo (Mountain View), Madera (Bass Lake), Los Angeles (Tanbark Flat), San Bernardino (Mill Creek), Riverside (San Jacinto Mountains, San Gorgonio Pass). I have also seen a female specimen from Medford, Oregon. Recorded dates of capture are from May to September.

Stenodynerus (Parancistrocerus) acarophorus, new species

Male.—Black marked with sulfur yellow as follows: mandible mostly, clypeus except narrowly at base, interantennal and ocular dots, scape in front, postocular dot, spots on humeral angles, tegula mostly, spots beneath, 2 spots on postscutellum, legs partly, apical margins of tergites I to V and sternites II to IV (free lateral spot on tergite II in some paratypes). Flagellum light brownish within almost to apex. Wings rather evenly brown stained. Pubescence fulvous, inconspicuous. Puncturation fine to moderate, punctures of clypeus very fine, small and close on front, farther apart on mesonotum, rather coarse toward summit of tergite I, fine over most of tergite II but moderate and well separated in apical band. Shape of clypeus and genitalia as in figure 2. Last antennal segment slender, flattened beneath, reaching base of eleventh segment, interocellar area punctured, not raised; humeral angles moderate; parategula narrow apically, posterior edge incurved; propodeum not shelf-like below postscutellum; mid femur not depressed toward base beneath; tergite I shallowly depressed above, somewhat narrower than II which is reflexed apically about ½ ocellus diameter; sternite II bent near base and without a median crease (in most paratypes). Length to apex of second tergite 7.0 mm.

Female.—Clypeus moderately incised at apex, rather finely punctured, with a basal crescent of yellow, flagellum all dark, postscutellum mostly yellow, parategula sometimes yellow, lateral free or attached spot sometimes present on tergite I, apex of clypeus and angle of propodeum sometimes yellow spotted. Vertex depression about equal in size to an ocellus. Length to apex of second tergite 8.0 mm.

Holotype, male (Calif. Acad. Sci.), Berkeley, Alameda Co., California, June 27, 1933 (R. M. Bohart). Paratypes, 31 males and 36 females from the following CALIFORNIA counties: Siskiyou (Finley Camp), Trinity, Plumas (Quincy), Mendocino (Ryan Creek), Eldorado (Snowline Camp, Kyburz), Placer (Alta), Mono (Virginia Lakes, 9,000 ft.), Inyo (Independence, Lone Pine), Mariposa (El Portal, Briceburg, Fish Camp), Lake (Blue Lake), Solano (Vallejo), Contra Costa (Antioch), Marin (Mill Valley), Alameda (Berkeley, Oakland), Santa Clara (Stanford), Santa Cruz (Felton), Los Angeles (Eagle Rock Hills, Camp Baldy), Orange (Silverado Canyon), and Riverside (Gavilan, Riverside). I have also seen specimens from Oregon (Klamath Lake, 20 miles N. of Grants Pass, Gold Hill) and Washington (Almota). Collection dates are from March to September. Some of the paratypes from Berkeley were reared from nests in twigs.

The species is related to *declivatus*, *rectangulis*, *perennis*, and *chiricahuae* as indicated by the distinctive type of genitalia and the angled profile of abdominal sternite II. It differs from all of these by a combination of characters: second tergite of normal length and finely punctured toward the base, hind pronotal margin dark.

Stenodynerus (Parancistrocerus) declivatus R. Bohart

Stenodynerus declivatus R. Bohart, 1948. Proc. Calif. Acad. Sci. (4)24: 331.

The type locality is La Laguna, Sierra Laguna, Baja California. Specimens have also been seen from other Baja California localities and in California from San Diego Co. (San Diego, La Jolla), Orange Co. (Costa Mesa), and Los Angeles Co. (Puente Hills).

Stenodynerus pensylvanicus ignotatus, new subspecies

Markings white to yellowish white, otherwise similar to typical *pensylvanicus Saussure* (Etudes sur la famille des Vespides 3: 257) in somewhat narrowed body form, sharp and well punctured male clypeus, pale male flagellum beneath, moderate interocellar tubercles, narrow parategula, obtusely reflexed apex of tergite II, and mostly or entirely black female clypeus. Also, the male clypeus is edged with black along posterolateral edge, reflex of tergite II varies in width from 1.0 ocellus diameter or less in females to 1.5 or even 2.0 ocellus diameters in males (1.5 in holotype), and apex of tergite III may be banded, spotted or all dark. Free lateral spot on tergite II sometimes present (as in holotype).

Details of male genitalia and clypeus as in figure 4; margin of aedeagus between subbasal and median expansions composed of fine, close-set teeth as seen under high magnification.

Holotype, male (Calif. Acad. Sci.), Meadow Valley, Plumas Co., California, 4,000 ft., June 21, 1924 (E. C. Van Dyke). Paratypes, 6 males and 6 females from the following CALIFORNIA counties: Modoc (Buck Creek), Trinity (Big Flat), Lassen (Bridge Creek Camp), Plumas (Quincy), Sierra (Gold Lake), Eldorado (Lake Tahoe, Strawberry Valley, Echo Lake), San Bernardino (Cajon Pass). I have also seen specimens from Oregon (Bend, Lake of the Woods, Mt. Hood), Washington (Seattle, American River), Idaho (Coolin, Emmett), Minnesota (Beltrami Co., Polk Co., Ramsey Co., Sedan, Itasca Park), Michigan (Muskegon Co., Alger Co., Constantine), New Brunswick (Nerepsis). The distribution picture appears to be similar to that of other Canadian Zone species; that is, transcontinental in Canada reaching southward in the Great Lakes region and along the mountains of the Pacific Coast states. The typical subspecies has a more southerly range, extending from Ontario to Texas and from the Atlantic Coast to Colorado. Both subspecies occur in Minnesota and Michigan. Collecting dates are from June to August in California and as late as September in Minnesota and Michigan.

Stenodynerus (Parancistrocerus) minimoferus R. Bohart

Stenodynerus minimoferus R. Bohart, 1949. Proc. Ent. Soc. Wash. 51: 256.

The type locality is Davis, Yolo Co., California, and the species ranges over much of western United States as far east as Texas and Wyoming. In California it is known from the following counties: Yolo (Davis), Inyo (Independence), Los Angeles (Camp Baldy, Glendale), and Imperial (Coyote Wells). Collecting dates are from March to July.

This is the only species in the subgenus in which the third tergite is thickened apically in the same degree as the second. It has been reared several times from old *Sceliphron* nests, the mud cells of which it remodels. A previously unreported nesting site was discovered by E. Schlinger who reared three specimens from a mud-plastered, empty pupal case of a swallowtail butterfly which had been parasitized by tachinids.

Stenodynerus (Parancistrocerus) parapedestris, new species

Male.—Black with sulfur-yellow markings as follows: clypeus, scape in front, mandible mostly, squarish interantennal dot, ocular dot, postocular dot, front margin of pronotum (disconnected medially), anterior spot on tegula, parategula, pleural spot, postscutellum mostly, legs partly, apices of abdominal tergite I, segment II, sternite III broken laterally, tergites IV to VI, free laterobasal spot on tergite II. Wings brown stained, especially along costal margin. Pubescence grayish, inconspicuous. Puncturation moderate, rather fine and sparse on clypeus, coarse subapically on tergite II, shallow pit-like across summit of tergite I. Shape of clypeus and genitalia as in figure 6. Interocellar area with very broad low tubercles separated by a barely perceptible crease; humeral angle slightly obtuse seen from above; parategula blunt apically, somewhat incurved posteriorly; propodeum not forming a ridge behind postscutellum; middle femur not appreciably depressed beneath; tergite I narrower than II, without a definite carina across summit, tergite II with apical margin sharp, about ⅔ an ocellus diameter thick in posterior view. Length to apex of second tergite 7 mm.

Female.—Clypeus black with a basal yellow crescent, broader than long. Markings in general as in male but somewhat more extensive. Tegula mostly yellow, tergite I with an attached or nearly attached oblique lateral spot. Clypeal emargination shallow and rounded, vertex depression well defined, extending laterally to inside margin of ocelli.

Holotype, male (Calif. Acad. Sci.), Newhall, Los Angeles Co., California, April 20, 1940 (R. M. Bohart). Paratypes (all from Riverside Co., CALIFORNIA), 2 males and 3 females, The Gavilan, May 17, 1951 (R. Bechtel and E. Schlinger), 1 male, 1.5 miles north of Perris, on *Salvia mellifera*, May 4, 1938 (P. H. Timberlake); 1 female, Riverside, on *Encilia farinosa*, April 27, 1927 (P. H. Timberlake); 1 female, Murrieta, April 18, 1950 (J. W. MacSwain).

This species is similar in conformation of the male genitalia and many other respects to the eastern *pedestris*. However, the latter has the second tergite somewhat drawn out apically as viewed from above. *S. parapedestris* occurs in a yellow-marked form and in the white-marked desert race described below.

Stenodynerus (Parancistrocerus) parapedestris arenosus, new subspecies

Male.—Markings white, agreeing almost exactly in extent with description of *parapedestris* s.s. except that interantennal spot is broadly Y-shaped and touches clypeus, ocular spot extends along lower orbit to clypeus, tegula is mostly white, and tergite I has a free lateral spot.

Female.—Agreeing in general with description of *parapedestris* s.s. except for white markings. Clypeus usually with a pair of basal pale spots or all black; pronotal spots sometimes reduced, lateral spot on tergite I usually free.

Holotype, male (Calif. Acad. Sci.), Big Pine Creek, 4,500 ft., Inyo Co., California, May 19, 1947 (R. M. Bohart). Paratypes, 7 males and 21 females from the following CALIFORNIA counties: Inyo (Big Pine Creek, Mazourka Canyon, Keeler to Darwin), Kern (Willow Springs), San Bernardino (Victorville, Adelanto), Los Angeles (Westwood Hills, Lovejoy Butte), Riverside (Indio, Whitewater, Palm Desert, Palm Springs, Andreas Canyon, Taquitz Canyon), San Diego (Borego). Also, 4 males from Nevada (Charleston Mountains, Mt. Montgomery), and a pair from Arizona (Wickenburg, Roosevelt Lake). Recorded dates of capture are from March to July.

Stenodynerus (Parancistrocerus) lacunus (Fox)

Odynerus lacunus Fox, 1894. Proc. Calif. Acad. Sci. (2)4: 111.

The type locality is San Jose del Cabo, Lower California, and the species ranges over most of the arid southwest as far east as Texas. In California I have seen specimens from San Bernardino Co. (Needles), Riverside Co. (Idyllwild, Aguanga), San Diego Co. (Borego), and Imperial Co. (San Felipe Creek). Collecting dates in California are in April and August.

Stenodynerus (Parancistrocerus) acarigaster, new species

Male.—Black, marked with sulfur yellow as follows: mandible mostly, clypeus and adjoining Y-shaped interantennal spot, lower orbit, scape in front, postocular spot, front half of pronotum; pleural spot, tegula mostly, parategula, mesonotal dot, postscutellum mostly, propodeal dots above and below, legs partly, apical margins of tergites I to VI, I with large attached lateral spot, II with free lateral spot, apical margins of sternites II to VI, II with free lateral spot. Wings reddish brown, costa and stigma reddish, tarsi partly reddish. Pubescence obscure, fulvous. Puncturation moderate, rather fine on clypeus, coarse at summit of tergite I and subapically on II. Shape of clypeus and genitalia as in figure 8. Last antennal segment slender, flattened beneath, reaching base of eleventh segment; interocellar area with moderate, narrow tubercles, not bridged across median ocellus; humeral angle about 90° seen from above; parategula blunt apically, slightly incurved posteriorly; propodeum not forming a ridge behind postscutellum; middle femur depressed beneath toward base; tergite I nearly as broad as II, summit irregular but with a definite carina, tergite II decidedly reflexed so that apical margin is nearly 2 ocellus diameters thick in posterior view, apical outline convex as seen from above. Length to apex of second tergite 7 mm.

Female.—Markings about as in male except as follows: clypeus sometimes with a median black dot, usually with a yellow dot behind lateral ocellus, with 2 pleural spots, spots on scutellum sometimes present, a large spot on propodeal angle, tergites I and II and sternite II with attached lateral spots which may form a continuous transverse band.

Clypeus shallowly incised apically, moderately punctured. Vertex depression as broad as distance between lateral ocelli. Apical margin of tergite II about 1.5 ocellus diameters thick. Length to apex of second tergite 8-10 mm.

Holotype, male (Calif. Acad. Sci.), Big Pine Creek, 4,500 ft., Inyo Co., California, June 13, 1942 (R. M. Bohart). Paratypes, 68 males and 37 females from the following CALIFORNIA counties: Plumas (Quincy), Inyo (Big Pine Creek), Los Angeles (Tanbark Flat). In addition I have seen specimens from most of the other counties in California from Modoc to Riverside as well as from Nevada, Arizona (northern), Utah, Oregon, Washington, and Idaho. It occurs in California at elevations from 2,500 to 7,000 ft. but is most common in the foothill areas. Dates of capture are from April to August. It is related to *coronado* but is not so heavily sculptured and has only moderately developed interocellular tubercles.

Stenodynerus (Parancistrocerus) siccus, new species

Male.—Black with ivory-yellow markings as follows: clypeus, mandible mostly, scape in front, lower orbit, interantennal "Y" reaching clypeus, postocular and mesonotal dots, tegula mostly, pleural spot, parategula, postscutellum mostly, legs partly, apical band on tergites I to VI and sternite II, lateral spot on sternites III to V, free lateral spot on tergites I and II. Wings lightly brown stained, veins mostly dark brown. Pubescence pale grey, as long as one ocellus diameter on summit of tergite I, pollinose in some lights on dorsum of abdomen. Puncturation moderate, fine on clypeus, coarse at summit of tergite I where it outlines an irregular and indistinct transverse shelf-like carina, moderately coarse toward apex of tergite II but punctures spaced much more than a puncture diameter apart. Shape of clypeus and genitalia as in figure 9. Last antennal segment slender, flattened beneath, reaching base of eleventh segment; interantennal area with two low tubercles not bridged over front ocellus; parategula narrowed apically, posterior edge slightly incurved; propodeum not forming a shelf behind postscutellum; mid femur somewhat depressed at base beneath, apex of tergite II not so thick as one ocellus diameter but appreciably thicker than that of III. Length to apex of second tergite 6.5 mm.

Female.—Clypeus weakly incised apically, rather finely punctured, with a basal curved pale spot or nearly all black; mandible mostly dark; interantennal spot V-shaped; orbital spot present; a pair of vertex spots sometimes present; large propodeal spots; tergite I with lateral spot attached to apical band, tergite III rarely all dark. Vertex pit larger than an ocellus, as broad as interocellar distance. Length to apex of second tergite 8.0 mm.

Holotype, male (Calif. Acad. Sci.), Yuma, Arizona, May 6, 1939 (R. M. Bohart). Paratypes, 3 males and 5 females from

Yuma, Welton, and Tempe, ARIZONA. Also, 10 male and 6 female paratypes from the following CALIFORNIA counties: Riverside (Indio, Salton Sea, Mecca, Blythe), Imperial (Westmoreland, Harpers Well, Brawley, Palo Verde). In addition I have seen females apparently of this species from Baja California (El Mayor), Utah (Neola), Colorado (Delta), and Washington (Toppenish).

This species is closely related to *mcclayi* but averages smaller in size and paler in markings. Also, the callous along the summit of tergite I is not so strong and the aedeagus is more slender.

Stenodynerus (Parancistrocerus) mcclayi, new species

Male.—Black with sulfur-yellow markings as follows: clypeus, scape in front, prominent Y-shaped interantennal mark, lower orbit, postocular spot, 2 large humeral spots, tegula mostly, spot beneath, parategula, mesonotal dot, postscutellum mostly, spot on upper propodeal angle, legs partly, broad apical margin of tergites I to VI and sternites II to IV, attached spot on tergite I extending along summit nearly to middle, large free lateral spot on tergite II, free lateral spot on sternite II. Wings lightly stained, veins brown. Pubescence grayish, inconspicuous. Puncturation moderate, rather fine on clypeus, fine toward base of tergite II, coarse toward summit of tergite I where there is a smooth callous-like area on each side but no ridge, punctures near apex of tergite II rather coarse but well spaced. Shape of clypeus and genitalia as in figure 10. Last antennal segment slender, flattened beneath, reaching base of eleventh segment. Interocellar area with low tubercles not bridged over front ocellus; raised area present between ocelli and compound eye; humeral angle upturned, parategula somewhat narrowed apically and incurved posteriorly; propodeum not forming a ridge behind postscutellum; middle femur with a small but definite depression at base beneath; tergite I slightly depressed between summit and belt-like apical portion, about as wide as tergite II which has the apical thickness only about one-third of an ocellus diameter. Length to apex of second tergite 7.0 mm.

Female.—Clypeus usually yellow with apical black margin and 2 or 3 small black dots across middle, but sometimes more blotched with black; interantennal spot V-shaped; yellow vertex spots sometimes present; scutellum sometimes spotted; propodeal spots large; tarsi brown. Vertex pit somewhat larger than an ocellus. Length to apex of second tergite 9.0 mm.

Holotype, male (Calif. Acad. Sci.), Davis, Yolo Co., California, August 24, 1939 (G. E. Bohart). Paratypes, 55 males and 49 females from the following CALIFORNIA counties: Modoc (Alturas, Davis Creek), Siskiyou (Walker), Lake (Pillsbury Lake), Butte (Richardsons Springs), Sacramento (Sacramento), Yolo (Davis), Contra Costa (Antioch, Marsh

Creek), Alameda (Arroyo Mucho), Calaveras (Mokelumme Hill), San Joaquin (Stockton, Tracy, Weston), Santa Clara (San Antonio Valley), Inyo (Bishop, Shoshone, Westgard Pass, Lone Pine, Big Pine, Independence), Merced (Dos Palos), Fresno (Fresno), Monterey (Priest Valley), Tulare (Sequoia National Park, Three Rivers, Lemon Cove, Wood Lake), Los Angeles (Whittier, Los Angeles, Santa Monica), Riverside (Blythe, Riverside), San Diego (Ramona). I have also seen female specimens apparently of this species from Idaho (Notus) and New Mexico (Albuquerque). Collecting dates are from May to October.

The general body structure shows a relationship to *colon* but the reduced pubescence on tergite I and the practically unthickened apical margin of tergite II are separating characters. The species is named for Mr. A. T. McClay who collected some of the type series as well as many of the other specimens reported in this paper.

Stenodynerus (Parancistrocerus) cotti, new species

Male.—Black, marked with sulfur yellow as follows: mandible mostly, clypeus, Y-shaped interantennal spot reaching clypeus, scape in front, lower orbital margin, postocular dot, transverse humeral band narrowly broken medially, pleural spot, tegula mostly, parategula, postscutellum mostly, a small propodeal spot lateral to it, legs mainly, apical bands on tergites I to VI and sternites II to IV, large lateral spots on tergites I and II, and on II extending inward along summit. Wings light reddish brown, veins reddish. Pubescence obscure, fulvous, that of tergite I with hairs of one to three ocellus diameters extending about to middle of tergite. Puncturation moderately heavy and close, punctures rather coarse on clypeus, coarse on tergite I from summit to near apex, and coarse in a subapical band on tergite II. Structure of clypeus and genitalia as in figure 11. Last antennal segment slender, flattened beneath, reaching base of eleventh segment; parategula narrowed apically, posterior edge incurved; interocellar area with tubercles narrow but well developed, not bridged in front, separated by a punctured area; humeral angle obtuse as seen from above, propodeum not forming a shelf behind postscutellum, mid femur strongly depressed beneath on basal one-third; abdominal tergite I nearly as broad as II, without a defintie ridge across summit, II not reflexed apically, edge as seen in posterior view about one-third an ocellus diameter thick. Length to apex of second tergite 8.0 mm.

Female.—Clypeus striatopunctate, slightly incised apically, with a basal crescent and one or two subapical yellow marks. Interantennal and orbital spots shortened, propodeal spot lengthened. Vertex depression shallow, almost as wide as interocellar distance. Length to apex of second tergite 8.5 to 9.5 mm.

Holotype, male (Calif. Acad. Sci.), Sugar Hill, Modoc Co., California, July 5, 1950 (H. E. Cott). Paratypes, CALIFORNIA: 1 female, Buck Creek, Modoc Co., July 25, 1922 (C. L. Fox); 1 female, Davis Creek, Modoc Co., July 12, 1922 (C. L. Fox); and 1 female, Truckee, Nevada Co., June 20, 1927 (E. P. Van Duzee). I have also seen a female specimen from Baker, Oregon (E. C. Van Dyke) which agrees structurally but has the yellow markings more restricted, especially on the clypeus and pronotum.

The species is generally similar to *colon* and has very much the same form of aedeagus in the male. However, the second tergite is not at all channeled subapically and not appreciably thickened apically. The species is named for the collector of the holotype, Mr. H. E. Cott.

Stenodynerus (Parancistrocerus) toltecus (Saussure)

Odynerus toltecus Saussure, 1857. Rev. Mag. Zool. (2)9: 277.

The type locality is Mextitlan, Mexico. The species ranges over the more arid parts of the Pacific Coast and Great Basin States and extends to western Texas in the southwest. In California I have seen it from the following counties: Inyo (Big Pine, Lone Pine, Argus Mountains), San Bernardino (Morongo Valley, Twentynine Palms), Riverside (Idyllwild, Box Canyon, Pinon Flat, Indio, Palm Springs, Whitewater, San Jacinto, La Quinta, Cathedral City, Oasis), San Diego (Borego) and Imperial (Potholes). Collecting dates in California are April to September.

EXPLANATION OF FIGURES

Drawings were made with a camera lucida and corrected for bilateral asymmetry. Each figure includes the flattened aedeagus (a, subbasal expansion and b, median expansion), the basal extension of the volsella with its crest (c), and the male clypeus (d).

ENTOMOLOGICAL SOCIETY OF WASHINGTON
611TH REGULAR MEETING, OCTOBER 4, 1951

The 611th regular meeting of the Entomological Society of Washington, Thursday, October 4, 1951, was called to order by President Alan Stone at 8:05 PM, in the Auditorium of the U. S. National Museum. There were 77 members and 45 visitors present. The minutes of the previous meeting were read and approved.

The Society elected the following to membership:

Yale S. Sedman, Department of Invertebrate Zoology and Entomology, 203 Biology Building, University of Utah, Salt Lake City 1, Utah.

Allan R. Barr, Department of Parasitology, Johns Hopkins School of

Hygiene and Public Health, 615 North Wolfe St., Baltimore 5, Maryland.

José Herrera Gonzales, Instituto Pedagogico, Casilla 147, Santiago, Chile.

Frank E. Skinner, Division of Biological Control, University of California, P. O. Box 8, Albany 6, Calif.

Morris Schlosberg, P. O. Box 1857, Sacramento, California.

C. W. Sabrosky called attention to the Synoptic Catalog of the Hymenoptera of America North of Mexico, prepared by Muesebeck, Krombein, Townes and others and published as Memoir 2, U. S. Department of Agriculture.

Mr. Austin H. Clark called attention to a paper on postage stamps figuring butterflies appearing in Zeitschrift für Lepidopterologie, Band I, Heft 3, pages 184-185, October 1951.

K. V. Krombein circulated copies of *Insect Natural History*, by Imms, and *Parasitic Animals*, by Lapage; reviews of these books were published in the Proceedings.

Mr. Krombein announced the death of Prof. J. B. Parker on September 2, 1951, and gave the following brief resumé of his career. John Bernard Parker was born on a farm near Danville, Ohio, on September 24, 1870. He majored in entomology at Ohio State University, and received his bachelor's, master's and doctor's degrees from that institution. From 1908 to 1910 he was an assistant entomologist at Kansas State College and the Experiment Station. In 1910 he joined the staff of the Biology Department at Catholic University, Washington, D. C., as an instructor, and remained in that department until his retirement as emeritus professor in 1940. Dr. Parker's chief entomological contributions were a revision of the bembicine wasps of the world, and a series of papers on the nesting habits of certain solitary wasps. He joined the Entomological Society of Washington in 1912, and was a member in good standing at the time of his death.

W. H. Anderson reported the occurrence of living larvae of *Melyris* (*Zygia*) *oblonga* Fabricius (Melyridae) in a house at Haddonfield, New Jersey. The identification was based on an adult reared from one of the larvae, which were exhibited by Dr. Anderson. This is the first such record in this country.

R. I. Sailer told of an Alaskan Indian child he had observed in Fort Yukon, Alaska, who had recently been vaccinated for smallpox. The transfer of vaccine to numerous mosquito bites on the child's body by scratching had resulted in a simulated case of smallpox.

The regular program opened with a speech by Avery S. Hoyt, Chief of the Bureau of Entomology and Plant Quarantine, on the subject "Is Entomology Keeping Up with the Times?" The following is a brief abstract of Mr. Hoyt's address. Mileposts in the progress of entomology were the recognition of the power of insects to frustrate men in their way of life, attempts to control insects, perception of differences in their structure and appearance, and observation of their behavior. In ancient times, students of insects had no conception of the number of their species, while today, although it is possible to identify many thousands of species accurately, we still can only guess at the total number of species in existence. Progress in controlling insects has paralleled that in identifying them. A long list of chemicals has been added to the Paris green used before 1900 for control of the potato beetle and the kerosene emulsion used as the first practical contact spray for agricultural purposes. DDT was the forerunner of several chlorinated hydrocarbons and these were followed by phosphorus compounds. With the development of new insecticides, new equipment and techniques were devised for their application. Cultural practices and biological control methods were applied, and cooperation between State and Federal workers brought about more effective control programs. There were also heart-breaking setbacks, as in the resistance to insecticides that has been found to develop in some insects. These developments and setbacks may be compared with the general progress made by mankind that is familiar through history. Consideration of such factors will answer whether entomology is keeping up with the times. (Secretary's abstract.)

Reports on the IXth International Congress of Entomology at Amsterdam were given by F. C. Bishopp and C. W. Sabrosky.

Dr. Stone thanked Dr. W. H. Anderson for arranging the meeting in the auditorium. Adjournment at 10:15 P.M.

KELLIE O'NEILL, *Recording Secretary.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
612TH REGULAR MEETING, NOVEMBER 1, 1951

The 612th regular meeting of the Entomological Society of Washington was held at 8:00 P. M. Thursday, November 1, 1951, in room 43 of the U. S. National Museum, attended by 43 members and 22 visitors. The minutes of the preceding meeting were read and approved.

President Alan Stone asked that the officers prepare reports for 1951 to be given at the next Executive Committee meeting.

The Society elected R. C. Wallis, Department of Parasitology, The Johns Hopkins University School of Hygiene and Public Health, 615 North Wolfe Street, Baltimore 5, Maryland, to membership.

President Stone announced he had appointed C. F. W. Muesebeck chairman and W. B. Wood and C. A. Weigel members of the nominating committee.

A note was presented by W. D. Reed on the great interest of the Japanese in insects. Mr. Reed arrived in Japan in the middle of the "Insect Hearing Festival," an annual observance which has come down from feudal days.

K. V. Krombein circulated a copy of *American Social Insects* by Charles D. and Mary H. Michener, reviewed in the December issue of the Proceedings.

Stamps of Chile and Sarawak portraying insects were exhibited by J. F. Gates Clark. The Chilean stamps are part of a series showing animals and plants commemorating the hundredth anniversary of Gay's work.

A. B. Gurney presented a note on termites prepared by T. E. Snyder:

Zootermopsis angusticollis (Hagen) infesting Douglas fir lumber at Philadelphia, Pa. On October 7, 1951, a lumber dealer received a carload of 2x10 Douglas fir at his Willow Grove, Pa., lumber yard, near Philadelphia. This was shipped from Portland, Oregon, and the grade was no. 3 common, which grade allows local areas of decay and scattered ''worm holes.'' The lumber was found to be infested with the Pacific Coast damp-wood termite, *Zootermopsis angusticollis* (Hagen). Dr. Snyder inspected the lumber on October 11th with a representative of the Pennsylvania State Dept. of Agriculture. They found large numbers of nymphs (some with well-developed wing pads) and soldiers in large chambers in the lumber. Every board examined contained termites or showed termite galleries or pellets from the exterior. The infestation was several years old; probably these termites had attacked standing trees or logs from which the lumber was cut. State authorities condemned this lumber (30,317 board feet) and ordered that it be burned. This damp-wood termite could be dangerous if it became established in Pennsylvania, since it causes more damage to buildings in certain areas on the Pacific Coast than do subterranean termites.

Dr. Gurney then briefly discussed a collecting trip in central and southern Texas made by himself and O. L. Cartwright in September and October of this year.

F. P. Hubert exhibited a number of issues of stamps of entomological interest.

Don J. Pletsch brought greetings to the Society from Public Health Service personnel in the Orient.

On the regular program Lt. Col. Robert Traub spoke on ''Army Entomological Research in Borneo and Malaya.'' Col. Traub illustrated the work of the scrub typhus research team in these mountainous areas with colored slides.

The program was concluded with a paper by J. F. Gates Clarke on ''Host Relationships in *Depressaria* and *Agonopterix.*''

Collections of larvae and adults and records of host plants of species of *Depressaria* were made at eighty stations, mainly in Oregon and Washington, but with scattered ones in Idaho, Montana, Wyoming, South Dakota, Nebraska, and Iowa. Special attention was paid to larvae feeding on poison or water hemlock. Substitution of food plants was attempted in as many *Depressaria* species as possible, but not a single successful rearing on such substitutions was achieved. Similar substitution experiments with larvae of the closely related genus *Agonopterix* were successful. The study added substantially also to the known distribution of the family Oecophoridae in North America. Four undescribed species of *Depressaria* were collected, one European species was newly recorded for North America, additional food plant records were obtained, and new life history and habit data were secured in some species. (Author's abstract.)

The meeting was adjourned at 10:25 P. M.

KELLIE O'NEILL, *Recording Secretary.*

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AMERICAN CHRYSOMELIDAE IN THE BOSC COLLECTION (COLEOPTERA)

BY DORIS HOLMES BLAKE, *Washington, D. C.*

No matter what the race or age in which he lives, the real naturalist manifests himself in early youth in much the same fashion the world over. He has an absorbing, indivertible interest in the natural life about him. Louis Augustin Guillaume Bosc (known under the surname of d'Antic), born in Paris January 29, 1759, was a naturalist from childhood until his death in 1828.

His people had planned a military career for him, but in school he neglected his military studies steadily, and spent all his leisure collecting plants and insects with which he filled his room. So on leaving school, he was not pressed by his father, a Protestant physician, to go into the army. Instead he was found a position as secretary in a Paris office. Here he had a chance to establish a correspondence with the most celebrated naturalists of the day, and in particular with Fabricius, with whom he soon formed a close friendship. The French Revolution brought an end to his office work. In fact he seems to have escaped the guillotine that brought death to many of his associates only by hiding away in a cottage in the forest of Montmorency, a retreat quite in keeping with his tastes.

Later his friends managed to get him appointed as a consul to the United States, first at Wilmington and then at New York. Bosc, travelling on foot to Bordeaux, shipped on an American vessel bound for America in August, 1798. As a consul he never fulfilled his position. He landed at Charleston, S. C., and at once settled down in Michaux's gardens, where he spent his days collecting specimens and his evenings in preparing and studying them.

In an article written 41 years ago, W. C. Coker[1] wrote that Michaux's gardens had been a tract of some 111 acres situated near Ten Mile Station on the Southern Railway near Charleston, but all that remained at the time he wrote was a few old bricks and drainage ditches and a grove of oaks and magnolias said to have been planted by Michaux. Michaux had first come to Charleston about 1778 and remained there for at

[1]Coker, W. C., 1911, Journ. Elisha Mitchell Scientific Soc., 27: 65-72.

least 10 years, establishing a nursery where he planted the seeds of promising plants that he collected on his trips from Kentucky to Florida and even among the Bahamas. These plants were grown to send back to France.

Michaux and Bosc were not in Charleston at the same time, since Michaux had already sailed back to France when Bosc landed. But Michaux's gardens were the surroundings in which Bosc lived and collected while he was in America. Here he collected the specimens that he took back to France and that were later described by his friends Fabricius and Olivier. In 1800 the relations between France and the United States became such that Bosc had to return to France. He gave his insect collection to Fabricius and Olivier and distributed his other natural history specimens among the specialists of the day.[2]

In 1925, M. Pierre Lesne of the Muséum National d'Histoire Naturelle, Paris showed me a few specimens of *Oedionychus* that he said were cotypes of Fabricius' species from the Bosc collection. On my second visit to Paris, in the summer of 1950, I was particularly anxious to hunt up this Bosc collection. When I presented myself to Professor René Jeannel at the administration building in the Jardin des Plantes, he sent me with a note to M. André Descarpentries who works nearby in the entomological laboratory. M. Descarpentries did not know of the existence of the Bosc collection. There is no one there who at present is working on Chrysomelidae of which the Bosc collection chiefly consisted. Together we went up to the museum attic to hunt for it. He gave up the search after a bit but allowed me to continue by myself. The attic is a large, unpartitioned one, running the length of the building, with double rows of double cases ranged down the middle; other cases and shelves are along the sides. The collection in these cases is arranged first according to families and then according to individual collectors. There are collections made by Sedillot, Sicard, Abeille de Perrin, Demaison, Fairmaire, Rothschild, Bedel, and many others. Cases 5, 6, 7, 8, 9, and 34 were chrysomelids. After some hours' search, I found down near the bottom of case 9, which contained many miscellaneous boxes of undetermined material (some of them Lefevre's eumolpids), two old, red, paper boxes labelled Bosc Collection.

In passing I might say that practically all the insect material in the attic was in paper insect boxes, but all that I examined seemed moderately free of any insect infestation. I asked M. Descarpentries how they managed to keep out museum pests, and he told me that they went through the boxes

[2]Cuvier, George, 1829, Mémoires du Muséum d'Histoire Naturelle, 18: 69-92.

twice a year with paradichloride. The two boxes of Bosc material were not suffering from pests. Considering their age of approximately 150 years, I think that they were in good condition. Probably all specimens that were not had long since been discarded.

The beetles were pinned with strong, not corroded, long, steel pins, often through the left elytron. Sometimes there were two pin holes in a specimen. The labels, strips of black-bordered paper, were 52 or 54 mm. long, 9 mm. wide, and always folded on the pin. These two boxes contained mostly Chrysomelidae, and besides the American beetles, there were others labelled "h. f." (France), "h. in Lusitania," and so forth.

I made a quick sketch of all the American species, and notes on the condition, color, and sculpture of the specimens, and copied the labels. I wish that it were possible to publish these sketches, but they are too crude to be worth much except to the writer.

M. Lesne, when he showed me Bosc specimens in 1925, called them ''cotypes,'' and I have followed the same practice. Most of the species were described after Bosc had returned to Paris, although a few from Cayenne were described by Fabricius from Bosc's collection as early as 1792; at least one was described in 1798. It seems probable that Bosc turned over his material to Fabricius who may have kept part and returned the rest to him. Olivier later worked over the same material for his *Entomologie*. That this is probably so is indicated by the rather close correspondence between the Bosc specimens and the Olivier descriptions.

The following is a list of the American chrysomelids in the order in which they occurred in the two boxes with the names as given on the old labels, together with references to the original description and to Olivier's description. All Olivier's descriptions were in volume 6, 1808, of his *Entomologie*, except one, noted below.

Box 1

''*G.* [*alleruca*] *gelatinariae* Bosc. h. in Carolina.'' Two specimens, the one bearing the label incrusted with mold, with one of the elytra gone, the second specimen of similar coloration and cleaner, doubtless the same species.

Fabricius, 1801, Syst. El., vol. 1, p. 490; Olivier, p. 631, f. 36.

Fabricius gives the habitat as Carolina, from the Bosc collection. His description fits these specimens. Olivier's description and figure also agree. These may be regarded as cotypes. Olivier gives a clue to the identity of this species in stating that the food plant is Rondachine or *Hydropeltis*, Michaux's name for *Brasenia schreberi* Gmel., which is a gelatinous water plant related to water-lily. The beetle may be *Galerucella nymphaeae* (L.).

"*G. vittata* Oliv. h. in Carolina." Three specimens, all in fair condition.

Fabricius, 1775, Syst. Ent., p. 122; Olivier, p. 633, f. 38.

Fabricius in his first description in 1775 gives the habitat as Carolina from "Mus. Dom. Monson." These Bosc specimens are undoubtedly the ones from which Olivier drew up his description and the ones that Fabricius later in 1801 referred to, but are not the cotypes of his 1775 description. This is the species known as *Acalymma vittata* (Fab.), which, as Olivier wrote, feeds on cucurbits.

"*G. calmariensis* Fab. h.f." One specimen in poor condition, with the head detached but held by mold between the front legs.

Fabricius, 1775, Syst. Ent., p. 119; Olivier, p. 632, f. 37.

This cannot be the type. It is *Galerucella luteola* (Müll.) that feeds on elm.

"*G. notulata* Bosc. h. in Carolina." Two specimens, the one bearing the label in very poor condition, only a shell with the surface of the head, thorax and elytra left, no legs, nor antennae. The second specimen is nearly entire.

Fabricius, 1801, Syst. El., vol. 1, p. 489; Olivier, p. 636, f. 44.

Fabricius gives the habitat as Carolina from the Bosc collection; his description fits quite well except that the three outer vittae do not join at the apex, only the outer and inner ones join, and the color of the head is given as black, whereas in the labelled specimen the head has only a median dark line. Olivier's description agrees very well, but in his figure the dark occipital line is omitted. These may be regarded as cotypes. I believe that this is the species that is found on *Ambrosia artemisiifolia* L. and is known as *Galerucella notulata* (Fab.).

"*G. notata* Bosc. h. in Carolina." Two specimens, both covered with mold through which the surface shows indistinctly.

Fabricius, 1801, Syst. El., vol. 1, p. 488; Olivier, p. 637, f. 45.

Fabricius's description does not mention the basal spot on the elytra, but otherwise agrees well with the specimens. Olivier's description is much more exact, as usual, and corresponds very well, although the figure he gives does not correspond to his description or to the specimen in the head markings. These two specimens may be regarded as cotypes. I believe this is the species that occurs on *Eupatorium perfoliatum* L., and is known as *Galerucella notata* (Fab.).

"*G.*———h. in Cayenne." Two specimens of a *Schematiza* not determined.

"*G.*———h. in Guiana." One specimen of a *Diabrotica* with vittae, the thorax gone, not determined.

"*G. notata* Bosc. h. in Carolina." Two specimens similar to the ones above under the same label. These may also be regarded as cotypes. Following these, there are three specimens of a different species with much coarser punctation and quite different elytral markings. These do not match the Fabrician or Olivier descriptions and are not cotypes.

"*A.* [*ltica*] *petaurista* Oliv. h. in Carolina." Three specimens in fairly good condition.

Fabricius, 1801, Syst. El., vol. 1, p. 495; Olivier, p. 674, f. 7.

Fabricius gives the habitat as Carolina from the Bosc collection. His description matches the specimens, and Olivier's adds little details. The Olivier figure agrees. These may be regarded as cotypes and are the species we call *Oedionychus petauristus* (Fab.).

"*A. thoracica* Oliv. h. in America." One specimen with the abdomen missing.

Fabricius, 1775, Syst. Ent., Append., p. 821; Olivier, p. 678, f. 16.

This is not Fabricius' type. It corresponds to the description of Olivier, but not entirely to his figure, in which the marks on the thorax are somewhat different. Olivier gives the habitat as "America meridionalis" from the collection of Bosc, whereas Fabricius gave the habitat as America from Lee's collection. This may be the specimen that Olivier was describing. It is what we know as *Oedionychus thoracicus* (Fab.).

"*A. concinna* Oliv. h. in Carolina." Three specimens in good condition.

Fabricius, 1808, Syst. El., vol. 1, p. 499; Olivier, p. 679, f. 18.

Fabricius and Olivier both give the habitat as Carolina from the Bosc collection and both descriptions fit the specimens, although Olivier's figure is bluer. These may be regarded as cotypes. The species is known to-day as *Oedionychus concinnus* (Fab.).

"*A. fasciata* Fab. h. in Brasilia." One specimen in good condition.

Fabricius, 1798, Suppl. Ent. Syst., p. 96; Olivier, p. 675, f. 9.

This does not correspond either to Fabricius' or Olivier's descriptions and is not a type This specimen has the apex of the elytron yellow, although banded as in *Oedionychus fasciatus*, and is probably misidentified. The habitat given in both Fabricius and Olivier is St. Domingo. I am not able to identify this specimen.

"*G.* [*alleruca*] *suilla* Bosc. h. in Carolina." Two specimens in poor condition covered with old, yellow mold.

Fabricius, 1801, Syst. El., vol. 1, p. 417; Olivier, p. 892, f. 28.

Both Fabricius and Olivier give the habitat for this as Carolina from the Bosc collection and their descriptions apply very well to these old specimens which may be regarded as cotypes. This is not a *Colaspis*, but may be a species of *Metachroma*. It is about 3 mm. in length without elytral costae, the rows of elytral striae disappearing before the apex. The pronotum is densely but not coarsely punctate. Olivier compares *C. lurida* with it.

"*G. americana* Fab. h. in Carolina." Two specimens nearly covered with mold.

Fabricius, 1801, Syst. El., vol. 1, p. 489; Olivier, p. 636, f. 43.

Both Fabricius and Olivier give the habitat for this as Carolina from the Bosc collection, and their descriptions apply very well to these old specimens which may be regarded as cotypes. These specimens are coarsely punctate with short pubescence and have two vittae on each elytron and darkened sutural edges. They are known to-day as *Galerucella americana* (Fab.).

"*G. dorsalis* Oliv. h. in Carolina." One specimen.

Olivier, p. 646, f. 54.

This specimen does not at all correspond with Olivier's description or figure of *G. dorsalis*, but does agree well with the species following it on the same page, *G. nitidula*. Possibly the original specimen of *G. dorsalis* was lost and its label transferred to the following specimen. This might, therefore, be the cotype of *Galeruca nitidula* Oliv. It is a species of *Altica* about 4.5 mm. in length with deep blue-green, very minutely punctate prothorax with a depressed line along the base and blue-purple elytra with coarser punctation. I do not recognize the species.

"*A.* [*ltica*] *bicolor* Lin. Fab. h. in Cayenne." One specimen lacking one elytron, otherwise in fair condition.

Linnaeus, 1767, Syst. Nat., ed 12, p. 693; Fabricius, 1775, Syst. Ent., p. 112.

This is not a cotype but does appear to be the species we call *Oedionychus bicolor* (L.).

"*A. nobilitata* Fab. h. in Brasilia." Two specimens in good condition.

Fabricius, 1787, Mant. Ins., vol. 1, p. 76; Olivier, p. 684, f. 26.

These specimens do not correspond to Fabricius's description or Olivier's description and figure. They are not cotypes. They resemble *A. cruciata* Oliv.

"*A. ametystina* Oliv. h. in Canada." One specimen in fair condition.

Olivier, p. 687, f. 31.

This label does not agree with Olivier's type locality of St. Domingo This specimen is the North American species with plicate elytra that occurs on alder, *Altica ambiens* var. *alni* Harris, which occurs only in the northern states. It is not a cotype of the West Indian *amethystina*

"*A. equestris* Fab. h. in Brasilia." One specimen in good condition.

Fabricius, 1787, Mant. Ins., p. 76; Olivier, p. 673, f. 5.

This corresponds very well to the descriptions of Fabricius and Olivier and also to Olivier's figure. It was described, however, from Hunter's collection, and that fact probably excludes this specimen from being a cotype, although it might be. It is what we now know as *Asphaera equestris* (Fab.).

"*A. macula* Fab. (with a question mark) h. in Brasilia." Two specimens in fair condition.

Fabricius, 1801, Syst. El., vol. 1, p. 492.

These do not correspond to Fabricius's description which states that the thorax has a basal sulcus; the description also mentions that the elytra have two large black spots, which these specimens do not have. They are not cotypes. I do not recognize the species.

"*A. miniata* Bosc. h. in Carolina." Three specimens in good condition.

Fabricius, 1801, Syst. El., vol. 1, p. 495; Olivier, p. 685, f. 29.

These correspond to Fabricius's description and Olivier's description and figure. Both writers give Carolina as the habitat and from the Bosc collection, and the specimens may be regarded as cotypes. They are known to-day as *Oedionychus miniatus* (Fab.).

"*A. conjugata* Oliv. h. in Carolina." One female in fair condition.

Fabricius, 1801, Syst. El., vol. 1, p. 495; Olivier, p. 686, f. 30.

Except that Fabricius describes the elytra as "laevia" and Olivier as usual more accurately describes them as "sulcata," the specimens agree very well with the descriptions and figure. Both authors give Carolina as the habitat and Bosc the collector, and the specimens may be regarded as cotypes. This species is now known as *Oedionychus conjugatus* (Fab.).

"*A. glabrata* Fab. h. in Carolina." One female specimen in fair condition.

Fabricius, 1781, Spec. Ins., vol. 1, p. 156; Olivier, p. 685, f. 28.

This specimen does not entirely correspond to the descriptions of Fabricius and Olivier since the thorax has only one spot instead of three as described. Fabricius gave the locality as Jamaica and Olivier as Jamaica and Carolina and Olivier might have drawn up his description in the main from this specimen. It is not a cotype and is what we now call *Disonycha glabrata* (Fab.).

"*A.*———h. in Brasilia." One specimen, not determined.

"*A.*———h. in Carolina." One specimen, not determined.

"*A. frontalis* Bosc. h. in Carolina." One poor specimen lacking legs and antennae.

Fabricius, 1801, Syst. El., vol. 1, p. 500; Olivier, p. 694, f. 46.

This specimen corresponds to the unusually accurate description of Fabricius and the one by Olivier with its excellent figure, and as both writers give Carolina as the habitat and from the Bosc collection, this may be taken as a cotype. It is what we call to-day *Systena frontalis* (Fab.).

"*A. tibialis* Oliv. h. in Carolina." Two poor specimens, the surface of one all moldy and the other so dirty that only the color is visible.

Olivier, p. 697, f. 52.

Olivier's description and figure agree with these specimens and the locality as Carolina from the Bosc collection, so they may be regarded as cotypes of what we call to-day *Lactica* (*Monomacra*) *tibialis* (Oliv.).

"*G.* [*alleruca*]—h. in Brasilia." A single specimen of an unrecognized chrysomelid.

"*A.* [*ltica*] *pallens* Fab. h. in Guadeloupe." Two well preserved specimens.

Fabricius, 1792, Ent. Syst., vol. 1, part 2, p. 4.

These specimens are what we now know as *Diabrotica ochreata* (Fab.), also described from the island of Guadeloupe, P. de Badier collection. I have received word from S. L. Tuxen of the Copenhagen Zoological Museum that the type specimen of *Crioceris ochreata* Fab. in the Fabricius collection agrees with the sketch of *Diabrotica ochreata* that I sent him. Since *pallens* and *ochreata* were described from the same locality, this mistake in identification may have been made. This is not a type.

"*A. collata* Oliv. h. in Carolina." Two very moldy but entire specimens.

Fabricius, 1801, Syst. El., vol. 1, p. 463; Olivier, p. 702, f. 61.

The descriptions of both Fabricius and Olivier as well as the latter's figure agree with these specimens. The habitat by both is given as Carolina from the Bosc collection, so these two specimens may be regarded as cotypes. They are known to-day as *Disonycha collata* (Fab.).

"*A. volkameriae* Fab. h. in Brasilia." Two specimens somewhat eaten by dermestids.

Fabricius, 1792, Ent. Syst., vol. 1, pt. 2, p. 28; Olivier, p. 698, f. 53.

These specimens agree with both Fabricius' and Olivier's descriptions and the latter's figure. Fabricius described the species from America meridionalis, Pflug's collection, and Olivier from Para, Richard's collection. Possibly these specimens in the Bosc collection came from Richard's collection. They are probably not cotypes. They are a species of *Diphaulaca*, but I do not know which one.

"*A. iris* Oliv. h. in Carolina." A single specimen well covered by old mold but with the color visible.

Olivier, p. 702, f. 62.

Olivier's description and figure agree with this specimen. He gives the habitat as Carolina from the Bosc collection, so this may be regarded as a cotype. It is what is known to-day as *Lactica iris* (Oliv.).

"*A. caroliniana* Fab. h. Carolina." One specimen in good condition.

Fabricius, 1775, Syst. Ent., p. 122; Olivier, p. 684, f. 27.

Fabricius's and Olivier's descriptions agree with this specimen although Olivier's figure omits the two dark pronotal spots visible in this specimen. Fabricius gives the habitat as Carolina from the Drury collection, Olivier gives neither habitat nor collector. It is possible, of course, that this is a cotype, but not too probable, although the identification is correct. This is the species known to-day as *Disonycha caroliniana* (Fab.).

"*C.* [*hrysomela*] *12-punctata* Fab. h. in Carolina." One specimen in fair condition above but lacking breast and abdomen.

Fabricius, 1775, Syst. Ent., p. 103; Olivier, p. 628, f. 31.

Both Fabricius's and Olivier's descriptions and the latter's figure agree with this specimen. Fabricius in 1775 and again in 1792 leaves the habitat a blank. In his account of 1801, he gives the locality as Carolina from the Bosc collection. Olivier also gives this information, so this specimen may be regarded as one seen and identified by Fabricius but not the one from which he drew up his first description. It is known to-day as *Diabrotica 12-punctata* (Fab.).

"*A.* [*ltica*] *copalina* Bosc. h. in Carolina." One specimen, recognizable but with a large pin that breaks one side.

Fabricius, 1801, Syst. El., vol. 1, p. 466; Olivier, p. 720, f. 92.

Both Fabricius's and Olivier's descriptions and the latter's figure agree with this specimen. Since both writers gave Carolina as the habitat and from the Bosc collection, the specimen may be regarded as a cotype. It is the species occurring on *Rhus copallina* L., as Olivier wrote, and is known as *Orthaltica copalina* (Fab.) in present-day literature.

"*C. [ryptocephalus] pubescens* Fab. h. in Carolina." Two specimens, one dirty and in fair condition with the antennae missing, the other eaten by dermestids and with a round, green paper disc on the pin.

Fabricius, 1776, Gen. Ins., p. 220; Olivier, p. 820, f. 91.

These specimens agree with the short Fabrician description and with Olivier's description and figure. Fabricius gives the habitat as America borealis, Olivier adds Carolina and Georgia. Olivier cites this species from Fabricius. The trouble is that Fabricius' name had been applied to a species of *Glyptoscelis* and Olivier's name and description are of a *Pachybrachys*. Dr. S. L. Tuxen of the Zoological Museum at Copenhagen has written me that the type of *Cryptocephalus pubescens* in the Fabrician collection is an eumolpid, about 9 mm. long with long yellowish and whitish hairs. Thus Olivier's application of Fabricius' name to the species that we know to-day as *Pachybrachys pubescens* (Oliv.) will have to be dropped and the later name *Pachybrachys morosus* Haldeman be substituted.

"*A. [ltica] abdominalis* Oliv. h. in Canada." One specimen lacking head and thorax, only the elytra, abdomen and legs remaining.

Olivier, p. 679, f. 17.

Olivier's description and figure agree with what is left of the specimen and the habitat as Canada from the Bosc collection also agrees, so that this may be regarded as a cotype of Olivier's species. To-day it goes under the name *Oedionychus vians* (Illiger).

"*A. suturalis* Bosc. h. in Carolina." One specimen lacking antennae and hind legs.

Fabricius, 1801, Syst. El., vol. 1, p. 499; Olivier, p. 692, f. 42.

The descriptions of Fabricius and Olivier agree with this specimen although Olivier's figure lacks the spot he describes in the middle of the elytron and also has a longer sutural vitta. Both writers give the habitat as Carolina from the Bosc collection. The specimen therefore may be regarded as a cotype. It is known to-day as *Oedionychus suturalis* (Fab.). In connection with this species, Dr. S. L. Tuxen has made a sketch of the type of *Galleruca atomaria* Fab., described in the same publication on p. 490, and never identified by American coleopterists. It is apparently a more heavily marked specimen of *Oedionychus suturalis*. In combining them, I retain the name *suturalis* although *atomaria* has page priority, to avoid a change in this well-known name. *New synonymy.*

"*A. strigata* Bosc. h. in Carolina." One specimen in good condition.

I am not able to find any species described by Fabricius or Olivier under this specific name. There is an *Oedionychus strigatus* in Dejean's Catalogue, 1836-7, p. 410, from Brazil, but it seems merely a nomen nudum. This specimen is *Oedionychus sexmaculatus* (Illiger).

Following this are a number of undetermined specimens. There is also a row of specimens at the bottom of the box with green and yellow paper discs on the pins that bear no name labels.

"*A. aequinoctialis* Fab. h. in Brasilia." Five specimens, all in good condition.

Linnaeus, 1758, Syst. Nat., ed. 10, p. 374.

These are mirror-smooth Alticinae with black heads having a pale front, a pale yellow thorax, and black elytra with a violet tinge having on each five pale yellow spots. Which of several very similar species is *Asphaera aequinoctialis* (Linn.) I have never been able to determine satisfactorily. These are not cotypes.

"*A. obsidiana* Bosc. h. in Carolina." Two well-preserved specimens, the second covered with mold.

Fabricius, 1801, Syst. El., vol. 1, p. 497; Olivier, p. 691, f. 40.

Both Fabricius's and Olivier's descriptions fit these specimens but Olivier's figure does not show the pale apex. Both authors give the same habitat and from Bosc's collection. These may be regarded as cotypes and are known to-day as *Oedionychus obsidianus* (Fab.).

"*A. quercata* Bosc. h. in Carolina." One specimen, entire but deeply incrusted with a layer of dirt or old mold, the color still visible.

Fabricius, 1801, Syst. El., vol. 1, p. 495; Olivier, p. 687, f. 32.

Both the descriptions of Fabricius and Olivier and Olivier's figure correspond with this specimen. Both authors give the habitat as Carolina from the Bosc collection. This may be regarded as a cotype, and the species is known to-day as *Oedionychus quercatus* (Fab.).

"*C.* [*lythra*] *Dominicanus* Bosc. h. in Carolina." Two specimens in good condition.

Fabricius, 1801, Syst. El., vol. 2, p. 34; Olivier, p. 864, f. 28.

Both Fabricius' and Olivier's descriptions and the latter's figure agree with these specimens. Both authors give the habitat as Carolina from the Bosc collection, so these may be regarded as cotypes. They are known to-day as *Coscinoptera dominicanus* (Fab.).

"*C. humeralis* Bosc. h. in Carolina." Two specimens, one lacking one elytron and very moldy, the other less moldy with the surface visible.

Fabricius, 1801, Syst. El., vol. 2, p. 37; Olivier, p. 870, f. 35.

These specimens agree with the descriptions of Fabricius and Olivier and Olivier's figure. Both authors give Carolina as the habitat and from the Bosc collection. These may be regarded as cotypes. They are known to-day as *Babia humeralis* (Fab.).

Box 2

"*C.* [*hrysomela*] *scripta* Fab. h. in America." One specimen pinned through the left side and in good condition.

Fabricius, 1801, Syst. El., vol. 1, p. 438; Olivier, Entomologie, vol. 5, 1807, p. 559, f. 120.

Both Fabricius and Olivier give descriptions that agree with this specimen although Olivier's figure agrees better with two other specimens farther down in the box that are labelled "*G. interrupta* Bosc. h. in Carolina," and which do not at all agree with either Fabricius' or Olivier's descriptions of *interrupta*. There are a number of specimens of species of this genus near this specimen. It is possible that labels became shifted in the course of time. These specimens labelled *scripta* and *interrupta* are probably cotypes that Fabricius and Olivier worked over and described from Carolina and the Bosc collection. They are the species known to-day as *Chrysomela scripta* Fab.

"*C. carniolica* Meg. h. in Jamaica." (The label is not very legible and I may not have interpreted it correctly.) One specimen in good condition. This name does not appear in either Fabricius or Olivier. The specimen belongs among the Chrysomelinae, but I do not recognize it.

"*C.* [*ryptocephalus*] *limbatus* Fab. h. in Cayenne." One specimen, very moldy.

Fabricius, 1781, Spec. Ins., vol. 2, app., p. 498; Olivier, p. 909, f. 19.

Fabricius's account agrees with this specimen He states that the habitat is Cayenne from Dr. Schultz. Olivier's description and figure are of this beetle and he gives the habitat as French Guiana. It is possible this is a cotype. It is now known as *Colaspoides limbata* (Fab.).

"*C. livens* (?) Fab. h. in Carolina." This specific name is not legible, and *livens* is the best that I can make of it. The name, however, does not occur in connection with any beetle of this description. These are two well-preserved specimens of a *Colaspis* with reddish brown, densely punctate pronotum and costate elytra, the costae being paler yellow brown, the margin piceous, the body beneath chestnut brown with a greenish lustre. This beetle may be what we now call *Colaspis brunnea*, but Fabricius gives the Hybner collection as the one from which he described *brunnea*, and the specific name on this label cannot be construed as *brunnea*.

"*C.* [*rioceris*] *variegata* Fab. h. Cayenne." One poor specimen lacking one elytron and most of the abdomen.

Fabricius, 1792, Ent. Syst., vol. 1, pt. 2, p. 4; Olivier, p. 654, f. 70.

The descriptions of both Fabricius and Olivier and Olivier's figure except for the color agree with this poor specimen. Both gave Cayenne as the habitat and from the Bosc collection, so it seems probable that this is a cotype. The species is now known as *Cerotoma arcuata* (Oliv.).

"*C. bifida* Oliv. h. in Guadeloupe." One specimen in fair condition.

Olivier, p. 737, f. 16.

Olivier's description and figure do not apply entirely to this specimen and neither does the habitat Guadeloupe, Olivier's being French Guiana. The habitat of the preceding species in Olivier's Entomologie, *Crioceris retusa*, is given as Guadeloupe from the Bosc collection. This specimen is not marked like *retusa* but more like *bifida*, but I believe that it is neither, and that this is not a cotype.

"*C. solani* Bosc. h. in Carolina." Two specimens in fair condition with all the antennae and some of the legs missing.

Fabricius, 1798, Suppl. Ent. Syst., p. 93; Olivier, p. 742, f. 25.

The descriptions of both Fabricius and Olivier and Olivier's figure except for the red head agree with these two specimens. The thorax has now faded from red to pale yellow. Likewise the habitat Carolina from the Bosc collection agrees with the descriptions and these may be regarded as cotypes of the species now called *Lema solani* (Fab.).

Following these are undetermined specimens of an eumolpid from Brazil and a gallerucid from Guadeloupe.

"*C. fulva* Fab. h. Cayenne." One specimen of a large, pale, reddish-brown gallerucid about 10 mm. long, in good condition.

There is no Fabrician species with the specific name *fulva* that resembles this. There is a *Crioceris fulva* from Nova Cambria and a *C. fulva* from America meridionalis, from Schmidt's collection at Copenhagen, that is of a reddish-brown color, but it is an eumolpid. Evidently this Bosc specimen is misidentified.

"*C. retusa* Fab. h. in Guadeloupe." One poor specimen lacking antennae and pinned on the left side with broken elytra.

Fabricius, 1792, Ent. Syst., vol. 1, pt. 2, p. 6; Olivier, p. 730, f. 15.

The descriptions of both Fabricius and Olivier and Olivier's figure apply to this specimen, likewise the habitat Guadeloupe and from the Bosc collection, so this may be regarded as a cotype of what is now known as *Lema retusa* (Fab.).

"*G.* [*alleruca*] *hectica* Fab. h. in Brasilia." One well preserved specimen of a pale, yellow-brown *Oedionychus* about 9½ mm. long.

Fabricius, 1801, Syst. El., vol. 1, p. 496.

This specimen does not entirely agree with the description of *G. hectica.* Fabricius describes that species as having the thorax posteriorly impressed, which is not true of this specimen. Otherwise the description and habitat might fit. In Syst. El. vol. 2, p. 56, is the description of a *Cryptocephalus hecticus,* but it is a species from India. This specimen is probably not a cotype.

"*G. ferruginea* ? Fab. h. in Brasilia." One specimen lacking antennae but in good condition, a brown eumolpid nearly 10 mm. long with toothed prothorax. Two other specimens (? the same species) are in the next row. None of these specimens agrees with the type of *Colaspis ferruginea* Fab. from America meridionalis in the Museum at Copenhagen, so cannot be regarded as cotypes.

"*G. caminea* Bosc. h. in Carolina." One poor, but recognizable specimen more or less moldy with one antenna gone and the elytra broken by the pin.

Fabricius, 1801, Syst. El., vol. 1, p. 459; Olivier, p. 656, f. 73.

The descriptions of both Fabricius and Olivier and the latter's figure together with the habitat and the Bosc collection agree with this poor specimen and it may be regarded as a cotype. The species is now known as *Cerotoma ruficornis* (Oliv.).

"*G. albicollis* Fab. h. in Guadeloupe." Four specimens, all in fair condition, three probably the same species and the fourth another.

Fabricius, 1787, Mant. Ins., vol. 1, p. 76; Olivier, p. 682, f. 22.

These specimens do not come from the type locality given by both writers—French Guiana (Cayenne), and therefore cannot be cotypes of *Asphaera albicollis* (Fab.).

THE SIMULIIDAE OF ALASKA

(DIPTERA)

BY ALAN STONE, *Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, United States Department of Agriculture*

The intensive study of the biology of the Alaskan biting Diptera, undertaken in 1947 and 1948 by the Alaskan Insect Project,[1] has resulted in 36 species of black flies being known from that Territory, more than from any state of the United States or any Province of Canada. I had hoped to incorporate the descriptions of the five new species and of formerly unknown pupae or sexes in a complete revision of the Nearctic Simuliidae. Completion of that task is not foreseeable in the immediate future, so in order to make names available for six species I am presenting this preliminary paper. A more complete treatment of all the species here included, with further illustrations and descriptions, will have to await the complete revision. The bibliographic citations given are only those of the original proposal of the valid or newly synonymized names and of the best available descriptions. I have described in detail only that which is new. For the parts of the male terminalia I have adopted the terms used by Freeman 1950 (Ann. Trop. Med. & Parasit. 44(2): 146-152), the adminiculum of authors becoming the ventral plate, and the adminicular arms the parameres.

I have given only the Alaskan distribution for all but the new species, leaving the entire distribution of the described species for the later paper. Since a paper is being prepared on the biology of the Alaskan black flies, I here omit seasonal distribution or other biological information. In the distributional data the numbers following the Alaskan roads indicate the distance on the road from its beginning, as shown on the accompanying map prepared by Kathryn M. Sommerman.

I am particularly indebted to Dr. R. I. Sailer and Dr. Kathryn M. Sommerman, and their assistants, who greatly extended the work in 1948 that I began in 1947.

KEYS TO ALASKAN GENERA, ADULTS

1. A bulla behind eye laterally; scutum with stout erect hairs but no fine recumbent hairs .... *Gymnopais* Stone
   No bulla behind eye; scutum usually with fine recumbent hairs but never with stout, erect ones 2

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[1]This project was conducted under a transfer of funds from the Department of the Army to the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

ALCAN HIGHWAY - CANADIAN BORDER MILE-POST 1220 TO DELTA JUNCTION MILE-POST 1430, 210 MILES

CHITINA ROAD - RICHARDSON HIGHWAY TO CHITINA, 40 MILES

CIRCLE HOT SPRINGS ROAD - STEESE HIGHWAY TO CIRCLE HOT SPRINGS, 10 MILES

ELLIOTT HIGHWAY - FOX TO LIVENGOOD, 77 MILES

GLENN HIGHWAY - ANCHORAGE TO GLENALLEN JUNCTION, 189 MILES

NABESNA ROAD - BIG TIMBER LODGE TO NABESNA, 110 MILES

NORTHWAY ROAD - ALCAN HIGHWAY TO NORTHWAY, 9 MILES

RICHARDSON HIGHWAY - VALDEZ TO FAIRBANKS, 358 MILES

SLANA-TOK ROAD - SLANA TO TOK, 75 MILES

STEESE HIGHWAY - FAIRBANKS TO CIRCLE, 170 MILES

WILLOW ROAD - PALMER TO WILLOW, 60 MILES

MAP OF ALASKA, SHOWING THE HIGHWAYS

2. Second hind tarsal segment with pedisulcus; vein R with or without setae above .... *Simulium* Latreille
   Second hind tarsal segment without pedisulcus; vein R with setae on dorsal surface 3
3. Microtrichia of anterior wing veins hair-like, not intermingled with spiniform ones; radial sector forked .... *Prosimulium* Roubaud
   Microtrichia of anterior wing veins mixed, hairlike and spiniform; radial sector rarely forked .... *Cnephia* Enderlein

PUPAE

1. Dorsum of abdomen with no hooks; sternites 4-6 each with about 10 hooks in more than one transverse row; almost no cocoon .... *Gymnopais* Stone
   Dorsum of abdomen with hooks on some of the segments; if sternites 4-6 have more than 4 hooks these are in a single transverse row 2
2. Strong terminal hooks present; cocoon irregular without any clearly defined anterior margin; respiratory filaments if fewer than 14 not arising from more than two main trunks; if more than 14 not arising from a rounded knob on a short petiole .... *Prosimulium* Roubaud
   Terminal hooks usually very weak or absent and cocoon well formed and with a clearly defined anterior margin; if not, the respiratory organ of about 11 filaments arising at a considerable distance from the base from two main trunks, or the filaments more numerous, arising from a rounded knob on a short petiole 3
3. Either terminal hooks well developed and cocoon poorly formed or cocoon with a broad antero-ventral collar so that it is boot-shaped and tergites 5-7 each have an anterior row of small spines .... *Cnephia* Enderlein
   Terminal hooks weak or absent; cocoon well developed; either cocoon is boot-shaped with a series of loops forming the anterior margin and tergites 5-7 are free of spines anteriorly, or the cocoon is wall-pocket shaped .... *Simulium* Latreille

Genus **Gymnopais** Stone

FEMALES

Width of eighth tergite greater than width of head .... *dichopticus* Stone
Width of eighth tergite about half inch width of head .... *holopticus* Stone

MALES

Dichoptic; genitalia broader than head .... *dichopticus* Stone
Holoptic; width of genitalia about half width of head .... *holopticus* Stone

Pupae

No terminal hooks; respiratory filaments usually 4, the dorsal pair usually short .... *dichopticus* Stone
Well developed terminal hooks present; respiratory filaments usually 2 or occasionally with a third short one .... *holopticus* Stone

Gymnopais dichopticus Stone

Proc. Ent. Soc. Washington, 51:261, 1949, ♀, ♂, pupa.

Alaskan Distribution.—Elliott Highway, 27-68; Glenn Highway, 117-138; Nabesna Road 50-96; Willow Road, 41; Richardson Highway, 73-112; Steese Highway 19-121; Slana Tok Road, 8-83; Whittier.

Gymnopais holopticus Stone

Proc. Ent. Soc. Washington, 51:265, 1949, ♀, ♂, pupa.

Alaskan Distribution.—Near Circle Hot Springs; Elliott Highway, 42-68; Glenn Highway, 137; Nabesna Road, 50-84; Richardson Highway, 193; Slana-Tok Road, 11-15; Steese Highway, 15-121.

Genus **Prosimulium** Roubaud

Females

1. Claws bifid; that is, with the basal swelling produced into a strong acute tooth 2
   Claws simple, with no more than a basal swelling or with a very minute basal tooth adjacent to the basal swelling 5
2. Mesoscutum predominately reddish brown; rather large species, the wing 4.5-5.0 mm long .... *onychodactylum* D. & S.
   Mesoscutum dark brown; smaller species, the wing less than 4.0 mm long 3
3. A few fine sternopleural hairs .... *pleurale* Mall.
   No sternopleural hairs 4
4. Antenna with 11 segments; mandibles and maxillae not toothed or serrate .... *alpestre* D. R. & V.
   Antenna 9 or 10 segmented; mandibles serrate; maxillae with retrorse teeth .... *decemarticulatum* (Twinn)
5. Integument orange .... *fulvum* (Coq.)
   Integument dark brown to black 6
6. Sclerotized sternal plates on segments 2-6 .... *ursinum* Edw.
   Sternites 2-6 membranous 7
7. Stem vein with dark hairs .... *dicum* D. & S.
   Stem vein with pale yellow hairs .... *hirtipes* (Fries), *travisi*, n, sp.

Males

1. Antenna with 11 segments 2
   Antenna with less than 11 segments .... *decemarticulatum* (Twinn)
2. Hind femora, at least, yellow 3
   Hind femora brown or blackish 5

3. Integument of thorax orange .... *fulvum* (Coq.)
   Integument of thorax dark brown to blackish........ 4
4. Diststyles with 4 or 5 teeth........ *alpestre* D. R. & V.
   Diststyles with 2 teeth........
   ....*onychodactylum* D. & S. *travisi*, n. sp., *ursinum* Edw.
5. Ventral plate apically with sharp lateral prongs between which lies a two-tined fork........ *pleurale* Mall.
   Ventral plate not so formed........ *dicum* D. & S., *hirtipes* (Fries)

PUPAE

1. Respiratory organ consisting of two stout, divergent tubes on a short petiole, from which arise slender filaments (Fig. 1)........
   ....*oinychodactylum* D. & S.
   Respiratory organ not so formed........ 2
2. Respiratory filaments 9, arranged in a whorl from a short base
   ....*decemarticulatum* (Twinn)
   Respiratory filaments 14 or more........ 3
3. Respiratory filaments 14 or 15........ *ursinum* Edw.
   Respiratory filaments 16 or more........ 4
4. Respiratory filaments 16, closely clumped; dorsum of thorax rugose........ *travisi*, n. sp.
   Respiratory filaments 16 or more; if only 16 the main trunks more divergent and thorax not rugose........ 5
5. Respiratory filaments 16........ *fulvum* (Coq.), *hirtipes* (Fries)
   Respiratory filaments more than 16........ 6
6. Respiratory filaments 21........ *dicum* D. & S.
   Respiratory filaments more than 21........
   ....*alpestre* D. R. & V., *pleurale* Mall.

Prosimulium alpestre Dorogostajskij, Rubzov, and Vlasenko

Leningrad Acad. Sci., URSS, Inst. Zool., Mag. Parasitol. 5:136, 1935, ♀, ♂, pupa.

Alaskan Distribution.—Anchorage; Chitina Road, 4-10; Eklutna Lake; Elliott Highway, 9-245; Slana-Tok Road, 4-46; Steese Highway, 16-99; Valdez.

This species, described from East Siberia, is here reported from the North American continent for the first time. It is one of the most abundant species in many streams in the Alaska Range of central Alaska. Adults are rarely encountered, probably because they are not bloodsucking.

Prosimulium decemarticulatum (Twinn)

Canad. Jour. Res. D, 14:110, 1936 (Simulium (*P.*)), ♀, ♂, pupa.

Alaskan Distribution.—College.

A male and female were collected in an emergence trap in the outlet stream of a pond near College. The male has only 9 antennal segments, but the terminal segment is slightly constricted giving the appearance of two fused segments, and the genitalia agree well with Twinn's figure and description.

Prosimulium dicum Dyar and Shannon

Proc. U. S. Nat. Mus. 69(10):17, 1927. ♀.

Alaskan Distribution.—Ketchikan (nine of type series).

Prosimulium fulvum (Coquillett)

Proc. U. S. Nat. Mus. 25:96, 1902 (*Simulium*), ♀, ♂; Dyar and Shannon, Proc. U. S. Nat. Mus. 69(10); 7, ♀, ♂.

Pupa.—I have found no means of distinguishing the pupa of *fulvum* from that of *hirtipes*. Although the adult females of this species are frequently encountered very few pupae have been collected and only 6 adults, all females, have been reared.

Alaskan Distribution.—Anchorage; Camp 327, Alaskan Engineering Commission; Cape Fanshaw; Chitina Road 4; Eklutna Lake; Fourth of July Creek; Glenn Highway, 16-36; Golovin; Homer; Juneau; Katmai; Kukak Bay; Nabesna Road 80; Naknek Lake; Richardson Highway, 15-188; Seward; Sitka; Skagway; Steese Highway, 59-118; Valdez; Virgins Bay, Prince William Sound; Willow Road 29-36.

Prosimulium hirtipes (Fries)

Monog. Simul. Sueciae, observationes entomologicae 1:17, 1824 (*Simulia*), ♀, ♂; Puri, Parasitology 17:359-362, 1925 (*Simulium*), larva, pupa; Twinn, Canad. Jour. Res. D, 14:103, 1936 (*Simulium* (*P.*)), ♀, ♂, pupa.

Alaskan Distribution.—Anchorage; Camp 327, Alaskan Engineering Commission; Cape Fanshaw; Chitina Road, 3-13; Douglas Island; Eklutna; Elliott Highway, 25-43; Glenn Highway, 16-65; Goose Bay, Knik Arm; Hurricane; Katmai; Ketchikan; Kodiak; Kukak Bay; Lagoon; Matanuska; Mount McKinley; Nabesna Road, 52-96; Naknek Lake; Pigot Bay, Prince William Sound; Popoff Island; Richardson Highway, 8-298; Seward; Slana-Tok Road, 10-38; Steese Highway 6-97; Valdez; Virgins Bay, Prince William Sound; Whittier; Willow Road, 2-33.

Prosimulium onychodactylum Dyar & Shannon

Fig. 1

Proc. U. S. Nat. Mus. 69(10):14, 1927, ♀; Hearle, Proc. Ent. Soc. British Columbia 29:18, 1932 (unnamed), pupa.

Male.—Considerably darker than female, the orange of the scutum scarcely evident. Head holoptic, the facets above antennae much larger than those below; clypeus dark, with erect, dark brown hair. Stem vein with yellowish brown hair; legs slightly darker than in female. Leg ratios: I. 8:4:15:16:9:5:3:1.8:1.5; II. 6:4:18:16:7:4.2:2.6:1.5:2; III. 8.5:4:24:21:14:6:3:1.5:1.5. Hind basitarsus 4 times as long as greatest width; second hind tarsus slightly less than three times as long as

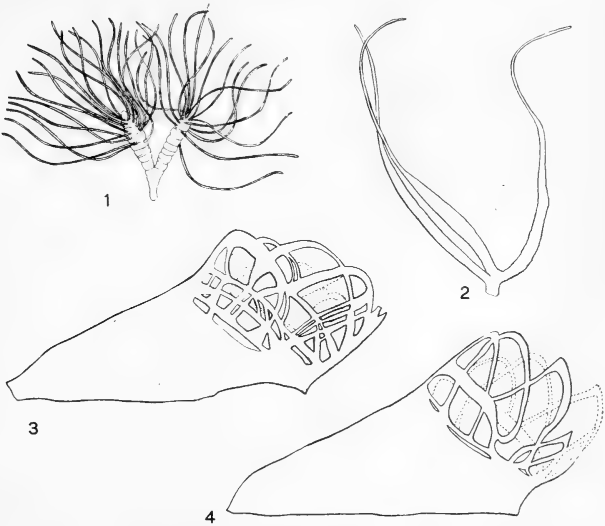

Fig. 1, *Prosimulium onychodactylum* D. & K., pupal respiratory organ. Fig. 2, *Simulium* (*Eusimulium*) *baffinense* Twinn, pupal respiratory organ. Fig. 3, *Simulium* (*S.*) *arcticum* Mall., cocoon. Fig. 4, *Simulium* (*S.*) *corbis* Twinn, cocoon.

greatest width. Tergites and sternites dark brown, the latter well developed on segments 3-8; basistyle short, stout; dististyle rather short, tapering, the apex with two teeth; ventral plate broad, scarcely notched apically.

Pupa.—Length 4.5 to 5.0 mm. Respiratory organ (fig. 1) consisting of two stout, shallowly-ringed clubs arising from a small, slender base, the dorsal club slightly the smaller, with about 16 slender filaments arising from the apical third, the ventral with more than 20 filaments arising from the apical half. Thorax slight rugose anteriorly; no trichomes. Abdomen dorsally with an anterior transverse band of very fine teeth on segments 3-9 and eight heavier hooks posteriorly on segments 3 and 4; ventrally segment 5 with two stout teeth near the posterior margin and segments 6 and 7 with four each, the median ones in line with those on 5, the lateral ones clear to the side. Terminal hooks of abdomen large, arising close together and diverging. Cocoon poorly developed, consisting of strong threads to which sand grains, often of considérable size, adhere.

Alaskan Distribution.—Anchorage; Glenn Highway, 17-36; Ketchikan; Nabesna Road 64-70; Richardson Highway, 14-38; Steese Highway, 42; Willow Road, 32.

Prosimulium pleurale Malloch

U. S. Dept., Agr., Bur. Ent. Tech. Ser. No. 26:17, 1914, ♀.

Synonym.—*Prosimulium pancerastes* Dyar & Shannon, Proc. U. S. Nat. Mus. 69(10):10, 1927, ♂ (new synonymy).

Pupa.—Length 3-3.5 mm. Respiratory organ of about 26 slender filaments, forming a broad clump about 0.4 length of pupa. Dorsum of thorax smooth or very faintly rugose; trichomes slender. Abdomen dorsally with an anterior transverse band of fine teeth on segments 4-9 and 8 large hooks posteriorly on segments 3-4; ventrally segments 4-7 with 4 hooks posteriorly; terminal hooks large, close together at base, divergent. Cocoon irregular, often covering entire pupa including the respiratory organ.

Alaskan Distribution.—Anchorage; Camp 334, Alaskan Engineering Commission; Chitina Road, 4-10; Glenn Highway, 36; Healy; Hurricane; McKinley Park Station; Matanuska; Nabesna Road, 91-98; Nenana; Willow Road, 32; Paxson; Richardson Highway, 58-188; Slana-Tok Road, 64; Steese Highway, 40-93; Valdez.

The cotypes of *Prosimulium pancerastes* consist of two males in the U. S. National Museum from Peck, Idaho, one mounted whole on a slide, the other with abdomen and hind legs on a slide, the rest on a pin. This latter specimen is here designated as lectotype of the species. This specimen shows sternopleural hairs characteristic of *pleurale*, while all the males reared in Alaska show the characteristic genitalia of *pancerastes*. The other specimens mentioned by Dyar and Shannon under *pancerastes*, are, for the most part, other species of *Prosimulium*.

Prosimulium travisi, new species

Female.—(Reared and possibly not fully darkened). Length 3 mm. Head orange-brown, densely clothed with yellow hair; width to height of head capsule as 4:3; width of head to width of thorax as 4.1:5.9; Antennae 11-segmented, the scape and pedicel orange-brown; the flagellum slightly darker; pedicel about equal in length to first flagellar segment; clypeus slightly longer than wide; palpi darker brown; width of frons at narrowest equal to combined lengths of scape and pedicel, strongly divergent above; mandibles and maxillae toothed. Scutum somewhat darker than head, densely clothed with yellow hair; extreme sides and most of pleura ashy gray; scutellum with dense, erect yellow hair; postnotum reddish brown; no hairs on pleural membrane or sternopleuron; mesepimeral tuft pale yellow. Wing 4 mm long, the veins yellow; hairs of stem vein bright yellow; halteres pale yellowish. Legs yellowish brown with yellow hair, the tarsi somewhat darkened; Leg ratios: I. 6:3:13:13:9:4:3:1.5:3. II. ?:2:15:14:8:3.5:2:1.5:2. III. ?:?: 18:18:12:4:2:1.5:2; claws untoothed. Abdomen yellowish brown, the hairs pale yellow; sternites 2-6 undeveloped; anterior gonapophyses and paraprocts short, the latter not projecting posteriorly and not approaching apex of the rounded cerci.

Male.—Length 3 mm. General color somewhat darker than ♀; hair coloration as in female. Leg ratios: I. 6:3.5:12:13:7.5:4.5:3.5:1.5:2; II. ?:4:13:13:6:3.5:2.3:1.5:1.5; III. 6:4:18:17:11:5:2:1.5:2; greatest width of hind basitarsus 0.3 length; second hind tarsus 2.5 as long as greatest width. Abdominal sternites sclerotized, clothed with pale hair. Ventral plate transverse, truncate apically, with the usual ventral, triangular lip; dististyle conical, with two distal teeth.

Pupa.—Length without respiratory organ 5 mm. Respiratory organ a narrow clump of 16 filaments arising from three main trunks, the whole about as long as pupal body to apex of wing pads; dorsum of thorax strongly, irregularly rugose; dorsal trichomes 6, rather stout, curving forward, arranged in a transverse ellipse. Abdominal segments 3-4 with 8 stout hooks on posterior margin of each; tergites 5 or 6-8 with anterior row of many fine spines; terminal hooks well developed, rather far apart basally; segments 5-7 ventrally with 4 retrorse hooks each on posterior margin; segment 4 with 2 hooks ventrally. Cocoon rather loosely woven but somewhat more regular than usual for genus, wall-pocket shaped, usually covering the abdomen only.

Holotype: Female, reared, Anchorage, Alaska, Sept. 30, 1948 (Sommerman & Dover). Paratypes.—ALASKA: Same data as type, ♂; Horsetail Falls, near Valdez, July 19, 1947 (Travis & Wilson), pupa; Richardson Highway, 17, Aug. 19, 1947 (Travis & Wilson), 26 pupae; 26, Aug. 13, 1947 (Storm), 4 pupae; Whittier, Aug. 5, 1947 (Travis), 5 pupae; Willow Road, 28.4, Aug. 1, 1948, pupa; Valdez, July 18, 1947 (Travis & Wilson), 2 pupae. (U. S. Nat. Mus. No. 61188). COLORADO: Loveland Pass, July 23, 1938 (H. H. & J. A. Ross), pupa (Ill. Nat. Hist. Surv.).

I take pleasure in naming the species after my friend B. V. Travis, leader of the Alaskan Insect Project of 1947 and 1948, and the first collector of this species in Alaska.

Prosimulium ursinum (Edwards)

Ann. & Mag. Nat. Hist. (10)15:535, 1935, (*Simulium* (*P.*)), ♀, larva, pupa.

Synonym.—*Simulium* (*Prosimulium*) *browni* Twinn, Canad. Jour. Res. D. 14:113, 1936, ♀, pupa (new synonymy).

Male.—Length 4.5 mm. Head dark, the clypeus with dark hair; antenna brown, slender, the pedicel about as broad as long, the first flagellar segment slightly more slender; third palpal segment dark, the sensory organ small, about 0.25 length of segment; 4th and 5th palpal segments paler, the 5th twice as long as 4th. Thorax nearly black, the hairs yellowish-brown, the more erect ones somewhat darker. Wing 4 mm long; veins yellowish. Coxae dark brown, with dark hair; rest of legs yellowish brown, somewhat darkened at femoro-tibial joint; Leg ratios I. 6.5:4:13:16:8.5:5:3:1.5:1.5; II. 6:5:15:16:7:4:2.5:1.5; 1.5; III. 8:4:22:19:12:5:2.5:1.5:2; first and second hind tarsal segments swollen, the ratio of length to greatest width being 3 and 2 respectively. Sclerotized portions of abdomen dark brown, the sternites developed; genitalia half as wide as head; basistyles reddish brown, stout; dististyle broad at base, tapering apically and slightly curved, with two teeth, one at apex, the other subapical on the convex margin; ventral plate about as broad as long, the basal prongs compressed, the median portion stout, scarcely emarginate apically, the median lip thick, blunt, and curved backward only slightly.

Alaskan Distribution.—Alcan Highway, 1363-1380; Glenn Highway, 117-135; Nabesna Road, 50-84; Richardson Highway, 26; Slana-Tok Road, 15; Steese Highway, 16-139.

I have seen topotypic larvae and pupae of *ursinum* and have compared the pupae with the original pupae of *browni* and find no differences. Twinn pointed out to me the possible synonymy of these species and I think it is quite correct. Twinn described the female of *browni* as having no tooth on the claw, but the holotype and paratypes do have a small but distinct one.

Genus **Cnephia** Enderlein

Of the six species that I have assigned to this genus in Alaska, four are undescribed. Two of these, *saileri* and *sommermanae*, are closely related to *Prosimulium borealis* Malloch, 1919, but this species was described from a male, and without the females or pupae it will be very difficult to fix the identity of Malloch's species. There appear to be one or more northern species scarcely distinguishable from *borealis*, so Malloch's species must remain a *species dubium* for the present. The pupae of the Alaskan *Cnephia* show a great deal of divergence in structure, which throws some doubt upon the generic position of some of the species, but until adult characters can be found to support the pupal divergence, I prefer to place them all in *Cnephia*.

Females

1. Tarsal claws simple 2
   Tarsal claws each with a strong basal projection 3
2. Maxillae with retrorse teeth; mandibles serrate; calcipala large and broadly rounded .... *mutata* (Mall.)
   Maxillae without teeth; mandibles not serrate; calcipala shorter and somewhat pointed .... *emergens*, n. sp.

3. Mesopleural membrane with a distinct patch of fine hairs 4
Mesopleural membrane bare 5
4. Maxillae with retrorse teeth; mandibles serrate; tooth of tarsal claw stout, the sides convex in profile *saileri*, n. sp.
Maxillae without retrorse teeth; mandibles not serrate; tooth of tarsal claw slender, the sides straight in profile *sommermanae*, n. sp.
5. Usually smaller species, the wing less than 3 mm long; basal projection of tarsal claw somewhat more than half length of claw, the cleft very narrow; maxillae with retrorse teeth; mandibles serrate *minus* (D. & S.)
Usually larger species, the wing more than 3 mm long; basal projection of tarsal claw about half length of claw, the cleft not so narrow; maxillae without retrorse teeth; mandibles not serrate *eremites* Shewell

Males

1. Dististyle with two rather blunt terminal teeth 2
Dististyle with one apical tooth 3
2. Galea greatly reduced, much shorter than labrum-epipharynx *emergens*, n. sp.
Galea of normal size, nearly as long as labrum-epipharynx *mutata* (Mall.)
3. Mesopleural membrane bare 4
Mesopleural membrane with a distinct patch of fine hair *saileri*, n. sp., *sommermanae*, n. sp.
4. Usually smaller species, the wing less than 3 mm long; hind basitarsus parallel-sided, more than 4 times as long as wide; ventral plate rather broad with a median lip but not with a thick, compressed median lobe *minus* (D. & S.)
Usually larger species, the wing more than 4 mm long; hind basitarsus somewhat narrowed basally, less than 4 times as long as wide; ventral plate with a thickened, compressed median lobe *eremites* Shewell

Pupae

1. Terminal hooks absent; cocoon boot-shaped, with a broad antero-ventral connection 2
Terminal hooks present; cocoon loose and poorly defined, with no antero-ventral connection 3
2. Respiratory organ extending antero-posteriorly, the filaments spreading out laterally from this enlarged portion *sommermanae*, n. sp.
Respiratory organ without a strong trunk extending anteriorly; some of the central filaments extending medially *saileri*, n. sp.
3. Respiratory filaments about 11, arising irregularly from two main trunks *mutata* (Mall.)

Respiratory filaments 25-28, arising from a rounded knob on a short petiole .... *eremites* Shewell

The pupa of *minus* is not known to me, but according to Hearle (1932) it has 8 respiratory filaments. The pupa of *emergens* has not been discovered.

Cnephia emergens, new species

Female.—Length 2.0 to 2.5 mm. Head brown, with yellow, recumbent hair; width of frons at narrowest 0.94 mm, widened above; antenna yellow-brown, 11-segmented, about 0.5 mm long: segments 3-10 broader than long; palpus about 0.47 mm long; ratios of segments 3-5: 2:1.7:2.3; sensory organ of segment 3 small, about 0.2 length of segment; maxillae with a few fine hairs on margin but no retrorse teeth; mandibles not serrate. Scutum dark brown, clothed with yellow recumbent hair; humeri and scutellum yellow, the hairs of the scutellum yellowish brown, erect; postnotum yellowish; pleuron mostly yellow-brown; pleural membrane bare; mesepimeral tuft yellow. Wing 2.5 to 3.0 mm long; hairs on base of costa, stem vein, and vein R dark brown; subcosta with hairs beneath; halteres pale yellowish brown. Legs almost uniformly yellow-brown, with yellowish hairs; leg ratios: I. 4.5:2.2:7.3:8:5:2:1.6:1:1.5; II. 3.5:3:8.5:7:4.5:2:1.2:1:1.5; III. 5.5:3.5:12:11:8:2:1:1:1.5; hind basitarsus about 5.3 times as long as greatest width, the sides nearly parallel; calcipala well developed, but not as large as in *mutata;* second hind tarsal segment narrowed at base, but with no pedisulcus; claws simple. Abdomen yellow-brown with concolorous hair; tergites 2-4 well developed, those posteriorly scarcely sclerotized; sternites unsclerotized; anterior gonapophyses short, the inner apical angle not produced; paraprocts slightly longer than wide, the ventral margin concave; cerci much shorter than wide; stem of genital fork about 0.19 mm long; each arm abruptly widened to form a pale rectangular plate.

Male.—Holoptic, the large facets extending to level of bases of antennae; rest of head dark, with dark hairs; antenna rather dark brown, about 0.4 mm long; palpus about as in ♀, but sensory organ even smaller. Scutum deep brownish black, with dark yellow-brown hairs, the humeri and scutellum paler; pleuron brown; postnotum dark; mesepimeral tuft dark brown. Wing 2.0 mm long; halter with stem brown, knob paler; Legs rather uniformly brown; leg ratios: I. 4:2.5:6.5:7:5:2:1.3:1:1; II. 4:3:8:7:4:2:1.3:1:1; III. 4.5:2.5:10:9.5:7:1.6:1:1:1; hind tibia somewhat broadened, about 3.5 times as long as wide; calcipala short. Abdomen yellow-brown; tergites all sclerotized, the posterior ones weakly so; sternites weakly sclerotized; basistyle subquadrate; dististyle about twice as long as broad, nearly parallel-sided to near apex, with a single stout spine at apex inwardly; ventral plate slightly longer than broad, the sides parallel, the apex rounded, hairy, the basal arms short and stout.

Holotype: Female, emergence trap, Fairbanks, Alsaka, June 19, 1948. Paratypes—same, June 19-24, 5 ♀ ♀, 1 ♂. (U. S. National Museum No. 61189).

This species resembles *mutata* in that the female has simple claws, but the absence of retrorse teeth on the maxillae and serrations on the mandibles of the female, and the greatly reduced galea of the male will readily separate it. The species is also somewhat smaller than *mutata* and the calcipala is not so large.

Cnephia eremites Shewell

Canad. Ent. 84:36, 1952.

Alaskan Distribution.—Alcan Highway, 1363; College; Elliott Highway, 46; Richardson Highway, 358.

Cnephia minus (Dyar & Shannon)

Proc. U. S. Nat. Mus. 69(10):21, 1927 (*Eusimulium*) ♀; Hearle. Proc. Ent. Soc. Brit. Columbia 29:10, 1932 (*Eusimulium*) ♀, ♂, pupa.

Hearle described the male and pupa of this species, but the descriptions are rather brief and I do not feel certain that his determination was correct, since he mentions a pedisulcus, which is absent or extremely shallow in *minus*. Females and males were collected in considerable numbers in an emergence trap in Alaska, but none was reared from collected pupae, nor were any pupae found corresponding to Hearle's description. I describe males associated with females I consider *minus*.

Male.—Holoptic, the upper half of eyes with enlarged facets; rest of head blackish, with dark brown hair; antennae entirely dark brown, usually with 11 segments, but sometimes as low as 8 due to fusion of some of the segments; palpus paler, about 0.40 mm long; ratio of segments 3-5: 1.7:1.6:2.2; sensory organ small, about one-eighth length of segment; scutum velvety blackish brown with golden brown recumbent hair; scutellum paler, with erect dark hair; postnotum and pleuron dark brown; no hairs on mesopleural membrane; mesepimeral tuft dark brown. Wing 2.0-2.5 mm long; basal cell very small or undeveloped; hairs at base of costa and on stem vein dark; halteres yellowish brown, the knobs paler. Legs yellowish brown, darkened at femoro-tibial joint, and apex of hind tibia; hairs brownish; leg ratios: I. 3:2.5:7:6:5.5:2.3:1.2:0.8:0.8; II. 2.5:3:7:6:3.7:2:1:0.6:1; III. 4:2:9:9:6.5:2:1:1:1; hindtibia rather stout, tapering toward base; hind basitarsus with parallel sides about 4.2 times as long as wide; calcipala very short; no pedisulcus, but sometimes with a very shallow depression. Abdomen dark brown, the tergites broad, with brownish hair; sternites 3.6 sclerotized but small, with dark hair; basistyle stout, subquadrate; dististyle longer than basistyle, broad basally, tapering to a single tooth apically, curved but not abruptly so; ventral plate rather broad, with short basal arms and a slightly downcurved median lip.

Alaskan Distribution.—Outlet stream of lake at College.

Cnephia mutata (Malloch)

U. S. Dept. Agr, Bur. Ent. Tech. Ser. 26:20, 1914 (*Prosimulium*), ♀;

Twinn, Canad. Jour. Res. D, 14:125, 1936 [*Simulium* (*Eusimulium*)], ♀, ♂, pupa.

Synonym.—*Eusimulium mutatum permutatum* Dyar & Shannon, Proc. U. S. Nat. Mus. 69(10):17, 1927 ♀, (new synonymy).

Alaskan Distribution.—Camp 327, Alaskan Engineering Commission; Cape Fanshaw; College; Deer Mountain; Goose Bay, Knik Arm; Ketchikan; Metlakahtla; Petersburg; Pigot Bay, Prince William Sound; Sitka; Thane; Virgins Bay, Prince William Sound; Wrangell; Yakutat. The only inland record is that from College, consisting of a pupa with fully developed female, and a pupal exuvium.

There seems to be no justification for considering western specimens as being racially distinct from those in the Eastern United States.

Cnephia saileri, new species

Female.—Length 3.0-3.5 mm. Head gray, with dense, pale yellow recumbent hair; width of front at narrowest 0.12 mm, somewhat widened above; antenna 11-segmented about 0.6 mm long, dark brownish black, including scape and pedicel; palpus 0.69-0.81 mm long; ratios of segments 3-5: 2.7:3.2:6.5; third segment dark, somewhat swollen basally, the sensory organ large, nearly half length of segment; 4th and 5th segments pale; maxillae with retrorse teeth; mandibles serrate. Scutum gray on anterior margin except for narrow median portion, and gray on lateral and posterior declivities, disk brown with three narrow paler lines; most of scutum clothed with pale yellow recumbent hairs; scutellum reddish brown with long, erect, pale hair; postnotum darker; pleuron gray with reddish brown areas; pleural membrane with a dense patch of pale hair; mesepimeral tuft pale yellow. Wing 4.0-4.5 mm long; radial sector not forked; basal cell small but distinct; hairs at base of costa and on stem vein mixed pale yellow and dark; hairs on vein R dorsally abundant, dark; subcosta with hairs beneath. Halteres yellow: Legs to tarsi brown, clothed with pale yellow hair; tibiae somewhat paler centrally; tarsi darker, with mostly dark hair; leg ratios: I. 5:4.5:11.5:13:9:4:3:1:2; II. 5:4:14:12:7:3:1.8:1:1.7; III. 6.5:4:17:17:12:3.6:2:1:1.6; hind basitarsus about 8 times as long as wide, nearly parallel sided; calcipala very short; no pedisculus; claw with basal tooth about half length of claw, the sides somewhat convex. Abdomen grayish brown, segments 7-8 grayer; dorsum of abdomen with abundant yellow hair; hairs of venter somewhat paler; tergites moderate in size; sternites not developed; stem of genital fork 0.19 mm long; each arm abruptly widened to form a pale, rectangular plate; anterior gonapophyses short, rounded apically; paraprocts short, not produced ventrally; cerci slightly higher than long.

Male.—Holoptic, the eyes very large, the upper two-thirds with enlarged facets; rest of head black with dark brown hairs; antennae entirely dark; palpus dark, about 0.68 mm long; ratios of segments 3-5: 2.6:2.2:4; sensory organ small, about 0.2 length of segment. Scutum velvety black with golden brown, recumbent hair; scutellum black with long, erect, black hair; postnotum black; pleuron mostly black, the hairs of the mesopleural membrane and upper mesepimeron varying from yellow to dark brown. Wing 3.5-4.0 mm long; hairs at base of costa and stem vein black, sometimes with an admixture of long yellow hairs. Halteres yellowish brown. Legs black, clothed with yellowish brown to dark brown hairs; leg ratios: I. 6:3.5:11:12.5:9:4.5:3:1.5:1.2; II. 5.5:3.5:13:11:6.5:3.5:2:1:1.5; III. 7:3:18:11.5:3.5:2:1.5:1.5; hind tibia fusiform, its greatest width about 0.23 length; hind basitarsus broad and flat, its width about 0.32 length; calcipala very short. Abdomen brownish black, the hairs mostly dark; well developed sternal sclerites on segments 3-7, with dark hair; basistyle stout, subquadrate; dististyle about same length, curved, compressed and tapering apically with a single tooth at apex; ventral plate broad, with short, slightly converging basal arms; central portion paler, coming to a median, ventrally turned, pointed lip.

Pupa.—Length 3.75-4.75 mm; respiratory organ of 35-45 slender filaments which branch irregularly to form a rounded mass 1.0-1.5 mm long; many of the filaments arise at or close to the base and there is no strong trunk running antero-posteriorly; dorsum of thorax smooth; trichomes very small and indistinct; abdominal segments 3 and 4 dorsally with 14-16 retrorse spines near posterior margin, arranged as 4 or 5 on each side near median line and 3 more laterad; similar spines but smaller on segment 2; segments 7 and 8 dorsally each with a row of 16-18 spines near anterior margin; segment 3 ventrally with 3 spines on each side; segment 4 with 5 on each side; segment 5 with 2 close together on each side; segments 6 and 7 each with 2 farther apart on each side; segment 8 with 2 small, on each side near lateral margin; terminal hooks absent. Cocoon 5-6 mm long, closely woven, having a broad anteroventral band at an angle to the surface; aperture distinctly dorsal and the respiratory organ of pupa scarcely extending above margin of cocoon.

Holotype: Female, outlet of Lower Fire Lake, Glenn Highway, 16, Alaska, May 29, 1948 (Alaska Ins. Proj.). Paratypes ALASKA: Alcan Highway, 1320-1396, ♀, 5♂♂, 2 pupae; Elliott Highway, 8.1, ♀; Glenn Highway, 16-148, 8♀♀, 14♂♂; Nabesna Road, 82-98♀,♂, pupa; Richardson Highway, 27-298, 8♀♀, 6♂♂, 20 pupae; Steese Highway, 34-140, ♀,♂, May 29-July 25. (All adults associated with pupal skins). ALBERTA: Maligne River, Jasper, July 27-31, 1932, 120♀♀, 47♂♂ (Hearle); MANITOBA: Churchill, June 29, 1948, ♂, 2 pupae. MONTANA: Two Medicine River, July 27, 1921, 3♀♀ (Dyar). NORTHWEST TERRITORY: Lake Harbor, Baffin Island, July 5, 1935. ♀ (Brown). YUKON TERRITORY: Watson Lake, June 18-23, 1948, 18♀♀, 6♂♂ (Mason & Hughes) Whitehorse, June 22, 1949, ♀ (Hocking). (Holotype and paratypes, U. S. National Museum No. 61190; paratypes, Canadian National Collection).

I take great pleasure in dedicating this species to my friend, Dr. Reece I. Sailer, who has added so much to our knowledge of the Alaskan blackflies.

Cnephia sommermanae, new species

Female.—Length 2.75-4.0 mm. Head brownish gray to clear gray, with fine yellow to brown hair; width of front at narrowest 0.125-0.156 mm, slightly widened above; antenna 11-segmented, about 0.6 mm long, entirely dark brownish black; palpus 0.62-0.75 mm long; ratios of segments 3-5: 2.1:2:4; third segment dark, slightly swollen at basal third, the sensory organ very small, less than 0.15 length of segment; segments 4-5 paler; maxillae smooth, without teeth; mandibles without serrations, but with fine hairs distally. Scutum dark grayish, with pale yellow recumbent hair; a median and a pair of curved sublateral lines paler; scutellum reddish brown with long, erect, yellowish hair; postnotum darker; pleuron dark gray with reddish brown areas; pleural membrane with a patch of pale yellow hair on upper half; mesepimeral tuft pale yellow. Wing 3.0-3.8 mm long; radial sector not forked; basal cell small but distinct; hairs at base of costa and on stem vein mostly pale yellow; hairs on vein R dorsally abundant, pale yellow to brown; subcosta with hairs beneath. Halteres pale yellow; legs brown, the femora and tibiae, except at ends, and most of hind tarsal segments 1-2, somewhat paler; hairs of legs mostly pale; leg ratios: I. 6:3.7:11.5:13:8.5:4:2.5:1.5:2; II. 6:4:13:12.5:6.5:2.9:1.6:1.2:1.5; III. 7:4:18:16:10:3.5:2:1.5:2; hind basitarsus about 6 times as long as wide, with nearly parallel sides; no calcipala or pedisulcus; claw with an acute basal tooth slightly less than half length of claw, the sides in profile not convex. Abdomen grayish brown, clothed with rather sparse yellowish hair; tergites moderate in size; sternites not developed; stem of genital fork 0.19 mm long; each arm abruptly widened to form a somewhat rectangular plate, darkened on the antero-lateral margin and the apex; anterior gonapophyses very short and blunt, the inner margin parallel; paraprocts short, not produced ventrally; cerci about 1.5 times as high as long.

Male.—Holoptic, the eyes not so large as in *saileri*, the line between the large and small facets extending obliquely upward from just above the level of the antennae so that less than half the area is covered with the enlarged facets; rest of head black with mostly dark brown hair; antenna entirely dark; palpus dark, about 0.75 mm long; ratios of segments 3-5: 2.6:2.5:5; third segment dark, the sensory organ small as in ♀; segments 3-4 paler. Scutum black with long, pale yellow, recumbent hair; scutellum black with long, erect, pale yellow hair; postnotum black; pleuron mostly dark gray; a few pale yellow hairs on mesopleural membrane; mesepimeral tuft pale yellow: Wing 3.0-3.5 mm long; hairs at base of costa and on stem vein pale yellow to brown; subcosta with a row of fine hairs beneath Halteres pale yellow. Legs reddish brown to black, the femora, tibiae, and hind basitarsi palest;

hairs pale yellow; leg ratios: I. 6:3:11.5:12:8:4:2.5:1.5:1.5; II. 5:3:13:11:6:3:2:1:1.7; III. 6.5:3:17:15:9:3:1.7:1:2; hind tibia somewhat swollen, 4 times as long as greatest width; second hind tarsal segment thickened, about twice as long as wide. Abdomen black, with pale hair; sternites 3-8 well developed, the hairs long, pale; basistyle stout, subquadrate; dististyle about same length as basistyle, broad basally, tapering to a rather blunt apex bearing a single short spine; ventral plate broad, with short arms expanded distally, each with a short lateral projection; central portion paler, hairy, coming to a median, ventrally turned, pointed lip.

Pupa.—Length 3.5 mm. Respiratory organ of 50 to 60 filaments, or rarely as low as 25, these branching very irregularly and spreading outwardly from a stout, irregular trunk that extends antero-posteriorly and curves medially both before and behind, leaving a median dorsal oval above the thorax free of filaments; each mass of filaments is about 1.7 mm long and about half as wide medially; dorsum of thorax smooth; trichomes small and indistinct; abdominal segment 2 with an irregular row of about 16 small hooks extending clear across the segment; segments 3 and 4 each with a similar row of about 24 extending clear around, tergites 7 and 8 with a few small spines on each side near anterior margin; sternite 5 with 3 hooks on each side; sternites 6 and 7 each with 4 large hooks rather regularly spaced; no terminal hooks. Cocoon 5-6 mm long, rather closely woven, boot-shaped, the anterior aperture in which the respiratory organs of the pupa lie being obliquely dorsal in position, with a broad, oblique antero-ventral band beneath this aperture.

Holotype: Female, Steese Highway, 32, Sept. 3, 1948. Paratypes—Alcan Highway, 1380.1, Aug. 9, 1947, pupa (Storm); Glenn Highway, 91.5, July 25, 1948, 5♂♂, 96, Aug. 9, 1947, 3 pupae (Jenkins); Richardson Highway, 65.9, July 11, 1948, 2♂♂, 87, Aug. 13, 1948, 2 pupae, 187.5, July 17-24, 1948, 3♀♀, 1♂; 192.9, July 24, 1948, ♀, 220.2, July 23, 1948, ♀, 297.3, Sept. 1, 1948, ♀; Steese Highway, 16.2, Aug. 10, 1947, 3 pupae (Storm), Aug. 24, 1948, ♀, ♂, 40, Sept. 3, 1948, 3♀♀, 41.7, Aug. 10, 1947, 13 pupae (Storm), Sept. 3, 1948, ♂, 43.5, Sept. 3, 1948, 3♀♀, ♂; 53.4, Sept. 3, 1948, 2♀♀, 57.7, Sept. 3, 1948, ♂, 64.1, Sept. 3, 1948, 2♂♂, 89, Sept. 4, 1948, ♀, 120.3, Aug. 10, 1947, 2 pupae (Storm), Sept. 3, 1948, ♂; Willow Road, 32.3, July 31, 1948, ♂, 33, July 31, 1948, ♀, 2♂♂, 2 pupae. (U. S. National Museum No. 61191).

I take pleasure in naming this species after Kathryn M. Sommerman, who has done so much to make known the blackfly fauna of Alaska.

The close resemblance of the cocoon and the pupal respiratory organ to those of *pallipes* as figured by Rubzov (1940) led me to believe this to be that species, but further study shows this not to be the case. Rubzov describes *pallipes* as having toothed mandibles and maxillae, and he shows the tooth of the tarsal claw to be decidedly stouter than in *sommermanae.* There are several species of the far north that could not be separated from the types of *pallipes* as described by Edwards (1924) so that the correct identity of *pallipes* may be very doubtful, but if we accept Rubzov's recognition of the species, I have not seen it from Alaska.

Genus **Simulium** Latreille

FEMALES

1. Vein R with hairs dorsally 2
   Vein R without hairs dorsally 6
2. Claws with a strong basal projection 3
   Claws simple or with a very small subbasal tooth 5
3. Postnotum with a patch of yellow, recumbent scales; scape and pedical pale brown .... *aureum* Fries
   Postnotum bare; antennae entirely dark 4
4. Stem vein with dark pile which may appear coppery in reflected light .... *gouldingi,* n. sp.; *latipes* Mg.; *pugetense* (D. & S.)
   Stem vein with light yellow pile .... *bicornis,* D. R. & V.
5. Mandibles serrate; maxillae with strong retrorse teeth .... *furculatum* Shewell
   Mandibles and maxillae with fine hair apically .... *baffinense* Twinn
6. Claws simple 7
   Claws with a basal projection or subbasal tooth 10
7. Frons and terminal abdominal tergites shining black 8
   Frons and terminal abdominal tergites with at least a thin pollinosity 9
8. Hairs on stem vein and base of costa pale .... *rubtzovi* Smart; *venustum* Say
   Hairs on stem vein and base of costa dark .... *tuberosum* (Lund.)
9. Abdomen with a very distinct black and light gray pattern .... *vittatum* Zett.
   Abdomen posteriorly blackish with a thin but distinct gray pollinosity .... *decorum* Walk.
10. Claws with a strong basal projection 11
    Claws with a small subbasal tooth 12
11. Frons and terminal abdominal segments shining black .... *rugglesi* N. & M.
    Frons and terminal abdominal segments gray pollinose .... *meridionale* Riley
12. Fore coxae dark; terminal abdominal segments with thin gray pollinosity .... *nigricoxum,* n. n.
    Fore coxae yellow; terminal abdominal segments shining 13
13. Mesoscutum with three narrow lines, the median one straight and slender, the laterals curved and somewhat wider .... *hunteri* Mall.

Mesoscutum not lined

arcticum Mall.; *corbis* Twinn; *malyschevi* D. R. & V.

MALES

1. Vein R with hairs dorsally ... 2
   Vein R bare dorsally ... 5
2. Postnotum with appressed yellow scales; ventral plate greatly compressed medially, the basal arms divergent ... *aureum* Fries
   Postnotum without scales; ventral plate not greatly compressed ... 3
3. Dististyle, when viewed from end, showing a flattened, shiny, triangular area, one corner of this forming an inner lobe ... 4
   Dististyle tapering to a point, not truncated in this manner ... *baffinense* Twinn
4. Dististyle, viewed ventrally, more than twice as long as basal width ... *bicornis*, D. R. & V.; *gouldingi*, n. sp.; ... *latipes* Mg.; *pugetense* D. & S.)
   Dististyle, viewed ventrally, much less than twice as long as basal width ... *furculatum* Shewell
5. Dististyle short and stout with three or more teeth ... *vittatum* Zett.
   Dististyle longer, with only one distal tooth, or none ... 6
6. Dististyle with a stout spine or distinct tubercle at base internally ... 7
   Dististyle without a stout spine or distinct tubercle at base ... 9
7. Base of dististyle with a stout spine internally ... *hunteri* Mall.
   Base of dististyle with a rounded tubercle internally ... 8
8. Basal lobe of dististyle with a number of short stout spines ... *tuberosum* (Lund.)
   Basal lobe of dististyle with fine hairs only ... *rugglesi* N. & M.
9. Ventral plate more or less compressed, with denticles on margin ... 10
   Ventral plate broadly rounded without denticles on margin ... *meridionale* Riley
10. Ventral plate narrow, in the shape of an inverted Y, with ventral process or keel ... 11
    Ventral plate broader, tooth-shaped, without ventral process ... *venustum* Say
11. Ventral keel of ventral plate setose, forming an angle before apex of median portion of ventral plate ... *decorum* Walk.
    Ventral keel of ventral plate concave in profile, the angle being at the apex ... 12
12. Dististyle flattened and sinuous on both margins similar to that in the sub-genus *Dyarella* ... *rubtzovi* Smart
    Dististyle narrower, less sinuous ... 13
13. Basal arms of ventral plate each with an outward prong; no large parameral hooks; central portion of ventral plate not widened beyond base ... *malyschevi* D. R. & V.

Basal arms of ventral plate without outward prongs; some large parameral hooks; base of central portion of ventral plate very constricted, the distal portion usually wider 14

14. Ventro-apical angle of ventral plate scarcely produced beyond dentate portion; parameral hooks a few large ones mingled with much smaller ones .... *arcticum* Mall.

Ventro-apical angle of ventral plate forming a distinct bare projection beyond dentate portion; parameral hooks gradually lengthening toward center .... *corbis* Twinn

The male of *nigricoxum* is unknown.

PUPAE

1. Respiratory filaments 3 (Fig. 2) .... *baffinense* Twinn
   Respiratory filaments more than 3 2
2. Respiratory filaments 4 3
   Respiratory filaments more than 4 6
3. Anterior margin of cocoon with a rather long median projection anteriorly, single or split; this may be broken off but usually the base is visible 4
   Anterior margin of cocoon nearly or quite straight 5
4. Anterior projection of cocoon, if not worn off, split into two divergent arms; petiole of respiratory organ twice as long as wide .... *bicornis* D. R. & V.
   Anterior projection of cocoon single and usually tapering; petiole of respiratory organ not longer than wide .... *latipes* Mg.
5. Dorsal respiratory filament strongly diverging from other three .... *aureum* Fries
   Dorsal respiratory filaments not strongly diverging from other three .... *pugetense* (D. & S.)
6. Respiratory filaments 6 7
   Respiratory filaments more than 6 8
7. Dorsal pair of respiratory filaments diverging from the two ventral pairs; cocoon with a median projection from anterior margin .... *gouldingi*, n. sp.
   Dorsal pair of respiratory filaments not distinctly diverging from the two ventral pairs; cocoon without a median projection from anterior border .... *tuberosum* (Lund.); *venustum* Say
8. Front of cocoon with a broad collar at distinct angle to surface so that cocoon is boot-shaped 9
   Front of cocoon with a narrow collar, little raised above the surface, or the sides not touching antero-ventrally, so the cocoon is wall-pocket shaped 11
9. Respiratory filaments 10; cocoon as in figure 4 .... *corbis* Twinn
   Respiratory filaments 12 or more 10
10. Respiratory filaments 12; cocoon as in figure 3 .... *arcticum* Mall.
   Respiratory filaments 16 .... *malyschevi* D. R. & V.
11. Respiratory filaments 8 12
   Respiratory filaments 10 or more 15

12. Respiratory filaments arranged 3-1-2-2, the upper three being sessile and divergent, the single filament being mesad, and the two lower pairs on short petioles .... *decorum* Walk.
    Respiratory filaments either in four distinct pairs or in three groups 13
13. Respiratory filaments all paired 14
    Respiratory filaments in three groups .... *furculatum* Shewell
14. Respiratory organ with first pair of filaments on a short petiole, second pair sessile .... *rubtzovi* Smart
    Dorsal pair of filaments nearly sessile; second pair directed mesad on a longer petiole .... *rugglesi* N. & M.
15. Respiratory filaments 16 .... *vittatum* Zett.
    Respiratory filaments more than 16 16
16. Respiratory filaments 22-26 .... *meridionale* Riley
    Respiratory organ a dense tuft of more than 100 filaments .... *hunteri* Mall.

The pupa of *nigricoxum* has not been found.

Simulium (Eusimulium) aureum Fries

Monog. Simul. Sueciae, observationes entomologicae 1:16, 1824 (*Simulia aurea*), ♀, ♂; Puri, Parásitology 17:354-356, 1925, larva, pupa; Twinn, Canad. Jour. Res. D, 14:115, 1936, ♀, ♂, pupa.

Alaskan Distribution.—Alcan Highway, 1236; Anchorage; Chitina Road, 4; College; Fairbanks; Katmai; Matanuska; Nabesna Road, 91; Naknek Lake; Northway; Richardson Highway, 23-358; Steese Highway, 38.

Simulium (Eusimulium) baffinense Twinn

Fig. 2

Canad. Jour. Res. D, 14:121, 1938, ♀, ♂.

Pupa.—Respiratory filaments (Fig. 2) three, the longest about as long as pupa; dorsal filament weakly swollen basally and strongly divergent upwardly from the other two; second filament bending slightly inwardly and with the base distinctly swollen; third curving slightly downward and outward, slightly less swollen. Dorsum of thorax not rugose. Trichomes 3 on each side, rather long and curved. Tergites 2-4 each with 4 retrorse hooklets on each side, those on 2 very fine; tergites 5-8 each with an irregular row of hooklets near anterior margin; a pair of very short terminal hooks; sternites 4-7 each with 4 hooklets on each side, those on 4 and 5 placed close together on each side, and those on 4 very weak; those on 6 and 7 more evenly placed across the segment.

Alaskan Distribution.—Alcan Highway, 1380; Circle Hot Springs Road, 6; Fairbanks; Nabesna Road, 82; Richardson Highway, 103; Willow Road 31.

Simulium (Eusimulium) bicornis Dorogostajskij, Rubzov, and Vlasenko

Leningrad Acad. Sci., URSS, Inst. Zool., Mag. Parasitol. 5:179, 1935, ♀, ♂, larva, pupa.

Alaskan Distribution.—Alcan Highway, 1273-1375; Anchorage; Circle Hot Springs, 6; Ekultna Lake; Elliott Highway, 8-62; Fairbanks; Glenn Highway, 82-135; Matanuska; Nabesna Road, 31-98; Richardson Highway, 8-301; Slana-Tok Road, 14; Steese Highway, 32-158; Willow Road, 26-33.

This is the first North American record for this species.

Simulium (Eusimulium) furculatum Shewell

Canad. Ent. 8:40, 1952 (*Eusimulium*).

Alaskan Distribution.—Outlet of Summit Lake, Richardson Highway.

Simulium (Eusimulium) gouldingi, new species

Female.—Length about 2.0 mm. Head gray, with fine, recumbent yellow hair; width of frons at narrowest 0.082 mm, strongly widened above; antenna 11 segmented, about 0.44 mm long, brownish black, the scape and pedicel paler. Palpus 0.53 mm. long; ratios of segments 3-5: 1.5:2:3.6; third segment dark, the sensory organ about one-third length of segment; mandibles serrate; maxillae with retrorse teeth. Scutum dark, gray-brown, with recumbent hairs, golden yellow medially, nearly white marginally; scutellum reddish brown with erect yellow hair; postnotum dark with yellowish-gray pruinosity; pleuron reddish brown, varied with blackish; mesoepimeral tuft pale yellow. Wing 2.8 mm long; radial sector not forked; basal cell rarely completely closed distally; hairs on base of costa dorsally, stem vein, and vein R black; base of costa ventrally with pale hairs; subcosta with abundant hairs ventrally. Halteres pale yellow: Legs yellowish brown, the coxae, apices of femora and tibiae, and the tarsi darker; hairs of most of legs pale yellowish; leg ratios: I. 4:3:8:9:6:2.8:1.8:1:1.2; II. 3:3.4:8.5:8.5:4.8:2:1:1:1; III. 5:3:10.6:10.3:8.5:2:1:1:1:1.1; hind basitarsus about 6.5 times as long as wide, with nearly parallel sides; calcipala distinct, reaching to the deep pedisulcus; claw with a stout basal projection, at least half length of claw. Abdomen brown, clothed with yellow hair; tergites rather small; sternites not developed; stem of genital fork 0.21 mm long, each arm irregularly widened, weakly sclerotized; anterior gonapophyses short, blunt, pale; paraprocts short, not produced ventrally; cerci short, subquadrate, about twice as broad as long.

Male.—Holoptic, the large facets of eye extending down to antenna; rest of head nearly black, with dark brown hair; antennae entirely dark; palpus dark, about 0.37 mm long; sensory organ of third segment very small. Scutum velvety black, with recumbent golden hair; scutellum reddish brown with erect orange-brown hair; postnotum dark reddish brown, with whitish pollinose reflections; pleuron mostly reddish black; mesepimeral tuft nearly black. Wing 2.25-2.6 mm long; hairs all black. Halteres brownish, the knobs paler. Legs blackish-brown, the fore coxae, femora, and tibiae, yellowish, with yellow hair; hairs elsewhere mostly dark; leg ratios: I. 4:2.6:8:8.5:5.5:2.9:2:1:1; II. 4:3:8:7.5:4.2:2:1:1:1; III. 4.5:2.7:10.5:9.5:7.6:1.8:1:1:1; hind tibia slightly swollen, about 4.75 as long as greatest width; hind basitarsus about 5 times as long as greatest width; calcipala and pedisulcus as in female. Abdomen velvety brownish black, with dark hair, the tergites broad, the sternites small and weakly sclerotized; basistyle subquadrate; dististyle about as long as basistyle, the end with a depressed shiny area, the inner angle of which bears a small tooth; ventral plate broad, rounded distally, the arms short, slightly expanded distally, and without lateral projections.

Pupa.—Length 2.0-3.0 mm. Respiratory organ about two-thirds length of pupa, of six filaments arising from a short petiole; dorsal pair of filaments diverging strongly upward from the other two pairs, the petiole about three times as long as broad; petiole of median pair slightly shorter and directed somewhat laterad; petiole of third pair directed somewhat mediad and with the petiole about as in first pair. Trichomes 3 or 4 on each side, slender, rather long; tergites 3 and 4 each with 4 retrorse teeth on each side; 7 and 8 with an irregular row of teeth near anterior margin, few and scattered on 7; terminal hooks small, blunt; sternite 5 with a pair of slender bifid hooks on each side; 6 and 7 each with a single bifid hook on each side. Cocoon wall-pocket shaped, well formed but rather loosely woven, with a tapering anterior median projection.

Holotype: Female, reared, Route 115, 14.5 miles west of Wilkes Barre, Pa. June 5, 1948 (Stone). Paratypes.—ALASKA: College, June 5-6, 1948, 3 pupae; NEW YORK: Wheeler Creek, Inlet, Hamilton Co., June 11, 1950, ♂, June 16-18, 1949, 2 ♂♂, July 6, 1950, ♀, July 11, 1949, ♀; High Rock Pond Outlet, Inlet, Hamilton Co., June 11, 1949, ♂ (G. R. De Foliart). PENNSYLVANIA: Kendall Creek, Luzerne Co., June 4, 1948, 2 ♂♂; Buck Township, Luzerne Co., June 4, 1948, pupa (Stone & Goulding); north of Red Rock, Sullivan Co., June 5, 1948, 2 ♂♂, 2 pupae (Stone). All adults reared. (U. S. Nat. Mus. No. 61192.)

No characters have been found in the adults to seperate this species from *latipes* or *pugetense*, but the pupa is quite different from either. I name the species in honor of Mr. R. L. Goulding, who showed me the first place that this species was collected in Pennsylvania.

Simulium (Eusimulium) latipes (Meigen)

Klass. Beschr. Eur. Zweifl. Ins. —:96, 1804 (*Atractocera*); Friederichs, Zeitsch. Angew. Ent. 8:52, 59, 66, 1921, ♀, ♂, larva, pupa.

Alaskan Distribution.—Alcan Highway, 1259; Anchorage; College; Circle Hot Springs, 6; Elliott Highway, 13; Fairbanks; Nabesna Road, 31-98; Richardson Highway, 23-240; Slana-Tok Road, 42; Willow Road, 31-51.

Simulium (Eusimulium) pugetense (Dyar & Shannon)

Proc. U. S. Nat. Mus. 69(10):23, 1927 (*Eusimulium*), ♂.

Synonym.—*Simulium* (*Eusimulium*) *quebecense* Twinn, Canad. Jour. Res., D, 14:117, 1936, ♀, ♂, pupa (New synoymy).

Alaskan Distribution.—Alcan Highway; Anchorage; Eklutna; Glenn Highway, 17-24; Nabesna Road, 91-98; Richardson Highway, 8-240; Slana-Tok Road, 21-38; Steese Highway, 16-103; Whittier; Willow Road, 26.

This may be *Simulium costatum* Fried., as recognized by Rubzov. I am very doubtful that it is the true *costatum*, however, so have not used the name.

Simulium (Neosimulium) vittatum Zetterstedt

Insecta Lapponica Descripta, p, 803, 1838, ♀; Twinn, Canad. Jour. Res. D, 14:132, 1936, ♀, ♂, pupa.

Alaskan Distribution.—Adak I.; Amchitka I.; Anchorage; Chitina Road, 4-5; Glenn Highway, 16-153; Katmai; Kodiak I.; Matanuska; Nabesna Road, 91-98; Naknek; Northway; Paxson; Popoff I.; Richardson Highway, 25-245; Seward; Willow Road, 5-41.

Simulium (Simulium) arcticum Malloch

Fig. 3

U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26:37, 1914, ♀; Cameron, Dom. Canad., Dept. Agr. Bull. 5:4-13, 1922 (*simile*), ♀, ♂, larva, pupa.

Alaskan Distribution.—Anaktuvak Pass; Anchorage; Camp 327, Alaskan Engineering Commission; Glenn Highway, 85-174; Healy; Matanuska; Nabesna Road, 36-91; Nenana; Richardson Highway, 81-230; Slana-Tok Road, 39; Steese Highway, 40; Umiat; Willow Road, 5-50.

The excellent description of this species by Cameron was published under the name of *simile*, but this was, I believe, a misdetermination. Cameron's description agrees very well with the species that I have compared with the type of *arcticum* but not with the type of *similis*.

Simulium (Simulium) corbis Twinn

Fig. 4

Canadian Jour. Res., D, 14:147, 1936, ♀, ♂, pupa.

Synonym.—*Simulium* (s. str.) *relictum* Rubzov, Faune de l'URSS, Ins. Dipt. 6(6):425, 516, 1940 (new synonymy).

Alaskan Distribution.—Anchorage; Elliott Highway 46; Glenn Highway, 16-148; Goose Bay, Knik Arm; Nabesna Road, 36-96; Richardson Highway, 131; Tok.

Simulium (Simulium) decorum Walker

List Diptera British Museum 1:112, 1848, ♀.

Synonyms.—*Simulium nölleri* Friedrichs, Berl. Tierarztl. Wochenschr. 36:567, Nov. 1920 (new synonymy).

Simulium subornatum Edwards, Bull. Ent. Res. 11:227, Dec. 1920, ♀, ♂, pupa (new synonymy).

Simulium tenuimanus Enderlein, Sitz. Ber. Ges. nat. Freunde Berlin 1920:222, 1921 (new synonymy).

Simulium decorum katmai Dyar & Shannon, U. S. Nat. Mus. Proc. 69(10):31, 1927 (new synonymy).

Simulium ottawaense Twinn, Canad. Jour. Res. D, 14:146, 1936, ♀, ♂, pupa (new synonymy).

Alaskan Distribution.—Anchorage; Big Timber; Chitina Road, 4; Circle; College; Fort Yukon; Gakona; Glenn Highway, 16-24; Golovin; Katmai; Ketchikan; Kotzebue; Kulak Bay; Matanuska, Mentasta; Nabesna Road, 52-97; Nenana; Pigot Bay, Prince William Sound; Richardson Highway, 87-358; Seward; Skagway; Slana; Steese Highway, 61-156; Umiat; Valdez; Willow Road, 5.

Simulium (Simulium) hunteri Malloch

U. S. Dept. Agr., Bur. Ent. Tech. Ser. No. 26:59, 1914, ♀.

Male.—Holoptic, the large facets of eye extending down to antennae; rest of head nearly black, with dark brown hair; antenna dark, the scape and pedicel paler; palpus dark. Scutum velvety black, with fine golden hairs, the anterior margin behind humeri, the sides, and the prescutellar area gray pollinose; humeri yellow brown; scutellum dark brown; postnotum black, with grayish reflections; pleuron mostly dark; mesepimeral tuft dark brown. Wings 3.25 mm long, the hairs at base of costa and on stem vein dark brown. Halteres pale yellow. Legs yellow brown to dark brown, the fore coxae and bases of tibiae and metatarsi palest; fore tibia with a large area of silvery white pollen and pile; leg ratios: I. 5:3.6:11:13:8.5:4:3:1.2:2; II. 5:3.5:11.5:12:6:2.5:2:1.2:2; III. 5:2.5:16:15:11:2.5:2:1.3:2; hind tibia expanding to distal fourth, and then narrowing, about four times as long as greatest width; hind basitarsus broad and flat, 3.6 times as long as wide; calcipala a broad triangle; pedisculcus deep. Abdomen velvety brownish black, with dark hair; sternites sclerotized but rather small; basistyles slightly broader than long; dististyles rather long and narrow, about four times as long as wide, with a broad, flattened, sclerotized lobe at base internally; apex with a single slender tooth; ventral plate triangular, the median portion longer than wide, with a narrow hyaline apex; basal arms about two-thirds length of median portion, with no lateral prongs; parameral hooks largest medially.

Pupa.—Length 3.8-4.25 mm. Respiratory organ a dense mass of very fine filaments extending laterally and antero-posteriorly, the mass about equal in size to the cephalothorax exclusive of appendages. Dorsum of thorax densely covered with erect hairs or trichomes. Tergites 3 and 4 each with 4 hooks on each side; 6-9 each with an irregular row of hooks anteriorly; terminal hooks short; sternites 3, 5 and 6 each with one hook on each side, 4 with two hooks on each side. Cocoon closely woven, wall-pocket shaped, floored on posterior half, the anterior rim sloping backward from base.

Alaskan Distribution.—Chitina Road, 4; Eklutna Lake; Haines; Richardson Highway, 8-297; Seward; Valdez.

Simulium (Simulium) malyschevi Dorogostajakij, Rubzov, and Vlasenko

Leningrad Acad. Sci., URSS, Inst. Zool., Mag. Parasitol. 5:142, 1935; ♀, ♂, larva, pupa.

Synonym.—*Simulium* sp. 4, Malloch, Report Canadian Arctic Exped. 1913-18, 3 Insects, C Diptera, p. 43, 1919, pupa.

Alaskan Distribution.—Elliott Highway, 38; Richardson Highway, 325; Steese Highway, 34-148; Willow Road, 50.

The respiratory filaments of the pupa, and the somewhat swollen, divergent anterior gonapophyses of the female make the determination of these Alaskan specimens as this Siberian species rather certain. Malloch first described the pupa of this species in the far north but designated it by number only.

Simulium (Simulium) meridionale Riley

Rept. U. S. Dept. Agr. for 1886, p. 513, 1886, ♀.

Synonyms.—*Simulium occidentale* Townsend, Psyche 6:107, 1891; Dyar & Shannon, Proc. U. S. Nat. Mus. 69(10):32, 1927, ♀, ♂.

Simulium tamaulipense Townsend, Journ. N. Y. Ent. Soc. 5:171, 1897.

Simulium forbesi Malloch, U. S. Dept. Agr., Bur. Ent. Tech. Ser. 26:50, 1914, ♀, ♂, pupa.

Alaskan Distribution.—Galena, VII.30.44 (Stage), 19 females collected on plane after leaving for Fairbanks; Golovin, 23.VII.29; Lower Yukon River, 10.VII.51 (Berg). Dyar & Shannon record *occidentale* from Skagway, but I have not been able to find a specimen to verify this.

Simulium (Simulium) nigricoxum, new name

Synonym.—*Simulium similis* Malloch, Report Canadian Arctic Exped. 1913-18, 3 Insects, C Diptera, p. 42, 1919, ♀. (Preoccupied by *Simulium simile* Figueroa, 1917.)

Alaskan Distribution.—Anaktuvak Pass; Chitina Road, 13; Nabesna Road, 70-93; Steese Highway 96-108; Umiat.

This species has been synonymized with *arcticum* Malloch, but an examination of the type shows the fore coxae to be dark, whereas in *arcticum* these are yellow. Only the female is known, but many specimens were collected on the wing in Alaska. The tooth of the tarsal claw is often difficult to see, but the species can be distinguished from *venustum* and related species by the faint grayish bloom on the frons and terminal abdominal segments, from *decorum* by its considerably smaller size, and from all Alaskan species of the subgenus by the dark fore coxae.

Smart (Proc. Roy. Ent. Soc. London, B, 13:133, 1944) proposed the name *figueroa* for *Simulium simile* Figueroa, 1917, believing it to be preoccupied by *S. similis* Malloch. The reverse is the case, however, Malloch's species not being described until 1919, so *figueroa* Smart falls into synonymy, and a new name is here proposed for Malloch's species.

Simulium (Simulium) rubtzovi Smart

Entomologist 79:22, 1946.

Synonym.—*Simulium similis* Rubzov, Leningrad Acad. Sci., URSS, Inst. Zool., Mag. Parasit. 7:196, 1940, ♀, ♂, larva, pupa. (Preocc. by *S. simile* Figueroa, 1917, and *S. similis* Malloch, 1919).

Alaskan Distribution.—Fairbanks; Richardson Highway, 163.

This is the first report of this Siberian species in North America. Females, males, and pupae were collected.

Simulium (Simulium) rugglesi Nicholson and Mickel

Univ. Minnesota, Agr. Expt. Sta., Tech. Bull. 192:60, 1950, ♀.

Male.—Holoptic, the eyes large and the large facets extending down to antennae; rest of head blackish with dark hair; antenna dark brown with pale pile, the scape and pedicel yellowish; antenna slightly enlarged to apical third and then tapering to apex; palpus dark; sensory organ small. Scutum velvety black, with coppery brown, recumbent hair; oblique patches behind the humeri, the sides, and the prescutellar area gray, subshining; scutellum dark reddish brown, with erect black hair; postnotum black; pleuron mostly dark; mesepimeral tuft dark brown. Wing about 2.0 mm long, the hairs at base of costa and on stem vein dark brown. Halteres pale yellow. Legs dark brown, the fore coxae, most of fore tibia, narrow bases of mid and hind tibiae, base of mid basitarsus, and basal two thirds of hind basitarsus yellowish; leg ratios: I. 5:3:9:10:7:3:2:1:1; II. 4:3:9:8.5:5:1.2:1:1; III. 5:2:12:10:8:2:1:1:1; hind tibia expanding to distal third and then narrowing, about 3.3 times as long as greatest width; hind basitarsus flattened, about 4 times as long as wide; calcipala well developed; pedisulcus deep. Abdomen brownish black, with dark hair; tergites large; sternites narrow transverse bands; basistyles subquadrate; dististyles somewhat flattened, their inner margins concave; at base internally a small rounded lobe bearing fine hairs; apex with a single rather large spine; ventral plate moderately broad, truncate distally; basal arms with no lateral prongs; parameral hooks rather small.

Pupa.—Length about 3 mm. Respiratory organ about 1.5 mm long of 8 filaments in pairs; dorsal pair nearly sessile; second pair internal on a larger petiole; two lower pairs on a short petiole, and each with a much longer petiole: Tergites 3-4 each with four large hooks on each side; 6-9 each with an anterior row of smaller hooks; terminal hooks very short. Cocoon wall-pocket shaped, the sides produced anteriorly, the anterior margin in middle slightly convex.

Alaskan Distribution.—Steese Highway, 139.

This species is included here on the basis of a single female collected at the above locality Sept. 4, 1948. The male and pupa are described for the first time from a series of specimens associated with females collected by J. W. and F. A. Leonard in the Pere Marquette River, Lake Co., Michigan, June 30, 1947.

Simulium (Simulium) tuberosum (Lundstroem)

Acta Fauna Flora Fenn. 34(12):14, 1911, ♂, (*Melusina*).

Synonyms.—*Simulium perissum* Dyar & Shannon, Proc. U. S. Nat. Mus. 69(10):43, 1927, ♀, ♂; Twinn, Canad. Jour. Res. D, 14:138, 1936, ♀, ♂, pupa.

Simulium vandalicum Dyar & Shannon, Proc. U. S. Nat. Mus. 69(10): 44, ♂.

Simulium turmale Twinn, Canad. Ent. 70:51, 1938, ♂.

Simulium twinni Stains & Knowlton, Ann. Ent. Soc. Amer. 33:77, 1940, ♂.

Alaskan Distribution.—Alcan Highway, 1248-1380; Anchorage; College; Elliott Highway, 13-76; Fairbanks; Glenn Highway, 16-186; Kotzebue; Nabesna Road, 36-96; Richardson Highway, 24-310; Slana-Tok Road, 37-48; Steese Highway, 32-148; Willow Road, 5-50.

Simulium (Simulium) venustum Say

Journ. Acad. Sci. Philadelphia 3:28, 1823, ♀, ♂; Twinn, Canad, Jour. Res. D, 14:136, ♀, ♂, pupa.

Alaskan Distribution.—Alcan Highway, 1225-1375; Anchorage; Camp 227, Alaskan Engineering Commission; Canadian border, lat. 69° 10′; Dead Horse; Elliott Highway, 13-45; Fairbanks; Glenn Highway, 16-153; Healy; Hurricane; Ketchikan; Kotzebue; Matanuska; Metlakahtla; Mount McKinley National Park; Nabesna Road, 80-110; Northway; Old Crow River; Paxons Lake; Popoff Island; Rampart House; Richardson Highway, 17-310; Seward; Slana; Slana-Tok Road, 1-42; Steese Highway, 10-149; Tok; Willow Road, 2-5.

Summary

The Alaskan distribution of 36 species of blackflies is given and 5 of these are described as new. Keys for the females, males, and pupae, as far as these are known, are given. In addition to the new species the males of five species and pupae of six species are described and a new name is proposed. Some new synonymy is given and it is shown that 11 of the species are Holarctic in distribution.

THE CORRECT NAME FOR THE GROUP OF ANTS FORMERLY KNOWN AS PSEUDOMYRMA

(HYMENOPTERA)

BY MARION R. SMITH, *Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, United States Department of Agriculture*

For approximately one hundred years ants belonging to this genus have been erroneously called *Pseudomyrma,* and the authorship of the group has been attributed to Latreille, Lund, or Guérin. The facts concerning this matter are briefly discussed below, followed by a chronological outline of the synonymy.

Lund (June 1831), Ann. Sci. Nat. Zool. 23:137, in a letter addressed to M. Audouin entitled "Lettre sur les habitudes de quelques fourmis du Brésil," described these ants generically, gave an account of their biology, and mentioned the fact that he had brought five or six species with him from Brazil. These he had shown to Latreille, who had proposed for them the name *Pseudomyrme.* Had this name not been in the vernacular, it would have been accepted, and the authorship of the group would have been correctly attributed to Lund. This would have prevented subsequent complications that have been confusing to later students of ants. Guérin (1844), Iconogr. Règne Anim. Ins., v. 7, p. 427, emended the name to *Pseudomyrma* and thereby would have been credited with the authorship had not other publications antedated his.

Upon reviewing the entire matter of the correct names and authorships for the ant section of the Synoptic Catalogue of the Hymenoptera of America North of Mexico, U. S. Dept. Agr. Monogr. No. 2 (July 1951), I found that the name *Leptalea* proposed in Erichson's article (Klug ms.) of 1839 (see citation below) antedated all other available names then known to me. Accordingly *Leptalea* was designated as the proper generic name for these ants and the authorship was credited to Erichson. The subfamily name was changed from Pseudomyrminae to Leptaleinae, of which I naturally became the author. Soon after the appearance of the catalogue, however, William F. Buren and Father Walter Kempf called my attention to an obscure European publication containing a correct name for this genus of ants antedating even *Leptalea.* Upon examining the publication I found that Lund (Nov. 1831), Notizen aus dem Gebiete der Natur und Heilkunde, No. 7, v. 32, p. 106, in an article entitled "Ueber die Lebensweise einiger brasilianischen Ameisen," gave an account of these ants almost identical with that in the French publication of June 1831 referred to above. The name that he stated Latreille had proposed for the ants was, however, given this time as *Pseudomyrmex,* an acceptable scientific name in every sense. Hence, it is clear that the correct generic name should be *Pseudomyrmex* Lund. The subfamily name as a result of the change becomes Pseudomyrmecinae.

Subfamily **PSEUDOMYRMECINAE**
Genus **Pseudomyrmex** Lund

Pseudomyrme Lund (Latreille ms.), 1831 (June). Ann. Sci. Nat. Zool. 23:137. Vernacular.

Pseudomyrmex Lund (Latreille ms.), 1831 (Nov.). Notizen aus dem Gebiete der Natur und Heilkunde No. 7, v. 32, p. 106.
Type: *Formica gracilis* Fabricius. By present designation.

Leptalea Erichson (Klug ms.), 1839. Arch. f. Naturgesch. 5:309.
Type: *Formica gracilis* Fabricius. Designated by W. M. Wheeler, 1911.

Myrmex Guérin, 1844. Iconogr. Règne Anim. Ins., v. 7, p. 427. Preocc.
Type: *Formica* (*Myrmex*) *perboscii* Guérin. Monob.

Pseudomyrma Guérin, 1844. Iconogr. Règne Anim. Ins., v. 7, p. 427. Emend.
Type: *Formica gracilis* Fabricius. Designated by W. M. Wheeler, 1911.

Leptalaea Spinola, 1851. Accad. Torino Mem. 13:68. Emend.

THE LEAFHOPPER GENUS EUSCELIS BRULLE IN NORTH AMERICA
(HEMIPTERA)

Recently, in the course of studying some material submitted by John E. Davis, of the Oregon Department of Agriculture, one male specimen was determined as *Euscelis obsoletus* (Kbm.), a species which Oman (1949, Mem. Ent. Soc. Wash. 3: 109) stated has been heretofore erroneously reported from the United States. This North American specimen was taken at Port Orford, Oregon, by Mr. Davis. The genitalia of the specimen agreed almost perfectly with a specimen determined by Lindberg, and with Ossiannilsson's (1947, Svensk Insektfauna: 225) published illustrations of this species. Subsequently, specimens have been found in the U. S. National Museum collection from Kalama, Washington, and McMinnville, Oregon. These records establish the presence of the genus *Euscellis* Brullé in North America.

Other specimens in the U. S. National Museum collection bearing determination labels with the above specific name appear to be misdetermined, as reported by Dr. Oman.—DAVID A. YOUNG, JR., *U. S. Bureau of Entomology and Plant Quarantine.*

AN UNRECORDED HOMONYM IN GELECHIIDAE
(LEPIDOPTERA)

Parelectra Meyrick, *in* Wytsman, Genera Insectorum, fasc. 184, p. 129, 1925, was proposed for *Strobisia helicopis* Meyrick (Trans. Ent. Soc. London, 1922, p. 101). Also included in the genus were:

Gelechia selectella Walker, List of specimens of lepidopterous insects in the collection of the British Museum, vol. 29, p. 614, 1864; *Gelechia subvectella* Walker, ibid., p. 610; *Strobisia scintillula* Walsingham, Biologia Centrali-Americana, vol. 4, p. 81, pl. 3, fig. 1, 1911; *Strobisia ithycosma* Meyrick, Trans. Ent. Soc. London, 1914, p. 267.

Parelectra Dognin, Hétérocères Nouveaux de L'Amerique du Sud, fasc. 8, p. 32, 1914, was proposed for *P. homochroa* Dognin (*Phalaenidae*) the only included species.

Parelectra Meyrick is, therefore, antedated by *Parelectra* Dognin and requires a new name. I propose *Parelectroides*, nom. nov., for it. All of the species included in *Parelectra* Meyrick are hereby transferred to *Parelectroides*.

This case of homonymy was brought to my attention by John G. Franclemont who discovered it while working with the Phalaenidae.—J. F. GATES CLARKE, *U. S. Bureau of Entomology and Plant Quarantine.*

BOOK REVIEW

BIOLOGY OF THE LEAF MINERS, by Erich Martin Hering, Berlin. Cloth, octavo, 420 pages, 180 text figures, two plates, one colored, bibliography, index. W. Junk, 's-Gravenhage, 1951, 36 guilders ($10.00).

This volume embodies the results of the author's more than 30 years of study of leaf mining insects. His researches have covered all the known kinds of leaf miners—Lepidoptera, Diptera, Hymenoptera-Symphyta, and Coleoptera. These are diverse forms related only in that their larvae inhabit the same environment, the parenchyma tissues in the minute space between the two surfaces of the leaves of plants.

This book is in no sense a taxonomic treatise but it considers the leaf miners as living entities with the many intricate modifications of structure and behavior that fit them for this specialized way of life. There are advantages in the leaf mining habit. The generally higher humidities and temperatures within the leaf, the ample food supply, and the protection afforded by the two leaf surfaces permit the mining larvae to grow to maturity more quickly than external feeders do. These conditions, on the other hand, make leaf miners vulnerable to the many parasitic insects with ovipositors capable of penetrating the mines.

This book is written (conveniently for us) in English. It is beautifully printed and bound.—B. D. BURKS, *U. S. Bureau of Entomology and Plant Quarantine.*

BOOK REVIEW

THE BUTTERFLIES OF VIRGINIA, by Austin H. and Leila F. Clark. 239 pages, colored frontispiece, 30 halftone plates, bibliography. Smithsonian Miscellaneous Collections, vol. 116, no. 7, 1951.

Austin and Leila Clark deserve great credit for this contribution, a splendid companion volume to "The Butterflies of the District of Columbia and Vicinity," by the senior author. Through more than 20 years of persevering and painstaking search, in remote and inaccessible parts of Virginia, the Clarks have brought together the only complete collection of butterflies of the area and have recorded carefully the distribution and occurrence of these specimens in their book. The unusually-accurate colored frontispiece and the thirty splendid halftone plates render it possible to identify any butterfly in Virginia and many over a much wider area. There are abundant keys. The family arrangement is strictly that of the authors and, though unorthodox, is somewhat refreshing. The Clarks recognize the affinities of the North American fauna with that of Europe and Asia which is reflected in their use of the name *Minois* in place of *Cercyonis.* The nomenclature used for certain species differs from that of Klots, the National Museum, and elsewhere. The treatments of two species deserve comment: To *Colias eurytheme* Boisduval, the authors have devoted 14 pages, and to *Papilio glaucus* L., no less than 20! In the latter, keys are provided for almost every possible form. The book is well worth having and will undoubtedly serve the professional as well as amateur lepidopterist for years to come.—J. F. GATES CLARKE, *U. S. Bureau of Entomology and Plant Quarantine.*

SUMMARY REPORTS OF SOCIETY OFFICERS FOR 1951

TREASURER

General Fund		
Cash on hand Jan. 1, 1951	$ 407.44	
Receipts from all sources during 1951	3630.51	
Total		$4037.95
Cash on hand Dec. 31, 1951	782.75	
Expenditures during 1951	3255.20	
Total		4037.95
Memoir Publication Fund		
Cash and securities on hand Jan. 1, 1951	$3924.79	
Income during 1951	788.49	
Total		$4713.28
Cash and securities on hand Dec. 31, 1951	4691.07	
Expenditures during 1951	22.21	
Total		4713.28

Respectfully submitted,

ROBERT H. NELSON, *Treasurer*

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

Custodian

Report on Memoirs

Memoir 1. Original issue—300; sold in 1951—5; on hand 122
Memoir 2. Original issue—300; sold in 1951—8; on hand 74
Memoir 3. Original issue—510; sold in 1951—58; on hand—337

Receipts from sales during the year 1951 for all items handled by this office, $833.37.

Respectfully submitted,
HELEN SOLLERS, *Custodian*

Copies of the complete Custodian's report are on file with the Corresponding Secretary and the Custodian.

Corresponding Secretary

Membership, Jan. 1, 1951		462
Losses during 1951:		
Resigned	10	
Dropped	2	
Deceased	6	
Transferred to inactive membership	1	
Total	19	
Elected to membership during 1951	26	
Net gain during 1951	7	
Membership, Dec. 31, 1951		469
Classes of membership:		
Active, dues paying members	451	
Retired members	13	
Honorary members	2	
Life members	3	
Circulation of *Proceedings*:		
To members	465	
To subscribers	172	
Total	637	

Respectfully submitted,
RALPH W. SHERMAN, *Corresponding Secretary*

A complete copy of this report is on file in the office of the Corresponding Secretary.

ENTOMOLOGICAL SOCIETY OF WASHINGTON 613TH REGULAR MEETING, DECEMBER 6, 1951

The 613th regular meeting of the Society was called to order at 8 P.M. Thursday, December 6, 1951 by President Alan Stone in Room 43 of the U. S. National Museum. Fifty-one members and 21 guests were present. The minutes of the preceding meeting were read and approved.

The Society elected Dr. P. O. Ritcher, Department of Zoology and Entomology, University of North Carolina, Raleigh, N. C., to membership.

President Stone read a summary report on the affairs of the Society for 1951 in lieu of individual officers' reports.

F. W. Poos called attention to the desirability of closer cooperation with the Washington Academy of Sciences, which meets in the Assembly Hall at the Cosmos Club at 8:15 P.M. on the third Thursday of each month.

The President announced with regret the death on October 31, 1951 of Dr. Guy Chester Crampton, a member of the Society for 34 years. A. B. Gurney, one of Dr. Crampton's former students, spoke briefly about his life work.

He graduated from Princeton in 1904, then studied at Freiburg, Munich, and Berlin, receiving a doctorate from Berlin in 1908. He came to the Massachusetts Agricultural College in 1911 and taught there until 1947. He was deeply interested in the natural relationships and structures of insects and their relatives. He published more than 100 papers and became one of the leaders in morphological research and teaching. A long generation of students remembers Dr. Crampton as a wise and fair teacher and as a kind friend who combined professional counsel with genial fellowship. (Editor's abstract.)

The report of the Nominating Committee was presented by C. F. W. Muesbeck. The following slate of officers was proposed, each being unanimously elected:

Honorary President	C. L. Marlatt
President	W. Doyle Reed
First Vice President	D. J. Caffrey
Second Vice President	W. H. Anderson
Recording Secretary	Kellie O'Neill
Corresponding Secretary	Arlo M. Vance
Treasurer	Robert H. Nelson
Editor	B. D. Burks
Custodian	Helen Sollers
Executive Committee	Alan Stone
Representing Society as Vice President of Washington Academy of Sciences	F. W. Poos

Austin H. Clark called attention to "A catalog of the American Hesperiidae" by Brigadier W. H. Evans, published by the British Museum, Natural History, and exhibited the copy sent to him by Brigadier Evans.

Helen Louise Trembley circulated some snapshots showing Deed C. Thurman and several associates at work on malaria control in Chiengmai and Lampoon Provinces in Thailand.

The speaker of the evening, James A. G. Rehn, of the Academy of Natural Sciences of Philadelphia, addressed the Society on ''Grasshopper Quest—Impressions of a half century in the field and laboratory.''

Mr. Rehn observed and collected Orthoptera all over the world; for over 40 years this work was done in cooperation with the late Morgan Hebard. Together they were instrumental in developing the Academy collection of Orthoptera into one of the finest in the world. Mr. Rehn explained that his early associations with mammalogists helped to develop his thinking along lines of geographical distribution and subspeciation which 50 years ago were little known in entomology. At present, distribution patterns for few insect groups, except butterflies, are as well known as they are in the Orthoptera. (Editor's abstract.)

Visitors introduced to the Society were Dr. Roy E. Campbell, President of the American Association of Economic Entomologists, and Mrs. Campbell and Professor and Mrs. José Herrera.

The meeting was adjourned at 10:15 P.M.

KELLIE O'NEILL, *Recording Secretary*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
614TH REGULAR MEETING, JANUARY 3, 1952

The 614th regular meeting of the Society was called to order at 8 P.M., Thursday, January 3, 1952, by President W. D. Reed, in Room 43 of the U. S. National Museum. Forty-nine members and twenty-six visitors were present. The minutes of the preceding meeting were read, corrected, and approved.

President Reed announced the appointment of the following committees:

Program.—A. B. Gurney, *Chairman*, John J. Pratt, Jr., Eugene B. Reagan, Kathryn M. Sommerman, Helen Louise Trembley, H. H. Shepard.

Membership.—P. M. Woke, *Chairman*, C. H. Hoffman, R. I. Sailer, R. H. Smith, Phyllis Johnson, H. H. Stage.

Notes and Exhibition of Specimens.—William E. Bickley, *Chairman*, D. J. Pletsch, Robert Traub, Louise M. Russell, W. N. Sullivan, W. D. Field.

Memoirs.—C. F. W. Muesebeck, *Chairman*, 1953, William H. Anderson, 1952, Karl V. Krombein, 1954.

Committee to Assist Custodian.—Howard Baker, Alice Renk. Committee on Reserve Stock of Publications.—Alan Stone, Lucille Yates.

Auditing.—L. B. Reed, C. W. Sabrosky.

A copy of ''Butterflies of Virginia'' by Austin H. Clark was exhibited by J. H. Fales, who reviewed this work briefly. A review will appear in the *Proceedings*.

A note on the distribution of certain liquids in the alimentary tract of mosquitoes was presented by Helen Louise Trembley.

Investigations over a period of seven years in four species of *Anopheles*, four *Aedes*, and *Culex pipiens*, did not confirm the oft-repeated conclusion that blood is dispatched exclusively to the stomach (midgut) and sugary solutions exclusively to the oesophageal diverticula. Although blood taken by bite went primarily to the stomach, it was found in noticeable amounts in one or more diverticula of approximately 75% of the *A. quadrimaculatus,* about 50% of the *C. pipiens,* but in less than 1% of *A. aegypti.* Sugary solutions went primarily to the diverticula, but were also found in small quantities in the stomachs of more than half of the *A. quadrimaculatus, A. albimanus, A. aegypti, A. atropalpus,* and *C. pipiens.* (Author's abstract.)

The first paper on the regular program was given by L. E. Rozeboom of Johns Hopkins University on "Problems in Speciation among Mosquitoes."

Comparative physiological, genetic, ecological, and morphological studies of the members of mosquito complexes should furnish information regarding the mechanisms of speciation among these insects. *Culex pipiens, C. molestus,* and *C. quinquefasciatus* represent such a complex. No real differences could be demonstrated between *pipiens* and *quinquefasciatus* in their responses to temperature, or by serological means, and laboratory colonies were completely interfertile. *C. pipiens* and *quinquefasciatus* can be separated by the morphology of the male mesosome. Experimental hybrids are intermediate in the structure of the mesosome; there is evidence that considerable hybridization occurs in nature, thus indicating that *C. pipiens, C. quinquefasciatus,* and possibly *C. molestus* are subspecies rather than species. The North American representatives of the holarctic *Anopheles maculipennis* complex are *quadrimaculatus, freeborni, earlei, occidentalis,* and *aztecus.* Of these, *earlei* appears to be the most closely related to the palearctic species, especially to typical *maculipennis.* These forms seem to have arisen through geographic isolation, and studies on cage behavior, responses to temperature, and interfertility show that they should be considered as distinct species. Results of crossbreeding experiments suggest a much closer relationship between *freeborni* and *aztecus* than between these species and *quadrimaculatus.* When given a choice, males of *A. quadrimaculatus* and *A. freeborni* prefer to mate with their own species rather than with others. (Author's abstract.)

Ralph E. Sasscer, B. E. & P. Q., followed with a talk on "Entomological Aspects of a Recent European Trip." He summarized his observations made in Belgium, France, and Italy, emphasizing the preshipment inspections made by U. S. agents, working with the phytopathological services of each country. Following President Reed's announcement that the Executive Committee would meet January 11, the meeting was adjourned at 10:03.

KELLIE O'NEILL, *Recording Secretary*

Actual publication date of vol. 54, no. 1, Feb. 15, 1952.

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TO BE PUBLISHED IN SEPTEMBER

Memoir 4 of the Society

A MANUAL OF THE CHIGGERS

by G. W. Wharton & H. S. Fuller

From prehistoric times man has certainly been aware that chiggers existed, but the foundation for a scientific understanding of them was laid in 1912, when Oudeman's and Berlese's classic works were published. Since that time an enormous literature has accumulated. Wharton and Fuller's *Manual of the Chiggers* brings the salient information from that literature together and presents it in a form designed to be most useful to workers in biology, medicine, and public health.

This volume gives a comprehensive survey of our present knowledge of these larval forms of the trombiculid mites—their biological relationships and life histories, their importance as transmitters of disease and as the producers of dermatitis, and their distribution and host relationships. Methods of rearing and collecting chiggers, as well as techniques for studying them are covered. Successful methods of controlling chiggers and for personal protection against them are given. Finally, a catalog of the nearly 500 species in the world is given, cross-indexed by hosts and countries of distribution. Keys for identifying the various forms of chiggers to subfamily, genus, and subgenus are included. The volume ends with a complete bibliography of over 700 titles.

This *Manual of the Chiggers* will be ready for distribution in early September. The price is $6.00 ($5.00 to members of the Society). For a limited time (through Oct. 1, 1952) the entire set of 4 Memoirs may be purchased for $16.50 ($14.50 to members). This is a substantial saving over the cost of the individual Memoirs.

VOL. 54 JUNE 1952 No. 3

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of the

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

PUBLISHED BIMONTHLY BEGINNING WITH FEBRUARY

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THE

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OF WASHINGTON

ORGANIZED MARCH 12, 1884.

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

Annual dues for members are $4.00, initiation fee $1.00 (U. S. currency). Members are entitled to the Proceedings, and manuscripts submitted by them are given precedence over any submitted by non-members.

PROCEEDINGS

ENTOMOLOGICAL SOCIETY OF WASHINGTON

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Authors will be furnished copies of the number in which their articles appear at cost to the Society, or reprints of such articles, at the following rates, plus postage and insurance, provided a statement of the number desired accompanies the returned proofs.

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The Corresponding Secretary, Custodian, and Treasurer should be addressed care Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 54 JUNE 1952 No. 3

THE NEARCTIC SPECIES OF DENTICOLLIS

(COLEOPTERA, ELATERIDAE)[1]

BY EDWARD C. BECKER, *University of Illinois, Urbana, Ill.*

The genus *Denticollis* Piller & Mitterpacher is a small genus of click beetles containing about thirty species in the world, four of which are found in North America. Two of these occur in the northeastern United States and southeastern Canada, one occurs chiefly in Alaska and Yukon, while the fourth species is found in Tennessee.

The first record of any species now placed in this genus in North American is by Kirby (1837) when he described *Campylus denticornis* from Canada. Randall (1838) described *Elater productus* from Maine. Melsheimer (1845) described *C. flavinasus,* but LeConte (1853) and succeeding authors have placed this as a synonym of *denticornis.* Germar (1846) described *C. varians* and *C. sahlbergi,* but Hamilton (1894) listed these, and also *C. fulvus* Motschulsky (1859), as varieties of *C. variabilis* Eschscholtz (1829). Schwarz (1906) also listed *Lepturoides varians* and *L. sahlbergi* as varieties of *L. variabilis,* but he considered *L. fulvus* as a valid species. Leng (1920) listed *L. productus, L. denticornis,* and *L. fulvus* as occurring in North America, and *L. variabilis,* found in Siberia, as possibly occurring here. Schenkling (1927) is probably right in listing *Denticollis denticornis, D. productus,* and *D. varians* as occurring in North America and placing *D. fulvus, D. sahlbergi,* and *D. variabilis* (Eschscholtz) (not Degeer) as synonyms of *D. varians.*

Study of the male genitalia of the four North American species considered here as valid showed good differences among them. Study was also made of the female genitalia of three of the species, but the differences among them were not great. Two species had nearly identical female genitalia.

I am indebted to Dr. Henry Dietrich, Cornell University, Ithaca, New York; Mr. Merton C. Lane, U. S. Department

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[1]Joint contribution from the Department of Entomology, University of Illinois, and the Illinois Natural History Survey, Urbana, Illinois.

A portion of a thesis submitted in partial fulfillment of the requirements for the Degree of Master of Sciences in Entomology in the Graduate School of the University of Illinois.

of Agriculture, Walla Walla, Washington; Dr. R. E. Blackwelder, U. S. National Museum, Washington, D. C.; the late Dr. Walter R. Sweadner, Carnegie Museum, Pittsburgh, Pennsylvania; and Dr. R. H. Beamer, University of Kansas, Lawrence, Kansas, for loaning material for study. I am also indebted to Dr. M. W. Sanderson and Dr. H. H. Ross, Illinois Natural History Survey, Urbana, Illinois, for continued assistance and advice during this study.

Genus **Denticollis** Piller & Mitterpacher

Denticollis Piller & Mitterpacher (1783, p. 86). Type: *Denticollis rubens* Piller & Mitterpacher, by subsequent designation of Hyslop (1921).

Lepturoides Herbst (1784, p. 103). Type: *Elater linearis* Linnaeus, monobasic.

Campylus Fischer (1823-24, p. 153). Type: *Elater linearis* Linnaeus, monobasic.

Exophthalmus Berthold (1827, p. 335). Type: *Elater linearis* Linnaeus, by subsequent designation of Hyslop (1921).

Hammionus Latreille (1829, p. 456). Type: *Elater linearis* Linnaeus, by subsequent designation of Hyslop (1921).

There is much confusion in the literature regarding the correct name for this genus. Melsheimer (1853) and LeConte (1853) placed the North American species in the genus *Campylus*, while Schwarz (1906) and Leng (1920) put them in *Lepturoides*. Dietrich (1945) correctly assigned them to *Denticollis*. Hyslop (1921) considers *Denticollis* and *Lepturoides* as distinct genera with *Campylus*, *Exophthalmus* and *Hammionus* as synonyms of *Lepturoides*. Study of the genotypes of *Denticollis* and *Lepturoides*, *D. rubens* Piller & Mitterpacher and *L. linearis* (Linnaeus) respectively, has shown that these species belong to the same genus, and *Denticollis* must be used because it is the prior name. Many previous authors used *Lepturoides* in preference to *Denticollis* because the latter was derived from an adjective, whereas *Lepturoides* is a noun. This criticism is not valid in a nomenclatorial sense. Lane (1949) clarifies the status of the name *Denticollis* by giving a chronological summary of the data relating to this subject and listing *Lepturoides*, *Campylus*, *Exophthalmus* and *Hammionus* as synonyms.

The adults of *Denticollis* are odd in appearance, looking more like lampyrid beetles than Elateridae. They are medium sized, brownish in color (except *denticornis* which has yellow markings), and the metasternum is pointed anteriorly so that the mesocoxae are almost contiguous. The front of the head is margined and the prosternum is rounded anteriorly. The tarsi are simple and the tarsal claws are without teeth. The combination of a pointed metasternum and margined front of the head will distinguish this genus from all other known North American elaterid genera.

Glen (1950) discussed and keyed out the larvae of *linearis* (European species), *denticornis* and a species which was thought to be *fulvus*. The latter species, represented by a single larva from Alaska, was associated with *fulvus* because of the locality. In the present revision, *fulvus* is considered as probably synonymous with *varians* and since *varians* is the only species occurring near Alaska, it seems probable that this is the larva.

Key to Species

1. Lateral and anterior edges of pronotum yellow; each elytron generally with a median longitudinal yellow stripe, and with a narrow yellow border on the outer edge; clypeal margin always yellow; male genitalia (fig. 4) with teeth-like projections on each side of median lobe .... *denticornis* (Kirby)

   Pronotum with at most a faint narrow reddish border on sides and anterior edge; elytra and front uniformly colored; male genitalia (figs. 1, 3, and 6) without teeth-like projections on median lobe 2

2. Punctures on pronotum not umbilicate; sides of prothorax straight and parallel or nearly so; anterior angles of prothorax nearly square; lateral lobes of male genitalia (fig. 3) slightly longer than median lobe, base of basal piece smoothly rounded, without projections or indentations .... *quadrosa*, new species

   Punctures on pronotum distinctly umbilicate; sides of prothorax either arcuate or converging anteriorly; anterior angles of prothorax much rounded; median lobe of male genitalia (figs. 1 and 6) visibly longer than lateral lobes, base of basal piece either with projections or indentation 3

3. Length more than 12 mm.; punctures on pronotum nearly contiguous, thus giving pronotum a dull appearance; hind angles of prothorax blunt and but slightly divergent; elytral intervals rugose and deeply punctulate; bases of median lobe of male genitalia (fig. 1) blunt, subcylindrical, and very strongly diverging, tips of lateral lobes large .... *productus* (Randall)

   Length less than 9 mm.; punctures on pronotum sparse, thus giving pronotum a shiny appearance; hind angles of prothorax pointed and divergent; elytral intervals reticulate but not punctulate; bases of median lobe of male genitalia (fig. 6) flattened and diverging but little, median lobe longer than lateral lobes, tips of lateral lobes small .... *varians* (Germar)

Denticollis quadrosa, new species

Fig. 3

Male.—Length 11 mm., width 3 mm. Elongate, flattened, with the prothorax distinctly narrower than the base of elytra; elytra and abdomen brown with rest of body dark brown; dorsum covered with short, yellowish-grayish pubescence which is longer on pronotum than on elytra.

Head one-half as wide as prothorax; punctures deep, separated by at least their own diameters; eyes large, extending outward to edge of pronotum. Antenna serrate, extending four segments beyond the apex of the hind angle; 2nd segment cylindrical; 3rd triangular, twice as long as 2nd and four-fifths as long as 4th; segments 4-11 elongate, each longer and more narrowed than preceding. Prothorax with sides parallel; slightly wider than long including hind angles; from the side view, the lateral margin is nearly straight; punctures deep, separated by at least their own diameters; interspaces reticulate; hind angles without carinae, slightly produced, pointed when viewed from above, but very blunt from the side. Elytra with sides parallel for the basal half, then rounded to apex; four times as long as wide; striae with large individually impressed punctures; intervals reticulate, sparsely punctulate. Proepisternum moderately and coarsely punctured; remainder of venter finely and sparsely punctured.

Genitalia (fig. 3) with lateral lobes slightly longer than median lobe; bases of median lobe each diverging approximately forty-five degrees; base of basal piece smoothly rounded; membrane covering basal four-fifths of median lobe and adjoining parts of lateral lobes.

Type.—Holotype male, Gatlinburg, Tennessee, June 15, 1947, R. H. Whittaker, hemlock forest, 4000 feet elevation. Deposited in the collection of the Illinois Natural History Survey, Urbana, Illinois.

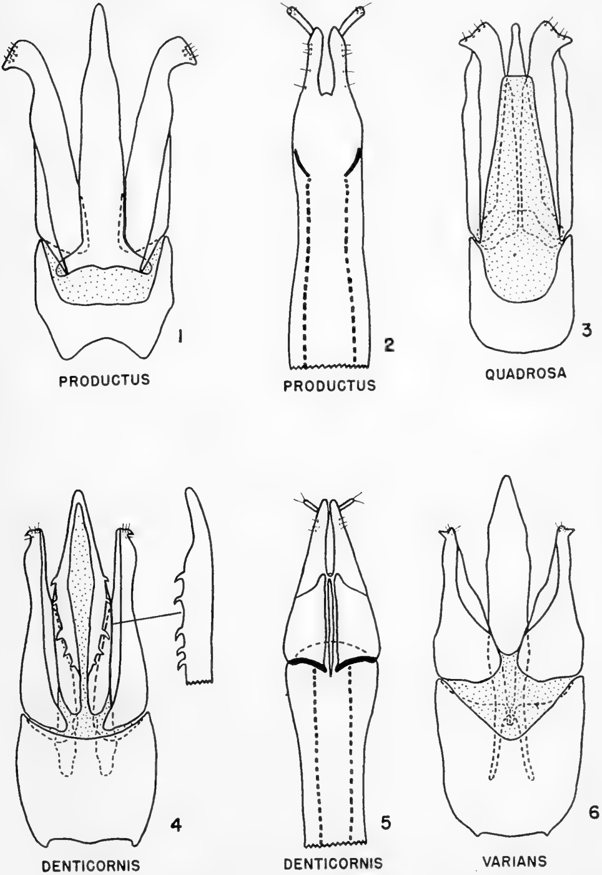
In general appearance this species looks more like *productus* than our other species, but may readily be distinguished by the parallel sides of the prothorax, serrate antennae, and the simple punctures of the pronotum. In *productus* the sides of the prothorax are converging, the male has pectinate antennae, and the punctures on the pronotum are umbilicate.

Denticollis productus (Randall)

Figs. 1, 2

Elater productus Randall (1838, p. 8).
Campylus productus (Randall) Melsheimer (1853, p. 70).
Lepturoides productus (Randall) Leng (1920, p. 169).
Denticollis productus (Randall) Dietrich (1945, p. 19).

Male.—Length 12-14 mm., width 3.5 mm. Elongate, subconvex, with prothorax nearly as wide as elytra; body dark brown with at most a narrow reddish border on lateral and anterior margins of pronotum, legs and antennae reddish-brown; pubescence silvery-gray and moderate.



Genitalia of *Denticollis*, ventral aspect. Fig. 1, *productus*, male; fig. 2, *productus*, female; fig. 3, *quadrosa*, male; fig. 4, *denticornis*, male; fig. 5, *denticornis*, female; fig. 6, *varians*, male.

Head about two-thirds as wide as pronotum; densely punctured with large umbilicate punctures; eyes large. Antenna extending from two to four segments beyond hind angle of prothorax; 2nd segment small; segments 3-10 distinctly pectinate, each succeeding segment becoming longer, narrower, and slightly less pectinate; last segment longest and rounded at end. Prothorax subquadrate, including hind angles; sides straight, converging anteriorly; anterior angles rounded and posterior angles blunt without carinae; median longitudinal groove on disc; punctures coarse, close, umbilicate, separated by their own diameters on disc and approximate at sides; interspaces reticulated. Elytra with sides nearly parallel for basal three-fourths, then sharply rounded to apex; approximately three times as long as wide; striae consisting of rows of punctures very little impressed; intervals deeply punctulate and rugose, but somewhat shiny.

Genitalia (fig. 1) with bases of median lobe very strongly diverging, almost perpendicular; median lobe noticeably longer than lateral lobes; lateral lobes with large apexes; base of basal piece with large rounded indentation.

Female.—Length 12-15 mm., width 3.5-4.5 mm. Color similar to that of male; eyes smaller; antenna extending only to the hind angle or slightly past, segments serrate instead of pectinate, very similar in proportion to those of male; lateral margin of pronotum arcuate with much rounded anterior angles; elytra widest two-thirds from base with sides straight, then rounded to apex; small movable lobe on each lateral piece of genitalia (fig. 2) equal to one-half the length of lateral piece.

Records.—Three males and 7 females have been studied, collected in June and August from Canada and the United States. QUEBEC: Laniel; MICHIGAN: Lake Superior, Marquette, White Fish Point; MINNESOTA: Duluth; NEW HAMPSHIRE: Mt. Washington, White Mountains; NEW YORK: Buffalo, Maplecrest; VERMONT: Jacksonville.

Besides being the largest species of North American *Denticollis*, the uniformly dark brown color, except for the margin of the pronotum, and the closely-placed, umbilicate punctures on the pronotum will distinguish this species easily.

Denticollis varians (Germar)

Fig. 6

Campylus variabilis Eschscholtz (1829, p. 33), not *Elater variabilis* Degeer (1774, p. 154).

Campylus varians Germar (1846, p. 153).

Lepturoides variabilis (Eschscholtz) Leng (1920, p. 169).

Male.—Length 7-9 mm., width 2-2.5 mm. Elongate and flattened, with prothorax distinctly narrower than elytra; color light to dark brown with prothorax and head usually darker than elytra; body generally shiny; pubescence short, yellowish, sparse, and erect.

Head shiny, with coarse umbilicate punctures sparsely placed; areas between punctures may or may not be reticulated. Antenna extending from two to four segments beyond apex of hind angle; 2nd segment cylindrical, segments 3-10 serrate, each about twice as long as wide; 11th slightly longer than 10th. Prothorax slightly wider than long; sides arcuate and converging anteriorly; punctures coarse, umbilicate, and sparsely placed; hind angles without carinae, produced and divergent. Elytra slightly over twice as long as wide, gradually widening posteriorly on basal two-thirds, then narrowing to apex; striae consisting of deep, coarse, somewhat impressed punctures; intervals subconvex, rough, and with very small punctures.

Genitalia (fig. 6) with bases of median lobe flattened and diverging slightly; median lobe much longer than lateral lobes; lateral lobes each with small apex; base of basal piece with two projections.

Female.—Length 7.5-8.5 mm., width 2.5-3 mm. Prothorax only slightly narrower than elytra; eyes much smaller than those of male; antenna extending only one or two segments beyond the hind angle; genitalia similar to that of *denticornis* (as in fig. 5), except it is about three-fourths as large.

Records.—Nine males and seven females were studied, collected in April, June, and August from Alaska and Canada. ALASKA: Circle City, College, Eagle, McKinley, 141 Meridian; HUDSON BAY TERRITORY; YUKON TERRITORY: Dawson, Fort Yukon.

This is the only North American species in which the pronotal punctures are sparse. The color varies considerably, but the smaller size and shiny appearance distinguish it readily. The male genitalia are rather distinctive as noted.

There is much confusion in the literature about this species. Degeer (1774, p. 154) described *Elater variabilis* which has since been placed as an aberration of *Denticollis linearis* (Linnaeus). Therefore *variabilis* Eschscholtz is a homonym and, following Schenkling (1927), *varians* is the valid name for this species. Study of the types of *fulvus* Motschulsky, *sahlbergi* Germar, *varians* Germar and *variabilis* Eschscholtz will be necessary to establish the correct name for this species.

Denticollis denticornis (Kirby)

Figs. 4, 5

Campylus denticornis Kirby (1837, p. 145).
Campylus flavinasus Melsheimer (1845, p. 219).
Lepturoides denticornis (Kirby) Leng (1920, p. 169).
Denticollis denticornis (Kirby) Dietrich (1945, p. 19).

Male.—Length 9-13 mm., width 2-3 mm. Elongate, flattened, with prothorax distinctly narrower than base of elytra; body light to dark brown with clypeal margin, lateral and anterior edges of pronotum yellow, median longitudinal stripe and the outer edge of each elytron yellow, sometimes there is a longitudinal median yellow stripe on the pronotum; pubescence moderately long, grayish, and prostrate.

Head about two-thirds as wide as prothorax; coarsely and closely punctured; eyes large, extending outward to at least the edge of pronotum when viewed from above. Antenna extending at least three segments beyond apex of hind angle; 2nd segment cylindrical, segments 3-10 each distinctly longer than wide, with ventral posterior angle produced so as to become slightly pectinate, each segment becoming longer and more narrowed towards the tip; 11th segment one-half longer than 10th. Prothorax wider than long including hind angles; sides nearly parallel; from the side view the lateral edge is arcuate; punctures large, umbilicate, almost contiguous; hind angles without carniae, pointed slightly produced, and divergent. Elytra three and one-half times as long as wide; sides parallel for basal three-fourths, then narrowed and rounded to apex; striae consisting of moderate punctures, but slightly impressed; intervals very rough, but shiny. Venter generally light to dark brown; proepisternum yellow and without punctures on outer half; prosternal sutures yellow; abdomen margined with a narrow yellow stripe, except at base.

Genitalia (fig. 4) with median lobe with five teeth-like projections on each side; bases of median lobe flattened and almost parallel; lateral lobes considerably shorter than median lobe, and with small apexes.

Female.—Length 11-14 mm., width 2.5-3.5 mm. Color similar to that of male; eyes about one-half as large as those of male; serrate antenna extends from one to three segments beyond apex of hind angle; small movable lobe on each lateral piece of genitalia (fig. 5) equal to one-fourth the length of the lateral piece.

Records.—Forty-five males and 28 females were studied, collected in May, June, and July from Canada and the United States. ALBERTA: Bilby; NOVA SCOTIA: Millsville; ONTARIO: Toronto, Trout Creek; QUEBEC: Sherbrooke; ILLINOIS; MAINE: Aziscoos Lake, Great Pond, Mt. Desert, Monmouth, Paris, Wales, Weld; MASSACHUSETTS: Framingham; MICHIGAN: Douglas Lake, Lakeside, Lake Superior, Marquette, Port Huron; NEW HAMPSHIRE: Mt. Washington, Otsego County, Rumney, Tamworth, White Mountains; NEW YORK: Argus Brook, McLean Reservation, Artist's Brook (Essex County), Bolton, Buffalo, Catskill Mountains, Cold Brook, Cook's Falls, Essex County, Hart Lake, Indian Falls (Mt. Marcy), Ithaca, Labrador Lake (Cortland County), McLean Bogs (Tompkins County), Mt. Whiteface, Old Forge, Slide Mountain (Ulster County), Warrenborg; NORTH CAROLINA: Mt. Mitchell (6500′ el.), Summitt (Black Mountains), Sunburst; OHIO; PENNSYLVANIA: Pike County; TENNESSEE: Great Smoky National Park; VERMONT; WISCONSIN: Mountain, "Wisc."

This species superficially looks much like a lampyrid beetle, and it is the only North American species of *Denticollis* in which the body is distinctly bicolored.

Doubtful Species

As indicated in the discussion under *varians*, three described species of this genus have not been placed definitely. All the evidence I have seen indicates that they are synonymous with *varians*, but until the types are re-examined critically certain disposition of the names cannot be made. The three species are, *Campylus fulvus* Motschulsky (1859, p. 386), *Campylus sahlbergi* Germar (1846, p. 153), and *Campylus variabilis* Eschscholtz (1829, p. 33).

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BOOK REVIEW

GUIDE TO THE INSECTS OF CONNECTICUT. PART VI. THE DIPTERA OR TRUE FLIES. Fifth fascicle: Midges and Gnats. Tendipedidae (Chironomidae) by O. A. Johannsen and Henry K. Townes, Heleidae (Ceratopogonidae) by O. A. Johannsen, Fungivoridae (Mycetophilidae) by Frank R. Shaw and Elizabeth G. Fisher. Connecticut State Geological and Natural History Survey Bulletin 80, 255 p., March 19, 1952, Hartford, Conn.

Anyone who has tried to identify North American midges and fungus gnats will greatly welcome the publication of the first comprehensive works on our Tendipedidae, Heleidae and Fungivoridae to appear in several decades. Professor Johannsen, who has been the outstanding authority in these families for over fifty years, has combined here his ability and experience with the ''new look'' of three younger American workers to present an up-to-date taxonomic treatment applicable to the entire northeastern United States. The keys and diagnoses for genera and higher categories will be useful and authoritative the country over, and for the regional worker there are specific keys, utilizing in many cases the highly diagnostic genitalic characters, and brief distribution summaries.

Dr. Townes' treatment of the Tendipedini merits special praise for having included from his recent revision the most important references and brief descriptions of each species to supplement the keys in this very difficult tribe. An important editorial change in this fascicle to the use of the older but controversial names of Meigen, 1800, will do much to bring these names into general use in this country.

Illustrations are numerous and of high quality. The composition is excellent, and the use of an improved, glossy paper will insure the keys lasting through the many years of hard usage they are sure to receive.—Willis W. Wirth, *U. S. Bureau of Entomology and Plant Quarantine.*

THE HOMOLOGY OF THE CHAETOTAXY OF IMMATURE MOSQUITOES AND A REVISED NOMENCLATURE FOR THE CHAETOTAXY OF THE PUPA

(DIPTERA, CULICIDAE)

BY JOHN N. BELKIN, *University of California at Los Angeles*

There are in use at the present time several systems of nomenclature for the chaetotaxy of the immature stages of mosquitoes. These were developed independently for the larval and pupal stages. Recently Belkin (1951) revised the nomenclatures for the larva in an effort to obtain a more uniform system, equally applicable to anopheline and non-anopheline mosquitoes. Knight and Chamberlain (1948), after a comparative study of all but 2 of the 30 recognized genera, devised a special nomenclature for the pupa. In the work of these authors no attempt was made to homologize the elements of the larval and pupal chaetotaxy, although Belkin (1951) suggested possible homologies. It appears that Baisas and Pagayon (1949) were the first to recognize the evident homologies of the chaetotaxy of the larva and the pupa and to attempt to correlate its individual elements in the two stages. They utilized as a criterion of homology the position of the developing pupal hairs in relation to the position of the overlying hairs of the fourth instar larva shortly before pupation. It is indeed remarkable that this well known condition has been overlooked for so long. The homologies determined by Baisas and Pagayon (1949) do not agree closely with either the system proposed by Belkin (1951) for the larva or Knight and Chamberlain (1949) for the pupa since they were not aware of the work of these authors and the latter were equally ignorant of theirs. More recently Baisas (1951) and Baisas and Pagayon (1951), drawing on unparalleled knowledge of the first-instar larva and the information obtained by Knight and Chamberlain for the pupa pointed out the very remarkable fact of the similarity of the chaetotaxy of the first-instar larva and the pupa. Puri (1931), Hurlbut (1938), Baisas (1948, 1951), and Baisas and Pagayon (1951) have shown that the first-instar larva has two ventral hairs less than the fourth-instar. It can be readily seen from an examination of the figures in Knight and Chamberlain as well as direct comparison of the developing pupal hairs in the mature fourth-instar larva that the pupa also has two hairs less ventrally. Baisas (1951) and Baisas and Pagayon believe that the two hairs that are added in later larval instars are not carried over to the pupa. My own work fully supports this view, as will be seen below. It is of interest to note that the situation clarified by Baisas and Pagayon appears to be an excellent illustration of Berlese's theory as to the nature of the larva in the life history of insects with complete metamorphosis. The specialization of the chaetotaxy of the larva, including the development of characteristic branching as well as the addition of new elements, is lost at pupation and the chaetotaxy of the pupa reverts to the earliest stage of the larva. It is of further interest to note that the pupal chaetotaxy, which apparently originates from pupal discs similar to imaginal discs, appears to be influenced, to some degree at least, by the characteristic development of the homologous elements of the superimposed larval stage as can be seen by the similarity of the branching of some of the mature larval and pupal hairs.

In determining the homologies of the chaetotaxy of the first- and fourth-instar larvae with the pupa difficulties arise only on the venter of the abdominal segments, where the transitory larval hairs are found. The system of nomenclature for the chaetotaxy of the larva, originated by Martini (1923) was developed for the fourth-instar anopheline larva and includes the transitory larval hairs mixed in with the others. This system in its various forms and modifications is at present widely used and it appears best to retain it. Baisas (1948) first suggested that the transitory hairs be put at the end of the numerical sequence but agreed that the necessary changes in nomenclature would lead to confusion and that the original nomenclature should be retained, modified only to conform to the new findings. This necessitates the determination of the homologies of the first-instar hairs with those of the older instars. The transitory abdominal hairs both appear in the second-instar (Baisas, 1951 and Baisas and Pagayon, 1951), in some forms or one in the second- and the other in the third-instar. In the past the chief criterion used in homologizing these hairs in the different instars has been the degree of development of the hairs and to a lesser extent the relative position. Baisas (1951) has used the method of position of developing hairs in relation to the position of the overlying hairs of the preceding instar just before molting. This appears to be very difficult to determine accurately, particularly because of the simplicity of the hairs involved in the earlier instars, but can undoubtedly be accomplished with a great deal of painstaking work, if a large species with characteristically developed hairs is used. As a result of inherent difficulties a variety of different interpretations have arisen in determining the homology of the transitory ventral hairs of the first instar larva. Hurlbut interpreted them in *Anopheles walkeri* Theobald, 1901 as hair 10 on abdominal segments I, II, V, or hair 11 on segments III, IV, VI, VII, appearing in the 2nd instar, and hair 9 on segments I, II, III, IV, V, or hair 6 on segment VI or hair 7 on segment VII, appearing in the third-instar. Baisas (1948) on the other hand considered them to be uniformly hairs 12 and 10 in Oriental species of *Anopheles* and later (Baisas, 1951 and Baisas and Pagayon, 1951) changed them uniformly on all segments to 13 and 9 in both anophelines and *Tripteroides microcala* Dyar, 1929. When one attempts to reconcile these interpretations and to homologize the chaetotaxy of the first- and fourth-instar larvae and the pupa one is faced with an impossible situation where for each species or group and for different segments entirely different hairs are involved. On the other hand it is perfectly obvious from an examination of Knight and Chamberlain's figures that there is a perfect similarity on all unmodified segments and in all species considered. It seems likely that the same hairs are lacking on all abdominal segments or there would be little chance for the uniformity that is so clear in the pupa. Furthermore the fact that a hair appears at a given instar indicates a homology in time as pointed out by Baisas (1951). Belkin (1951) showed that some of the difficulties encountered were due to the incorrect interpretation of hairs 7 and 9 on abdominal segments III-VII in fourth-instar anopheline larvae.

A further complication is introduced into the homology of the larval and pupal chaetotaxy in the form of the pupal abdominal hair 8 of Knight and Chamberlain, an extremely uniformly placed hair but one whose homology can be interpreted in different ways. In order to clarify this puzzling situation I have attempted to reexamine all the previous interpretations, to check them all on the material available to me, and in addition to try all the other possible combinations of larval hairs since even Baisas and Pagayon's latest (1951) interpretation did not appear to fit in with the findings of Knight and Chamberlain. My own interpretation based entirely on evidence from larval chaetotaxy, is almost in perfect agreement with the serial homologies established by Knight and Chamberlain solely on the basis of pupal chaetotaxy. Furthermore, the criteria used by Belkin (1951) for determining general and serial homologies hold equally well for the pupa, at least on the dorsum of the abdomen and with the exceptions noted below. I believe that the abdominal segment II of the larva is the most useful segment for general homologies and as a starting point for serial homologies because on this segment there is no difficulty in determining the important landmark of hairs 6 and 7 in addition to the greater regularity of sequence of all hairs. Baisas (1951) and Baisas and Pagayon (1951) recommend segments III-V for the fourth-instar larva and Knight and Chamberlain (1948) segment VI for the pupa. Superficially these appear to be the least modified segments in the respective stages but the characteristic chaetotaxy of a species or group appears to be best developed on the second segment of both stages.

Following is a discussion of the comparative chaetotaxy of the fourth-instar larva and the pupa with a revised nomenclature for the pupa homologous with the revised nomenclature for the mosquito larva proposed by Belkin (1951). Again as few changes as possible are introduced and where no homologies can be determined an artificial numerical sequence is used or the old nomenclature retained. For the sake of completeness the entire pupal chaetotaxy is reviewed and a few new morphological features which came to light during this work are included. For those who wish to use the revised nomenclature here proposed it will be a simple matter to make the necessary changes on the excellent drawings of Knight and Chamberlain. A pupal drawing (fig. 14)of *Tripteroides mathesoni* Belkin, 1950 is included and labelled with the new terminology to add a member of the subgenus *Rachisoura* to the series presented by the above-mentioned investigators. It is of interest to note that the pupal chaetotaxy can be of considerable help in solving problems in the homology of larval chaetotaxy. For this reason it is highly advisable to study the two stages together and not treat them as two entirely different animals as has often been done in the past.

I wish to acknowledge my indebtedness to F. E. Baisas, without whose meticulous work in all fields of chaetotaxy of immature stages of mosquitoes this study would not have been possible, and who further contributed by sharing his views in personal communications.

Material and Methods

Pupal hairs *in situ* in full-grown fourth-instar larvae were studied in the following species, representing the chief groups of mosquitoes: *Anopheles* (*Nyssorhynchus*) *albimanus* Wiedemann, 1821; *Trichoprosopon* (*T.*) *digitatum* (Rondani), 1848; *Tripteroides* (*T.*) *lipovskyi* Belkin, 1950; *Uranotaenia* (*U.*) *geometrica* Lutz, 1901; *Culiseta* (*C.*) *incidens* (Thomson), 1868; *Aedes* (*Mucidus*) *aurantius nigrescens* (Edwards), 1929; and *Culex* (*Lutzia*) *halifaxii* Theobald, 1903. No such material was available for the genus *Toxorhynchites* (= *Megarhinus*) and only larvae and pupal skins of *T. rutilus septentrionalis* (Dyar and Knab), 1907 were examined.

The homologies were determined according to the following criteria, used in this order: (1) relative position of developing pupal hairs to one another, (2) comparison of these relative positions to the relative positions of the overlying larval hairs, allowing for mass movement of hairs, (3) similarity in degree of development and branching with larval hairs, (4) local shifting of hairs due to differential growth influenced by adjoining structure, such as the appendage and wing cases on the first two abdominal segments, (5) comparison with the chaetotaxy of the first instar larva in case of the ventral abdominal hairs.

A word of caution is needed regarding the examination of material. First of all, large species with characteristic stable larval chaetotaxy make observations easier. Second, the proper stage of pupal development must be secured or the correspondence of the hairs is difficult to determine as a great deal of shifting takes place at later stages. Duplications and omissions of pupal hairs occur occasionally and may lead to misinterpretations,. It appears best to figure the pupal hairs *in situ* along with the larval hairs and then to check them independently against immature fourth-instar larvae as well as free pupae.

Head and Thorax

In the pupa the head capsule, the prothorax, and the mesothorax are closely united into the *cephalothorax*, while the metathorax is reduced almost entirely to a dorsal plate known as the *metanotum*. There are four groups of hairs corresponding to these regions. Baisas and Pagayon (1949) have demonstrated the homologies of these hairs with those of the pupa in the genus *Tripteroides*. The homologies of the cephalic hairs appear quite clear but the thoracic hairs may be interpreted in several ways. Since the larval thoracic chaetotaxy of the majority of culicines is not known at present and several glaring discrepancies are apparent in the present serial homologies within the thorax it seems best to retain the pupal nomenclature in use at the present time. Furthermore since the cephalothorax is usually mounted, studied and figured as a unit, the introduction of larval homologies would lead to confusion because of the repetition of identical numbers.

It should be pointed out that the pupal cephalothorax, in addition to trumpets, possesses several anatomical features that have not been studied, namely the various sclerites and appendage cases. Its chaetotaxy too, despite statements to the contrary, is quite varied. Both of these features appear to offer more possibilities for generic differentations than have been found on the pupal abdomen. Similarly the larval thoracic chaetotaxy is extremely varied and appears to show supraspecific as well as specific differences. It, too, has been largely neglected to the present.

Head Capsule (fig. 1).—The three pairs of cephalic pupal hairs are borne on the two ocular plates overlying the imaginal eyes. These plates appear to correspond to the "ocular lobes" of the larva. In the method of mounting the cephalothorax currently in vogue the pupal ocular lobes are folded in such a manner that the hair 1, the most dorsal of the three becomes the most mesal and caudal while hair 3 becomes the most lateral and anterior. The anatomical positions and homologies of these hairs are as follows:

1—the most dorsal pupal cephalic hair; homologous with larval cephalic hair 10;

2—the median pupal cephalic hair; homologous with larval cephalic hair 12;

3—the ventral pupal cephalic hair; homologous with larval cephalic hair 13.

Prothorax (fig. 2).—The four pairs of pupal prothoracic hairs are developed dorsally mesad of the trumpets and are borne on a distinct prothoracic lobe. They are arranged in two distinct groups of two hairs on each side. In the fourth-instar larva they appear to develop in the region of larval prothoracic hairs 0 to 4 but since this area is greatly altered through the development of the pupal trumpet this relationship may be misleading. Several interpretations of homologies can be made but none appear conclusive at this time. Superficially it appears that in *Trichoprosopon* the more lateral group (hairs 6 and 7) may be homologous with larval prothoracic hairs 4 and 0. Hair 0 is a transitory one, appearing, if at all developed, in the second- or third-instar. It is not clear at present whether this hair is homologous with the transitory ventral abdominal hairs and the transitory ventral meso- and metathoracic hairs (8 and 7 respectively) or whether it is homologous with the dorsal abdominal hair 0 which is frequently poorly developed or entirely lacking in the larva while it is always conspicuous although small in the pupa. Furthermore in anophelines hair 0 has a different, more mesal, position. For these reasons it would appear that none of the pupal prothoracic hairs are likely to be homologous with larval prothoracic 0. Going back to the first-instar larva it is noted that the most median prothoracic hairs are generally found in two groups, 1-3 and 4-5 respectively. In subsequent instars hairs 4 and 5 usually become widely separated and 5 becomes associated with 6 and 7. The third alternative is to disregard the grouping of the pupal hairs and to homologize them with larval hairs 1 to 4. At the present time there appears to be little to choose among the alternatives. To summarize:

4 and 5—the more dorsal or mesal group; probably homologous with larval hairs 1 and 2, 1 and 3 or 2 and 3 respectively;

6 and 7—the more ventral or lateral group; homologous with 3 and 4, 4 and 0 or 4 and 5 respectively.

Mesothorax (fig. 2).—The mesonotal plate of the pupa bears two pairs of hairs. They develop close to the middorsal line of the larva. Their position and homologies are as follows:

8—the more dorsal hair appears to be homologous with larval mesothoracic 1 both on position and degree of development;

9—the more ventral hair, because of the space separating it from 8, does not appear to be larval hair 2; it could be homologized with any of the other larval dorsal mesothoracic hairs; Baisas homologizes it with larval hair 5 but in *Trichoprosopon* its branching suggests hair 4.

Metathorax (figs. 2 and 6).—The three pairs of pupal metathoracic hairs are borne on the metanotal plate which is more closely associated with the abdomen than with the cephalothorax and is ordinarily mounted with the former. In *Trichoprosopon* (fig. 2) their relative position and branching make it easy to homologize them with larval metathoracic hairs 1, 2, and 3. It will be noted that their position and relation to the larval hairs is almost identical in *Anopheles albimanus* (fig. 6). This appears to support the change made by Belkin (1951) in the terminology of the larval metathoracic hairs 1 to 4 in anophelines to conform to the condition found in non-anophelines. To summarize:

10, 11 and 12—the dorsal, median, and ventral (or lateral) pupal metanotal hairs are homologous with larval metathoracic hairs 1, 2, and 3 respectively.

Abdomen

As mentioned above there is no difficulty in homologizing the dorsal abdominal chaetotaxy of the pupa with that of the larva utilizing the criteria mentioned above in that order. As can be seen on fig. 9-12, the developing pupal hairs generally shift mesad of the corresponding overlying larval hairs but normally retain their relative position mesolaterad and cephalocaudad and frequently preserve the corresponding relative development and branching of the individual hairs. The latter may be misleading however for certain pupal hairs may have a characteristic development of their own on the majority of the abdominal segments independent of the different development of the corresponding larval hairs on these segments. On abdominal segments VI and VII the shift of the pupal hairs is laterad but again the relative positions are preserved.

The homology of the dorsolateral and ventral hairs involves disregarding two pairs of fourth-instar larval hairs, which are absent from the first instar larva. After trying various combinations previously suggested it became obvious that none of these would fit the known facts in all cases without extreme migration of hairs, unexplainable by differential growth of the pupal discs, and that none of these would fit all the forms studied both in the larva and the pupa. It was thought that possibly those hairs which were missing on the venter of the first instar larva behaved in the same manner as dorsal hair 0 which is apparently absent in some larvae but is always present in the pupa. This again introduced unsurmountable difficulties. All the other possible combinations of larval hairs 6 to 13 were also tried and of these only one appears to meet the test. I believe that larval hairs 9 and 11 are absent in the first instar larva and that they are also absent in the pupa. At least in the forms I have studied such an interpretation makes possible a uniform homology of pupal hairs, fits all the known facts, and furthermore explains certain discrepancies formerly noted in the larval chaetotaxy.

In the larva hairs 9 and 11 may appear in different positions in different species and at different stages of development, or either one or perhaps even both may not be developed at all. From examination of the available material it seems to me that hair 9 always appears ventrolaterally in association with hairs 7 and 8 and usually between them. Hair 8 is always the most anterior lateral hair on segment II and, as far as I am aware, always retains its relationship to the *rudimentary spiracle* which is cephalad of it and usually slightly dorsad. The *rudimentary spiracles* occur on all seven proximal abdominal segments of the larva. They have generally been overlooked by culicidologists, although Dodge (1945) noted them in several species of mosquitoes. It appears that these *rudimentary spiracles* may be developed into special sense organs in the larva. Work is now in progress to determine their histological nature. In the pupa the rudimentary spiracles become larger and more anteriorly placed. Their structure and function in the pupa are also being investigated. It is of interest to note that these *rudimentary spiracles* appear to be embryonic features retained by the larva and carried through the pupa to the adult stage where they become functional—again supporting Berlese's theory. The functional spiracles of the larva, those of segment VIII, are vestigial in the pupa and disappear completely in the adult. Whatever the nature of these structures is, hair 8 is associated with them on all seven proximal abdominal segments and hair 9 is always caudad of hair 8. Hair 11 usually appears in its numerical sequence on segment II but is subject to considerable migration or even disappearance on other segments. In sabethines it frequently appears laterad of hair 10 in association with hair 9 on segments II-VI, and is frequently entirely absent on segment I.

In the pupa the lateral hairs 6 and 7 (new terminology) are developed slightly mesad (or dorsad) of the corresponding larval hairs. Hair 6 is often well developed on the proximal abdominal segments and its homology is evident. Hair 7 becomes greatly reduced and usually occurs on the extreme lateral margin of each segment but may move dorsad or ventrad in some species or some segments. It is interesting to note that the homology of this hair with pupal hair 8 of Knight and Chamberlain supports the change proposed by Belkin (1951) for the nomenclature of hairs 7 and 9 in anopheline larvae. Hair 8 moves ventrad and frequently caudad of its larval homologue. The three ventral hairs 10, 12 and 13 on the other hand move laterad as a group. Their homologies are somewhat obscured by the extensive shifting of larval hairs in this region and to a larger degree by the presence of transient larval hair 11. On the other hand the uniform occurrence of a considerable space

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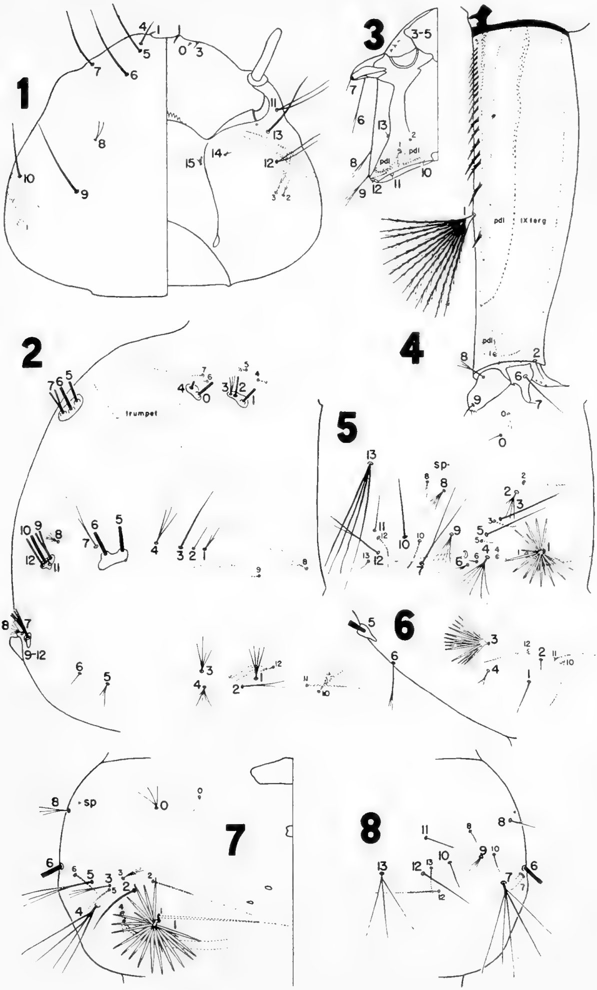
PLATE I. FOURTH-INSTAR MOSQUITO LARVAE.

(Pupal hairs and structures are represented *in situ* by broken lines.)

Fig. 1, *Trichoprosopon digitatum,* dorsal and ventral aspects of head; fig. 2, same, dorsal aspect of left side of thorax; fig. 3, *Anopheles albimanus*, caudal aspect of spiracular lobe; fig. 4, *Aedes aurantius nigrescens,* left lateral aspect of siphon; fig. 5, *Anopheles albimanus,* left lateral aspect of abdominal segment VII; fig. 6, same, dorsal aspect of metathorax; fig. 7 and 8, same, dorsal and ventral aspects of abdominal segment II.


1
2
3
4
5
6
7
8
trumpet
pdl
IX terg
sp

between pupal hairs 10 and 12 supports the interpretation that the more mesal hairs are 12 and 13 since that appears to be the more common occurrence also in the larval hairs. Hair 14 is generally developed on the anterior margin of each segment in the same position as the corresponding larval hair, except on segment VIII where it moves caudad and laterad for a considerable distance. In *Trichoprosopon* hair 14 apparently also moves far caudad to the point where it confuses the homologies of hairs 12 and 13. To further complicate the situation larval hair 14 is apparently undeveloped in the species I have examined.

The homologies determined in this investigation are based on the revised larval terminology of Belkin (1951) and are indicated below. In parentheses following the homologous terminology is a reference to the nomenclature of Knight and Chamberlain (1949). The new terminology applies to abdominal segments I through VII and it appears that on these segments the serial as well as the general homologies determined by Knight and Chamberlain hold perfectly so that in order to use the new terminology all that is needed is to relabel the excellent figures already available. On segments VIII-XII the homologies are not as evident, although the pupal chaetotaxy appears to clarify the larval chaetotaxy somewhat. Therefore for the present the terminology proposed is partially homologous and partially arbitrary.

Segments I through VII (figs. 5, 7-13).—There is essentially no difference in the chaetotaxy of these segments except that on segment I and frequently on segment II hairs 6, 7 and 10 move dorsad, the ventral hairs are entirely absent on I and frequently reduced in number on II, and hair 0 is absent on segment I. The homologies have been determined as follows:

0 (1)—always the most anterior dorsal hair; absent on I; its characteristic position in the pupa clarifies the larval chaetotaxy of species of sabethines with hair 0 and 2 both developed as large stellate tufts, in such situations hair 2 is mesad of 0 in the larva and is placed considerably more cephalad in the pupa than normally;

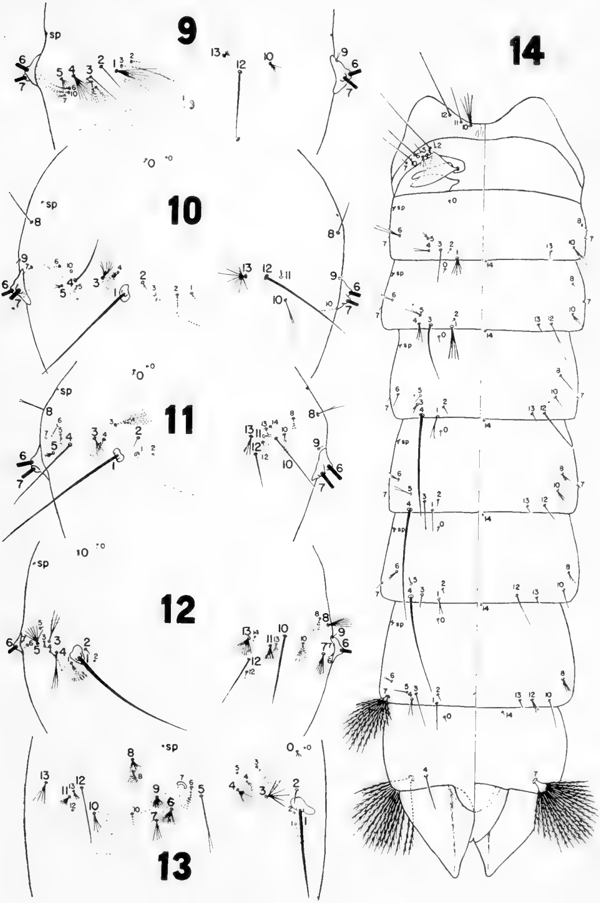
1 (2)—usually the most mesal and caudal hair on segment II; on other segments hair 2 (3) usually moves mesad of it and may rarely do so on segment II, in which case this hair is usually small and more cephalic; often as well developed as 5;

2 (3)—generally poorly developed and bearing the relationship to 1 as outlined above;

Plate II. Fourth-Instar Mosquito Larvae and Pupa

(Pupal hairs are represented *in situ* by broken lines in figs. 9-13.)

Figs. 9-12, *Trichoprosopon digitatum*, dorsal and ventral aspects of abdominal segments I, II, III, VI respectively; fig. 13, same, left lateral aspect of abdominal segment VII; fig. 14, *Tripteroides* (*Rachisoura*) *mathesoni*, dorsal and ventral aspects of pupal abdomen and metanotum.


9
10
11
12
13
14

3 (4)—generally well developed on segments I, II and III and variously on other segments, and subject to considerable shift in position;

4 (5)—generally the most conspicuous hair on segments IV-VII and placed on caudal margin;

5 (6)—associated with the ''hairless setal ring'' on segments III through V and subject to much shifting of position in relation to 4;

6 (7)—dorsolateral in position; frequently well developed; may move to lateral margin on caudal segments;

7 (8)—generally lateral in position; often well developed on I, reduced on II and becoming progressively larger on following segments; in sabethines greatly developed as a tuft on VII and subject to migration ventrad; the ''lateral spine'' of anophelines, (fig. 5, 7, 8), placed on extreme caudolateral margin of segments much as the corresponding larval hair; in non-anophelines generally placed more cephalad on each segment except on caudal segments and subject to migration ventrad;

8 (9)—ventral or ventrolateral; always the nearest hair ventrally to the rudimentary spiracle; absent on I and often on II;

10 (10)—ventral in position and caudad of 8 except on I and usually on II; generally ventrad of 7 and laterad of 8; on I and II often moves caudad and dorsad of 7 as the venter of these segments appears to be affected by the development of the leg and wing cases;

12 & 13 (11, 12)—ventral in position; subject to considerable change in position in relation to each other as in the larva; generally 13 is more cephalic and smaller than 12;

14 (13)—ventral in position; placed far forward near midventral line, except in *Trichoprosopon* in which it is associated with hairs 12 and 13; may be entirely absent, developed on all segments except I, or absent from the more anterior segments.

Segment VIII.—The pupal chaetotaxy of segment VIII is even further reduced than its larval chaetotaxy. It is evident that hairs 0 and 14 are serially homologous with those of the proximal segments as in the larva. It appears further that in the pupa Knight and Chamberlain have demonstrated that the posterolateral hair is hair 7 and that possibly the remaining hair is 4. It was not possible to homologize these hairs *in situ* in the mature larva in the material available to me and the first-instar larva was again of no help. It seems nevertheless that with the proper type of larva this can be sucessfully accomplished in the future and by working back through the pupa it will be possible to determine the serial homology of the hairs of the segment VIII in the larva. For the present time the following partially homologous nomenclature is suggested:

0 (1)—anterior dorsal hair;

4 (5)—inner dorsal hair;

7 (8)—lateral caudal hair;

14 (13)—Anterior ventral hair.

Caudal Segments (figs. 3 and 4).—The ''anal flap'' medially produced from the posterior margin of segment VIII of the pupa has been shown by Christophers (1922a, b) to be tergite IX. *In situ* in the fourth-instar larva (fig. 4) it extends as a lobe to the tip of the siphon in the region of the dorsal valves. It has been impossible to see in my material the pair of usually minute hairs found laterally on this lobe. It appears that any number of the larval siphonal hairs belonging to segment IX, outside of those associated with the ventral valves, could be homologous with this hair. Study of adequate material will resolve this problem undoubtedly, but for the present I suggest that this hair be called arbitrarily hair 1. Christophers has indicated that at pupation this median flap is withdrawn into the body so that only a short piece remains exposed. In the pupa vestigial spiracles of segment VIII are sometimes found near its junction with this segment.

Ventrad of tergite IX are the two paddles and below them two superimposed lobes, more evidently separated in the male. The dorsal lobe is the anal lobe or proctiger and will be considered below. The ventral lobe is the ''genital lobe'' and is much better developed in the male. Tergite IX, the paddles, the genital lobe and connecting lateral areas, as well as a distinct basal sternal sclerotization in the female (greatly reduced or apparently entirely absent in the male) represent segment IX. The paddles develop in the ventral part of the spiracular lobe of anopheline larvae (fig. 3) and in the ventral part of the siphon of non-anopheline larvae (fig. 4). At the apex of each paddle one or two pairs of hairs may be developed. They appear to correspond to the two outer hairs of the ventral valve but could be homologized equally well with some of the inner ventral valve hairs. For this reason it appears best to use an artificial terminology for these hairs at present. The genital lobe develops in the ventral proximal part of the anal segment of the larva. It bears no hairs. The paddles are transitory pupal structures as is the great development of tergite IX, while the genital lobe, the remainder of segment IX and the proctiger are developed into the genitalia or terminalia of the imago.

The anal lobe or proctiger is a composite structure, being composed of segments X, XI with its cerci, and the telson or segment XII. It develops in the lateral, dorsal, and apicoventral portions of the anal segment of the larva. In *Toxorhynchites*, and to a lesser extent in other genera, it shows a pair of lateral sclerotizations which appear to overlie the area where, according to Christophers (1922a, b), the cerci develop. In this genus a hair arises from each of the lateral sclerotizations. I have not been able to observe this hair *in situ* because of absence of material in the proper stage of development but it appears very likely that this hair is homologous with hair 1 of the anal segment of the larva.

The homologies and changes in nomenclature proposed for the caudal abdominal segments are as follows:

1 (1)—lateral hair of abdominal tergite IX; may be absent, poorly developed, or conspicuous as in *Uranotaenia;*

1 (8)—terminal or outer hair of paddle; usually present;
2 (7)—subterminal or inner hair of paddle; often absent;
1 (8)—lateral hair of proctiger; observed only in *Toxorhynchites*.

Addendum

Anomalies, particularly those produced through developmental arrest or excess, furnish some of the most convincing evidence for the homology of structures and are widely used in the field of comparative anatomy. Several authors have reported the presence of "extra" hairs in the mosquito pupa as well as the absence of other hairs normally present. As far as I am aware, no attempt has been made to identify these hairs or to utilize their presence or absence to determine or support the homology of other hairs. Since the main body of this paper was completed I have studied several such anomalies in the pupa of *Uranotaenia quadrimaculata* Edwards, 1929 and they appear to support the interpretation of the homology of larval and pupal hairs outlined above and also require a modification in the interpretation of hair 14 in the pupa of *Trichoprosopon digitatum* (Rondani), 1848. On abdominal segments III-V (and occasionally on others as well) of the pupa of *U. quadrimaculata* an extra hair associated with hairs 12 and 13 is frequently present. This extra hair is evidently homologous with larval hair 11 as it shows the same relationship in position to these hairs in the pupa as hair 11 does in the larva. It may be present on both sides or on only one side of the segments. In this species hair 14 has the normal anterior intersegmental position but is frequently absent. In view of this evidence it appears that the hair I interpreted as hair 14 on abdominal segments III-VI of *Trichoprosopon* is actually hair 11, that the true hair 14 is absent in this species, and that, in all probability, hair 14 does not shift caudad on these segments in other mosquitoes. It is well known that anomalies, ordinarily sporadic, may become established in certain lines as hereditary characteristics. It appears that this is the case with hair 11 in *Trichoprosopon*. In addition to the sporadic presence of hair 11 in *U. quadrimaculata* it is not uncommon to find duplications of hairs 12 or 13. These duplications occur either cephalocaudad or mesolaterad and may be distinguished from the "extra" hairs by their symmetrical relationship as well as the identical degree of development of the "twins."

U. quadrimaculata also furnished evidence for the interpretation that hair 9 is normally absent on the abdominal segments of the mosquito pupa. I have a single pupal skin which shows an extra hair in the region of hairs 7, 8, and 10 on the left side of abdominal segment V. This hair is entirely different in appearance from any other pupal hair, bears a very strong resemblance in degree of development to hair 9 of the larva, and shows the same relationship in position to hairs 7, 8, and 10 in the pupa as in the case of the larva.

It is of interest to note that one or two "extra" hairs are occasionally present on the metanotum of this species. One of these is associated with hair 12 in the same relationship as larval hair 4 bears to larval 3, while the second more lateral hair cannot be homologized directly. All the anomalous pupal hairs and their alveoli in particular are generally weaker than the normal ones. It appears that such anomalies may have taken part in the evolution and differentiation of some groups of mosquitoes through their hereditary retention, as in the case of duplication of some of the thoracic hairs of *Toxorhynchites* larvae.

Summary

The homologies of the pupal and larval hairs and the criteria used to determine them are reviewed. It is shown that the first-instar larva and the pupa lack abdominal hairs 9 and 11. A revised terminology for the pupa is proposed to indicate the homology with the larval nomenclature of Belkin (1951). It is shown that some of the difficulties encountered in homologizing the larval chaetotaxy may be resolved by studying the pupal stage. The morphological relationships of the caudal abdominal segments of the larva, pupa, and imago are reviewed.

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LARVACARUS, A NEW GENUS OF FALSE SPIDER MITES

(ACARINA, PHYTOPTIPALPIDAE)

BY EDWARD W. BAKER[1] and A. EARL PRITCHARD[2]

Two species of false spider mites are remarkable in that the adults retain nearly all the characters of the larval stage. One species, *Phytoptipalpus paradoxus* Trägårdh (1905) forms cortical galls on the gum arabic tree (*Acacia nilotica* Willd.) in Egypt. The other species, *P. transitans* Ewing (1922), forms galls on the jujube tree (*Zizyphus jujuba* Lam.) in India.

P. paradoxus, the type of the genus *Phytoptipalpus*, was redescribed and illustrated by Sayed (1942). A new genus is here proposed for *transitans*, and this species is illustrated for the first time and redescribed.

Larvacarus, new genus

Type.—Phytoptipalpus transitans Ewing.

Adults.—Body subelliptical, the integument finely striate. Palpus one segmented, proximally fused to rostrum. Legs six in number; coxa III without seta. Rostral shield absent. Propodosoma with 3 pairs of dorsal setae; hysterosoma with 3 pairs of setae mediodorsally, six setae on each lateral margin, and one seta between the first dorsocentral and first lateral. Podosoma with 1 pair of medioventral setae. Female opisthosoma with 1 pair of medioventral setae, the ventral plate absent; 2 pairs of genital setae, the genital plate absent; 2 pairs of anal setae, the anal plates absent. Male opisthosoma with 1 pair of medioventral setae and 3 pairs of genito-anal setae.

Nymph.—Similar to female except with only 1 pair of genital setae and vulva absent.

Larva.—Similar to female except genua of legs I and II without dorsal setae, and opisthosoma with medioventral and genital setae absent.

In addition to differing from Sayed's drawings (1942) of *Phytoptipalpus* by the strongly reduced number of palpal segments, *Larvacarus* further differs by having only 1 pair of setae between the dorsolaterals and laterals on the hysterosoma, by having only a single pair of medioventrals on the podosoma, and by lacking a seta on coxa III.

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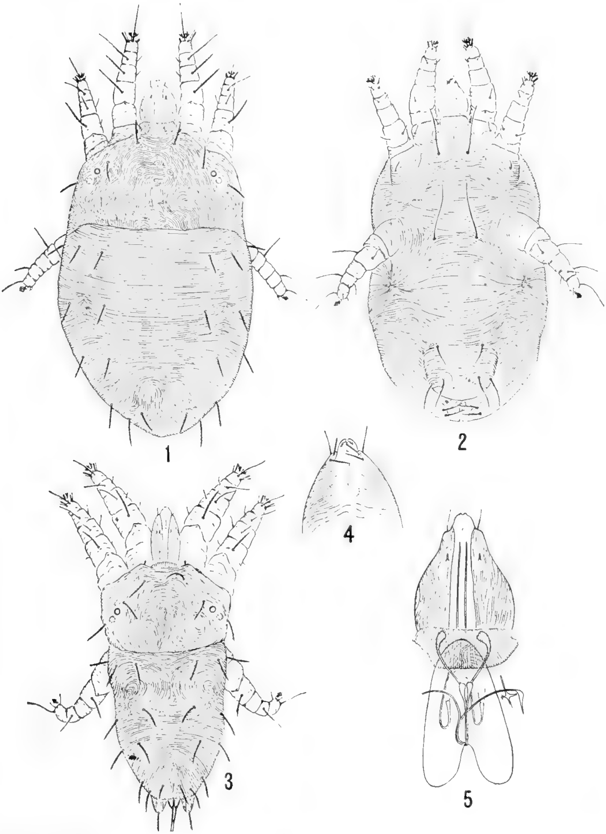

Larvacarus transitans, cotypes. Fig. 1, female, dorsal aspect; fig. 2, female, ventral aspect; fig. 3, male, dorsal aspect; fig. 4, enlargement of venter of female rostrum; fig. 5, enlargement of dorsum of rostrum and tracheal system of female.

Larvacarus transitans (Ewing), new combination

Figs. 1-5

Phytoptipalpus transitans Ewing, 1922, Proc. Ent. Wash., 24: 108; Sayed, 1942, Bul. Soc. Fouad 1er Ent., 26:115. Cotypes: females and males, Pusa, India, in galls on *Zizyphus jujuba;* in the U. S. National Museum.

Female.—Legs I and II with dorsal setae of femora, genua, and tibiae all slender, tapering, serrate; tarsus I and II each with a slender sensory peg posterodistally, and a short sensory peg anterodistally; claw without hook, with two rows of tenent hairs; empodium similar to claws. Propodosoma with dorsal setae slender, serrate, of similar length, the anterior pair being two-thirds as long as intervals between them; dorsal striae fine, irregular. Hysterosoma with dorsal setae similar to dorsal propodosomals; dorsal striae transverse except for irregularities in caudal area. Medioventral podosomals smooth, slender, somewhat longer than distance between them; medioventral opisthosomals short, slender, serrate; genital setae long and slender, smooth or slightly serrate; anal setae shorter than genital setae and serrate. Length of body, 350 μ; greatest width, 189 μ.

Male.—Tarsus I and II each with two slender sensory rods distally. Dorsal setae similar to female. Opisthosoma with medioventral and genito-anal setae slender, finely serrate. Length of body, 280 μ; greatest width, 116 μ.

Nymph.—Similar to female except for missing pair of genital setae.

Larva.—Similar to female except dorsal setae of body proportionally longer and integumentary striae of body coarser.

Redescribed on a basis of cotype material, Pusa, India (O. S. Misra), in galls on *Zizyphus jujuba.* One female differs from the others in that the genital setae are short and serrate, similar to the medioventral opisthosomals.

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THE GENUS PSEUDOSCHONGASTIA LIPOVSKY, 1951 WITH THE DESCRIPTION OF TWO NEW SPECIES AND A KEY TO THE WORLD SPECIES, ALSO NEOSCHONGASTIA PAENITENS, NEW NAME FOR NEOSCHONGASTIA KOHLSI BRENNAN, 1951, PREOCCUPIED

(ACARINA, TROMBICULIDAE)

By JAMES M. BRENNAN, *National Microbiological Institute, Public Health Service, Rocky Mountain Laboratory, Hamilton, Mont.*

Lipovsky (1951) erected the genus *Pseudoschöngastia* within the sub-family Walchiinae for the reception of his two species, *hungerfordi* and *farneri*, and included *Ascoschöngastia diazi* Hoffmann, 1948. Two more species described below, *P. occidentalis*, n.sp. from California and *P. guatemalensis*, n.sp. from Guatemala, are now added to this group.

A key to the 5 species recognized is given as an aid in establishing systematic relationships.

As Lipovsky has shown, *Pseudoschöngastia* can be confused with *Ascoschöngastia* Ewing, 1946, hence by inference, the confusion of their respective subfamilies, the Walchiinae and the Trombiculinae, a lamentable situation, but withal, a needless complication.

According to the subfamilial concepts of Wharton (1947) based on leg segmentation in the larva and further endorsed by Wharton *et al.* (1951), the Walchiinae are characterized by leg I having 7 segments and legs II and III each having but 6 segments while in the Trombiculinae all legs have 7 segments. The critical segment is the femur which is articulately divided into basifemur and telofemur in the Trombiculinae (*Ascoschöngastia*) and fused in legs II and III in the Walchiinae (*Pseudoschöngastia*).

In some specimens of *Pseudoschöngastia* may be detected either the vestige of or possibly the anlage of division, especially in femur II and occasionally in femur III, hence the opportunity for confusion with *Ascoschöngastia*. However, through experience and careful observation it becomes clear that in no case are femur II and III segmentally divided in any species of *Pseudoschöngastia*, while in the three species only of *Ascoschöngastia*, the femoral division is distinct and articulate. Furthermore, *Ascoschöngastia* does not occur in the Western Hemisphere, and conversely *Pseudoschöngastia* does not occur outside the Western Hemisphere.

It would appear that *Pseudoschöngastia* is a genus of considerable taxonomic interest and phylogenetic importance since obviously it represents a transitional group between the Trombiculinae and the Walchiinae.

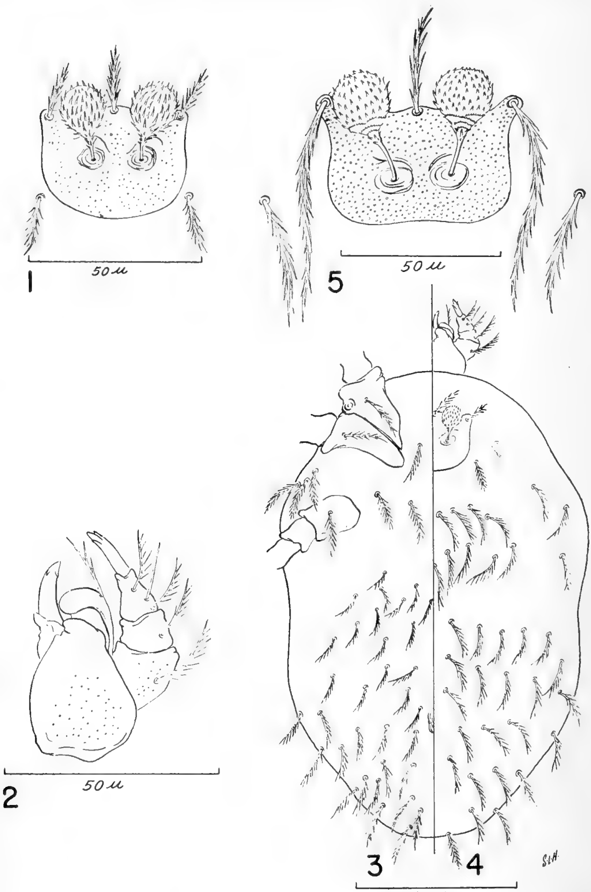

Fig. 1, scutum of *Pseudoschöngastia occidentalis*, n. sp. showing displaced posterolateral setae; fig. 2, dorsal view of right half of gnathosoma of *occidentalis*, palpal tarsus omitted; figs. 3 and 4, venter and dorsum respectively of *occidentalis*; fig. 5, scutum and displaced posterolateral setae of *P. guatemalensis*, n. sp.

Pseudoschöngastia occidentalis, new species

Figs. 1-4.

Body.—Striae moderate. Length and width of holytype, slightly engorged, 280 by 157 microns. Eyes small, 2/2, on obscure ocular plate. Anus located at the level of the sixth row of ventral setae.

Gnathosoma.—Base of chelicera with few punctae, not quite twice as long as broad. Blade of chelicera with small tricuspid cap. All palpal setae branched except the nude lateral tibial seta. Palpal claw trifurcate. Palpal tarsus with 5 branched setae and a strong spur, subterminala not detected. Galeal seta with few branches.

Scutum.—Very small, with scattered punctae, broadly rounded posteriorly with no posterolateral angles. Sensillae capitate, the setules continuing slightly more than halfway down the stem. The anterolateral setae not longer than and frequently shorter than the anteromedian seta. Scutal measurements of holotype: AW-39, PW-45, SB-15, ASB-17, PSB-17, AP-23, AM-19, AL-16, PL-24, S-25.

Legs.—All segments of all legs punctate. Setae distributed as follows: Leg I coxa, trochanter, and basifemur each with one branched seta; telofemur with 5 branched setae; genu with 4 branched setae, 2 genualae and a microgenuala; tibia with 8 branched setae, 2 tibialae and a microtibiala; tarsus with about 18 branched setae, a spur, a microspur, a parasubterminala, a subterminala and a pretarsala. Leg II coxa and trochanter each with a branched seta; femur with 6 branched setae; genu with 3 branched setae and a genuala; tibia with 6 branched setae and 2 tibialae; tarsus with about 15 branched setae, a spur, a microspur and a pretarsala. Leg III coxa and trochanter each with a branched seta; femur with 5 branched setae; genu with 3 branched setae and a genuala; tibia with 6 branched setae and a tibiala; tarsus with about 12 branched setae. All tarsi terminated by 2 lateral claws with a slender claw-like empodium between them.

Setae.—Dorsal setae in irregular rows especially the first two or three rows and the posterior rows. Apparently 2 pairs of humerals plus about 62. Excluding the humerals, the setae of the posterior rows are slightly longer than those of the anterior rows. Ventral setae 2-4 (sternals) plus about 64 and in addition, 2 or more setae between coxae II and III. The setae posterior to the anus are longer than those in the anterior rows and similar in form to the dorsal setae.

Type data.—Holotype and four paratypes, RML No. 28942, from *Peromyscus boylii*, Plumas County, California, 29 July 1950, E. W. Jameson, Jr., collector. One paratype, RML No. 27927, from *Peromyscus californicus*, the Hastings Natural History Reservation, Monterey County, California, 20 December 1938, Robert Holdenried, collector; one paratype, RML No. 27911, same host and locality, 24 May 1938, C .E. North, collector; one paratype, RML No. 28083, from *Peromyscus boylii, Plumas* County, California, E. W. Jameson, Jr., collector. Holotype and 3 paratypes deposited in the collection of the Rocky Mountain Laboratory. One paratype each to the United States National Museum, the British Museum (Natural History), the South Australian Museum, Adelaide, and the University of Kansas.

Pseudoschöngastia guatemalensis, new species

Fig. 5

Body.—Striae moderate. Length and width of holotype, partly engorged, 330 by 185 microns. Eyes 2/2, on an ocular plate. Anus located at about the level of the fifth row of ventral setae.

Gnathosoma.—Base of chelicera somewhat longer than broad and with large sparsely scattered punctae. Blade of chelicera with tricuspid cap. Palpal setae as follows: Femoral with several branches, genual with few branches, dorsal tibial nude or with a branch, lateral tibial with about 3 branches, ventral tibial with several branches. Palpal claw trifurcate. Palpal tarsus with 5 branched setae and a spur. Galeal seta nude.

Scutum.—Broadly rounded posteriorly. Punctae large, conspicuous, sparsely distributed. Sensillae capitate, the setules continuing downward not beyond the basal two-thirds of the stem. Head of sensilla encircled at base by a girdle composed of three rows of very minute almost contiguous setules. Setae strong, with fairly long and moderately appressed barbs, the anterolaterals much longer than the anteromedian.

Legs.—As described for *P. occidentalis,* q.v., but with this exception: The ratio of the lengths of spurs I and II in *occidentalis* is 1/1, in *guatemalensis* 1/1.3.

Setae.—Dorsal setae like the scutal setae in form, in rather irregular rows, 2 pairs of humerals plus about 58, the setae of the posterior rows longer than those of the anterior rows. Ventral setae 2-2 (sternals) plus about 52 and also 2 setae between coaxe II and III. As usual the setae posterior to the anus are the longer and similar in form to the dorsal setae.

Type data.—Holotype and 5 paratypes, RML No. 29908, from *Sylvilagus floridanus chiapensis,* Finca Armenia, Acatenango, Chimaltenango, Guatemala, 27 February 1951, Herbert T. Dalmat, collector. Holotype and 2 paratypes deposited in the collection of the Rocky Mountain Laboratory. A paratype each to the United States National Museum, the British Museum (Natural History), and the University of Kansas.

Key to Species

1. Sternal setae 2-4 .... *P. occidentalis,* n. sp.
   Sternal setae 2-2 2
2. Sensillae clavate, galeal seta branched .... *P. diazi* (Hoffmann)
   Sensillae capitate, galeal seta nude 3

3. Palpal genual seta nude, AL not longer than AM .... *P. farneri* Lipovsky
   Palpal genual seta branched, AL much longer than AM 4
4. With 3 genualae I; palpal lateral tibial seta nude .... *P. hungerfordi* Lipovsky
   With 2 genualae I; palpal lateral tibial seta branched .... *P. guatemalensis*, n. sp.

Neoschöngastia paenitens, new name

Neoschöngastia kohlsi Brennan, 1951 (not Philip and Woodward, 1946).

Dr. Charles D. Radford has advised the writer that *Neoschöngastia kohlsi* Brennan, 1951 is preoccupied by *Neoschöngastia kohlsi* Philip and Woodward, 1946. The homonymy is evident in spite of the fact that the latter species was, on the basis of information available at the time of its description, misplaced generically. While it was described as a *Neoschöngastia,* the type slides assign it to *Ascoschöngastia* but, according to the generic concepts of Wharton *et al.* (1951) it more properly is a *Euschöngastia.* The new combination *Euschöngastia kohlsi* (Philip and Woodward), 1946 is therefore proposed, and for *Neoschöngastia kohlsi* Brennan, 1951, which requires a new name, *Neoschöngastia paenitens* is proposed.

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A NEW HELIODINID FROM ILLINOIS

(LEPIDOPTERA, HELIODINIDAE)

BY J. F. GATES CLARKE, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

The species herein described was submitted by Mr. C. Wester, a student at the University of Illinois, Urbana, who is studying the insects attached to the four-o'clock, *Mirabilis nyctaginea* (Michx.) MacM. Since a name is required for inclusion in a paper on his studies it is supplied below.

The similarity between this species and *H. nyctaginella* Gibson and the identical food plant are unusual.

The outline drawings were made by the author.

Heliodines ionis, new species

Figs. 2-2b

Alar expanse, 9-12 mm.

Labial palpus cream colored with brassy sheen; apex of third segment black. Antenna and collar black, the former with purplish iridescence. Head and thorax metallic brassy-green. Forewing shining ochraceous-orange; basal fourth of costa broadly black; costa with six leaden metallic spots of raised scales with pale violaceous iridescence; spots more or less narrowly edged with black; on dorsum three similar spots; narrow black edging from subapical costal spot, around apex and termen, to tornus; cilia very dark gray. Hind wing black; cilia gray. Legs mostly metallic brassy-green, but tibiae and tarsi with shining black bands. Abdomen brassy in male, shining black in female.

Male genitalia.—As figured.

Female genitalia.—Bursa copulatrix and bursa seminalis as figured. Ductus bursae threadlike; ostium membranous.

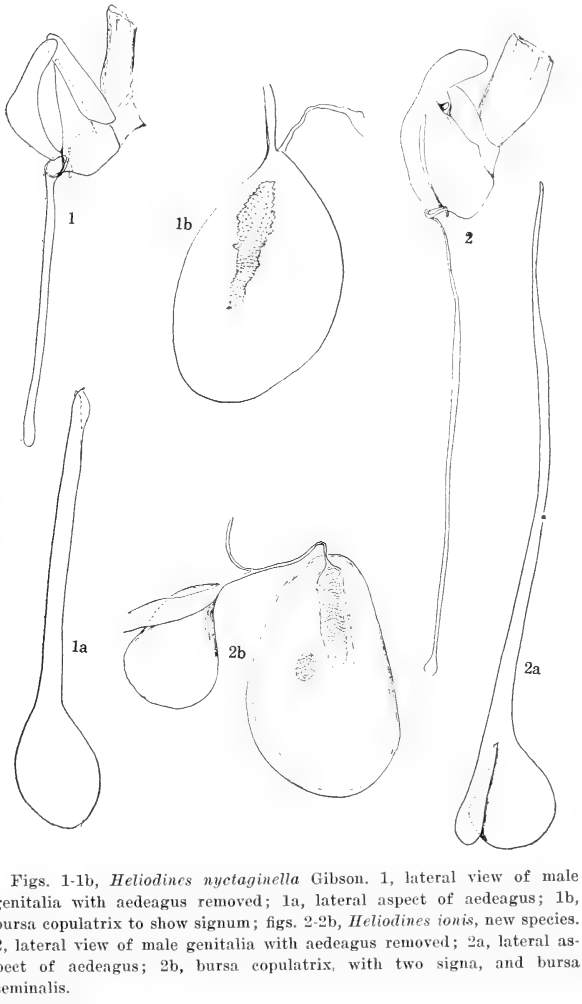
Type.—U. S. N. M. no. 61496.

Type locality.—Champaign, Illinois (5. vii. 51).

Food plant.—*Mirabilis nyctaginea* (Michx.) MacM.

Remarks.—This species and *nyctaginella* are so similar superficially that they are easily confused and may be separated only by the absence of the narrow black basal portion of the forewing in *ionis*. The genitalia, however, present abundant differences. A comparison of the outline figures of the genitalia will suffice to distinguish the two. For completeness and easy comparison I have added figures of *nyctaginella* (figs. 1-1b).

Described from the male type and 24 male and female paratypes, all from the same locality. Paratypes in the U. S. National Museum and in Mr. Wester's collection. Dates on the specimens range from July 5 to November 25, 1951.



Figs. 1-1b, *Heliodines nyctaginella* Gibson. 1, lateral view of male genitalia with aedeagus removed; 1a, lateral aspect of aedeagus; 1b, bursa copulatrix to show signum; figs. 2-2b, *Heliodines ionis*, new species. 2, lateral view of male genitalia with aedeagus removed; 2a, lateral aspect of aedeagus; 2b, bursa copulatrix, with two signa, and bursa seminalis.

A MEMBRACID AND ITS MILKERS

(HEMIPTERA)[1]

BY J. DOUGLAS HOOD, *Cornell University, Ithaca, N. Y.*

At Belém, at the mouth of the Amazon River, in the State of Pará, Brazil, on the grounds of the Instituto Agronômico do Norte, a membracid which feeds upon papaya is attended by two species of hymenopterous insects—one a bee, the other an ant. Adults and nymphs of the membracid occur together in dense groups arranged along the midribs of the much-lobed leaves. Members of this family are commonly attended by ants wherever their numbers are sufficiently large to make them attractive; but in the case of the present species[2] the ant[3] is exclusively a nocturnal visitor and is replaced during the day by a small bee.[4]

Both the bee and the ant feed upon honey-dew, secured mostly, if not entirely, from the nymphs of the membracid, rather than from the adults. This liquid is perfectly clear and colorless, has no detectable taste (in small quantities, at least to the author), and is emitted through the anal opening.

The behavior of the bees is easily observed, for they are stingless, not easily disturbed, and work by daylight. With antennae vibrating rapidly, a bee caresses the body of a young membracid, whereupon the latter tips the extreme end of its abdomen upwards, extrudes it slightly, and exudes a small drop of the liquid. This is immediately taken by the milker. A single nymph will usually give forth two or three such drops in rapid succession. The bee, after a brief feeding period, during which it has gathered the secretion from several nymphs, remains stationary for several moments, forcing the accumulated honey-dew from its mouth to form a pendant drop which may be half as large as its head. Apparently this serves to reduce the bulk of the drop by evaporation, for the liquid will again be ingested and the bee will resume its feeding, to repeat the performance again and again.

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[1]My thanks go to Karl V. Krombein for the interest which he has shown in this brief paper and for the pains to which he went in securing the determinations of the three insects concerned.

[2]*Aconophora* sp.; determined by Miss L. M. Russell.

[3]"An undescribed race or subspecies of *Camponotus* (*Myrmoturba*) *substitutus* Emery." Determination by Thomaz Borgmeier, who says, "In my opinion it is not advisable to describe the new race without the soldiers."

[4]*Trigona* (*T.*) *hyalinata* var. *branneri* Ckll.; determined by Karl V. Krombein. In one lot of material sent to him, a second species of the same genus was represented, *Trigona* (*T.*) *pallida* Latreille.

Each bee seemingly has its own limited territory of exploitation, for if all the bees are removed from a group of nymphs in the morning, no other bees will take their places during the day. The nymphs then become engorged, and minute droplets of the secretion appear in succession at the tips of their abdomens and are squirted away instantly; or the liquid may be expelled even before it has formed visible droplets. If a leaf is tied in a horizontal position close beneath a group of nymphs attended by bees, and one beneath a similar group from which the bees have been removed, there will thus be a marked difference between the two in the amount of accumulated honey-dew. The bees ordinarily do not collect quite all that is produced, however: Perhaps they are not sufficiently orderly or thorough in their operations, or perhaps the groups of membracids which were observed could have supported larger populations of bees. Over a period of nearly two months, the membracid population apparently about doubled, and the number of bees in attendance kept increasing at approximately the same rate.

After sunset, during the brief period of tropical twilight, the bees fly away to their nest. With sunset at 6:05 p.m., all bees are gone at 6:25. On two successive nights the last bee departed at precisely this time. In the morning they reappear before sunrise, when the intensity of the light has reached about that of the sunset period during which they made their departure.

In the evening, after the bees have left, the ants appear. They started to arrive at 6:45 p.m.—twenty minutes, only, after the bees had gone—and were present in full force before 7:00. They are much more difficult to observe than the bees, because they cease their feeding activities and run about rapidly under the illumination of even a dull flashlight, or of a match held at a distance of a foot or more. But occasionally it can be seen that they, too, titillate the nymphs with their antennae and secure minute drops of honey-dew. They become so replete that the abdomen is distended and translucent, and the wide, white, intersegmental membranes become very conspicuous. Before daybreak the ants depart, and the bees quickly take over the process of milking, with competition and possible conflict between the two shifts of milkers as completely eliminated by the factor of light intensity as though controlled by a factory whistle. The diurnal visitors apparently never see their nocturnal replacements.

This nearly continuous milking of the membracid nymphs is almost certainly not disadvantageous to them, but is clearly one way in which the pressure of the ingested liquid becomes reduced. The other method, as was mentioned, is by forcible extrusion.

If the midrib of the papaya plant is pierced with a needle, a large drop of sap is instantly forced out of the puncture by pressure within the plant. This sap is very different in appearance from the honey-dew which appears at the tip of the abdomen of the membracids, being whitish and milky. Within a few minutes it coagulates or congeals to form a soft, white, starch-like ball. Certainly, feeding by the nymphs must be effortless, with unlimited food supplied and that under pressure. In fact, the life of this membracid, from egg to death, is one of idyllic indolence. No movement is necessary excepting that of crawling out of the egg shell, attaching the mouthparts once and for all to a never-ending food supply, upending the abdomen (when caressed) for the automatic removal of excrement, shedding the old clothes (with new ones already present beneath!), and mating. Females, "the overworked sex," have only the additional labor of laying eggs in the tissues of the plant.

A NEW SPIDER MITE

(Acarina, Tetranychidae)

By E. A. McGregor, *Collaborator, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.*

This paper contains the description of a new tetranychid mite from Arizona. The type material is deposited in the U. S. National Museum, Washington, D. C.

Tetranychus frosti, new species

Female.—Dorsum of abdomen with striations mostly transverse (the "*Eotetranychus*" type). Twenty-six dorsal body setae, well developed, linear lanceolate, distinctly setose, not arising from tubercles. A perfect and an imperfect eye cornea each side. Legs shorter than body to front of cephalothorax. Tarsus I with two sets of duplex setae, these proximate, longest seta almost as long as segment; 6 (occasionally 7) setae proximad of proximal set of duplex setae; segment abruptly constricted distad of duplex setae. Relative length of segments of leg I as follows: Coxa, 14±; trochanter, 10; femur, 24; patella, 12; tibia, 16; tarsus, 23. Mandibular plate barely indented anteriorly. Claw of tarsus I deeply cleft into six rather delicate divisions, these appressed right and left. Palp-tarsus with basal thickness distinctly greater than axial length; terminal sensilla somewhat longer than thick; dorsal sensilla very slender. Collar trachea consisting of a straightish tube, terminating internally in a few thickened septa, the last at times forming a very short, reflexed arm.

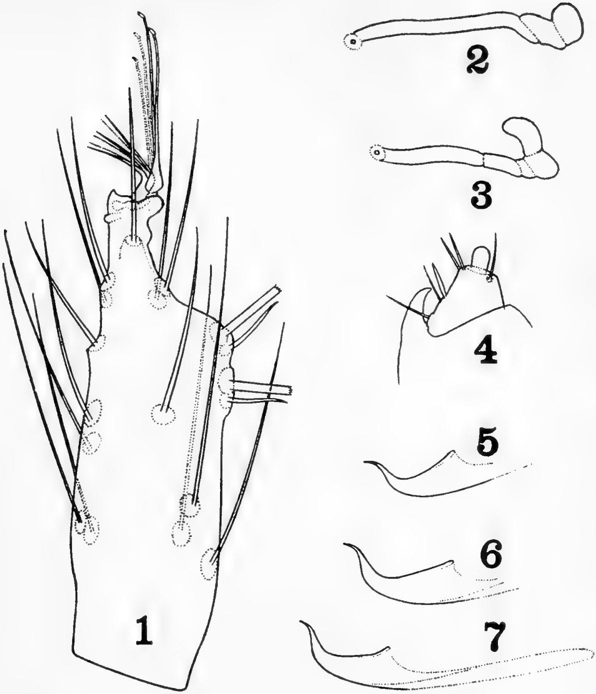

Fig. 1, tarsus I of female, of *Tetranychus frosti*, lateral view; figs. 2 and 3, collar trachea; fig. 4, tip of palpus of female, lateral view; figs. 5, 6 and 7, aedeagus, lateral view.

Male.—Much smaller than female, body from above rather narrowly elliptical. Legs somewhat shorter than usual for males, all shorter than body. Tarsus I with two somewhat swollen (sensory ?) setae near base. Palpus with hornlike spur on second segment; palp-tarsus with terminal sensilla much reduced, conelike. Aedeagus with inner lobe rodlike, expanding dorso-caudad to the right-angled basilar lobe; shaft convex ventrally, narrowing caudad, bending upward about 60° from general axis of aedeagus to form the hook element; the latter about two-thirds as long as shaft; the hook tapering to a rather sharp tip, which is weakly deflexed.

Type locality.—Tempe, Arizona.

Type material.—U. S. N. M. no. 1928. Collected by Marvin H. Frost, May 12, 1949. In addition to the 12 ♀ and 3 ♂ type specimens, there are present on the slide 5 females of another species of *Tetranychus* which could not be identified.

Distribution.—Known only from the type locality.

Food plant.—Rose bush.

The present species constitutes one of the rarely known cases where the structure of the aedeagus strongly resembles that of a species in a different genus. The portion of it caudad of the basilar lobe is very similar to that of *Paratetranychus pilosus* (C. & F.).

ADDITIONS TO THE HISTORY OF MEIGEN 1800

(DIPTERA)

BY CURTIS W. SABROSKY, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

In 1944 (Ann. Mag. Nat. Hist., ser. 11, 11: 261-272), Dr. John Smart presented a very useful compendium of the literature and events relating to the long disputed "Nouvelle classification" of Diptera by Meigen, 1800. He listed eight published references to Meigen's generally overlooked paper prior to its so-called rediscovery in 1908, when Hendel reprinted the taxonomic portion and indicated considerable synonymy. The writer has recently found several other pre-1908 references which should be added to Smart's historical review.

Cuvier (1817, "Le Règne Animal," vol. 4, p. 141), in a list of literature by Meigen: "M. Baumhauer avait publié, en 1800, un extrait du même travail, sous le titre de: 'Nouvelle classification des Mouches à deux ailes,' in-8°, Paris, 1800." It is possible that this note also appeared in other editions of Cuvier's work, which would add a few references.

Duméril (1823, "Considérations générales sur la classe des insectes," p. 265), in a discussion of Meigen: "M. Baumhauer avoit donné à Paris, en l'an VIII (1800), un extrait de ce travail en françois." The "travail" referred to was published by Meigen (1804).

Sherborn (1902, "Index animalium, 1758-1800"): All Meigen 1800 names are listed.

Hoyle (1902, Jour. Conchology 10: 214; paper read before the Conchological Society, June 11, 1902): *Antiopella* proposed to replace *Antiopa* Alder and Hancock (1848) in the Nudibranchia, because "the generic name *Antiopa* seems to have been used for Diptera by Meigen in 1800."

Hendel (1903, Wien. Ent. Ztg. 22: 58): In reviewing a paper by Bezzi (1902), Hendel called attention to the existence of the generic name *Potamida* Meigen (1800). He also definitely associated several 1800 and 1803 names by noting that Meigen had changed in the two papers from *Erinna* to *Xylophagus, Eulalia* to *Odontomyia, Chrysozona* to *Haematopota, Zelima* to *Xylota* and *Clythia* to *Platypeza.* He concluded with these words which presaged his 1908 work: "Leider sind keine typischen Arten angegeben, wodurch die Deutung mancher Gattungen, unmöglich wird. Ich werde auf diese Arbeit Meigen's noch einmal ausführlicher zurückkommen."

Bezzi (1907, Wien. Ent. Ztg. 26: 55-56) listed all Meigen 1800 names, as given in Sherborn.

In addition to these six references, it is also possible to infer knowledge of Meigen (1800) by Billberg (1820, Enum. Insect. in Mus. Billberg). On page 81, Billberg proposed *Ailus* as a substitute name for *Zelima* Fabricius (1807) in the Lepidoptera. He did not mention what preoccupied the latter, but there is no other use in botany or zoology to which Billberg could have referred except *Zelima* Meigen (1800).

ALASKAN SALDIDAE

(HEMIPTERA)

BY CARL J. DRAKE, *Iowa State College, Ames*

Very little is known about the Hemiptera of Alaska. Through the kindness of Dr. Reese I. Sailer, U. S. National Museum, the writer has recently received a small collection of Alaskan Saldidae, which were collected by him during the summer of 1951. As this collection was taken beyond the timber line, the species are of particular interest.

This collection is represented by five species divided among four genera as follows: *Chiloxanthus stellatus* (Curtis), Kotzebue, June 26; *C. pilosus* (Fallén), Kotzebue, June 26; *Salda littoralis* (Linnaeus), Kotzebue, June 28, 1951; *Saldula pallipes* (Fabricius), June 28; and *S. monae* Drake, new species.

Other Alaskan saldids recorded in the literature or in the writer's collection are as follows; *Calacanthia trybomi* (J. Sahlberg), *Micracanthia fennica* (Reuter), *Salda anthracina* Uhler, *S. bouchervillei* (Provancher), *S. opacula* (Zetterstedt), *S. fernaldi* Drake, *Teloleuca bifasciata* (Thomson), and *T. pellucida* (Fabricius). In addition, four other European species — *Micracanthia marginalis* (Fallen), *S. arenicola* (Scholtz), *S. c-album* (Reuter) and *S. hirsuta* (Reuter)—are recorded in the literature as occurring in Canada or United States. *Saldula xanthochila* (Fieber) and variety *limbosa* Horvath are recorded from United States, but the records are based upon wrongly determined specimens; *Saldula opiparia*

Drake and Hottes, *S. coxalis* (Stal) and an undescribed species from eastern part of United States are the species wrongly cited as *xanthochila* and its variety. *Saldula scotica* (Curtis) is also wrongly listed in Van Duzee's Catalogue as occurring in America.

Of the above 16 speices, 14 are holarctic in distribution and only two (*Saldula fernaldi* and *S. monae*, new species) are indigenous to the Americas. *Saldula pallipes* is the commonest and most widely destributed of the holarctic species in the Americas. It ranges from Alaska south through Central and Insular America into Brazil, Argentina, and Chile, and is the commonest shore bug in Canada and United States. Although not so abundant, *S. saltatoria* and *S. opacula* are widely dispersed in Canada and United States; *saltatoria* is also recorded from Mexico.

Saldula monae, new species

Rather large, elongate-ovate, blackish usually with several small flavous or testaceous spots on each hemelytron. Head, pronotum and scutellum rather deep black, somewhat shining; hemelytra not as dark, with considerable bluish bloom. Male usually smaller than the female. Length, 4.50 mm. (male), 6.00 mm. (female); width, 2.20 mm. (male), 3.00 mm. (female).

Head.—Head black, feebly shining, clothed with very short grayish pubescence; front shallowly grooved on median longitudinal line; with two large, swollen, testaceous callosities (one on each side) not meeting at apex; vertex with two testaceous spots on each side near each eye; ocelli reddish brown, separated by less than the diameter of one of them; clypeus swollen, convex above, testaceous, almost twice as long as wide, a small testaceous callus in adjoining area on each side. Eyes large reddish brown, converging anteriorly, with a few scattered, short, dark bristles growing out of each of them. Rostrum long, black-fuscous, shining, extending to hind coxae. Antennae long, brownish black, shortly pilose with a few scattered short bristles but without long bristly hairs, with most of one side of basal segment testaceous; formula—I, 40; II, 100; III, 50; IV, 50 (male); I, 40; II, 105; III, 60; IV, 60 (female).

Thorax.—Deep black, slightly shining, densely clothed with grayish pubescence, more than twice as wide at base as median length (120:45, male and 150:60, female), moderately narrowed anteriorly with the outer margin straight, deeply widely emarginate behind; callus large, moderately elevated, deeply transversely impressed on the disc, not extending laterally on explanate margins of pronotum, set-off behind with a deep arcuate furrow, its median length distinctly greater than that of the hind lobe; hind lobe about one-half as long as fore lobe. Scutellum concolorous with and as densely pubescent as the pronotum, slightly wider at base than median length, transversely impressed just in front of the middle. Legs brown-black with sides of femora testaceous, usually with a row of small dark spots in the testaceous areas, densely clothed with short pale hairs which are longer beneath on the femora; tibiae dark or with apices whitish, with usual spines; tarsi dark with the second segment testaceous, the apical segment of hind legs longer than the preceding; coxal plates testaceous.

Abdomen.—Blackish beneath, clothed with short pale hairs. Hemelytra brown-black with bluish bloom, each hemlytron usually with five or six flavous or testaceous spots, one subapical on clavus, one or two subapical spots on outer clavus and a subapical, a median and a subbasal spots on inner clavus, any or all the spots may be missing and hemelytra entirely dark in some specimens; membrane with four long cells, dark at the base and usually with a large dark spot in each cell just beyond the middle of each cell; short hairs (or long pubescence) moderately dense, but not as dense as on scutellum and pronotum, golden in color. Wings whitish, extending beyond tip of abdomen.

Types.—Type male, allotype female, and many paratypes: Kotzebue, Alaska, June 28, 1951, collected by R. I. Sailer. Type no. 61415, U. S. N. M., Washington, D. C. Named in honor of Mrs. Mona MacKinnon. She and her husband have spent several years at Kotzebue as weather observers. Their advice on local arctic weather conditions as well as their generous hospitality contributed much to the success of Dr. Sailer's in that region.

In general appearance and coloration, *S. monae* very much resembles the European *S. scotica* (Curtis), but it lacks the long hairy clothing on the dorsal surface of the body. *S. varabilis* (H. S.) is also quite similar in general aspect, but is narrower and has different hemelytral markings as well as shorter pubescence. *S. monae* is not readily confused with its Eurasian congeners, and the markings, shape, and pubescence also separate it from related species occurring in Alaska and Canada.

Teloleuca pellucens (Fabricius)

Acanthia pellucens Fabricius, Reise Norweg., p. 234. 1779.

Salda riparia Fallén, Suppl. Mon. Cim., 2:1. 1826.

Salda affinis Zetterstedt, Ins. Lapp., p. 269. 1840.

Salda luteipes Herrich-Schaeffer, Wazn. Ins., 6:40, fig. 597. 1841.

Salda conspicua Douglas and Scott, Ent. Mo. Mag., 4:93, pl. I, fig. 1. 1867.

Salda elongata Uhler, U. S. Geol. Surv., 3:448. 1877 (New Synonymy).

Chartoscirta (*Chartolampra*) *cursitans* Bueno, Bull. Brookl. Ent. Soc., 18:151. 1923.

Acanthia celeripedes Bueno, Can. Ent., 56:298. 1924.

An examination of the type female labeled "Brit. Col., G. R. Croldi., *type* no. 808" in Museum of Comparative Zoology, Harvard University, shows *elongata* Uhler to be identical with the European *T. pellucens* (Fabr.), and is here suppressed as a synonym. Recently, Bueno's species, *Chartoscrita cursitans* as well as his subgenus *Chartolampra* were synonymized as indicated above. Also, *Acanthia bellatrix* Bueno was made a synonym of *T. bifasciata* (Thomson). Widely separated records show that these two holarctic shore bugs are widely dispersed in Alaska, Canada, and Northern United States. both species exhibit considerable variation in color markings of hemelytra, which seems to account for part of the confusion and synonymy. *T. bifasciata* may be separated from *T. pellucida* by the subbasal, marginal, flavous spot on each side of the pronotum.

BOOK REVIEW

AN INTRODUCTION TO ACAROLOGY, by Edward W. Baker, G. W. Wharton. Small 8vo., cloth, 465 pp., 1 col. pl., 377 figs., N. Y., Macmillan Co., 1952. $10.00.

This book should have an especial appeal to our Society's local members. It deals with a subject that to many of us is reminiscent of long association with Nathan Banks, with Henry Ewing, and with others of our colleagues who for years were pioneer laborers in this field. The mere mention of those names brings back to us pleasant memories of enjoyable associations and valued friendships.

The need for a down-to-the-minute, comprehensive work on this subject has been intensified recently by the rapid advancement of our knowledge concerning the use of DDT and other of the newer insecticides in control of Acarina and other pests, some of which are known to carry human diseases. It has been the urgency of this need that has led to the preparation of this book. "An introduction to Acarology" has been designed not only for the professional acarologist, but also for the growing number of students in related fields of entomology, parasitology, and medicine.

This notice (definitely not a critical review) is limited to furnishing a general idea of the scope and purpose of this book. In addition to a short introduction covering the general structure, development, and ecology of mites, this volume considers each family as a unit. Keys are provided which are designed to enable the reader to place any acarine in its proper family. In the discussion of each family, information (where known) is given as follows: a diagnosis of characters, a list of genera and their type species, a discussion which includes the biology, the economic, or medical importance with emphasis on the important species, and a list of references to pertinent literature. In addition, 377 line drawings of the representatives of the families are included.

The section by Vitzthum on Acari published in 1942 in Bronn's "Klassen und ordungen des Tierreichs," proved of extreme helpfulness to these authors, and they state that they have followed his classification, except in a few cases where their own or other more recent studies have indicated necessary changes. The suborders and related sections treated in detail are as follows: Onychopalpida Wharton, 1947 (pp. 36-39); Mesostigmata G. Canestrini, 1891 (pp. 40-136); Ixodides Leach, 1815 (pp. 137-145); Trombidiformes Reuter, 1909 (pp. 146-258); Hydrachnellae Latreille, 1802 (pp. 259-319); Sarcoptiformes Reuter, 1909 (pp. 320-386); and Orbitatei Duges, 1833 (pp. 387-438). As would be expected in a comprehensive work such as this, it has been necessary to make a general summary from various sources of the more important information accumulated by previous workers, and to organize it under respective subdivisions. Such procedure has proved essential not only to visualize what has been accomplished, but also to locate interstices not previously studied. Needless to add, these blank spots proved to be large in size and abundant in number. The authors emphasize that, on the whole, the Acarina are still very little known even by specialists within the respective groups, and "it is anticipated that many changes will have to be made before a definitive work on the group is achieved."

Since the senior author is a valued local member of our Society, it will be with pleasure that his fellows in our organization can congratulate him and his co-author on the successful completion of a considerable contribution to our knowledge of Acarology. It should also be added, as a human interest touch (which shows appreciation and does honor to their goodness of heart) that this work is dedicated by its authors to the memory of "our friend and teacher Dr. Henry Ellsworth Ewing, 1883-1951."—J. S. WADE, *Washington, D. C.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
615TH REGULAR MEETING, FEBRUARY 7, 1952

The 615th regular meeting of the Society was held in room 43 of the U. S. National Museum on Thursday, February 7, 1952, attended by 49 members and 31 visitors. At 8:00 P.M. President W. D. Reed called the meeting to order and asked for the reports of the officers for 1951. Reports were read by R. W. Sherman, corresponding secretary; R. H. Nelson, treasurer; K. V. Krombein, editor; Helen Sollers, custodian; Kellie O'Neill, for the auditing committee; and Alan Stone, chairman of the committee on the reserve stock of publications.

C. F. W. Muesebeck reported for the committee on Memoirs that the manuscript of "A Manual of the Chiggers," by George W. Wharton, recommended to the Executive Committee for publication as Memoir 4 of the Society, had been approved and the low bid on the printing job, made by Monumental Printing Company, had been accepted.

Two members of the Society are to be honored when the Washington Academy of Sciences presents its awards for 1951 in March, announced Mr. Muesebeck. Dr. Edward W. Baker is to receive the award in Biological Sciences in recognition of his distinguished research in the classification of the Acarina. Mr. Howard B. Owens is to receive a special award to be made for the first time in the field of Science Teaching, in recognition of his exceptional record.

The following were presented for membership by P. A. Woke and elected by the Society:

K. A. Haines, Division of Cereal and Forage Insect Investigations, Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

Dr. Francis M. Summers, Division of Entomology and Parasitology, University of California, Davis, Calif.

Dr. Justin W. Leonard, Michigan Department of Conservation, Lansing 13, Mich.

Mona S. Ally, 3728 Harrison St., N. W., Washington 15, D. C.

Douglas J. Gould, Department of Entomology, AMS Graduate School, Walter Reed Army Medical Center, Washington 12, D. C.

Capt. Harold D. Newsom, same address.

Dr. Garland T. Riegel, Eastern Illinois State College, Charleston, Illinois.

Emory D. Burgess, Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

Dr. Wayne L. Howe, Associate Entomologist, Tidewater Agricultural Experiment Station, Holland, Virginia.

A photograph was circulated by H. S. McConnell showing *Anopheles punctipennis* as a beast of burden. Attached to the mosquito was an immature pseudoscorpion, determined as *Illinichernes distinctus* by Dr. Clayton Hoff.

H. H. Stage circulated ''Illustrated Map of the Anopheline Imagines of Indonesia,'' published by the Ministry of Health in Indonesia.

W. H. Anderson reviewed ''An Introduction to Acarology,'' by E. W. Baker and G. W. Wharton. A review of this book will appear later in the Proceedings.

Three moths of a rarely collected species of *Orneodes* were exhibited by J. F. Gates Clarke, who found them hibernating in a West Virginia cave.

The address of the retiring president was given by Alan Stone, who reviewed the history of mosquito classification.

Mosquito taxonomy began with the description of six species by Linnaeus in 1758; of these only *Culex pipiens* now is a valid name. There was relatively little done on mosquitoes from 1758 to 1900, only 7 per cent of the species now considered valid being described in that period. The period from 1901 to the present saw a great deal of activity in mosquito taxonomy. There were three great leaders in this work, F. V. Theobald, H. G. Dyar, and F. W. Edwards. A series of charts was exhibited showing the year by year accumulation of mosquito descriptions, both generic and specific, with an indication of the ratio of valid to invalid names. It was shown that there has been a great reduction in the number of genera. It was also shown that the ratio of valid names ranged all the way from .436 for the palaearctic region to .810 for the ethiopian, that for the entire world being .626. In all, 407 authors used

3,897 names to describe 2,439 species. Of these proposed names the National Museum has the types of about 22 per cent and of the valid species it has about 58 per cent represented by specimens. (Speaker's abstract.)

A. B. Gurney gave a note on ''Grasshopper glacier,'' in the mountains near Cooke, Montana, and also discussed the unusual occurrence of fossil Mormon crickets.

Visitors introduced to the meeting were Dr. Herbert Crandall, Mrs. Robin Brooks, and Mr. J. M. McGough. Adjournment at 9:50 P.M.

KELLIE O'NEILL, *Recording Secretary.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON
616TH REGULAR MEETING, MARCH 6, 1952

The regular meeting of the Society was held in Room 43 of the U. S. National Museum, Thursday, March 6, 1952. Sixty members and 32 visitors were present. President W. D. Reed called the meeting to order at 8:00 P.M. and the minutes of the previous meeting were read and approved.

The Society elected the following to membership:

Dr. Mohan Singh, 75 Man Nagar, Cornwallis Road, New Delhi, India.
Mr. Howard R. Bullock, Division of Biology, Univ. of Utah, Salt Lake City, Utah.
Capt. Gordon Field, 1614 Roberts Lane, Falls Church, Va.
Mrs. Robin H. Brooks, 1337 21st St., N. W., Washington, D. C.
Lt. Comdr. A. Burns Weathersby, Medical Service Corps, U.S.N., Naval Medical Research Institute, Naval Medical Center, Bethesda 14, Md.
Dr. Leslie W. Teller, Lt., Medical Service Corps, U.S.N., Naval Medical School, Naval Medical Center, Bethesda 14, Md.
J. P. Toffaleti, District Manager, California Spray-Chemical Corporation, P.O. Box 1164, Shreveport, La.

A review was given by G. H. Nelson of ''How to Know the Beetles,'' by H. E. Jaques, and J. J. Pratt reviewed ''Insect Control by Chemicals,'' by A. W. A. Brown.

An *Ornithodoros* tick which had developed only seven legs was exhibited by W. E. Bickley.

Lt. William B. Hall, who showed slides demonstrating louse control in Korea, was warmly applauded by the Society.

A brief review of the life of Dudley Moulton, widely known thysanopterist whose death occurred in July 1951, was given by Kellie O'Neill.

The principal paper of the evening was given by Dr. Leigh E. Chadwick, Chief of the Entomology Branch, Army Chemical Center, Maryland, who spoke on The Physiology of Insect Flight.

Dr. Chadwick stated that flight is one of the outstanding characteristics of adult pterygote insects. To them it is often of primary importance for the survival of the individual and the perpetuation of the species. The significance of flight for the past and present distribution of insects, and in the economic problems they present, is equally apparent. Dependence on flight has also left its imprint in manifold details of insect morphology and physiology. Although the small size and rapid wing motion of many species have been obstacles to our comprehension of the nature of insect flight, modern instrumentation is facilitating progress. As examples, data were presented on the pattern, frequency, and amplitude of wingbeat, obtained by high speed photography and stroboscopic observation. Concurrent measurements of the respiratory exchange, plus biochemical data and aerodynamic theory, provide some insight into the energy sources and requirements. (Speaker's abstract.)

Visitors who were introduced included Dr. E. Morales Agacino of Madrid, O. Fisher, biochemist, of Ottawa, and several students of the University of Maryland. Adjournment at 9:50 P.M.

KELLIE O'NEILL, *Recording Secretary.*

Actual publication date of vol. 54, no. 2, Apr. 25, 1952.

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PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 54 AUGUST 1952 No. 4

BIOLOGY OF THE COCKROACH PARASITE, PIMELIAPHILUS PODAPOLIPOPHAGUS TRAGARDH, WITH A DISCUSSION OF THE GENERA PIMELIAPHILUS AND HIRSTIELLA

(ACARINA, PTERYGOSOMIDAE)

BY FREDERICK CUNLIFFE, *Pinellas Biological Laboratory, Inc., St. Petersburg, Fla.*

The study of a little-known species of mite, *Pimeliaphilus podapolipophagus* Trägårdh, was begun when it was found to be a pest in cockroach rearing cages which were being used in laboratory studies during World War II. No observations had been made previously on the biology of this mite, but it was suspected of being parasitic on the roaches. Work was begun with this relationship in mind, and the results have proven the mite to be a true parasite.

The literature shows that several other species of mites had been placed in the genus *Pimeliaphilus*, but since these others were lizard parasites there was some doubt as to the validity of this generic placement. More detailed work showed that there is a distinct morphological difference between the arthropod and vertebrate parasites. This, coupled with the biology, has led to the separation of the two groups of species as different genera.

A new species of *Pimeliaphilus* and two new species of *Hirstiella* are described in this paper, and keys to the species in each genus are given. The identification of the specimens from cockroaches as *P. podapolipophagus* was confirmed by Trägårdh.

BIOLOGY

The eggs of *Pimeliaphilus podapolipophagus* are laid indiscriminately in the rearing cages, usually on tissue paper, soft wood, paraffin, or cardboard, rather than on the cockroaches themselves although occasionally eggs have been laid on the wings of a roach. Eggs are deposited singly or in batches of one to twenty, usually in groups of about twelve. It is noteworthy that the eggs, when laid in the same spot, cling together in a mass, and that one alone on the back of a roach will not roll off, but if pushed to the edge of the wing will roll around it to the underside. This is due to a sticky substance secreted by the mite while laying the egg. This substance was observed under a binocular microscope to surround the egg as a minute droplet while the egg was being extruded by the mite. The eggs are at first translucent in appearance, gradually developing into a yellowish-red, then shading into a darker red pattern as the embryos develop. The eggs measure about 195 μ long by 150 μ wide and are elliptical in shape. The time the eggs require to hatch ranges from six to eleven days at a temperature of 90° to 95° F., and from nine to eleven days at a temperature of 80° F. At the latter temperature it is possible to discern the larval appendanges folded to the ventral side of the body by the eighth day. The last two days before hatching the entire larva is visible, and the striations, setae, and eyes can be seen without difficulty. The shell after hatching shows a slit in the lateral terminal portion through which the larva emerged.

The newly-hatched, six-legged larva is pale red, becoming darker as it matures. When it has just emerged from the egg and stretched itself, it measures 270 μ in length. It is faster moving in this stage than at any other time in its life cycle, and starts to feed immediately on the roach. The male larva, which possesses a pointed posterior, is smaller than the female and seems to have a cavity or depressed area on the dorsal surface which is not present in its later stages. The three pairs of legs of the male appear longer and slimmer due to the smaller size of the body as compared to the female. The larval integument separates from the underlying surface and shows up as a translucent or transparent covering just before the larva enters its resting stage. The larval stage lasts from four to six days and the resting period from two to three days. During this resting period, or nymphochrysalis, the larval integument turns white, and it is possible to discern the nymphal skin underneath.

After the quiescent interval has passed the nymph works its way out of the larval skin through an anterior, transverse slit. It moves about very actively after emerging. The male in this stage can be separated from the female by the narrower body shape and sharp posterior. The nymph, since it has now acquired an additional pair of legs, shows no morphological differences from the adult, except that it lacks a genital opening and the body setae are not so regularly and systematically arranged. There is only one nymphal instar. During a period of six or seven days the nymph feeds on the roach and moves about. Then, as in the larval period, there is a resting stage lasting from three to four days, the imagochrysalis.

During the resting stages of this mite, both larval and nymphal, it may drop anywhere in the culture, even under the debris, resting on its back or side, and is completely helpless until it molts. After the second resting stage the mite works its way out of the nymphal skin through a transverse slit across its anterior width from shoulder to shoulder. Sometimes after the molt from the nymphal to adult stage, the mite may have some trouble divesting itself of its cast skin, and drags the skin around with it for two or three hours before casting it loose.

The life cycle covers a period of from twenty-eight to thirty-two days under laboratory conditions, depending upon the temperature. An adult mite will live two or three weeks, and during this time is capable of producing two or three batches of eggs.

Adults

The adult is sac-like with a tendency to be oblong-elliptical. There is no separation between the propodosoma and the hysterosoma. The color varies from a deep red to a light shade of orange. The skin is thick, very flexible, and is ridged with symmetrical convolutions. In addition, the entire body, except for the propodosomal shield, is covered with fine striations. The body of the adult female is large and broad, the sizes of individuals varying from 555 μ to 975 μ in length and 355 μ to 555 μ in width. The gnathosoma of this mite is one-fourth as long as the rest of the body. There is a prominent palpal thumb and the claw arises from the penultimate segment. Each palp has only four segments, the second being longer than the other three combined; this second segment consists of the fused genu and femur. The fixed chela is degenerate and the movable chela is distal and possesses two teeth. The peritremes project laterally at the base of the gnathosoma. The dorsal shield is oblong. There are three pairs of setae on the shield, fairly evenly distributed. There is a total of thirteen pairs of dorsal setae, counting those on the shield and the humeral pair; all setae are serrate. On the lateral shoulders is a pair of very small shields, each of which bears an eye and a seta. Tarsus and tibia I each possesses a long, rodlike sensory organ, tarsi II and III each has a short, rodlike sense organ, and tibia III and IV each has a whiplike sense organ. The adult male is similar in structure to the female except that it is smaller in size. Mature males average about 425 μ long by 250 μ wide. The male has no propodosomal shield and no claw on the palp.

Parasitism

When these mites were first observed in the cockroach rearing cages it was suspected that they might be parasitic upon the roaches. Most specimens in the U. S. National Museum collection had been collected "in association" with roaches, but no one had definitely proven a parasitic relationship.

It was determined, first of all, that the mite was unable to exist on roach fecal matter, dead roaches, molted roach skins, or other debris. Unless live roaches were present in the cages, the mites died within four to six days. Three species of roaches were used as hosts: *Blattella germanica* (L.), *Blatta orientalis* L., and *Periplaneta americana* (L.). All were readily parasitized by the mites.

To prove definitely a parasitic relationship between the mite and the roach a technique was devised in which radioactive sodium chloride, which emits beta and some gamma rays, was fed to the roaches mixed with their food. When the mites fed on the roaches some of this material was picked up by the mite and could be detected by exposing the mites to X-ray films, since this film is sensitive to these rays.

Roaches were first kept without food for three days. Then they were allowed to feed on dog food to which radioactive NaCl had been added. Mites to be studied were denied access to roaches for two days. This insured immediate feeding. Roaches were allowed to feed on the activated food for approximately one hour and were then placed into clean containers with the test mites. After allowing the mites to feed for a half hour the roaches and mites were etherized and taped on PSB2 dental film with cellulose tape. Exposure time of the films was four minutes in all cases.

For checks roaches carrying mites were fed on dog food to which activated salts had not been added and X-ray films were exposed to them. The results were negative as shown in Plate I, figure 1. Figure 2 is a film exposed to a roach without mites, which had fed on the activated diet; figure 3 is a film exposed to a roach, with an attached mite, which had fed on the activated diet; figure 4 is a film exposed to mites which had been allowed to feed on roaches fed on the radioactive diet. The activated salts in the roaches and in the mites produced clouded areas on the film: This series of X-ray pictures demonstrate that these salts passed from the cockroaches into the mites, definitely proving that the mites had fed on the roaches, and were, therefore, parasites of the roaches.

There is no doubt that, in sufficient numbers, the mites will kill roaches. As many as twenty-five mites have been seen riding on the body of a single roach. A roach so burdened will run about very actively, apparently seeking a means of escape. After about one hour of such heavy parasitism, the roach succumbs, falling over on its back. It thrashes about for some five hours before dying. It has been observed that roaches engage in apparent combat with the mites. Fifteen or so mites

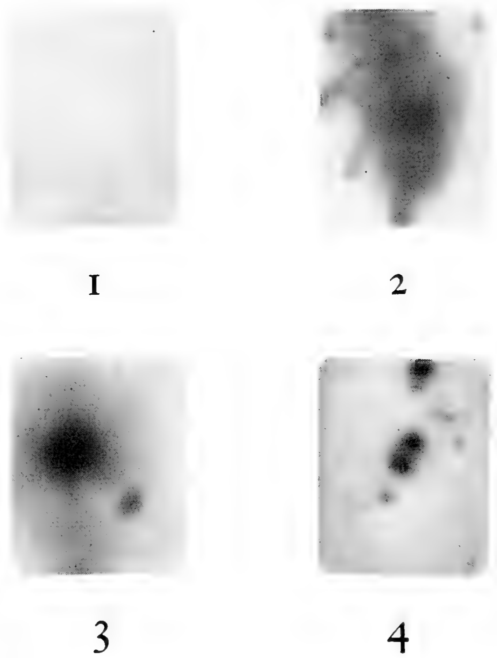

PLATE I. RESULTS WITH RADIOACTIVE SALT

Fig. 1, Control—X-ray film exposed to cockroach which had fed on dog food only; fig. 2, X-ray film exposed to cockroach which had fed on dog food to which radioactive sodium chloride was added; fig. 3, X-ray film exposed to cockroach which had fed on dog food mixed with radioactive sodium chloride; mite attached to roach; fig. 4, X-ray film exposed to mites which had been allowed to feed on cockroaches fed on the radioactive sodium chloride diet.

have been seen harassing or riding along on a roach when suddenly the roach will succeed in grasping some of the mites with its front legs and mouthparts. One or two, and sometimes three, mites may become involved, until either they escape or the roach finally manages to swallow them. This has been seen to occur a number of times.

Systematic Relationships

Pimeliaphilus podapolipophagus Trägårdh was first found by Ivar Trägårdh (1904) 1905 in Africa under the elytra of a species of *Pimelia* beetle. He believed that it lived on a mite, *Podapolipus apodus* (Trägårdh, 1902) belonging to the family Podapolipodidae Oudemans. Trägårdh placed *Pimeliaphilus podapolipophagus* in the family Raphignathidae. Vitzthum (1942) also placed this mite in that family. He did this possibly because of this mite's free living habits and body structure. The gross structure of this mite differs from that of the highly-specialized parasitic forms of the genera belonging to the Pterygosomidae, which parasitizes lizards. Baker and Wharton (1952), however, placed this genus in the family Pterygosomidae (where it properly belongs, as is shown below), but gave no reasons for doing so.

Most of the mites parasitic on lizards are entirely different from *Pimeliaphilus* in general appearance, being flat, usually hairy and bag-like with all four pairs of legs pointed anteriorly, adapting them to living beneath the scales of lizards. *Pimeliaphilus podapolipophagus*, parasitic on insects, is a primitive, free-living type, while the lizard parasites, as represented by *Geckobia* spp., are the more highly adapted forms. When the mouth parts of this free-living *Pimeliaphilus* are, however, compared with those of the genera which are parasitic under the scales of lizards, it can be seen that there is no fundamental difference between them in such character as the number of palpal segments, types of palpal claws and thumbs, or the chelicerae, all of which are basically the same. Although the bodies appear radically different in form, if one examines a series of species which are parasitic on lizards it is not difficult to see the relationship. This can best be illustrated by the figures to be found in the paper by S. Hirst, 1924, "On the parasitic mites of the suborder Prostigmata (Trombidoidea) found on lizards," Jour. Linn. Soc. Lond. Zool. 36: 173-200. The species illustrated show the gradations from those mites without dorsal shields or eyes (*Pterygosoma neumanni* Berlese) to those with eye plates and dorsal shields contiguous (*Geckkobia clelandi* Hirst.). The shield development apparently is not correlated with the specializations of the mites for parasitism of arthropods or lizards. It is of special interest that *Geckobia diversipilis* Hirst has a free-living type male, while the female is a typical bag-like, parasitic form. Although the legs are borne in a different position in the lizard and insect parasite groups, a study of the tarsi in both group indicates a close relationship, since there is very little difference in claws, tenent hairs, lack of pulvilli, and arrangement of sensory organs. The peritremes are the same in all forms, extending free from the body. When the relationships of these characters are understood it is easily seen that there is no basic difference other than that caused by the special habitats of the two groups. The primitive or free-living type of mite has transverse rows of setae (*Pimeliaphilus*), and the more specialized mites, lizard parasites, are covered with a dense setal pattern (*Geckobia*).

The genus *Hirstiella*, whose members are lizard parasites, is closely related to *Pimeliaphilus*, and at present can be differentiated only in the dorsal setal count and type of leg sensory setae. These mites are of the free living type and are not to be found beneath the lizard scales, but are probably parasites of the leathery Iguana lizards or are parasitic on regions of the bodies of other lizards which are not scaly.

A detailed discussion of the relationships between lizards and their mite parasites (of genera other than *Hirstiella*) can be found in R. F. Lawrence's paper, "The Prostigmatic Mites of South African Lizards" (Parasitology 27(1):38-43, 1935). Lawrence likewise, in his second paper on these mites (Parasitology 28(1):32-37, 1936), considers the correlation existing between parasite structure and the habits and anatomy of their lizard hosts.

Genus **Pimeliaphilus** Trägårdh

Pimeliaphilus Trägårdh, (1904) 1905, Acariden aus Ägypten und dem Sudan, Results Swedish Zool. Exped. to Egypt and the White Nile 1901, 20: 31-46; Vitzthum, 1942, Acarina, Bronns Klassen und Ordnungen des Tierreichs, 5, Sect. 4, Book 5, Lief. 6, p. 812; Radford, 1942, Parasitol. 35 (1,2): 71; Baker and Wharton, 1952, An Introduction to Acarology, Macmillan, pp. 207-209.

Type.—Pimeliaphilus podapolipophagus Trägårdh. Monobasic.

Palpus four or five segmented, with small round thumb or tarsus; legs arranged in two distinct groups, the two front pairs pointed anteriorly and the two posterior pairs posteriorly, a typical free-living arrangement; propodosomal shields distinct; with thirteen pairs of dorsal (and humeral) setae arranged in regular, transverse rows; body longer than wide and striate, each of the paired eyes located on a small plate which also possesses a single seta; claws each with tenent hairs; whiplike sensory setae arise from large, cuplike pseudostigmata on tibiae I, III, and IV; tarsus I with a single pair of duplex sensory setae, the posterior whiplike pair minute; tarsus III with a short rodlike sense seta.

KEY TO SPECIES

Dorsal shield almost rectangular; palpal femur and genu coalesced; movable chela short and tiny, with two teeth........................ *podapolipophagus* Trägårdh

Dorsal shield pentagonal; palpal femur and genu coalesced; movable chela long, conspicuous........................ *isometri* Cunliffe

Dorsal shield triangular; palpal femur and genu distinct; movable chela short and tiny, without teeth........................ *triatomae*, new species

Pimeliaphilus podapolipophagus Trägårdh

Pl. II, Figs. 5-7

Pimeliaphilus podapolipophagus Trägårdh, (1904) 1905, Acariden aus Ägypten unde dem Sudan, Results Swedish Zool. Exped. to Egypt and the White Nile 1901, 20: 31-46; Hirst, 1917, Ann. Mag. Nat. Hist. 19, ser. 8 (109): 143; Hirst, 1926, Jour. Linn. Soc. Lond. 36 (242): 199; Radford, 1942, Parasitol. 35 (1, 2): 71; Baker and Wharton, 1952, An Introduction to Acarology, Macmillan, pp. 207-209.

Diagnostic characters are to be found in the almost rectangular dorsal shield, the short, tiny two-toothed movable chela, and in the four-segmented palpus. The palpal tibia of the male does not possess a claw.

Type host.—*Pimelia* sp. (Coleoptera, Tenebrionidae), Egypt. The type is probably in the Trägårdh collection in Stockholm, Sweden.

This mite has been taken on cockroaches or found associated with them in various parts of the world. Its occurrence on the *Pimelia* beetle in Egypt may or may not have been accidental. Distribution records are: Egypt, Scotland (at U. S. Quarantine), Portugal (at U. S. Quarantine), Canada (at U. S. Quarantine), Venezuela (at U. S. Quarantine), Washington, D. C., Texas, Indiana, Connecticut, Ohio, Michigan, and Iowa. It is probably cosmopolitan.

Pimeliaphilus isometri Cunliffe

Pimeliaphilus isometri Cunliffe, 1949, Proc. Ent. Soc. Wash. 51 (3): 123, 124; Baker and Wharton, 1952, An Introduction to Acarology, Macmillan, pp. 207-209.

Diagnostic characters are to be found in the pentagonal propodosomal shield, the long, conspicuous, movable chela, and four-segmented palpus.

Type host.—*Isometrus* sp. (scorpion) Manila, P. I. Type in the U. S. National Museum.

Pimeliaphilus triatomae, new species

Pl. II, Figs. 8-12

Diagnostic characters may be found in the long, narrow triangular propodosomal shield, the long dorsal setae, and the five-segmented palpus in which the femur and genu are distinctly separated.

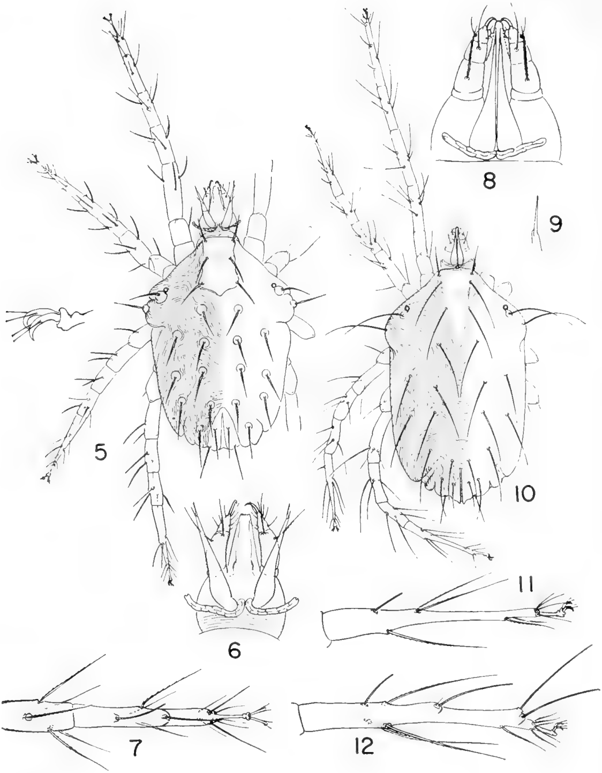

PLATE II. PIMELIAPHILUS PODAPOLIPOPHAGUS AND P. TRIATOMAE

P. podapolipophagus—fig. 5, dorsum of female with enlargement of tarsal claws; fig. 6, detail of gnathosoma of female; fig. 7, tarsus I of female.

P. triatomae—fig. 8, detail of gnathosoma; fig. 9, detail of movable chela; fig. 10, dorsum of female; fig. 11, tarsus II; fig. 12, tarsus I.

Female.—Palpus five segmented, the femur and genu distinctly separated and not coalesced as in *P. podapolipophagus* and *P. isometri;* palpal thumb more prominent than in other species, with 2 rodlike sensory setae and 5 normal whiplike setae. Body distinct in having long, slender dorsal setae reaching well past bases of setae in next row, and in having a long, narrow, triangular dorsal shield, the apex pointing posteriorly. The usual thirteen pairs of body setae are present. Legs long, slender, with long setae. Tarsal claws each with a single tenent hair; tarsal sensory organs as figured, differing very little from those of *P. podopolipophagus.* Femora I and IV with indications of being divided by a transverse suture. Length 671 μ, including rostrum 800 μ; width 414 μ.

Male.—Unknown.

Nymphs.—Similar to female.

Type host.—*Triatoma infestans* (Klug), Hemiptera, Reduviidae.

Type.—U. S. N. M. no. 2006.

Described from the female type and 6 female paratypes from Santiago, Chile, Feb. 18, 1949(?), A. Neghme.

The following is discussed here because of its close relationship to *Pimeliaphilus.* Further, since *Pimeliaphilus tenuipes* Hirst clearly belongs in *Hirstiella,* and *P. insignis* (Berlese) appears also to belong in *Hirstiella* (although placed in *Pimeliaphilus* by Hirst and in a new genus, *Pimeliaphiloides,* by Vitzthum), it has been thought best to treat the species of both *Pimeliaphilus* and *Hirstiella* in this paper, rather than dissociate them by covering their species in separate publications.

Genus **Hirstiella** Berlese

Geckobiella (*Hirstiella*) Berlese, 1920, Redia 14: 194.

Hirstiella Berlese, Hirst, 1926, Jour. Linn. Soc. Lond. 36 (242): 19; Vitzthum, 1942, Acarina, Bronns Klassen und Ordnungen des Tierreichs, 5, Sect. 4, Book 5, Lief. 6, p. 806; Radford, 1942, Parasitol. 35 (1,2): 71; 1950, Parasitol. 40 (3,4): 377; Baker and Wharton, 1952, An Introduction to Acarology, Macmillan, pp. 207-209. *Pimeliaphiloides* Vitzthum, 1942, Acarina, Bronns Klassen und Ordnungen des Tierreichs, 5, Sect. 4, Book 5, Lief. 6, p. 806; Baker and Wharton, 1952, An Introduction to Acarology, Macmillan, pp. 207-209.

Hirstiella Berlese was described for a Mexican species, host unknown, but probably a lizard, and may be characterized as follows: Palpus five segmented with a low, elongate thumb; legs arranged in two groups as in *Pimeliaphilus;* with distinct or indistinct propodosomal shields possessing a varying number of setae; body setae consisting of fourteen pairs of dorsal (and humeral) setae arranged in transverse rows; body longer than wide, typical free-living in shape, striated; a single eye and seta on each lateral plate; duplex sensory setae of tarsus 1 with

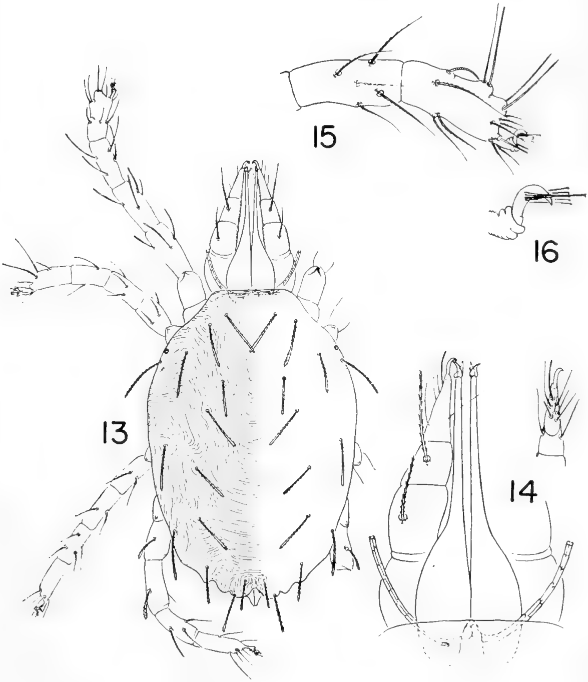

PLATE III. HIRSTIELLA TROMBIDIFORMES

Fig. 13, dorsum of female; fig. 14, gnathosoma with detail of venter of palpal tarsus; fig. 15, tarsus and tibia I; fig. 16, detail of tarsal claw.

posterior whiplike seta as long as the anterior rodlike sense seta; tarsus III without the short, rodlike sense seta; tarsal claws each with tenent hairs; whiplike sensory setae arise from large, cuplike pseudostigmata on tibia I, II, and IV; movable chela simple.

Hirstiella has fourteen pairs of dorsal and humeral setae whereas *Pimeliaphilus* has thirteen pairs; *Hirstiella* is parasitic on lizards and *Pimeliaphilus* is parasitic on arthropods; *Hirstiella* has the duplex sensory setae of tarsus I of equal length whereas in *Pimeliaphilus* the posterior seta is very short; tarsus III of *Hirstiella* does not possess the short, rodlike sensory seta of the other genus. Both genera are easily separated from the others in the Pterygosomidae by their free-living forms.

Pimeliaphiloides Vitzthum, 1942 (Type, *Geckobia insignis* Berlese) was placed in synonymy with *Hirstiella* by Baker and Wharton, 1952. Berlese's figures show some differences which may not be more than specific. Other characters are so similar that it is somewhat hard to believe that a third genus should be erected, especially on a figure and without proper qualifications as to differences, etc., for a species in this closely-related, specialized group. Studies of Berlese's types are needed to clarify the situation, but until then the species *insignis* will be included with the others in *Hirstiella*.

Key to Species

1. Dorsum of mite with a narrow groove running entire length of body; venter of rostrum with peculiar two-segmented appendage .... *insignis* (Berlese)
   Dorsum of mite smooth, without longitudinal groove 2
2. Dorsal shield indistinct or wanting .... *trombidiformes* (Berlese)
   Dorsal shield distinct, with at least one pair of seate 3
3. Dorsal shield triangular, with one pair of setae .... *pelaezi* (Cunliffe)
   Dorsal shield with more than one pair of setae 4
4. Dorsal shield with three pairs of setae; dorsal body setae long, reaching past bases of next setae .... *tenuipes* (Hirst)
   Dorsal shield with two pairs of setae 5
5. Dorsal shield pentagonal; dorsal setae long, reaching to bases of next setae .... *boneti*, new species
   Dorsal shield oval; dorsal body setae not half as long as distance between bases .... *bakeri*, new species

Hirstiella insignis (Berlese), new combination

Gekobia insignis Berlese, 1892, Acari Myr. Scorp. Ital. Prostigmata, Fasc. LXVL, No. 1.

Pimeliaphilus insignis (Berlese), Hirst, 1926, Jour. Linn. Soc. Lond. 36 (242): 199: Radford, 1942, Parasitol. 35 (1,2): 71.

Pimeliaphiloides insignis (Berlese), Vitzthum, 1942, Bronn's Klassen

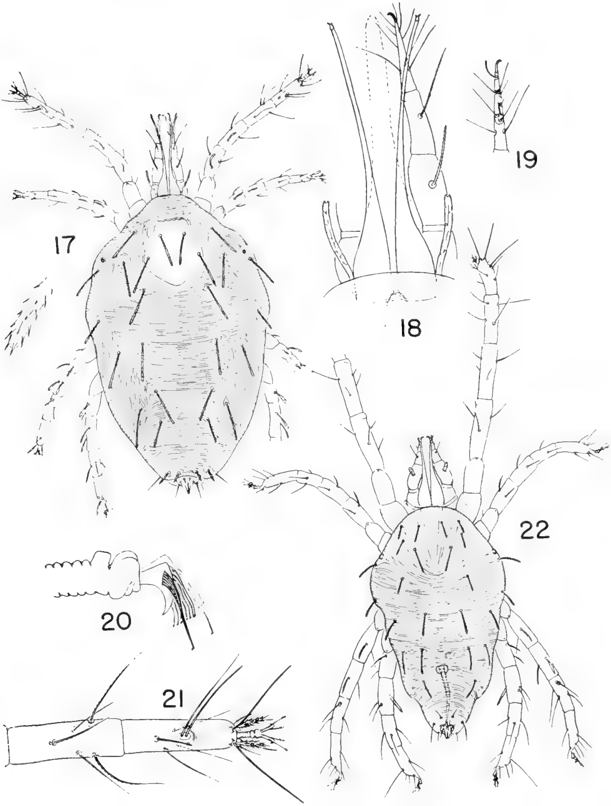

PLATE IV. HIRSTIELLA BONETI

Fig. 17, dorsum of female with detail of seta; fig. 18, detail of gnathosoma; fig. 19, detail of palpal tarsus; fig. 20, detail of tarsal claw, female; fig 21, tarsus and tibia I, female; fig. 22, dorsum of male.

und Ordnungen des Tierreiches, 5, Sect. 4, Book 5, Lief. 6, p. 812; Radford, 1950, Parasitol. 40 (2,3): 377.

Diagnostic characters are to be found in the rostrum which has a two-segmented knob-like protuberance on the anterior ventral side, and in the groove which runs the entire length of the body on the dorsum from the base of the gnathosoma to the anal-terminal area.

Type host.—Lizard, Italy. (*Tarentola mauritanica mauritanica* (L.) according to Radford, 1950.)

This diagnosis is based on Berlese's original figures made in 1892. Specimens have not been studied. The type is probably in the Berlese collection in Florence, Italy.

Hirstiella trombidiformes (Berlese)

Pl. III

Geckobiella (Hirstiella) trombidiformes Berlese, 1920, Redia 16: 194-195; Hirst, 1926, Jour. Linn. Soc. Lond. 36 (242): 197; Radford, 1942, Parasitol. 35 (1,2): 71; 1950, Parasitol. 40 (3,4): 377.

Diagnostic characters are to be found in the dorsal propodosomal shield being present but very poorly defined with striae similar to those on body but much lighter, and in the dorsal body setae being of medium length, reaching to the bases of the next row.

Type host.—Unknown, but probably lizard, Mexico. The type is probably in the Berlese collection in Florence, Italy.

This short diagnosis was taken from specimens collected by Dr. Federico Bonet in the Gruta del Carrizal, Nuevo Leon, Mexico (a cave). A figure of this mite was sent to Dr. C. D. Radford who compared it with specimens of *Hirstiella trombidiformes* deposited in the British Museum and found them to be the same.

Hirstiella boneti, new species

Pl. IV

Diagnostic characters are to be found in the pentagonal propodosomal shield which possesses two pairs of setae, and in the long dorsal body setae which reach to the bases of the next row.

Female.—Gnathosoma about one-third as long as body; palpal femur and tibia each with a simple, pilose seta of medium length; palpal thumb flat, elongate, with one rodlike sense seta and five simple setae; chelicerae long and slender. Peritremes extend almost to the end of the second palpal segment. Dorsal shield pentagonal, without striae, and with two pairs of setae. Body striations tend to be transverse. Body setae pilose, of medium length, reaching about to base of next setae, fourteen pairs of dorsal setae present. Legs typical of the genus, with few pilose setae and the usual sensory setae. Length 757 μ, including rostrum 972 μ; width 546 μ.

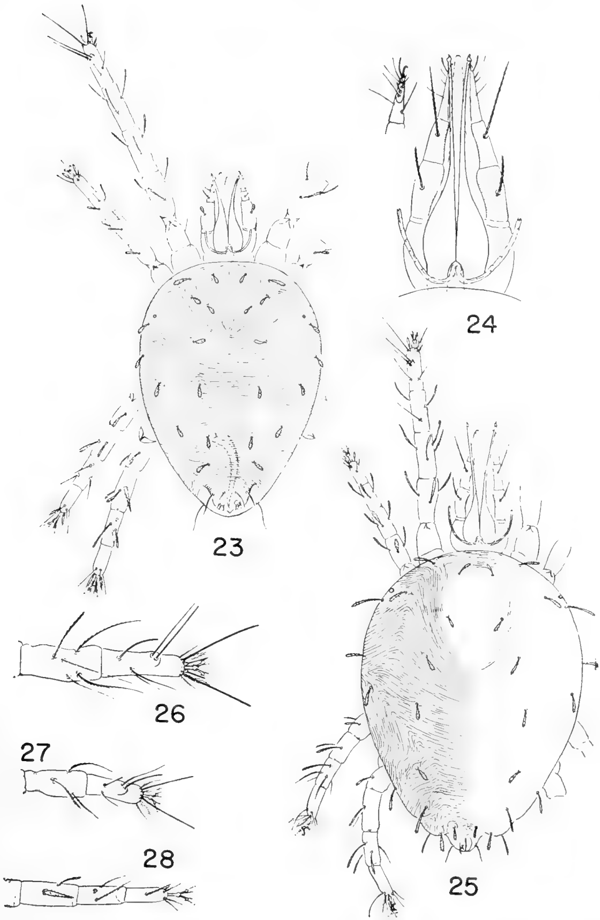

PLATE V. HIRSTIELLA BAKERI

Fig. 23, dorsum of male; fig. 24, detail of gnathosoma and palpal tarsus of female; fig. 25, dorsum of female; fig. 26, tarsus and tibia I of female; fig. 27, tarsus and tibia I of male; fig. 28, venter of leg IV of male.

Male.—Similar to female but without dorsal shield; femur of palpus with short, almost conical seta somewhat reminiscent of that found on males of the genus *Tetranychus*, family Tetranchidae; genu IV of male with enlarged, spinelike ventral seta; aedeagus slender, slightly curved. Length 400 μ, including rostrum 528 μ; width 228 μ.

Type host.—*Ctenosaura multispinis* Cope.

Type.—U. S. N. M. no. 1859.

Described from the female type and four female and one male paratypes from *Ctenosaurus multispinis* in College Reptile Collection, Wayne, Nebr., P. Spong, Nov. 22, 1923.

Hirstiella bakeri, new species

Pl. V

Diagnostic characters may be found in the oval propodosomal dorsal shield and the short, clublike body setae.

Female.—Gnathosoma long and slender, about one-third as long as body; femur of palpus with short, pilose seta; palpal tibia with pilose seta about twice as long as that on femur; palpus with a low, flat tarsus from which arise five simple and two rodlike sensory setae; chelicerae long, slender. Peritremes project just beyond first palpal segment. Propodosomal shield oval, without striae, and possessing only two pairs of setae; dorsal body setae short, pilose, clublike, the usual fourteen pairs present; body striations, as a whole, transverse. Legs of normal structure, as figured, most leg setae clublike. Length 657 μ, including 900 μ; width 500 μ.

Male.—Gnathosoma not so slender in proportion to the body as in the female; palpal femur with short, clublike, spined seta; palpal tibia with normal pilose seta about twice as long as that on femur; palpal tarsus with one short, rodlike and four whiplike sense setae. No dorsal shield; dorsal body setae short, clublike as in female. Aedeagus short, thick, curved. Legs with clublike pilose setae; venter of tibia IV with a small, triangular, short spine and venter of genu IV with a large, strong, serrate spine. Length 356 μ, including rostrum 470 μ; width 257 μ.

Type host.—Iguana.

Type.—U. S. N. M. no. 1860.

Described from the female type and two female and one male paratypes, San Diego, Calif., Mar. 2, 1923, L. F. Conti.

Hirstiella pelaezi Cunliffe

Hirstiella pelaezi Cunliffe, 1949, Proc. Ent. Soc. Wash. 51 (1): 25, 26.

Diagnostic characters may be found in the distinct, triangular dorsal shield which possesses striae and one pair of setae.

Type host.—*Sceloporus ferrari-perezi* Cope (lizard), Mexico, D. F. Type in the U. S. National Museum.

Hirstiella tenuipes (Hirst), new combination

Pimeliaphilus tenuipes Hirst, 1917, Ann. Mag. Nat. Hist. 19, ser. 8 (109): 1942; Hirst, 1926, Jour. Linn. Soc. Lond. 36 (242): 197; Radford, 1942, Parasitol. 35 (1,2): 71.

Diagnostic characters are to be found in the triangular dorsal shield which lacks striae and possesses three pairs of setae. Hirst gives the body measurements as 274 μ long by 220 μ wide, making this the smallest of these mites.

This short diagnosis was made from a figure by Hirst, 1926.

Type host.—*Gonatodes albogularis* (Duméril and Bidron) (lizard), Honda, Magdalene River, Colombia. Type in British Museum (Natural History).

ACKNOWLEDGEMENTS

I am indebted to Dr. M. L. Pool, of the Ohio State University Department of Physics, for making suggestions about techniques and supplying the activated salts, and to Dr. E. W. Baker, of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, for suggestions on the taxonomy of these mites.

NOTES ON NEOTROPICAL MUTILLIDAE IV. SYNONYMY AND DISTRIBUTION OF HOPLOCRATES, WITH DESCRIPTIONS OF NEW FORMS

(HYMENOPTERA)[1]

By RUDOLF M. SCHUSTER, *Department of Biology, University of Mississippi, University*

The species of the striking and bizzare genus *Hoplocrates* have been recently monographed by Mickel (Rev. de Ent. 12: 341-414, 1941), who has brought the descriptions of species and their distributions up to date.

The present short contribution is supplemental to this study. For keys, discussions of the phylogeny, etc., the student is referred to the above-cited paper. The synonymy cited in the present paper is new or differs from that given by Mickel.

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[1] Previously-issued papers in this series:

A new species of Pseudomethoca from the West Indies. Bull. Brooklyn Ent. Soc. 40: 7-8, 1945.

A key to the Central American, Mexican and West Indian species of Ephuta, with descriptions of new species. Rev. de Ent. 16: 187-204, 1945.

A key to the subfamilies represented and descriptions of several new genera. Ent. Amer. (n.s.) 29: 59-140, 1949.

Contributions to the genus Hoplomutilla Ashmead. Rev. de Ent. 22: 315-328, 1951.

Hoplocrates specularis (Gerstaecker)

Mutilla erythraspis Gerstaecker, Arch. Naturg. 40:48, 1874, male; *Hoplocrates erythraspis,* Mickel, Rev. de Ent. 12: 362, 1941. NEW SYNONYMY.

Hoplocrates scutellaris Mickel, Rev. de Ent. 12: 363, 1941, male. NEW SYNONYMY.

The above synonymy is based on four females and five males taken together by Fritz Plaumann, at Nova Teutonia, Providence Santa Catarina, Brazil. Four males and one female were taken on December 22, 1938; three of these males were typical *erythraspis,* while one was the form with the genal spines reduced and inconspicuous.

Several collections from the same locality appear to demonstrate that *specularis* is the only female of the genus at that locality, and *erythraspis* and *scutellaris* the only males. Of the five males before me, two belong to the *scutellaris* extreme, having the genal spines reduced; one of these males is 11 mm. long, and similar in size to the type material of *scutellaris* (which ranged from 9-13 mm.); the other male is 15 mm. long, and exactly identical in size with typical males of *erythraspis.* Critical examination discloses no other difference between *erythraspis* and *scutellaris;* furthermore, the genal spines of *erythraspis* (typical) vary somewhat in size. Under these conditions I cannot but conclude that *scutellaris* is not specifically distinct; it may possibly be an underdeveloped modification induced by parasitism of an unusually small host species. The occurrence of reduced genal spines (mere angulations) on one full sized male appears to indicate that the size of the genal spines is not fixed even under normal conditions of nutrition. Mickel (*loc. cit.*, p. 364) states that the type material of *scutellaris* varies considerably in the vestiture of the apex of the second abdominal tergite; in some males it is silvery, interrupted medially by black, in others it is entirely black. It is of some interest that the same variation also occurs in *erythraspis,* one of the three males of that form before me having the apical fringe entirely black. This similarity in variation is a further indication that *erythraspis* and *scutellaris* are not specifically distinct.

Hoplocrates rufonotata (André)

Two females before me of this species, heretofore known from four females from Peru and Bolivia.

PERU: Upper Rio Huallaga, September 30, 1929, one ♀; Moyobamba Region, December 5, 1925, one ♀.

These two specimens have the pygidial area distinctly granulose, with the granules scarcely arranged in rugae, even at the pygidial base.

Another female from Ecuador appears to represent either a distinct species or subspecies. Since its range appears to be more northern, and its distribution may be complementary to that of *rufonotata,* I prefer to consider it subspecifically distinct for the time being.

Hoplocrates rufonotata subspecies **upanoa**, new subspecies

Similar to *rufonotata*, but differing as follows: Fulvous median, basal macula of second abdominal tergite narrowly obcuneate (about 1.5 as long as wide), scarcely a third as wide as second tergite (in *rufonotata* broadly obovate, and not or scarcely longer than wide, nearly half as wide as second tergite); head behind temples less developed (ratio of length of eye to distance from posterior eye-margin to apex of posterolateral angulation is 7:10, or about 1.5 eye-length; in typical *rufonotata* this ratio is 7:14, or twice eye-length); silvery maculae of vertex reduced (width about equal to length of area behind macula; in *rufonotata* region of silvery pubescence extends back to near posterolateral angles, and area back of maculae scarcely half as long as macula); transverse, median line of elevation of clypeus has two teeth laterad of median line much more strongly developed than tooth on outer side of transverse ridge (in typical *rufonotata* outer teeth somewhat more strongly developed; in no case are they mere angulations); pygidium distinctly, obliquely, outwardly rugose on basal two-thirds of area, apical third largely devoid of sculpture (in *rufonotata* entire pygidial area, except apex, granulose, with granules arranged locally in rows approaching rugae in appearance, but never distinctly rugose).

Holotype.—Macas, Rio Upano, Ecuador, January 1, 1939. Deposited in the collection of the American Museum of Natural History.

This subspecies keys out to *rufonotata* in Mickel's key (*loc. cit.*, p. 351); it may easily be separated from that species by the narrower macula of the second tergite, and by the difference in armament of the elevated, transverse line of the clypeus.

Hoplocrates ucayalia, new species

Female.—Length 16.5 mm. Totally black, except for middle portions of mandibles, and legs, which are less intensely pigmented (reddish-piceous in color). Pubescence of dorsum black, composed of simple, erect hairs and decumbent, flattened, setose, scale-like hairs, except for two large maculae on vertex, apex of tergite one, a lanceolate, median, longitudinal macula at base of tergite two, thin, apical border of tergite two, and most of tergite three, which are provided with erect and decumbent, thick, pale, golden-fulvous hairs; some scattered, inconspicuous, golden hairs on dorsum of alitrunk; smaller areas of pale pubescence also laterally on base of tergite two, on clypeal region, on genae, and at apex of abdomen; with erect, white hairs on pleural and ventral regions of body (these regions totally lack black vestiture).

Head black; ventral part of face with erect, sparse, fine, white hair; genae with sparse, decumbent, white hair; clypeal region with whitish, erect hair; the rest of head with sparse, erect, terete, and decumbent, dense, stiff, flattened, scale-like black pubescence, except for vertex, which is provided on each side with an obliquely-rectangular macula of appressed, pale golden, bright, prominent hair, merging gradually into the silvery hair of the genae; frons and vertex with contiguous, deep, coarse, dense punctures, separated by thin, lamelliform, sharp intervals; genae and outer face of hypostomal processes with coarse, round, close (but distinctly separated) punctures; hypostomal processes very large, nearly four times as high as genal processes, conical, spinous, tips abruptly, outwardly bent; genal processes small, located directly posterior to and laterad of hypostomal processes, not connected with the posterolateral angles of the head by a carina; each mandible acuminate at apex, with a moderate tooth about a fourth from apex on inner margin, and a larger, coarser tooth just basad of that; clypeus with anterior margin quadrituberculate, with a pair of outer, large, tooth-like tubercles, and with a pair of small, glabrous, rounded, mesally-situated, nearly approximate tubercles, separated by a narrow, shallow sinus; just behind these, clypeus raised as a polished, transverse, low, broad ridge, almost devoid of punctures (this not at all, however, produced into a second pair of tubercles); dorsal part of clypeus closely, moderately punctured and pubescent, flat, slightly delimited near posterior margin by an obscure ridge (thus not distinctly concave); antennal tubercles spinose-dentiform produced; scape, pedicel, and proximal half of first flagellar segment with appressed, silvery hair; first flagellar segment as long as segments 2-4 combined; posterolateral angles of head strongly, almost lamellately produced, ending below in a dentiform process.

Alitrunk entirely black; dorsum coarsely, densely, deeply, contiguously to confluently punctured, intervals high and thin (often obsolete transversely; middle of posterior face of propodeum nearly impunctate; dorsum clothed with moderate, erect, fuscous or black hair, and with flattened, blade-like, decumbent hair on pronotum (to a lesser degree on metanotum); meso-metanotum in addition with sparse, rather inconspicuous, appressed pale golden hairs; dorsal face of propodeum with erect, fuscous hairs, posterior face with sparse, erect silvery hair; pleural faces and venter with sparse, erect, silvery hair, lateral faces of alitrunk, in addition, with dense, fine, appressed, sericeous, cinereous microvestiture; humeral angles moderately carinate; posterolateral edges of propodeum rugose-punctate, pleural areas (excepting a few scattered punctures) with micropunctures only.

Abdomen totally black, except narrow, apical border of each segment, which has integument deep ferruginous; first tergite with anterior face with rather small, scattered punctures, bearing erect, fine, white hair; junction between anterior and dorsal faces closely, confluently punctured; dorsal face clothed with a transverse band of conspicuous, pale golden pubescence which is narrowly interrupted on meson; second tergite with coarse, strongly confluent punctures (resulting in a decidedly asperate appearance), laterally punctures as coarse, but less sharply defined; vestiture of second tergite black, sparse, simple, erect and decumbent hair (scattered among which are spatulate, scale-like hair), except for a cuneate-lanceolate median, longitudinal macula of pale golden hair (which extends from base to slightly beyond middle of tergite), and some scattered hair near antero-lateral corners, and on the lateral margins and felt lines, which are pale, and apical band of tergite, which is provided with dense, golden hairs (slightly interrupted medially by black hairs); third and following tergites with contiguous, rather coarse punctures apically, those of third tergite bearing a broad band of pale golden-fulvous hair (interrupted medially by sparse fuscous hair, and not continuing quite to lateral margins of tergite), those of tergites four to five, and on base of tergite six, with erect and decumbent, fuscous or blackish hair; pygidium granulose; second sternite with scattered, coarse punctures, bearing white hairs; punctures closer apically, and a weak band of white hair visible there; apical sternites with distal bands of close, contiguous, moderate to rather coarse punctures, bearing sparse whitish hairs; distal part of hypopygium with close, small punctures, bearing short, subfuscous hair.

Holotype.—Rio Tapiche, Peru, December 14, 1923 (H. Bassler, coll.). Deposited in the collection of the American Museum of Natural History. PERU: Middle Rio Ucayali, November 10, 1923 (H. Bassler, coll.), 1 ♀ paratype retained in author's collection (to be deposited in Cornell University).

This species is somewhat allied to *H. dryope* Mickel, but differs from that species in that the antennal tubercles are strongly dentate (not "subdentate"), in that the dorsal face of tergite one has a transverse band of appressed, pale golden hairs (instead of "dorsal face with few, scattered, appressed golden hairs, in addition to erect black hairs"), and in that the second tergite has a linear-obcuneate longitudinal median spot of very pale golden, not fulvous hairs (instead of an "ovate spot of . . . golden pubescence").

In Mickel's key (*loc. cit.*, p. 350), *ucayalia* runs to couplet 14. If the first part of that couplet is followed, because of the golden or pale fulvous color of the spot of the second tergite, it runs to *dryope*, from which it differs as above. If the second part of the couplet is followed, because of the almost linear nature of the macula of the second tergite, it runs to couplet 21. It differs from *pompalis* Mickel, which keys out here, in that the clypeus is not flat throughout, but is somewhat convex medially (though not produced as a pair of tubercles); it also does not have the antennal tubercles quite as strongly armed nor is the pale maculation of the dorsum of the thorax distinct (it, furthermore, is not whitish, but somewhat golden pigmented). The weak development of the anterior median pair of tubercles of the clypeus separates this species from *armata* Klug, while the absence of a pair of subapical weak tubercles posterior to the marginal clypeal tubercles separates the species from *tartarina* Mickel, *admiranda* Mickel, and *oblectanea* Mickel.

The types of *ucayalia* have been compared with the three species with which confusion is most likely: *pompalis, armata,* and *admiranda;* the student may seek this species under any of these three in Mickel's key; for that reason a short key, separating the four forms, is given below:

1. Anterior margin of clypeus strongly bituberculate medially (almost bidentate), without a pair of subapical, median tubercles immediately behind marginal ones; second tergite silvery maculate medially; alitrunk with a pair of longitudinal, prominent maculae of pale hairs .... *H. armata* Klug
   Anterior clypeal margin weakly bituberculate medially 2
2. With a pair of weak, median, submarginal tubercles on the clypeus, just posterior to the marginal, anterior tubercles; alitrunk with few, scattered, pale hairs dorsally .... *H. admiranda* Mickel
   With a transverse, slight, impunctate and shining elevation just posterior to marginal, median tubercles of clypeus, but the face of clypeus not at all produced as a pair of tubercles 3
3. Alitrunk with a pair of lateral, elongate maculae of silvery hairs; antennal tubercles with teeth very strong and prominent; maculae of second tergite silvery; clypeus posteriorly strongly defined by an elevated margin, punctate area anterior to this conspicuously concave .... *H. pompalis* Mickel
   Alitrunk as in *admiranda,* with scattered silvery and golden hairs; tubercles with teeth moderately strong, as in *admiranda;* maculae of second tergite pale golden; clypeus scarcely defined by a raised margin posteriorly, punctate area flat, not strongly concave .... *H. ucayalia,* new species

Hoplocrates moneta (Gerstaecker)

A single female from Felippe, Ovalle, Q., Colombia, is before me.

Hoplocrates pompalis Mickel

A single female from Los Canales, Naiguata, D. F., Venezuela, September 24, 1938 (G. Vivas Berthier) is before me.

Holocrates admiranda Mickel

Three females are before me. This species was known only from two females, from Ecuador.

PERU: Rio Santiago, September 15, 1923, one ♀; Rio Ucayali, September 27, 1923, one ♀. Species new to Peru.

ECUADOR: Sucua, Rio Upano, February 2, 1939, one ♀.

PRELIMINARY ANNOTATED LIST OF THE WASPS OF LOST RIVER STATE PARK, WEST VIRGINIA, WITH DESCRIPTIONS OF NEW SPECIES AND BIOLOGICAL NOTES

(HYMENOPTERA, ACULEATA)

BY KARL V. KROMBEIN, *Arlington, Va.*

The following preliminary list of the wasps of Lost River State Park, West Virginia enumerates the species captured during a week's stay in the park with my family (June 18-25, 1951), and an excursion of one day (July 18, 1951) with E. A. Chapin and O. L. Cartwright.

The park is located in the Shenandoah Mountains of eastern West Virginia, and comprises nearly 4000 acres at elevations ranging from 1750 to 3250 feet. Almost the entire area is covered with dense to open woods except for some open spots along steep hillsides.

The wasp fauna, like the flora, shows a mingling of northern and southern elements. While many of the wasps (42 species) are common to both the Transition and Upper Austral Zones, there are 15 which are chiefly Transition (or Transition and Canadian) in distribution and 12 which are predominantly Austral. The presence of a typically Canadian element, *Vespula norwegica norvegicoides* (Sladen), is noteworthy. The several remaining species are known from so few localities that it is not possible to deduce their faunal affinities. A total of 78 species is recorded herein.

I am indebted to the following specialists for identifications of prey of several wasps discussed herein: B. J. Kaston (Araneae), Miss Louise M. Russell (Homoptera) and C. W. Sabrosky (Diptera).

Family TIPHIIDAE

Tiphia egregia Viereck. 1 ♀; July 12.

Tiphia micropunctata Allen. 2 ♂♂; June 21.

Myrmosa (Myrmosa) unicolor Say. 3 ♂♂; June 23 and July 12.

Family MUTILLIDAE

Pseudomethoca frigida (Smith). 2 ♀♀; June 21 and 28.

Family SAPYGIDAE

Sapyga centrata Say. 1 ♀; June 19; taken resting on trunk of loblolly pine in open woods. The putative host in this area is the megachilid bee, *Hoplitis* (*Alcidamea*) *t. truncata* (Cresson), which was nesting in the trunk of this pine tree.

Family VESPIDAE

Vespula (Vespula) maculifrons (Buysson). 3 ♀♀, 2 ☿☿; June 21, 22, 24 and July 12.

Vespula[1] **(Vespula) rufa consobrina** (Saussure). 1 ♀, June 19; 13 ☿☿, July 12.

Vespula (Vespula) rufa vidua (Saussure). 2 ♀♀; June 18.

Vespula (Vespula) vulgaris (Linnaeus). 3 ♀♀; June 18 and 23.

Vespula (Dolichovespula) arenaria arenaria (Fabricius). 1 ♀, June 19; 1 ☿, June 21.

Vespula (Dolichovespula) maculata (Linnaeus). 1 ☿; June 23.

Vespula (Dolichovespula) norwegica norvegicoides (Sladen). 1 ♀; June 21.

Polistes fuscatus pallipes Lepeletier. 2 ♀♀; June 20 and 22.

Rygchium foraminatum foraminatum (Saussure). 3 ♀♀, 2 ♂♂, June 20 and 23.

Rygchium leucomelas (Saussure). 1 ♂; June 21.

Ancistrocerus antilope antilope (Panzer). 7 ♀♀; June 20-24.

Ancistrocerus campestris (Saussure). 19 ♀♀, 1 ♂; June 18-22; nesting in burrows in logs of cabin walls.

Ancistrocerus tigris tigris (Saussure). 2 ♀♀, 4 ♂♂; June 19-24.

Symmorphus canadensis (Saussure). 25 ♀♀, 12 ♂♂; June 19-24 and July 12; nesting in burrows in logs of cabin walls.

Stenodynerus (Parancistrocerus) fulvipes fulvipes (Saussure). 1 ♀, 2 ♂♂; June 21 and 24.

Stenodynerus (Parancistrocerus) pedestris pedestris (Saussure). 3 ♀♀; June 20, 21 and July 12.

Stenodynerus (Parancistrocerus) perennis perennis (Saussure). 1 ♀, June 20.

Family **POMPILIDAE**

Chirodamus albopilosus (Cresson). 1 ♀; June 23; in woods.

Dipogon (Deuteragenia) pulchripennis (Cresson) [det. H. K. Townes]. 1 ♂; June 22; on trunk of pine tree in woods.

Dipogon (Deuteragenia) sayi sayi Banks. 3 ♀♀; June 21-24 and July 12; several captured on trunks of pine trees in woods.

Priocnemis (Priocnemis) minorata Banks. 1 ♀; June 23; in woods.

Priocnemis (Myrmecosalius) germana (Cresson). 1 ♀, 11 ♂♂; June 19 and July 12; in woods.

Priocnemis (Myrmecosalius) scitula relicta Banks. 1 ♀, 5 ♂♂; July 12; in open woods.

Calicurgus hyalinatus alienatus (Smith). 5 ♀♀, 2 ♂♂; June 19-24 and July 12; in open woods.

Phanagenia bombycina (Cresson). 1 ♀; June 19; in woods.

Auplopus nigrellus (Banks) [det. H. K. Townes]. 2 ♀♀, 1 ♂; June 21 and 23; in open woods.

Auplopus mellipes (Say). 4 ♀♀, 1 ♂; June 19, 23, 24 and July 12. Some observations were made on the nesting activities of one female

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[1] Social wasps of this genus were extremely common and no attempt was made to capture all specimens seen.

(62351 A) on June 23rd. This specimen was first noticed while she gathered a pellet of damp clay in a sunny, open area along the edge of a trail about mid-afternoon. She flew down the trail about 25 feet with the bit of clay, and disappeared beneath a slight overhang of the bank along the edge of the trail. In a few seconds she returned to gather another pellet of clay. It took her only a few seconds to obtain this, and again she flew at once to the site of her building activities. This time she was captured when she emerged from beneath the overhang. Two cylindrical, clay cells, side by side and about half an inch long and a quarter of an inch in diameter, were found on the under surface of an exposed, decaying tree root. One cell was complete and capped at each end; the other was almost complete and lacked only the final cap. The completed cell was still damp, and had been stocked very recently, for the wasp egg had not hatched. The spider prey, a female gnaphosid, *Herpyllus vasifer* (Walckenaer), bore the wasp egg firmly attached on the right side of the abdomen at the anterior third. The wasp had amputated all the spider's legs at the trochanters except the first two on the left side. The spider was thoroughly paralyzed and exhibited only weak, quivering movements of the mouthparts and remaining legs. The wasp egg did not hatch, having been injured during transportation back to the cabin.

Ceropales fraterna fraterna Smith. 1♂; June 24.

Allaporus rufiventris (Cresson). 1 ♀; June 20; on gravelly slope in sun along edge of trail.

Psorthaspis mariae (Cresson). 2 ♀♀; July 12; along edge of trail in open woods; a sight record.

Episyron biguttatus biguttatus (Fabricius). 2 ♀♀; June 21 and 22.

Anoplius (Arachnophroctonus) semirufus (Cresson). 1 ♀; June 20.

Anoplius (Pompilinus) insolens (Banks). 2 ♂♂; June 21.

Anoplius (Pompilinus) marginatus (Say). 4 ♀♀; June 20-23.

Anoplius (Pompilinus) rectangularis rectangularis (Dreisbach). 2 ♂♂; June 20; in woods.

Anoplius (Anoplius) virginiensis (Cresson). 9 ♀♀, 7♂♂; June 18-24 and July 12; in open woods.

Pompilus (Arachnospila) arctus Cresson. 1 ♀; June 19; in woods.

Pompilus (Anoplochares) apicatus Provancher. 4♀♀, 9♂♂; June 19-24 and July 12; in woods.

Aporinellus fasciatus (Smith). 1 ♀; June 24.

Family **SPHECIDAE**

Trypoxylon (Trypoxylon) frigidum Smith. 10♀♀, 6 ♂♂; June 19-24 and July 12; in woods and nesting in burrows in logs of cabin walls.

Trypoxylon (Trypoxylon) pennsylvanicum Saussure. 1 ♀; June 21.

Trypoxylon (Trypoxylon) richardsi Sandhouse. 1 ♀; June 23; in open woods.

Trypoxylon (Trypargilum) politum Say. No specimens seen, but typical, abandoned "pipe-organ" nests seen on cabin wall.

Trypoxylon (Trypargilum) striatum Provancher. 1 ♀; July 12; gathering damp clay along trail; a sight record.

Diodontus (Diodontus) trisulcus (Fox). 3 ♀♀; June 19 and 22 and July 12; the June females taken hovering before burrow openings in logs of cabin walls.

Psen (Psen) monticola (Packard). 1 ♀; July 12.

Mimesa (Mimumesa) nigra (Packard). 3 ♀♀, 4 ♂♂; June 19-21 and July 12; several females taken hovering before burrow entrances in logs of cabin walls.

Pemphredon (Pemphredon) virginiana Rohwer. 2 ♀♀; June 20; both taken hovering before burrow entrances in bark of loblolly pine; one of them (62051 A) was carrying a paralyzed adult aphid, *Cinara* species, at 6 p.m.

Stigmus (Stigmus) americanus Packard. 27 ♀♀, 22 ♂♂; June 18-24 and July 12; nesting in the logs of the cabin walls; one female (62151 A) was captured carrying a nymphal aphid, probably *Myzocallis* species.

Stigmus (Stigmus) fraternus Say. 2 ♀♀, 2 ♂♂; June 20 and 24 and July 12.

Passaloecus annulatus (Say). 2 ♀♀; June 19; nesting in logs in cabin walls.

Passaloecus mandibularis (Cresson). 8 ♀♀, 1 ♂; June 19-24; taken in woods and nesting in logs in cabin walls.

Passaloecus relativus Fox. 6 ♀♀, 7 ♂♂; June 18-24; nesting in logs in cabin walls.

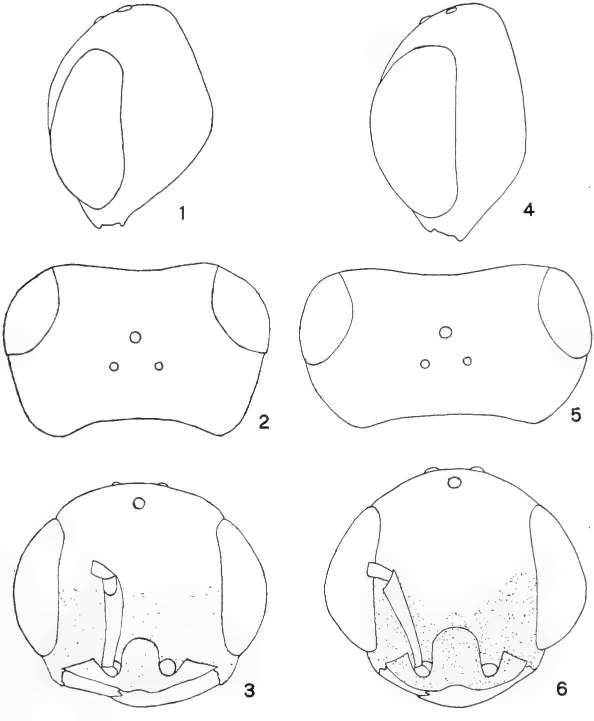
Spilomena ampliceps, new species

Figs. 1-3

The present species is separated from the previously described Nearctic species by the well-developed temples and vertex. In the female of *ampliceps* the greatest width of the temple is 1.3 the greatest eye width viewed from laterally, and the greatest length of the vertex is subequal to the greatest eye length viewed from above. In the male of *ampliceps* the greatest width of temple is subequal to the greatest eye width, and the greatest vertexal length is 0.9 the greatest eye length. In *Spilomena pusilla* (Say) (figs. 4-6) the proportions of the head and extent of the yellow maculations on front of male are different from those of *ampliceps*. The affinities of *ampliceps* with other species will be discussed in a forthcoming revision of the genus.

Type.—Male, Lost River State Park, Hardy County, West Virginia, June 19, 1951: hovering before burrow entrance in log of cabin wall (K. V. Krombein). Placed on loan deposit in U. S. National Museum.

Male.—Length 2.3 mm., forewing 1.6 mm. Black, without metallic re-



Figs. 1-3, *Spilomena ampliceps,* new species (paratypes from Lost River State Park, W. Va.); figs. 4-6, *Spilomena pusilla* (Say) (pair from Lost River State Park, W. Va.). Figs. 1 and 4, lateral view of head of female; figs. 2 and 5, dorsal view of head of female; figs. 3 and 6, frontal view of head of male (extent of yellow facial markings indicated by shaded areas). X71.

flections, the following lemon yellow—mandible except apex, clypeus, malar space, postmandibular triangle, lower half of front more or less (this spot narrowed in middle) and antennal scape; the following testaceous—apex of mandible, antennal pedicel and flagellum except last segment, tegula, fore and mid legs entirely, and hind trochanter, tibia and tarsus. Pubescence very sparse in general, appressed and pale, the head with a few scattered setulae on upper front and vertex, thorax bare except mesonotum and mesosternum somewhat more densely setose than head, abdominal tergites almost bare except for a few, very scattered setulae at apices of posterior segments, second to sixth sternites with well-defined hair bands, those of second to fourth covering approximately the apical third of exposed areas of segments, and those of last two covering all the exposed areas. Wings clear hyaline with some iridescent reflections, the stigma black and veins brown.

Head shining, delicately and minutely lineolate; in frontal view (fig. 3) subcircular, the height slightly less than the greatest width (7:8); viewed from above the head behind the eyes is almost (0.9) as long as the greatest eye length above; viewed from the side, the temple is angulate behind with the angle opposite the middle of eye, and the greatest width of temple subequal to greatest eye width; length of antennal scape 0.6 the clypeal width at anterior mandibular condyles; postocellar distance subequal to ocelloccipital distance and 0.6 the ocellocular distance; front with a central carina, strong below and gradually becoming weaker until it disappears halfway to anterior ocellus.

Thorax shining; pronotum dorsally with a complete transverse carina, viewed from laterally not produced upward into a conspicuous tooth; mesonotum and scutellum more strongly lineolate than front, no punctures discernible at 85 diameters, the notauli evanescent; mesopleuron not lineolate or punctate, the episternal suture minutely foveolate; metapleuron smooth; sides of propodeum with a few oblique rugulae posteriorly and a carina separating lateral from posterior surface; posterior surface in addition with a median carina and a transverse carina above separating it from the dorsal surface, the posterior surface otherwise with a few oblique rugulae on each side of median line.

Second submarginal cell rectangular, 0.6 as high as wide; first transverse cubital and recurrent veins interstitial. Legs normal for genus.

Abdomen without noteworthy modifications except as detailed under the description of the vestiture.

Allotype.—Female, same data as type in every particular. Also placed on loan deposit in U. S. National Museum.

Female.—Length 2.7 mm., forewing 1.9 mm. Black, without metallic reflections, the mandibles ferruginous, the following testaceous—scape, pedicel, flagellum beneath, tegula, all trochanters, fore femur narrowly at base and apex, fore and mid tibiae, and all tarsi. Pubescence similar to that of male though correspondingly slightly denser, the sternites without dense hair bands, only scattered setulae on apical margins. Wings as in male.

Head shining, correspondingly more strongly lineolate than in male; in frontal view subcircular, the height subequal to greatest width; viewed from above (fig. 2) the head behind eyes is about as long as the greatest eye length above; viewed from the side (fig. 1) the temple is well-developed, angulate behind opposite the middle of eye, and with its greatest width 1.3 the greatest eye width; length of antennal scape 0.6 the clypeal width at anterior mandibular condyles; postocellar distance subequal to ocelloccipital distance and 0.6 the ocellocular distance; clypeus with a narrow, flat, trigonal platform in middle, the apical margin of which is shallowly emarginate; lower fourth of front with a sharp median carina which extends slightly onto base of clypeus and which becomes gradually evanescent above.

Thorax as in male, but scattered mesonotal punctures discernible at 60 diameters. Venation as in male. Legs and abdomen without modifications.

Paratypes.—One ♀, 1 ♂, same data as type in all particulars, but June 20 (♀) and June 22 (♂) [K. V. Krombein collection]. The paratypes do not vary significantly from the above descriptions of type and allotype. The male is 2.5 mm. long and the female is 2.4 mm.

Spilomena pusilla (Say) (Figs. 4-6.) 10 ♀♀, 5 ♂♂; June 18-23; hovering before burrow entrances in logs in cabin walls; none taken with prey.

Sphex arvensis (Dahlbom). 2 ♂♂; June 20; along trail in open areas.

Chalybion californicum (Saussure). 1 ♀; June 18-24; a sight record at swimming pool.

Nysson (Nysson) subtilis Fox. 9 ♀♀, 2 ♂♂; June 20-24 and July 12; along trail in open areas.

Gorytes (Gorytes) simillimus Smith. 2 ♂♂; July 12.

Cerceris clypeata Dahlbom. 1 ♂; July 12.

Crabro (Crabro) juniatae Krombein. 5 ♀♀; June 20-24; along trail at edges of wooded areas; one female (62051 B) captured carrying a paralyzed female anthomyid, *Hylemya cilicrura* (Rondani), the seed corn maggot.

The present series demonstrates a certain amount of variation in the yellow markings: the clypeus may have a pair of yellow spots; the pronotal dorsum usually has a yellow band broadly interrupted in middle, and the pronotal tubercles are usually yellow; scutellum may have a narrow, anterior band; in one specimen the small spots on first tergite are almost entirely absent.

Crossocerus (Crossocerus) lentus (Fox). 1 ♂; June 22.

Crossocerus (Crossocerus) minimus (Packard). 1 ♀; June 21.

Crossocerus (Crossocerus) planifemur, new species

This is distinguished from the other known Nearctic species of the typical subgenus by the following combination of characters: in both sexes by the absence of a tubercle on mesopleuron before mid coxa and of a supra-orbital fovea, and presence of a weak, oblique tooth laterally on pronotum; in the female by the lack of a pecten on fore tarsus and predominantly pale trochanters, tibiae and tarsi; and in the male by the yellow beneath on head and thorax, the fore femur flattened beneath but not hirsute, and the mesosternum with appressed silvery pubescence only.

C. planifemur, like the Palaearctic *C. elongatulus* (van der Linden)[2], appears to be one of the few species, in an otherwise soil-dwelling subgenus, which nests in tunnels in wood.

Type.—Female, Lost River State Park, Hardy County, West Virginia, June 23, 1951; hovering before burrow entrance in log in cabin wall 10 feet above ground surface (K. V. Krombein). Placed on loan deposit in U. S. National Museum.

Female.—Length 5.3 mm., forewing 4.0 mm. Black, the apex of mandible, apex of clypeus, tegula, apices of second to fifth sternites and sixth sternite entirely, pale reddish; the following eburneous—mandible except tip, antennal scape and pedicel beneath, pronotal tubercle, trochanters beneath, fore femur beneath except at base, fore tibia except a narrow line beneath, mid and hind tibiae externally, and all tarsi, the terminal segments somewhat reddened. Wings hyaline with very weak iridescent reflections; stigma black, veins brown.

Head shining, the clypeus and temples with moderately dense, appressed, short silvery pubescence, the front and vertex with shorter, erect hair; clypeal lobe with apical margin broadly rounded, the surface of clypeus gently convex from side to side, the median length about 0.26 the distance between anterior mandibular condyles; upper part of front with close fine punctures and a strong furrow running forward from fore ocellus; supra-orbital foveae evanescent; vertex with scattered fine punctures; postocellar distance 0.62 the ocellocular distance; antennal scape slender, ecarinate, twice as long as median length of clypeus, flagellum reaching about to occiput, the ratio of scape, pedicel, first two and last two flagellar segments about 3.6:1.0:1.0:0.9:0.7:1.3.

Thorax with dorsum subopaque, the sides, venter and propodeum shining, the dorsum with fine, short, suberect pale hair, the mesopleuron and mesosternum with longer, appressed silvery hair, the rest of thorax and propodeum lacking pubescence; pronotum not crested, laterally with a weak oblique tooth; mesonotum with very fine, close lineolation and moderately dense, fine punctures; sutures between mesonotum, scutellum and postscutellum deeply impressed but not foveolate; scutellum and postscutellum gently convex, punctate as on mesonotum; mesopleuron more closely punctate anteriorly than posteriorly, not tuberculate before

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[2] Hamm, A. H. and O. W. Richards, 1926, The Biology of the British Crabronidae. Trans. Ent. Soc. London, p. 315.

mid coxa, the episternal suture weakly foveolate, the posterior margin very delicately and minutely foveolate; metapleuron glabrous, the posterior margin about as strongly foveolate as episternal suture; propodeum shining, the lateral surface separated by a well-developed carina from dorsal and posterior surfaces, the dorsal surface with a well-defined, more or less trapezoidal smooth enclosure margined anteriorly and on sides by foveolate furrows, and bisected by a narrow foveate channel which terminates in the narrow discal impression of posterior surface.

Fore tarsus not flattened or pectinate; longer spur of hind tibia straight, about two-thirds as long as hind basitarsus.

Abdomen dorsally subopaque from very delicate lineolation, the venter shining, the tergites with fine scattered punctures bearing sparse, appressed silvery setae; pygidium flat, almost an equilateral triangle in outline, and with a few, scattered coarse punctures bearing short, fine, suberect bristles; second to fifth sternites with one to several rows of preapical punctures.

Allotype.—Male, same data as type in every particular, but June 24, 1951. Also placed on loan deposit in U. S. National Museum.

Male.—Length 5.3 mm., forewing 3.8 mm. Black, tip of mandible, antennal scape and flagellum beneath and tegula reddish; the following lemon yellow: mandible except tip, clypeus, head beneath entirely, lower fourth of temple, transverse band on dorsum of pronotum except laterally, pronotal lobe, lower half of side of pronotum, lower two-thirds of mesopleuron before episternal suture and lower third behind it except a small dark spot before mid coxa, anterior half of scutellum, entire thoracic sternum, fore and mid legs entirely except short narrow lines below on mid femur and fore and mid tibiae, hind coxa and trochanter entirely, hind femur beneath except at apex, hind tibia except for short narrow lines on outer surface and beneath, and hind tarsi.

Sculpture similar to that of female, but the punctures slightly sparser, and integument, particularly the mesonotum, shinier; the following differences may be noted: propodeal area at base with a longer area foveolate, pronotal tooth weaker, median length of clypeus 0.29 the distance between anterior mandibular condyles, and ratio of scape, pedicel, and first two and last two flagellar segments as 4.7:1.0:1.0:1.0:0.9:1.6.

The following secondary sexual characters are of importance: flagellum beneath with a fringe of hair, mesosternum flat and with dense, very short, fine, appressed silvery pubescence; fore femur broad, flat beneath but without hair, the length about 2.5 the greatest width, the legs otherwise not modified; sternites unmodified except the fourth to seventh with apical margins shallowly and rather narrowly emarginate in middle; last tergite without delimited pygidial area, and with a few scattered punctures which are coarser than on preceding tergite.

Paratypes.—One ♀, Ithaca, Tompkins County, New York, July 21, 1938 (J. G. Franclemont) [K. V. Krombein collection]. 1 ♀, Washington, District of Columbia; July 23, 1947 (D. G. Shappirio) [D. G. Shappirio collection]. The paratypes agree with the above description of the type in all essential details; they are respectively 6.0 and 5.7 mm. long.

Crossocerus (Crossocerus) similis (Fox). 1 ♀, 2 ♂♂; June 18 and 22 and July 12.

Crossocerus (Blepharipus) ambiguus (Dahlbom). 1 ♀; June 21; in open woods hovering before pile of fireplace wood.

Crossocerus (Blepharipus) harringtonii (Fox). 9 ♀♀, 1 ♂; June 21-23; in open woods. The male of this species has not been recognized previously. In Pate's key[3] to the species of this subgenus the male of *C. harringtonii* runs to couplet 9 and differs from the species keying out there and in the succeeding couplet in the following combination of characters: fore trochanter flattened beneath but without long, dense erect hair; fore femur flattened beneath and without long dense hair, the hind margin extended downward as a flange on apical half so that apical part of femur appears concave beneath; fore tibia flattened, but not explanate nor with long hair beneath; antennal flagellum not fringed nor tuberculate beneath; propodeal enclosure not defined; supra-orbital fovea minute, shallow and punctiform. In other respects it is quite similar to female *C. harringtonii,* differing only in having outer surface of fore tibia and a narrow line on hind basitarsus creamy, and in the comparatively sparser and weaker punctation. The single male taken at Lost River is 5.6 mm. long, forewing 4.1 mm.

Crossocerus (Blepharipus) impressifrons (Smith). 1 ♀; June 21; in open woods.

Crossocerus (Blepharipus) tarsalis (Fox). 4 ♀♀, 1 ♂; June 20-23; in open woods.

Crossocerus (Blepharipus) wickhamii (Ashmead). 1 ♂; June 22; in open woods.

Ectemnius (Clytochrysus) nigrifrons (Cresson). 1 ♀; June 21.

Ectemnius (Hypocrabro) continuus (Fabricius). 2 ♂♂; June 18 and 21.

Lestica (Solenius) producticollis (Packard). 2 ♀♀, 3 ♂♂; June 19-24.

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[3] Pate, V. S. L., 1944 (1943), The Subgenera of *Crossocerus,* with a Review of the Nearctic Species of the Subgenus *Blepharipus.* Lloydia 6: 295-297.

AN UNUSUAL AULACINE FROM NEW MEXICO

(HYMENOPTERA—GASTERUPTIIDAE)

BY LUELLA M. WALKLEY, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

Among parasitic wasps taken from caged trees infested with *Dendroctonus* sp. in Lincoln National Forest, Cloudcroft, New Mexico, and submitted for identification by C. J. Hay under Hopkins U. S. no. 34208, were three specimens that constitute a new species of *Aulacus* Jurine.

Aulacus aneurus, new species

Figs. 1, 2

Lack of the second recurrent vein in the forewing (fig. 1) quickly distinguishes this species from all other known species in the genus.

Female holotype.—Black. Length of body about 4.5 mm.; forewing about 3.5 mm. long; ovipositor sheath not more than 4 mm. long; frons minutely granular, vertex finely wrinkled to occipital foramen, occipital carina wanting; antennae 13-segmented; proepisternum anterodorsally

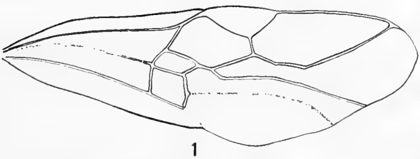
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Fig. 1, forewing of *Aulacus aneurus;* fig. 2, scutellum.

much shorter than in any other known North American species of *Aulacus;* mesoscutum with transverse rugae, entirely impunctate, notaulices sharp and distinct to base of mesoscutum, two short, anteromedian, longitudinal impressions converging caudad with the space between them more finely rugose; scutellum with basal depressions about 4 times as wide as long and polished within, transversely rugose with the rugae more or less humped medially as they follow the contour of the scutellum (fig. 2); basal depression of propodeum longitudinally rugose and the rest of propodeum generally transversely or obliquely rugose; distance from postscutellum to insertion of abdomen greater than distance from insertion of abdomen to insertion of hind coxa, a ratio of about 4:3 (insertion of abdomen not so high on propodeum in this species as in other American species of the genus), propodeal spiracles elevated, nodule-like with the spiracular slit in the posterior face and with a strong ruga running from anterior face across the basal depression of propodeum; hind coxa without a groove or ventral lobe.

Male.—Similar to female, but a little larger.

Type locality.—Lincoln National Forest, Cloudcroft, New Mexico.

Holotype.—U. S. N. M. no. 61308. Described from the female holotype and two male paratypes.

Probable host.—*Dendroctonus* sp.

It may be that more material will show the existence of a natural group characterized by the lack of the second recurrent vein and the lower insertion of the abdomen on the propodeum. If so it may be treated as a new genus or as a new subgenus of *Aulacus*. At present *Aulacus aneurus* seems to be unique in these respects. In the U. S. National Museum collection there are, in addition to the identified material, five undetermined specimens representing four different species from South America and Australia which, by these two characters, belong to *Aulacus* in the strict sense.

A NEW SPECIES OF TRICHODES FROM SOUTHERN OREGON

(COLEOPTERA, CLERIDAE)[1]

By WILLIAM F. BARR, *University of Idaho, Moscow*

Recently the writer received two large series of specimens of a *Trichodes* species for identification. Examination of these has shown that the species is undescribed. In view of its close resemblance to another species of *Trichodes* and of the abundance of material available for study, it is believed that this undescribed species should be made known at this time. The writer is indebted to J. R. Helfer, P. D. Hurd, A. T. McClay and F. H. Parker for the loan of material used in this study.

Trichodes oregonensis, new species

Male.—Moderately robust, body and legs densely clothed with short and long, erect, pale hairs, shining, steel-blue; clypeus dark brown; labrum aeneous, front margin dark testaceous; maxillae and labrum black, with their appendages becoming testaceous toward apices; antennae piceous, dull, underside of first few segments testaceous; gula aeneous; each elytron with a small, obliquely transverse, median, yellowish spot near lateral margin; legs with a faint purplish cast, tarsi aeneous; undersurface with a greenish cast. *Head* finely, sparsely punctured; front feebly bi-impressed above clypeus; labrum with front margin evenly, more or less arcuately rounded; antenna with club elongate-triangular, twice as long as broad. *Prothorax* subquadrate; disk convex,

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[1] Published with the approval of the Director of the Idaho Agricultural Experiment Station as research paper 352.

sparsely punctured and roughened, with a transverse impression in front of middle and a strongly indicated, nearly smooth, transverse impression immediately in front of hind margin; sides densely punctured and roughened, very feebly constricted behind front margin, moderately constricted in front of hind margin; hind margin ridged. *Scutellum* transverse; disk flattened, medially impressed near hind margin, very finely punctured; sides and hind angles rounded; hind margin subtruncate. *Elytra* slightly less than two and one fourth times longer than width behind humeri, finely, densely roughened and indistinctly punctured; subbasal tumescences distinct; humeri distinct, umbones nearly smooth; sides broadest at apical third; apices separately, more or less narowly rounded. *Legs* finely, densely, irregularly roughened and punctured; coxae finely scabrous; tibiae not carinate, apical spines subequal. *Mesothorax* finely sparsely punctured, distinctly rugose medially. *Abdomen* finely, very sparsely punctured; fifth sternite with hind margin broadly, very deeply, arcuately emarginate; sixth sternite nearly smooth, strongly convex, broader at base than long, lateral margins straight, oblique, hind margin feebly arcuate; sixth tergite narrower, but slightly longer than sixth sternite, disk very finely and densely punctured, with a longitudinal row of long, erect hairs on either side of midline, and a deep, median depression in front of hind margin, lateral margins feebly arcuate, hind margins rather narrow, deflexed, more or less semicircular rounded. Length: 8.1 mm.

Female.—Differs from the male in having the hind margin of fifth abdominal sternite truncate; sixth abdominal sternite short, much broader than long, hind margin nearly semicircularly rounded, and shallowly, triangularly notched at middle; sixth abdominal tergite with a broad, deep, median depression extending from front to hind margin, margins of depression densely clothed with long and short, erect and suberect, pale hairs, lateral margins strongly arcuate, hind margin broadly, very shallowly, triangularly emarginate. Length; 8.6 mm.

Types.—Holotype male, allotype female (California Academy of Sciences, Entomology) and 155 paratypes from Lake of the Woods, Klamath County, Oregon, June 6, 1951, (J. R. Helfer); 122 paratypes from Union Creek, Jackson County, Oregon, July 5 and 6, 1941 (A. T. McClay), July 12, 1950 (C. Fitch), July 15, 1939 (A. T. McClay), July 19, 1949 (A. T. McClay); and one paratype from Oregon Caves, Josephine County, Oregon, September 1, 1948 (B. Adelson). Paratypes in the collections of the California Academy of Sciences, University of California, Chicago Natural History Museum, American Museum of Natural History, University of Idaho, U. S. National Museum, J. R. Helfer, A. T. McClay, J. B. Corporaal, F. H. Parker, and the writer.

T. oregonensis is closely related to *T. ornatus* Say with which it occurs in a sympatric manner. The two species, however, can be readily distinguished. *T. oregonensis* has the front margin of the labrum evenly rounded, the sides of the prothorax are moderately constricted in front of the hind margin, and the body is of a more or less uniform steel-blue color with the elytra bearing two small, yellowish, median spots. *T. ornatus*, on the other hand, has the front margin of the labrum notched at the middle, the sides of the prothorax are strongly constricted in front of the hind margin, and the elytra usually are of a different ground color from the remainder of the body. The elytra are variably maculated with yellow to red markings which often are very greatly enlarged. Furthermore, the tarsi and outer antennal segments of *T. oregonensis* are dark, whereas these structures tend to be testaceous in *T. ornatus*. In the males of these two species, characters of specific value are likewise present. *T. oregonensis* has the hind margin of the sixth abdominal sternite broadly arcuate, and the apices of the lateral lobes of the genitalia are very slender, prolonged, and directed downward. *T. ornatus* has the hind margin of the sixth abdominal sternite truncate or feebly emarginate, and the apices of the lateral lobes of the genitalia are thick and not prolonged, but are directed downward. In distribution, *T. oregonensis* occupies a very restricted range in southern Oregon, while *T. orantus* occurs throughout the western United States and southwestern Canada.

T. oregonensis could be confused with the uncommon *T. bimaculatus* Horn because of similarity in color and markings. The markings, however, of *T. bimaculatus* consist of two, large, round, reddish spots which extend to the lateral margins of the elytra. The elytral spots of *T. oregonensis* are small and do not attain the lateral margins. *T. bimaculatus* is, moreover, a much more slender and elongate species than is *T. oregonensis.* The elytra in the former are approximately two and three-fourths times longer than their width behind the humeri; in the latter they are about two and one-fourth times longer than their width behind the humeri. The ranges of these species may also overlap, for *T. bimaculatus* has been recorded from southern Oregon. These records, however, may refer to specimens of *T. oregonensis*. *T. bimaculatus* is definitely known from northwestern California (Humbolt and Mendocino counties). Records of its occurrence in southern California are incorrect and must have been based on mislabeled material.

In the large series of specimens of *T. oregonensis* studied, remarkably little structural or color variation has been noted.

Without question, *T. oregonensis* is what Horn (1891, Ent. News 2:6-8) considered to be an extreme color variation of *T. ornatus*.

NOTES ON THREE GYNANDROMORPHS OF AEDES AEGYPTI (L.)

(Diptera, Culicidae)

By Louis M. Roth and Edwin R. Willis, *Pioneering Research Laboratories, U. S. Army Quartermaster Corps, Philadelphia, Pa.*

The occurrence of mosquito gynandromorphs is extremely rare (Komp and Bates, 1948; Roth, 1948a). It is even more unusual to obtain these aberrant individuals alive, so that observations on their behavior are seldom reported. While carrying on some work on the behavior of the yellow-fever mosquito, *Aedes aegypti* (L.), the writers found three gyandromorphs in the laboratory colony. The specimens were isolated and observations on their behavior were made prior to their being killed. After they were killed, the specimens were heated in 20% KOH solution, washed, and then mounted in chloral gum medium on microsope slides. These have been deposited in the United States National Museum.

Descriptions of the Gynandromorphs

Specimen 1.—Both antennae, normal male (fig. 1). Left palpus, male; right palpus, female-like but longer than the normal female palpus and with the last two segments deformed (fig. 5); some basiconic sensillae characteristic of the female palpus are present. Tarsal claws of the right fore- and midlegs (fig. 4), female; tarsal claws of the left foreleg female-like except that one claw lacks a tooth while the other has only a slight indication of a tooth (tends towards maleness); last tarsal segment and tarsal claws of the left midleg, male (fig. 2). Wings female-like with the left wing slightly shorter and narrower (tends toward maleness) than the right. Abdomen and external genitalia (fig. 3), normal female.

Specimen 2.—Both antennae, normal male (fig. 6). Left palpus, male; right palpus, more male-like than female—the segments are shorter than those of a male palpus and the last segment is deformed near its base (fig. 6). The right and left fore- and midlegs have female tarsal claws. The wings, abdomen, and external genitalia (fig. 7) are those of a normal female.

Specimen 3.—Both antennae, normal male (fig. 8). Left palpus, male; right palpus deformed, the segments stout and female-like but their length more nearly that of a male (fig. 9). The right and left forelegs and the right midleg (fig. 12) have female tarsal claws; the tarsal claws of the left midleg are male (fig. 11)—however the last tarsal segment of this leg is female-like in that the ventral margin of the segment is not concave (cf. figs. 2 and 11). The left wing is slightly shorter than the right. The abdomen and external genitalia are those of a normal female (fig. 10).

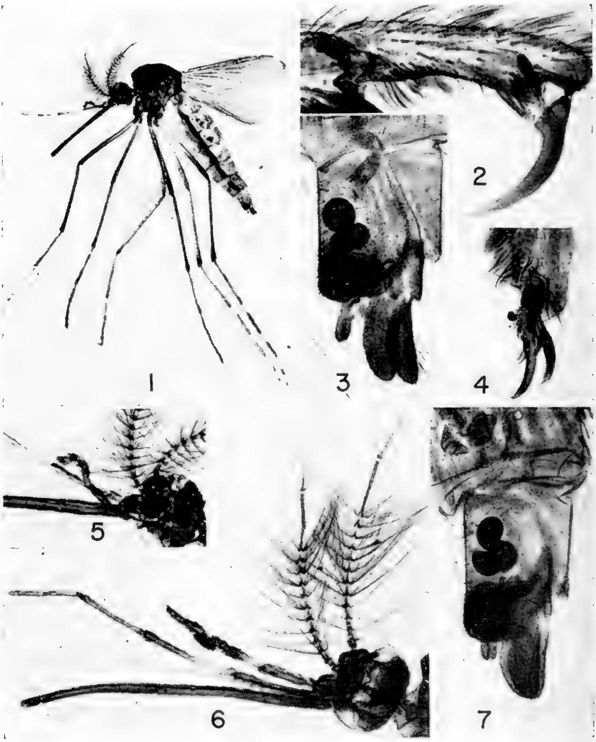

PLATE I. GYNANDROMORPHS OF AEDES AEGYPTI

Specimen number 1: Fig. 1, entire insect (X 7.5); fig. 2, last tarsal segment of left midleg (X 258.5); fig. 3, tip of abdomen (X 72.5); fig. 4, apex of last tarsal segment of right midleg (X 258.5); fig. 5, portion of head (X 25). Specimen number 2: Fig. 6, head (X 25); fig. 7, tip of abdomen (X 72.5). (Photographs by Mr. Alan Wrigley, Microscopy and Photometry Laboratory, Pioneering Research Laboratories, U. S. Army Quartermaster Corps.)

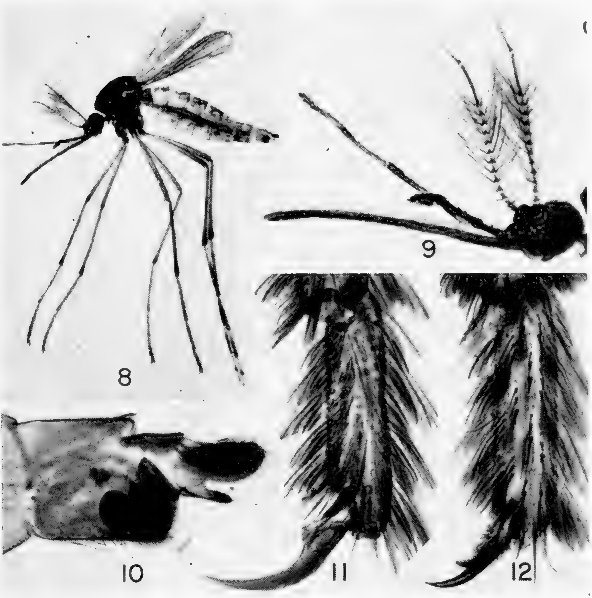

PLATE 2. GYNANDROMORPH OF AEDES AEGYPTI, SPECIMEN NUMBER 3

Fig. 8, entire insect (X 7.5); fig. 9, head (X 25); fig. 10, tip of abdomen (X 72.5); fig. 11, last tarsal segment of left midleg (X 258.5); fig. 12, last tarsal segment of right midleg (X 258.5). (Photographs by Mr. Alan Wrigley, Microscopy and Photometry Laboratory, Pioneering Research Laboratories, U. S. Army Quartermaster Corps.)

Martini (1931) described a gynandromorph of *A. aegypti* in which the head was male and the abdomen female.

Observations on the Behavior of Gynandromorph Mosquitoes

From the known behavior of other insects, Roth (1948a) stated with regard to mosquito gynandromorphs, ''It is likely that sex mosaics in which the head is male and the abdomen female would react like a male and attempt to copulate with normal females though copulations would be unsuccessful because of the lack of male genitalia. Whether or not a male-acting individual would succeed in seizing a partner would also depend upon the character of the last tarsal segments and claws of the first and/or middle legs. . . . If the wings of the gynandromorph are female the sound produced by them in flight would no doubt fall within the spectrum which would attract, and therefore normal males would attempt to copulate with these gynandromorphs. . . . It is difficult to predict the mating behavior of a complete or partial bilateral gynandromorph or of a form in which the structures are deformed or show characteristics of both sexes.''

Certain mechanically produced sound frequencies will induce the males of *A. aegypti* to give a typical mating response which, upon analysis, is comparable to the mating behavior with the female (Roth, 1948b). This response of the male to sound can be broken down into four behavior patterns: (1) Flight—a male which is at rest when exposed to a stimulating sound frequency takes to flight; (2) attraction—after taking to flight the male is attracted to the sound source; (3) seizing response—once attracted the male seizes and clings to the cloth of the cage near the sound source and its wings vibrate rapidly (this behavior is comparable to seizing the female in flight); (4) clasping response—the last pattern of behavior consists of flexing the abdomen ventrad so that the genitalia touch the cloth of the cage (this corresponds to the final stage in copulation in which the male makes connection with the female).

The aberrant individuals were about a week old when they were first noted (specimens 1 and 2 on July 17, and specimen 3 on September 21, 1951) and observations made on their behavior. The gynandromorphs were indifferent to the human arm when it was placed near them. When exposed to about a dozen females the gynandromorphs 1 and 2 made no attempts to mate (specimen 3 was not exposed to females). The flight behavior of both individuals seemed typically male in that they would fly back and forth in the cage after all the female mosquitoes had come to rest.

The gynandromorphs were observed individually in a cage with about a dozen one-week old males. The normal males made repeated attempts to mate with gynandromorph number 2, mistaking it for a female; this indicates that the sound produced by this insect resembled that of a female. A few attempts were made to mate with gynandromorph number 3 and in at least one case a male succeeded in clasping the aberrant individual's genitalia. The males did not attempt to mate with gynandromorph number 1. This specimen had wings of unequal length and width and apparently the sound produced by it in flight failed to attract the males (specimen number 3 also had wings of unequal length).

The gynandromorphs were exposed to the sounds produced by a number of tuning forks (384 cps, 480 cps, 512 cps, etc.). Specimen number 2 was more sensitive than females to sounds and took to flight readily when the sounding tuning fork was held near it (females are more or less unresponsive to these sounds). On a number of trials its flight was definitely altered by the sound (i.e., it would dart toward the source of sound) and a few times it seemed to be attracted and landed near the prongs of the tuning fork. This specimen failed to give the characteristic seizing response when stimulated by the sounding forks. However, it was induced to give distinct clasping responses though these were usually somewhat less intense than those elicited from a normal male. Specimens 1 and 3 when exposed to the sounding forks behaved like typical males. They gave vigorous seizing responses (vibrating both wings) when stimulated; this behavior was strikingly absent from specimen number 2.

It is interesting to note that all of the gynandromorphs could be induced to give a mating response to mechanically produced sounds indicating the brains of these insects to be structurally, for the most part, male; also the more normal mating response was obtained from specimens 1 and 3 which had more male-like characters than specimen 2. Since the gynandromorphs did give positive mating rseponses to sounds it is difficult to understand why the two individuals exposed to females did not attempt to mate. Perhaps the aberrant individuals required a more intense sound stimulus than that produced by the females in flight.

Summary

Three gynandromorphs of *Aedes aegypti* are described in which the abdomens are female and the heads are predominantly male. The specimens failed to feed on the human arm and two of the aberrant individuals were sexually indifferent to flying females. However, the three specimens did respond to the sounds of tuning forks, the more normal response being obtained from the gynandromorphs having more male-like structures.

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THE SCIENTIFIC NAME OF THE TARNISHED PLANT BUG
(HEMIPTERA, MIRIDAE)

BY JAMES A. SLATER AND NORMAN T. DAVIS, *Department of Zoology and Entomology, Iowa State College, Ames*

In 1818 Palisot de Beauvois (Griffin, 1937) described a plant bug from the United States under the name *Coreus ? lineolaris* (the colored figure accompanying the description is labeled *linearis;* Beauvois himself, however, rectified this in the Errata section). This name *lineolaris* was used for the economically important Tarnished Plant Bug by Harris (1841 and 1862), Uhler (1872, 1877a, 1877b, 1878a, and 1878b), LeBaron (1871), and Walsh (1864).

In 1831 Thomas Say described the Tarnished Plant Bug as *Capsus oblineatus.*

Reuter (1876) tentatively synonymized *Capsus oblineatus* Say with the Palearctic Linnaean species *Lygus pratensis.* This synonymy was adopted by Uhler (1886) in his "Check-list" where he recognized *lineolaris* P.B. and *oblineatus* Say as identical and placed both names as synonyms of *Lygus pratensis* (L.). This synonymy was followed by subsequent American workers without question until Knight (1917) in his revision of the Nearctic *Lygus* recognized that the Nearctic species was at least of varietal distinctness from the Palearctic *pratensis.* Unfortunately, in placing the American Tarnished Plant Bug as a variety of *pratensis* Knight chose to use the Say name *oblineatus* and called the species *Lygus pratensis* var. *oblineatus* (Say). In 1941 Knight showed that the genital parameres of the Nearctic and Palearctic species are distinctly different and raised the American form to specific rank, calling it *Lygus oblineatus* (Say).

There is no question that the Palisot de Beauvois name *lineolaris* has priority over *oblineatus* of Say by many years. From the meagre description and the figure it is evident that the Palisot de Beauvois specimens could have been only the Tarnished Plant Bug or the related *Lygus vanduzeei* Knight. The length line showing actual length in the plate is 6 mm. *L. vanduzeei* is a much larger species than this; a sample of 4 males and 3 females measured gives the following: Males, mean 7.20 (6.85-7.72); females, mean 7.46 (7.33-7.72). Although the Tarnished Plant Bug is generally somewhat under 6 mm. in length, an occasional specimen will reach this length. In a series of 3 male and 3 female specimens measured, even the smallest male more closely approached the 6 mm. figure than did the smallest *vanduzeei,* while the means were much closer. Females, mean 5.71 (5.43-6.09); males, mean 5.30 (5.24-5.39).

In measuring total length in most Miridae the method of measurement is most important in arriving at comparable figures, as the membrane of the hemelytron is deflexed downward at a considerable angle, and the head and thorax likewise are curved downward from the plane of the scutellum and coriaceous portions of the hemelytra. The above measurements were taken with the insect in a more or less natural position. If the insects were "straightened out" it would of course only emphasize the close relationship of length in the Tarnished Plant Bug with that given for the Palisot de Beauvois species. If one considers the method of mounting in common use in Europe, where the specimen is glued flat on a supporting card (which has a tendency to straighten out the insect), it will further be realized that a measurement of 6 mm. would very closely approximate the length of the Tarnished Plant Bug if mounted on a supporting card. The coloration of the scutellum, while similar in both species, is much more sharply delimited in many specimens of the Tarnished Plant Bug than it is in any specimens of *vanduzeei* that we have examined, and compares very closely with the Palisot de Beauvois figure.

It is also very unlikely that the specimen seen by Palisot de Beauvois and recorded as from "États-Unis d'Amérique" could have come from within the range of *vanduzeei*. In the two sections of his work which were published in 1818, fifteen North American species are treated. Of these, 10 are definitely recorded as from southeastern seaboard states. This is a region where the Tarnished Plant Bug is everywhere abundant. *Lygus vanduzeei*, on the other hand, is widely distributed in the northeastern states, but is not known to occur south of Virginia. In Virginia and also in Pennsylvania records for *vanduzeei* are for localities situated high in the mountainous western parts of those states. Thus, a combination of factors involving Palisot de Beauvois' description of *lineolaris* and the probable source of his specimens would seem to remove any doubt that Say's *oblineatus* is the same species.

We have been able to confirm Knight's (1941) conclusions that the Nearctic species is distinct from the Palearctic *pratensis*. It is also distinct from the closely related Palearctic *Lygus rutilans* Horvath. Dr. Eduard Wagner of Hamburg, Germany, has kindly examined specimens of our species and agrees that they are distinct from Palearctic forms.

In the males the right paramere is distinctly different in all three species. *L. lineolaris* (fig. 4) has a prominent fold at the base of the hypophysis which is obsoletely developed in both of the Palearctic species. In both *lineolaris* and *pratensis* the hypophysis is sharply angled, whereas in *rutilans* (fig. 5) it projects as an even curving surface. The female structures of the bursa copulatrix also illustrate good differences in the three species. The sclerotized rings of *L. lineolaris* (fig. 9) are much more elongate than in the Palearctic species, whose rings are very similar to one another, although those of *rutilans* (fig. 7) taper more strongly mesad than is the case with *pratensis* (fig. 8). The condition of the posterior wall of the bursa is very interesting in the three species. Slater (1950) considered this posterior wall to be chiefly of generic value in the genus *Lygus*. However, in the species under consideration good specific differences are present. The A structures (*see* Slater, 1950 for letter designations) are very similar in *pratensis* (fig. 1) and *lineolaris* (fig. 3) with the caudal margin evenly rounded, whereas in *rutilans* (fig. 2) the caudal margin of the A structure is strongly angled near the lateral edge. Structure B in *lineolaris* has an accessory projection which is absent in the other two species. The C structure of *lineolaris* is also very different in shape from the two Palearctic forms whose C structures are nearly identical.

The valid name of the Nearctic *Lygus* known in the economic literature as the Tarnished Plant Bug is, therefore, *Lygus lineolaris* (Palisot de Beauvois), 1818. The species is referable to the subgenus *Exolygus* Wagner (1949).

An excellent bibliography of the Tarnished Plant Bug is contained in the Van Duzee (1917) Catalogue and therefore synonymy other than that pertaining to the preceding discussion is not included in the present paper.

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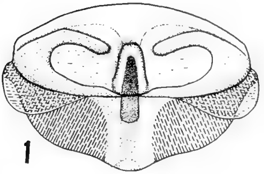
Fig. 1, *Lygus pratensis* (L.), posterior wall of bursa copulatrix, anterior view; fig. 2, *L. rutilans* Horvath, posterior wall of bursa copulatrix, anterior view; fig. 3, *L. lineolaris* (P.B.), posterior wall of bursa copulatrix, anterior view; fig. 4, *L. lineolaris* (P.B.), right paramere; fig. 5, *L. rutilans* Horvath, right paramere; fig. 6, *L. pratensis* (L.), right paramere; fig. 7, *L. rutilans* Horvath, left ring of dorsal wall of bursa copulatrix; fig. 8, *L. pratensis* (L.), left ring of dorsal wall of bursa copulatrix; fig. 9, *L. lineolaris* (P.B.), left ring of dorsal wall of bursa copulatrix.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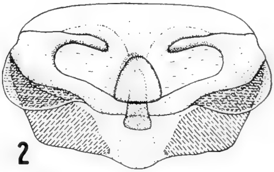
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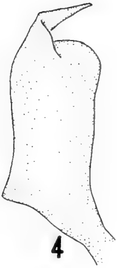
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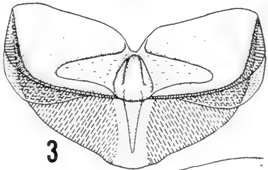
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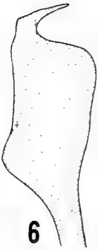
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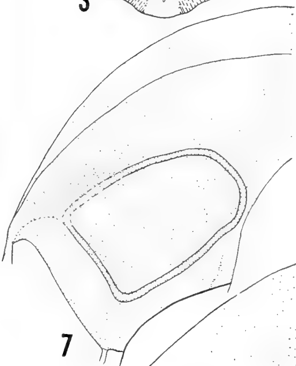
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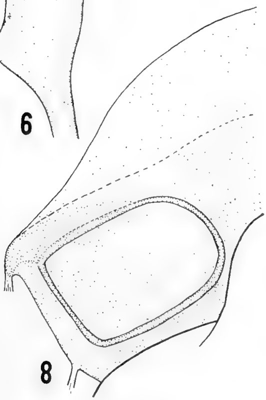
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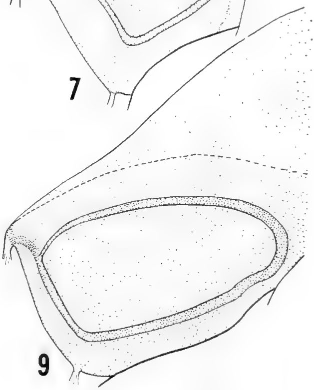
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NEW RECORDS OF PERDITA FROM THE EASTERN UNITED STATES

(HYMENOPTERA, APOIDEA)[1]

BY P. H. TIMBERLAKE, *University of California Citrus Experiment Station, Riverside*

The author is greatly indebted to Professor T. B. Mitchell of the North Carolina State College for the privilege of studying the new species and other material of the genus *Perdita* Smith, herein described and recorded. These are all from the eastern half of the United States and indicate that the genus is considerably more extensive in the East than has been recognized.

Perdita carolina, new species

This is a new species of the *Alloperdita* group that is intermediate between *P. novae-angliae* Vier. and *P. obscurata* Cress. in the shape of the head, and similar to the former in colorational characters.

Female.—Head and thorax dark shining green, the clypeus and labrum black; apical half of the mandibles rufous; basal half of mandible, very small lateral face marks, and one to three small marks on clypeus, yellow. Median spot of clypeus generally confined to upper half of disk and in the form of a fine-limbed T. A spot of each side of anterior part of disk often present. Lateral face marks triangular, often restricted to anterior corners of face but sometimes extending thinly inward along anterior margin of the lateral face plates. Thorax without markings. Abdomen shining blackish, the pygidium rufous, and the apical margin of the ventral segments rufotestaceous. A rather narrowly interrupted basal yellow band on tergites 2 to 4, not quite reaching the lateral margins, and with the halves subacute mesad and gradually broadened laterad. Sometimes two widely separated basal yellow spots present on tergite 5. Legs blackish, the apex of front femora and anterior side of front tibiae, yellow; tarsi brownish yellow, usually becoming more brownish on the basitarsi. Antennae black, the scape narrowly yellow beneath, at least at the base. Tegulae testaceous. Wings whitish hyaline, the nervures and stigma pale testaceous, except subcosta, which is fuscous. Head as broad as long, thin fronto-occipitally, becoming thickest just below the upper ends of eyes. Clypeus rather produced and prominent. Facial foveae almost half as long as eyes. Face below antennae, and the mesonotum, polished, the former nearly impunctate and the latter with minute and rather sparse punctures. Frons, vertex, and pleura of thorax minutely tessellate but shining and minutely punctured. Abdomen

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minutely lineolate and almost impunctate except on tergite 5. Pygidium almost plane and subacute at apex. Fore wing usually with a small intercalary submarginal cell. Stigma rather large and broad. Substigmatal and poststigmatal parts of marginal cell equal, the apical truncation oblique and rather wide. Pubescence thin and whitish, the hair on mesoscutum short and erect. Length, 6-6.5 mm.; anterior wing, 4-8.5 mm.

Male.—Similar to female in many characters. Mandibles except rufous tips, labrum, and large part of face below level of antennae, yellow. The supraclypeal area except anterior margin, however, green, and the green of frons descending on each side to make a triangular excision between the yellow subantennal plates and the upper end of the lateral marks. A black dot on each side of disk of clypeus. Head and thorax more bluish green than in female, the thorax immaculate except for a small yellowish spot on tubercles. Abdomen piceous, the narrow apical depression of tergites tinged with rufous, more broadly so on tergite 5, and tergites 6 and 7 entirely rufous; venter rufotestaceous, the basal segments more or less yellowish, except at apex. An interrupted yellow band on tergites 2 to 4 or 5; these bands more uniform in width than in female, and those on the more apical segments often concealed by apex of the preceding segment. Legs yellow, with the following parts fuscous or black: base of coxae, broad streak on front femora behind, a narrower streak on middle and hind femora, a small spot on antero-dorsal surface of hind femora often confluent with the posterior streak, posterior side of front tibiae, a streak over nearly the whole length of middle tibiae on outer side, and the hind tibiae except on anterior side. Antennae yellow beneath, becoming dilute fuscous above on flagellum and darker fuscous on scape. Tegulae and wings as in female, but margins of stigma fuscous like the subcosta, the nervures forming the marginal cell also slightly darkened. Head somewhat broader than long and thicker fronto-occipitally than in female. Mandibles moderately long, slender, and with a small preapical inner tooth. Frons duller and more tessellate than in female, impunctate, but sculpture of other parts not differing from female. Pubescence similar, except that hair of cheeks is much longer and moderately denser, and hair at apex of abdomen somewhat sparser, than in female. Length, 5-6 mm.; anterior wing, 4.2-4.5 mm.

Type.—U. S. N. M., no. 61610.

Described from the holotype female, allotype male, and 8 female and 12 male paratypes, at flowers of *Batodendron*, Taylor's Bridge, Sampson County, North Carolina, May 24 and 30, 1951 (T. B. Mitchell and H. K. Townes); 1 female paratype, Sampson County, N. C., on *Batodendron*, May 18, 1950 (Mitchell); and 1 female paratype, Raleigh, N. C., middle of August, 1922. Paratypes in collections of the North Carolina State College and the Citrus Experiment Station.

Perdita crawfordi Cockerell

P. crawfordi Cockerell, 1901, Entomologist, 34, p. 190, ♂, ♀.

Described from Lincoln, Nebraska, and also recorded from Texas by Cockerell. New records are based on 2 males and 1 female from Winnfield, Winn County, Louisiana, June 27, 1918 (G. R. Pilate), and 3 females from Branson, Missouri, September 14, 1939 (E. C. Van Dyke).

Perdita bishoppi Cockerell

P. bishoppi Cockerell, 1906, Entomologist, 39, p. 148, ♀, ♂.

This has been known previously only from Texas, but I find that the following material must be referred to this species: 1 male, 14 females, south of Ponte Vedra Beach, Florida, Sept. 1, 1949 (T. B. Mitchell); and 12 males, 7 females, Saint Simons Island, Georgia, Sept. 10, 1931 (Bradley and Knorr).

Perdita blatchleyi, new species

This Florida species is similar to *P. asteris* Cockerell, of New Mexico, in regard to the face marks, but differs in having the wings a little dusky, with pale-brown nervures, and in having a broad, interrupted white band on tergites 2 to 4, and a spot on each side of tergite 1 of abdomen. It belongs to the *ignota* group, together with the two preceding species.

Female.—Dark, rather dull blue-green, the abdomen brownish black, the light markings creamy white. Mandibles except rufous tips, clypeus except irregular fuscous band on upper margin, and large lateral face marks, white. The latter marks much higher than wide, acute above, and reaching level of antennae. Labrum testaceous. Collar of pronotum, cuneate marks on posterior corners of pronotum, and tubercles, white. Light bands of abdomen rather broad, considerably widened at outer ends of tergite 2, moderately narrowly interrupted in middle on tergites 2 and 3, and slightly more so on tergite 4, with the two marks thus formed on tergite 3 distinctly oblique, their inner ends more basal than their outer ends. The two spots on tergite 1 rather small and placed on lateral margins of disk. Apical tergite rufo-testaceous. Legs brownish, the tarsi, especially the small joints, paler brown, and a small white spot present on front knees. Antennae reddish brown, becoming darker above and nearly black at base of flagellum and on the scape. Tegulae testaceous hyaline. Wings somewhat dusky, with nervures and margins of stigma brown. Head about as broad as long except for the rather strongly produced clypeus. Mandibles moderately long and stout, abruptly narrowed and incurved at apex, and without a distinct inner tooth. Face below antennae rather strongly convex and prominent, the inner orbits of eyes only slightly converging below. Pygidial plate of abdomen broad and broadly rounded at apex. Marginal cell of wing with substigmatal and poststigmatal parts equal, and its apex obliquely truncate. First recurrent nervure received by the second submarginal cell about one fifth of the length of cell from the base. Frons and mesoscutum minutely and strongly tessellate and rather dull, the pleura of thorax and propodeum also tessellate but more shining. Abdomen very minutely lineolate and shining. Pubescence of head and thorax short, moderately sparse, and whitish but definitely less pure white than in *asteris;* that of mesonotum very short and erect. Hair of legs and of apex of abdomen ochreous. Length, 4.5-5.5 mm.; anterior wing, 3.5-3.8 mm.

Types.—Two females, holotype and paratype, Dunedin, Florida, Oct. 20-30, 1914 (W. S. Blatchley). Holotype in collection of Cornell University; the paratype retained for the Riverside collection.

Perdita consobrina consobrina Timberlake

P. consobrina Timberlake, 1928, Amer. Mus. Nov. 321, p. 3, ♀.

A large series of both sexes of this species was collected by Professor Mitchell at Southern Pines, North Carolina, Sept. 10-22 in 1949 and 1950; also one female in Harnett Co., N. C., Oct. 10, 1945, and another at Lakeview, N. C., Sept. 10, 1950. Most of these were collected at flowers of *Chrysopsis.*

The females from North Carolina agree in general with description of the type from Sumter, South Carolina, but the wings apparently are more strongly dusky than is indicated by the original description. The two black bars on disk of clypeus are broad and irregular in shape, and the two yellow spots on supraclypeal area, and the yellow band on tergite 5, are sometimes obsolete. A single female from *Kuhnistera pinnata* has the lower part of face black, with a slender median yellow streak on clppeus and slender yellow orbital stripes; but four other specimens from the same flower agree with the remainder of the series from flowers of *Chrysopsis.* Length of females, about 5.5-6 mm; anterior wing, 3.3-3.5 mm.

Male.—In general, similar to female, but face usually entirely yellow, or nearly so, below level of antennae. The yellow also includes mandibles except rufous tips, labrum, under side of scapes, and a tenuous line on inferior orbits nearly to middle of eyes. Usual pair of dark dots present on clypeus. Lateral face marks broadly truncate at lower level of antennal sockets, with a short slender spur along the orbits above the sockets. Supraclypeal mark usually distinctly emarginate above. Subantennal plates usually all yellow, but entirely green in one specimen. Tubercles and hind margin of pronotum very narrowly yellow on each side. An interrupted basal yellow band in tergites 1 to 3 (more rarely on 1 to 4), always ending distantly from lateral margins and occasionally obsolete. Legs blackish; the following parts yellow: front coxae beneath except base, front and middle trochanters except spot beneath, hind trochanters except a dark annulus, femora at apex and line on upper anterior surface surface of front pair, front tibiae except blotch behind, front tarsi, anterior side of middle tibiae, and extreme base of hind tibiae. Middle tarsi brownish yellow. Antennae piceous, the flagellum except last joint somewhat more brownish yellow beneath than the scape. Tegulae testaceous. Wings strongly dusky, the nervures and margins of stigma, brown. Head subquadrate, about as broad as long. Claws bifid at apex. Frons, vertex, meso- and metanotum excessively finely granular tessellate and dull; remainder of head and thorax minutely tessellate and more shining. Length, 4.5-5.5 mm.; anterior wing, 3.0-3.4 mm.

Perdita consobrina subspecies **lepida**, new subspecies

As this Florida bee agrees closely with *consobrina* in general appearance and structure, it seems to be no more than a southern race. The female differs from typical *consobrina* in having a large supraclypeal mark, the dark bars of clypeus slender, the marks on posterior corners of pronotum large, and the abdominal bands broader and less interrupted medially. The markings also are paler yellow than in *consobrina*. The males of the two races are virtually identical.

Female.—Head and thorax dark green, with pale-yellow markings. The markings include mandibles except rufous tips, labrum, clypeus except usual pair of dots and two dark vittae on upper half of disk, lateral and supraclypeal marks, collar of pronotum, cuneate mark on posterior corners of pronotum, and the tubercles. Vittae on disk of clypeus generally free from the dots and converging above. Supraclypeal mark large and quadrate. Lateral marks much higher than wide and truncate at upper end, where they reach to the frontal foveae. Subantennal plates may be margined with yellow at their upper end. Antennae reddish brown, darker above, becoming narrowly yellow beneath on scape. Abdomen piceous, with a pale-yellow band on tergites 1 to 5; these bands broad and reaching lateral margins, or, in fact, extending on to the reflexed ventral part of tergites 2 to 4; those on tergites 4 and 5 entire although constricted medially, and those on tergites 1, 3, and 2 interrupted more and more broadly in the middle in the order mentioned (interruption on 1 very narrow and that on 2 somewhat less than one fifth of width of segment), with the inner ends of the resulting marks much narrowed and pointed mesad. Pygidial plate rufo-testaceous. Legs brownish piceous, with the knees broadly, the anterior and lower side of front and middle tibiae, yellow, and the front tarsi testaceous yellow. Tegulae testaceous hyaline, with the more opaque base yellow. Wings somewhat dusky hyaline, the nervures and margins of stigma pale brown (the Lake Worth female has the wings slightly longer and less dusky than the Dunedin specimens). Length, 6 mm.; anterior wing, 3.7-3.8 mm.

Male.—Essentially identical with male of *consobrina*. In the two type specimens the yellow band on tergite 1 is represented by about three or four dots in a transverse line. In the allotype the other abdominal bands are represented by two widely separated, small oval spots on tergites 2 and 3, and in the paratype by larger, less separated spots on tergites

2 to 4. Structural characters as in *consobrina*, the sculpture of frons and notum of thorax being very fine and dense, with surface dull, but the propodeum and under parts of head and thorax becoming smoother and more shining. Length, 4.5-5 mm.; anterior wing, 3-3.2 mm.

Types.—Holotype female, allotype, and 2 females, 1 male (paratypes) Dunedin, Florida, Oct. 23-30 (females), and Oct. 30 (males), 1914 (W. S. Blatchley); 1 female (paratype), Lake Worth, Florida, Nov. 19, 1928 (Bromley).

The types in collection of Cornell University, except one paratype female retained at Riverside, and the Lake Worth specimen, which belongs in collection of the North Carolina State College.

The species of *Perdita* recorded hitherto from the eastern part of the United States and Canada are as follows:

octomaculata (Say), 1824, ♂, ♀. N. B. to Minn., south to S. C. and Miss.
halictoides Smith, 1853, ♀. Fla.
obscurata Cresson, 1878, ♀, ♂. N. J. to Fla.
  bradleyi Vierck, 1907, ♂.
maura Cockerell, 1901, ♂, ♀. Ind., Wis., to Colo.
  bisignata Cockerell, 1922, ♂.
boltoniae (Robertson), 1902, ♀, ♂. Ill.
gerhardi gerhardi Viereck, 1904, ♀, ♂. Ind., Wis.
gerhardi monardae Viereck, 1904, ♀, ♂. N. J.
gerhardi arenicola Timberlake, 1929, ♀, ♂. Ill.
novae-angliae Viereck, 1907, ♀, ♂. Mass., Conn., N. J., Md., N. C.
perpallida citrinella Graenicher, 1910, ♀, ♂. Wis., N. D., Alta.
maculigera maculipennis Graenicher, 1910, ♀, (♂). Wis., Ill.
maculigera bilineata Timberlake, 1929, ♀. Mo., Ill.
lacteipennis pallidipennis Graenicher, 1910, ♀, ♂. Wis., Ill.
swenki Crawford, 1915, ♀, ♂. Mich., Alta., south to Neb.
  bruneri Graenicher, 1910 (not Cockerell), ♀, ♂.
bequaerti bequaerti Viereck, 1917, ♀, ♂. N. J., Ga., Ala., Tenn., Miss.
bequaerti indianensis Cockerell, 1922, ♂, ♀. Ind., Okla.
  wichhami Cockerell, 1922, ♀.
chrysopsina Timberlake, 1928, ♂, ♀. N. J. to Fla. and Miss.
  halictoides Viereck, 1917 (not Smith).
georgica Timberlake, 1928, ♂, ♀. Ga., Fla.
consobrina Timberlake, 1928, ♀. S. C.
floridensis Timberlake, 1928, ♂, ♀. Fla., N. C.
ainsliei Crawford, 1932, ♂, ♀. Iowa.
gerardiae Crawford, 1932, ♂, ♀. N. C., Fla., Miss.
mitchelli Timberlake, 1947, ♀, ♂. Miss., N. C.
graenicheri Timberlake, 1947, ♀, ♂. Fla.

THE MESOSTIGMATIC NASAL MITES OF BIRDS, III. NEW SPECIES OF RHINOECIUS FROM OWLS

(ACARINA, RHINONYSSIDAE)[1,2]

BY R. W. STRANDTMANN, *Texas Technological College, Lubbock*

Cooreman (Bull. Mus. Hist. Nat. Belgique 22: 1-4, 1946) was the first to describe a nasal mite from an owl, finding the specimens in the screech owl, *Asio otus*, in Belgium. The mite differed appreciably from all previously known forms, so he proposed a new genus, *Rhinoecius*, for its reception. The principal character of this genus is the one-armed chela. The three new species to be described below all have this characteristic, but they differ sufficiently in other particulars that Cooreman's original diagnosis needs to be modified.

Genus **Rhinoecius** Cooreman

Nasal mites of owls. Stigmas in normal position, between coxae III and IV, dorsolateral, and with short peritremes. *Chela of female with one arm only;* immovable arm lacking. Gnathosoma apical or nearly so. All tarsi with well developed claws and pulvillum. Podosomal shield present and well developed. Opisthosomal shield present or not; small accessory dorsal plates present or not. Genital and anal plates present and fairly distinct. Sternal plate very poorly developed or entirely lacking. Setae rather sparse and weak, best developed on tarsi. Telotarsus of each leg with a long, dorsal seta.

The above characterization is based on the females but, except for the usual sexual differences, may be applied also to the males.

Rhinoecius grandis, new species

Figs. 1-8, 26-28

A large nasal mite parasitizing the Great Horned Owl. It has one large and four small podosomal shields. The anal plate has three setae. The females average nearly one millimeter long.

Female (figs. 1, 2, 4, 26-28).—Average size of eleven specimens, 955 μ; size varied from 815 μ to 1100 μ. Large dorsal plate uniform and averaged 391 μ long by 330 μ wide at widest point. *Dorsum.*—One large, fairly distinct dorsal shield covers approximately half of the podosoma. Under phase contrast microscope, this plate shows several clusters of small, clear circles, those of median anterior cluster about half the size of those of other clusters. A faint reticulation barely

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[1]Parts I and II in Jour. Parasitol. 34: 505-514, and 37: 129-140 respectively.

[2]This study aided by a grant from the Research Fund of Texas Technological College.

discernible over the rest of plate. Two rather prominent setae present on posterior margin, otherwise this plate devoid of setae. Four small platelets present, as shown in fig. 2. Nine pairs of small, indistinct setae and four pairs of pores are scattered over dorsum (this varies among specimens, and number may be slightly more or less than this). Stigmas dorsolateral, approximately between coxae III and IV, with short petritremes. *Venter.*—Three pairs of short sternal setae. A very faint sternal shield can be found in region of two anterior pairs of sternal setae. Genitoventral plate quite distinct, about twice as long as wide, broadly rounded posteriorly, faintly reticulate and with several clear spots in center. This plate flanked by a pair of pores or very tiny setae. Anal plate present, oval in outline and with a large cribrum, margin of anal plate not so distinct as figure indicates. It bears three setae, paired ones anterior to anal pore, odd one about midway between pore and cribrum. Venter otherwise has four pairs of tiny setae and a few small pores. *Gnathosoma* (fig. 27).—Terminology used here is the same as that proposed by Gorirossi (1950). *Basis capituli* has one pair of fairly prominent setae, were present on all specimens seen. Capitular groove and capitular teeth lacking. Beak generally has three pairs of setae; these extremely small, very difficult to find, and apparently lacking in some specimens. Palpal setae small and indistinct. Palp tarsus a small segment placed ventrally on the palp tibia; it has several setae including two rather long and distinct ones. Tectum an irregular membrane reaching nearly to middle of palp genu. The chelae one-armed, this single arm being about one-fifth length of chelicera. *Legs.*—Becoming progressively longer from anterior to posterior and averaging as follows: I, 572 μ; II, 586 μ; III, 614 μ; IV, 722 μ long. Chaetotaxy as shown, the dorsal setae smaller than ventral, except on tarsi.

Male (figs. 3, 7, 8).—Average length of 4 specimens 860 μ; range from 800 μ to 920 μ. Dorsal plate 330 μ long by 330 μ wide. Legs: I, 472 μ, II, 472 μ, III, 500 μ, and IV, 586 μ long. Chelicerae have a short immovable arm and a long movable arm to which is attached equally long spermatophore carrier. Sternal and genital plates combined as shown in fig. 7, but this very indistinct; genital pore quite evident. Sperm tube broadens posteriorly, as indicated by dotted lines in fig. 7. This structure visible in all males studied. Male otherwise exactly like female.

Nymph (figs. 5, 6).—Length 739-813 μ. No dorsal plate present, but several small, sclerotized areas may be picked out with difficulty. Nine to ten pairs of setae present in same relative positions as in female. On venter, only anal plate present, but it is much less distinct than shown. Same number of ventral setae present as in female.

Larva.—Two females contained larvae. They showed no unusual characters.

Types.—Holotype female and several paratypes, including male, female, and nymph are in the U. S. National Museum, Washington, D. C. The description was based on 18 females,

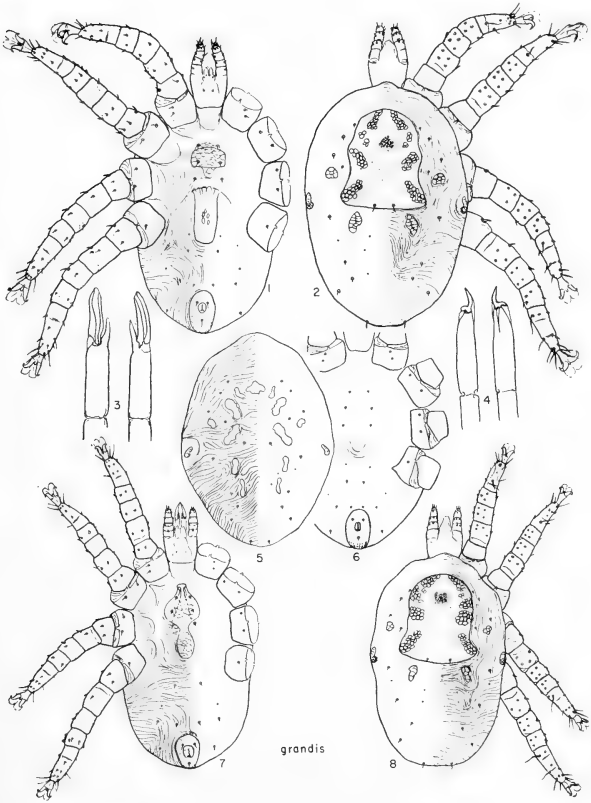

PLATE I. RHINOECIUS GRANDIS

Figs. 1 and 2, female; fig. 3, male chelicerae; fig 4, female chelicerae; figs. 5 and 6, nymph; figs. 7 and 8, male.

5 males, and 9 nymphs. Specimens collected in Lubbock Co., Texas, December 13, 1950, John D. McLean.

Type host.—*Bubo virginianus* (Gmelin), the Great Horned Owl.

Discussion.—This mite is quite similar to the genotype, *Rhinoecius oti* Cooreman. It differs primarily in the shape and chaetotaxy of the dorsal plate. In *oti* this plate is broadly rounded and is devoid of setae, whereas in *grandis* it is bell-shaped and has two setae on the posterior margin. In his figure of *oti* Cooreman shows six setae on the anterior margin of the plate but in the text he says, "Il ne porte aucune pilosité."

It is true that the characters we have mentioned are variable in some Rhinonyssidae and that perhaps no real difference exists between these two mites, but I have seen a total of 18 females and five males and they all showed the same characteristics. This, plus the fact *grandis* is larger (*oti* is only 800 μ long) and comes from a different species of host, makes me confident that this is indeed a species distinct from *R. oti*.

The host owl was shot in a canyon near Lubbock, Texas on December 13, 1950. I examined it for mites the next day. Nearly all the mites were in the forward and drier portion of the nose and the nasal membranes were thickly speckled with what looked like fecal droppings from the mites. The mites were all well fed and the typical form of the digestive tract was clearly visible. The mites crawled actively and seemingly with better coordinated movements than most nasal mites; they all were still alive the next day. They were then placed in physiological saline and mounted in a chloral hydrate medium.

On December 25, 1950 I found a Great Horned Owl dead on the highway near Trinidad, Colorado. I examined the head two days later but found no mites.

Rhinoecius cooremani, new species

Figs. 9-16, 29-31

A rather elongated mite with a triangular podosomal shield and only two small platelets. Average length of the female about 760 μ.

Female (figs. 9-11, 29-31).—Five females were available for study. The length varied from 630 μ to 886 μ. The dorsal plate was uniform for all and measured 245 μ long by 214 μ wide at the widest point. *Dorsum.*—Podosomal shield fairly distinct, triangular, with several clusters of clear circles and faint reticulation, bearing 1 pair of small setae, medially located. Two small plates located in the midregion, posterior to podosomal shield. Ten pairs of very small setae and about six pairs of small pores present on soft portion of dorsum, arranged as shown.

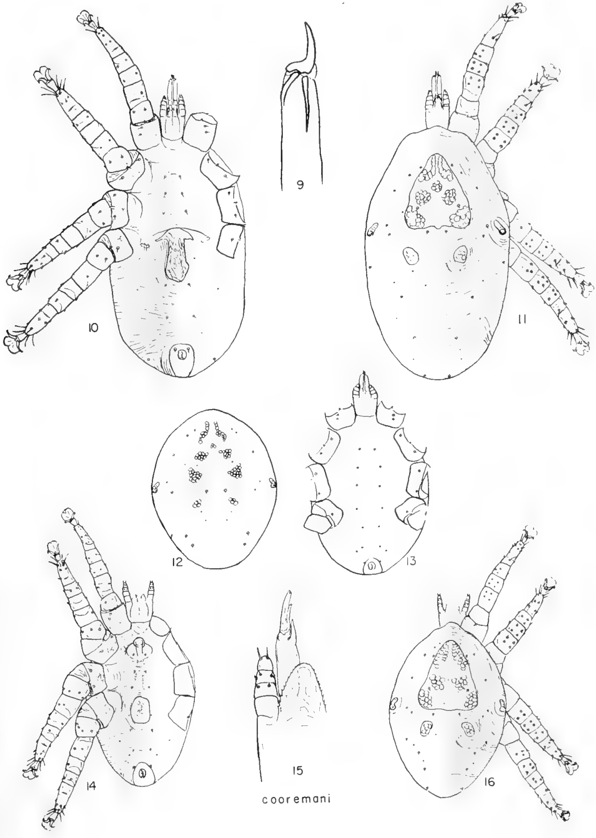

PLATE II. RHINOECIUS COOREMANI

Fig. 9, female chela; figs. 10 and 11, female; figs 12 and 13, nymph; fig. 14, male ventral; fig. 15, chela, tectum, and left palp of male; fig. 16, male dorsal.

Venter.—Sternal plate apparently lacking. Genital plate distinct, faintly reticulate, and with several clear spots on its center. Anal plate rather indistinct, pore near anterior margin; only two setae present, located anterior to pore. Well developed cribrum present which generally extends onto dorsal side. All ventral setae very small and slender. Three pairs of sternal setae and three pairs of opisthosomal setae, and several small pores arranged as shown. *Gnathosoma* (fig. 30).—The *basis capituli* devoid of setae. The beak with or without a pair of setae, these small and weak and extremely difficult to find. Other structures weak and difficult to see, but I believe them to be essentially as illustrated. Tectum a weak membrane extending as far as apex of the palp genu. Ratio of chela to segment that bears it, 2:9. *Legs.*—Starting with longest one, order of length is IV, I, III, II. Length in microns: I, 443; II, 400; III, 440; IV, 472. As in the other species, setae weak, a little longer on ventral side and longest on tarsi.

Male (figs. 14, 15, 16).—Only one male was available, 570 μ long. Dorsal plate measures 229 μ long by 220 μ wide. Leg I, 370 μ; II, 343 μ; III, 360 μ; IV, 400 μ long. Small sternal plate indicated. Genital plate present between coxae IV. Sperm duct can be traced back nearly as far as genital plate, but it does not widen posteriorly as does sperm duct of *grandis*. Chelae composed of a short, immovable arm and a longer, movable arm to which is attached a spermatophore carrier that extends well beyond the tip of the movable arm (fig. 15). Tectum a thin membrane with a finely serrated margin. Otherwise as in female.

Nymph (figs. 12, 13).—There were two specimens of nymphs, of equal size. Body length, 536 μ. Leg I, 330 μ; II, 300 μ; III, 307 μ; IV, 330 μ. Dorsum with several clusters of clear circles but no plates. Venter shows only anal plate, that indistinctly. Chaetotaxy weak and arranged as shown.

Larva.—A larva was found within one female. It shows no unusual characters.

Types.—The holotype female and several paratypes, including the male and a nymph are in the U. S. National Museum, Washington, D. C. Specimens collected near Luling, Texas, March 22, 1951, Lamar Strandtmann.

Type host.—*Strix varia* Barton, the Barred Owl.

Discussion.—The triangular dorsal shield and the presence of only two small platelets distinguished this mite readily from others of the genus.

The host bird was collected early on the morning of March 22 and was not examined for mites until five days later. In the meantime the bird had been kept in an ice box two days and in a deep freeze box one night. Between times it had been in the car at about 70 degrees F. When examined on March 27 some of the mites were still alive.

This mite is named in honor of the Belgian Acarologist, Jean Cooreman.

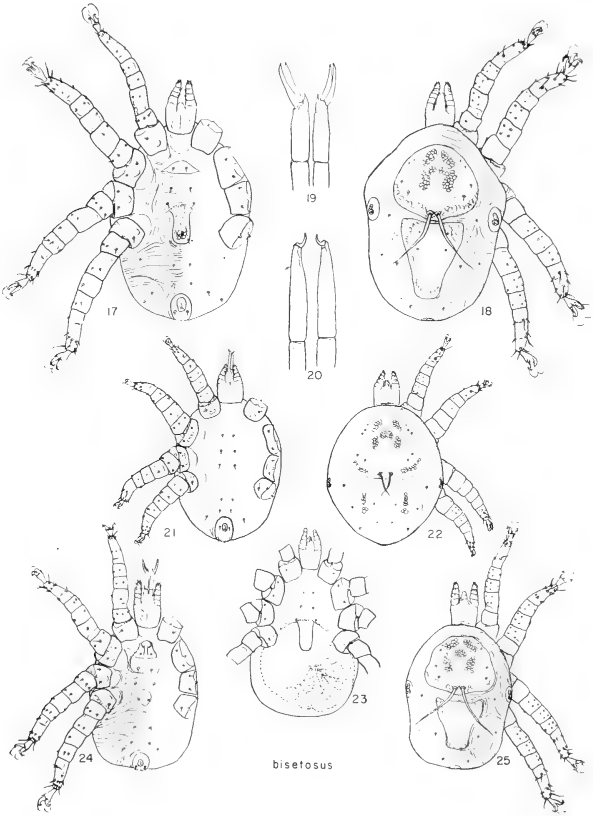

PLATE III. RHINOECIUS BISETOSUS

Figs. 17 and 18, female; fig. 19, male chelicerae; fig. 20, female chelicerae; figs. 21 and 22, nymph; fig. 23, female with larva, ventral view; figs. 24 and 25, male.

Rhinoecius bisetosus, new species

Figs. 17-25, 32-34

A short, broad mite inhabiting the nasal passages of the Burrowing Owl. It has two large dorsal shields and a pair of enormous, vertical setae arising from near the posterior margin of the anterior plate. Average length, 715 μ.

Female (figs. 17, 18, 20, 32, 33, 34).—Six specimens available for study, five of the same size, measuring 715 μ long; other shorter, only 630 μ long. Anterior dorsal plate 243 μ long by 315 μ wide; posterior plate 264 μ long by 230 μ wide. *Dorsum.*—Two large shields cover approximately half the dorsum, anterior one rounded at front and sides, posterior margin slightly convex, with a more prominent convexity medially, as shown. Plate lightly reticulate, with several clusters of clear circles and four pairs of very small setae in addition to a pair of enormous ones; anterior two pairs extremely small. Very long setae average 230 μ long and arise from a swollen area near posterior margin of plate; in life these setae stand erect, with tips bent backward. Posterior plate triangular with a broadly rounded apex; anterior margin slightly concave. Surface faintly reticulate, in some specimens it is possible to see one or two pairs of extremely small setae. Soft portion of dorsum has about four pairs of small setae and three or four pairs of small pores, all in opisthosomal region. *Venter.*—Three pairs of small, slender, sternal setae present. A faint suggestion of a sternal plate can be seen in region of first sternal setae. Genital plate distinct, reticulate and with a cluster of clear spots medially. Sometimes one or two setae found on posterior lateral margin. A pair of small pores present near plate. Anal plate fairly distinct, nearly terminal; cribrum extends onto dorsal side. Anal pore in anterior portion of plate. Only two setae present, located below middle of anal pore. All specimens showed four pairs of small setae and one pair of pores between anal and genital plates. *Gnathosoma* (fig. 33).—*Basis capituli* without setae or capitular groove (it is interesting to note, however, that one nymph did have an irregular row of capitular teeth). Beak with full complement of three pairs of setae, although they may be difficult to see. Tectum a simple, thin membranous structure reaching nearly to apex of palp genu. *Legs.*—Progressively longer from I to IV: leg I, 470 μ, II, 475 μ, III, 495 μ, V, 530 μ. All coxae show a slight ventral tuberosity. *Coxa I apparently with only one seta.* Otherwise chaetotaxy essentially like previously described species.

Male (figs. 19, 24, 25).—Only one male available, 543 μ long. Anterior dorsal plate measures 215 μ long by 257 μ wide, posterior plate 200 μ long by 171 μ wide. Legs I, II, and III 386 μ long, leg IV 414 μ. Long dorsal setae 171 μ long. A very faint shield surrounds genital pore and first pair of genital setae, and a non-striated region extends laterally and posteriorly to include second sternal setae. Otherwise as in female.

Nymph (figs. 21, 22).—Four nymphs available, three of these alike

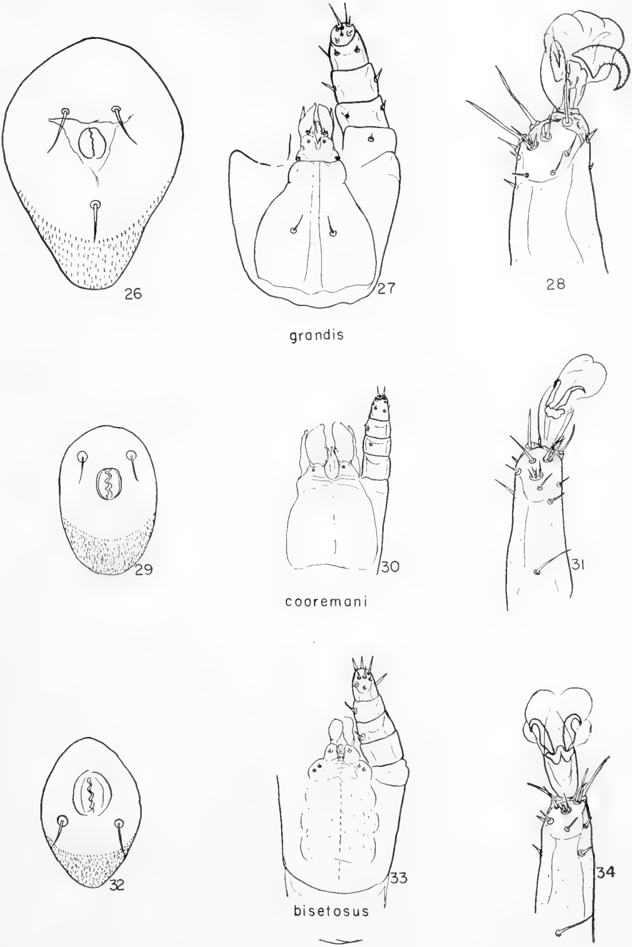

PLATE IV. STRUCTURES OF RHINOECIUS

Figs. 26, 27, 28, anal plate, gnathosoma, and tarsus I respectively of *Rhinoecius grandis;* figs. 29, 30, 31, anal plate, gnathosoma, and tarsus I of *Rhinoecius cooremani;* figs. 32, 33, 34, anal plate, gnathosoma, and tarsus I of *Rhinoecius bisetosus.*

in size, measuring 490 μ long. Legs I to IV respectively 280, 300, 300, and 300 μ long. Long dorsal setae 100 μ long. Fourth nymph larger, measuring 515 μ long, legs of this mite 315, 315, 330, and 345 μ long. Only anal plate visible, dorsum shows characteristic clusters of clear circles.

Larva (fig. 23).—One female mite contained a hexapod larva. It shows nothing unusual. I could find two points of attachment for large setae, but the setae themselves not yet developed. The figure indicates the relative size of the larva and mother.

Types.—The holotype female and several paratypes, including the male and nymph are in the U. S. National Museum, Washington. Specimens collected Dec. 30, 1950, Lubbock Co.

Type host.—*Speotyto cunicularia* (Bonaparte), the Burrowing Owl.

Discussion.—Several hours after the host was collected it was placed in a jar and a chloroform-moistened pad added to kill the Mallophaga. The bird was dead before placed in the jar and it was left about ten minutes. When the head was opened later some of the nasal mites were still alive.

The two enormous setae on the center of the dorsum distinguish this mite at once from all other nasal mites. In life these setae are erect. What function they might serve I do not know. Apparently the mite causes no great discomfort as the host bird was in excellent condition, very fat.

SUMMARY

Three new species of nasal mites from Strigiforme birds are described. They are *Rhinoecius grandis* from the Great Horned Owl, *Rhinoecius cooremani* from the Barred Owl, and *Rhinoecius bisetosus* from the Burrowing Owl. The male, female and nymph of each species is described and figured.

ENTOMOLOGICAL SOCIETY OF WASHINGTON
617TH REGULAR MEETING, THURSDAY, APRIL 3, 1952

The 617th regular meeting of the Society was called to order at 8 P.M. by President W. D. Reed on Thursday, April 3, 1952, in Room 43 of the U. S. National Museum. Forty-seven members and 19 visitors attended. The minutes of the previous meeting were read and approved.

New members elected were:

Rufus H. Vincent, Office of the Chief of Engineers, Department of the Army, Washington 25, D. C.

Lt. B. G. Hightower, 315 Claremont, San Antonio, Texas.

Dr. Joseph H. Camin, Entomology-Zoology Department, South Dakota State College of Agriculture and Mechanic Arts, Brookings, South Dakota.

David W. Walker, c/o International Health Service, U. S. Public Health Service, Federal Security Building, North, Washington 25, D. C.

President Reed appointed Elizabeth Haviland, Richard H. Smith, D. G. Hall, Engel Gilbert, and Helen Louise Trembley, chairman to the committee to arrange the June meeting, to be held jointly with the Insecticide Society.

Lt. Col. Robert Traub, the unit field director of the Army Medical Research Unit from Walter Reed Hospital, was cited by the British government for his work as a member of the unit in developing the control of typhus and typhoid fevers with new antibiotics, announced President Reed. Col. Traub's work was done at Kuala Lumpur, Malaya, in testing the drugs aureomycin, chloromycetin, and terramycin.

An obituary of the late Dr. H. L. Dozier was given by B. D. Burks. Dr. Herbert Lawrence Dozier, who had been a member of this Society for 20 years, died suddenly at his home in Louisiana last December 4. Born at Wilmington, N. C., June 24, 1895, he received his B.S. degree from the U. of South Carolina in 1915, a M.S. degree from the U. of Florida in 1917, and a Ph.D. from Ohio State in 1922. He served in the Infantry during World War I, and did advanced study in France in 1919 at Clarmont-Ferrand. At various times he worked for the States of Mississippi, Louisiana, and Delaware, the U. S. Bur. Ent. and P. Q. Puerto Rico, Haiti, and, finally, the U. S. Fish and Wildlife Service. His research was devoted largely to the taxonomy of various insect groups, with more work on Chalcid-flies than other groups. He published some 50 papers describing nearly 125 species, more than half of which were chalcidoids. He also described Ichneumonidae, Proctotrupoidae, and a number of Homoptera, including 14 white flies. His judgment concerning species differences was extremely good; the great majority of the species he described are certainly valid and recognizable. (Speaker's abstract.) M. D. Leonard and T. L. Hubbell added remarks about their associations with Dr. Dozier.

R. H. Nelson's suggestion that the Society congratulate Herbert Osborn on his 96th birthday was approved and the Corresponding Secretary was instructed to send a letter of congratulations to Professor Osborn.

A. W. Morrill exhibited bronze and silver replicas of insects which he and D. J. Pletsch obtained in Japan. Some of these replicas had been recently made, but others were antique. The exquisite detail and intricately made, movable joints of the insects (some of which had been made by Japanese armorers) were fascinating to those present, especially the ladies.

The principal speech of the evening, given by Dr. T. L. Hubbell of the Museum of Zoology at the University of Michigan, was "Some Applications of the 'New Systematics'." Taxonomy involves the describing, naming, and categorizing of organisms, while systematics treats of the dynamic, evolutionary aspects of classification. In the "new systematics" methods and data from the fields of mathematics, genetics, cytology, ecology, morphology, and zoogeography have been applied to the problems of evolution at the species level and below. Species are now viewed as living populations, and factors that produce divergence and discontinuity between populations are studied. The new systematics has already contributed much to our understanding of species and subspecies, while its implications are of the utmost importance to the taxonomist. For the museum worker, however, older morphological species concepts must continue to form the basis for most work; conventional taxonomy is not outdated, but rather is complemented by the new systematics. Even though the taxonomist cannot use the methods of the new systematics in most of his identification work, the concepts of the new systematics inevitably affect his thinking. The order Orthoptera, for example, affords numerous instances in which application of the methods of the new systematics has clarified taxonomic problems, and others in which these methods have revealed previously unsuspected complexities in supposedly simple species populations. The cytological studies of McClung, Helwig, and White; the zoogeographic and racial analyses of Rehn, Hebard, Roberts, and others; and the investigations on the locusts of the Old World by Uvarov and his colleagues may be cited as having re-oriented taxonomic thinking. (Speaker's abstract.) A lively discussion followed Dr. Hubbell's talk.

Visitors introduced were Dr. Ching-Hsi Tsao, A. M. Nadler, and Louis Davis. Adjournment at 10:00 P.M.

KELLIE O'NEILL, *Recording Secretary*

Actual publication date of vol. 54, no. 3, June 24, 1952

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REVISION OF THE LATHRIDIINI OF THE STATE OF WASHINGTON

(COLEOPTERA, LATHRIDIIDAE)

By LUELLA M. WALKLEY, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

The Lathridiidae are minute beetles, usually measuring from one to three millimeters in length. Herbst,[1] in the original description of "Latridius," said, "The beetles which I place in this new genus are all very small so that they are difficult to find and to recognize. The generic name has reference to this." [Translation.] So far as is known they feed upon various molds. One may usually collect them by sweeping vegetation, especially around conifers, or by sweeping or shaking the coniferous trees or shrubs themselves. Herbst[1] also said, "These beetles occur principally under bark of trees." [Translation.]

Species of this family are sometimes regarded as pests of stored products, though in reality their presence is an indication that conditions under which the products are stored are conducive to mold or mildew (see Hinton, 1941, Bul. Ent. Res. 32 (3):191-247). Representatives of the family have been found in shipments of grains, cheeses, hay, packing materials, bulbs, and orchids by plant quarantine inspectors. Specimens are also frequently reported from mildewed leather, basements, and newly built homes where mildew or mold has been present.

Lathridiidae have been found the world over. Some species, such as *Lathridius minutus* (L.) and *Aridius nodifer* (Westw.), are cosmopolitan.

The last revisionary work on the American Lathridiidae was by Fall in 1899. He divided the family into four groups: the Merophysiini, Dasycerini, Lathridiini, and Corticariini. Only the Lathridiini will be considered here.

Sources of material used in the preparation of this paper are the following: Collection of M. H. Hatch, University of Washington, Seattle, Wash., consisting of about 1,700 specimens from that State; Fall's and LeConte's collections at the Museum of Comparative Zoology, Harvard University, Cam-

[1]Herbst, 1793. *In* Jablonsky, Nat. Ins. Käfer, b. 5, p. 3.

bridge, Mass.; Canadian specimens from W. J. Brown, Entomologist of the Canada Department of Agriculture, Ottawa, Canada; and the H. C. Fall material in the U. S. National Museum, Washington, D. C., as well as other material there.

My thanks go to M. H. Hatch for the use of his collection and for the suggestions and help he has given me; to P. J. Darlington for the opportunity to study the LeConte and Fall collections; to W. J. Brown for many specimens that helped to clarify certain problems that arose; to E. A. Chapin for the use of the U. S. National Museum material and other assistance; to C. F. W. Muesebeck for his assistance in nomenclatural matters as well as his constant encouragement; to W. S. Fisher, and to the late H. S. Barber for their many kindnesses.

Thanks are also due René Malaise of Stockholm, Sweden, for the loan of the type of *Tenebrio lardarius* Degeer.

The tribe Lathridiini includes those Lathridiidae characterized as follows: Body glabrous or subglabrous (excepting *Stephostethus productus* (Rosenhauer) n. comb., and *Lathridius hirtus* Gyllenhall, not occurring in Washington), hairs when present sparse and erect; anterior coxal cavities closed behind; epistoma on a slightly lower plane than the frons and separated from it by a distinct suture; front coxae usually distinctly separated (excepting *Adistemia* Fall); abdomen with five visible sternites; and with the body in some part covered with a waxy exudate which is either clear or white in appearance (scarcely noticeable in *Enicmus* Thoms.).

Practically none of the European generic and specific synonymy has been used in this paper since types could not be seen and the original descriptions are too general or vague for use in critical work.

KEY TO GENERA OF THE LATHRIDIINI OF THE STATE OF WASHINGTON

1. Prosternal process keeled and elevated to, or above, the apices of the anterior coxae; ventral surface of body without a waxy exudate, except in rare cases and then with only a trace; pronotum almost always broadened at middle, but when not, the anterior angles not lobed .... *Enicmus* Thomson

   Prosternal process not keeled as above (see discussion under *Enicmus*); ventral surface of body more or less generally covered with a waxy exudate; pronotum usually narrowed or constricted at or near middle (except in some species of *Lathridius* Herbst) 2

2. Humerus of 7th elytral interval more or less prominent; pronotal costae usually complete, prominent and more or less carinate; body usually definitely ovate 5

   Humerus of 7th elytral interval weak or absent; pronotal costae usually not present, but if present evident or carinate only posteriorly; body usually not definitely ovate, sometimes parallel-sided 3

3. Elytra with four rows of punctures in posterior half of space between 7th interval and lateral margin; elytra strongly convex .... *Thes* Semenov

   Elytra with only two rows of punctures in space between 7th interval and lateral margin or with no such defined space; elytra weakly convex or depressed 4

4. Eyes usually small with few facets, but if with many, the facets are prominent; form slender, depressed, rarely exceeding 1.5 mm. in length; elytra parallel-sided; scutellum usually not evident .... *Microgramme* Walkley

   Eyes normal in size and appearance; form ovate, weakly convex, more than 1.5 mm. in length (*crenatus* Lec. is sometimes less than 1.5 mm.); elytra not parallel-sided; scutellum evident .... *Lathridius* Herbst

5. Epimera not separated posteriorly by the prosternal process and coalescent along median line; lateral margins of prothorax not deeply incised .... *Stephostethus* LeConte

   Epimera completely separated by the prosternal process; lateral margins of prothorax deeply incised 6

6. Antennal segments 3 to 8 little or barely longer than broad; antennal club 2-segmented; tempora parallel and appearing at least as long as the eyes .... *Cartodere* Thomson

   Antennal segments 3 to 8 much longer than broad; antennal club 3-segmented; tempora somewhat convergent and never appearing as long as the eyes .... *Aridius* Motschulsky

Genus **Enicmus** Thomson

Enicmus Thomson, 1859. Skand. Coleopt., t. 1, p. 93. Thomson, 1863. Skand. Coleopt., t. 5, p. 223.—Reitter, 1875. Ent. Zeit. Stettin, j. 36, pp. 325-333.—LeConte, 1878. *In* Hubbard and Schwartz, The Coleopt. of Mich., p. 600.—Belon, 1897. Rev. d'Ent. (Caen), t. 16, pp. 114, 131-135. Belon, 1897. Ann. Soc. Linn. de Lyon, v. 26, pp. 320-322.—Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 121-135.

Genotype: (*Ips transversa* Olivier) = *Enicmus transversus* (Olivier). Monobasic and original designation.

Thomson characterized his genus as follows [translation]: Antenna shorter than thorax, inserted well before the eyes, their sulci deep; thorax narrower at apex, base strongly, transversely impressed; head narrower than thorax; eyes large, prominent.

While all these characters apply to this genus, they also apply to *Lathridius* Herbst. The distance of the antennae from the eyes is of no generic value, but the length of the antennae in comparison with that of the thorax is of some generic significance. In this genus they seldom reach the hind margins of the pronotum.

Superficially *Enicmus* Thomson seems very close to *Lathridius* Herbst (= *Conithassa* Thoms.) and indeed *Conithassa* has previously been considered a synonym of it. Actually the relationship is remote. The elevation of the prosternal process upon which the supposed similarity was based is structural in *Enicmus*, but in *Lathridius* it is merely a waxy exudate which may easily be removed with amyl acetate and a needle. I have never found this exudate in any noticeably concentrated amount on species of *Enicmus*. Biologically speaking, too, the two genera are quite distinct (see discussion under *Lathridius* Herbst).

The pronotum in *Enicmus* tends to broaden at, or near, the middle, and has the anterior angles lobed; where it does not broaden at, or near, the middle (as in the genotype *E. transversus*) the anterior angles are *not* lobed. In species of *Lathridius* the pronotum tends to narrow at or near the middle, and has the anterior angles lobed. In species of *Enicmus* no pronotal costae are present.

The punctation of the head and thorax of *Enicmus* species is finer than that of *Lathridius* species.

I have seen specimens of the following North American species, and consider them correctly placed in this genus: *Enicmus tenuicornis* (Lec.); *E. mendax* Fall; *E. aterrimus* Motsch.; *E. nitens* Fall (new status); *E. maculatus* (Lec.); *E. fictus* Fall; *E. crassipunctatus* Fall; *E. minus* Fall; *E. cordatus* Bel.; *E. sulcatulus* Fall.

Enicmus ventralis Fall was incorrectly placed in this genus. It belongs in *Lathridius* since the elevation of the prosternal process in this species is not structural.

Key to Washington State Species of Enicmus

1. Head with median sulcus 2
   Head without median sulcus; lateral margins of pronotum and elytra broad and somewhat reflexed; postcoxal foveae of middle coxae large, broad, extending almost to lateral margins of abdomen .... *cordatus* Belon
2. Lateral margins of pronotum not much widened, if at all, at or near middle, postcoxal foveae of middle coxae small, deep, and round; elytral intervals not wider than the punctures .... *fictus* Fall
   Lateral margins of pronotum conspicuously widened at or near middle; postcoxal foveae of middle coxae deep anteriorly and half-moon shaped; elytral intervals wider than the punctures .... *tenuicornis* (LeConte)

Enicmus cordatus Belon

Enicmus cordatus Belon, 1895. Ann. Soc. Ent. Belg., v. 39, pp. 91, 95.

This is a pretty, little beetle of uniform reddish brown. The broadly explanate margins of the heart-shaped thorax and of the elytra, together with the lack of any kind of impression on the head, and the large postcoxal foveae of middle coxae with many longitudinal rugae help to distinguish this species.

Distribution.—British Columbia to Oregon. Washington: Seattle; taken by the late Ernst C. Angst with the slime-mold, *Stemonitis.*

Enicmus fictus Fall

Enicmus fictus Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 124, 131, pl. 4, fig. 24.

This species very closely resembles the genotype, *Enicmus transversus* (Oliv.), in general habitus, but the latter is a little more slender and the club of the antenna not so abruptly formed. According to a Reitter-determined specimen I have before me *E. transversus* differs further by having on the first ventral segment a very low carina (Fall spoke of this as an "impressed line" and there is an impression along part of the carina) running obliquely back from the inner margin of each coxal cavity for more than half the length of the segment and met or apparently met by a carina arising from the opposite side of the coxa and setting off a triangular area.

Distribution.—Montana, Colorado, Washington to California. Washington: Davenport, Grand Coulee, Kahlotus, Seattle.

Enicmus tenuicornis (LeConte)

Lathridius tenuicornis LeConte, 1878. *In* Hubbard and Schwarz, Proc. Amer. Philos. Soc., v. 17, p. 601.

Lathridius laticollis LeConte, 1878. *In* Hubbard and Schwarz, Proc. Amer. Philos. Soc., v. 17, p. 601.

Enicmus tenuicornis (LeConte); Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 124, 134.

The presence of a median sulcus on the head, weak though it is, immediately separates this species from *E. cordatus* which it most closely resembles.

Another character which separates *E. tenuicornis* from both *E. cordatus* and *E. fictus* is the presence of merging foveae between and behind the middle coxae. A third character is the presence of a rather deep transverse impression behind each posterior coxa. *E. cordatus* and *E. fictus* have only a suggestion of such an impression.

Distribution.—New York, Michigan, Washington, Oregon, Arizona, California. Washington: Seattle.

Genus **Thes** Semenov

Lar Semenov, 1904. Rev. Russe d'Ent., v. 4, p. 314. Preoccupied.
Thes Semenov, 1909. Rev. Russe d'Ent., v. 9, p. 434. New name.
Genotype: *Lathridius bergrothi* Reitter, 1880. Autobasic.

This genus is treated here because either of the two included species might well be found in Washington. The type of the genus, *Thes bergrothi* (Reitt.), has been taken in several port cities on the eastern coast of the United States in various imported materials. *Thes laeviventris* (Fall),[2] n. comb., was described from a single specimen taken in Astoria, Oreg. The characters in the key to genera will serve to identify this genus.

Key to Included Species of Thes

Elytral intervals 3, 5, 7 strongly elevated with 5 and 7 carinate their entire lengths; about 2 mm. long........*bergrothi* (Reitter)
Elytral intervals 3, 5 not strongly elevated, only the 7th elevated and carinate its entire length; less than 1.5 mm. long....*laeviventris* (Fall)

Genus **Microgramme** Walkley.

Cartodere Thomson, 1863 (*nec* 1859). Skand. Coleopt., t. 5, p. 219.
Microgramme Walkley, 1948. Proc. Ent. Soc. Wash., v. 50, n. 6, p. 150.
Genotype: *Lathridius filiformis* Gyllenhall. Original designation.

Members of *Microgramme* are recognized principally by their slender usually more or less depressed form rarely exceeding 1.5 mm. in length; distinctly striato-punctate elytra with the punctures larger than the intervals (there are 6 to 8 rows of punctures); the small eyes which in some species consist of only five or six facets; and the lack of any costae on the prothorax.

This distinctive genus represented in the State of Washington by two species: *Microgramme arga* (Reitter) and *M. filum* (Aubé).

Key to Washington State Species of Microgramme

Antennal club 2-segmented; head with median sulcus broadening posteriorly ....*filum* (Aubé)
Antennal club 3-segmented; head without median sulcus....*arga* (Reitter)

Microgramme filum (Aubé), new combination

Cartodere filum Aubé, 1850 Ann. Soc. Ent. France, v. 8, n. 2, p. 334.

Microgramme filum varies in size from 1.2 mm. to 1.6 mm. and, in addition to the characters in the key, may be further distinguished by the large-faceted eyes situated at the hind angles of the head and only a little darker in color than the body; the elytra, each with seven rows

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[2]See discussion under genus *Lathridius* below.

of punctures, the punctures larger than the intervals; rather deep discal fovea of pronotum; and on the metasternum a more or less cordate disc set off by deep furrows.

Distribution.—New York, Canada, Colorado, Washington. Washington: Seattle: with *Microgramme arga* (Reitt.) in herbarium sheets in the Botany Department, University of Washington.

Microgramme arga (Reitter), new combination

Cartodere argus Reitter, 1884. Wein. Ent. Zeit., v. 3, p. 35.

This species is superficially similar to *Microgramme filum* (Aubé). In addition to the characters in the key *M. arga* differs further from *M. filum* by having eight rows of elytral punctures with the seventh interval carinate, and having no fovea on the disc of the pronotum.

Distribution.—Europe, Africa, Mexico; Michigan, Kentucky, Indiana, Montana, Washington to California. Washington: Seattle. Reported as infesting an apartment house in October 1928, and again from a house in January 1932; in March 1934, in herbarium sheets in the Botany Department of the University of Washington. A similar infestation of a building in Covington, Ky., was reported by Drury (1910, Jour. Cincinnati Soc. Nat. Hist., v. 21, p. 63). In this instance the beetles had apparently come from a nearby drugstore where they were found in a package of Solomon's Seal.

Genus **Lathridius** Herbst (nec auct.)

Latridius Herbst, 1793. *In* Jablonsky, Nat. Ins. Käfer, b. 5, pp. [3], 10.
Lathridius Illiger, 1801. Mag. für Insektenk., v. 1, p. 140. Emendation.
Conithassa Thomson, 1859. Skand. Coleopt., t. 1, p. 93.
Lathridius Herbst; Walkley, 1948. Proc. Ent. Soc. Wash., v. 50, n. 6, p. 149.

Genotype: (*Latridius porcatus* Herbst, 1793) = *Lathridius minutus* (L.), 1767. Designated by Latreille, 1810.

This genus, which has been wrongly interpreted for more than one hundred years due to acceptance of an incorrect genotype designation (see Walkley, 1948), is more closely related to *Stephostethus* LeConte than to *Enicmus* Thomson. The presence of the heavy waxy exudate on species in these genera is evidently of biological significance. Where the life history is known (Hinton, 1945, Beetles Associated with Stored Products, v. 1, pp. 135-143) it has been found that members of this genus are often associated with molds in stored foods, on leather, and various other materials; an association which gives them economic importance. No such indoor association has been found in the case of the true *Enicmus* unless we accept a record of *Enicmus histrio* Joy and

Tomlin in bulk wheat in Australia (Munro, 1940, Dept. Sci. Indus. Res. London, pp. 24-25) which might well have been based on a misidentification.

Lathridius differs in habitus from *Stephostethus* in its smaller size, less convex elytra and proportionately wider thorax. In these characters it resembles *Enicmus* Thomson. Unlike *Enicmus*, it usually has pronotal costae crossing the transverse impression and the apices of the elytra are generally more narrowly rounded. *Lathridius* also has the head and pronotum coarsely, rugosely punctate while in *Enicmus* the punctation is finer, and much less rugose. The antennae usually reach the hind margins of the pronotum, or nearly reach it.

The following species, recorded from North America and which I have seen, belong here: *Lathridius minutus* (L.); *L. desertus* (Fall), n. comb.; *L. protensicollis* Mannh.; *L. consimilis* Mannh.; *L. hirtus* Gyll.; *L. ventralis* (Fall), n. comb.; *L. nigritus* (Fall), n. comb.; and *L. crenatus* Lec. The Fall species listed here were originally described in the genus *Enicmus*. *Enicmus* (*Conithassa*) *laeviventris* Fall does not belong here, but in the genus *Thes* Semenov.

KEY TO WASHINGTON STATE SPECIES OF LATHRIDIUS

1. Elytral punctures very coarse and somewhat irregular, distinctly wider than intervals, antennae never reaching hind angles of pronotum .... *crenatus* LeConte
   Elytral punctures finer, not wider than intervals, antennae reaching hind angles of pronotum 2
2. Pronotum with anterior angles lobed and lateral margins converging posteriorly .... *minutus* (Linnaeus)
   Pronotum with anterior angles lobed but with lateral margins more or less parallel 3
3. Second tarsal segment not longer than first .... *nigritus* (Fall)
   Second tarsal segment about half again as long as first .... *protensicollis* Mannerheim

Lathridius crenatus LeConte

Lathridius crenatus LeConte, 1855. Proc. Acad. Sci. Phila., v. 7, p. 304.

This tiny beetle does not seem to fit exactly in any genus, but seems best placed in *Lathridius*. Once known it is easily recognized thereafter. The short antennae, large punctures placed in irregular rows, rather small eyes, small size and more rounded form readily identify it. The sexes may be distinguished by the presence of long narrow spines on the inner side of apices of tibiae of male.

Distribution.—Texas, Utah, California, Washington. Washington: Ellensburg, Evans Creek (King Co.), Port Townsend, Seattle, Stehekin, Whidby Is.

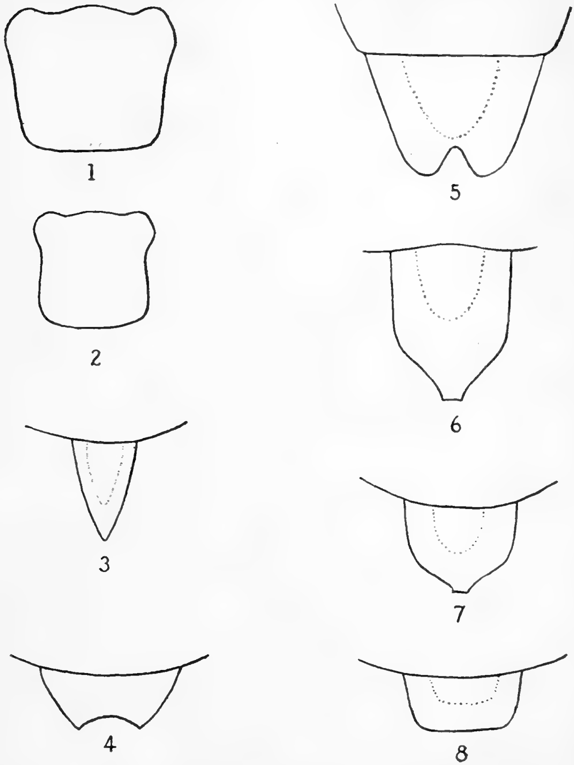


Fig. 1, Pronotum of *Lathridius minutus* (L.), 40X; fig. 2, Pronotum of *Lathridius protensicollis* Mannh., 40X; fig. 3, Ventral view of parameral plate of *Stephostethus costicollis* (Lec.), 75X; fig. 4, Ventral view of parameral plate of *Stephostethus liratus* (Lec.), 75X; fig. 5, Dorsal view of parameral plate of *Stephostethus bilobatus*, n. sp., 75X; fig. 6, Ventral view of parameral plate of *Stephostethus lardarius* (Deg.), 75X; fig. 7, Ventral view of parameral plate of *Stephostethus cinnamopterus* (Mannh.), 75X; fig. 8, Ventral view of parameral plate of *Stephostethus montanus* (Fall), 75X.

Lathridius minutus (Linnaeus)
Fig. 1

Tenebrio minutus Linnaeus, 1767. System. Nat., Ed. 12, p. 675.
Latridius porcatus Herbst, 1793. *In* Jablonsky, Nat. Ins. Käfer, b. 5, p. 6.

This species, known the world over, is a most variable one. The variations may be of color, extent of carination of intervals 3, 5, and 7 of elytra, punctation, and shape and degree of convergence of margins of thorax. Because of this great variability many synonyms have been made. However, since types were not available, only one synonym is given here and that because it is the genotype. The important characters for distinguishing this species are the lobed anterior angles of the pronotum and the convergence of the side margins, the degree of which may vary, fig. 1. A specimen from Kahlotus, Wash., which is almost black in color, differs quite markedly from most specimens of *minutus* (L.) I have seen. The punctation of the elytra is much finer, with the intervals much wider in proportion.

Distribution.—Cosmopolitan; in North America from Alaska and Labrador to Louisiana, Texas and California. Washington: Kahlotus, Moclips, Pullman, Pleasant View (Walla Walla Co.).

Lathridius nigritus (Fall), new combination

Enicmus (Conithassa) nigritus Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 123, 126.

Lathridius nigritus resembles *L. minutus* (L.) in general habitus but differs in the shape of the pronotum, the margins of which do not converge posteriorly but are parallel, and the anterior angles of which are only weakly lobed. In *nigritus*, the punctation of the metasternum and first ventral abdominal segment is of the same size and density, while in *minutus* that of the first ventral abdominal segment is finer than that of the metasternum; and the tempora are shorter than are those of *minutus*. The only specimen in the Fall collection recorded from Washington is minus the head and thorax.

Distribution.—California (Los Gatos). Washington: Tenino.

Lathridius protensicollis Mannerheim
Fig. 2

Latridius protensicollis Mannerheim, 1843. Bul. Moscou, v. 16, p. 299
Ladridius [!] *quadricollis* Mannerheim, 1843. Bul. Moscou, v. 16, p. 299.
Lathridius sobrinus Mannerheim, 1852. Bul. Moscou, v. 25, p. 362.
Enicmus (Conithassa) suspectus Fall, 1899. Trans. Amer. Ent. Soc. v. 26, pp. 123, 125. New synonymy.

Head rugosely punctate, about as wide as long with median sulcus widening at base; hind angles obtuse; tempora at least half as long as the eyes and divergent; eyes prominent; antennae reaching the hind angles of the prothorax; antennal club 3-segmented, the tenth segment about as long as wide, the eleventh about three-fourths as long as the ninth and tenth segments together.

Anterior angles of thorax lobed; thorax widest at these angles and narrowest just behind the lobes or just before the middle, with side margins more or less parallel behind the lobes, fig. 2; a narrow median impression extending the length of the thorax; two costae usually cutting the posterior transverse impression.

Elytra elongate, ovate, with subbasal impression which is sometimes darkened; apices narrowly rounded; third, fifth, and seventh elytral intervals usually more convex than others, the sixth often becoming convex posteriorly; the seventh usually carinate to beyond the basal half and the fifth often costate its full length; punctures wider than the intervals basally but quickly becoming finer apically where the intervals are wider than the punctures. In some specimens none of the intervals are costate or carinate.

Epimera completely separated by the prosternal process.

Metasternum rugosely punctate; middle coxae separated by an excavation more than half the coxal width; the small, deep, and sometimes margined post-coxal foveae with radiating rugae, the longitudinal ones extending the full length of the metasternum; first ventral segment with longitudinal rugae extending its full length; next three segments subimpunctate and subequal in length; the apical or last segment somewhat longer.

The male differs from the female in having arcuate tibiae.

Resembles *Lathridius minutus* (L.), but differs by having a less transverse pronotum with parallel sides and smaller anterior lobes, and more narrowly rounded elytral apices. The tarsal character mentioned in the key readily separates *L. protensicollis* from *L. nigritus* (Fall).

H. C. Fall, when he described *Enicmus suspectus*, stated, "It may possibly be only a geographical race of *protensicollis*." More material, of wider distribution, definitely shows there are no constant characters for separating *suspectus* and *protensicollis* so they must be considered the same.

Length: 1.77 mm. to 2.5 mm.

Distribution.—Alaska, Washington, Oregon, California, Utah. Washington: Metalline Falls, from bark of Douglas fir at an elevation of 2600 ft., collected by W. D. Bedard, Aug. 10, 1933.

Genus **Stephostethus** LeConte

Stephostethus LeConte, 1878. Proc. Amer. Philos. Soc., v. 17, p. 601.—Walkley, 1948. Proc. Ent. Soc. Wash., v. 50, n. 6, p. 150.
Lathridius auct. *nec* Herbst.

Genotype: *Lathridius liratus* LeConte. Monobasic.

The character by which members of this genus may be readily distinguished from those of *Lathridius* Herbst, *Cartodere* Thomson, and *Aridius* Motschulsky, is the coalescence of the epimera on the median line. However, the extent of coalescence varies in the different species and even varies within the species. In the other genera mentioned above the prosternal process completely separates the epimera.

All the species appear to have a pronotum longer than wide, but measurement shows that the opposite is usually true. The parameral plate referred to in the key and descriptions is a term I have chosen for the fused lateral lobes or parameres of the male genitalia (teste R. E. Snodgrass). It is usually visible in the males and is an excellent character for separating the species in this genus quickly and easily.

A key to the Washington State species follows. Two species not yet found in Washington are included. *Stephostethus lardarius* (Deg.) is included and may ultimately be found in Washington (see later discussion in paper). *Stephostethus costicollis* (Lec.) is also included since specimens have been found in California, British Columbia, and Alaska.

Key to Washington State Species of Stephostethus

1. Pronotum definitely constricted behind the middle, and at its constriction always definitely narrower than the pronotum is long (*liratus* group) 2
   Pronotum only slightly constricted before, or at, never behind, the middle, or almost parallel, and at its constriction nearly as wide as, or wider than, pronotum is long (*lardarius* group) 3
2. Costae of pronotum always complete; length of tempora less than half as long as the width of eye; parameral plate of male emarginate (see fig. 4) .... *liratus* (LeConte)
   Costae of pronotum usually incomplete anteriorly; tempora about two-thirds to three-quarters as long as width of eye; parameral plate of male narrowly conical, acute at apex (see fig. 3) .... *costicollis* (LeConte)
3. Tempora about as long as width of eyes (dorsal view); parameral plate of male bilobed (see fig. 5) .... *bilobatus*, n. sp.
   Tempora not more than two-thirds length of width of eyes; parameral plate of male not bilobed 4
4. Eyes prominent, protruding laterally a distance almost equal to their width (or at least three-fourths their width); tempora about two-thirds as long as width of eyes and slightly convergent; parameral plate of male truncate (see fig. 8) .... *montanus* (Fall)
   Eyes protruding a distance not more than two-thirds their width; tempora never more than, and usually less than, one-half as long

as width of eyes and parallel; parameral plate of male rounded and terminating in a nipple 5

5. Minimum length 2.5 mm.; apices of elytra produced; parameral plate of male narrowly rounded and terminating in a nipple (see fig. 6) .... *lardarius* (Degeer)
   Maximum length 2.45 mm.; apices of elytra less produced than in *lardarius;* parameral plate of male broadly rounded and terminating in a nipple (see fig. 7) .... *cinnamopterus* (Mannerheim)

Stephostethus liratus (LeConte)

Fig. 4

Lathridius liratus LeConte, 1863. Smithsonian Miscellaneous Collections 167:72.

Stephostethus liratus (LeConte); LeConte, 1878. Proc. Amer. Philos. Soc., v. 17, p. 601.

Lathridius costicollis Fall (*nec* LeConte), 1899. Trans. Amer. Ent. Soc., v. 26, pp. 117, 118. Misidentification.

Lathridius carinifer Fall, 1926. The Pan-Pacific Ent., v. 2, n. 4, p. 197. New synonymy.

The new synonymy recorded here is based upon two facts: (1) The parameral plates of the males of *carinifer* (Fall) and of *liratus* (Lec.) are alike; (2) the carination of the seventh elytral interval (upon which character the two species were originally separated) varies from no carination to almost complete carination of the interval with no stage at which a division into two species or subspecies can be made.

The coalescence of the epimera along the median line reaches its greatest length in this species but varies considerably within the species because of the varying amounts of waxy exudate on the prosternal process. Even with the removal of the wax there is still some variation. However, it is a good character to further aid recognition of the species.

I might say here that in identifying members of the tribe Lathridiini removal of the waxy exudate on at least one side of the beetle is necessary for accurate identification of species in many of the genera.

Distribution.—Maine and Ontario to Texas, west to Alaska, British Columbia and California. Washington: Seattle, Snoqualmie, Fall City, Cedar Mt. (King Co.), Sultan, Mercer Is., Bay Center, Kirkland, Manchester, Pullman, Tenino.

Stephostethus costicollis (LeConte), new combination

Fig. 3

Lathridius costicollis LeConte, 1855. Proc. Acad. Nat. Sci. Phila., v. 7, p. 303.

Lathridius armatulus Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 116, 118.

The type series, in the LeConte Collection at the Museum of Comparative Zoology, Harvard University, is a mixed series. The specimen with a type label and No. 6996 on it is *S. costicollis* and is here designated as lectotype. It is a male. The five specimens on a card on one pin are *S. montanus* (Fall). Another specimen on a point with the pin carrying only a gold disc and no other label is *S. liratus* (Lec.).

In addition to the key characters, *S. costicollis* may be further distinguished from *S. liratus*, which it most closely resembles, by the narrower and deeper basal elytral foveae; the third antennal segment which is distinctly longer than the second (in *S. liratus* the third segment is shorter than the second); and in the male the presence of a spine on the inner side of the base of each of the anterior femora, and a spine on the inner side of the apex of each of the anterior tibiae. The constriction of the side margins of the pronotum varies so within each species that it has no value for separating the two.

Distribution.—California, British Columbia, Alaska.

Stephostethus bilobatus, new species
Fig. 5

Lathridius cinnamopterus Mannerheim; Fall, 1926. Pan-Pacific Ent., v. 2, n. 4, p. 197 (in part).

H. C. Fall misdetermined the above species as *Lathridius cinnamopterus* Mannh. He considered them conspecific with specimens collected at Anchorage and Fort Yukon, Alaska (treated as *cinnamopterus* in this paper), and with his *montanus*. Examination of his specimens revealed that three species were confused and considered as one. In order to clear up this confusion *S. bilobatus* is described here even though it has not been found in the State of Washington.

The characters in the key identify this new species very quickly, but care must be taken as the species of the *lardarius* group are very similar and have usually been confused in the past. *S. bilobatus* may be further distinguished by the more definite constriction of the pronotum, the more coarsely, rugosely punctured head and thorax, the more ovate elytra, and the more strongly elevated third elytral interval. External sex characters for distinguishing the male are a sharp tooth at the base of the anterior femur, a broader tooth on the inner face of the anterior tibia near the apex, a small tooth on the inner face near the apex of the middle tibia, and a broad tooth on the inner face of the posterior tibia somewhat below the apex.

Distribution.—California: Eureka and Little River, Humboldt Co.; San Francisco Co.

Type locality.—Eureka, Calif.

Type.—U. S. N. M. no. 61309.

Described from 25 specimens, including both males and females, collected by H. S. Barber at Eureka, Calif., in 1903, seven on May 22, twelve on May 24, one on June 4, and five (one the holotype ♂) on June 7. Holotype male and 20 paratypes in U. S. National Museum Collection; three paratypes in M. H. Hatch Collection, University of Washington; one paratype in British Museum (Natural History), London; three paratypes in Fall Collection, Museum of Comparative Zoology, Harvard University, Cambridge, Mass.

Stephostethus montanus (Fall), new combination
Fig. 8

Lathridius montanus Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 117, 118. Fall, 1926. Pan-Pacific Ent., v. 2, n. 4, p. 197 (in part).

Lathridius laevior Brown, 1932. Canad. Ent., v. 64, n. 9, p. 208. New synonymy.

The male holotypes of *montanus* and *laevior* were examined. The parameral plates are alike. Each is truncate at the apex and somewhat convex dorsally (see fig. 8). The differences are minor and the variation merely what may be expected in the group.

This species is very similar to *S. cinnamopterus* (Mannh.) and, in addition to characters in the key, differs as follows: The elytra are less ovate at the sides, the insect as a whole a little more slender; the elytral humeri are less prominent; and, while each species has a median impressed line beginning at the posterior margin of the metasternum and extending about halfway to the anterior margin, the depression caused by the line is deepest at the anterior end in *montanus* and at the posterior end in *cinnamopterus*.

The male may be further distinguished from the female by the presence of a sharp tooth at the base of each anterior femur and a small sharp tooth on the inner face near the apex of each anterior tibia.

Length: 2.07 mm. to 2.15 mm. (Only four specimens were available for measuring.)

Distribution.—Colorado: Leavenworth Valley; Canada: Bradore Bay, Quebec; Churchill, Manitoba.

Stephostethus lardarius (Degeer), new combination
Fig. 6

Tenebrio lardarius Degeer, 1775. Mém. Ins., b. V. p. 45.

Lathridius lardarius (Degeer); Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 116, 117.

I have examined the female type specimen which René Malaise so kindly lent for that purpose. Other male and female European specimens determined as *lardarius* have also been studied. I am not at all certain that the Queen Charlotte Island, British Columbia, specimens which Fall determined as *lardarius* are this species. Either they are smaller than usual specimens of *S. lardarius* or larger than usual specimens of *S. cinnamopterus* (Mannh.), apparently the latter, as the parameral plate is more broadly rounded. However, *S. lardarius* is included in this paper in the hope that further records for both species in North America will clarify the status of the two. A female specimen from St. John's, Newfoundland, sent me by W. J. Brown and determined by him as *lardarius*, is, in my opinion, that species.

Although they are treated here as two distinct species it is possible that *cinnamopterus* is only a subspecies of *lardarius.*

There are no characters that I have found, other than those given in the key, that will separate the two.

External sex characters are the same as those of *S. cinnamopterus.*

The specimens of *S. lardarius* measured vary in length from 2.57+ mm. to 2.85 mm. The length of the type was 2.75 mm.

Stephostethus cinnamopterus (Mannerheim), new combination
Fig. 7

Lathridius cinnamopterus Mannerheim, 1853. Bul. Moscou, v. 24, p. 213.
Lathridius cinnamopterus Mannerheim; Fall, 1926. Pan-Pacific Ent., v. 2, n. 4, p. 197 (in part).

This pretty species, first collected by Dr. Hatch in and near Seattle, was thought to be new. However, upon examination of the type of *Stephostethus montanus* (Fall) and the specimens collected in Alaska, which Fall considered *cinnamopterus* Mannh. and synonymous with his *montanus,* it was discovered that the Seattle and Alaska specimens were conspecific while Fall's *montanus* was distinct. Specimens from Eureka, Calif., which Fall also considered *cinnamopterus* Mannh., are a distinct new species. A redescription of *cinnamopterus* follows.

Head about as broad as long, densely punctate with median sulcus more or less evident; hind angles of head toothed; eyes large, finely faceted; distance between eyes from three and a half to four times the width of eye, with a depression median to the length of the eyes; tempora less than one-half length of eyes; third antennal segment longer than second and not shorter than fourth.

Thorax as broad as long, with pronotum strongly punctate and feebly constricted before the middle, the side margins diverging slightly anteriorly; margins carinate; the two pronotal costae forming a longitudinal, elongate horseshoe cutting the transverse anterior and posterior impressions, the posterior transverse impression being deeper near the margins and the anterior one deeper in the center but with the anterior transverse impression at no place being so deep as the posterior transverse impression; anterior lobes more or less roundly triangular.

Elytra, at their widest part just below the middle, nearly twice the width of the pronotum and produced apically but not so strongly as in *S. lardarius;* seventh elytral interval not carinate except at its humeral base; elytral margins somewhat flat and broadened near the center with such flattening and broadening disappearing apically; apical half of elytra more cone-shaped than in *S. liratus* (Lec.). The parameral plate of the male broadly rounded and nippled (see fig. 7).

Male external sex characters are a sharp tooth or spine at the base of each anterior femur and another less prominent tooth on the inner face of each anterior tibia near the apex.

S. cinnamopterus closely resembles *S. montanus* (Fall), and characters for separating the two are given under the latter species.

From *S. bilobatus*, n. sp., *cinnamopterus* may be distinguished by the much shorter tempora and the less evident constriction of the prothorax.

Length 2 mm. to 2.43 mm. The five Queen Charlotte Island, British Columbia, specimens are from 2.45 to 2.49 mm. in length.

Distribution.—Alaska, British Columbia, Washington, Oregon. Washington: Duval; Gilberton; Mora; Mt. Rainier; Piper's Creek, King Co.; Seattle; Sultan.

Genus **Cartodere** Thomson

Cartodere Thomson, 1859 (*nec* 1863). Skand. Coleopt., t. 1, p. 93.

Coninomus Thomson, 1863. Skand. Coleopt., t. 5, p. 217.

Cartodere Thomson; Walkley, 1948. Proc. Ent. Soc. Wash., v. 50, n. 6, p. 150.

Genotype: *Latridius constrictus* Gyllenhall. Monobasic and original designation.

The name *Cartodere* has heretofore been used in the sense of Thomson, 1863, but the name was, of course, preoccupied by Thomson, 1859. The genus is used here in the sense of Thomson, 1859.

Only one species of this genus is found in North America, and that is the genotype, *Cartodere constricta* (Gyll.). The characters in the generic key serve to identify the genus. Fall considered *Aridius australicus* (Belon) and *A. nodifer* (Westw.) as belonging in *Coninomus* Thoms., but if they are to be considered congeneric with *constricta* then certainly everything in the genera *Stephostethus, Thes, Cartodere* and *Lathridius* as treated here would also have to be considered as belonging to the same genus. It seems to the writer that such lumping would not clarify the classification without the use of subgenera which in turn only makes for more cumbersome nomenclature.

Cartodere constricta (Gyllenhall)

Latridius constrictus Gyllenhall, 1827. Insecta Suecica, t. 1, pars 4, p. 138.

Cartodere constricta (Gyllenhall); Thomson, 1859. Skand. Coleopt., t. 1, p. 93.

Coninomus constrictus (Gyllenhall); Thomson, 1863. Skand. Coleopt., t. 5, p. 218.

Coninomus sculptilis LeConte, 1855 (*nec Latridius sculptilis* Gyll., 1827). Proc. Acad. Nat. Sci. Phila., v. 7, p. 303.

This small species is quickly recognized by the short antenna with 2-segmented club, the antennae reaching not more than halfway to the posterior angles of the pronotum which has deeply incised sides. Other characters are the long tempora which are at least two-thirds as long as the width of the eyes, the more elongate head, and the rugose punctation of head and pronotum. Between the carinae on the pronotum is an elongate, triangular fovea. A translucent wax often covers the sides of the prothorax as well as the prosternum. This is the "membrane" to which Fall refers. No external sex characters were found. Length: 1.19 mm. to 1.85 mm.

Distribution.—Cosmopolitan; in North America from Manitoba and Washington to South Carolina, Illinois, Arizona, California, and Mexico. Washington: Bay Center, Seattle.

Genus **Aridius** Motschulsky

Aridius Motschulsky, 1866. Bul. Soc. Imp. Nat. Moscou, t. 39, 2nd pt., p. 260.

Aridionomus Reitter, 1911. Fauna Germanica, b. 3, pp. 18, 82. Proposed as a subgenus of *Lathridius* Herbst.

Coninomus Thomson; Fall, 1899 (in part). Trans. Amer. Ent. Soc., v. 26, pp. 119-121.

Aridius Motschulsky; Walkley, 1948. Proc. Ent. Soc. Wash., v. 50, n. 6, p. 150.

Genotype: *Lathridius nodifer* Westwood. Designated by Walkley, 1948.

The two species of this genus found in North America are the genotype, *A. nodifer* (Westw.), and *A. australicus* (Belon).

Motschulsky, in his original description, included in this genus species which have since been placed in several other genera. The genus has generally been considered a synonym of (*Coninomus* Thomson) = *Cartodere* Thomson.

In addition to the characters in the generic key, the members of this genus may be distinguished from those of *Cartodere* by the head being broader in relation to its length, by the more prominent humeri, and by the relatively shorter first ventral segment of the abdomen.

The head of *Aridius* species including the eyes is about as wide as, or scarcely narrower than, the widest part of the pronotum exclusive of the waxy border often found present. In *C. constricta* (Gyll.) the head is measurably narrower than the widest part of the pronotum.

Key to North American Species of Aridius

Elytral intervals 3, 5, 7 prominent and undulant, interval 3 ending in a rounded hump .... *nodifer* (Westwood)

Elytral intervals 3, 5, 7 prominent but not undulant, interval 3 not ending in a hump .... *australicus* (Belon)

Aridius nodifer (Westwood)

Lathridius nodifer Westwood, 1839. Introd. Modern Classif. Ins., v. 1, p. 155.

Coninomus nodifer (Westwood); Thomson, 1863, Skand. Coleopt., t. 5, p. 217.

Aridius nodifer (Westwood); Motschulsky, 1866. Bul. Soc. Imp. Nat. Moscou, t. 39, 2nd pt., p. 260.

Coninomus nodifer (Westwood); Fall, 1899. Trans. Amer. Ent. Soc., v. 26, pp. 120, 121.

Lathridius (Aridionomus) nodifer (Westwood); Reitter, 1911. Fauna Germanica, b. 3, p. 82.

This species is easily recognized by the undulation of elytral intervals 3, 5, and 7. This undulation is caused by the basal elytral impression and two additional impressions, one before and one behind the elytral disc.

The male can be distinguished from the female by the presence of two subacute conical tubercules, one on each side of the base of the median impression arising from the posterior margin of the metasternum, by the modification of the hind tibia which expands toward the apex into a large tooth before the apex, and by the enlarged or thickened femora.

Length: 1.5 mm. to 2.28 mm.

Distribution.—Cosmopolitan. Washington: Bay Center; Bellingham; Kirkland; Lake Ballinger, Snohomish Co.; Loveland; Manchester; Nasel River, Pacific Co.; Port Townsend; Seattle; Steele Lake, King Co.

Aridius australicus (Belon), new combination

Coninomus australicus Belon, 1887. Rev. d'Ent. (Caen), v. 6, p. 223.

The broad head, deeply incised pronotum, elytra with intervals 3, 5, 7 prominent, all serve to identify this species. It is easily separated from *Cartodere constricta* (Gyll.), which it superficially resembles, by the shape of the head and tempora, by the longer segments of the antenna and by the 3-segmented antennal club.

The male differs from the female in having two very small tubercles, placed as the much larger ones in *A. nodifer,* one on each side of the base of the median impression of the metasternum, and in having a small tooth at the inner apex of each hind tibia. The femora are somewhat enlarged in the male but the difference is not great enough to be of much use.

Length: 1.7 mm. to 2.07 mm.

Distribution.—Australia; Europe (Portgual, Italy, England); New Jersey (in Quarantine Inspector's office, Hoboken); California.

THREE NEW NEARCTIC SPECIES OF SYSTENUS WITH A DESCRIPTION OF THE IMMATURE STAGES FROM TREE CAVITIES

(Diptera, Dolichopodidae)

By Willis W. Wirth, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

In the course of a general investigation of the dipterous inhabitants of moist tree holes and tree ulcers, I was fortunate in rearing two apparently new species of *Systenus* from tree-hole debris. In an attempt to identify them I came across a third undescribed species which had erroneously been labeled in the National Museum collection as *Systenus americanus* Van Duzee (1914). The latter has been the only known representative of the genus in North America and has been recorded only from North Carolina.

In Europe there are five species of *Systenus,* all of which have been reared from ulcerative sap and decaying wood of common trees. In fact this genus is known almost entirely from reared specimens. The immature stages of *S. adpropinquans* (Loew) have been described by Laboulbène (1873) and Lundbeck (1912) and those of *S. leucurus* (Loew) by Beling (1882).

The study of the immature stages of the Dolichopodidae is of considerable general interest because this family stands with the Empididae at the evolutionary apex of the Brachycera. It is here that morphologists have sought clues to the stages by which the structural organization of the larva of the lower families of Diptera underwent such radical changes which resulted in the peculiar maggot-type larva of the Cyclorrhapha. Unfortunately the immature stages of the Dolichopodidae are very poorly known, and for the most part the published descriptions, including those of *Systenus,* are old.

The general studies on dipterous larvae such as those by Brauer (1883), Meinert (1886), Becker (1910), De Meijere (1916) and Bischoff (1924), some of which included notes on Dolichopodidae, were excellent for their time. However, as indicated by Malloch's (1917) failure to include any important facts on the dolichopodid larvae in his basic classification of dipterous larvae, and the omission of this family in Cook's (1949) series of study forms, more serious work on representative species of Dolichopodidae, such as that of De Leon (1935), is greatly needed. The descriptions and figures of the immature stages of one of the new species of *Systenus* are offered, therefore, in the hope that they will aid and stimulate further comparative studies of the larvae of higher Brachycera and their place in the phylogeny of the Diptera.

Because *Systenus* was omitted from Curran's (1934) keys to the North American genera, I found it difficult to place my material correctly, finally relying on Lundbeck's (1912) Diptera Danica where the genus was excellently treated. *Systenus* is most closely related to *Rhaphium* Meigen. The characters originally given by Loew (1857) when he split *Systenus* from *Rhaphium* still serve well to characterize the genus: (1) antenna with first segment bare, second simple and transverse, third large, longer in the male than in the female, broad at the base, narrowed apically, long pubescent, the arista apical; (2) legs slender, plain in both sexes, with sparse bristles, hind basitarsus bare and about half as long as second segment; (3) last section of fourth vein with more or less flexure, the sixth vein distinct; and (4) male genitalia free and pedunculated.

I am greatly indebted to Fred C. Harmston of Salt Lake City, Utah, for his kindness in reading over my manuscript and in making available several specimens of *Systenus albimanus* for inclusion in my type series.

Key to the North American Species of Systenus

1. Palpus and upper orbital cilia pale yellowish or white; all legs pale 2
   Palpus and upper orbital cilia black; at least hind leg dark 3
2. Antenna entirely brownish black; mid tibia with two bristles at basal fourth only, none at middle; male with apex of wing white with a prominent, subapical, black spot between third and fourth veins .... *apicalis,* new species
   Antenna yellowish at base to middle of third segment; mid tibia with one bristle at middle in addition to the two at basal fourth; male wing without black or white markings .... *shannoni,* new species
3. All legs mainly black; bristle on outer side of hind coxa white; fore femur with fringe of long white hairs on lower outer edge .... *americanus* Van Duzee
   Hind leg only with black markings; bristle on outer side of hind coxa black; fore femur without long hairs .... *albimanus,* new species

Systenus apicalis, new species

Fig. 1

Male.—Length about 3 mm., wing 3 mm. by 1.2 mm.

Head black, frons and face with metallic-blue reflections overlaid with course gray pollen. Eyes finely pubescent. Face as broad as first antennal segment, upper two-thirds concave, lower third with a vertical carina narrowly shining in middle. Palpus yellow, short and broad with fine, black setae and long, apical, black bristle. Antenna (fig. 1b) brownish black, third segment finely pubescent, length two-thirds that of fore tibia; basal half broad, abruptly narrowed midway and distal half very narrow; arista stout, 0.28 as long as third segment. Orbital cilia entirely white.

Thorax metallic green with blue and violet reflections and with coarse grayish pollen; bristles strong and black. Acrostichals biseriate, eight in each series, about a fourth as long as the dorsocentrals. Propleuron with a single, long, bristly, yellow hair.

Legs yellow, mid and hind coxae brownish above; tarsi darker toward apices, fifth segments of fore and hind tarsi black. Coxae with numerous yellow hairs on fore and middle legs; mid coxa with a strong yellow hair on outer side; hind coxa with a single, long, yellow, outer bristle. Distal segments of legs with fine, black setae; fore legs without bristles; mid and hind tibiae each with a pair of anterodorsal and posterodorsal, strong, black bristles at basal fourth and an anterior pair at apex. Apices of hind tibia and basitarsus each with a dense comb of short, flattened, scalelike, black hairs; hind basitarsus half as long as second segment.

Wing (fig. 1a) with extreme apex white, the membrane proximad of this area between third and fourth veins with a quadrate black spot; last section of fourth vein sinuate; crossvein subequal to last section of fifth vein. Calypters, their cilia, and halteres yellow.

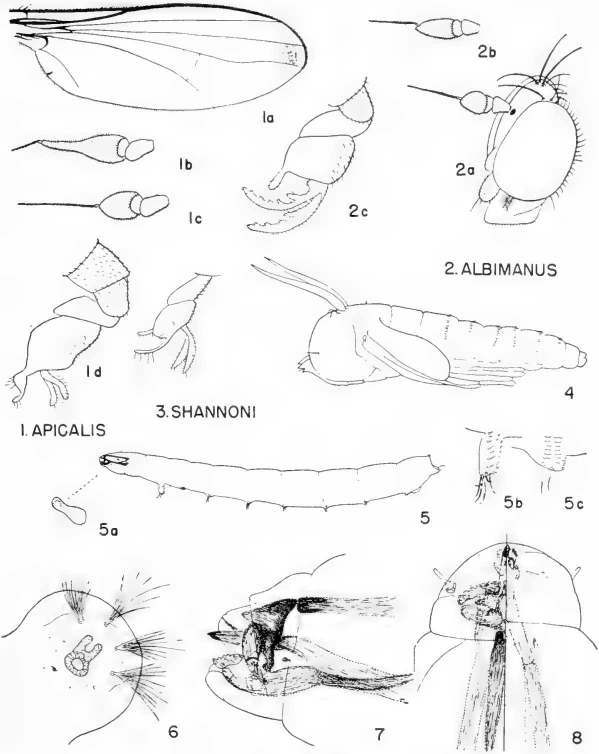
Abdomen metallic, bluish green; hairs strong, hind margin of first apparent tergite with especially strong, black bristles. Genitalia (fig. 1d) pedunculate, color brownish black; outer lamellae of tenth segment fused on basal third, with apices slender and slightly brownish; ventral lobes yellowish brown, stout at bases, apices hooklike and very slender, with a few fine hairs.

Female.—Similar to the male but antenna (fig. 1c) with third segment 1.2 times as long as broad, with subterminal arista about twice as long as segment. Wing without apical black or white spots, the fourth vein more nearly sraight.

Types.—Holotype ♂, allotype, 1 ♀ paratype, Falls Church, Virginia, April 15, 1951, W. W. Wirth, reared from wet debris in hollow of tulip tree, *Liriodendron tulipifera* (type no. 61311, U. S. N. M.). One male paratype, College Park, Maryland, June 16, 1935, C. T. Greene.

Easily recognized by the subapical black spot on the wing of the male, a character shared only by *Systenus scholtzii* (Loew) from Europe, which, however, has the fourth vein strongly curved toward the third at the apex, the palpi darker, the antenna yellowish with the third antennal segment more gradually narrowed, a pair of white hairs on the fore femur below at the base, and, according to Loew, the fifth segments on the fore and hind tarsi are not noticeably black.

Other Diptera which were reared from the same lot of tree-cavity debris at Falls Church were: *Dasyhelea oppressa* Thomsen, *Culicoides borinqueni* Fox and Hoffman and *Culicoides*



4-8. SYSTENUS ALBIMANUS

STRUCTURES OF SYSTENUS

Fig. 1a-d, *apicalis*, a—wing, b—male antenna, c—female antenna, d—male genitalia; fig. 2a-c, *albimanus*, a—head of female, b—male antenna, c—male genitalia; fig. 3, *shannoni*, male genitalia; figs. 4-8, *albimanus*, immature stages: fig. 4—pupa; fig. 5—larva, side view; f; g. 5a—anterior spiracle, enlarged; fig. 5b, pseudopod of third segment, enlarged; fig. 5c—pseudopod of sixth segment, enlarged; f; g. 6—right dorsal lobe of caudal segment of larva, caudal view; fig. 7—details of head of larva, lateral view; fig. 8—details of head of larva, left side dorsal view, right side ventral view.

piliferus Root and Hoffman (Heleidae); *Pachygaster pulcher* Loew (Stratiomyidae); and *Stomosis luteola* Coquillett (Milichiidae) (the last determined by C. W. Sabrosky).

Systenus shannoni, new species

Fig. 3

Male.—Length 2.7 mm., wing 2.5 mm. by 1.0 mm.

Head black; face and frons with dense gray pollen, face narrowest just above mouth with a short, sharp, polished, green, vertical carina at oral margin; palpi yellow including vestiture. Antennae about as figured for *apicalis* (fig. 1b); first, second and broad portion of third segments yellowish, distal parts dark brown. Orbital cilia wholly pale.

Thorax metallic, bluish green, with grayish pollen; bristles black and well-developed as in *apicalis;* propleuron with single pale bristle.

Legs yellow including coxae; fore femur without long hairs; fore tibia and tarsus white with pale setae; fifth tarsal segment brown on all legs. Strong, black bristles on mid and hind tibiae as follows: two on posterior side at basal fourth, a posterodorsal bristle midway and three apical bristles on mid leg; a dorsal series of six the length of hind tibia, and an anterior bristle on basal fifth and one at apex on hind leg. A comb of short, flattened, silvery, scalelike hairs on posterior side at apices of hind tibia and basitarsus; hind basitarsus half as long as second segment.

Wing hyaline, without markings; fourth vein nearly straight, only very slightly approaching third vein toward apex; last section of fifth vein 2.5 times as long as crossvein. Calypters, their cilia, and halteres yellow.

Abdomen metallic greenish, with yellowish hairs, those at apex of first tergite very long. Genitalia (fig. 3) pedunculate; same color as abdomen, outer lamellae of tenth segment pale yellow, fused on basal third, apices bladelike with fringe of very fine pubescence; ventral lobes with two slender unequal arms, the ventral arm three times as long as the other and bearing a sparse comb of about six very long hairs.

Types.—Holotype ♂, Plummer's Island, Maryland, June 8, 1914, Schwarz and Shannon, collectors, at light (type no. 61312, U. S. N. M.). One male paratype, same data except collected by R. C. Shannon, May 9, 1914.

Resembling *apicalis* closely in the shape of the antenna and in the yellowish legs and palpi, but differs in the yellowish base of the antenna, in the possession of a bristle at the middle of the mid tibia, and in the male, by lacking the subapical wing spots.

Systenus albimanus, new species

Fig. 2

Male.—Length 2.7 mm., wing 2.2 mm. by 0.8 mm.

Head black, with dense, grayish-green pollen; palpi black with black bristles. Antenna black, third segment (fig. 2b) triangular, twice as long as broad with long, dense pubescence; arista as long as third segment, coarsely pubescent. Lower orbital cilia pale, the upper half of orbital series black.

Thorax metallic, bluish green, with coarse gray pollen; bristles very strong and black; a single, yellow propleural hair.

Coxae yellow, anterior surface with dense, white hairs on fore leg, sparse, black setae on mid leg; hind coxa with a single, black, outer bristle. Femora without long hairs or bristles; fore tibia and tarsus white with white setae; fore femur and mid leg dusky yellow with black setae. Hind leg brownish black except knee and basal two-thirds of femur yellowish. Mid tibia with a posterodorsal and an anterodorsal, long black bristles at basal fourth, a series of three short bristles on posterior side and three long bristles at apex; hind tibia with a series of three short dorsal bristles and three apicals. Apices of hind tibia and basitarsus each with a conspicuous posterior comb of flattened, scalelike, silvery hairs; hind basitarsus 0.6 times as long as second segment.

Wing brownish hyaline, unmarked; fourth vein nearly straight and parallel to third, last section of fifth vein 2.2 times as long as crossvein. Calypters, their cilia, and halteres yellow.

Abdomen shining bluish green, with strong, black bristles and hairs. Genitalia (fig. 2c) pedunculate, normally at rest within sixth tergite; color brown, outer lamellae of tenth segment bifid, yellowish, the lobes ribbonlike.

Female.—Similar to the male, but the head (figure 2a) with the third antennal segment shorter and rounded; arista over twice as long as segment.

Types.—Holotype ♂, allotype, Falls Church, Virginia, March 25, 1951, W. W. Wirth, reared from moist debris in cavity in a beech tree (Type no. 61313, U. S. N. M.). Paratypes: 1 ♂, same data as type; 1 ♀, same except July 22; 1 ♀, Alexandria, Virginia, May 6, 1951, W. W. Wirth (reared from cavity in beech tree); 3 ♂♂, 2 ♀♀, 2 pupal exuviae, 7 larvae, same data except June 14 and 24; 3 ♂♂, with pupal exuviae, Falls Church, Va., April 19, 1913, C. T. Greene (reared ex *Liriodendron*).

This species resembles *S. americanus* Van Duzee in the black palpi and upper orbital cilia, but *americanus* differs in having all the legs mostly black, the outer bristle on the hind coxa white and a fringe of long, white hairs on the fore femur.

One of the larvae was found with the larval head capsule of a biting midge, *Dasyhelea oppressa* Thomsen, in the mid gut. This heleid, which is extremely common in tree-hole debris, probably forms the principal item of diet of these dolichopodid larvae. Other associates of the Falls Church tree cavity were *Limonia* (*Rhipidia*) *fidelis* (Osten Sacken) (Tipulidae), *Phronia similis* Johannsen (Fungivoridae) (both determined by Alan Stone), *Chyromya flava* (Linnaeus) (Chyromyidae), *Coenosia* (*Neodexiopsis*) *basalis* (Stein) (Muscidae) (both determined by C. W. Sabrosky) and an undetermined, large species of Stratiomyidae which was not reared. Very closely related species inhabit the comparable environment in tree cavities in Britain, where Keilin (1927) recorded *Systenus adpropinquans* Loew and *S. scholtzii* Loew associated with *Phaonia cincta* Zetterstedt and *P. keilini* Collin (Muscidae) and *Rhipidia ctenophora* Loew (Tipulidae).

The Immature Stages of Systenus albimanus

Figs. 4-8

Pupa (fig. 4).—Length, about 3.5 mm. Enclosed in a loose, elliptical, whitish cocoon. Color creamy white, the respiratory organs and spines amber brown. The paired thoracic respiratory organs about half the length of pupa, blade-shaped, arising from dorsal side of cephalothorax near mid-line, each with a tubular basal section about half as long as free portion and extending under integument to the tracheal opening just above base of wing sheath. A pair of small, hemispherical tubercles just anterior to bases of free portions of respiratory organs, and a submedian pair of minute, sharp spines about halfway back on cephalothoracic dorsum. Ventrocephalic mid-line of cephalothorax with a contiguous pair of heavily sclerotized triangular tubercles, each bearing a shorter, spinelike, ventral tooth, and a small bristle-bearing tubercle just ventrolaterad of bases. A more widely separated pair of longer bristles above the bases of the anterior tubercles. Abdominal tergites 2-7 each with a transverse, subapical row of sharp, appressed, brownish spines; first, eighth and ninth segments bare.

Mature larva.—Length, about 7 mm. Color creamy white, only the sclerotized parts of head brown to black. Body (fig. 5) cylindrical, narrowed toward head; head segment very short and unsclerotized externally, internal parts extend past first thoracic segment. Posterior margin of third body segment with a long, thumblike, ventral pseudopod (fig. 5b) bearing several long spines at apex and shorter, retrorse hooks on posterior side; fourth segment with pseudopod reduced; posterior margins of fifth to ninth segments (fig. 5c) with progressively smaller ventral pseudopods, each bearing a median pair of long spines and double lateral rows of low, scalelike hooks; pseudopod between tenth and eleventh segment low and without longer spines; eleventh segment bearing a pair of low, semi-circular, anal lobes near front of ventral surface, flanked on each side by low, spinose warts and further laterad a pair of rosettes of warts. Posterior side of eleventh segment truncated and bearing two pairs of short lobes; the ventral pair longer and angular, each lobe bearing a subapical and a subbasal palmate hair; the short, rounded, dorsal lobes (fig. 6) each bearing a spiracle which is flanked on upper and outer sides by a row of four long, palmate hairs. Anterior spiracles (fig. 5a) borne halfway back on sides of first body segment, with short internal chamber and simple exterior opening, apparently nonfunctional.

Head (figs. 7, 8).—Membranous externally, the labrum with two pairs of minute truncate sensillae on middle of dorsum. Antennae borne laterally, long and peglike, each with two minute conical sensillae at base and an adjacent semicircular sclerotized band with a group of minute conical sensillae. Maxillae marked externally by a flattened, membranous lobe with several subdivisions, none sclerotized, bearing minute conical, truncate and spinose sensillae. Labrum unsclerotized externally, with three pairs of minute truncate sensillae along anterior margin.

Internal sclerites of head consisting of two pairs of long, slender, sclerotized rods, the dorsal or metacephalic rods and the ventral tentorial rods, the more heavily sclerotized anterior ends of which articulate against the posteromedian side and the ventrolateral arms, respectively, of the median, heavily sclerotized, dorsal plate. Mandibles each divided in two sclerites; a smaller, vertical, barlike sclerite with the dorsal end bearing against the ventrolateral arm of the dorsal plate and the ventral end articulating apparently with the sclerotized cardo of the maxilla; the second sclerite of the mandible of the usual sickle-shaped mandibular form with the slender apex directed down and working in a verticolongitudinal plane, and the broad dorsal or proximal end articulating against the dorsolateral surface of the dorsal plate on the lateral side and against the anterodorsal side of the first sclerite on the inner side. Between the bases of the mandibles a triangular, bladelike, median epipharyngeal sclerite projects forward from under the anterior side of the dorsal plate, slightly past the upper lip. Labrum unsclerotized except for a very slender rod extending from base of the epipharynx to the dorsomedian surface of the labrum at the level of the group of four labral sensillae. Ventral side of head with a dorsoventrally flattened, pitted pharyngeal sclerite between the tentorial rods, the posterior end of which curves dorsad to lie between the posterior ends of the metacephalic rods. The salivary duct opens on the mid-line in an unsclerotized area just cephalad of the pharyngeal sclerite. Anterior end of pharyngeal sclerite flanked by a pair of slightly arcuate, barlike, hypopharyngeal sclerites, on the anterodorsal ends of which articulate a submedian, anterior pair of short, four- to six-toothed, labial sclerites.

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PROTHORACIC AORTIC SINUSES IN ANOPHELES, CULEX, AND AEDES

BY JACK COLVARD JONES, *U. S. Public Health Service, National Microbiological Institute, Laboratory of Tropical Diseases, Bethesda, Md.*

In studies on the anatomy and physiology of the cardiac tube ("heart") of the mosquito, *Anopheles quadrimaculatus* Say, a hitherto undescribed structure was observed in its aortic (*i.e.*, thoracic) part in larvae, pupae, and adults.

This structure is a dilatation of the aorta in the dorsal prothoracic region and is termed the *prothoracic aortic sinus.* It is bounded laterally by the compound corpora allata-cardiaca glands and attached to them by connective tissue strands. A single pair of intra-aortic thickenings (valves) occur at the

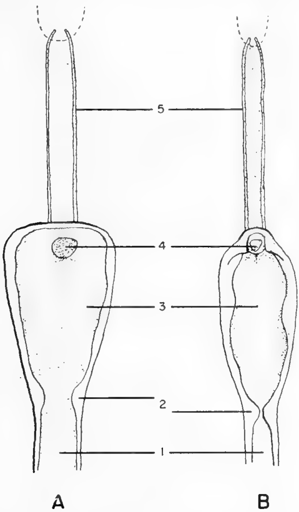


Diagram of structure of prothoracic aortic sinus in first instar *Anopheles quadrimaculatus* Say: A—in diastole, B—in systole; 1—lumen of aorta; 2—intra-aortic thickening (valve); 3—faint outline of corpora allata-cardiaca glands; 4—anterior valve; 5—cervico-cephalic portion of aorta. Magnified about 1500 x. The outline of the underlying portion of the corpora allata-cardiaca glands is shown in the drawing for purposes of orientation.

posterior entrance into the sinus. The sinus opens through a single, anterior, ventrally located valve directly into a narrow cervico-cephalic continuation of the aorta that terminates between the supraesophageal ganglion and the esophagus to which structures it is attached by connective tissue threads. At no point in the aortic portion of the cardiac tube were ostial openings to the hemocoele observed; such openings were seen only in the abdominal part of the cardiac tube.

The structure and operation of the prothoracic aortic sinus can be best observed in living, newly hatched, first instar larvae with an ordinary compound microscope. In older *Anopheles* larvae the details of the sinus tend to be obscured by overlying fat body and pigment cells. The sinus cannot be observed in intact living pupae and adults, but histological preparations (sagittal sections) of these stages show it to be present and fundamentally unmodified. For the most part, however, sectioned material is not suitable for demonstration of the prothoracic sinus.

Subsequent to these observations, larvae of *Culex pipiens* and *Aedes aegypti* were examined and structures similar to the one described were found in them.

ON THE RECOGNITION OF TWO ECONOMIC SCAPHYTOPIINE LEAFHOPPERS

(Homoptera, Cicadellidae)

By David A. Young, Jr., *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

Recently, while attempting to identify some leafhoppers submitted by E. C. Klostermeyer, of the State College of Washington, I noted some confusion in previous work. This paper is an effort to clarify the identity of two species of *Scaphytopius,* both of which have been implicated as vectors of virus diseases of plants.

Van Duzee (1908), in discussing what he believed to be a distinct species, wrote: "The larger and paler specimens from Utah have been determined for me as Baker's *latus,* and in all essential characters they seem to agree fairly well with the description of that species. From these paler forms they run by almost insensible gradations in form and colour toward the smaller and darker *acutus.* In all, however, the vertex is longer, the oblique veins of the costa are more regularly placed, and the face is either entirely pale or but slightly infuscated anteriorly, with the basal angular pale line never entirely obsolete. I believe these should be separated from *acutus,* but whether they are the true *latus* of Baker is perhaps questionable."

At this time Van Duzee evidently had a segregate in mind, although it is doubtful that he kept specimens separated as examples.

A short time later (1910, p. 220), he wrote the following, after a formal description of *Platymetopius acutus* (Say): "Toward the north and west this species varies to a lighter almost fulvous color with little if any black beneath, the face is paler, scarcely shading to darker on the sides of the cheeks, and the vertex is more strongly produced, at least one-half longer than broad between the eyes. I call this variety *dubius* to distinguish it from the typical form with which it is connected by almost insensible gradations. It in turn forms a connecting link with *oregonensis*, which, however, I believe to be a distinct species. I have listed this as *latus* in Canadian Entomologist, xl, p. 157, 1908.''

It is noteworthy that Utah was not specifically mentioned in the latter quotation, and that the description is valid. At this time Van Duzee presumably *did* choose specimens to represent his concept, for three cotypes of this ''variety'' were found in the U. S. National Museum collection, and seventeen additional specimens from the type series were borrowed through the kindness of Dr. Edward S. Ross, of the California Academy of Sciences.

In spite of the mention of Utah in the first reference to the species, and the phrase .''to the north and west'' in the actual description, Van Duzee, at some undetermined later date, chose a lectotype male from Quinze Lake, Quebec, since a somewhat damaged male bearing a lectotype label and ''dubius'' in what appears to be Van Duzee's handwriting was found in the type series loaned by Dr. Ross. Apparently this choice of lectotype was not published.

Faced with the choice of validating the intended lectotype selection or selecting a lectotype conforming to the original description as nearly as possible, the writer has chosen the latter. A male cotype in the California Academy of Sciences collection, bearing the label, ''Rifle, Col. 7-25-00, E. P. Van Duzee Collector,'' is hereby designated lectotype of *Scaphytopius dubius* (Van Duzee). None of the specimens in the type series were from Utah, and none were from locations more ''to the north and west.'' The pin also bears a yellow paratype label, presumably affixed by Van Duzee at some date following the original description. The type series is mixed. The male genitalia of the lectotype here selected are illustrated in the accompanying figure.

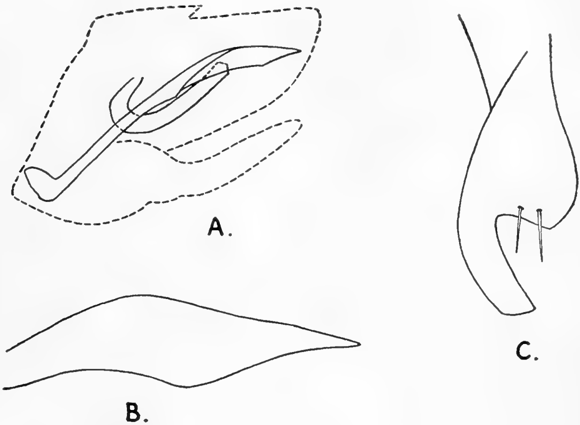
Klostermeyer and Menzies (p. 456, footnote 4) have called attention to some of the confusion which has existed with regard to the name *dubius*. The above selection of a lectotype eliminates *dubius* (Van D.) as the species involved in the transmission of witches' broom virus of alfalfa, since material submitted by Dr. Klostermeyer appears to be distinct from the lectotype. This virus vector has been determined by the writer as a form of *Scaphytopius acutus* (Say), although the aedeagus is slightly different from that illustrated by DeLong whc designated a neotype for the Say species. The aedeagus of *S. acutus* (Say), *sens.* DeLong, although apparently somewhat variable, is narrower than that of *dubius* in the sense employed here, and the preapical lobes of the styles in ventral aspect are narrower than those of *dubius.* Considerable study, and perhaps rearing experiments eventually, will be necessary to learn whether the name *acutus* (Say) will have to undergo further restriction.

Hepner (1947, p. 511), apparently without recourse to type material, relegated *dubius* to synonymy under *Scaphytopius acutus* (Say). His third illustration of *acutus* (*op. cit.*, pl. XXVII, fig. 61) is a form closely related to the lectotype of *dubius* selected here, but apparently with narrower paraphyses.

Severin (1947, pl. I, figs. A and B) illustrated a species which conforms to DeLong and Severin's (see below) later description of their conception of *dubius,* but he mislabeled it in the legend as *Cloanthanus irroratus* (Van Duzee). DeLong and Severin (1947, p. 530) redescribed and illustrated their conception of *dubius* (Van D.), and stated that the species appears to be confined to the West Coast and probably to California.

Through the kindness of Norman W. Frazier, of the University of Califoria, I have been able to study "material used by Dr. Severin in his virus tests, bred from material I [Frazier, *in litt.*] originally collected May 23, 1942 at Dry Creek in Napa County." Seven males and one female were examined. The species appears to be distinct from the species represented by the lectotype of *dubius,* and is here treated as **Scaphytopius delongi,** new species. It has been adequately described and illustrated in the DeLong and Severin reference (1947), and in Severin (1947, pl. I, figs. A and B (not C and D, as the legend states)). The species is represented by the holotype male, allotype female (in U. S. N. M. collection, cat. no. 61509), four paratype males (in N. W. Frazier collection), and two paratype males (in DeLong collection).

Scaphytopius delongi is related to *S. dubius* (Van D.) and to a complex of western forms which includes *graneticus* (Ball), *utahensis* Hepner, *canus* Hepner, and *oregonensis* (Baker). Holotypes, allotypes, or paratypes have been examined for all except *utahensis* in connection with this study. From *dubius, delongi* may be distinguished by its twice-crossed paraphyses in ventral aspect, whereas its sharply deflexed paraphyses in lateral aspect will distinguish it from *graneticus.* This group of species, like the forms of *acutus* (Say), is greatly in need of a careful study which will include a consideration of intraspecific variation. It is possible that some of the problems cannot be solved in the laboratory.



Scaphytopius dubius (Van Duzee) lectotype: A—outline of male genital capsule, lateral aspect, showing aedeagus and one aedeagal paraphysis; B—left paraphysis, apical portion, lateroventral (broadest) aspect; C—style, apical portion, ventral aspect (all drawn *in situ*).

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ACARINA TAKEN DURING WEST TEXAS PLAGUE STUDIES

By R. B. Eads,[1] G. C. Menzies[1] and V. I. Miles[2]

The following mites and ticks were taken during west Texas plague studies conducted jointly by personnel of the Texas State Department of Health and the Communicable Disease Center, Public Health Service. Considerable assistance has been received from Dr. R. W. Strandtmann, Texas Technological College, Lubbock, in the determination of the mites.

Family LAELAPTIDAE

Androlaelaps grandiculatus Eads. Common on small mice. Selected records: 2 ex *Perognathus hispidus,* Sept. 23, 1947, Dawson Co., coll. W. H. Williams; 1 ex *P. hispidus,* Oct. 26, 1948, Dawson Co., coll. M. J. George; 10 ex *Reithrodontomys* sp., May 11, 1948, Gaines Co., coll. W. R. Everitt; 3 ex *Perognathus flavus,* May 5, 1948, Gaines Co., coll. V. I. Miles; 1 ex *Reithrodontomys* sp., May 11, 1948, Dawson Co., coll. V. I. Miles.

Androlaelaps leviculus Eads. 8 ex *Onychomys leucogaster,* Sept. 14, 1948, Cochran Co., coll. C. W. Johnson; 2 ex *O. leucogaster,* Sept. 21, 1948, Cochran Co., coll. C. W. Johnson; 2 ex 2 *O. leucogaster,* May 12-13, 1948, Gaines Co., coll. V. I. Miles; 1 ex *O. leucogaster,* Sept. 21, 1948, Cochran Co., coll. V. I. Miles.

Eubrachylaelaps crowei Jameson. 4 ex *O. leucogaster,* Sept. 23, 1947, Dawson Co., coll. W. H. Williams; 1 ex *O. leucogaster,* Feb. 4, 1948, Terry Co., coll. G. Halyard; 1 ex *O. leucogaster,* Oct. 12, 1948, Gaines Co., coll. C. W. Johnson; 1 ex *O. leucogaster,* May 5, 1948, Dawson Co., coll. W. B. Brooks; 1 ex *Dipodomys spectabilis,* June 3, 1948, Gaines Co., coll. W. B. Brooks; 21 ex *O. leucogaster,* Dec. 2, 1947, Cochran Co., coll. G. Halyard; 2 ex *O. leucogaster,* March 3, 1948, Dawson Co., coll. G. Carpenter; 2 ex *O. leucogaster,* March 18, 1948, Dawson Co., coll. G. Carpenter; 4 ex *O. leucogaster,* Sept. 2, 1948, Gaines Co., coll. M. J. George; 5 ex *O. leucogaster,* Oct. 1, 1948, Cochran Co., coll. C. W. Johnson; 4 ex *O. leucogaster,* Oct. 13, 1948, Gaines Co., coll. C. W. Johnson.

Haemolaelaps glasgowi (Ewing). Very common. Selected records: 6 ex 6 *D. spectabilis,* Nov. 4, 1948, Yoakum Co., coll. G. Halyard; 1 ex *Citellus spilosoma,* Nov. 4, 1947, Yoakum Co., coll. G. Halyard; 2 ex *D. spectabilis,* Nov. 6, 1947, Cochran Co., coll. G. Halyard; 1 ex *Cynomys ludovicianus,* Nov. 11, 1947, Yoakum Co., coll. V. I. Miles; 1 ex *Neotoma micropus,* Nov. 21, 1947, Cochran Co., coll. G. Halyard; 15 ex 20 *O. leucogaster,* Dec. 12, 1947, Cochran Co., coll. V. I. Miles; 1 ex *O. leucogaster,* Jan. 1, 1948, Terry Co., coll. W. H. Williams; 1 ex *D. spectabilis,* Jan. 21, 1948, Yoakum Co., coll. V. I. Miles; 31 ex *O. leu-*

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cogaster, March 18, 1948, Dawson Co., coll. G. Carpenter; 2 ex *O. leucogaster,* Oct. 12, 1948, Gaines Co., coll. C. W. Johnson; 3 ex *O. leucogaster,* May 28, 1948, Gaines Co., coll. G. Carpenter; 1 ex *Rattus norvegicus,* Sept. 15, 1948, Lubbock Co., coll. M. A. Donica; 1 ex *R. norvegicus,* Oct. 5, 1948, Yoakum Co., coll. V. I. Miles; 3 ex 2 *R. norvegicus,* April 2, 1947, Hockley Co., coll. T. S. Scoggins; 6 ex *R. norvegicus,* Aug. 5, 1947, Terry Co., coll. V. I. Miles.

Haemolaelaps megaventralis (Strandtmann). 1 ex *R. norvegicus,* June 25, 1947, Lamb Co., coll. M. A. Donica.

Ischyropoda armatus Keegan. 10 ex 2 *O. leucogaster,* Jan. 15, 1948, Terry Co., coll. W. H. Williams; 1 ex *D. spectabilis,* March 16, 1948, Dawson Co., coll. G. Carpenter; 10 ex *O. leucogaster,* March 19, 1948, Dawson Co., coll. W. H. Williams; 7 ex *O. leucogaster,* Sept. 2, 1948, Gaines Co., coll. M. J. George; 9 ex *O. leucogaster,* Sept. 14, 1948, Cochran Co., coll. C. W. Johnson; 5 ex *O. leucogaster,* Sept. 17, 1948, Cochran Co., coll. C. W. Johnson; 3 ex *O. leucogaster,* Sept. 30, 1948, Cochran Co., coll. C. W. Johnson; 1 ex *O. leucogaster,* Oct. 12, 1948, Ganies Co., coll. C. W. Johnson; 1 ex *N. micropus,* Nov. 19, 1948, Lynn Co., coll. C. W. Johnson; 1 ex *Sylvilagus auduboni,* April 17, 1948, Terry Co., coll. M. J. George; 5 ex *O. leucogaster,* April 22, 1948, Dawson Co., coll. M. J. George; 3 ex *O. leucogaster,* May 6, 1948, Dawson Co., coll. M. J. George; 1 ex *Dipodomys ordi,* Oct. 1, 1948, Gaines Co., coll. W. B. Brooks.

Brevisterna utahensis (Ewing). 2 ex *N. micropus,* Nov. 19, 1948, Lynn Co., coll. C. W. Johnson.

Family **MACRONYSSIDAE**

Neoichoronyssus incomptus Eads and Hightower. 1 ex *Dipodomys ordi,* Jan. 16, 1948, Terry Co., coll. W. H. Williams; 1 ex *D. ordi,* March 3, 1948, Dawson Co., coll. G. Carpenter; 1 ex *D. ordi,* March 11, 1949, Gaines Co., coll. M. J. George.

Neoichoronyssus triacanthus Jameson. 1 ex *D. ordi,* March 5 ,1948, Dawson Co., coll. M. J. George.

Bdellonyssus bacoti (Hirst). Very common. Selected records: 2 ex *N. micropus,* July 13, 1948, Gaines Co., coll. W. R. Everitt; 58 ex 2 *R. norvegicus,* July 13, 1948, Yoakum Co., coll. M. A. Donica; 13 ex *R. norvegicus,* July 13, 1948, Gaines Co., coll. M. A. Donica; 27 ex 4 *R. norvegicus,* Oct. 5, 1948, Yoakum Co., coll. V. I. Miles; 16 ex *R. norvegicus,* Oct. 5, 1948, Lubbock Co., coll. V. I. Miles; 4 ex *R. norvegicus,* Nov. 3, 1948, Gaines Co., coll. V. I. Miles; 4 ex *R. norvegicus,* Nov. 11, 1946, Cochran Co., coll. T. S. Scoggins; 2 ex *R. norvegicus,* May 31, 1949, Hockley Co., coll. V. I. Miles; 11 ex *R. norvegicus,* April 2, 1947, Lamb Co., coll. M. A. Donica; 2 ex *R. norvegicus,* May 14, 1947, Yoakum Co., coll. M. A. Donica; 64 ex 3 *R. norvegicus,* June 4, 1947, Gaines Co., coll. M. A. Donica; 75 ex *R. norvegicus,* June 10, 1947, Yoakum Co., coll. M. A. Donica; 12 ex *R. norvegicus,* June 18, 1947, Terry Co., coll. M. A. Donica.

Family MACROCHELIDAE

Macrocheles spp. 6 ex *Speotyto cunicularia,* March 29, 1948, Dawson Co., coll. G. Carpenter; 1 ex *C. spilosoma,* July 8, 1948, Gaines Co., coll. W. B. Brooks; 1 ex *R. norvegicus,* June 18, 1947, Terry Co., coll. M. A. Donica.

Family UROPODIDAE

Uropoda spp. 2 ex *O. leucogaster,* Jan. 1, 1949, Gaines Co., coll. C. W. Johnson; 1 ex *O. leucogaster,* Feb. 8, 1949, Gaines Co., coll. C. W. Johnson; 1 ex *O. leucogaster,* March 2, 1949, Yoakum Co., coll. C. W. Johnson; 2 ex *O. leucogaster,* March 31, 1949, Dawson Co., coll. M. J. George; 1 ex *O. leucogaster,* Oct. 26, 1948, Gaines Co., coll. W. R. Everitt; 2 ex *O. leucogaster,* Oct. 27, 1948, Gaines Co., coll. W. R. Everitt; 4 ex *O. leucogaster,* Dec. 2, 1948, Gaines Co., coll. J. W. Lucas; 2 ex *N. micropus,* Dec. 18, 1948, Gaines Co., coll. T. Crossland; 2 ex *O. leucogaster,* Dec. 18, 1948, Gaines Co., coll. T. Crossland; 5 ex *D. ordi,* Dec. 18, 1948, Gaines Co., coll. T. Crossland.

Family TROMBICULIDAE

Trombicula montanensis Brennan. 2 ex *C. ludovicianus,* June 11, 1947, Terry Co., coll. G. C. Menzies and R. W. Strandtmann.

Neoschongastia americana (Hirst). 4 ex roadrunner, *Geococcyx californianus,* June 13, 1947, Howard Co., coll. G. C. Menzies and R. W. Strandtmann.

Family IXODIDAE

Ixodes woodi. Common on pack rats. Selected records: 1 ex *N. micropus,* Dec. 2, 1948, Garza Co., coll. J. W. Lucas; 3 ex 2 *N. micropus,* Dec. 8, 1948, Howard Co., coll. W. R. Everitt; 19 ex 9 *N. micropus,* Nov. 9, 1948, Dawson Co., coll. W. B. Brooks; 6 ex *N. micropus,* Oct. 28, 1948, Dawson Co., coll. C. W. Johnson; 1 ex *N. micropus,* Dec. 7, 1948, Garza Co., coll. J. W. Lucas; 1 ex *N. micropus,* Oct. 26, 1948, Dawson Co., coll. M. J. George; 1 ex *N. micropus,* Dec. 9, 1948, Howard Co., coll. C. W. Johnson.

Ixodes kingi. 1 ex *C. ludovicianus,* Sept. 13, 1948, Cochran Co., coll. G. Sexton; 2 ex *C. ludovicianus,* May 13, 1948, Gaines Co., coll. V. I. Miles; 1 ex *C. ludovicianus,* Sept. 27, 1948, Cochran Co., coll. G. Sexton; 1 ex *C. ludovicianus,* May 4, 1948, Gaines Co., coll. V. I. Miles.

Ixodes sculptus. 1 ex *C. spilosoma,* May 6, 1948, Dawson Co., coll. M. J. George.

Dermacentor parumapertus. Very Common. Selected records: 23 ex 3 *S. auduboni,* April 5, 1948, Gaines Co., coll. G. Carpenter; 2 ex *C. spilosoma,* April 6, 1948, Gaines Co., coll. G. Carpenter; 8 ex *D. ordi,* April 6, 1948, Gaines Co., coll. G. Carpenter; 8 ex *Lepus californicus,* April 7, 1948, Gaines Co., coll. M. J. George; 1 ex *N. micropus*, Gaines Co., April 8, 1948, coll. M. J. George; 14 ex *L. californicus*, April 21, 1948, Dawson Co., coll. M. J. George; 4 ex *C. spilosoma*, April 22, 1948, Dawson Co., coll. M. J. George; 1 ex *C. ludovicianus*, April 23, 1948, Dawson Co., coll. M. J. George; 1 ex *D. ordi*, April 23, 1948, Dawson Co., coll. M. J. George; 5 ex *S. auduboni*, April 23, 1948, Dawson Co., coll, M. J. George; 2 ex *Citellus tridecemlineatus*, Dawson Co., April 23, 1948, Dawson Co., coll. George; 1 ex *O. leucogaster*, May 7, 1948, Dawson Co., coll. M. J. George; 6 ex *L. californicus*, Aug. 31, 1948, Cochran Co., coll. T. Crossland; 27 ex *D. ordi*, Nov. 18, 1948, Gaines Co., coll. T. Crossland; 4 ex *L. californicus*, Dec. 1, 1948, Garza Co., coll. J. W. Lucas; 1 ex *Peromyscus* sp., Dec. 7, 1948, Howard Co., coll. W. R. Everitt; 30 ex 5 *D. ordi*, Dec. 21, 1948, Gaines Co., coll. W. R. Everitt; 11 ex 4 *S. auduboni*, Jan. 28, 1949, Terry Co., coll. W. R. Everitt; 29 ex *D. ordi*, March 10, 1949, Yoakum Co., coll. W. R. Everitt; 1 ex *R. norvegicus*, April 25, 1947, Hockley Co., coll. M. A. Donica; 1 ex *D. spectabilis*, Dec. 3, 1948, Gaines Co., coll. M. J. George; 57 ex *D. ordi*, Oct. 16, 1947, Lamb Co., coll. G. Halyard.

Haemaphysalis leporis-palustris. Selected records: 1 ex *S. auduboni*, April 16, 1948, Gaines Co., coll. M. J. George; 3 ex *S. auduboni*, May 14, 1948, Gaines Co., coll. T. Crossland; 1 ex *N. micropus*, June 5, 1948, Gaines Co., coll. W. R. Everitt; 27 ex 2 *S. auduboni*, Oct. 6, 1948, Gaines Co., coll. T. Crossland; 1 ex *D. ordi*, April 8, 1949, Gaines Co., coll. W. R. Everitt; 32 ex *S. auduboni*, March 25, 1949, Gaines Co., coll. M. J. George; 4 ex *S. auduboni*, Sept. 25, 1947, Dawson Co., coll. G. Halyard; 3 ex *D. ordi*, Oct. 3, 1947, Dawson Co., coll. G. Halyard; 13 ex *D. ordi*, Oct. 15, 1947, Lamb Co., coll. G. Halyard; 1 ex *S. auduboni*, Feb. 16, 1949, Lynn Co., coll. C. W. Johnson; 11 ex *S. auduboni*, March 15, 1949, Gaines Co., coll. C. W. Johnson.

Family **ARGASIDAE**

Ornithodoros turicata. Common. Selected records: 23 ex *C. ludovicianus* burrow, April 19, 1948, Gaines Co., coll. G. Carpenter; 17 ex *S. auduboni*, April 7, 1948, Terry Co., coll. G. Carpenter; 1 ex *C. ludovicianus*, April 19, 1951, Dawson Co., coll. V. I. Miles; 1 ex *N. micropus*, June 4, 1948, Gaines Co., coll. W. R. Everitt; 1 ex *C. spilosoma*, June 17, 1948, Gaines Co., coll. W. R. Everitt; 1 ex *C. tridecemlineatus*, June 17, 1948, Gaines Co., coll. W. R. Everitt; 1 ex *O. leucogaster*, July 27, 1948, Dawson Co., coll. W. R. Everitt; 7 ex *C. ludovicianus*, Aug. 16, 1948, Terry Co., coll. J. W. Lucas; 14 ex *C. tridecemlineatus*, Sept. 16, 1947, Dawson Co., coll. V. I. Miles; 1 ex *L. californicus*, Oct. 23, 1947, Lamb Co., coll. G. Halyard; 1 ex *C. ludovicianus*, Nov. 11, 1947, Yoakum Co., coll. V. I. Miles; 1 ex *S. cunicularia*, Nov. 3, 1947, Terry Co., coll. G. Halyard; 3 ex *C. ludovicianus*, Nov. 20, 1947, Cochran Co., coll. V. I. Miles; 5 ex 2 *S. auduboni*, Jan. 22, 1948, Yoakum Co., coll. G. Halyard.

NEW DATA ON SABETHINI

(DIPTERA, CULICIDAE)[1]

BY J. LANE and O. P. FORATTINI, *Departamento de Parasitologia e Higiene Rural, Faculdade de Higiene e Saúde Publica, Universidade de São Paulo, Brasil.*

The junior author collected the material studied in this note in the southwestern corner of the State of S. Paulo, near the banks of the Paranapanema river. Some larvae were found in bromeliads and brought to our laboratory for study. From these larvae one new species of *Phoniomyia* and interesting variant specimens of *Wyeomyia* (*Wyeomyia*) *aphobema* Dyar, 1928, were reared and are the subject of this paper.

We take this opportunity to thank Dr. N. L. Cerqueira of the Serviço Nacional de Febre Amarela, Rio de Janeiro, Brasil for the criticism of this paper. The illustrations were made by Mr. E. B. Ferraz.

Phoniomyia diabolica, new species

Male.—Head: Proboscis slightly longer than fore femur, curved, dark brown. Palpus slightly longer than clypeus, dark brown. Clypeus white pruinose. Antenna one third as long as proboscis, very slightly plumose. Occiput with brown scales except for a violaceous spot at vertex and silvery ones on mentum.

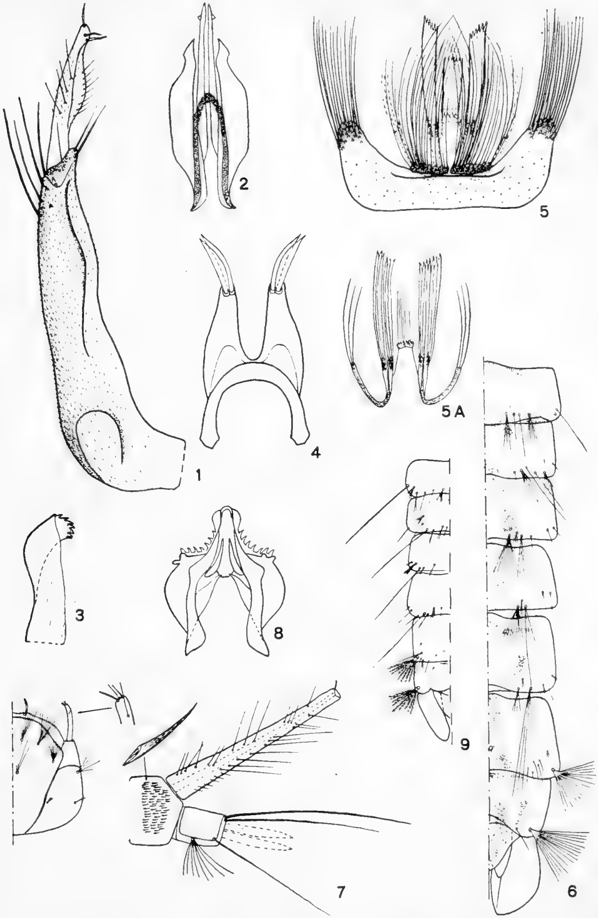
Thorax.—Pronotal lobe violaceous on top and with yellowish scales below. Mesonotum with dark brown integument and bronzy scales. Scutellum silvery scaled on mid lobe. Pleurae with silvery scales.

Legs.—Femora dark brown, the fore one and mid one with a stripe of white scales from base to apex, the hind one with white scales only at base. Tibiae dark, the mid one with a stripe of white scales from base to apex, the hind one with the white scales scattered and not forming a stripe. Fore tarsi dark; mid tarsi dark but with a continuous white line of silvery scales from I to apex of IV, the white nearly forming a complete band on these segments, V blackish and thickened; hind tarsi dark but IV and V white on one side except at apex.

Abdomen blackish on top; whitish below; the colours apparently separated on the sides in an undulated line.

Genitalia (fig. 1).—Basistyle three times as long as wide, slightly setose at apex and on external margin, Dististyle half as long as basistyle, thickened in the middle where it is setose and bears three short, curved differentiated setae. Mesosome (fig. 2) large, elongate with a double filament in the middle and two broad, outcurved lateral structures. Tenth sternite (fig. 3) high and ending in seven teeth. Ninth tergite

[1]This paper was read before the Sociedade Brasileira de Entomologia at the meeting held Sept. 26, 1951.



Phoniomyia diabolica: fig. 1, basistyle and dististyle, side view; fig. 2, mesosome; fig. 3, tenth sternite; fig. 4, ninth tergite; fig. 5, eighth tergite, first series of setae; fig. 5A, eighth tergite, second series of setae; fig. 6, abdominal segments II to apex of pupal exuvia; fig. 7, head and terminal segments of larva. *Wyeomyia (Wyeomyia) aphobema* Dyar, 1918: fig. 8, mesosome; fig. 9, abdominal segments III to apex of pupal exuvia. All drawings made with the camera lucida.

(fig. 4) of peculiar shape because the lobes are exceedingly high and end in two broad leaves each. Eighth tergite densely setose, with two series of setae as in figures 5 and 5A.

Female.—Unknown.

Pupa (fig. 6)—Tube longer than segment VII, slender, yellowish, the apical opening small. Cephalothorax darker dorsally, with a long four or five branched tuft and a double one, the other hairs minute.

Abdomen with darker markings on middle of segments IV to VII; such markings are progressively larger to apex; there are also white median triangular spots which may be luminescent. Setae of segment II as in fig. 5; hair B of segment III longer than segment, simple; of IV to VI longer than the segment and triple. Hair C.1 multiple on segments II and III. Hair C in a multiple tuft, two thirds as long as segment in III to VI. Paddle one and a half times as long as segment, rounded and broad.

Larva (fig. 7).—Head broader than long, rounded, the hairs large and multiple as in the figure. Antenna half as long as head, straight, cylindrical and with a single small hair on the distal fourth.

Thorax.—Prothoracic hair formula 1.1.3—m—1.1.1. Skin nude. Lateral comb of segment VIII of many scales in several rows forming a patch. Siphon six times as long as the basal width, slender, with many simple hairs from base to apex and several multiple tufts at base. Anal segment with the plate nearly enveloping it; dorsal setae (1 + 1); lateral seta single, all these setae very long; subventral tuft of seven hairs.

Type.—Holotype male; paratype one male (with pupal and larval exuviae). Registered in our collections under numbers 9.110 and 9.140.

Type locality.—BRASIL, State of São Paulo, Municipio de Presidente Wenceslau, rio Cuiabá (região da Serra do Diabo), 25.IV.1951 and 17.VIII.1951 O. P. Forattini).

Note.—The name of this species is that of the locality where it was found. *P. diabolica* belongs to the group of species which have a simple dististyle. Its position is the following, when compared with the keys given by J. Lane and N. Cerqueira (1942). In the key for adults it would come close to *P. palmata.* In the key for male genitalia it would come to dichotomy 10. It is near *P. flabellata* from which it differs by the characters of the ninth tergite and eighth sternite, besides the apical structures of the mesosome. In the keys for pupae it would come close to *P. antunesi* but the abdominal markings are different. As to the larval characters it would fall close to *P. fuscipes.*

Bionomics.—The specimens were found in water held by epiphytic bromeliads as larvae. The first at 2 meters from ground level and inside a forest. The temperature of the water at time of capture was 19° C. At room temperature it pupated in 11.V.1951 and the adult emerged in 18.V.1951. The second in a bromeliad growing on the ground inside a forest. At time of capture the water temperature was 6° C. At room temperature it pupated in 12.IX.1951 and the adult emerged in 19.IX.1951.

Wyeomyia (Wyeomyia) aphobema Dyar

The studies of a small series of specimens showed that they vary from the typical form to a large extent. The variation found in our material is mentioned below and the pupa described.

Adults.—The white markings on mid tarsi vary from segment I to V on one side. Male genitalia: The mesosome (fig. 8) has from none to eight teeth on the upper external margin. They are progressively smaller to apex.

Pupa.—Slightly darker on cephalothorax and in the middle of the abdominal segments. Tube slightly expanded at apex and slender. Cephalothoracic hairs two, both double and long, other hairs minute. Abdomen (fig. 9) with hair B longer than segment in II to VI, in III to VI nearly twice as long as the segment. Other setae small except C which is nearly half as long as segment and multiple in II to IV, simple in V and double in VI. Tuft A developed and as long as segment in VII, longer than segment in VIII, with fifteen to twenty branches. Paddle long and one and a half times as long as segment VIII, with minute spicules at apex.

Larva.—Head rounded. Antenna small, uniform and with a single small hairs at base of distal fourth. Head hairs as in figure.

Body nude. Prothoracic hair formula 2.1.1.—m—1.1.1? Pecten of segment VIII with several rows of free scales. Siphon elongate and five to six times the basal width; false pecten on basal three fourths, with many single or double setae over whole siphon. Anal segment with plate well down on the ventral portion; dorsal setae (1+1); lateral hair single and feathered, all these hairs long; subventral tuft of six pennate and long hairs.

Locality.—The same as that of *P. diabolica.*

Note.—Collected as larvae in the same bromeliad as *P. diabolica.* The pupal period varied from 7 to 11 days.

We examined male genitalias of specimens from several localities. Seven males from British Guiana, Georgetown showed six specimens devoid on lateral teeth on mesosome and one with six teeth on each side; one male from Brasil, Goiáz, Anapolis showed eight teeth on each side of the mesosome; two specimens from S. Paulo, S. do Diabo showed respectively three and eight teeth on each side of mesosome.

THE NORTH AMERICAN SPECIES OF SYNTOMOSPHYRUM

(HYMENOPTERA, CHALCIDOIDEA)

BY B. D. BURKS, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, D. C.*

The eulophid genus *Syntomosphyrum* Foerster was originally described from Germany with a single included species.[1] This generic name first appeared in the North American literature in 1894, when Ashmead described two species, one from the island of St. Vincent[2] and the other from the State of Virginia.[3] In 1897 Howard[4] transferred to *Syntomosphyrum* a species previously described by Riley in the genus *Cirrospilus*. He pointed out that the species from Virginia that Ashmead had described in *Syntomosphyrum* in 1894 was a synonym of it.

In his classification of the chalcid flies, Ashmead[5] keyed out the genus *Syntomosphyrum*, but used characters which do not at all agree with those given in the original description of the genus. As characterized in Ashmead's classification the genus actually would be the same as *Tetrastichus* Walker. Kurdjumov[6] considered *Syntomosphyrum* to be a synonym of either *Tetrastichus* or *Geniocerus* Ratzeburg. Waterston[7] was of the opinion that *Syntomosphyrum* was a distinct genus, and he pointed out that it had been wrongly characterized in Ashmead's classification. A number of foreign species have been described in *Syntomosphyrum* in the last 50 years, but no North American species were added to the genus until 1951, when three species, described in other genera, were transferred to it.[8]

When I revised the North American species of *Tetrastichus* in 1943,[9] I concluded that *Tetrastichus* and *Geniocerus* should be combined but that *Syntomosphyrum* was a distinct genus. At that time I excluded from consideration in *Tetrastichus* the three species which have now been transferred to *Syntomosphyrum*. Recently I received for identification a long series of a new species of *Syntomosphyrum*, so that it seems desirable to describe this new form and to key out and characterize the other North American species, and to redefine the genus.

---

[1]Naturh. Ver. Preuss. Rheinlande Verh. 35:60. 1878.
[2]Linn. Soc. London Jour., Zool. 25:181, 1894.
[3]Amer. Ent. Soc. Trans. 21:343, 1894.
[4]U. S. Dept. Agr., Div. Ent. Tech. Ser. 5:38, 1897.
[5]Carnegie Mus. Mem. 1(4):225-551, 1904.
[6]Russ. Ent. Obozr. (Rev. Russe d'Ent.) 13:242, 1913.
[7]Bul. Ent. Res. 5:364, 1915.
[8]Muesebeck and others, U. S. Dept. Agr. Monog. 2, p. 451, 1951.
[9]U. S. Natl. Mus. Proc. 93:505-608, 1943.

It has unfortunately not been possible for me to locate authentically determined specimens of the type species of *Syntomosphyrum*. Kurdjumov stated in 1913 that the species was missing from the Foerster collection in Vienna at that time. Mr. Gahan did not locate it when he studied the Foerster collection in Vienna in 1927, and when I visited the Zoological Museum in Berlin in 1945, Dr. Bischoff informed me that there were no Foerster types of chalcids there. I know of no authentic material of the species in any other museum. It has, accordingly, been necessary for me to rely on Foerster's description of the genus and on his characterization of the type species in forming my concept of this genus.

Genus **Syntomosphyrum** Foerster

Syntomosphyrum Foerster, 1878. Naturh. Ver. Preuss. Rheinlande Verh. 35:60.

Type: *Syntomosphyrum fulvipes* Foerster. Orig. desig.

Tetrastichopsis Girault, 1916. U. S. Natl. Mus. Proc. 51:132.

Type: *Tetrastichopsis prionomeri* Girault. Orig. desig.

The following combination of characters will serve to distinguish the members of the genus *Syntomosphyrum* from all other members of the subfamily Tetrastichinae of the family Eulophidae:

Antennae inserted at or slightly below center of frons, at level of ventral margins of compound eyes; eyes hairy; an obscure, triangular fracture present in scrobe cavity just ventral to anterior ocellus, and a median furrow in scrobe cavity extending from this triangle to level of antennal bases; antennal scape relatively short, never exceeding level of vertex, usually not exceeding level of ventral margin of anterior ocellus; pedicel elongate, always longer than first funicle segment; female with 3 funicle segments, male with 4, club with 3 clearly defined segments in both sexes; width of malar space three-fifths or more as great as height of compound eye. Mesoscutum with median, longitudinal furrow virtually or quite obliterated; mesoscutellum with longitudinal, sublateral carinae faintly visible at anterior margin of this sclerite, completely obliterated more posteriorly; submarginal vein of fore wing bearing 2 to 6 dorsal bristles, marginal vein thickened at base and length of this vein two and one-half or more times as great as length of stigmal vein; hind wing with 3 hamuli. Gaster oval in dorsal outline, flattened, always wider than thorax and usually shorter than thorax and propodeum combined, sometimes the same length; apex of ovipositor at most protruding only slightly past apex of gaster, usually not reaching its apex.

Key to Nearctic Species of Syntomosphyrum

1. Hind coxae white .... **ischnopterae** (Girault)
   Hind coxae mostly or entirely brown or black 2

2. Propodeum shagreened, median carina well developed .... **esurus** (Riley)
   Propodeum smooth, median carina vague or wanting 3
3. Mesal length of propodeum one and one-half times as great as length of postscutellum .... **philodromi** (Gahan)
   Mesal lengths of propodeum and postscutellum equal 4
4. Antennal scape mostly brown in both sexes; body with faint, iridescent blue luster; marginal vein two and one-half times as long as stigmal .... **prionomeri** (Girault)
   Female with entire antennal scape light yellow or white, male scape light yellow or white with anterior, foliaceous lamina darkened; body very dark brown to black, without metallic luster; marginal vein four times as long as stigmal .... **blattae**, new species

Syntomosphyrum ischnopterae (Girault)

Epomphaloides ischnopterae Girault, 1917. Ent. News 28:257.
Syntomosphyrum ischnopterae (Girault) Peck *in* Muesebeck and others, 1951. U. S. Dept. Agr. Monog. 2, p. 451.

Female.—Length of body 1.3-1.6 mm. Head and body very dark brown, antennal scape and pedicel yellow, funicle and club brown; legs including coxae usually entirely light yellow or white, hind femora sometimes partly brown, hind tibiae often slightly darkened.

Apex of antennal scape reaching level of ventral margin of anterior ocellus; relative lengths of parts of antenna—scape, 7; pedicel, 3.5; first funicle segment, 3; second, 3; third, 3; club, 6. Mesoscutum bearing one row of bristles at each lateral margin; marginal vein of fore wing 4 times as long as stigmal; submarginal vein bearing 4-5 dorsal bristles; median length of mesoscutellum 3 times as great as length of postscutellum and twice as great as length of propodeum. Surface of propodeum smooth, median carina weak; gaster as long as thorax and propodeum combined; apex of ovipositor just reaching apex of abdomen.

Male.—Length of body 1.2 mm. Antennal scape bearing a darkened, anterior carina on apical half; relative lengths of parts of antenna—scape, 6.5; pedicel, 3.5; first funicle segment, 2; second, 3.5; third, 3.5; fourth, 3.5; club, 7; funicle segments enlarged near bases and bearing conspicuously long bristles; gaster slightly shorter than alitrunk.

Type locality.—Plummer's Island, Md.
Types.—U. S. N. M. no. 20932.
Distribution.—District of Columbia; Maryland.
Host.—Oothecae of woods roach, *Ischnoptera* sp.

Syntomosphyrum esurus (Riley)

Cirrospilus esurus Riley, 1879. Canad. Ent. 11:162. Comstock, 1879. Report upon Cotton Insects, p. 195. Riley, 1880. U. S. Ent. Comm. Bul 3:43.

Tetrastichus esurus (Riley) Riley, 1885. U. S. Dept. Agr., Fourth Rpt. U. S. Ent. Comm., p. 115, [111].

Syntomosphyrum esurus (Riley) Howard, 1897. U. S. Dept. Agr., Div. Ent. Tech. Ser. 5:38. Marlatt, 1902. U. S. Dept. Agr., Div. Ent. Bul. 37:86. Marlatt, 1903. Ent. Soc. Washington Proc. 5:138. Howard and Fiske, 1911. U. S. Dept. Agr., Bur. Ent. Bul. 91:139, 144. Viereck, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22:452. Britton, 1918. Conn. Agr. Expt. Sta. Bul. 203:323. Ruhl, 1921. Soc. Ent. 36:11. Stellwaag, 1921. Monog. angew. Ent. 6:89, 91. Bott, 1926. Jour. Agr. Res. 33:800. Driggers, 1929. N. Y. Ent. Soc. Jour. 37:169. Haeussler, 1930. Jour. Agr. Res. 41:367. Roney, 1930. Jour. Econ. Ent. 23:286. Driggers, 1931. N. J. State Expt. Sta., Dept. Ent. Rpt. 1929-1930, p. 159. Frost, 1931. Jour. Econ. Ent. 24:1213. Clarke, 1933. Georgia Office of State Ent. Bul. 77:30. Nettles, 1934. Jour. Econ. Ent. 27: 815. Creighton, 1936. Jour. Econ. Ent. 29:93, 282. Schedl, 1936. Monog. angew. Ent. 12:193. Swain, 1937. Ent. News 48:246. Brimley, 1938. Insects of N. Car., p. 512. Gahan, 1951. Canad. Ent. 83:171.

Syntomosphyrum esurum (Riley) Howard, 1903. Ent. Soc. Washington Proc. 5:139.

Syntomosphyrum orgyriae Ashmead, 1894. Amer. Ent. Soc. Trans. 21: 343. Viereck, 1917. Conn. State Geol. and Nat. Hist. Survey Bul. 22: 452. Ruhl, 1921. Soc. Ent. 36:11. Britton, 1937. Conn. Agr. Expt. Sta. Bul. 396:309. [Synonymized with *esurus* Riley by Howard, 1897.]

Female.—Length of body 1.2-1.6 mm. Color black; antennal scape black, pedicel dark brown with apex tan, flagellum brown dorsally, tan ventrally; coxae black, trochanters tan or yellow, femora dark brown with yellow apices, tibiae yellow with median area of each usually slightly darkened, tarsi yellow.

Apex of scape not quite reaching level of ventral margin of anterior ocellus; relative lengths of parts of antenna—scape, 7; pedicel, 3; first funicle segment, 2.5; second, 2; third, 2; club, 5. Mesoscutum with one and a partial second rows of bristles at each lateral margin; marginal vein of fore wing three times as long as stigmal vein; submarginal vein bearing 4-6 dorsal bristles; median length of postscutellum one-half as great as that of propodeum. Surface of propodeum shagreened, median carina strongly developed; apex of ovipositor not quite reaching apex of abdomen.

Male.—Length of body 1.0-1.2 mm. Antennal scape bearing an anteriorly projecting flange on apical four-fifths, funicle segments enlarged near bases and bearing conspicuously long bristles, relative lengths of parts of antenna—scape, 6; pedicel, 2; first funicle segment, 1.5; second, 2; third, 2; fourth, 2; club, 7.

Type locality.—Selma, Ala.

Types.—U. S. N. M no. 2793.

Distribution.—Eastern States and southeastern Canadian Provinces west to Texas, Kansas, and Manitoba.

Hosts.—Pupae of Lepidoptera: Cotton leafworm, *Alabama argillacea* (Hübner); *Anomis erosa* Hübner; walnut leaf crumpler, *Acrobasis juglandis* (LeBaron); spruce budworm, *Choristoneura fumiferana* (Clemens); sugarcane borer, *Diatraea saccharalis* (Fabricius); Oriental fruit moth, *Grapholitha molesta* (Busck); pecan bud moth, *Gretchnia bolliana* (Slingerlund); white-marked tussock moth, *Hemerocampa leucostigma* (J. E. Smith); fall webworm, *Hyphantria cunea* (Drury); forest tent caterpillar, *Malacosoma disstria* Hübner; brown-tail moth, *Nygmia phaeorrhoea* (Donovan); gypsy moth, *Porthetria dispar* (Linnaeus); *Stenoma algidella* (Walker).

Syntomosphyrum philodromi (Gahan)

Tetrastichus philodromi Gahan, 1924. U. S. Natl. Mus. Proc. 64 (4):18. Auten, 1925. Ent. Soc. Amer. Ann. 18:242.

Syntomosphyrum philodromi (Gahan) Peck *in* Muesebeck and others, 1951. U. S. Dept. Agr. Monog. 2, p. 451.

Female.—Length of body 1.0-1.1 mm. Color black, with faint iridescent luster; antenna light yellow, dorsal sides of scape and pedicel slightly darkened; coxae and basal four-fifths of each femur dark brown, trochanters, apices of femora, tibiae, and tarsi white or light yellow.

Apex of scape not reaching level of ventral margin of anterior ocellus; relative lengths of parts of antenna—scape, 8; pedicel, 4; first funicle segment, 3; second, 3; third, 3; club, 8. Mesoscutum broader than long and bearing two and a partial third rows of bristles at each lateral margin; marginal vein of fore wing two and one-half times as long as stigmal; submarginal vein bearing 2-4 dorsal bristles; length of mesoscutellum five times as great as length of postscutellum, and propodeum one and one-half times as long as postscutellum. Surface of propodeum smooth, median carina wanting; apex of ovipositor reaching or very slightly exceeding apex of abdomen.

Male.—Length of body 1.0 mm. Antennal scape bearing a darkened, anteriorly projecting flange on apical four-fifths; funicle segments semiquadrate, lacking long bristles; relative lengths of parts of antenna—scape, 8; pedicel, 4; first funicle segment, 2; second, 2; third, 2; fourth, 2; club, 6.

Type locality.—South Bass Island, Ohio.
Types.—U. S. N. M. no. 26182
Distribution.—Ohio.
Host.—Egg sac of spider, *Philodromus canadensis* Emerton.

Syntomosphyrum prionomeri (Girault)

Tetrastichopsis prionomeri Girault, 1916. U. S. Natl. Mus. Proc. 51:132.

Syntomosphyrum prionomeri (Girault) Peck *in* Muesebeck and others, 1951. U. S. Dept. Agr. Monog. 2, p. 452.

Female.—Length of body 1.1-1.2 mm. Color very dark brown with faint, metallic blue luster; antennal scape and pedicel dark brown with apex of each yellow, flagellum light brown, with bristles yellow; coxae and basal four-fifths of each femur dark brown, trochanters light brown, apices of femora, entire tibiae, and basal three segments of each tarsus yellow, apical segment of each tarsus brown.

Apex of antennal scape not reaching level of ventral margin of anterior ocellus; relative lengths of parts of antenna—scape, 10; pedicel, 4; first funicle segment, 3; second, 3; third, 3; club, 8. Mesoscutum as long as broad and bearing a single row of bristles at each lateral margin; marginal vein of fore wing two and one-half times as long as stigmal; submarginal vein bearing 2-3 dorsal bristles; median lengths of propodeum and postscutellum equal. Surface of propodeum smooth, median carina weak; apex of ovipositor just reaching apex of abdomen.

Male.—Unknown.

Type locality.—Clarksville, Tenn.

Types.—U. S. N. M. no. 19649.

Distribution.—Tennessee.

Host.—Leaf-mining curculionid *Odontopus* (= *Prionomerus*) *calceatus* Say.

Syntomosphyrum blattae, new species

Female.—Length 0.8-1.5 mm Head and body very dark brown to black, shining but non-metallic; antennal scape yellow, pedicel and flagellum light brown; coxae and hind femora dark brown, trochanters yellow, fore and mid femora tan, tibiae and tarsi yellow, with apical segment of each fore tarsus brown.

Antennae inserted at level of ventral margins of compound eyes, apices of scapes not quite reaching level of ventral margin of anterior ocellus; length of malar space two-thirds as great as height of compound eye; ocellocular and postocellar lines equal in length; relative lengths of parts of antenna—scape, 10; pedicel, 6; first funicle segment, 4; second, 4; third, 4; club, 8. Mesoscutum as wide as long and bearing one row of bristles at each lateral margin; submarginal vein of fore wing bearing 3-5 dorsal bristles; marginal vein four times as long as stigmal; median lengths of propodeum and postscutellum equal. Surface of propodeum smooth, median carina obscure, virtually wanting, lateral carinae wanting, propodeal spiracle round, its diameter twice as great as width of space separating it from anterior propodeal margin; gaster as long as thorax and propodeum combined; apex of ovipositor not quite reaching apex of gaster.

Male.—Length 1.0-1.2 mm. Similar to female except as follows: Antennal scape yellow, apical three-fifths bearing a darkened, anteriorly projecting flange; relative lengths of parts of antenna—scape, 10; pedicel, 6; first funicle segment, 3; second, 3; third, 4; fourth, 4; club, 10;

funicle segments enlarged near bases and bearing conspicuously long bristles; gaster slightly shorter than thorax and propodeum combined.

Type locality.—Morgantown, W. Va.

Types.—U. S. N. M. no. 61310.

Described from 33 male and 239 female specimens as follows: Female holotype, male allotype, and 8 female and 1 male paratypes from the type locality, May 15, 1931, reared from roach eggs, L. M. Peairs; 2 female paratypes, Durham, N. C., 1940, A. S. Pearse; 228 female and 31 male paratypes, High Bank, Ohio, May-June 1951, reared from oothecae of woods roach, *Parcoblatta* sp., L. R. Edmunds. Six hundred sixty additional specimens, not included in the type series, were reared by Mr. Edmunds from *Parcoblatta* oothecae collected at High Bank and University Woods, Ohio, May-June 1951.

BOOK REVIEW

FOREST ENTOMOLOGY, by Samuel Alexander Graham, University of Michigan. [American Forestry Series.] Third ed., 8 vo., cloth, 334 pp., 85 illus., N. Y., McGraw-Hill Book Company, 1952, $6.00.

The enormous advances made in recent years in the use of the newer insecticides in control of forest insects is much more keenly realized when a revision such as this appears, in which accounts are given of such progress. A page by page checking of the sections pertaining to insecticides in the second edition of this work, issued in 1939, with this third edition reveals that the changes have been so great and progress has been so rapid recently that the author has had to rewrite those portions of the book. As would be expected, considerable attention is given to the present status of the investigations with various compounds of DDT, benzene hexachloride, toxaphene, chlorinated camphene, chlordane, and the like. The advent of these highly effective insecticides has brought about changes in methods of application, particularly from the air. Instead of dusting, the materials more often are now used in oil solutions or emulsions. This has made possible the present-day large scale control operations that would have been impossible in 1929 when the first edition of this book appeared. New chapters also have been added, in this third edition, describing latest methods of making forest insect surveys as well as new procedures in detecting and appraising damage. In the remainder of the book there prevails the same high standards of scholarship as in previous editions.—J. S. WADE, *Washington, D. C.*

Actual publication date of vol. 54, no. 4, August 26, 1952.

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NOTICE

Due to unforeseen delays in the completion of the preparation of Memoir 4, *A Manual of the Chiggers*, by G. W. Wharton and H. S. Fuller, it has been necessary to postpone its publication date. The volume was originally scheduled for publication in September; it will not, however, be ready for distribution before November.

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A NEW SPECIES OF MITE TAKEN FROM NEST OF ARMADILLO

(ACARINA LAELAPTIDAE, HYPOASPINAE)

BY GEORGE C. MENZIES[1] and R. W. STRANDTMANN[2]

The species of mite here described was taken from the nest of the armadillo, *Dasypus novemcinctus*, during ecological studies on the armadillo made by Mr. W. K. Clark of the University of Texas. In the available literature, we have not been able to find a description to fit this mite and therefore conclude that it is new. It is described below as follows:

Hypoaspis dasypus, new species

Female.—Pale brown in color, oval in outline with faint shoulders, average size 600 microns long and 343 microns wide. The dorsal setae are long and overlap each other. This species has a pair of small round pores posterior to the second pair of setae on the ventral plate instead of slit-like pores present in *H. murinus*. The measurements given below are in microns and indicate the average and the two extremes of five measurements.

	DL	*DW*	*StL*	*StW*	*GVL*	*GVW*	*AL*	*AW*	*A-GV*	*F lg*	*H lg*	*TI*
Smallest	582	315	151	100	216	123	57	72	10	588	665	22
Largest	610	360	160	108	231	134	67	82	86	625	717	24
Average	600	343	153	103	222	127	60	77	41	610	692	53

The above symbols are explained as follows: *DL,* length of the dorsal plate; *DW,* width of the dorsal plate; *StL,* length of the sternal plate; *StW,* width of the sternal plate at its narrowest point; *GVL,* length of the genitoventral plate, measured from the posterior margin of the sternal plate to the tip of the genito-ventral plate; *GVW,* width of the genitoventral plate at the widest point; *AL,* lengh of the anal plate from the anterior margin to the base of the odd setae; *AW,* width of the anal plate; *A-GV,* distance between the genitoventral and anal plates; *F Lg,* length of leg I from base of coxa to tip of tarsus exclusive of the claw; *H Lg,* length of leg IV similarly measured; *TI,* length of tarsus I, exclusive of the claw.

Venter.—Sternal plate reticulate, longer than wide, expanded on the posterior portion to shield-shape, the posterior margins extending beyond the middle of coxa III; with three pairs of setae and two pairs of pores.

[1]Bureau of Laboratories, Texas State Department of Health, Austin.
[2]Texas Technological College, Lubbock.

The first pair of pores are slit-like and located posterior to the first pair of setae, the second pair of pores are round and located posterior to the second pair of setae. Presternal area lightly sclerotized containing a pair of transversely bistriate presternal plates, fig. B. Endopodal plates distinct extending from the posterior lateral angle of the sternal plate to the anterior edge of coxa IV; endopodal setae set slightly off centerally. Genitoventral plate drop-shaped, broadened behind coxa IV, and bears one pair of setae; the reticulation of lines on the piece are characteristic and are essentially as shown in fig. B. Anal plate roundly triangular, the anal pore placed nearer the anterior margin; the three anal setae are of equal size, the paired ones placed opposite the posterior edge of the anal pore. A pair of large elongate metapodal plates and three pairs of smaller ones as shown in fig. B. Setae on the non-sclerotized portion of the venter vary in number from 7 to 10 pairs. Stigma situated opposite the posterior lateral edge of coxa III and the anterior lateral angle of coxa IV, the narrow peritreme extending forward to the middle of coxae I. Post stigmal sclerotization reaching backward to a point beyond the middle of coxa IV where it is truncate and bears a pore.

Dorsum.—Dorsal plate undivided, almost covering the entire dorsum. Approximately 39 pairs of long moderately heavy overlapping setae arranged in a regular pattern. Approximately 10 pairs of small pores scattered over the dorsum including a pair of slit-like pores near the anterior margin. A network of fine closely spaced lines cover the entire plate.

Gnathosome.—Corniculi pronounced and strongly pigmented. There are 3 pairs of hypostomal setae. The anterior pair and the central lateral pair are approximately equal. The centro-posterior pair are longer and equal in size to those on the basis capituli. Capitular groove with seven rows of capitular teeth of approximately 10 teeth in each row. Epistome apparently with a serrate margin. Chelicerae prominent, arms of chela equal. Digitus mobilis with two teeth below the incurved apex and with a semicircle of small setae at its base: digitus fixus with six or seven teeth and a slender, straight, non-inflated pilus dentilis. Tritosternum branching at the apex of the base. Cilia of each lacinia rather long and widely spaced. The laciniae are approximately twice the length of the base.

Legs.—Essentially characteristic for the genus. Coxa I-III each with two slender setae, coxa IV with one. No spurs or heavy spines present except the apical setae of tarsus II-IV especially those on tarsus II quite strong. Legs II and III are approximately equal, 521 microns in length compared to 610 microns for leg I and 692 microns for leg IV. All tarsi with claws and pulvillus.

Male.—Pale brownish in color oval in outline with very faint shoulders; average size approximately 390 microns long and 250 microns wide. The setae are moderate to weak in length and thickness.

Venter.—Holoventral plate broadest behind coxa IV. The genital pore is large and quite prominent. There are 3 pairs of small pores on the

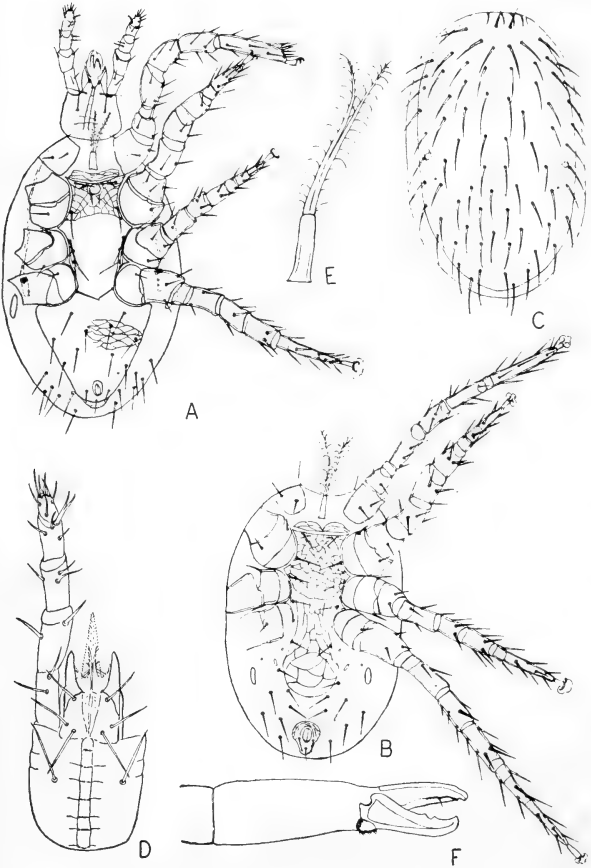

Fig. A, *Hypoaspis dasypus,* venter of male; fig. B, venter of female; fig. C, dorsal plate of female; fig. D, venter of female rostrum; fig. E, tritosternum; fig. F, chelicera.

holoventral plate. The first pair is slit-like and lies midway between the anterior ventral setae and the genital opening. The second and third pairs are oval and lie approximately midway between paired setae two and three and three and four respectively, see fig. A. There are 10 pairs of setae on the ventral plate excluding the anal setae, as shown in fig. A. The paired anal setae are situated opposite the middle of the anal pore and are short. There are 7 pair of setae located on the area not covered by the ventral plate.

Dorsum.—The dorsal plate entirely covers the dorsum, and overlaps the sides slightly. There are 38 paired setae and three unpaired centro-posteriorly located setae. The dorsal plate is covered with a network of fine lines.

Gnathosome.—Hypostome similar to that in the female with six rows of capitular teeth in the capitular groove. Chelicerae prominent, digitus mobilis branched near the base and has a semicircle of small setae at its base. One arm with two teeth placed below the incurved apex, the other longer and abruptly truncate. Digitus fixtus has two teeth at the incurved apex, and a slender straight non-inflated pilus dentalis.

Legs.—Similar to those of female in setation and length. All tarsi have claws and pulvillus.

Immature forms.—Not Known.

Types.—Described from five females and two males of which one male and one female was designated as holotype and allotype respectively. Four females and one male are paratypes. The holotype female was taken from the nest of armadillo, *Dasypus novemcinctus,* January 17, 1948, Austin, Travis County, Texas; the allotype male was taken from the nest of armadillo, *Dasypus novemcinctus,* April 3, 1948, Austin, Travis County, Texas. Types deposited in the U. S. National Museum. Paratypes are in the collection of the Texas State Health Department and Texas Technological College, Lubbock, Texas.

Host and Distribution.—This mite has been taken from two nests of armadillo, *Dasypus novemcinctus,* from Travis County, Texas. Five female specimens were recovered from armadillo nest over a Berlese funnel on January 17, 1948. Two males were recovered from Berlese funnel from nest material taken April 3, 1948.

Remarks.—This mite can be distinguished from the *Haemolaelaps* in that the sternal plate is longer than wide, the second pair of pores of the ventral plate are oval (slit-like in *Haemolaelaps*) the tritosternum branches at the apex of the base, the teeth in the capitular groove are 8-10 or more per row (3-5 in *Haemolaelaps*). The epistome is serrated and the pilus dentilis of the fixed chela is not inflated.

This mite is approximately 610 microns as compared to 581 for *Hypoaspis murinus,* and is only slightly wider. This species differs further from *Hypoaspis murinus* in that the second pair of pores on the sternal plate are oval instead of slit-like. On the gnathosome the anterior setae and the centrolateral setae are equal in size and length and are approximately two-third the length of the central and basal pairs which are of equal size and length. The dorsal setae are much heavier and longer in this species, 55-76 microns long as compared to 35-45 microns on *H. murinus*. The width of the anal plate at the widest portion is greater than the distance from the anterior margin to the base of the odd setae, in *H. murinus* these measurements are approximately equal. The anal pore is placed nearer the anterior margin than to the posterior setae, and the paired setae are located opposite the posterior margin of the anal pore.

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A NEW FLEA FROM WESTERN NORTH AMERICA

(Siphonaptera, Hystrichopsyllidae, Neopsyllinae)

By F. G. A. M. Smit, *British Museum (Natural History), The Zoological Museum, Tring, Herts.*

The new species described here has hitherto been confused with *Delotelis telegoni* (Rothschild), which it closely resembles and with which it is compared below. I have much pleasure in naming this previously unrecognized flea after the eminent Canadian siphonapterist, George P. Holland, to whom I am indebted for the loan and gift of additional specimens of it. I also wish to express my sincere thanks to Miss Phyllis T. Johnson for checking specimens of *Delotelis* at her disposal.

Delotelis hollandi, new species

Types.—Holotype male and allotype female: Gaston, Oregon, ex *Microtus townsendi,* 14 Feb. 1940, C. A. Hubbard. Paratypes—Oregon: Chehalem Mt., Newberg, ex *Peromyscus maniculatus rubidus*, 20 April 1932, C. A. Hubbard, 1 ♀; California: 2 mi. east of Quincy, Plumas Co., ex *Neurotrichus gibbsi,* 28 Sept. 1950, E. W. Jameson Jr. 1 ♂, 1 ♀; British Columbia: Vancouver, ex *Microtus oregoni serpens,* 25 Sept. 1948 to 6 Dec. 1948, M. Merry, 2 ♂, 7 ♀. All these specimens are in the British Museum flea collection at Tring. Through the courtesy of Mr. G. P. Holland (who also presented to the British Museum the 9 specimens from Vancouver listed above) I have been able to study the following additional paratypes which have been returned to the Canadian National Collection. British Columbia: Vancouver, ex *Peromyscus maniculatus austerus,* 22 Oct. 1947, G. P. Holland, 1 ♂; ex *Microtus oregoni serpens,* 16 Jan. 1945, H. D. Fisher, 1 ♂, 1 ♀; Rayleigh, ex nest of *Microtus montanus canescens,* 25, Oct. 1947, G. P. Holland, 1 ♀; Chilliwack, ex *Peromyscus maniculatus austerus,* 18 March 1947, G. P. Holland, 1 ♀; Mt. Seymour, ex *Peromyscus maniculatus oreas,* 14 Dec. 1947, J. Yatwood, 1 ♀; Huntingdon, ex *Microtus townsendi townsendi,* 14 March 1943, G. P. Holland, 1 ♀; Kinbasket Lake, ex *Peromyscus* sp., 7 Sept. 1948, G. P. Holland, 2 ♂; ex *Microtus longicaudus mordax,* 6 Aug. 1943, G. P. Holland, 1 ♂; Tenguille Lake, ex *Clethrionomys* sp., Aug. 1945, J. Ronayne, 1 ♂, 1 ♀; Washington; Tacoma, ex *Peromyscus* sp., 27 Feb. 1945, F. M. Prince, 1 ♀; Oregon: Gaston, ex *Neurotrichus gibbsi gibbsi,* 22 Dec. 1940, C. A. Hubbard, 1 ♀. Additional specimens from Alaska not included in the type series.

Diagnosis.—Separable from the only other known species in the genus, *Delotelis telegoni* (Rothschild) 1905 (Nov. Zool. 12:172-174), in the male by the shape and chaetotaxy of the clasper and the ninth sternum, and in the female by the shape of the posterior margin of sternum VII.

Description.—Male. Apart from differences in the genitalia of the male and the 7th sternum of the female, which are described below, the two species are practically indistinguishable. The phallosomes of the two are likewise virtually identical.

Delotelis hollandi, new species (Fig. 1)	*Delotelis telegoni* (Rothschild) (Fig. 2)
Corpus of Clasper.	
Eight strong setae near upper part of posterior margin; this row of large setae ending well below acetabular sclerotization.	Five or six strong setae near upper part of posterior margin; this row not reaching acetabular sclerotization.
Along apical part of dorsal margin 6-7 small setae, below which, on outer surface, a patch of about 13-15 slender setae and along lower part of posterior margin, below row of large setae, a row of 10-12 slender setae which decrease in size from above downwards.	Along apical part of dorsal marmargin 2-3 small setae, below which, on outer surface, a patch of about 11 thin setae; along lower part of posterior margin, below row of large setae, a row of 5-7 slender setae, also decreasing in size downwards.

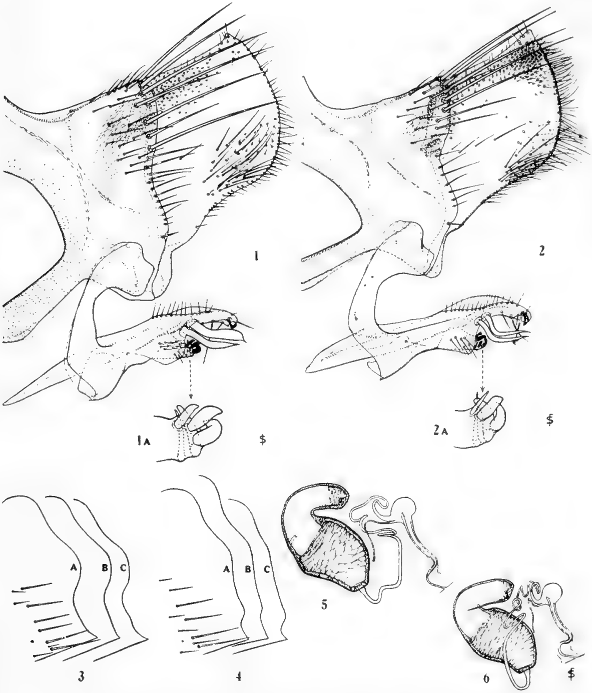

Fig. 1, *Delotelis hollandi,* new species, clasper and sternum IX of holotype; fig. 2, *D. telegoni* (Rothschild), clasper and sternum IX of holotype; fig. 3, *D. hollandi,* sternum VII of female (A from Gaston, Oregon, B from Newberg, Oregon, C from Quincy, California); fig. 4, *D. telegoni,* sternum VII of female (A and B from Kicking Horse Canyon, B. C., C from Horse Creek, B. C.); fig. 5, *D. hollandi,* genitalia of female (from Quincy, California); fig. 6, *D. telegoni,* genitalia of female (from Horse Creek, B. C.).

Dorsal margin of manubrium forming an angle of at least 90° with anterior margin of corpus.	Dorsal margin of manubrium forming an angle of less than 90° with anterior margin of corpus.
Manubrium about 9 times as long as broad at base.	Manubrium about 14 times as long as broad at base.
Movable process of clasper.	
Measured across middle, about as long as broad; dorsal margin turned upwards apically.	Measured similarly, process distinctly longer than broad; dorsal margin not (or at most very little) turned upwards apically.
Posterior margin with a fringe of short setae. On lower half of outer surface a fairly large patch of long, slender setae. On inner surface, near dorsal margin, a dense patch of minute setae anteriorly, not extending to posterior margin; a patch of similar, but somewhat stouter setae ventro-posteriorly.	Posterior margin with a much denser fringe of longer (about twice as long), thin setae. Patch of setae on outer surface occupying a much smaller area, setae being more crowded together. On inner surface a very dense patch of much longer setae posteriorly on dorso-apical area; a small patch of less numerous, long, thin setae ventro-posteriorly.
Sternum IX.	
Ventral (apical) arm with a dorsal row of about 11-12 setae. A short and thick, spiniform seta preapically.	Ventral (apical) arm with a dorsal row of about 18-20 setae. Preapical, spiniform seta less thickened.
Near ventral margin of basis of narrow apical part of ventral arm, two flattened and curved setae, more apical one of which is broader and wider apically, where it tapers very abruptly. Ventro-anteriorly of these two flattened setae a small patch of short setae.	These flattened setae much less broad, distinctly elbowed, subequal in shape, and tapering very gradually. Ventro-anteriorly of the two flattened setae, a patch of less numerous but much longer setae.
All three outer apical spiniforms of inner branch of vertical arm stout (fig. 1 A).	Most anterior and lowest of these three outer spiniforms much more slender (fig. 2 A).

Female.—The genitalia of both species are very similar, and I have been unable to find constant differences in either the spermatheca or the bursa copulatrix (cf. figs. 5 and 6). *Sternum VII:*

Fig. 3	Fig. 4
Posterior margin with a very distinct, rounded lobe in about its middle part (fig. 3).	This lobe much less distinct and not rounded; instead, this portion of margin straight or even slightly concave (fig. 4).

Although *Delotelis hollandi* seems to have a more western distribution than *D. telegoni*, they both occur in the Columbia River Valley. This could be a meeting-place of two subspecies, but the evidence from the general pattern of distribution and from the degree of difference in morphology of the male genitalia is rather against regarding the two forms as subspecies. No definite conclusion can as yet be made because of the relative paucity of records; this is doubtless due to the species of *Delotelis* being nest-fleas and rather difficult to collect. Both species apparently occur mainly on Microtinae.

CONCERNING SOME HOLARCTIC MIRIDAE

(HEMIPTERA, HETEROPTERA)

BY EDUARD WAGNER[1] and JAMES A. SLATER[2]

Recently we have investigated several species of Miridae considered to be Holarctic in distribution. In the course of this investigation it has become evident that in several cases populations that have previously been considered conspecific are in reality represented by different species in the Palearctic and Nearctic regions. In the present paper a discussion of the status of several of these forms is undertaken.

1. **Lygus campestris** (Linnaeus) and **L. scutellatus** (Uhler)

The Nearctic species formerly considered conspecific with the Palearctic *campestris* represents a distinct, although closely related species. The parameres of the males present excellent specific differences for the separation of the two species as do the sclerotized rings of the dorsal wall of the bursa copulatrix in the females.

A name is available in the literature for the Nearctic species. In 1877 Uhler described *Orthops scutellatus*[3] from specimens taken at Clear Creek Canyon, Colorado. Reuter (1909) synonymized this species with the European *campestris* and this synonymy has been followed by subsequent authors. Dr. Sailer of the U. S. National Museum has kindly informed us that there are at present no specimens of *scutellatus* in the Uhler collection from the type locality. However, there is a specimen in the Uhler collection bearing the locality label ''Wyoming July 26-83'' and labeled ''type.'' Dr. Sailer informs us that this specimen is identical with material we have used in this study.

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[2] Department of Zoology and Entomology, Iowa State College, Ames.

[3] *Lygus scutellatus* Lindberg 1934, a homonym, was renamed *L. lindbergi* by Hsiao (1942).

Lygus scutellatus (Uhler) may be distinguished from the Palearctic *Lygus campestris* (L.) by the following characteristics. The right paramere of *scutellatus* (Plate 1, Fig. N) is more slender than that of *campestris*, the hypophysis projects transversely upward and presents two small but distinct points at the apex, one of these being considerably longer than the other and somewhat hook-shaped. In *campestris* (Plate 1, Fig. O) the hypophysis projects vertically and has two slightly curved, horn-shaped points. The left parameres of the two species differ most conspicuously in the shape of the sensory lobes (''*Sinneshocker*''). In *scutellatus* (Plate 1, Fig. L) this lobe is relatively much smaller and rounded, whereas in *campestris* (Plate 1, Fig. M) it is not only much larger but more angularly produced. In addition the hairs present on the sensory lobe are much larger and more prominent in *campestris*. The hypophysis shows much similarity in the two species, but in *scutellatus* the arm of the hypophysis is thicker and shorter than is the case with *campestris*.

In the females the sclerotized rings of the bursa copulatrix are of a considerably different shape. In *campestris* (Plate 1, Fig. T) the ring is relatively much larger with the median end broadly rounded, whereas in *scutellatus* (Plate 1, Fig. U) the ring is much smaller and mesally bluntly pointed.

Externally the two species are very similar and the differences are of a considerably less definitive nature than are those of the genital structures. Generally *scutellatus* is somewhat longer and more slender, the males averaging 3.4 times, the females 2.8 times as long as the width (measured across the base of the pronotum). *L. campestris* averages 2.75 (males) and 2.6 (females) times as long as width. The vertex of *campestris* averages slightly broader compared to the width of an eye than does *scutellatus*. In *campestris* the vertex averages 1.5 (males), 1.8 (females) times the width of an eye; scutellatus averages 1.3 (males), 1. 6 (females) vertex to eye width.

Both species are extremely variable in color, grading from nearly uniform yellow to almost black, with many gradations between (Plate 2, Figs. 2L-P). There are, however, certain color characteristics that appear

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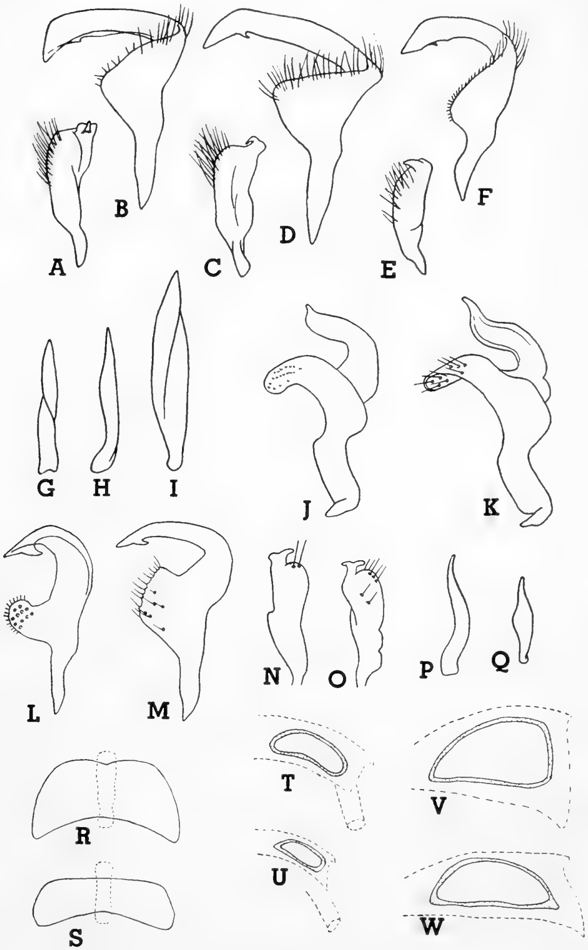
PLATE I. STRUCTURES OF LYGUS AND MONALOCORIS

Lygus pulverulentus (Uhler): A, right paramere; B, left paramere; G, vesica; R, ''C''-structure of bursa copulatrix; V. right ring of bursa copulatrix. *L. reclairei* Wagner: C, right paramere; D, left paramere; H, vesica. *L. rubicundus* (Fallén): E, right paramere; F, left paramere; I, vesica; S, ''C''-structure of bursa copulatrix; W, right ring of bursa copulatrix. *Monalocoris americanus* Wagner & Slater: J, left paramere; P, right paramere. *Monalocoris filicis* (L.): K, left paramere; Q, right paramere. *Lygus scutellatus* (Uhler): L, left paramere; N. right paramere; U, right ring of bursa copulatrix. *L. campestris* (L.) M, left paramere; O, right paramere; T, right ring of bursa copulatrix.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to differ in the two species. In *campestris* the head usually remains pale even in rather dark forms, whereas in *scutellatus* the head if often partially darkened even in specimens that are otherwise generally pale. This is particularly true of the males. In specimens of *campestris* that show dark head markings the dark areas usually reach the base of the head, but leave the area adjacent to the eyes pale (Plate 2, Figs. 2G-K), whereas in *scutellatus* the vertex of the head is usually pale while the area adjacent to the eyes is often very extensively darkened (Plate 2, Figs. 1G-K) The cuneus also presents points of difference between the two species. In *scutellatus* (Plate 2, Figs. 1A-C) the cuneus is much longer and more slender than in *campestris*, the darkened area near the apex is more extensive in light specimens than is the case with *campestris* and very often reaches the lateral margin, where it may in dark specimens often be more extensive along this lateral margin than it is along the mesal margin (Plate 2, Fig. 1C). In *campestris* (Plate 2, Figs. 2A-C) the cuneus is relatively shorter and broader, the darkened area less extensive and even in dark specimens this darkened area is never more extensive along the lateral margin than it is along the mesal margin (Plate 2, Fig. 2C). In *campestris* (Plate 2, Figs. 2D-F) the scutellum is relatively shorter and broader and apparently in correlation with this the dark color markings are less attenuated than is the case with *scutellatus* (Plate 2, Figs. ID-F). It also appears that the dark color markings on the scutellum are of much more common occurrence in *scutellatus* than they are in *campestris*, although insufficient series are available to provide adequate figures. Specimens of *scutellatus* from the western United States are generally darker than are those from the middle western and eastern states and perhaps subsequently it will be possible to ascertain subspecific differences in the populations of this species within the Nearctic region. A series of specimens from Alaska kindly sent for examination by Dr. Sailer all prove to be typical *scutellatus* Uhler.

2. **Lygus (Agnocoris) rubicundus** (Fallén) and **L. (A.) pulverulentus** (Uhler)

Specimens of the subgenus *Agnocoris* from the eastern and midwestern United States that have been considered previously as *L. rubicundus* prove upon examination to be distinct from the European species.

A name is available in the literature for this species. Uhler (1892) described *Hadrodema pulverulenta* from "Utah Lake" and numerous eastern states. The U. S. National Museum collection contains no specimens in the Uhler material from the Utah Lake locality, but does contain specimens from the type series. We therefore designate as lectotype a male bearing 3 labels, the first "Washington, D. C., June 7, 1884," the second indicates the specimen is from the Uhler collection, and a third label in Uhler's handwriting reads "*Hadrodema pulverulenta* Uhler." The specimen does not bear Heidemann's name as collector, but Dr. Sailer informs us that the style of mounting is characteristically Heide-

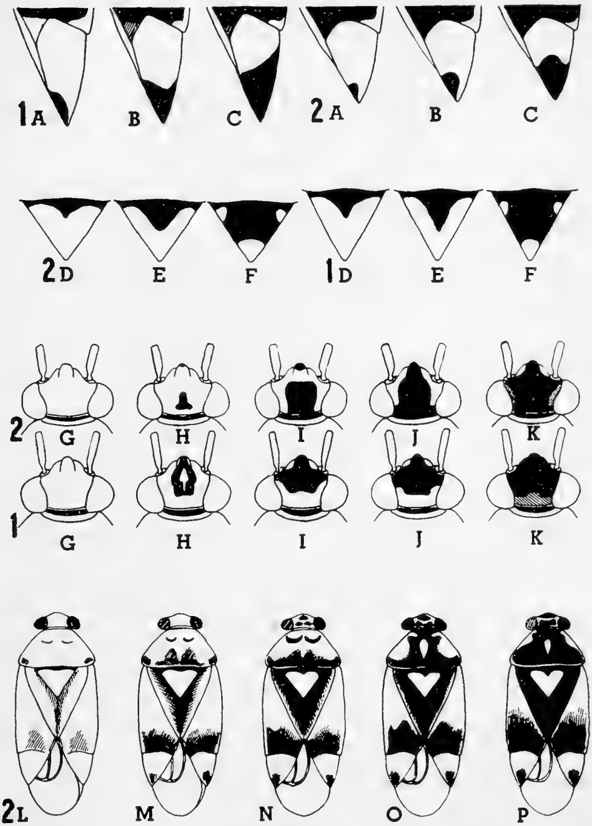

PLATE II. COLOR VARIATION IN SPECIES OF LYGUS

Lygus scutellatus (Uhler): 1A, B, C, dorsal view of right cuneus; 1D, E, F, dorsal view of scutellum, 1G, H, I, J, K, dorsal view of head. *L. campestris* (L.): 2A, B, C, dorsal view of cuneus; 2D, E, F, dorsal view of scutellum; 2G, H, I, J, K, dorsal view of head; 2L, M, N, O, P, dorsal view of insect.

mann's. The lectotype specimen will bear the type number U.S.N.M. no. 61302.

The eastern specimens heretofore considered as *Lygus rubicundus* (Fallén) therefore will take the name *Lygus pulverulentus* (Uhler). The true *rubicundus* may be present in the western United States, where it has been recognized under the varietal name *winnipegensis* Knight.

L. rubicundus and *L. pulverulentus* are readily separable by characters present in both the male and female genitalia. Th right paramere offers very good characters to separate the two species, and also serves to separate the closely related European species *Lygus reclairei* Wagner (1949) from the above mentioned species. In *pulverulentus* the right paramere is very broad distally and much more slender toward the base (Plate 1, Fig. A). The hypophysis is small and directed upward at a distinct angle. In *rubicundus* the entire paramere is rather slender, the hypophysis thick, pointed and tooth-shaped (Plate 1, Fig. E). In *reclairei* the paramere is thick throughout its entire length, the hypophysis is produced, hook-shaped, small and directed toward the inner side (Plate 1, Fig. C.), The sclerotized rod of the vesica also shows slight but definite differences as illustrated in Plate 1, Figs. G, H, I.

The left paramere also shows differentiating characters in the three species. In *pulverulentus* (Plate 1, Fig. B) the paramere has a thick, heavy hypophysis, a flat sensory lobe that extends to the right prominently, but less markedly than in *reclairei* (Plate 1, Fig. D), the latter also having a longer and more slender hypophysis. The left paramere of *rubicundus* (Plate 1, Fig. F) is relatively very slender, the sensory lobe being only moderately developed and the hypophysis shorter and more strongly curved.

In the females differences are present in the shape of the sclerotized rings located on the dorsal wall of the bursa copulatrix and in structure "C" of the posterior wall of the bursa. In *pulverulentus* the sclerotized ring is broad, widest near the lateral end and tapering strongly to the mesal end (Plate 1, Fig. V). In *rubicundus* the ring tapers somewhat to each end and is broadest mesad of the center of the ring (Plate 1, Fig. W). The "C" structure of *pulverulentus* (Plate 1, Fig. R) is considerably broader and deeper than is the case with *rubicundus* (Plate 1, Fig. S).

The two species are very similar externally, but some small differences appear to be present in the ratios of several parts. For example, in *pulverulentus* the vertex is as broad as the eye while in *rubicundus* it is 1.15 (male), 1.43 (female), times as broad as is the eye. (In *reclairei* the vertex is 1.31 (male), 1.8 (female) times as broad as the eye. *Pulverulentus* appears to possess longer and more dense pubescence than do either of the European species.

3. **Monalocoris filicis** (Linnaeus) and **M. americanus**, new species.

European and North American specimens of *Monalocoris* that have hitherto been called *Monalocoris filicis* prove upon examination to represent different species in the two faunal regions. The European species will retain the name *filicis*. The Nearctic species has not been described in the literature and may be called *americanus* n. sp.

The two species are readily separable by characters present in the male parameres. The right paramere of *americanus* (Plate 1, Fig. P) is relatively longer, more slender and evidently curved. In *filicis* the right paramere (Plate 1, Fig. Q) is shorter, thicker, and more nearly straight. The left paramere in *Monalocoris* is bifurcate and thus divided into two arms of nearly equal length. The sensory lobe (left arm) in *filicis* (Plate 1, Fig. K) is relatively slender, and more nearly truncate at the apex than is the case with *americanus* (Plate 1, Fig. J.) The hypophysis (right arm) in *filicis* (Plate 1, Fig. K.) is longer, more strongly curved and drawn out into a longer point than in the Nearctic species.

Externally the two species are very similar although a few dimensional differences may be detected. *Filicis* has a slightly broader head than does *americanus*. In *filicis* the vertex averages 3.5 (males), 3.3 (females), times as broad as the eye while *americanus* has the vertex 2.7 (males), 2.8 (females) times as broad as the eye. Occasional individuals from each continent will approach the average measurements of the other species. The cuneus and membrane in *filicis* is broader and shorter than is the case with *americanus*. In *filicis* the cuneus plus membrane length is .8 the length of the corium, while in *americanus* the length of the cuneus and membrane is .92 that of the corium.

The majority of specimens of *americanus* examined appeared darker in color than the European *filicis*, this color darkening being particularly evident on the head and antennae.

Monalocoris americanus, new species

Male.—Oval-elliptical, surface shining, blackish or blackish-brown; sparsely clothed with soft, light-colored hairs. First and second segments of antennae pale yellow, apex of second, all of third and fourth segments fuscous; length of antennal segments I:II:III:IV: .29 mm., .65 mm., .37 mm., .33 mm., second segment very slightly incrassate toward the apex. Pronotum densely and finely punctate, scutellum and hemelytra obsoletely punctured. Median claval suture twice length of scutellum. Cuneus and membrane more than .9 length of corium, membrane dull greyish brown with a single prominent vein present. Collar and caudo-lateral angles of pronotum, embolium, legs and rostrum light yellow. Rostrum reaching caudad to mesocoxae. Male genital segment short and conical; right paramere (Plate 1, Fig. P) small, slender and sinuated; left paramere (Plate 1, Fig. J) with two arms of nearly equal length, the hypophysis blunt at the apex with a small short point, sensory lobe curved, rounded bluntly at apex, tuberculate; penis very small, vesica with a flat, broad sclerotized staff. Length 2.4 mm.; width of head across eyes .29 mm.; width of eye .08 mm.; length of pronotum .52 mm.; width of pronotum at base .96 mm.; length claval suture .56 mm.; maximum width 1.3 mm.

Types.—Holotype, male, Lake Itasca, Clearwater Co., Minnesota, September 3, 1950 (Jean Laffoon), U.S.N.M. no. 61295.

Paratypes: 29 males, 43 females. MINNESOTA: Lake Itasca, Clearwater Co. (Jean Laffoon). TENNESSEE: Gatlinburg (R. H. Whittaker); Great Smoky Mts. Nat. Pk. (R. R. Dreisbach). VERMONT: Mt. Mnsfld. (E. A. Chapin). MICHIGAN: Cheboygan Co. (R. R. Dreisbach). MASSACHUSETTS: (C. F. Baker). COLORADO: (C. F. Baker). PENNSYLVANIA: Springbrook (Sailer). MAINE: Tumbledown Mt., Franklin Co. (A. Stone); Mt. Desert (W. L. McAtee). VIRGINIA: Dead Run, Fairfax Co. (V. A. Roberts). FLORIDA: St. Croix (G. Sanders). WISCONSIN: Camp McCoy (E. Hicks). IOWA: Palisades-Kepler State Park, Linn Co. (Laffoon, Slater, Hicks); Strawberry Point (Harris and Johnston). NEW YORK: McClean; White Face Mountain (H. H. Knight); White Plains (J. R. Torre Bueno). ONTARIO: Muskoka (E. P. Van Duzee); Gull Lake; Parry Sound (H. S. Parish). NOVA SCOTIA: Truro (R. Matheson). ALBERTA: Slave Lake (O. Bryant). Paratypes deposited in the collections of Iowa State College, H. H. Knight, U. S. National Museum, and those of the authors.

In 1881 Reuter described a *Camptobrochis parvulus* from Madeira. China (1938) referred this species to the genus *Monalocoris*. *M. parvulus* (Reut.) has some affinities to the species discussed above, differing from both by its very small eyes and slender antennae. The second antennal segment of the female is 1.3 times as long as the width of head across the eyes, whereas in *M. filicis* and *M. americanus* this ratio is 1.1—1.2. In general shape *parvulus* most closely resembles *americanus*, while the head and anetnnae are of a still lighter color than are those of the Palearctic species. In *parvulus* the vertex is four times as broad as the eye; the pronotum 2.75 times as broad as long and the surpassing part of the clavus twice as long as the scutellum.

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NEW SPECIES OF DOLICHOPODIDAE IN THE U. S. NATIONAL MUSEUM

(DIPTERA)

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This report includes descriptions of thirteen apparently undescribed species of Dolichopodidae which were among material submitted to the writer for identification by Dr. Willis W. Wirth, Division of Insect Identification, U. S. National Museum. All of the specimens discussed herein have been returned to Dr. Wirth, and are deposited in the U. S. National Museum.

Dolichopus hirsutitarsis, new species

Male.—Length, 5 mm.; length of wing, 4.5 mm. Face ochreous yellow, broad on upper portion where its width equals the distance between the tips of third and fourth veins, slightly narrowed on lower portion. Front metallic, green, its reflections violet when viewed obliquely. Palpi dark yellow, the anterior surface with black hairs. Antennae black; first segment yellow on lower half; second segment slightly yellow at tip on lower portion; third segment scarcely longer than wide, obtusely pointed, with a thick, densely pubescent arista which is inserted near the apical fourth of the segment. Postocular cilia white, the black cilia descending to about the middle of the eye.

Dorsum of thorax bright green, metallic, the reflections somewhat of a purplish hue when viewed obliquely; pleurae concolorous with dorsum, subshining, lightly dusted with grayish pollen; the black bristles of the prothorax and metanotum exceptionally large and prominent. Abdomen green, metallic, with bronze and purple reflections, lightly dusted with gray pollen. Hypopygium concolorous with the abdomen, the apical half more blackish, overlaid with whitish dust; lamellae yellow, triangular, with jagged and blackened apical margin, fringed with black bristles.

Coxae concolorous with pleurae, the fore pair yellowish on inner portions and at apex; anterior surface of fore coxae clothed with black hairs and with black bristles at the apex; there are a few delicate, pale hairs at the base of fore and middle coxae. Femora and tibiae yellow; middle femora with a single preapical bristle; posterior femora without cilia along the lower, inner edge, but with a row of six prominent bristles of increasing length which end with the large preapical bristle; the tip of the fore tibia bears a delicate, pale bristle on inner side, which is approximately one-half the length of the anterior basitarsus. Fore tarsi of plain structure, black from the tip of the first segment, the comparative lengths of the segments as 12-5-3-2-3; middle tarsi black from the tip of first segment, the first and fifth segments of ordinary structure, the second, third and fourth segments greatly compressed, and with a fringe of short, sharp hair-like bristles on their upper edge, the first segment with a row of short, sharp bristles on the inner and outer sides; comparative length of the segments of middle tarsi as 15-6-5-2-2; posterior tarsi black from the tip of first segment, the comparative length of the segments as 13-13-7-6-5. Calypters and halteres yellow, the former with black cilia.

Wings grayish hyaline; costa with a prominent, knot-like enlargement at the tip of first vein; last section of fourth vein bent sharply forward slightly before its middle; hind margin of wing deeply incised at the tip of fifth vein; anal angle evenly rounded, not prominent.

Female.—Agrees with the male in general coloration; the face is much wider, its pollen silvery; the middle tarsi are of plain structure and the costa is not enlarged at the tip of first vein.

Types.—U. S. N. M. no. 61661. Described from 8 males and 3 females, collected by J. M. Aldrich. Five males and 2 females, which include the holotype male and allotype female, were taken at Klamath River, California, July 11, 1930; 3 males and 1 female were taken at Rowdy Creek, Smith River, California, July 8, 1930.

Dolichopus hirsutitarsis, new species closely resembles *D. aldrichii* (Wheeler), but the two species are readily separable by differences in the structure of the middle tarsi and the wings. In *hirsutitarsis* the second, third and fourth segments of the middle tarsi are greatly compressed, and are approximately as broad as they are long; in *aldrichii* the corresponding tarsal segments are approximately twice as long as they are broad. The anal angle of the wing differs greatly in the two species; in *aldrichii* the anal margin is distinctly bi-lobed, and the anal angle is at a right angle to the costal margin, whereas in *hirsutitarsis* the anal angle is evenly rounded. It may be noted, also, that *aldrichii* has the anterior surface of fore tarsi clothed with delicate, barely perceptible, pale hairs, whereas in *hirsutitarsis* these hairs are black and very prominent.

Dolichopus vegetus, new species

Male.—Length, 5 mm.; length of wing, 5 mm. Face golden brown, as wide as the distance between the tips of third and fourth longitudinal veins. Palpi yellow. Antennae black; first segment yellow on lower half; third segment slightly longer than broad, obtusely pointed; arista inserted near the middle of segment. Lateral and lower postocular cilia white, the upper cilia black.

Dorsum of thorax metallic green, with a prominent median bronze vittum. Pleurae concolorous with the metanotum, sub-shining because of a rather dense covering of gray pollen. Abdomen metallic, green, the apical margins of the segments with bronze reflections; hairs and bristles on the dorsum of abdomen black, the lateral and ventral portions of abdomen with delicate, pale cilia. Hypopygium black; lamellae rather large, with the stem being approximately the same length as posterior basitarsus, of a sordid yellowish color, the apical margin with a broad black border, which is jagged and bristly.

Fore coxae yellow, slightly blackened at the base on outer side; anterior surface with delicate pale cilia on outer half, and minute black cilia on inner half, the bristles at the apex black. Middle and hind coxae black. Femora yellow, the posterior pair blackened at the tip as far as the preapical bristle, and ciliated along lower inner edge with a row of about ten evenly-spaced hairs which appear black in some lights, brownish in others; the longest of these hairs equals the width of the femora. Middle femora with a single preapical bristle. Fore and middle tibiae yellow, the latter nearly one and one-half times the length of middle femora; posterior tibiae wholly black, noticeably enlarged and compressed, the inner surface glabrous, the outer surface with numerous prominent black bristles. Fore tarsi yellow, the last two segments black; middle tarsi blackened from the tip of the first segment, which bears a prominent black bristle on the upper surface slightly beyond the middle; posterior tarsi wholly black, the first segment very prominent, approximately one-half the length of the femora. Comparative length of the segments of fore tarsi at 15-10-7-6-5; of middle tarsi as 20-10-8-6-6; of posterior tarsi as 20-15-10-8-6. Calypters and halteres yellow, the former with black cilia.

Wings grayish, tinged with brown in front of the fourth vein; costa with an elongated, knot-like enlargement at the tip of the first vein; last section of fourth vein bent forward slightly before its middle; anal angle evenly rounded, not prominent.

Female.—Similar to the male in coloration of body and legs; face much wider and with silvery pollen; posterior femora without cilia along the lower, inner edge; fore coxae with prominent black hairs over the entire anterior surface.

Types.—U. S. N. M. no. 61662. Described from 9 males and 7 females taken in Mt. McKinley National Park, Alaska, in 1932, by F. W. Morand.

Dolichopus vegetus, new species, is similar in many respects to *D. pensus* Aldrich, which also was described from Alaska. Both species are alike in having yellow femora, and black posterior tibiae. *D. pensus* lacks the cilia along the lower, inner edge of posterior femora, and has calypters with white cilia, whereas in *vegetus* the calypters are fringed with black cilia, and the posterior femora are fringed with long hairs along the lower, inner edge.

Dolichopus divigatus, new species

Male.—Length, 4.5 mm.; length of wing, 4.2 mm. Face golden pollinose, but appearing somewhat grayish-brown in certain lights, rather narrow, particularly on lower portion, where its width equals the width of middle tibia. Front blue, metallic. Antennae black; third segment slightly longer than wide, rounded at tip. Lateral and lower postocular cilia white. Palpi yellow.

Dorsum of thorax green, metallic, with bronze reflections; pleurae green, dulled with white pollen. Abdomen green, metallic, the posterior margins of the segments darker, and with bronze reflections. Hypopygium black; lamellae brown, oval, very large and prominent, equaling the length of middle basitarsus, the apex truncate, jagged and bristly.

Fore coxae yellow, the basal one-fourth blackened on outer surface, the anterior surface with prominent black hairs. Middle and hind coxae black. Femora yellow, the posterior pair blackened at tip as far as the preapical bristle; middle and posterior femora each with two preapical bristles, the latter without cilia along the lower, inner edge. Tibiae yellow, the posterior pair narrowly, but distinctly, blackened at tip. Fore and middle tarsi black from the tip of first segment; middle basitarsus without a bristle on upper surface; posterior tarsi wholly black. The comparative length of the segments of fore tarsi as 10-5-5-4-4; of middle tarsi as 16-8-7-5-5; of posterior tarsi as 15-15-10-7-5. Calypters and halteres yellow, the former with black cilia.

Wings grayish; costa without enlargement at the tip of first vein; last section of fourth vein bent slightly forward just before its middle; anal angle evenly rounded, prominent.

Type.—U. S. N. M. no. 61663. Described from one male taken at Mt. Hood Meadows, Mt. Hood, Oregon, July 13, 1932, by J. M. Aldrich.

Dolichopus divigatus, new species, resembles both *D. apheles* Van Duzee and *D. affluens* Van Duzee in general appearance and coloration, but the two latter species possess a single preapical bristle on middle and posterior femora. *Dolichopus apheles* M. & B. also is similar to *D. divigatus* in coloration and size, but it likewise possesses a single preapical bristle on middle and hind femora, and the hypopygial lamellae are much smaller and of different shape.

Hercostomus indianus, new species

Male.—Length, 2.5 mm.; length of wing, 3 mm. Face silvery pollinose, narrow, particularly in the middle, where the eyes are nearly contiguous. Front gray-pollinose. Palpi concolorous with the face. Antennae yellow; third segment brown on the apical half, slightly longer than wide, obtusely pointed, pubescent. Arista arising from the middle of third segment, approximately three times the length of antenna, pubescent. Postocular cilia white.

Dorsum of thorax metallic, green, lightly grayish pollinose, the lateral portions brown; scutellum concolorous with metanotum, with one pair of very prominent marginal bristles and minute pale cilia along the margin; bristles of the thorax strong, black; pleurae yellowish-brown, lightly grayish pollinose, a conspicuous black spot below and near the base of calypters. Abdomen green, metallic, grayish pollinose, the venter and the anterior two thirds of the first segment yellow, the hairs and bristles brown, appearing pale in some lights. Hypopygium yellow; inner organs shining black, the outer lamellae yellow, triangular, the apical margin truncate, fringed along margins with delicate pale hairs.

Coxae and legs yellow, with only the extreme apices of all tarsi but slightly infuscated. Anterior surfaces of the fore and middle coxae with delicate pale hairs, the bristles at tips brownish; outer surface of middle and hind coxae with a prominent black bristle. Anterior tibiae with a row of strong, closely-spaced, black bristles which are of approximately the same length as the width of tibia; middle and posterior femora each with a single preapical bristle. Halteres and calypters yellow, the latter with pale cilia which appear brownish in some lights.

Wings grayish hyaline, veins yellow; third and fourth veins slightly converging toward their tips; wings broadly rounded at apex; cross-vein situated well before the middle of wing, its length is slightly less than one third the length of the last portion of fifth vein; anal angle evenly rounded toward the root of the wing.

Female.—Similar to the male in coloration of body and legs. The face is much wider, its width equaling the distance between the tips of the third and fourth veins.

Types.—U. S. N. M. no. 61664. Described from 4 males and 3 females collected at La Fayette, Indiana, July 4, 1916, by J. M. Aldrich.

Hercostomus indianus new species traces to *H. minutus* (Loew), in the table of species presented by Curran, American Museum Novitate, No. 682, 1933, but the latter species possesses wholly black postocular cilia which will readily distinguish it from *indianus.* No other species of *Hercostomus* known to the writer display the sharply contrasting colors evident in the case of *indianus,* which has the dorsum of the abdomen green and the pleurae and hypopygium pale yellowish.

Hercostomus coloradensis, new species

Male.—Length, 3 mm.; length of wing the same. Face silvery pollinose, rather wide, its width equalling the distance between the tips of the third and fourth longitudinal veins. Front concolorous with the face. Postocular cilia black. Antennae black; third segment slightly longer than wide, evenly rounded on lower portion. Arista inserted near the middle of third segment. Palpi brown.

Dorsum of thorax dark-green, sub-metallic, whitish pollinose; pleurae of a dull greenish color, pollinose. Abdomen concolorous with the metanotum, the lateral portions and the venter dulled with white pollen. Hypopygium black, whitish pollinose; outer lamellae yellow, ribbon-like, their length equaling that of the anterior tibia, tapering to a point, the sides jagged and fringed with long, yellow cilia.

Fore coxae yellow, their anterior surface clothed with delicate black hairs, the bristles at the tip long and black; middle and posterior coxae concolorous with pleurae, their tips yellowish. Femora, tibiae and tarsi yellow; posterior femora blackened on apical one-third; middle and posterior femora each with a single preapical bristle; anterior tibiae without a row of bristles along the anterior, outer edge; posterior tibiae brownish on apical one-fourth. Fore tarsi with first three segments yellow, slender, laterally compressed, their combined length equalling the length of fore tibia; fourth and fifth segments black, conspicuously flattened; comparative length of the segments of fore tarsi as 14-11-11-4-4; middle tarsal segments of plain structure, their comparative lengths as 22-13-11-6-5; posterior tarsi brownish, the comparative length of the segments as 15-15-11-6-5. Calypters and halteres yellow, the former with black cilia.

Wings grayish hyaline; third and fourth veins convergent on last portions, their tips separated by a distance equal to the width of middle tibia; anal angle evenly rounded.

Female.—Coloration as in the male. The face is much wider; the fore tarsi are of plain structure.

Types.—U. S. N. M. no. 61665. Described from 3 males and 4 females collected at Boulder, Colorado, by J. M. Aldrich. Date of collection not indicated on the labels.

Hercostomus coloradensis, new species is readily distinguishable by the peculiar structure of the fore tarsi, together with the elongate, ribbon-like, tapering hypopygial lamellae.

Hercostomus orbicularis, new species

Male.—Length, 3 mm.; length of wing the same. Face silvery pollinose, its width equaling the width of the third antennal segment. Front concolorous with the face. Postocular cilia black. Palpi black. Antennae yellow; third segment brownish on apical half, elongate-oval, slightly longer than wide, rounded at tip.

Dorsum of thorax metallic, dark green, lightly dusted with white pollen; pleurae appearing gray, the surface with dense coating of gray pollen. Abdomen concolorous with the metanotum. Apical half of the hypopygium yellow, the basal half black; outer lamellae yellow, the apical margin broadly blackened, basal half of the lamellae narrow, the apical half expanded, somewhat spoon-shaped, rounded at the apex; fringed with long yellow hairs; length of lamellae equal to the length of second segment of middle tarsi.

Coxae and all of legs yellow; anterior surface of fore and middle coxae with black hairs; outer surface of posterior coxae with a prominent black bristle. Tarsi of plain structure, the comparative length of the fore tarsal segments as 12-6-5-4-3; of middle tarsi as 16-12-9-5-4; of posterior tarsi as 12-12-9-6-5. Calypters and halteres yellow, the former with black cilia.

Wings grayish hyaline, with a prominent, jet-black, apical spot; this spot begins at the tip of the second vein and extends a considerable distance below the tip of fourth vein; posterior cross-vein situated before the middle of the wing; apical portions of third and fourth veins parallel; anal angle evenly rounded.

Female.—Similar to the male in coloration. The face is much wider, its width equalling the length of posterior cross-vein; third antennal segment shorter than in the male, being as broad as long; the wings lack the prominent jet-black apical spot, yet they are distinctly brownish on the apical one-fourth.

Types.—U. S. N. M. no. 61666. Described from 4 males and 11 females, collected in Mill Creek Canyon, San Bernardino Mountains, California, June 9, 1924, by J. M. Aldrich.

The prominent, round, jet-black apical spot of the wings readily distinguishes *orbicularis,* new species from other known members of *Hercostomus.*

Hercostomus consanguineus, new species

Male.—Length, 3 mm.; length of wing, 2.5 mm. Face brown, rather wide, the lower portion narrowed, equalling the width of posterior tibia. Front sub-shining, lightly dusted with brownish pollen. Palpi black. Postocular cilia black. Antennae black; third segment as broad as long, rounded below, obtusely pointed.

Dorsum of thorax dark green, its reflections blackish, almost devoid of pollen; scutellum concolorous with the metanotum, with a single pair of large marginal bristles, the upper surface with delicate black hairs; pleurae sub-shining, with dense layer of graying pollen. Abdomen concolorous with the metanotum, metallic, its reflections of a dark greenish hue. Hypopygium black; lamellae black, crescent-shaped, of nearly equal width throughout, the apex rounded, the outer margin jagged and with bristly, black hairs; the lamellae are as long as the second segment of middle tarsi.

Coxae black; anterior surface of fore and middle pairs clothed with black hairs and bristles. Femora and tibiae yellow; tarsi darkened from the tip of first segment; middle and hind femora each with a single preapical bristle. Comparative length of the segments of fore tarsi as 12-5-4-3-3; of middle tarsi as 15-7-6-5-4; of posterior tarsi as 12-13-8-7-5. Calypters and halteres yellow, the former with black cilia.

Wings grayish hyaline; apical portions of third and fourth veins parallel; anal angle evenly rounded, not prominent.

Types.—U. S. N. M. no. 61667. Described from 2 males collected at Olympia, Washington; one taken June 3, 1895, the other June 28, 1896, both collections made by Kincaid.

Hercostomus consanguineus, new species resembles *H. chalcochrus* (Loew) in general appearance. Both species have the coxae wholly black, the remainder of legs yellow. In *consanguineus* the hypopygial lamellae are of equal width throughout and are rounded at apex; the lamellae of *chalcochrus* are widest at the middle, from which point they taper to a sharp point. *H. chalcochrus* possesses a row of three to four evenly-spaced, long black hairs on the lower edge of the basal portion of middle femora; the middle femora of *consanguineus* are without such hairs.

Asyndetus scopiferus, new species

Male.—Length, 2.5 mm. Face and front silvery pollinose, of approximately equal width, the latter equalling the length of second segment of middle tarsi. Lateral and inferior postocular cilia, and the whiskers, white. Antennae black; third segment broader than long, rounded at tip; second segment overlapping the third a short distance on the inner side. Arista dorsal, inserted near the base of third segment. Palpi black, the anterior surface with thin white pollen and stiff black hairs, which are longer than the palps.

Dorsum of thorax metallic, bronze-green, lightly dusted with white pollen. Abdomen metallic, bronze-green; reflections more of a bluish hue in certain lights; hairs of the abdomen black; two pairs of prominent black bristles at the tip of abdomen. Hypopygium small, black; lamellae minute, each bearing three small, white bristles at tip.

Coxae and legs wholly black. Fore and middle coxae with black hairs on anterior surface. Fore femora with a row of long, black bristles on the outer lower surface, which are as long as the width of femora, and numerous shorter bristles on the lower surface; middle femora nearly glabrous on lower surface, but with a single, short, blunt spine situated near the basal third; posterior femora with a row of long, slender bristles on the outer surface of the basal half, and with several prominent bristles along the lower edge. Tibiae bristly; posterior pair noticeably enlarged. Segments of fore tarsi with dense, short, stiff bristles on outer surfaces, which are as long as the width of the tarsal segments; anterior pulvilli slightly longer than the fifth segment, which bears several prominent black bristles at its tip; middle tarsi of plain structure; first segment of posterior tarsi with a prominent black spine near the base and another at the tip on lower surface; third segment with a long black bristle at tip on upper surface; fourth segment with two long bristles on the upper surface, one of which arises near the middle of the segment is curved, scimitar-like, the other arising near the tip of the segment is straight; both bristles are approximately twice the length of the fourth segment; fifth segment of peculiar structure, its outer apical margin extending beyond the inner margin and terminating in four stiff bristles, which present a somewhat hand-like appearance. Comparative length of the segments of fore tarsi as 10-5-4-3-2; of middle tarsi as 12-6-5-4-4; of posterior tarsi as 9-9-5-4-4. Calypters and halteres white, the former with white cilia.

Wings grayish hyaline; costa ending at the tip of third vein; the very thin fourth vein is broken opposite the tip of third vein; anal angle prominent, at nearly a right angle to the costal margin.

Types.—U. S. N. M. no. 61668. Described from 2 males taken at Hood River, Oregon, July 14, 1932, by J. M. Aldrich. The peculiar structure and chaetoxaxy of the posterior tarsi readily distinguish *scopiferus*, new species from other known species of *Asyndetus*.

Chrysotus kansensis, new species

Male.—Length, 2 mm. Face silvery pollinose, narrowed on lower portion, the eyes contiguous. Front green, metallic. Palpi white, equalling the length of the third segment of fore tarsi. Lateral and lower postocular cilia white. Antennae black; third segment reniform, with a slight point below the insertion of the arista.

Thorax and abdomen metallic, green, their hairs and bristles black. Coxae, femora, hind tibiae and hind tarsi black; trochanters and the fore and middle tibiae yellow; fore and middle tarsi blackened from the tip of third segment. Lower edge of hind femora with a row of black, hair-like bristles whose length equals the width of femora; hind tibiae ciliated on outer surface with long black hairs which are approximately twice as long as the width of tibia, and with a brush of long hairs on the lower side near the tip. Hind basitarsus appears slightly swollen below near the middle, its lower surface densely ciliated with black hairs which are longer than the width of basitarsus. Halters, calypters and their cilia, yellow.

Wings grayish hyaline; third and fourth veins parallel on last portion.

Female.—Similar to the male except that the palpi are black, lightly dusted with silvery pollen; the hind tibiae and tarsi are yellow; the face is wider than in the male, its width equalling the distance between the tips of third and fourth veins.

Types.—U. S. N. M. no. 61669. Described from 2 males and 5 females collected at Lawrence, Kansas, by J. M. Aldrich. Date of collection is not shown on the labels.

Chrysotus kansensis, new species strongly resembles *C. hirtipes* Van Duzee. The two species differ, however, in the form of the third segment of the antennae, and in the chaetotaxy of posterior basitarsus. In the case of *hirtipes* the third segment of antennae is elongate-triangular, equalling the length of the third segment of hind tarsi, oblique on upper edge, with a slight notch for the insertion of the arista; in *kansensis* the third segment of antennae is less than one-third the length of third segment of posterior tarsi, reniform, the lower edge rounded and of slightly more prominence than the upper edge. Both species have the posterior basitarsus swollen on the lower surface near its middle; in *kansensis* the hairs arising from the swollen area are considerably longer than the width of basitarsus; in *hirtipes* the corresponding hairs are shorter than the width of basitarsus.

Chrysotus dakotensis, new species

Male.—Length, 1.6 mm.; length of wing, 1.5 mm. Face lightly dusted with silvery pollen, the bluish ground color perceptible on upper portion, the lower portion narrowed so that the eyes are contiguous. Front metallic, green. Palpi yellow. Lateral and lower postocular cilia white. Antennae black; third segment as broad as long, its length equalling the length of third segment of posterior tarsi, the upper edge oblique. Arista sub-apical, inserted slightly before the tip of third segment.

Dorsum of thorax and the scutellum green, metallic, the reflections bronze in some lights, their bristles black; pleurae lightly dusted with gray pollen. Abdomen metallic, green, with bronze reflections, its bristles and hairs black. Hypopygium black, embedded, the outer lamellae short, blunt, each as long as the third segment of fore tarsi, fringed with delicate pale hairs. Halteres, calypters and their cilia, yellow.

Coxae, femora, posterior tibiae and their tarsi black with green reflections. Fore coxae with black hairs and bristles on anterior surface; posterior femora with a row of prominent black bristles along lower edge, whose length equals the width of femora; posterior tibiae laterally compressed, their outer surface clothed with long black hairs which are as long as the width of tibia, and with a brush of hair below on the apical third; the long hairs on the outer surface of the posterior tibia are continued on the outer surface of the posterior basitarsus. Fore and middle tibiae yellow; fore and hind tarsi blackened from the tip of first segment. Comparative length of the segments of fore tarsi as 10-4-3-3-3; of middle tarsi as 13-5-4-3-3; of hind tarsi as 10-5-4-3-3.

Wings grayish hyaline; veins brown.

Types.—U. S. N. M. no. 61670. Described from 3 males collected in South Dakota, by J. M. Aldrich. No date is shown on the labels. The holotype male is labelled Brookings, South Dakota; the two paratype males are labelled "S. D."

Chrysotus dakotensis, new species closely resembles *C. tibialis* Van Duzee in the structure of the antennae and in the chaetotaxy of the hind tibiae and tarsi. However, in *tibialis* the fore and middle tibiae and the palpi are wholly black. In both species the hairs and bristles on anterior surface of fore coxae are black.

Syntormon variegatum, new species

Male.—Length, 3 mm. Face silvery pollinose, narrow, the lower portion equalling the width of the middle basitarsus. Front metallic, blue-green. Antennae black; first segment expanded laterally towards its tip; second segment overlapping the third segment to near its middle on the inner side; third segment triangular, evenly tapered on the upper and lower edges, ending in a sharp tip, its length equalling the length of posterior basitarsus. Arista sub-apical, equalling the length of third segment. Lateral and lower postocular cilia white. Palpi black.

Dorsum of thorax bronze, dulled with gray pollen; pleurae concolorous with metanotum, but the pollen much heavier. Abdomen concolorous with metanotum, with greenish reflections in certain lights. Hypopygium embedded, the external lamellae yellowish-brown, with delicate pale cilia.

Coxae, femora and tibiae yellow. Anterior surface of fore and middle coxae with delicate pale hairs, and with a few black bristles near their tips. Fore tibiae with a row of closely-spaced, sharp black bristles along inner edge; middle tibiae with a row of about ten evenly-spaced black bristles on the lower edge, which are longer near the base of tibia and decrease in length as they approach the apex. Posterior tibiae narrow on the basal four-fifths, the apical fifth greatly swollen and blackened, and bearing a number of prominent black bristles. Fore tarsi black from the base of third segment; middle tarsi with first segment whitish, the remaining segments black; second, third and fourth segments laterally compressed, their upper and lower edges fringed with short, black hairs, each of these segments being as broad as long; fifth segment narrow, forming a pointed tip to the tarsi; posterior tarsi blackened from near the base of second segment; posterior basitarsus with a long, bisinuate bristle on lower surface, a shorter, straight bristle on outer side near the base of the larger bristle, and several stiff, black hairs on the posterior surface. Segments of the fore tarsi as 15-6-5-4-4; of middle tarsi as 16-5-5-4-4; of posterior tarsi as 8-8-7-4-4. Halteres yellow; calypters yellow with narrow brownish margin, their cilia pale.

Wings grayish hyaline; last section of fifth vein slightly longer than the cross-vein; anal angle evenly rounded, not prominent.

Type.—U. S. N. M. no. 61671. Described from one male taken at Smith River, California, July 21, 1932, by J. M. Aldrich.

Syntormon variegatum, new species may be distinguished from the other *Syntormon* having the middle tarsi conspicuously widened, by means of the following key:

1. Some of the segments of both middle and posterior tarsi conspicuously widened .... *ornatipes* Van Duzee
   Only the middle tarsi with some segments conspicuously widened 2
2. Posterior tibiae wholly yellow; segments of middle tarsi depressed dorso-ventrally .... *utahensis* H. & K.
   Posterior tibiae darkened at tip; segments of middle tarsi compressed laterally 3

3. Second segment of middle tarsi wholly white in color........*palmare* Loew
   At least the apical half of second segment of middle tarsi black..... 4
4. Second segment of middle tarsi blackened only on the apical half; second and third segments but slightly widened; last four segments of posterior tarsi clothed with black hairs on upper surface ....*kennedyi* H. & K.
   Second segment of middle tarsi wholly black; second, third and fourth segments greatly compressed, as broad as long; entire upper surface of last four segments of posterior tarsi clothed with delicate pale cilia........*variegatum*, new species

Aphrosylus californicus, new species

Male.—Length, 1.5 mm.; length of wing, 2.2 mm. Face velvety black, appearing somewhat grayish when viewed obliquely, its width equals the width of the base of posterior femur. Front black, the dark green ground color barely perceptible. Antennae black; first segment widened apically; second segment short, spheroidal, with a few black bristles on apical margin; third segment elongate-triangular, approximately twice as long as the width at base. Arista apical, tapering rapidly, approximately two times the length of third antennal segment. Postocular cilia wholly black. Palpi black.

Body and legs wholly black, sub-metallic, lightly dusted with grayish pollen. Metanotum with two rows of dorsocentral bristles, each row containing six prominent bristles; acrostical bristles extremely minute, in a single row; two extremely prominent bristles on the margin of scutellum, and a single pair of delicate hairs situated outside the larger bristles. Hypopygium black; lamellae broad at base, expanded upward to form a broad, leaf-like structure, rounded at apex, from which extends a long, cylindrical projection which is expanded at tip, bearing numerous long, delicate, brownish hairs.

Fore coxae with short black hairs on anterior surface; middle coxae with black hairs on anterior surface near the tip. Fore and middle femora with delicate black hairs on lower surface, these being rather inconspicuous, their length being only about one-half the width of femora; posterior femora with a row of slender, black hair-like bristles on the apical half, on inner and outer edges; these slender bristles are nearly three times as long as the width of femora; tibiae and tarsi of plain structure, without noticeable hairs or bristles; tarsi of plain structure, the apical segments somewhat flattened. Comparative length of the segments of fore tarsi as 10-5-5-4-4; of middle tarsi as 13-7-5-4-4; of posterior tarsi as 10-10-7-5-5. Halteres and calypters yellowish-brown, the latter with black cilia which appear brownish in certain lights.

Wings dark gray, rather opaque, without any trace of darker clouds on the veins; last section of fifth vein slightly longer than the posterior crossvein; anal angle evenly rounded, not prominent.

Female.—Similar to the male in coloration of body and legs. The face is much wider, being about twice the width of posterior femur; posterior femora without long hair-like bristles on lower edges; knobs of halteres darker than in the male.

Types.—U. S. N. M. no. 61672. Described from 9 males and 8 females collected at Laguna, California, August 1, 1932, by J. M. Aldrich.

Aphrosylus californicus, new species may be distinguished from other members of the genus by its small size and the presence of long, slender bristles along the lower edges of posterior femora. It resembles *A. wirthi* H. in general appearance, but the latter species has the second, third and fourth longitudinal veins greatly broadened, whereas in *californicus* the corresponding veins are slender, of plain structure.

Hercostomus flagellatus, new species

Male.—Length, 3.8 mm.; length of wing, 4 mm. Face slightly wider than the width of posterior tibia, silvery pollinose. Front metallic, violet, lightly dusted with gray pollen. Lateral and lower postocular cilia white. Antennae black; first segment yellowish on lower portion; third segment slightly longer than broad, evenly rounded on lower portion. Arista inserted just before the tip of segment, equally the length of fore tibia, thickened on basal portion, very thin on apical half, and bearing a very conspicuous lamella at the apex.

Dorsum of thorax, scutellum and the pleurae dusted with gray pollen which partly obscures the blue-green ground color. Abdomen metallic, violet, the incisures with greenish reflections, the lateral portions densely grayish pollinose. Hypopygium black, with green reflections; lamellae black, short, round at apex; from the extreme base there arises a long, tapering, ribbon-like appendage which projects upward; this appendage equals the length of the second segment of posterior tarsi, and is fringed on the margins with delicate black hairs.

Coxae black with yellow tips; anterior surface of fore and middle coxae with black hairs and bristles. Femora and tibiae yellow; posterior femora black at tip on upper edge; middle and posterior femora each with a single preapical bristle. Tarsi black from the tip of first segment. Comparative length of the segments of fore tarsi as 10-3-2-2-3; of middle tarsi as 16-12-8 (last two segments missing); of posterior tarsi as 10-14 (last three segments missing). Halteres and calypters yellow, the latter with black cilia.

Wings grayish hyaline; veins black; last section of fourth vein bent forward slightly beyond the middle; this bend is rounded, from which point the vein extends obliquely forward to end slightly behind the tip of third vein; posterior cross-vein slightly longer than the last section of fifth vein; anal angle gradually and evenly rounded toward the root of wing.

Type.—U. S. N. M. no. 61673. Described from one male collected at Mobile, Alabama, April 2, 1924. The specimen was collected in the hold of a ship, containing a cargo of bananas from Panama. The specimen is labelled "Mobile, No. 1984."

The prominent lamella at tip of arista, together with the long prolongation arising from near the base of the hypopygial lamella will readily distinguish *flagellatus*, new species from the known species of *Hercostomus*. This species has been assigned to the genus *Hercostomus* despite the fact that the curvature of the last section of the fourth vein resembles that of certain species of *Paraclius*.

MECYNOTHRIPS SNODGRASSI, A NEW THRIPS FROM THE SOLOMON ISLANDS

(THYSANOPTERA)

By J. DOUGLAS HOOD, Cornell University, Ithaca, N. Y.

Everyone who has taken a college course in insect anatomy knows of the work of R. E. Snodgrass. If the student's contact with the subject fired a permanent interest, he has used Snodgrass's papers as a pattern for his own, because of their objectiveness and thoroughness, and the inimitable drawings with which they are always so generously illustrated. Perhaps Mr. Snodgrass is our greatest living American entomologist. Such at least is my own opinion, borne out by the number of honorary memberships which have been accorded him by the entomological societies of the world.

Some time ago I mentioned to him that I had long intended to name a new species after him—an empty honor to the recipient, of course, but always a source of satisfaction to the describer himself—but that I had not been able to turn up one of sufficient stature. The present species meets this specification quite well, for it is a veritable giant among thrips, measuring nearly a half inch in length.

Mecynothrips snodgrassi, new species
Figs. 1-9, 12-14

Male (macropterous).—Length about 10.3 mm. (fully distended, 12.22 mm.). Color nearly black, with red internal pigmentation showing through membranous areas and through pale areas of the integument at the lateral margins of abdominal segments II-VII in front of middle; all coxae, trochanters, and femora about concolorous with body; all tarsi yellow, with the usual dark cups, the fore pair brownish; fore tibiae broadly yellow along the morphologically inner and outer surfaces nearly to base, the upper and lower surfaces and the base blackish brown; middle and hind tibiae pale yellow in distal half and dark yellow in narrowed basal sixth, blackish brown between; antennae about concolorous with head in segments I, II, VII, and VIII, I yellowish basally and II apically, the intermediate segments yellow basally and blackish brown apically; III lightly shaded in basal two-thirds, dark

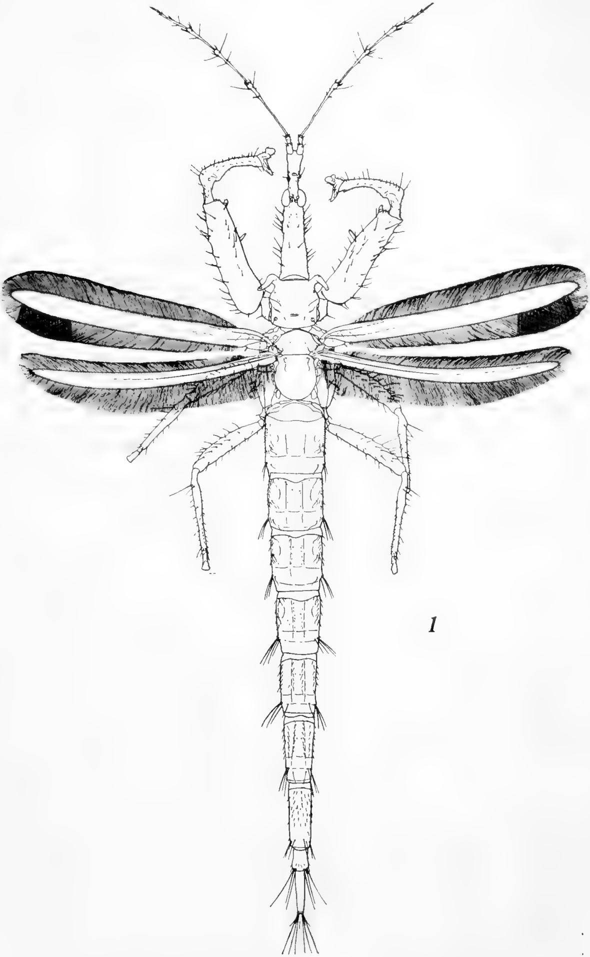

Plate I. Mecynothrips snodgrassi

Fig. 1. Male, holotype, length 10-12 mm.

in only the swollen apical tenth; IV and V similarly colored, but more heavily shaded in basal three-fifths and one half, respectively (especially at extreme base), V dark in apical third; VI dark in apical half or more, shaded at extreme base; wings heavily shaded with brown, the fore pair brown in about basal third and with a dark median vein in most of basal half, the hind pair brown to middle, darkest behind a submedian vein.

Head (figs. 1, 2, 4, 5, 7, 14).—About 5.2 times as long as width across eyes and 4.3 times the width just in front of base, where it is broadest; head-process (measuring from front margin of eyes) 0.3 the total length of head and 2.4 times as long as greatest width, its breadth at eyes 0.64 its breadth at bases of antennae; cheeks tapering rather evenly from base to near eyes, slightly flaring to latter, set with 8 or 9 pairs of large, strongly-projecting tubercles which bear stout, blunt, yellowish setae 170-213μ long; a pair of prominent tubercles (fig. 4) behind median ocellus, projecting beyond outline of head and bearing each a long (199-227μ), strong, blunt, nearly black seta; another pair of large tubercles (fig. 7) immediately behind posterior ocelli, these also setigerous, the setae themselves nearly black and 122-166μ long; postocular and dorso-cephalic setae nearly black and blunt, the former (much foreshortened in figs. 1, 2) about 148μ long, 125 apart, and 252 behind eyes, the dorso-cephalic ones 146-197μ long, 112 apart, and 448 from base of head; dorsal surface of head with a few minute setae, finely and sharply cross-striate in about basal tenth, the remainder obscurely transversely furrowed, the furrows barely visible when observed at right angles to the surface, but distinct on the ascending surface just posterior to eyes; ventral surface of head with a conspicuous excavation at middle (figs. 5, 14). Eyes rounded, protruding, with small, closely-packed facets, much longer dorsally (260μ) than ventrally, their width at ocelli 102μ, their interval across ocelli 146μ, their least ventral interval 87μ. Ocelli of posterior pair (fig. 7) much larger (50μ) than the median ocellus (19μ) and encroaching upon the inner margins of eyes, their interval 56μ, their distance from median ocellus 322μ, the latter (fig. 4) borne at the tip of a rounded tubercle which is directed forward as well as upward. Antennae (figs. 1, 12, 15) about 1.6 times as long as head, more slender than in the other species of the genus, segment III more than 12 times, and IV 9 times, as long as greatest width; setae on III-VI dark, conspicuous because directed strongly outward from the segments; sense-cones short, slender, curved, and pointed. Mouth-cone with sides almost perfectly straight, tip broadly rounded and extending about 309μ beyond dorsal margin of head.

Prothorax (figs. 1, 2, 3, 6, and 9).—Typical in bearing a pair of curious, hollow, horn-like processes which arise from the anterior angles of the pronotum, curving backward and outward, these not perfectly symmetrical in the type, but each with a small seta at tip (figs. 3, 6); antero-marginal and antero-angular setae minute (12-26μ), not identifiable with certainty, the other major setae short and arising from tubercles, the midlaterals 39μ, epimerals (fig. 9) 121μ, postero-marginals 90μ,

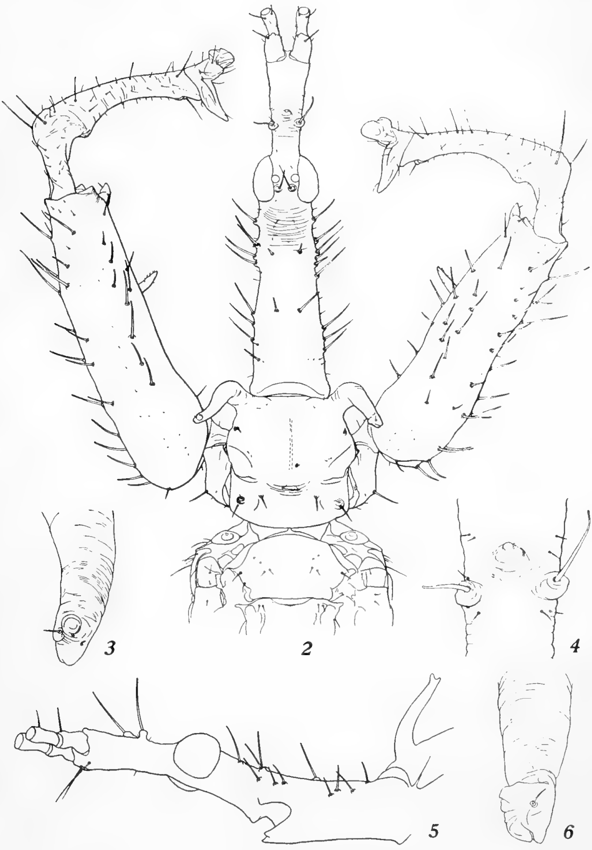

PLATE II. MECYNOTHRIPS SNODGRASSI

Fig. 2. Male, holotype, head and prothorax; fig. 3, tip of left pronotal horn; fig. 4, region of median ocellus; fig. 5, head, ventro-lateral aspect; fig. 6, tip of right pronotal horn.

coxals 136μ; epimeron and episternum only partially separated by sutures from each other and from notum; pronotum with a prominent dark median apodeme, but almost without sculpture save for a few delicate dark striae partially encircling the horns and three or four arcuate striae medially behind middle (fig. 2), where there is a pair of minute setae; mesonotum and metanotum without major setae, their surfaces very finely and delicately polygonally reticulate almost throughout. Legs (figs. 1, 2, 8, 13) normal to the genus, excepting the more slender fore femora and the heavier and more bent basal portion of the fore tibiae; fore tarsi with the usual strong tooth. Wings (fig. 1) thoroughly typical, the fore pair with the three major subbasal setae blackish brown and 164, 134, and 190μ, respectively; posterior margin of fore wings with about 65 accessory setae.

Abdomen (fig. 1).—Long and slender, finely reticulate over most of its surface; segment IX very short, VII and VIII very long, as is the condition in the other species of the genus; tube somewhat swollen just beyond base and tapering rather evenly to tip, its length about 0.37 that of head, more than twice that of the ninth abdominal segment, and about 4.5 times its greatest subbasal width, this last about 1.6 times the apical width, its surface with a few minute colorless setae but without sculpture; major abdominal setae yellow in basal segments, becoming brownish on V-VIII, and nearly black on IX and X, those on IX about 630μ, the terminal ones 588μ.

Measurements of male (holotype, KOH-treated), in mm.—Length about 10.33 (fully distended, 12.22); head, total length 1.82, width across eyes 0.349, least width just behind eyes 0.266, greatest width (near base) 0.420; length of head in front of eyes 0.546, apical width of process 0.288, basal width 0.147; prothorax, median length of pronotum 0.714, greatest width (inclusive of coxae) 0.883, exclusive of coxae (in front of middle) 0.707; pterothorax, width just behind anterior angles 1.04, greatest width 1.11; abdomen, greatest width (at base of segment II) 0.861; segment VIII, length 0.855; IX, length 0.308; tube (X, only), length 0.669, greatest subbasal width (across basal collar) 0.150, least apical width 0.093.

Antennal segments:	1	2	3	4	5	6	7	8
Length (microns):	164[1]	154	895	658	504	309	133	115
Width (microns):	112[2]	73	73	73	58	43	35	23

Type.—SOLOMON ISLANDS: Big Florida Island, November 29, 1944, Dr. H. E. Milliron, 1 ♂, "on shrub along jungle trail."

Mecynothrips wallacei Bagnall, the type of the genus, was described in 1908 from a unique male specimen taken by Alfred Russell Wallace at Dorey, New Guinea. Suspecting that

[1]The dorsal exposed length is 140μ.

[2]This is the greatest (diagonal) basal width.

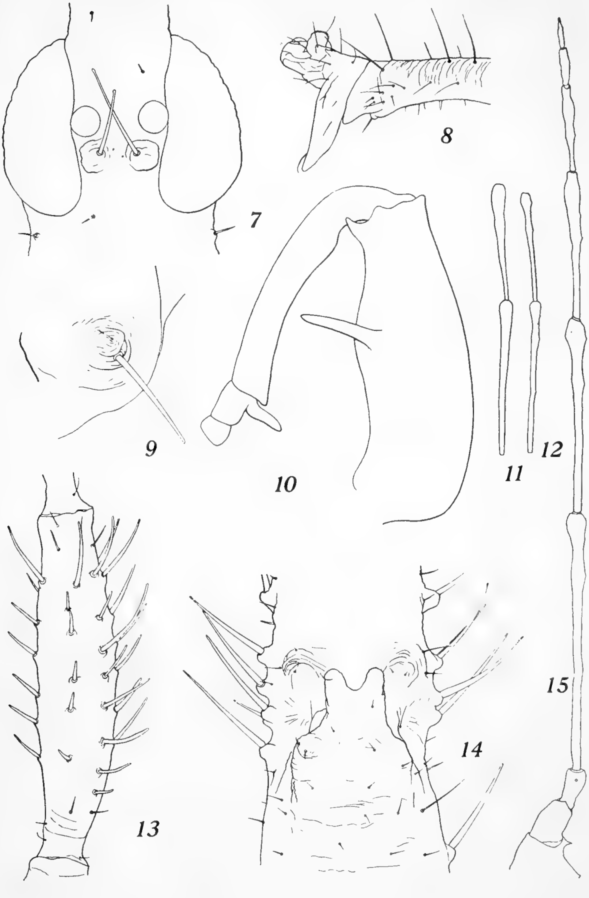

PLATE III. MECYNOTHRIPS SNODGRASSI AND M. WALLACEI

Fig. 7, *M. snodgrassi*, region of eyes; fig. 8, *M. snodgrassi*, right fore tarsus and tip of tibia; fig. 9, *M. snodgrassi*, region of epimeral seta of prothorax; fig. 10, *M. wallacei*, left fore leg, ventral aspect; fig. 11, *M. wallacei*, segments III and IV of antenna; fig. 12, *M. snodgrassi*, segments III and IV of antenna; fig. 13, *M. snodgrassi*, left middle femur; fig. 14, *M. snodgrassi*, head, middle portion, ventral aspect; fig. 15, *M. snodgrassi*, left antenna.

at least some of Bagnall's eight figures were in error, and being unable to borrow Bagnall's type, I asked the Department of Entomology of the British Museum to study it for me with reference to several details of structure. Tracings of several of the drawings of *M. snodgrassi* which are reproduced in the present paper were sent on for comparison. Six drawings of the type of *M. wallacei* were made by the British Museum, with evident care and great promptness, and these were forwarded to me together with valuable descriptive comments (quoted herewith) on the carded type specimen. As a result it is clear that *M. wallacei* is less distinct from its congeners than we would be led to believe from a study of Bagnall's work. In the first place, "The third and fourth antennal segments are much less clubbed apically" than shown in his figures, their true form being given in fig. 11 of this paper. Secondly, much as in *M. snodgrassi* (see fig. 5), "There is a deep recess on the ventral surface of the head." Thirdly, there is a prominent tooth at the apex of the fore femora; and, with reference to the form of the femora themselves, "Bagnall's figure is very bad here; the fore femora are not shrunken in the type; see my figure of the whole front leg" (this is reproduced here as fig. 10). And, fourthly, ". . . the ninth abdominal segment is much shorter than the tube," as in both *M. bagnalli* and *M. snodgrassi.* It is evident that Bagnall failed to count the abdominal segments correctly, in that he considered the eighth and ninth together to be the ninth; and this led him to describe the tube as "only two-thirds the length of the ninth abdominal segment," whereas it is actually about twice the length of that segment. Also, he overlooked the large apical fore-femoral tooth, and in his figures showed the fore femora with a wholly imaginary process at the base of the outer surface.

M. bagnalli Priesner was described in 1935 from a series of specimens of both sexes taken from dry leaves in the Kei Islands. I have one male paratype, in excellent condition, from Priesner. In his original description Priesner separated *bagnalli* from *wallacei* on the basis of two characters—the presence of a strong tooth near the tip of the fore femora, on their inner surface, and the tube twice as long as the ninth abdominal segment. He did not know, of course, that Bagnell's description of *wallacei* was in error, and that that species was precisely like his in these respects. However, I think that *bagnalli* is distinct, though it will be necessary to study Bagnall's type in comparison to make sure and to effect a separation.

M. snodgrassi, from the Solomon Islands, differs from *wallacei,* it would seem, by the much more slender third and fourth antennal segments (compare fig. 11, of *wallacei*, with fig. 12, of *snodgrassi*); by the more slender fore femora and tibiae—though heterogony doubtless affects these parts (compare figs. 10 and 2); by the less evenly setose cheeks; and by the different form of the pronotal horns. However, it must be admitted that here, again, the last two structures may be heterogonic; and, too, we are *now* assuming that Bagnall's figures of these structures are correct. The first two characters just mentioned ally *wallacei* with *bagnalli*, and if the two species are either identical or closely related, the following features should isolate *snodgrassi* from both, as the characters are based upon a comparison with the paratype of *bagnalli* before me: (1) In *snodgrassi* the head process is 0.3 the length of the head, instead of 0.22-0.26; (2) the length of this process is 2.4 times its greatest width, rather than 2.0 times; (3) the head is finely cross-striate dorsally only in its basal tenth, instead of in the whole area posterior to the eyes; (4) segments III and IV of the antennae are 12.2 and 9.0 times as long as wide, respectively, instead of less than 10 and 7.6; and (5) the prothoracic episternum, epimeron, and notum are all largely fused with each other, instead of separate.

The drawings which accompany this paper were all made with the camera lucida from the male holotypes of the species involved. Figs. 10 and 11 were prepared at the British Museum; the others are by the author.

THE IDENTITY OF STENOCEPHALUS MEXICANUS ASHMEAD

(Hemiptera, Coreidae)

By R. I. Sailer, *Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture*

In 1886 Ashmead described *Stenocephalus mexicanus*, based on a single specimen said to be from the "Isthmus of Tehuantepec, Mexico, F. Sumichrist [sic]." He reported that it had been sent to him for identification by Mr. Samuel Henshaw, curator of the Boston Society of Natural History. In 1893 Distant included the species in his volume of the Biologia Centrali-Americana, and Lethierry and Severin listed *mexicanus* in their catalogue published in 1894. No further reference has been made to the species since that time, and there is no evidence that anyone has reexamined the specimen on which the name is based.

Recently I had the good fortune to discover a specimen in the National Museum Collection which certainly is the type of *mexicanus*. The evidence must remain somewhat circumstantial, since the label on the specimen, in Ashmead's handwriting, reads "*Stenocephalus sumichrasti* Ash." There is no evidence that Ashmead ever described a species under this name, and it must be assumed that *sumichrasti* is a manuscript name. The specimen bears the additional information, "F. Sumichrast, Isth. of Tehuantepec." Except for the word "Mexico" this agrees exactly with the information published by Ashmead in his description of *mexicanus*.

If Ashmead had returned the type specimen to the Boston Society of Natural History, it should now be in the Museum of Comparative Zoology at Cambridge. Dr. P. J. Darlington informs me that no such specimen can be found in the collections of that institution. In the absence of evidence to the contrary, there seems no alternative but to accept the specimen labeled "*Stenocephalus sumichrasti*" by Ashmead, as the type of *mexicanus*. On this assumption it has been returned to the Museum of Comparative Zoology, where the types from the Collection of the Boston Society of Natural History are now deposited.

The question has much broader significance than merely the discovery of a lost type, for upon examination the specimen has proved to be a typical example of *Dicranocephalus agilis* (Scopoli). This species is widely distributed in the Mediterranean region of the Old World, and in all probability the specimen studied by Ashmead bears erroneous locality data. Ashmead seems not to have had *agilis* available for comparison, for he mentioned only the related species *neglectus* (H.-S.). It seems likely that Ashmead later became aware of his mistake, for the specimen was associated with miscellaneous unarranged Old World Coreidae when I found it.

The importance of this synonymy is apparent from the fact that, except for *mexicanus* and a species described from Galapagos Islands by Dallas under the name *Stenocephalus insularis*, the genus *Dicranocephalus* is entirely Old World in distribution. At present 21 species are known from the Palearctic, seven from the Ethiopian, and two from the Oriental region. It is desirable that the specimen of *insularis* be reexamined, for it would be remarkable if it should really belong to *Dicranocephalus*. The specimen was collected by Charles Darwin and should be in the British Museum.

It might be well to note that until recently all the species concerned here were treated under the name *Stenocephalus*. This name has been attributed to Latreille 1825, but was unfortunately not published in a latinized form. Berthold in 1827 published a translation of Latreille's work in which he latinized the name but spelled it *Stenocephala*. This was amended by Laporte 1832 to *Stenocephalus*. In 1826 Hahn published the name *Dicranocephalus*, and since the two names are based on the same type species Hahn's name must be used for the genus.

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A NEW RUGITERMES FROM GUATEMALA
(ISOPTERA, KALOTERMITIDAE)

BY THOMAS E. SNYDER, *Washington, D. C.*

Eleven species of *Rugitermes* have been described, ten from Middle and South America (Neotropical region) and one from the Marquesas (Papuan region). The previous most northern record is Costa Rica. Most (seven) of these species are definitely bicolored, the head being much darker colored than the pronotum. *R. costaricensis* (Snyder) is an exception, the head being only slightly darker colored (light castaneous-brown) than the yellow pronotum. *R. unicolor*, the species here to be described, is not bicolored and is from Guatemala, the farthest point north in the Americas where a member of this genus has been taken.

Family **KALOTERMITIDAE**

Rugitermes unicolor, new species

Winged adult.—Head yellow-brown, smooth, shining, longer than broad, sides rounded, with fairly dense long and short hairs. Post-clypeus white tinged with yellow. Labrum light yellow brown, with long hairs. Eye black, not round, projecting, separated from lateral margin of head by a distance equal to the eye diameter. Ocellus, hyaline, suboval, at an oblique angle to eye from which it is separated by a distance slightly greater than the long diameter of the ocellus.

Antennae light yellow-brown, whitish towards apex, 16-17 segments, longer towards apex, third segment longer than second or fourth.

Pronotum yellow, twice as broad as long, shallowly concave anteriorly and posteriorly, sides rounded, narrowed posteriorly, with scattered long hairs.

Wings dark brown to blackish, coarsely punctate. In forewing, median vein unites almost directly with radial sector; radial sector close to and parallel to with six branches to costal vein. Cubitus above middle of vein parallel to radial sector, with ten branches to apex. In hind wing median vein absent. Radial sector with two long and two short branches to costal vein. Cubitus above middle of wing, with ten branches to apex.

Legs blackish to yellowish-brown.

Abdomen with tergites yellow, with long dense hairs near base.

Measurements in mm.:

Length of entire winged adult		9.5-10.00
" " " dealated "		5.5- 6.00
" " head (to tip of labrum)	(average)	1.80
" " pronotum (to anterior corner)	"	0.90
" " forewing	"	7.00
" " hind tibia	"	1.25
Diameter of eye (long diameter)	"	0.35
Width of head (at eyes)	"	1.60
" " pronotum	"	1.95
" " forewing	"	1.80

R. unicolor is smaller than *R. costaricensis* (Snyder), shows slightly less contrast between the color of the head and the pronotum, the wings and legs are darker colored, and there are fewer segments in the antenna. *R. costaricensis* ranges from 11.5-12.25 mm. in length, and has 17-20 segments in the antenna.

Soldier.—Head yellow-brown, sides parallel, with dense long and short hairs. Shallow depression at epicranial suture. Eye spot hyaline, reniform. Gula half as wide at middle as at anterior.

Mandibles black, left mandible with two marginal teeth on apical third, a smaller tooth, and molar; right mandible with two larger marginal teeth, one in middle the other near the base.

Antenna yellow, 13 segments, third segment yellow-brown, longer than second segment and nearly as long as fourth and fifth together.

Pronotum yellow, reniform, over twice as broad as long, shallowly emarginate anteriorly and posteriorly, sides narrowed posteriorly, with dense long and short hairs.

Legs tinged with yellow, hairy, femora swollen.

Abdomen with tergites yellowish, a row of long hairs present at base of each.

Measurements in mm.:

Length of entire soldier		7.60-8.00
" " head with mandibles		3.50-3.65
" " " to anterior margin	(average)	2.43
" " left mandible	"	1.17
" " pronotum	"	1.00
" " hind tibia	"	0.95
Width of head	"	1.80
" " pronotum	"	1.80

The soldier is smaller and lighter colored, and the pronotum is of a different shape than in *R. costaricensis* where it is more angular. *R. costaricensis* ranges from 10-12.5 mm. in length, and has 15 segments in the antenna.

Type locality.—Sahacóc in the Alta Vera Páz, Guatemala in typical rain forest of low elevation.

Described from 4 winged adults (2 males, 2 females) and 2 soldiers collected by Dr. Günther Becker, Materialprufungsamt, Berlin—Dahlem, Germany, in May, 1951. The winged forms were reared from nymphs in the laboratory.

Cotypes, winged adults.—U.S.N.M., no. 61609.

Comorphotypes, soldiers, deposited in the U. S. National Museum.

ENTOMOLOGICAL SOCIETY OF WASHINGTON
618TH REGULAR MEETING, MAY 1, 1952

The 618th regular meeting of the Society was held at 8:00 P.M. Thursday, May 1, 1952 in room 43 of the U. S. National Museum, attended by 51 members and 25 visitors. The meeting was called to order by President W. D. Reed and the minutes of the previous meeting were read and approved. The report of the picnic committee was given by Helen Louise Trembley, recommending that the Society hold the June meeting as a joint picnic with the Insecticide Society of Washington at Beltsville, Md., on Saturday, June 7, from 4 to 8 P.M., and that $15 be voted by the members to defray necessary expenses. This report was adopted.

New members elected to the Society were:

Dr. Horace O. Lund, Department of Biology, University of Georgia, Athens, Georgia.

Louis G. Davis, Division of Insect Detection and Identification, Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

Kelvin Dorward, the same address.

President Reed remarked on the need for Entomologists to give speeches at schools to interest young people in becoming scientists, as is being done by Engineers. F. W. Poos, asked to comment, said that those interested should contact Mr. A. T. MacPherson, of the Bureau of Standards.

The first note was given by R. C. Wallis, who showed a short film demonstrating differences in oviposition activity between *Aedes pseudoscutellaris* and *A. aegypti*. A second note, concerning the finding of the alfalfa weevil in Maryland, was reported by T. L. Bissell. On April 8, 1952 while laying out plots of alfalfa for spittlebug spraying on a farm near Cockeysville, Md., I found a single weevil under a piece of wood. It was a species of *Hypera*. I later found that I had three similar specimens taken in 1951, one at Gambrills, Anne Arundel County, on July 14, and two reared from larvae but without date or locality. I took the four to the National Museum. On April 17 numerous other adults were collected on a farm near Long Green (Post office, Phoenix) in Baltimore County. Other workers collected adults and larvae at Gambrills on the same day. On April 21 Mr. Muesebeck notified us that Miss Rose Warner and Dr. Wm. H. Anderson had determined the insect as *Hypera postica* (Gyll.), the alfalfa weevil, heretofore unknown east of Nebraska. On April 30 Mr. H. S. McConnell and I made further collections of the alfalfa weevil in Baltimore and Harford Counties. It was found in eight localities from Maryland Line to Bel Air. On one farm several hundred adults were swept and larval feeding was quite evident.

On the regular program, Dr. James A. Beal spoke on some recent developments in forest entomology. He briefly reviewed some early accomplishments of the Division of Forest Insect Investigations, then he spoke of the current workers within the Division and outlined some outstanding developments made by them. He mentioned especially the ponderosa pine tree classification and risk rating system and the work on hybrid pines being done at the Berkeley laboratory, the work on mist blowers and concentrated sprays at the New Haven laboratory, the protection of logs and lumber and new soil poisons developed at the Gulfport laboratory, improvements in bark beetle control methods accomplished at the Fort Collins laboratory, improvements in aerial spraying of the Beltsville laboratory, and advances in aerial surveys made by the Portland and Beltsville laboratories.

Dr. Beal also pointed out that many forest insects, such as the spruce budworm, Engelmann spruce beetle, Douglas fir beetle, black turpentine beetle, and southern pine beetle, had shown some developmental changes in habits and patterns over the years.

Travels of an Entomologist in the Far East was the subject on which Mr. Austin W. Morrill spoke. He showed Kodachrome slides of typical mosquito breeding areas in Japan, Okinawa and Korea and of the control activities of the Army Corps of Engineer and Medical Department units. He also discussed and showed slides illustrating the interest of the Japanese in entomology and some aspects of their silk culture. He showed views of both the traditional and modern aspects of Japan as our new associate and ally in the community of nations.

Adjournment at 10:00 P.M.

KELLIE O'NEILL, *Recording Secretary.*

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