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PSYCHE

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C. V. BLACKBURN, (Member Cambridge Entomological Club) 26 MAPLE ST., STONEHAM, MASS.
Johannsen: Henicocephalidae.
On the evening of July 5th while walking in my garden on Cornell Heights, Ithaca, N. Y., I noticed a swarm of small insects hovering in the air about 6 feet above the ground. From their manner of flight I supposed that they were Chironomids but was surprised to find that they were small Hemipterous insects belonging to the strange family Henicocephalidae. During the days which followed until the last week in August I never failed to find these insects in small swarms flying in the sunlight in the same locality and at about the same hour (i.e., from 5 p.m. until after sundown). Of their further habits I could learn nothing, nor did I find them at any other time of day. In looking over the literature but few references to North American species were found. In the Lethierry and Severin catalogue twelve species are recorded from the world, of which two are from the United States and one from St. Vincent Isl., West Indies. In Biologia Centrali-Americana Champion described five species from Central America. The two species from the United States, \textit{H. formicina} and \textit{H. culicis}, were described by Uhler in the Transactions of the Maryland Academy Science for 1892; the latter is redescribed by Ashmead in Proceedings of the Entomological Society of Washington in 1892 and quite recently recorded in the same periodical by Mr. F. Knab, from Mexico. As Uhler's descriptions are rather inaccessible to many American Entomologists I may be pardoned for giving here description and figures of \textit{H. culicis} as well as the diagnosis of \textit{H. formicina} and a table including also the Central American and West Indian forms. The variation which exists in the wing venation, the segmentation of the tarsus, the tarsal claws, etc., in the different species has given occasion for the erection of several genera. As hemipterists are by no means agreed as to the classification no attempt will here be made to subdivide the American forms into genera.
Table of North American Species.

(Modified from Champion.)

a. Discal cell of the elytra closed; posterior lobe of the head transverse; dull, pilose. (*Hymenocoris*).

b. Antenna much longer than the pronotum, basal joint stoutest, second joint longest, a little thicker than the third, third a little shorter; insect minutely pubescent; legs unicolored; anterior tarsi with two claws; ocelli large. (California) *formicinæ* Uhler.

bb. Not as above.

c. Anterior tarsi each with two claws.

d. Legs unicolored, ocelli very small; first and second antennal joints very stout, the others slender. (Guatemala, Panama) *concolor* Champion.

dd. Legs annulate; ocelli prominent; first and second antennal joints but little stouter than the others; pilosity of head and pronotum long. (Panama) *annulipes* Champion.

cce. Anterior tarsi with a single claw.

d. Intermediate lobe of the pronotum broad, and as long as posterior lobe; ocelli very small; antennae elongate, three outer joints slender. Body thickly pilose. (Guatemala) *pilosus* Champion.

dd. Intermediate lobe of the pronotum short, and much narrower than the posterior lobe; ocelli prominent.

c. Anterior and intermediate lobes entirely flavous. (St. Vincent Isl.) *flavicollis* Westw.

eee. Anterior and intermediate lobes not wholly flavous; antennae short, second joint shorter than the third. (Guatemala) *emarginatus* Champion.

aa. Discal cell of elytra open, posterior lobe of the head subglobose, smooth, shiny; anterior tarsi with two long claws.

b. Intermediate lobe of pronotum measured along lateral margin longer than posterior lobe. (Guatemala) *angustatus* Champion.

bb. Intermediate lobe of pronotum measured along lateral margin not longer than posterior lobe. (United States and Mexico) *culicis* Uhler.
Henicocephalus culicis Uhler.


"Pale, smoky testaceous, tinged with piceous on the lobe of the head which holds the eyes, and on the tumid lobe behind this. Immature specimens have the front of head, pronotum, excepting the base, and scutellum yellow. Texture thin and flabby, the veins of the wing-covers coarse and dark colored. The last joint of the antennae infuscated. Rostrum pale piceous, the apical joint yellowish. Intermediate and posterior tibiae and margins of venter pale testaceous."

"The suborbate posterior lobe of the head a little longer than the lobe carrying the eyes, constricted abruptly both before and behind, a little narrower than the width across the eyes. Posterior lobe of pronotum widely sinuate behind, exposing the base of the transversely convex, and at apex acuminate, short scutellum. Wing-covers narrow, membranous throughout."

To the above description may be added the following: The antenna (fig. 5) has a minute intermediate joint between the first and second, second and third, and third and fourth long joints; the basal joint is much shorter than the others, the third joint is rather longer, the fourth slightly shorter than the second; the third is quite slender. All joints are sparsely haired. The beak (fig. 6) is four jointed, sparsely setose; apical joint is triangular in outline, third joint is about as long as the second and fourth taken together. The apex of the fore tibia (fig. 3) is provided with seven stout spines, and a comb of fine setae on the side nearest the body. The fore tarsus is one jointed, has two stout spines on the flexor surface and at its apex a pair of claws, the inner one of which is somewhat longer than the other. The middle and hind tibiae each have two spurs; the middle and hind tarsi are each two jointed, the basal joint being very short, claws subequal (figs. 2 and 4).

The venation of the fore wing (elytra) is shown in fig. 1, the short cell under the stigma is somewhat variable in shape, the curved vein which forms its posterior margin sometimes being more curved up at the apex. In one specimen, a male, this curvature is quite pronounced (fig. 7). The hind wing has three very indistinct longitudinal veins; the first and second separated by a cross vein near the middle of the wing. The sexes appear to be much alike. In the male the eyes are slightly larger, closer together ventrally; the abdomen is clavate, the second segment being narrower than the first, and the eighth segment is somewhat narrower in proportion
to its length. Length 4 mm. Ithaca, N. Y. One specimen was also found among leaves while sifting for spiders, by C. R. Crosby near Interlaken, N. Y.; another, possibly the same species, at Columbia, Mo., and now in the University of Missouri Collection.

Henicocephalus formicina Uhler.

1892. Hymenocoris formicina Uhler, Trans. Maryland Acad. Se. 182.

"Body broader than in H. culicis. Ground color fusco-piceous, a little polished, minutely pubescent. Wing-covers smoke brown, the veins darker; wings paler, with the veins smoke brown. Scutellum tinged with rufo-piceous, moderately convex, polished. Tergum paler than the venter, flat, with the incisures of the segments pale testaceous, or whitish. Middle and posterior tibiae a little paler than the anterior ones. Length to tip of abdomen 5 mm.; width of base of pronotum \( \frac{1}{2} \) mm. Los Angeles, California."

A specimen of this species was collected by Mr. J. C. Bradley, July, 1907, at Lemon Cove, Tulare Co., California. The second antennal joint is over three times as long as the first and half again as long as the third; the ocelli are large; the eyes contiguous below and the fore tarsi have two equal claws. In coloring this specimen is rather paler than those of Uhler.

EXPLANATION OF PLATE.

Fig. 1. Left elytra. \( \times 20 \).

" 2. Dorsal aspect of female insect. \( \times 20 \).

" 3. Inner lateral aspect of fore tarsus and apex of tibia. \( \times 100 \).

" 4. Ventral aspect of female insect. \( \times 20 \).

" 5. Antenna. \( \times 50 \).

" 6. Dorsal aspect of proboscis. \( \times 100 \).

" 7. Apex of wing showing variation. \( \times 20 \).
THE IMPORTANCE OF LOCAL ECOLOGICAL STUDIES TO ENTOMOLOGY.¹

BY CHARLES W. JOHNSON, BOSTON, MASS.

In the study of geographical distribution, all realize in a general way the great changes which have taken place over the entire country since America was settled by white men. The destruction of the forests by the axe and fire, the clearing and cultivating of the land, the diminution and pollution of the streams, the draining and filling of swamps, the construction of reservoirs and dams and extensive mining operations, all tend toward changing physical conditions governing the existence and distribution of the flora and fauna.

How frequently we hear complaints of the inadequate data kept by the early naturalist, of species now practically extinct. Here we might ask these questions: Are we keeping requisite data for future investigators? Are we taking into account the local changes which have taken place, and are continually taking place, and their effect upon the fauna and flora? These changing conditions, which have so long appealed to the mammalogist, the ornithologist and botanist, have either been ignored, or only touched upon lightly by entomologists. It is not often intentional on their part, for entomologists have a great deal to do. Then too there are so many insects, and species are often so widely distributed, that when they become scarce in one section they can so readily be obtained from another, that local conditions affecting certain species are easily overlooked.

In entomology there are other factors besides changes in physical conditions to consider, among which are the introduction of injurious insects through commerce and otherwise, followed by the introduction of their parasites to aid in keeping them in check. One naturally asks what will be the effect of the introduced parasites on the indigenous species. When these parasites are established, will they infest the native species and perhaps locally exterminate them? This seems to be the solution of the extermination of Pontia oleacea in many parts of New England after the introduction of Apanteles glomeratus, the parasite of the European cabbage butterfly (Pontia rapae). Another factor is the extensive cultivation of trees and plants far beyond their natural limits, thus enabling the insects feeding upon such

¹ Presidential address at the annual meeting of the Cambridge Entomological Club, January 19, 1909.
plants to extend their range of distribution. A noticeable illustration is the spread of the Catalpa sphinx (*Darcma catalpa*). The catalpa, which is a native of the southern States, has now become a common shade tree throughout the northern states. The sphinx, which has now reached New York, first made its appearance in the vicinity of Philadelphia in 1898, doing considerable damage. The following year it was more abundant and an interesting feature in this connection is that at that time it apparently had no natural enemy, but in 1900 parasites appeared which destroyed fully eighty per cent of the larvae. It was therefore evident that the moth, in its migration northward, advanced more rapidly than its parasites, or was for the time immune. It would also be well to consider the effect of the attacks of native insects on foreign plants.

Geographical distribution from an ecological standpoint, presents a most fascinating subject, made doubly interesting by its great diversity and many intricacies. Especially is this true of insects and particularly so in New England, where the varied surroundings within a comparatively small area, present many of the conditions which undoubtedly governed and limited the early dispersal of species. The birds and mammals have been mostly used in defining faunal areas, and while the areas thus defined represent what might be called the greater life zones, they are often too general in character to account for many of the unexpected appearances and peculiar variations of certain insects. A thorough ecological study of a given area will, no doubt, account for many if not all of these unusual occurrences, or add materially to our knowledge governing the conditions affecting the distribution of insects.

A brief history of geographical distribution bearing on New England, shows the characteristic progress which has attended all lines of scientific research. It was Prof. Louis Agassiz who in 1854 (in Nott & Gliddon, Types of Mankind), first attempted to divide North America into several zoological areas. On the Atlantic coast he recognized four—the Arctic, including Greenland and Labrador; the Canadian extending from Labrador south to a line drawn across the centre of New Hampshire and Vermont; the Alleghanian embracing all the region from southern Maine to North Carolina, and the Louisiana from southern Virginia to southern Florida. In 1859 Dr. John L. LeConte (Smith, Contr. Knowl., XI) divided the United States into a number of provinces, the first attempt made from an entomological standpoint, and based on the distribution of Coleoptera. In making these divisions he says: 'The whole region of the United States is divided by meridional or nearly meridional lines into three or perhaps four great zoological districts, distinguished each by numerous peculiar genera and species which, with but few excep-
tions, do not extend into the contiguous districts. These great districts are divided into a number of provinces of unequal size, which are limited by changes in climate and therefore sometimes distinctly, sometimes vaguely, defined. The Atlantic district may be divided into — a northern province, including Maine, Eastern Canada, Nova Scotia, Newfoundland, etc.; a middle province limited westwardly by the Appalachian chain and extending to southern Virginia; a southern province, including the States south of Virginia and Kentucky, and a subtropical province including the point of the peninsula of Florida.

In 1863 Prof. A. E. Verrill (Proc. Boston Soc. Nat. Hist., X, 260) made the dividing line between the Alleghenian and Canadian "coincident with a line which shall indicate a mean temperature of 50° Fahrenheit during the months of April, May, and June." In describing its course he says: — "It passes south of Moosehead and Umbagog Lakes, but rises somewhat northward along the Androscoggin valley, thence it passes southward of the White Mts. through the vicinity of Conway, N. H. It then bends northward again up the Connecticut valley as far as Craftsbury, Vt."

In 1871 Prof. J. A. Allen (Bull. Mus. Comp. Zool., II) in describing the northern boundary of the Alleghenian fauna says: — The line follows the northern boundaries of the low lands through southern Maine and southern New Hampshire. In the Connecticut Valley it rises farther to the northward and in its southern descent skirts the eastern base of the Green Mts." Both Verrill and Allen based their conclusions upon the study of birds during breeding season.

The next paper to consider is that exceedingly interesting chapter by Mr. Scudder on the distribution of insects in New Hampshire (in Hitchcock's Final Rept. on the Geol. of N. H., vol. I, chap. xii, 1874). Although only two groups are considered — the butterflies and grasshoppers — two which are perhaps the best to start with, he points out very clearly the many conditions governing their distribution, as follows: — "Since insects are not regularly migratory animals; as several generations frequently succeed each other during a single season; and, as the winter is passed in very various conditions, we can hardly expect their distribution to follow exactly that of birds. Various causes may modify unequally the distribution of insects belonging to a certain group: too intense cold in our arctic winters; the lack of snow during a less severe season; too excessive or too long a drouth in midsummer; or too sudden changes of temperature at critical periods. Taking our butterflies only, they may be found at every season of the year, even in midwinter, of one species or another, in every stage of existence, from the egg through all the larval periods and the chrysalis to the imago. The distribution of butterflies is therefore much more complicated than that of birds, whose early stages are always passed in com-
paratively warm weather, under the guardianship of the mother; and, if more than one brood appears during a season is only the produce of the same pair that raised the first." Mr. Scudder also refers to the effect of elevation, defining the subalpine and alpine areas of Mt. Washington.

In 1888 Prof. Wm. M. Davis and Mr. Scudder published a map showing the isothermal lines and faunal areas of New England. A modification of this map in which the areas defined as the "Ordinary southern limit of the Canadian" and the "Ordinary northern limit of the Alleghenian" fauna are united to form the Transition, leaving the restricted Alleghenian to constitute the Upper Austral, represents practically the present faunal zones as defined by Dr. C. H. Merriam, except that the whole Cape Cod region would be included in the Upper Austral, a feature which, from an entomological standpoint will probably prevail, and which is strengthened by a study of the distribution of New England locusts by Mr. A. P. Morse (Psyche, VIII, 315, 1899). In this paper the limits of the Upper Austral are locally increased. An area extending northward from Narragansett Bay to the Valley of the Merrimack near Lowell, and north almost to Manchester, N. H., is termed the "Dilute Carolinian locust fauna." From a Dipterological standpoint this is especially interesting as I am not only finding a number of Upper Austral but even Lower Austral species in this area.

In taking up the subject of insect distribution in New England, a region which was covered with ice during the glacial period, we must first consider the supposed source of the present fauna. The southeastern United States has been designated by Mr. C. C. Adams (Biol. Bull. III, 125, 1902) and others, as the probable centre of geographical distribution of the flora and fauna of the eastern United States, from which radiated the three primary paths of dispersal — the Mississippi valley, the coastal plain, and the Appalachian Mountains and adjacent plateau, the coastal plain being finally occupied by forms now placed in the Upper and Lower Austral, the former extending along the New England coast at least as far as Cape Cod and Plymouth if not farther, and up the Connecticut valley to Springfield. The Transition, which in the southern and middle states is confined to the more mountainous portions, spreads over the greater part of New England, leaving the Green Mountains, the White Mountains northward, and the northern half of Maine in the Boreal zone.

In further pursuing the subject of life zones we can look upon the boreal as receding, losing perhaps more from the despoliation of our forests and the results thereof, than either the Transition or Austral. There is, on the other hand, a natural tendency for insects to migrate northward. This is exemplified by the spread of the Brown-tail Moth which has extended to Nova Scotia, while to the southward it has
scarcely reached Connecticut; the Leopard Moth (*Zeuzera pyrina*), which has spread from the vicinity of New York City to Danvers, Mass.; the Harlequin Cabbage-bug (*Margarita histrionica*), which has migrated from Mexico to Long Island, N. Y.; the two asparagus beetles, *Crioceris 12-punctata*, which is now found in Milton, Mass.; *C. asparagi*, which has reached New Hampshire; and many other species. These advances northward, however, by many species of the Transition and Austral zones may in part be only temporary, an unusually cold winter destroying the invaders. It has been shown by Prof. E. Dwight Sanderson, in a paper on "The influence of minimum temperatures in limiting the northern distribution of insects" (Jour. of Economic Entom. I, 245, 1908) that a temperature of —24° F. will practically check the northern spread of the Brown-tail Moth. The northern limit of the asparagus and elm beetles "agrees quite closely with the average annual minimum isotherm of about —10° F." Prof. Sanderson also points out that the present Upper Austral zone of Doctor Merriam does not extend far enough northeast.

I now wish to consider some of the minor or local features bearing on distribution. In the maritime area, in which is included the fauna of the immediate coast line, and on which the limitation of the Upper Austral is partly based, we have a number of species even north of Cape Cod which are not only common in the Upper Austral, but in the Lower Austral as well. Among the Diptera might be mentioned *Chrysops flavidus* and *C. plangens* from Maine to Florida, *Tabanus nigrovittatus*, the common "greenhead" from Nova Scotia to Florida, *Odontomyia microstoma*, from New Hampshire to Maryland, *Culex sollicitans* (the "Salt Marsh Mosquito") from Maine to Florida and even in Jamaica; *Stichopogon argentea* among the sand dunes from Maryland to Massachusetts; *Hypocharass us pruinatus* from St. Augustine, Fla., to Cohasset, Mass.; *Triodonta curripes* from Cape May, New Jersey, to Nova Scotia; *Phyllogaster cordyluroideus*, Florida to Massachusetts; *Chaetopsis apicalis*, Ormond, Fla., to Cohasset, Mass., and *Caenia spinosa*, Florida to Massachusetts. In the other orders I can only mention a few of the more conspicuous: *Elis quadrinotata*, *E. plumipes* and Microbembex *monodonta* in the Hymenoptera; *Cicindula dorsalis*, *Stratopus antaeus*, *Saprinus pennsylvanicus*, *S. patruelis* and *Phaleria testacea* in the Coleoptera; *Junonia coenia*, *Callidryas ebule*, *Terias nicippe*, *T. lisa* and *Epaphtheria scribonia* in the Lepidoptera, and the salt marsh dragon-fly, *Micrathyria bercunie*, all common insects in Florida which are also found in Massachusetts.

The distribution of one insect often governs the distribution of another, thus we find even at the most northern limit of distribution in New England of the Carpenter bee (*Xylocopa virginica*), its parasite, *Spongistylus simson*. 
Another interesting feature in this Austro-transition area is the distribution of the three principal broods of the Periodical or Seventeen-year Cicada (\textit{Tibicen septemdecim}). Whether the different geological formations have any bearing in the matter I cannot say. Brood XI (1920) which occurs only in New England, and which I am sorry to say has been almost exterminated, owing to the clearing of the woodlands, is (or was) confined chiefly to the Triassic area of the Connecticut Valley, with two small colonies in or near the Narragansett basin. Brood II (1911), distributed throughout eastern Pennsylvania, New Jersey and southern New York, is confined principally to the granitic area of western Connecticut. Brood XIV (1923) which is confined to the Tertiary of the Cape Cod region extending northward almost to the town of Plymouth, seems to have reached New England by way of Long Island. It is also interesting to note that of the five broods occurring in New England, no two broods occupy the same area, as sometimes occurs further south.

On the coast of Maine there is an opposite condition to that of Massachusetts, the cold water and humidity presenting favorable conditions for many boreal trees and plants as far south as Mt. Desert and even to Casco Bay, which in turn foster many boreal insects.

An important factor and one which enters into the distribution of insects, is the relation of the geological formation of the soil to plant distribution. This is not as yet defined sufficiently to be of great value entomologically, but entomologists as well as botanists, should carefully consider this matter. In New England, even moderate elevations have a more noticeable effect on vegetation than further south. In New Hampshire Prof. C. H. Hitchcock (\textit{Geol. N. H.}, Vol. I) states that chestnut and white oak follow quite closely the contour of 600 feet. His map illustrating this feature, shows a long narrow strip varying slightly in width, extending south from the White Mts. into Massachusetts. It is a gneissic or granitic area, forming the water shed dividing the tributaries of the Connecticut from those of the Merrimack river. The numerous peaks, some exceeding 2000 feet, and cold springs, the sources of the numerous streams, provide conditions governing the flora and insect fauna. This upland area together with numerous local situations, such as cold swamps, constitutes the source of many boreal species that appear in what is considered the Transitional zone.

The relation of the flora to the abundance and distribution of insects, is not fully appreciated by the majority of entomologists. The two are inseparable, and in preparing faunal lists a knowledge of the food plant and condition under which the larva exists goes far toward solving many problems. The various oaks are preyed upon by a larger number of species of insects than perhaps all of the other hard-
wood trees. Packard in 1890 recorded over 500 species of all orders as injurious to the oak in the United States, and says that ultimately the number may even reach 1000. About 170 species infest the hickories, 40 the locust, 80 the elm, 100 the different species of maples, over 100 the various birches, 40 the beech, 130 the wild cherries, plums, thorns, etc., 45 the ash, 60 the linden, 100 the poplars, 225 the willows, 50 the alder, 35 the hazel, 170 the pines, 80 the spruces and fir, and 60 the larch and junipers. Add to these the army of dependent parasites, and we have a very forcible illustration of the flora as a factor in the distribution of insects.

The first list of New England insects was that published by Harris in 1833 in Hitchcock's Report on the Geology, Botany and Zoology of Massachusetts. This was revised in 1835 in a second edition of the same work. The list contains 2350 species, most of these having been collected in the vicinity of Boston. The relation of insects to plants, was fully appreciated by Harris, although it would be rather difficult, even at this time, to give a ratio. In closing his remarks he says:—"The proportion of insects to plants has been stated to be six species of the former to one of the latter. The flowering plants of Massachusetts amount to above 1,200 species, hence our insects cannot be much less in number than 7,000 species." It is not a bad estimate for that time, considering that we now estimate the number in New England at 11,000, but his number of plants was entirely too low, and his ratio on the present number of plants would give Massachusetts over 12,000 species.

There are comparatively few local faunal lists of New England insects to aid in working out many of the interesting features in geographical distribution. In 1874 Mr. E. P. Austin (Proc. Boston Soc. Nat. Hist., XVI, 265) published a "Catalogue of the Coleoptera of Mt. Washington, N. H.," followed by a list of additional species by Mr. F. Gardiner, Jr., in 1877 (Psyche II, 211). The two lists contain 314 species. In 1894, Mrs. A. T. Slosson commenced a "list of the insects taken in the alpine region of Mt. Washington." Additions to the list have appeared at various times up to November, 1906, the total number recorded being 2208 species, including 628 Coleoptera, 628 Hymenoptera, 599 Diptera, 119 Lepidoptera and 122 Hemiptera. While the species recorded were all taken in the alpine region, it is not in its entirety a list of the true alpine species, for strong winds frequently carry there large numbers of insects from the lower levels. Miss Mattie Wadsworth (Ent. News I-V) has listed 57 species of Odonata from Manchester, Me., a good local list considering that Dr. Calvert's list gives 140 for New England.

There is now in progress a great deal of work along the lines of distribution. Dr. W. E. Britton is at work on the insect fauna of Connecticut, Mr. N. S. Easton has just finished a list of 1019 species of Coleoptera collected within ten miles of the
city hall of Fall River, Mass., Dr. George Dimmock is making a card catalogue of the fauna of the middle Connecticut valley. Mr. S. A. Shaw is making a careful study of the fauna at Hampton, N. H., while a number of entomologists in Maine are doing excellent work. The members of the Cambridge Entomological Club are also hard at work, but we have a task before us more difficult than simply collecting. We are on debatable faunistic ground. We are in the midst of a war on the Gypsy and Brown-tail moths, the continued work on their suppression will undoubt-
edly reveal many changes in local conditions. It seems therefore essential that our local work should be the best, and that the importance of this matter be fully appre-
ciated.

MELANOPLUS HARRISH N. SP.

BY A. P. MORSE, WELLESLEY, MASS.

Closely resembling M. phoetaliotiformis of northern California but a little smaller and distinctly more slender, especially in the hind femora, the face more retreating and the abdomen more strongly keeled above.

Facial costa narrow, only equalling width of basal joint of antenna. Face deep plumbeous, brownish above, lacking the luteous tints of phoetaliotiformis. Top of head and pronotum without pale markings. Sides of pronotum, mesothorax and metathorax heavily marked with fuscous. Pronotum narrower, its hind margin more produced. Hind femora intense cherry red apically within and beneath, shading into luteous at base. Hind tibiae very pale glaucon, distinctly annulate with deep black at base, infuscated beneath apically and at proximal third. Genitalia similar to those of phoetaliotiformis, the cerci a little slenderer, the sides of the subgenital plate, not fuscous but only slightly infumated.

One male, Needham, Mass., Aug. 23. Collection of A. P. Morse. Taken among the rank herbage of an abandoned upland field on gravelly loam. But a single specimen was found in spite of prolonged sweeping and several subsequent visits to the scene of its capture.

Named in honor of Thaddeus William Harris, the first entomologist to write on the orthoptera of Massachusetts.
THE FOOD PLANT OF ENARMONIA TRISTRIGANA, CLEMENS.

BY C. A. FROST, SOUTH FRAMINGHAM, MASS.

WITH DESCRIPTION OF MATURE LARVA BY JOHN N. SUMMERS, MASS. AGRICULTURAL
EXPERIMENT STATION, AMHERST, MASS.

This beautiful species of Micro Lepidoptera was first described by Clemens in the Proceedings of the Entomological Society of Philadelphia, vol. v, 1865, and the original description is as follows:

"Fore wings blackish-brown, costa pale-yellow from near the base of the wing to the tip, with eight blackish, oblique streaks and four bluish metallic spots adjoining the yellowish costal stripe. On the middle of the dorsal margin is a large pale-yellow blotch containing three blackish lines, with a bluish metallic spot above it in the middle of the wing, and a semi-band between it and the hinder margin. Hind wings dark brown. Coll. Ent. Soc. Phil.—Va."

Dyar's Catalogue gives the localities of this species as Mass. and Va. Mr. W. D. Kearfott writes me that he has specimens from Anglesea, N. J., May 20th; Essex Co., N. J., May 11th, and July 4th, 7th, and 25th; Newark, N. J., June 1st; and Ashley, Pa., June 24th. He also adds that he has identified specimens from all the New England States and Eastern Canada.

Although the place where this species breeds is one of my favorite collecting grounds, I have never taken a flown specimen of it there and only one elsewhere.

My attention was first called to the work of this species by the dying bunches of Baptisia tinctoria which is very common in some localities near here. There seemed to be no healthy plants and an examination showed that nearly every stalk, except some of the smaller ones, was occupied by one or more whitish larvae which had eaten out the inside and left the space filled with a fine debris that resembled sawdust very closely.

The beginning of the burrow seemed to be either on the branches at some distance from the main stem, or, more often, at the point where it joins the stem, and always on the under side. The entrance is marked by a tiny black scar which is sometimes hidden by the leaf, or stipule scar, at the base of the branch. Further investigations show that there are other apparent entrances or exits on the larger stalks sometimes covered by a dead leaf held by silk. These are quite large and I am unable to account for them, assuming that they are made by the larva of the moth, unless they are used for the ejection of debris or as an exit for the imago.
The stem is also eaten out above the highest visible indications of an entrance and in many cases the branches are also mined for some distance. Examinations made August 26th and September 8th showed that the stems are hollow and that the larvae feed on the whitish inner layer which resembles pith; at intervals pits, or enlargements of the gallery, are excavated to the tough outer fibres, while in many instances the inside is eaten entirely away. There are holes eaten through to the outside at some of these places. In some of the larger stems there will be scarcely a trace of a larva for several inches, and then for some distance it will be tightly packed with sawdust. Many times a larva will be found in this sawdust and another larger larva at the base of the stalk below another plug of debris. In one of the large stems five larvae were found and in most cases there were at least two larvae. Many of the larger larvae have the abdominal segments stained a delicate orange-pink on the dorsum. The larvae at this time were about 9 mm. long and spun a thread when crawling.

On November 5th the larvae were found, sometimes one, again two, at the base of the stalk just above where the new buds have already started. They were enveloped in a flimsy cocoon of silk and sawdust with the larva head up. The stalks were dug up, cutting of the stem just below the buds under the ground, and kept in tin cans all winter. Some of the cans were closed and some left open and, although they moulded very badly, quite a number of imagoes emerged between May 17th and some time during the first week of June. In most of these cases the imagoes emerged from the stem where cut off at the top; but in nature they emerge at the side of the stalk a few inches above the ground and the exuviae is left sticking out of the hole about two thirds of its length.

A search for material on June 1, 1907, resulted in finding a few pupae and larvae in shaded places while the majority of the stems showed that the imagoes had emerged some time previous. Several of the infested stalks were sent to Prof. C. H. Fernald at Amherst, Mass., at his request, and the moths that appeared from them were pronounced to be the species, under discussion. Bred specimens of this moth were first identified for me by Mr. W. D. Kearfott of Montclair, N. J., to whom I am indebted for the determination of nearly all of my Micro Lepidoptera.

Full Grown Larva.

Length at rest 8 mm., in motion 9½ mm. These measurements were taken from larva described, but others were found measuring one or two millimeters more than this.

General color creamy white, tinged to varying degree with red, especially on
last few segments, so that some larvae have no trace of this color, and others are
decidedly red. From specimens examined it appears that young larvae have this
color more marked than even the reddest full grown ones. Entire body, with excep-
tion of head, second segment on dorsum, anal shield and numerous prominences
scattered over the body, has a peculiar rough appearance due to minute spine-bearing
elevations distinguishable only under the microscope, and it is also faintly shining.
These elevations, minus the spines and less prominent, may be found on all the
smooth portions by careful microscopic examination.

Head strongly bilobed, light castaneous, smooth, shining, with a few scattered
light brown hairs; bordered posteriorly by narrow dark brown band, which ends
just back of ocelli in an irregular brown spot. Lateral edges of clypeus and two
longitudinal sutures on under side of head very dark brown. Vase shaped light
central area on ventral side of head, with the base posterior, space between this
and the two above mentioned sutures dark brown. First segment of antennae pale,
rest same color as head with segments beyond second bearing several light brown
hairs. Ocelli six in number, pale, placed on a dark brown spot. Labrum with
central lighter band which varies from pale at upper end to light brown at lower,
and with all outside this band dark brown. Mandibles dark brown, with almost
black tips. Other mouth parts pale with their tips and lateral edges of labium darker.

Body strongly segmented, second segment anterior three-fourths light brown with
numerous small darker areas, wrinkled, shiny; third wider, fourth and fifth nar-
rrower than third, sixth wider again and remainder slightly decreasing in diameter to
posterior end of body. Third and fourth segments each with two transverse sinuate
wrinkles over whole of dorsum, and one small one each side of median line in front.
Fifth to twelfth segments with one wrinkle like large ones in other segments. Anal
shield smooth, shining, tinged with yellowish brown and possessing a slight central
depression. Numerous small, smooth, shining prominences are present on body
located as follows: on dorsum there are two parallel rows each side of median line
on fifth to twelfth segments inclusive, the four on each segment being placed so as
to form a trapezoid on segments five to eight, and a square on nine to twelve. These
two rows are replaced by double prominences on segments three, four and thirteen.
Just below these rows there is a partial row with prominences placed on segments
two, three, four and thirteen.

Below this and close to stigmata there is another row on segments three to eleven
inclusive and two more, evidently belonging to this row, on twelfth and thirteenth
segments on a level with stigmata, that on the twelfth being placed just in front of
the stigma. Another row set close to the stigmata below on segments two to thirteen
inclusive, those on segments three and four being out of line and on a level with the stigmata. Just above line of legs there is another row on segments two to thirteen inclusive and on ventral side, segments five, six, eleven, twelve and thirteen have each four prominences placed in a transverse line.

First prominence of the partial row on the side bears three hairs, each of the others of this row and all the double prominences mentioned bear two hairs and a single hair is borne by every other prominence. All hairs are light brown in color.

In addition to above mentioned hairs, there are three each side of median line on line with dorsal prominences, a circle broken in front around depression on anal shield and several on each leg, all of about the same color, but all those on under side of body are much shorter and somewhat lighter.

Under side of body uniform creamy white, true legs same color, with tips darker. Claws and vertical line on inside of first segment of each leg dark brown. Prolegs on segments seven to ten inclusive and thirteen same color as body with terminal ring of light brown hooks on first four pairs and half ring of same hooks on last pair.

Canker Worm Moths with Crippled Wings.—In the last warm days of November (20–23 Nov. 1908) the adults of the fall canker worm (Alsophila pometaria Harris) are emerging. Of these the ♂ ♀ are about one half as numerous as the ♀ ♀, this proportion of ♂ ♂ being considerably less than usual in this species. It was very noticeable that many ♂ ♂ were clinging to the trunks with crippled wings. On examining many specimens it was found that one out of 5 was crippled. We can not be in error in attributing this condition to the unusually dry summer and fall, for during this time the insects were in the pupa stage. It is well known that pupae kept dry either die or yield only dwarfed or crippled adults, if they are accustomed to other conditions in nature.

William Reiff,
MORE TIPULA WITH VESTIGIAL WINGS.

BY R. W. DOANE, STANFORD UNIVERSITY, CAL.

Since sending in the manuscript for the article on "A New Species of Tipula with Vestigial Wings," Psyche, Vol. XV, No. 3, three other species which have the wings more or less reduced have come to me. In one of them, T. quaylii, the wings are reduced to mere pads in both sexes. In another, T. silvestra the wings of the ♀ (♂ unknown) are about like those of the ♀ of T. vestigipennis. In T. williamsii the wings of the ♀ are reduced to about ½ the size of those of the ♀ which are normal. The three species here described together with T. simplex and T. vestigipennis make an interesting series.

*Tipula williamsii* n. sp. Brownish yellow; head yellowish brown, darker above, with a more or less distinct darker line in the middle; rostrum, first segment of palpi and first three segments of antennae yellow; second segment of palpi from yellow to brownish, others dark brown; segments of antennae beyond the third dark brown, black at the base; thorax brownish or grayish yellow; dorsal stripes brown, rather broad, the median one divided; scutellum, metanotum and pleura hoary; halter brownish, yellow at the base, knobs brown; legs brownish yellow; tarsi and the tips of the femora and tibia brown; abdomen brownish, more yellowish at the base, with darker dorsal and lateral stripes; posterior margin of the 8th sternite in the male somewhat crescent shaped, with two median tufts of rather long yellow hairs, lateral margin with sub-triangular membranous appendages from the posterior margin and the tips of which arise shorter yellow hairs, those at the tip being longest; just above the base of the median yellow tufts and usually hidden by them is a short, triangular, reddish, hairy, membranous appendage; posterior margin of 9th tergite somewhat crescent shaped, very slightly serrate and with a median pair of thin plates which are twisted in such a way that their edges are uppermost; 9th sternite almost divided by a deep narrow 'U' shaped incision; pleural suture complete, setting off the two sub-triangular sub-dorsal pleura; three pairs of apical, spatulate appendages, the 2nd largest and united at the base with the 3rd; ovipositor brownish, valves reddish; upper valves of moderate length, acute very slightly arcuate; lower valves acute reaching beyond the middle of the upper valves; wings hyaline with a smoky tinge and with a slight yellowish tinge along the anterior margin, a whitish band extending from in front of the stigma across the discal cell into the 4th posterior cell; a whitish spot beyond the stigma, stigma brownish; wings of ♀ but little more than
½ the length or width of those of the ♂, otherwise they are fully developed. Length ♂ 16 mm., ♀ 20 mm.; wings of ♂ 18 mm., of ♀ 10 mm. 5♂, 6 ♀ collected by Mr. F. X. Williams near San Francisco.

**Tipula silvestra** n. sp. Cinereous; head cinereous with a more or less distinct median brown stripe above; rostrum darker; palpi dark brown, yellowish at the base; antennae brown, segments one and two and the basal half of three yellow; thorax cinereous, dorsum with four rather broad brown stripes, lateral ones interrupted anteriorly; scutellum and metanotum with a more or less distinct median brown line; halter yellow, knobs brown; legs rather stout, yellowish brown; tarsi and tips of femora and tibia darker; abdomen cinereous with dorsal and lateral brown stripes; ovipositor dark reddish brown, upper valves acute, almost straight when viewed from the side, decidedly arcuated near the tip when seen from above; lower valves broad, ending in a sharp corner above, obtusely rounded below; wings much reduced and distorted, but little longer than the halter with more or less distinct, complete veins; length ♀ 26 mm., wing 4 mm. Two ♀ collected at Pacific Grove, Cal., by Mr. Ewal Newcomer, and 1 ♀ from Stanford University.

This species looks very much like *T. vestigipennis* Doane and the specimen from Stanford University, being in bad condition, was placed with this species, but a comparison with the two females from Pacific Grove shows it to belong with them. *T. silvestra* differs from *T. vestigipennis* in being cinereous instead of brownish or yellowish, and in the shape of the valves of the ovipositor. In *vestigipennis* the upper valves are straight when viewed from above as well as from the side, and the lower valves are narrower and obtusely rounded at the tip.

**Tipula quaylii** n. sp. Brown; head brown with a somewhat hoary bloom; a more or less distinct darker stripe above; rostrum short not longer than the head, brown, darker above; palpi brown, last segment darker, equal in length to the three preceding segments taken together, antennae wholly brown, 3rd segment almost as long as the first; thorax reddish or grayish brown, dorsum with a median darker brown stripe; pleura, coxae and metathorax hoary; wings reduced to mere irregular shaped pads less than ½ the length of the halter, halter rather long and slender, brown; legs with a short, dense, black pubescence, rather stout, brown; tarsi and tips of the femora and tibia darker; abdomen brown, with a rather distinct broad brown stripe above; hypopygium rather small; 9th tergite with a median groove and with a broad deep U-shaped incision from the middle of which arise two short sharp close cut processes; 9th sternite almost completely divided by a narrow deep V-shaped incision; first pair of appendages spatulate; second pair claw shaped and strongly chitinized at tip; upper valves of ovipositor curiously twisted in such a way as
to form a deep wide groove on the outer face, upper margin distinctly serrate posteriorly, tip drawn out to a rather blunt twisted claw; lower valves somewhat sickle shape, flattened, tip rather obtuse, longer than the upper valves but on account of their position the tips not reaching beyond the middle of the latter. Length of ♂ 4 mm., ♀ 6 mm., 15 ♂ 2 ♀ reared by Prof. H. J. Quayle, University of California, from larvae sent from Yuba City, Cal. Larvae reported as doing considerable damage to roots of grasses. The size, general appearance, the length of the segments of the palpi and other things seem to show close relation to the brevipalpi group but the structure of the hypopygina leads me to place the species in the genus Tipula for the present at least.

PROCEEDINGS OF THE CLUB.

The adjourned meeting of December 15, 1908, was held by the Club at 1050 Tremont Building, Boston, on Tuesday evening, January 19, 1909. Mr. C. W. Johnson, President, in the Chair, and eleven members and two visitors present. Minutes of previous meeting read and approved.

The business of the adjourned meeting was at once taken up. Nineteen proxies were produced and these together with the members present constituted two-thirds the entire membership as required by the Constitution for amendments.

The amended articles of the Constitution and By-Laws were read and each one adopted by a unanimous vote. The meeting was then adjourned.

The 283d regular and the 32nd annual meeting of the Club since incorporation, was held immediately after the conclusion of the adjourned meeting.

Report of the secretary having been lost the reading was postponed. The report of the Treasurer was read and referred to the auditors for approval.

The following list of officers as nominated by the committee were elected for the ensuing year:

President: P. G. Bolster.
Vice-President: Prof. W. M. Wheeler.
Secretary: C. A. Frost.
Treasurer: F. A. Sherriff.
Executive Committee: J. H. Emerton, C. W. Johnson and A. P. Morse.
Editor-in-Chief of Psyche: W. L. W. Field.
Mr. Field made a few statements in regard to the standing of *Psyche*, and said that there had been an increase in subscribers.

The address of the retiring President, Mr. C. W. Johnson, on Importance of Local Ecological Studies in Entomology, was then delivered.

Mr. Newcomb exhibited four boxes of Lepidoptera from western and southwestern United States.

Mr. Sherriff brought in a specimen of *Hepialus*, probably *argentcomaculatus*, which was taken on the piazza of a hotel at Fabyans, N. H. He reported that eight or ten more were present, but lack of cyanide jars prevented capture.

Mr. Morse exhibited several species of Hemiptera considered rare for Massachusetts. One of the species was *Nepa apiculata* which has also been taken several times at Framingham by C. A. Frost.

Mr. Field spoke of the meeting of the Association for the Advancement of Science in Boston next winter and suggested that the matter of delaying our annual exhibition until that time and the preparations for such an exhibition be discussed at the next meeting. It was so voted by the Club.

Meeting adjourned at the usual time.

C. A. Frost,
Secretary.

**CONSTITUTION OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.**

(Embodying amendments of January 19, 1909.)

**ARTICLE I.**

**Name and Object.**

The Association shall be called the Cambridge Entomological Club, and its object shall be to cultivate the study of entomology.

**ARTICLE II.**

**Election of Members.**

Members may be chosen at any regular meeting, after nomination, in writing, by two members at a preceding meeting, and the affirmative vote of two-thirds of the members present, shall be necessary to a choice.
ARTICLE III.

Rights of Members.

Those members only who are subject to the payment of fees shall be entitled to vote or hold office.

ARTICLE IV.

Officers.

The officers shall be a President, Vice-President, Secretary, Treasurer, and an Executive Committee of seven, of which the President, Vice-President, Secretary and Treasurer shall be members ex officis.

ARTICLE V.

Election of Officers.

Officers shall be chosen by ballot at a meeting designated for the purpose at least three weeks in advance, and a majority of the votes cast shall be sufficient for a choice.

ARTICLE VI.

Amendments.

The Constitution may be altered or amended by a two-thirds vote of those present and voting at any regular meeting of the Club, after a written proposition at a preceding meeting

BY-LAWS OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

(Embodying amendments of January 19, 1909.)

ARTICLE I.

Fees.

The Club shall consist of active and associate members. Active members are those who live near enough to attend the meetings of the Club, together with those who, living at greater distances, signify their willingness to be assessed and participate in the business of the Club. All others shall be known as associate members. The entrance fee shall be one dollar, and an assessment of the same amount shall be due January first of each year from each active member. The President and Treasurer may, at their discretion, exempt a member from assessment.

ARTICLE II.

Termination of Membership.

Members may withdraw from the Club by giving written notice of their intention and paying all arrearages due. A delay of one year in the payment of any fee shall work forfeiture of membership, unless said fee is paid within one month after a written notice to that effect given at the end of the year.
ARTICLE III.
Meetings and Proceedings.

Regular meetings of the Club shall be held on the third Tuesday of each month from October to June. Five members shall form a quorum for business. Officers shall be elected at the January meeting; at this meeting the retiring President shall give an address suitable to the occasion, the Secretary a written statement of the annual progress of the Club, and the Treasurer an account of its financial condition.

ARTICLE IV.
Publications.

The Club will publish a periodical, the general character of which shall be determined by the Club and one or more Editors shall be chosen at the annual meeting. Active members will be considered subscribers, in the absence of notice to the contrary, and will be assessed accordingly.

ARTICLE V.
Duties of Officers.

The duties of the President, Vice-President, Secretary and Treasurer shall be those ordinarily required of such officers. The Executive Committee of seven shall be the governing board of the Club in the intervals between the meetings, and shall act in behalf of the Club in all matters of finance. The members of this Committee chosen at large shall audit the accounts of the Treasurer.

ARTICLE VI.
Amendments.

The By-Laws of the Club may be altered, added to, or amended by a majority vote of the members present at any meeting; provided that they shall have been duly notified, at the previous meeting, of an intended change.
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PSYCHE.

THE FOSSIL CEROPALIDÆ OF FLORISSANT, COLORADO.

BY S. A. ROHWER, BOULDER, COLORADO.

There have been four fossil Ceropalids described by Prof. T. D. A. Cockerell from Florissant, and three more are added in this paper. The fossil Ceropalids found at Florissant do not seem to be very close to the recent ones found there during the summers of 1907 and 1908. The recent ones are small (none of them 10 mm. long), mostly black wasps — quite the ordinary kind for the lower Canadian Life Zone. The fossil ones, on the other hand, are rather large, robust wasps, like those found to-day in the eastern states and Mexico. Some of them (*Agenia saxigena, Salina florissantensis* and *S. scudder*) have the wings with two dark bands, a character which is well developed in the species living to-day in Central America and Mexico. So far none have been found with very dark wings, a character found in most of the large species of United States.

The following table will separate the Florissant fossil Ceropalids:

<table>
<thead>
<tr>
<th>Description</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdomen shortly petiolate; (wings clouded beyond the stigma)</td>
<td>Ceropalites infelix Ckll.</td>
</tr>
<tr>
<td>Abdomen sessile</td>
<td>1</td>
</tr>
<tr>
<td>1. Second cubital cell on the radius distinctly greater than the third on the same nervure; (wings clouded beyond the stigma)</td>
<td><em>Agenia cockerellae</em> Roh.</td>
</tr>
<tr>
<td>2. Second cubital cell on the radius not greater than the third</td>
<td>2</td>
</tr>
<tr>
<td>2. Second cubital cell small, but little more than half as long as the third on the radius; metathorax transversely wrinkled; ferruginous; cloud about the stigma not entering the radial cell</td>
<td><em>Salinus senex</em> Roh.</td>
</tr>
<tr>
<td>3. Wings clouded beyond the stigma; large black species</td>
<td>3</td>
</tr>
<tr>
<td>3. Wings clouded beyond the stigma; large black species</td>
<td><em>Salinus laminarum</em> Roh.</td>
</tr>
<tr>
<td>Wings with an apical cloud; and also a cloud on the basal nervure</td>
<td>4</td>
</tr>
</tbody>
</table>
4. Length 15 mm.; second and third cubital cells on the radius about the same length; robust, black species; anterior wing 10 mm. long.  

*Salius florissantensis* (Ckll.)  
Length less than 12 mm.; third cubital cell distinctly longer than the second  

5. Slender black species; length 10 mm.; length of anterior wing 6 mm.; head sub-quadrate; basal n. 120 μ basad of tr. med.  

*Salius scudder* (Ckll.)  
Robust species with abdomen a little paler than thorax; length 11 mm.; length of anterior wing 9 mm.; head subtransverse; basal n. 680 μ basad of tran. med.  

*Agenia saxigena* Ckll.  

Besides the reverse of Prof. Cockerell’s type, I have seen a specimen of this species from Fossil Stump Hill, 1907 (W. P. Cockerell).  

*Agenia cockerelli* n. sp.  
♀. Length about 13 mm.; length of the anterior wing 7.5 mm. Head about the same width as the thorax, normal for this broad type. Head and thorax sub-tily sculptured, at the sides of the thorax it is slightly aciculate. Legs moderately robust; fore femora not swollen, normal; middle tibiae without spines, and with the longer spur almost as long as the basitarsus; hind and fore tibiae indistinct. Radial cell broadest where the second tr. cu. joins the radius; stigma very small, only the apex remaining; first tr. cu. strongly curved toward the base of the wing, making the second cubital cell much broader on the cubitus; second tr. cu. almost straight; third tr. cu. on the lower part strongly curving toward the apex of the wing, making the third cubital cell much broader on the cubitus; second cubital cell much larger than the third, receiving the first recur. n. distinctly beyond the middle; third cubital cell receiving the second recur. n. somewhat beyond the middle; first discoidal cell long and acute at the apex, distinctly but not markedly longer than the first cubital; tran. med. not basad of the basal nervure, but its exact position is hidden by a leg. Abdomen sessile, broad, impunctate. Head and thorax black; abdomen and legs rufous. Basal half of wings hyaline, apical half dark fuscous; venation dark brown. The following measurements are in μ:—  

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of radial cell about</td>
<td>1275</td>
</tr>
<tr>
<td>Width of radial cell at the second tr. cu.</td>
<td>306</td>
</tr>
<tr>
<td>Third tr. cu. from costa on radius</td>
<td>782</td>
</tr>
<tr>
<td>Length of first cubital cell on cu.</td>
<td>1615</td>
</tr>
<tr>
<td>Length of second cubital cell on radius</td>
<td>595</td>
</tr>
</tbody>
</table>
Length of second cubital cell on cubitus 1122.
Length of third cubital cell on radius 306.
Length of third cubital cell on cubitus 782.
Distance from second recur. n. to third tr. cu. 306.
Length of the second tr. cu. 306.
Distance of the first recur. n. from first tr. cu. 561.

_Habitat:_ — The tertiary shales of Florissant, Colorado; at station 11 (the north end of Fossil Stump Hill). Named after Mrs. W. P. Cockerell who collected the specimen in 1907. Type in the University of Colorado.

This species is at once distinguished from the other fossil species of Florissant (_Salius florissantensis_ (Ckll.), _S. scudderii_ (Ckll.) and _Agenia saxigena_ Ckll.) by the larger second cubital cell, the different color of the wings and body and the larger size (_Salius florissantensis_ Ckll. is 15 mm. long). The short wings should help in determining this species. A search through the literature and among the species in my collection fails to bring to light any species closely related to this one, that is at present known to inhabit the Rocky Mountain Region. It does however show that species similarly colored, and similar in some other respect are to-day found in the Atlantic states and in Mexico. Such allies are _Agenia congrua_ (Cress.), _Agenia longula_ (Cress.) and _Agenia accepta_ (Cress.). The venation resembles that of _Pseudogenia monticaga_ Cam. from Mexico as figured in the Biol. Centr. Am. Hymenoptera, Vol. ii, plate 10, fig. 9.

_Salius senex_ n. sp.

♀. Length about 14 mm.; length of the anterior wing 9.5 mm. Form robust. Head of the usual subtransverse type. Sculpture subtle; postscutellum not strongly if at all obliquely striated; metathorax transversely wrinkled. Legs rather robust; more or less spinose. Abdomen stout, a little longer than the head and thorax united. Stigma distinct; radial cell reaching the costa; second cubital cell very small, almost quadrate; second recur. n. received by the second cubital basal of the middle; third cubital cell large, wider below, receiving the second recurrent a little beyond the basal third; first discoidal long, longer than the first cubital; transverse median beyond basal as far as the length of the basal below the cubitus. Color ferruginous, apparently without black markings. Wings hyaline, with a cloud below the stigma, but not in the radial cell; venation brownish. The following measurements are in μ:

Length of the stigma 850.
Breadth of the stigma 187.
Basal nervure basad of the stigma, about 1700.
Length of ba. n. above origin of cu. 306.
Length of ba. n. below origin of cu. 680.
Ba. n. basad of the tr. med. 680.
Length of tr. med. 340.
Length of first cubital on cu., about 2210.
Length of first cubital on rad. 204.
Length of second cubital on cu. 731.
Length of second cubital on rad. 595.
Length of third cubital on cu. 1785.
Length of third cubital on rad. 1105.
Distance from 3tr. cu. to costa on rad. 595.
First tr. cu. basad of first recur. n. 306.
Second tr. cu. basad of second recur. n. 680.

Habitat:—The tertiary shales of Florissant, Colorado, Station 14 (three-fourths of a mile southwest of the town), 1908. Collector unknown. Type in the University of Colorado.

The general habitus of this species is much the same as Anoplus (Arachnophroctonus Ashm.) ferrugineus (Say), but it differs in a number of ways from that species, especially in the venation. It has a number of points in common with Salius fenesstratus Sm. (Sylhet) especially in the wrinkled metathorax and position of the tran. med. It is more closely allied to Salius florissantensis (Ckll.) than any other described fossil Ceropalid but it may be known from that species by the much smaller second cubital cell, the absence of a cloud along the basal nervure, the wrinkled metathorax, the absence of striae on the postscutellum, and the ferruginous color.

Salius laminarum n. sp.

♀. Length about 15 mm.; length of anterior wing 8.5 mm. Robust. Head of the usual subtransverse type. Sculpture subtle, metathorax not wrinkled or postscutellum obliquely striated. Scape of the antennae elongate, cylindrical; the rest of the antennal joints are not clearly defined in the fossil. Legs long and robust, spinose; longer spur of hind tibiae much shorter than basitarsus. Stigma normal; radial cell reaching the costa; second cubital on rad. nearly as long as the third; first and second tr. cubiti bent basally on the lower part; third tr. cu. curved outwardly; first recur. n. received in the middle of second cubital cell; second recur. n. received a little beyond the middle of third; tran. med. considerable distance beyond the basal nervure. Abdomen long, somewhat flattened not nearly as conical as in
S. senex. Color entirely black. Wings hyaline; beyond the middle of the stigma dusky.

The following measurements are in μ: —

Length of stigma ........................................ 850.
Width of stigma, about .................................. 255.
Basal nervure basad of stigma ............................ 1870.
Length of first cubital cell ............................... 2210.
Length of first cubital on rad. ............................. 255.
Length of second cubital cell on rad. ..................... 918.
Length of second cubital cell on cu. ........................ 1020.
Length of third cubital cell on rad. ....................... 969.
Length of third cubital cell on cu. ................................... 1275.
Distance from third tr. cu. to costa on rad. .............. 716.
First tran. cu. basad of first recur. n. .................... 510.
Second tr. cu. basad of second recur. n. .................. 680.
Basal nervure above cu. ................................... 306.
Basal nervure below cu. ................................... 680.

Habitat: — Tertiary shales, Florissant, Colorado, Station 14 (three-fourths of a mile southwest of the town) 1908, (S. A. Rohwer). Type in the University of Colorado.

This species is most closely related to Salius florissantensis (Ckll.), but it is easily known from that species by the different markings of the wings. It is also related to Salius senex Roh., but that species has a smaller second cubital cell, and the apical part of the wings are not dark. I do not know a recent species found in North America which is just like S. laninarus in the flattened abdomen.

Salius scudderi (Ckll.).

♀. A slender species with a subquadrate head. Sculpture subtle. Antennal joints cylindrical, well defined, apical joint short. Wings with a cloud beyond the stigma, but not extending to the apex or bottom of the wings, and a smaller one on the basal nervure.

Salius florissantensis (Ckll.).

A large species. Sculpture subtle except the postscutellum which is obliquely striated. Wings with a cloud below and in front of the stigma, and one on the basal nervure.

The following is a list of the fossil Ceropalids of the world:

Pepsis sp. Burmeister.—Baltic Amber; Lower Oligocene. Handbuch Ent. 1, p. 636, 1832.


Anoplius induratus (Heer) Roh.—Oeningen in Baden; upper Miocene. Pompi-

Salius florissantensis (Ckll.) Roh.—Florissant, Colo.; Miocene. Hemipogonius

Salius scudder (Ckll.) Roh.—Florissant, Colo.; Miocene. Hemipogonius


Agenia saxigena Ckll.—Florissant, Colo.; Miocene. Am. Jn. Sc., Vol. XXV,
March 1908, p. 229.

Agenia cockerellae Roh.—Florissant, Colo.; Miocene.

Salius senex Roh.—Florissant, Colo.; Miocene.

Salius laminarum Roh.—Florissant, Colo.; Miocene.

I wish to thank Prof. T. D. A. Cockerell for the pleasure of studying these most interesting fossils, for the use of his manuscript notes on the species he described, and for going over my manuscript.

Zeuzera pyrina in Boston.—My friend R. W. Curtis, Assistant Superintendent of the Arnold Arboretum, found on the 18th of January, 1909, a full-grown and therefore two years old caterpillar of Zeuzera pyrina Linn. in the trunk of a Quercus palustris Du Doi, which was broken by a storm. He had already made the same discovery one year ago in another tree, but which one he does not remember. Dr. E. P. Felt in his work on Forest Insects (New York State Museum Memoir 8 Vol. I.) does not give Massachusetts as included in the distribution of Z. pyrina. According to verbal information given me several adults have been observed in the vicinity of Boston, Mass., in the past three years, but it has not yet been stated that Z. pyrina has advanced in Massachusetts to a regular brood. The findings made by Mr. Curtis prove that the breeding of the species in the neighbourhood of Boston must have taken place for the first time in 1906, if no earlier record of a brood has been made elsewhere.

William Reiff,
Bussey Institution of Harvard University.
A NEW CHALCIDOID OF THE EULOPHID GENUS *APHELINUS* DAL-MAN, PARASITIC ON *SCHIZONEURA CRATAEGI* OESTLUND.

BY A. ARSÈNE GIRault, Urbana, Illinois.

Family EULOPHID.E.

Subfamily ApheLININAE.

Tribe Aphelinini.

*Aphelinus varicornis* species nova.

Normal position.

*Female:* — Length, 1.24 mm., avg. Moderately large for the genus. Same in general coloration, stature and sculpture as *Aphelinus mali* (Haldeman), but differing in the following italicized details: Fore wings with a distinct fuscous patch under the marginal vein, more pronounced immediately caudad of the stigma, especially seen as a round dot at the stigma, the fuscous area quadrate and extending distinctly caudad to the middle of the wing where it is evanescent; caudal femora white, not sordid yellowish, basal joint of caudal tarsi blackish, cephalic and intermediate femora fuliginous, the knees and the intermediate and caudal trochanters white, the cephalic tibiae white clouded with dusky and the remaining tibiae sooty black, yellowish at their extremities; apical tarsal joints sooty; antennae variable, varicolored, the scape, pedicel and *first two funicle joints* sooty, the two basal joints of the funicle, however, with some yellowish; the apical funicle joint and the club chrome yellow, the latter often paler yellow; ventum sooty black; area of the fore wing proximad of the oblique hairless line also naked, but with no setae beneath the marginal vein as in *mali*, excepting one or two, and with but 2 transverse (caudo-proximal) lines of setae along the proximal border of the oblique hairless line; the proximad of these two lines of setae runs not quite to the center of the wing. Tip of the abdomen concolorous. Hind wings densely ciliate discally.

Shining black: Whole of thorax very delicately sheened, the mesopostscutellum acute along the meson; eyes hairy, deep purplish red, just after death imperial purple; ocelli deep ruby red, the lateral ones some distance from the eye margin, and widely separated, being about 5 times farther from each other than each is from
the eye margin and about one-fourth farther apart than each is from the cephalic ocellus and on or very near the occipital margin; proximal segment of the abdomen sordid yellowish. Pubescence of head and thorax black. Proximal intermediate tarsal joint longer than the combined length of the two next joints following. Submarginal vein narrow, dark, the marginal broader, pallid yellow.

Antennae 6-jointed, the scape short and slightly dilated, nearly as long as the funicle and pedicel combined, or twice the length of the pedicel; the latter oboeonic, slightly longer than the third funicle joint, or over half the length of the funicle; joints 1 and 2 of the funicle like ring-joints, subequal, joint 2 larger, both about one-third narrower than the pedicel and combined not as long as the third funicle joint, which is quadrate-oval and as wide as the unjointed club. The latter longest, subequal to the scape and longer than the funicle, ovate. Antennae inserted below the middle of the face, with very few hairs.

Mandibles quadrate-rectangular, bidentate, the outer (lateral) tooth short and moderately acute, triangular, the inner (mesal) one longer, four times broader and broad and truncate.

(From 20 specimens, 3/2-inch objective, 2-inch optic, Bausch and Lomb.)

Male: — Unknown.

Described from 20 females reared from November 16 to December 18, 1908, by Mr. John J. Davis in the insectary of the office of the State Entomologist of Illinois, from about the last three stages of the viviparous females of Schizoneura crataegi Oestlund on Crataegus, Chicago, Illinois. The hosts were collected on October 17th, 1908, in Garfield Park, by which date nearly all of the parasites had emerged; 13 of the specimens obtained emerged in the insectary at Urbana between November 16 and December 10, 1908, and the remaining 7 specimens between the latter date and December 18, 1908. The description was made from specimens mounted in xylol-balsam, tag-mounted and from living specimens stupefied with chloroform.

This species is very closely allied to Aphelinus mali (Haldeman) both in habits, structure and coloration and is very probably a variety of it, but until that point is settled by careful breeding, both expediency and progress demand that it should be given a name, and between the two grades of species and variety, I prefer to place it in that of the former, as being the less hazardous of the two.

Hosts parasitized by this parasite change to a deep pruinose blackish color and become considerably swollen and the caudal part of the abdomen is slightly elevated above the surface; the parasites are solitary and issue usually from circular holes in the dorsal or dorso-lateral aspect of the proximal end, or of the center, of the abdomen of the host; some of the emergence holes are, however, jagged and irregularly elongate.
The bodies of the parasitized hosts were empty after emergence of the parasite, and externally with little or none of the usual cottony excretion.

So far as known this is the only parasite of Schizoneura crataegi recorded in the literature.


*Chrysophanid Notes.* — *Zeroc* Boisd. I have recently obtained an egg of this species from Mr. E. J. Newcomer, who observed the female ovipositing in Placer County, near Lake Tahoe, where *zeroc* occurs abundantly. Shape depressed spheroid, the height not more than half the diameter; marked with large white walled polygonal or semicircular cells; considerably flattened at base, less so apically, where the net-work is small and low, the cells gradually enlarging as they approach the base; the micropylar area is deeply depressed, conspicuous. Color creamy-white. Deposited on the stem of the food-plant, which was not identified. Much smaller than the egg of gorgon and the indentations are much finer and evener.

*Gorgon* Boisd. In the December (1907) number of Psyche I gave a description of the egg of this species and remarked that the eggs which I had (laid in June and July) had not hatched at that time (October), although the normal hatching time was late August and September. I recently discovered this batch of eggs in a tin box in the drawer of my desk and I find but three of the nine eggs have disclosed larvae. This can probably be attributed to the cool and dry place in which the eggs were kept, as under natural conditions the eggs are particularly exposed to the warmth of the sun, being placed between the forks of its food-plant which only grows on the dry, hot hill-sides.

*Arcthusa* Dod. Mr. F. H. Wolley-Dod, the author of *arcthusa*, writes me: "It is the same form listed by Skinner as *phlaeas*, though I overlooked the latter name when describing it. It is probably a local form of *phlaeas*, of which *hypophlaeas* is also a geographical race, occurring in Northern Europe."

K. R. Coolidge,
Palo Alto, California.
NOTES ON THE SYNONYMY OF THE SPECIES OF ERAX OF THE EASTERN UNITED STATES.

BY CHARLES W. JOHNSON, BOSTON, MASS.

In most catalogues of insects there are some names in use which we know should be changed. This fact is brought forcibly to our minds in preparing faunal lists, and that such names should no longer be used is evident; a faunal list, however, is no place for such changes, which often require some elucidation. That the present names in use for the common species of the genus Erax are misapplied, is evident to all systematic dipterologists. Working on three faunal lists has compelled me to take up this matter, for it does not seem desirable to continue to perpetuate these discrepancies. While the following synonymy has been largely intimated by Baron Osten Sacken, and Dr. Williston, authors have failed to realize its significance.

Erax aestuans (Linne).


This is the most common and variable of the eastern species of Erax. It is on the other hand the only one with three white abdominal segments, therefore, it seems that the brief description of Linne can only apply to this species: "cinereus abdominis ultimis tribus segmentis albis. Habitat Pennsylvania." The number of white segments, however, varies from three to four, the latter representing the A. macrolabis of Wiedemann. If this was constant its specific standing might not be questioned, but among the specimens before me are many intermediates in which the dorsal portion of the fourth segment is blackish leaving very broad posterior and lateral margins of white. As to Macquart’s species there seems to be no question as to the synonymy.
Erax rufibarbis (Macquart).

Asilus aecstuans Wiedemann, Dipt. Exot. p. 200, 1820 (non Linne).

The A. aecstuans of Wiedemann is a very different species from what Linne described. "Rubido-fusce, ** barba et vibrissae rufo-flavicantes, ** mare abdominis segmentis duabus penultimis albis" seem only referable to the species common in late summer and early autumn, and later described by Macquart as E. rufibarbis: "Mystace rufo. Abdominis segmentis duobus apicalibus albis." Macquart noticed the discrepancy between Linne's and Wiedemann's description (Hist. Nat. Dipt., I, 312, 1834) and described Linne's species, but in 1838 (Dipt. Exot., I, pt. 2) he seems to have forgotten or ignored the fact and gives Wiedemann's description of E. aecstuans on page 115 and on page 116 describes his E. rufibarbis. Since Dr. Williston in 1885 (Trans. Amer. Ent. Soc., XII, 72) referred to the above synonymy, there has been no change. As Wiedemann's name cannot be used, we are obliged to adopt the one given by Macquart.

Erax albibarbis Macquart.


There seems to be no doubt regarding the synonymy of this common and widely distributed species, and Macquart's name will have to be adopted.

Erax interruptus (Macquart).

Erax maculatus Macq., Dipt. Exot., I, pt. 2, 11, pl. 9, f. 6, 1838.
Erax ambiguus Macq., Dipt. Exot., Suppl. 1, 84, 1846.

The above synonymy is practically that given by Osten Sacken. After a careful study of the descriptions Macquart's oldest name has been given precedence.
NOTES ON TACHINID PARASITES OF CHRYSOMELIDAE.

BY FREDERICK KNAB, WASHINGTON, D. C.

During the past summer the writer repeatedly visited some clumps of willows at the head of Plummer's Island, Maryland, in order to observe the habits of Calligrapha bigsbyana. On August 16 the following scene between a tachinid fly and a Calligrapha was observed among these willows. Upon the upper surface of a willow leaf, near its base, a specimen of Calligrapha was found, and in front, facing it, a rather small tachinid fly. The beetle was in the attitude of attention, its antennae held obliquely forward, while the fly sat facing it, just out of reach. The beetle appeared to be on the defensive and both insects remained motionless for several minutes. Finally the beetle advanced, and as it did so the fly retired, walking rapidly backward and all the time facing the beetle. Soon the fly reached the tip of the leaf and as the beetle bore down upon it the fly quickly transferred itself to the nearest leaf, whence it continously watched the movements of the beetle. The beetle advanced to the tip of the leaf, immediately turned around and started back again. As soon as there was room the fly returned to the leaf and followed close behind the beetle, at times even touching it. The pair proceeded back over the leaf to the stem and down the branch of the willow some nine or ten inches, the beetle winding about among the bracts, leaves and twigs, the fly always keeping close, either directly behind or directly opposite on the branch. When the beetle turned and came back over the same route the fly still followed close behind, the pair finally going out upon another leaf and from this to another one that was in contact. From this leaf the route again went to the branch and the rapid course then led farther into the bush where it was difficult to follow the movements of the pair. Fearful of losing the interesting fly I captured it, together with the beetle. The fly's behavior suggested a contemplated attempt at oviposition. However no eggs could be found upon the beetle.

The tachinid was sent to Mr. C. H. T. Townsend for identification. He replied that "the species is probably to be referred to Anisia, and is related to Hyposterna barbata Cogn., which has been bred from an adult beetle of Disomycha xanthomelaena collected near Washington, D. C." Mr. Townsend further stated that the specimen was opened "and disclosed uterine maggots of a type different from any that we have so far seen." It is evident, therefore, that this tachinid deposits living larvae; whether upon the beetle itself (as the actions of the fly would indicate) or upon its larvae remains to be determined.
It has long been known that tachinid flies parasitise adult beetles. It appears that not all of them have the same mode of infesting their host. Thus on June 14 I took a female Lina scripta which had four eggs of a tachinid fastened upon her elytra. This beetle was kept alive in order to ascertain if the parasitism was successful. Shortly afterward this beetle laid a large number of eggs and in the course of another week died. No tachinids resulted although the dead beetle was kept in the breeding jar for several weeks.

A number of records have been made of tachinid rearings from adult Chrysomelidae, as well as from coleoptera of other families. It is doubtful, however, that any statements can be found that indicate the mode of parasitization or the habits of the tachinids in question. It is to be hoped that this subject, in which Townsend has recently opened such an interesting perspective, will attract other students.

**A LIST OF COLEOPTERA COLLECTED WITHIN TEN MILES OF FALL RIVER, MASSACHUSETTS.**

BY NORMAN S. EASTON, FALL RIVER, MASS.

One of the aims of the Fall River Society of Natural History is to make a list of the fauna and flora found within ten miles of the City Hall. All the beetles in the following list were taken within this ten mile radius, and with a few exceptions, are represented in the collection of the society. Fully ninety percent have been taken during the last five years by a single individual. At least three hundred more species may be confidently expected to occur in the region.

The region, coming as it does, within a debatable portion of the transitional zone, is a very interesting one. The varied physical features make it a delightful and productive collecting ground.

From North to South, directly through the center of the region, runs the escarpment formed on account of the contact between hard granitic rocks and the soft sediments of the Rhode Island coal measures. A mile or more to the eastward of this contact, upon the upland, lies a chain of fresh water lakes, extending nearly the length of the area. To the eastward of the lakes are tracts of forest growth, principally of oak and pine, and extended areas of dense cedar swamps.

To the westward, of the escarpment lies the estuarian region of the Narragansett basin, with its miles of varied shore lines and acres of cleared lands.
In its retreat across this limited area, the glacier made four distinct pauses. The resultant moraines, and over-wash plains, are productive of many interesting forms of animal and plant life.

Many thanks are due to those, who by gifts of specimens, or by assistance in identification, have made this list possible.

One thousand and nineteen identified species are listed. The abbreviation "sp." occurring at the end of a generic list, indicates a specimen, or specimens in the collection which have not been identified. Some of them are undoubtedly undescribed forms. The compiler would be pleased to communicate with any coleopterist interested in these particular groups.

**Cicindelidæ.**

Cicindela.
6-guttata Fab.
purpurea Oliv.
generosa Dej.
vulgaris Say.
repanda Dej.
hirticollis Say.
punctulata Fab.
marginata Fab.

**Carabidæ.**

Omphron.
americatum Dej.
tessellatum Say.
Cychrus.
tessellatum Dej.
Carabus.
serratus Say.
Calosoma
scrutator Fab.
calidum Fab.
Elaphrus.
cicatricosus Lee.
Notiophilus.

aneus Hbst.
hardyi Putz.
Scarites.
subterraneus Fab.
Dyschirius.
globulosus Say.
Clivina.
americana Dej.
Bembidium.
americatum Dej.
nigrum Say.
ustulatum Linn.
variegatum Say.
versicolor Lee.
contractum Say.
assimile Gyll.
quadrimaculatum Linn.
semistriatum Hald.
Tachyus.
scitulus Lee.
corruscus Lee.
lavus Say.
nanus Gyll.
flavicauda Say.
incurus Say.
granarius Dej.

**Pteryxidæ.**

Patrobus.
longicornis Say.
Myas.
coracinus Say.
Pterostichus.
adoxus Say.
lucublandus Say.
luctuosus Dej.
corinus Dej.
scrutator Lee.
mutus Say.
luczotii Dej.
erythropus Dej.
paternalis Dej.
Amara.
avida Say.
fulvipes Putz.
latiör Kirby.
impuncticolis Say.
cupreolata Putz.
erratica Sturm.
interstitialis Dej.
chaleca Dej.
rubrica Hald.

**Dicetæ.**

dilatatus Say.
elongatus Bon.
politus Dej.
Badister.
notatus Hald.
Calathus.
impunctatus Say.
Platynus.
sinuatus Dej.
extensicollis Say.
decorus Say.
pusillus Lee.
attratus Lee.
melanarius Dej.
affinis Kirby.
cupripennis Say.
excavatus Dej.
octopunctatus Fab.
placidus Say.
bogennani Gyll.
aeruginosus Dej.
crenistriatus Lee.
punctiformis Say.
sordens Kirby.
ruficornis Lee.
retractus Lee.
picipennis Kirby.
Casnomia.
pennsylvanica Linn.
Galerita.
janus Fab.
Lebia.
grandis Hentz.
atriventris Say.
pulchella Dej.
viridis Say.
pumila Dej.
viridipennis Dej.
ornata Say.
var. axillaris Dej.
fusca Dej.
furiata Lee.
vittata Fab.
Apristus.
subsubduatus Dej.
Axiomalpus.
biplagiatus Dej.
Pinacodera.
limbata Dej.
platicollis Say.
Hellnomorpha.
praestua Dej.
Brachynus.
minutus Harr.
perplexus Dej.?  
funans Fab.
cordicollis Dej.
1 sp.
Chlaenius.
sericus Forst.
emoralis Say.
tricolor Dej.
penssylvanicus Say.
impunctifrons Say.
niger Rand.
torrentosus Say.
Anomoglossus.
pusillus Say.
Oodes.
fluvalis Lee.
Geopinus.
incassatus Dej.
Agonoderus.
lineola Fab.
pallipes Fab.

partiarius Say.
Gynandropus.
hyiacis Say.
Harpalus.
viridinennus Beauv.
calignosus Fab.
faunus Say.
penssylvanicus DeG.
var. compar Lee.
pleurites Kirby.
herbivagus Say.
latticeps Lee.
Selenophorus.
gagatinus Dej.
opalinus Lee.
Stenophorus.
fuliginosus Dej.
conjectus Say.
ocropeuz Say.
humidus Hamilton.
Acupalpus.
carus Lee.
Bradycellus.
rupestris Say.
Tachyellus.
kirbyi Horn.
Anisodactylus.
rusticus Dej.
harrisi Lee.
nigerrimus Dej.?
nigrita Dej.
baltimoresensis Say.
terminatus Say.
lugubris Dej.
sericus Harr.
interstitialis Say.
Haliplidæ.
Haliphus.
  fasciatus Aubé.
  (triopsis Aubé?)
  ruficollis De G.
  longulus Lee.
Chenidotus.
  muticus Lee.
  1 sp.

Dytisicidæ.
Hydrocanthus.
  iricolor Say.
Laccophilus.
  maculosus Germ.
  undatus Aubé.
Hydrovatatus.
  cuspidatus Germ.
Bidessus.
  (pulicarius Aubé.)
  affinis Say.
  fuscatus Cr.
  granarius Aubé.
Coelambus.
  inaequalis Fab.
  farcetus Lee.
  turbidus Lee.
  nubilus Lee.
  dissimilis Harr.
  impressopunctatus Sch.
Deronectes.
  catascopium Say.
Hydroporus.
  undulatus Say.
  eylepblis Sharp.
  teneosus Leear.
  tristis Payk.
  americanus Aubé.
  modestus Aubé.
  2 sp.
Hybius.
  biguttatus Germ.
Coptotomus.
  interrogatus Fab.
Hybiosoma.
  bifarius Kirby.
Copelatus.
  glyphicus Say.
Matus.
  bicarinatus Say.
Agabotes.
  acuaductus Harr.
Agabus.
  seriatus Say.
  seruginosus Aubé.
  semipunctatus Kirby.
  punctulatus Aubé.
  reticulatus Kirby.
  erythropterus Say.
  gagates Aubé.
Rhantus.
  binotatus Harr.
  bistriatus Bergst.
Colymbetes.
  sculptulis Harr.
Hydaticus.
  bimarginatus Say.
Dytiscus.
  fasciventris Say.
  hybridus Aubé.
Acilius.
  semisulcatus Aubé.
  fraterus Harr.
  mediatus Say.
  Graphoderes.
  liberus Say.

Gyrinidæ.
Gyrinus.
  limbatus Say.
  ventralis Kirby.
  borealis Aubé.
  lugens Lee.
Dineutes.
  vittatus Germ.
  assimilis Aubé.

Hydrophilidæ.
Helophorus.
  linearis Lee.
  inquinatus Mann.
Hydrochus.
  inaequalis Lee.
  subeupreus Rand.
  squamifer Lee.
Hydraena.
  pennsylvanica Kies.
Hydrophilus.
  triangulus Say.
Tropisternus.
  nimbatius Say.
  glaber Lee.
Hydrocharis.
  obtusatus Say.
Berosus.
  aculeatus Lee.
  peregrinus Hbst.
  striatus Say.
Laccobius.
  agilis Rand.
Philhydrus. ochraceus Mels. cinetus Say. perplexus Lec. hamiltoni Horn.
Cymbiodyta. fimбриatus Melsh. laeustris Lec.
Helocombus. bifidus Lec. Hydrobius. tumidus Lec?
Creniphilus.fuscipes Linn. subenprous Say.
Sphaeridium. scarabaeoides Linn.
Cereyon. praextatum Say. pygmaeum Ill. unipunctatum Linn. anale Payk.
Cryptopleurum. minutum Fab.

Silphidæ.

Necrophorus. americanus Oliv. sayi Lap. orbicollis Say. marginatus Fab. pustulatus Hersch. tomentosus Web.
Silpha. surinamensis Fab. lapponica Hbst. inaequalis Fab.

EASTON — COLEOPTERA

noveboracensis Forst. americana Linn.
Choleva. clavicornis Lec. Priouchaeta. opaca Say.

Scydmaenidæ.

Scydmaenus. clavipes Say.

Pselaphidæ.

Batrisus. globosus Lec. 1 sp. Bryaxis. rubicunda Aubé. 1 sp.

Staphylidæ.

Falagria. bilobata Say. dissecta Er. venustula Er. Atheta.

analis Grav. collaris Fauv Mns. 10 sp. Lonchusa. cava Lec. Tachyusa. 1 sp. Polistoma. maritima Casey. Microglossa?

1 sp. Arcochara. lata Grav. bimaculata Grav. nitida Grav. binotata?, 3 sp. Haploglossa. 1 sp. Oxypoda. brevithorax Fauv Mns. Thinusa. maritima?

Leptusa. 1 sp. Grophæna. dissimilis Er. corruscula Er. 1 sp. Acylophorus. pronus Er. pratensis Lec. Quedius. fulgidus Fab. anescens Mäkl. 1 sp. Listotrophus.
cingulatus Grav.
Creophilus.
villosus.
Staphylinus.
vulpinus Nordm.
maculosus Grav.
mysticus Er.
fossator Grav.
cinnamopterus Grav.
violeceus Grav.
praelongus Mann.
Ocypus.
ater Grav.
Philonthus.
aeaeus Rossi.
lactulus Say.
debilis Grav.
longicornis Steph.
discoideus Grav.
fulvipes Fab.
lomatus Er.
cyaniipennis Fab.
blanus Grav.
nigratus Grav.
Actobius.
paderoides Lee.
Cafius.
bistriatus Er.
sraceus Holme.
Xantholinus.
cephalus Say.
obsidians Melsh.
obscenus Er.
Leptacinus.
nigratus Lee.
Stenus.
juno Fab.
militaris Casey.
stygicus Say.
egenus Er.
flavicornis Er.
amularis Er.
arculus Er.
Cryptobium.
bicolor Grav.
pallipes Grav.
crbratum Lee.
Lathrobiunm.
pointulatum Lee.
angulare Lee.
othioiides Lee.
simile Lee.
simplex Lee.
collare Er.
ambugium Lee.
Stilicus.
angularis Lee.
Lithocharis.
confuens Say.
Paderus.
liptoreus Aust.
Sunius.
profuxus Er.
longiusculus Mann.
Tachinus.
memonius Grav.
luridus Er.
finbriatus Grav.
limbatus Melsh.
pallipes Grav.
Tachyporus.
jocosus Say.
chrysomelinus Linn.
brunneus Fab.
Erchomus.
ventriculus Say.
Conosoma.
crassum Grav.
pubesceus Payk.
Boletobius.
trinitatus Er.
cinctus Grav.
Mycetoporus.
consors Lee.
americanus Er.
Oxyporus.
femoralis Grav.
vittatus Grav.
fasciatus Melsh.
lateralis Grav.
Bledius.
1 sp.
Oxytelus.
sculptus Grav.
nitidulus Grav.
Trogophloeus.
4-punctatus Say.
Geodromicus.
nigrita Mühl.
Acidota.
subcarinata Er.
Olophrum.
rotundicolle Sahlb.
Homalium.
rufipes Fauv.
Anthobium.
convexum Fauv.
Glyptoma.
costale Er.
Triga.
picipennis Lee.
Trichopterygidae.

Ptenidium.

evanescens Marsh.

Scaphidiidae.

Scaphidium.

quadriguttatum Say.

var. piceum Melsh.

Breocera.

concolor Fab.

apicalis LeC.

Scaphisoma.

convexus Say.

Toxidium.

grammaroides LeC.

Phalacridae.

Phalacrus.

politus Melsh.

pumilio LeC.

1 sp.

Olibrus.

lecontei Casey.

pallipes Say.

apicalis Melsh.

nitudus Melsh.

Corylophidae.

Sacium.

lunatum LeC.

Corylophodes.

marginicollis LeC.

Sericoderus.

flavidus LeC.

Rhytobius.

marinus LeC.

Orthoperus.

glaber LeC.?

Coccinellidae.

Anisosticta.

strigata Thumb.

seriata Melsh.

Megilla.

maculata De G.

Hippodamia.

glacialis Fab.

13-punctata Linn.

parenthesis Say.

Coccinella.

trifasciata Linn.

9-notata Hbst.

5-notata Kirby.

sanguinea Linn.

Adalia.

frigida Selm.

bipunctata Linn.

var. humeralis Say.

Anatis.

15-punctata Oliv.

Psyllobora.

20-maculata Say.

Chilocorus.

bivulnerus Muls.

Brachyacantha.

ursina Fab.

var. 10-pustulata Melsh.

Hyperaspis.

fimbriolata Melsh.

undulata Say.

signata Oliv.

proba Say.

Scymnus.

fraternus LeC.

hemorrhous LeC.

brulli Muls.

collaris Melsh.

cervicalis Muls.

tenebrosus Muls.

namus LeC.?

Epilachna.

borealis Fab.

Endomychidae.

Lycoperdina.

ferruginea LeC.

Aphorista.

vittata Fab.

Mycetina.

perpulehra LeC.

Endomychus.

bivulnerus Say.

Erotylidae.

Languria.

mozardi Lat.

gracilis LeC.

Tritoma.

bivulnerus Say.

unicolor Say.

Colydidae.

Synchita.

fuliginosa Melsh.

Philothermus.

glabriculus LeC.

Cucujidae.

Silanus.

surinamensis Linn.
bidentatus Fab.
planatus Germ.
advena Waltl.
Laemophlebüs.
biguttatus Say.
fasciatus Melsh.
convexus Lee.
testaceus Fab.
Lathropus.
vernalis Lee.
Brontes.
debilis Lee.

Cryptophagidae.
Telmatophilus.
americanus Lee.
Loberus.
impressus Lee.
Atomaria.
ochracea Zimm.
ephippiata Zimm.
Ephistemus.
apicalis Lee.

Mycetophagidae.
Mycetophagus.
flexuosus Say.
Litargus.
didesmus Say.
Typhoea.
fumata Linn.

Dermestidae.
Byturus.
unicolor Say.
Dermecestes.
canus Germ.
lardarius Linn.

vulpinus Fab.
attagenus.
picens Oliv.
Anthrenus.
srophulariae Linn.
varius Fab.
museorum Linn.
Cryptorhopalum.
triste Lee.

Histeridae.
Hister.
planipes Lee.
arcuatus Say.
harrisii Kirby.
merdarius Hoffm.
abbreviatus Fab.
depurator Say.
unicus Say.
bimaculatus Linn.
sedecimstriatus Say.
americanus Payk.
subrotundus Say.
lecontei Mars.
coarctatus Lee.
cylindricus Payk.
Heterius.
brunnipennis Rand.
Onthophilus.
alternatus Say.
Saprinus.
rotundatus Kug.
pennsylvanicus Payk.
oregonensis Lee. var.
assimilis Payk.
placidus Er.

(To be continued.)

fraternus Say.
dimidiatipennis Lee.
Plegaderus.
transversus Say.
Aeletes.
politus Lee.

Nitidulidae.
Cerata.
abdominalis Er.
Carpophilus.
dimidiatus Fab.
Conoicetus.
obseurus.
Epurae.
helvola Er.
avara Rand.
labilis Er.
Nitidula.
rufipes Linn.
Stelidota.
geminata Say.
Phenolia.
grossa Fab.
Omosita.
colon Linn.
Soronia.
undulata Say.
Pallodes.
silaceus Er.
Cryptarcha.
ampla Er.
concinna Melsh.
Ips.
fasciatus Oliv.
Rhizophagus.
sculpturatus Mann.
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NOTES ON OUR SPECIES OF EMESID.E.

BY NATHAN BANKS.

The insects of the Hemipterous family Emesidae, commonly known as "skeleton-bugs," are not often taken by the collector. A number of species are, however, quite abundant, when one knows where to look for them. They are usually adult in the late summer and fall, and most are found in November and December, under boards, at the base of tufts of grass, or on the ground. A few are more common on tree-trunks, or dead logs.

During the past few years I have accumulated quite a number of these forms, including all those recorded from the United States, and a number of new forms. Twelve species are here recorded, and as many more will undoubtedly be found, as our country is more thoroughly explored.

Table of Genera.

1. Trochanter I bearing two small but distinct spines; tibia I not half as long as femur I.
2. Trochanter I without spines.
   Body apterous; antennae not hairy.
4. Tibia I nearly as long as femur I.
5. Tibia I hardly one-half as long as femur I.
6. Tylus between antennae is very prominent; prothorax well separated from mesothorax; head fully one-half as long as coxa I.
7. Tylus between antennae not prominent; prothorax not so distinctly separated from mesothorax; head less than one-half as long as coxa I.
8. Prothorax shorter than the head, and united to the mesothorax.
9. Prothorax longer than head, and distinct from the mesothorax.
Ploiariopsis.


Ploiariopsis hirticornis n. sp.

Brown, head pale above, basal joint of antennae dark brown beneath, rest pale, second and third joints very long and with many long fine hairs; beak with three black bands; coxa I dark brown, femur I streaked beneath with dark brown and a preapical band; tibia dark, spines pale, other legs pale, abdomen dark brown, wings pale, all veins margined with brown, giving a reticulate appearance to the wings. Head with an acute median spine behind, trochanter with a prominent double spine, femur with spines throughout its length, these of two sizes, many small ones and about five larger ones, which are as long as the width of the joint; prothorax subequal to the mesothorax; wings reaching beyond the end of the abdomen; the latter is very slender, and ends in a pair of short processes curved toward each other.

Length 7 mm.


Ploiaria.


We have two species of this genus, one is the Emesodema carolina of Herrich-Schaeffer, which has been placed by some in Lutera, but wrongly.

1. With five long spines on femur I. . . . . . . . . . . . . . . . . . . . P. carolina.

With six long spines on femur I. . . . . . . . . . . . . . . . . . . . P. texana.

Ploiaria texana n. sp.

A specimen from College Station, Texas, Sept., is in general very similar to the described species, P. carolina, but is a little larger. It differs in having six long spines on femur I (five in P. carolina), and in lacking the tubercle, and median spine to the posterior part of head; the prothorax is longer, nearly twice as long as head, and also coxa I is longer than in P. carolina.

Ploiaria carolina Her.-Schf.

Wanz. Ins. IX, 115, 1853.

Mr. Mance has sent me this species from Southern Pines, N. Car., Dec., and I also have it from Shreveport, La. It has a double spine on trochanter I, the beak.
banded, the femur I black beneath, with five long spines and many small ones; there is a median spine behind on the head, and a short one at each anterior corner of the posterior part of head; the antennae are without hairs; the legs show a dark pre-apical band on femora, and a sub-basal one on tibiae. The abdomen is nearly black, and there is no trace of wings; the upper edge of the last segment of the male has three little conical tubercles in a transverse row, and the tip has a short cylindrical tube; a female, with swollen abdomen, has a median tubercle in the middle of each dorsal segment, that on the third segment being the largest. Length 7 mm.

Luteva.

Dohrn, Linn. Ent. XIV, 213, 1860.

_Luteva arizonensis_ n. sp.

Pale brownish; antennae brown, second joint with four narrow yellowish wings, two on the third joint, both joints with short hairs. Femur I mostly brown, apex pale, tibia I with pale band at base and before the middle; frontal slope of mesonotum pale, rest dark brown; abdomen pale brown, legs brown, femora with five pale bands and the apex pale; tibiae with three pale bands; wings brownish, the costal margin yellowish. Coxa I much longer than prothorax, femur with many short and very fine spines, tibia about as long as femur, and the tarsus reaching over the trochanter; eyes prominent; prothorax constricted behind, in front with a tubercle at each corner; scutellum with a long erect spine at base, and a shorter one at apex; wings extending over the tip of the abdomen.

Length 10 mm.

From Palmerlee, Arizona, August (Biederman).

_Ploia_.


Our described species has been placed in _Cerascopus_, which is a synonym of _Ploia_. Champion has shown their proper position.

1. Mesonotum behind with a prominent median tubercle  
   Mesonotum without tubercle  
   2

2. Spine at base of scutellum longer than one at apex; Eastern species.  
   _P. ccrabunda_.

   Spine at base of scutellum shorter than one at apex; Western species.  
   _P. californica_.
Ploiariodes errahunda Say.

Hem. N. Harm. 34, 1832.


I have this species from Falls Church, Va., and Plummer's Island, Md., in July, August, and September. It has usually been taken on logs of wood, but once I found two specimens on the bark of a live tulip tree, and one was taken at light. There is some variation in the depth of coloration, enough to easily cover Haldeman's form.

Ploiariodes tuberculata n. sp.

Brown, the pronotum blackish, the legs and antennae pale, annulate with black on the basal parts, the wings brown or blackish, reticulate with whitish. In general it is similar to P. errahunda, but the wings are more evenly marked, the femur I is rather longer, and it is a slightly larger insect, but the most prominent difference is the black conical tubercle near the posterior border of the mesothorax; the posterior lateral corners of the mesothorax are also more prominent than in P. errahunda.

Length 5.2 mm.

From Sea Cliff, N. Y., and Falls Church, Va., in August and September.

Ploiariodes californica n. sp.

Pale brown, mesonotum with two whitish stripes, pronotum with a black line each side; legs and antennae banded. Wings mottled as in the other species, more heavily and evenly brown than in P. errahunda; the middle band on tibia I is broader than in P. errabunda. It differs also from P. errabunda in that the spine at the base of the scutellum is shorter than the one at its apex.

Length 5 mm.

From Stanford Univ., Calif. Sept. (Doane).

Barce.


Three species are fairly common in the Eastern U. S., one specimen of another species I have from Texas, and doubtless others will be found in the West.

1. Femora II and III with several bands; median carina of mesothorax not distinct.

B. annulipes.

Femora unbanded, or only one near apex, median carina of mesothorax distinct.

2.
2. Femora II and III with a dark preapical band, and a white ring on basal part of tibia, femur I mottled with brown and pale in streaks. B. fraterna.

Femora II and III, and these tibiae without bands; femur I unmarked, pale brown to black. B. uhleri n. sp.

Barce uhleri n. sp.

Brown to black, mostly unmarked, some pale spots at edge of each segment of the female abdomen, and a few pale spots on femur and tibia I; legs uniform pale brown. The armature of femur I is similar to that of the other species; the long spine is nearly twice the diameter of the joint at this point; coxa I is about as long as the prothorax. The mesonotum shows three carinae, and less distinctly one each side. The tip of the female abdomen is barely emarginate; one male has brown wings covering two-thirds of the abdomen. Length 10 mm.


These specimens are black, with only faint traces of pale spots. Other specimens from Sea Cliff, N. Y., and Falls Church, Va., are paler brown, the spots on abdomen distinct, and the femur I rather stouter in the middle, and the prothorax is shorter; but the tip of the abdomen is the same. These may be called Barce uhleri var. brunnea; their length is 8.5 mm.

Barce annulipes, Stål.


This species is very distinct by the several dark bands on the femora; femur I shows several dark spots beneath. Young specimens have the legs even more distinctly banded than the adults. I have never seen a winged specimen. Specimens are before me from Sea Cliff, and Ithaca, N. Y., from Falls Church, Va., and from Shreveport, La. It is usually taken in dry meadows.

Barce fraterna Say.

Hem. N. Harm. 33, 1831.

This is our largest species of the genus. The immature specimens do not usually show the dark preapical band to the femora, but the fully colored ones have it
distinct. About one in every six or eight taken is winged; the wings covering all but the last three segments of the abdomen. I have taken it commonly at Falls Church at the base of tufts of grass in moist fields, in Oct. and Nov. I have it also from Chesapeake Beach, Md., Cambridge, Mass. (Sept., in a marsh), and Southern Pines, N. Car., Nov. and Dec. (Manee). The *Emesodema simplipes* Uhler, must be the immature stage of *B. fraterna*, for he says that the femur 1 is clouded with brown, nearly white beneath, which fits this species and not the *B. uhleri*; moreover, he says the long spine is tipped with black, which is prominent in *B. fraterna*, and barely, if at all, visible in the other species.

**Emesa.**

Fabr., Syst. Rhyng. 263, 1803.

To this genus belong the largest members of the family. They are winged when adult, and there is but one generation a year. We have two species, and possibly others.

*Emesa longipes* De Geer.


*brevipennis* Say, Amer. Ent. III, pl. 47, 1828.

This species is common in the Eastern United States; it occurs on trees, on unpainted buildings, on spider webs, etc. It flies at twilight.

*Emesa brevicoxa* n. sp.

This species is similar to *E. longipes*, but coxa I is a third shorter than in that species, hardly twice as long as the head (while in *E. longipes* it is over twice as long as the head); the femur 1 is also shorter; the tip of the female abdomen has not the two processes as strong as in *E. longipes*. The legs are marked the same, and the wings are of the same length. The whole insect is a little shorter than *E. longipes*. From Los Angeles, Calif. (Hutchinson).
A LIST OF COLEOPTERA COLLECTED WITHIN TEN MILES OF FALL RIVER, MASSACHUSETTS.

BY NORMAN S. EASTON FALL RIVER, MASS.

(Continued from p. 42.)

LATRIDIIDAE.

Stephostethus.

liratus Lee.

Latridius.

minutus Linn.

Corticaria.

grossa Lee.

ferruginea Gyll.

cavicollis Mann.

Melanophthalimus.

distiguenda Com.

gibbosa —

TROGOSITIDAE.

Tenebrioides.

corticalis Melsh.

Thymalus.

fulgidus Er.

Monotoma.

producta Lee.

Bactridium.

ephippigerum Guér.

BYRRIIDAE.

Cytilus.

sericeus Forst.

Byrrhus.

americanus Lee.

PARNIDAE.

Psephenus.

lecontei Lee.

Dryops.

fastigatus Say.

striatus Lee.

Elmis.

4-notatus Say.

Stenehmis.

crenatus Say.

bicarinatus Lee.

Macronychus.

glabratus Say.

Ancyronyx.

variegatus Germ.

HETEROCERIDAE.

Heterocerus.

tristis Mann.

undatus Melsh.

DASCYLLIDAE.

Eurypogon.

niger Melsh.

Ectopria.

nervosa Melsh.

Seirtes.

tibialis Guér.

Cyphon.

robustus Lee.

ruficollis Say.

obscenus Guér.

variabilis Thumb.

ELATERIDAE.

Adelocera.

discoidea Web.

oblecta Say.

brevicornis Lee.

Alaus.

oculatus Linn.

Cardiophorus.

convexus Say.

cardisce Say.

convexulus Lee.

gagates Er.

robustus Lee.

Cryptohynus.

abbreviatus Say.

bicolor Esch.

Monocepidius.

auritus Hbst.

Elater.

pedalis Germ.

nigricollis Hbst.

semicinctus Rand.
nigricans Germ.
sanguinipennis Say.
 obliquus Say.
Megapenthes.
 rufilabris Germ.
Agriotes.
 maneus Say.
 oblongicollis Melsh.
 avulsus Lee.
Dolopius.
 lateralis Esch.
 Glyphonyx.
 recticollis Say.
Melanotus.
 trapezoideus Lee.
 fissilis Say.
 communis Gyll.
 verberans Lee.
 pertinax Say.
 americanus Hbst.
 sagittarius Lee.
Limoniis.
 griseus Beauv.
 confusus Lee. ?
 plebejus Say.
 basiliaris Say.
 agonus Say.
Sericosomus.
 silaceus Say.
Corymbites.
 cylindriformis Hbst.
 pyrrhos Hbst.
 hamatus Say.
 hieroglyphicus Say.
Asaphes.
 memnonius Hbst.
 bilobatus Say.

**PSYCHE**

**Throscidae.**

Throscus.
 constrictor Say.

**Buprestidae.**

Chalcophora.
 virginiensis Drury.
 Dicerca.
 divaricata Say.
 Melanophila.
 longipes Say.
 Chrysobothris.
 femorata Fab.
 dentipes Germ.
 harrisii Hentz.
 Eupristocerus.
 cogitans Web.
 Agrilus.
 arenatus Say.
 ruficollis Fab.
 otiosus Say.
 bilineatus Web.
 interruptus Lee.
 acutipennis Mann.
 auxius Gory.
 politus Say.
 imbellis Cr.
 Taphrocerus.
 gracilis Say.
 Brachys.
 ovata Web.
 aerosa Melsh.
 aeruginosa Gory.
 Pachyseclus.
 laevigatus Say.

**Lampyridae.**

Calopteron.
 reticulatum Fab.
 var. terminale Say.
 Eros.
 aurora Hbst.
 Plateros.
 canaliculatus Say.
 Lucidota.
 atra Fab.
 Ellychina.
 corrusca Linn.
 Pyropyga.
 nigricans Say.
 decipiens Harr.
 Pyraconoma.
 angulata Say.
 borealis Rand.
 lucifera Melsh.
 Photinus.
 consanguineus Lee.
 ardens Lee.
 scientiaus Say.
 Photuris.
 pensylvanica De G.
 Chauliognathus.
 pensylvanicus De G.
 marginatus Fab.
 Podabrus.
 tricostatus Say.
 frater Lee.
 basilaris Say.
 pattoni Lee.
 Telephorus.
 carolinus Fab.
 lineola Fab.
nigritulus Lee.
scitulus Say.
rotundicollis Say.
tuberculatus Lee.
bilineatus Say.
Polemius.
laticornis Say.
Ditemus.
bidentatus Say.

MALACHIDAE.

Collops.
eximius Er.
4-maculatus Fab.
vittatus Say.

Malachius.
aeneus Linn.
Pseudebaeus.
oblitus Lee.

Attalus.
terminalis Er.
morulus.
scincetus Say.

CLERIDAE.

Clerus.
quadrirugatus Oliv.
thoracicus Oliv.

Thanasimus.
dubius Fab.

Hydrocera.
humeralis Say.
var. difficilis Lee.
pallipennis Say.
verticalis Say.
tabida Lee.

Necrobia.

Sphindidae.

Sphindus.
americanus Lee.

Lucanidae.

Lucanus.
dama Thumb.

Platycerus.
depressus Lee.

Scarabaeidae.

Canthon.

lacvis Drury.
Copris.

minutus Drury.
amaglypticus Say.

Onthophagus.

muchiornis Linn.
hecate Panz.

striatulus Beauv.

pennsylvanicus Harold.

Ataenius.
cognatus Lee.

Aphodius.

fossor Linn.

fimetarius Linn.
granarius Linn.
vittatus Say.
inquinatus Hbst.

lentus Horn.
rubeculus Beauv.

stercorosus Melsh.

Odontaeus.

filiicornis Say.

Geotrupes.

splendidus Fab.
egeriei Germ.

blackburnii Fab.
balyi Jek.

Trox.

suberosus Fab.

unistratus Beauv.
sordidus Lee.

Hoplia.

trifasciata Say.

Dichelonycha.

elongata Fab.

subvittata Lee.

fuscuta Lee.
Serica.
   vespertina Gyll.
   sericce III.
   anthracina Lee.
   trociformis Burm.
Macrodactylus.
   subspinosus Fab.
Diploptaxis.
   sordida Say.
   liberta Germ.
Lachnosterna.
   gracilis Burm.
   fusca Froh.
   fraterna Harr.
   hirticula Knoch.
   hirsuta Knoch.
   tristis Fab.
Anomala.
   lucicola Fab.
Pelidnota.
   punctata Linn.
Cotalpa.
   lanigera Linn.
Ligyrus.
   relictus Say.
Aphonus.
   castaneus Melsh.
Xyloryctes.
   satyrus Fab.
Euphoria.
   inda Linn.
Osmorderma.
   scabra Beauv.
Trichius.
   piger Fab.
   affinis Gory.
Valgus.
   canaliculatus Fab.
   Spondylidae.
Paranda.
   brunnnea Fab.
   Cerambycidae.
Orthosoma.
   brunnneum Forst.
Prionus.
   laticollis Drury.
Criophphas.
   obsoletus Rand.
Hylotrupes.
   bajulus Linn.
Phymatodes.
   variabilis Fab.
   amoenus Say.
Callidum.
   antennatum Newm.
Gracilia.
   minuta Fab.
Romaleum.
   rufulum Hold.
Elaphidion.
   villosum Fab.
   subpubescens Lee.
Elytroleptus.
   floridanus Lee.
Batyle.
   saturalis Say.
Cylene.
   robinie Forst.
Calloides.
   nobilis Say.
Arhopalus.
   fulminans Fab.
Xylotrechus.
   colonus Fab.
Neodytus.
   erythrocephalus Fab.
Cyrtophorus.
   verrucosus Oliv.
Euderces.
   picipes Fab.
Desmocerus.
   palliatus Forst.
Rhagium.
   lineatum Oliv.
Acanthocops.
   proteus Kirby.
Strangalia.
   acuminata Oliv.
   luteicornis Fab.
Typocerus.
   velutinus Oliv.
Leptura.
   lineola Say.
   zebra Oliv.
   cordifera Oliv.
   rubrica Say.
   sanguinea Lee.
   vittata Germ.
   pubera Say.
Psenocerus.
   supernotatus Say.
Monohaummus.
   titillator Fab.
   scutellatus Say.
   confusor Kirby.
Leptostylius.
   macula Say.
Liopus.
   queri Fitch.
Hyperplatys.
aspersus Say.
maculatus Hald.
Urographis.
fasciatus De G.
Pogonocherus.
mixtus.
Saperda.
calcarata Say.
candida Fab.
tridentata Oliv.
lateralis Fab.
concolor LeC.
Oberea.
ocellata Hald.
Tetraopes.
canteriator Drap.
tetraophthalmus Forst.

Chrysomelidae.

Donacia.
palmata Oliv.
subtilis Kunz.
emarginata Kirby.
metallica Ahr.
flavipes Kirby.
cineticornis Newm.
rufa Say.
Orsodachna.
atra Ahr.
Zengophora.
varians Cr.
Syneta.
ferruginea Germ.
Lema.
trilineata Oliv.
Crioceris.

asparagi Linn.
Anomoena.
laticlavia Forst.
Cosinoptera.
dominicana Fab.
Babia.
4-guttata Oliv.
Chlanys.
plicata Fab.
cribripennis LeC.
Exema.
gibber Oliv.
Bassareus.
congestus Fab.
formosus Melsh.
amnifier Newm.
litratus Fab.
Cryptocephalus.
4-maculatus Say.
quadruplex Newm.
venustus Fab.
gibbicollis Hald.
mutabilis Melsh.
striatulus LeC.
Pachybrachys.
athonus Say.
trinitatus Melsh.
iridus Fab.
atomarius Melsh.
hepaticus Melsh.
subfuscatus Hald.
Monachus.
ater Hald.
Diachus.
aratus Fab.
levis Hald.
Triachus.

atomus Suffr.
Xanthonia.
10-notata Say.
Glyptoseelis.
pubescens Fab.
Chrysochus.
aratus Fab.
Tymnes.
tricolor Fab.
Typophorus.
canelus Fab.
Grahops.
pubescens Melsh.
curtipennis Melsh.
Chrysodina.
lobosa Say.
Colapis.
brunnea Fab.
Rhabdopterus.
pieipes Oliv.
Notodonta.
tristis Oliv.
Prasocuris.
vittata Oliv.
Libioderma.
civicollis Kirby.
Leptinotarsa.
10-lineata Say.
Zygogramma.
saturalis Fab.
Calligrapha-Chrysomela.
similis Rog.
elegans Oliv.
lnuata Fab.
scalaris LeC.
philadelphica Linn.
Plagiodera.
viridis Melsh.
Gastroideae.
	polygoni Linn.

cyanea Melsh.
Lina.
tremulae Fab.
Cerotoma.
caminea Fab.
Luperodes.
meraca Say.
Diabrotica.
12-punctata Oliv.
vittata Fab.
Trirhabda.
torrentosa Linn.

virgata Lee.
canadensis Kirby.
Galerucella.
americana Fab.
cavicollis Lee.
nymphaeae Linn.
decora Say.
notulata Fab.
notata Fab.
luteola Mull.
Blepharida.
rhais Forst.

Hytopampsis.
pilosa Ill.
Oedionychis.
viens Ill.
thoracica Fab.
fimbriata Forst.
limbalis Melsh.

var. subdivittata.
Disonychisa.
5-vittata Say.

PSYCHE

[June

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parallelus Melsh.
Boletotherus.
  bifurcatus Fab.
Helops.
  micans Fab.
Strongylium.
  tennicolle Say.

Cistelidae.
Allecula.
  atrata Say.
Hymenornus.
  pilosus Melsh.
  obscurus Say.
  niger Melsh.
Cistela.
  sericea Say.
Isomira.
  quadriradiata Coup.
Capnochroa.
  fuliginosa Melsh.

Melandryidae.
Penthe.
  obliquata Fab.
Synchroa.
  punctata Newm.
Symphora.
  flavicollis Hald.
Eustrophus.
  bicolor Say.
Orchesia.
  castanea Melsh.
Microscapha.
  clavicornis Lee.
Canifa.
  plagiata Melsh.

EASTON — COLEOPTERA

pallipes Melsh.
Mycterus.
  scaber Hald.

Pythidae.
Pytho.
  niger Kirby.
  americanus Kirby.

Oedemeridae.
Nacerdes.
  melanura Linn.

Cephaloidae.
Cephaloon.
  lepturides Newm.

Mordellidae.
Anaspis.
  rufa Say.
Mordella.
  melacena Germ.
  scutellaris Fab.
  marginata Melsh.
Mordellistena.
  trifasciata Say.
  limbalis Melsh.
  biplagiata Helm.
  comata Lee.
  aspersa Melsh.
  infirma Lee.
  varians Lee.
  impatiens Lee.
  postulata Melsh.
  convicta Lee.
  morula Lee. ?
  pubescens Fab.
  fuscata Melsh.

Anticidae.
Corphyra.
  collaris Say.
Xylophilus.
  subfasciatus Lee.
  piceus Lee.
Notoxus.
  monodon Fab.
  anchora Hentz.
Anticus.
  cinetis Say.
  florialis Linn.
  seabriceps Lee.
  fulvipes Laf.

Pyrochroidae.
Pyrochroa.
  flabellata Fab.
Dendroides.
  canadensis Lat.
  concolor Newm.

Meloidae.
Meloe.
  angusticollis Say.
  americanus Leach.
Macrobasus.
  unicolor Kirby.
Epicauta.
  trichrus Pall.
  cinerea Forst.
  pennsylvanica De G.
Pomphopoeca.
  sayi Lee.
Rhipiphoridae.

Rhipiphorus.
Gymnetron.
Heter Fab.
Miarus.
hispidulus Lee.
Laemosaccus.
plagiatus Fab.
Conotrachelus.
nemaphar Hbst.
aratus Germ.
posticus Boh.
anaglypticus Say.
Rhysematus.
lineaticollis Say.
Tyloderma.
aereum Say.
Cryptorhynchus.
fuscatus Lee.
lapathi Linn.
Mononychus.
vulpeculus Fab.
Coeliodes.
acephalus Say.
Centrohychineus.
sulpicientis Lee.
septentrionalis Gyll.
afluentus Dietz.
Phytobius.
vulatus Beck.
Coelogaster.
eretura Hbst.
Rhinoncus.
pyrrophus Lee.
Pseudobaris.
nigrina Say.

Madarus.
undulatus Say.
Stethobaris.
tubulatus Say.
Centrinus.
sculptellum-album Say.
Balanius.
obtusus Blanch.
asicus Say.

Calandridae.

Sphenophorus.
pertinax Oliv.
sculptilis Uhler.
parvulus Gyll.
Calandra.
remotepunctata Gyll.
Dryophthorus.
corticalis Say.
Cossonus.
corticola Say.

Scolytidae.

Monarthrum.
mali Fitch.
Pityophthorus.
materiarius Fitch.
puberulus Lee.
Hypoteneumus.
asperulus Eich?
Xyloterus.
politus Say.
Xyleborus.
pyri Peck.
caelatus Eich.
Tomius.
calligraphus Germ.
cacographus Lee.
Scolytus.
rugulosus Ratz.
Hylesinus.
aculeatus Say.
Hylurgops.
pinifex Fitch.

Anthribidae.

Hormiscus.
saltator Lee.
Cratoparis.
lunatus Fab.
Brachytarsus.
tomentosus Say.
limbatus Fab.
Myodites.
fasciatus Say.

Rhynchitidae.

Aulettes.
ater Lee.
cassandracea Lee.
Eugnamptus.
angustatus Hbst.
Rhynchites.
bicolor Fab.
hirtus Fab.
aeratus Say.
Pterocolus.
ovatus Fab.

Attelabidae.

Attelabus.
nigripes Lee.
bipustulatus Fab.
rhois Boh.
Otiorhynchidae.

Phyxelis.
rigidus Say.
Otiorhynchus.
sulcatus Fab.
ovatus Linn.
Pandeletejus.
hilaris Hbst.
Aphrastus.
taeniatus Gyll.
Sciaphilus.
asperatus Bonsd.

Curculionidae.

Sitones.
hispidulus Germ.
flavescens Marsh.
tibialis Hbst.
Ithycerus.
noveboracensis Fab.
Apion.
melanarium Gerst.
hereulanum Smith.
walshii Smith.
rostrum Say.
patrucole Smith.
puritanum Fall.
Phytomonos.
punctatus Fab.
nigrostris Fab.
Listronotus.
appendiculatus Boh.
frontalis Lee. ?
Macrops.
sparsus Say.
humilis Gyll.
solutus Boh. ?
Hylobius.
pales Hbst.
Erycns.
puncticollis Lee.
Smicronyx.
1 sp.

Otidocephalus.
myrmex Hbst.
Anthonomus.
profundus Lee.
suturalis Say.
helvolus Boh. ?
Musculus Say.
corvus Lee.
Psudanthomonos.
erataegi Walsh.
Orchestra.
pallicornis Say.
rufipes Lee.
niger Horn.
ephippiatus Say.
Prionomerus.
calceatus Say.
Piazorhinus.
sutellaris Say.
pictus Lee.

The following extract from a letter received from Mr. A. A. Packard, son of the late Professor A. S. Packard, is self-explanatory:

"My father had purposed to rewrite the Guide to the Study of Insects, and bring it up to date, as soon as he had finished Part II of his Monograph of the Bombycine Moths, which was going through the press at the time of his death. He left many notes and references, but we find that they cannot be edited properly by another hand."
INCIDENTAL CAPTURES OF LEPIDOPTERA AT PLANO, TEXAS.

BY E. S. TUCKER, BUREAU OF ENTOMOLOGY, U. S. DEPT. OF AGRICULTURE.

In connection with my study of the green bug at Plano, Collin county, Texas, from the first week of May to the end of December, 1907, a considerable number of insects in all of the principal orders were personally collected, and the results obtained from the identifications of the Lepidoptera thus taken are herewith presented.

Only a few butterflies were captured, since opportunities for collecting Lepidoptera especially were limited mostly to night work, which, however, proved to be an enjoyable diversion. At such times, the light of one or two ordinary lanterns shining against the breeding tent was employed with good success in the attraction of nocturnal flyers, and on this account, the records of night collecting predominate in my list. The locality in which the collecting was done is fairly typical of the black-belt prairie lands of northern Texas, where much of the country is under cultivation.

Most of the specimens were determined at the U. S. entomological laboratory in Dallas, Texas, with the assistance of Mr. F. C. Pratt, and acknowledgments are also due Dr. H. G. Dyar and Mr. A. Busek of Washington, D. C., through the courtesy of Dr. L. O. Howard, for valuable aid. For a few other determinations, credit is given in the particular cases to Dr. W. G. Dietz and Mr. W. D. Kearfott. Dr. Dyar's catalogue has been followed as a guide for the nomenclature and arrangement of my list. Permission to publish this list has been kindly granted by Prof. C. E. Sanborn, who, during the time of collection, directed my experimental work.

Summary of Families and Species.

<table>
<thead>
<tr>
<th>Family</th>
<th>Number</th>
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<tbody>
<tr>
<td>Pieridae</td>
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<td>Nymphalidae</td>
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<td>Lymnaidae</td>
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<td>Lycaenidae</td>
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<td>Hesperiidae</td>
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<td>Sphingidae</td>
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<td>Saturniidae</td>
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<td>Ceratochampidae</td>
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<td>Syntomidae</td>
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<td>Lithosiidae</td>
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<tr>
<td>Arctiidae</td>
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<tr>
<td>Noctuidae</td>
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<tr>
<td>Lasiocampidae</td>
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<td>Nolidae</td>
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<td>Psychidae</td>
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<tr>
<td>Cochliidiidae</td>
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Megalopygidae 1
Pyralidae 34
Pterophoridae 2
Tortricidae 6
Yponomentidae 2
Gelechiidae 1
Blastobasidae 1
Elachistidae 2
Tineidae 5

Total number of species, 130.
Family PIERID.E.

Pontia rapæ L. July in cabbage patch, all stages.
Pyrisita mexicana Boisd. July; July in cabbage patch.

Family NYMPHALID.E.

Euptoieta claudia Cram. August.
Mestra amymone Men. September.
Polygonia interrogationis Fab., var. umbrosa Lint. August.
Basilarchia archippus Cram. July.
Chlorippe celtis Bois. & Le C. July.

Family LYMADID.E.

Anosia berenice Cram. August.

Family LYC.ENID.E.


Family HESPERIID.E.

Ancyloxypha numitor Fab. July.
Hylephila campestris Boisd. August.
Hesperia tessellata Sc. November.

Family SPHINGID.E.

Hemaris diffinis Boisd., var. axillaris G. & R. July.
Pholus pandorus Hbn. May at night taken at trap light.
Phlegethontius quinquemaculata Haw. September twilight.

Family SATURNIID.E.

Automeris io Fab. August, freshly emerged under bridge.

Family CERATOCAMPID.E.

Adelocephala bicolor Haw. August at night, taken at trap light.
Family SYNTOMID.E.
Scepsis fulvicollis Hbn. July and August at night taken at trap light.
Ctenucha venosa Wk. June twilight; July; November.

Family LITHOSID.E.
Ozonadia unifascia G. & R. August at night taken at trap light.

Family ACRTIID.E.
Eubaphe aurantiaca Hbn. July at night taken at trap light; October.
Eurythra phasma Harv. August at night taken at trap light.
Estigmene aerata Dru. August at night taken at trap light.
Diacrisia virginica Fab. August at night taken at trap light.
Apantesis nais Dru. September at night taken at trap light.

Family NOCTUID.E.
Cyathisa percara Morr. August at night taken at trap light.
Platysenta videns Gn. August and September at night taken at trap light.
Caradrina exigua Hbn. July and September at night taken at trap light.
spilmela Wk. September at night taken at trap light.
Prodenia ornithogalli Gn. July and August at night taken at trap light.
Heliophila unipuncta Haw. November; November twilight.
Grotella septempunctata Haw. September.
Heliothis obsoleta Fab., (= armiger Hbn.). July and August at night taken at trap light; July to October, worms in corn ears and on fall sprouts; October, in cotton bolls.
Schinia chrysellus Grt. September at night taken at trap light.
Jaguarina Gn. August at night taken at trap light.
marginata Haw. August and September at night taken at trap light.
Plusiodonta compressipalpis Gn. August at night taken at trap light.
Autographa on Gn. May at night taken at trap light.
brassicae Ril. August at night taken at trap light.
fallegara Kirb. November.
Pteretholix bullula Grt. September and October at night taken at trap light.
Alabama argillaceae Hbn. September at night taken at trap light; October.
Xanthoptera nigrofimbria Gn. July.

Xanthothea nigrofimbria Gn. July.
Metoponia obtusa H.-S. May, August and September, all at night taken at trap light.
Tarache biplaga Gn. July at night taken at trap light.
erastrioides Gn. May, dusk in oat field.
candefacta Hbn. July; August at night taken at trap light.
Fruva fasciatella Grt. July and August at night taken at trap light.
obsoleta Grt. September at night taken at trap light.
Spragueia leo Gn. August at night taken at trap light.
dama Gn. July at night taken at trap light.
Hypsorapha hormos Hbn. July and August at night taken at trap light.
Drasteria erechtea Cram. July and September at night taken at trap light; October; October in oat field; November; November at night taken at trap light.
Melipotis jacunda Hbn. July; September at night taken at trap light.
Homoptera lunata Dru. September.
Salia interpuncta Grt. July at night taken at trap light.

Family NOTODONTID.E.
Hippia packardii Morr. August at night taken at trap light.
Litodonta hydromeli Harv. August at night taken at trap light.
Schizura unicornis S. & A. September.

Family LASIOCAMPID.E.
Heteropacha rileyana Harv. July and August at night taken at trap light.

Family GEOMETRID.E.
Hydriomena latirupta Wk. November.
Gypsochroa sitellata Gn. September at night taken at trap light.
Hemantopsis grataria Fab. July in corn field; September at night taken at trap light.
Cosymbia serrulata Pack. September at night taken at trap light.
Eois ossularia Hbn. July to September at night taken at trap light.
Chlorochlamys phyllinaria Zell. May at dusk in oat field; May to September at night taken at trap light.
Fernaldella fimetaria G. & R. July to September at night taken at trap light.
Mellilla inextricata Wk. August and September at night taken at trap light.
Sciagraphia californiaria Pack. August at night taken at trap light.
Macaria infimata Gn. August at night taken at trap light.
  s-signata Pack. August at night taken at trap light.
Tornos scolopacinarus Gn. August at night taken at trap light.

Family NOLIDE.
Celama sorghiella Ril. August at night taken at trap light.

Family PSYCHID.

Family COCHLIDI.D.
Euchlea chloris H.-S. August at night taken at trap light.

Family MEGALOPYGIDE.
Lagoa crispata Pack. August at night taken at trap light.

Family PYRALIDE.
Symphysa reniculalis Zell. August at night taken at trap light.
Hymenia perspectalis Hbn. August and September at night taken at trap light.
Conchylodes platinalis Gn. September at night taken at trap light.
Hellula undalis Fab. September.
Nomophila noctuella D. & S. September at night taken at trap light.
Loxostege coloradensis G. & R. August at night taken at trap light.
  mancalis Led. August and September at night taken at trap light.
  similalis Gn. July, worms and moths in alfalfa field; July and
  September at night taken at trap light.
  maculare Ril. August at night taken at trap light.
Phyctenia ferrugalis Hbn. September at night taken at trap light; October
  twilight; November.
Pyrausta illibalis Hbn. September at night taken at trap light.
  latifolia G. & R. July; August at night taken at trap light.
Lineodes integra Zell. July to September at night taken at trap light.
Elophila fulicalis Clem. July to October at night taken at trap light.
Pyralis farinalis L. September; December.
Omphalocera dentosa Grt. August at night taken at trap light.
Patissa xantholeucaitis Gu. August and September at night taken at trap light.
Crambus vulgivagellus Clem. October twilight.
teterrellus Zinck. August and September at night taken at trap light;
October twilight.
mutabilis Clem. May at dusk in oat field; August and September
at night taken at trap light.
Crambus hemiochrellus Zell. August and September at night taken at trap
light.
Argyria nivalis Dru. September at night taken at trap light.
Diatreaa differentialis Fern. September at night taken at trap light.
Galleria mellonella L. May, female moth disturbed from hiding-place in
covered mess wagon.
Benta melanogrammos Zell. August at night taken at trap light.
Tacoma feriella Hulst. August and September at night taken at trap light.
Thaseala reduetellia Wk. August at night taken at trap light.
Elasmopalpus lignosellus Zell. July to September at night taken at trap light;
October twilight.
Enzophera semifuneralis Wk. September at night taken at trap light.
Canarsia ulmiarrosorella Clem. July at night taken at trap light.
Honora mellinella Grt. September at night taken at trap light.
Homeosoma mucidellum Rag. September at night taken at trap light.
Saluria tetradella Zell. July and August at night taken at trap light.
Tampa dinediellata Rag. August and September at night taken at trap light.

Family PTEROPHORID.E.
Pterophorus paleaceus Zell. August at night taken at trap light.
inquinatus Zell. July to October at night taken at trap light.

Family TORTRICID.E.

Encosma circulana Hbn. May at night taken at trap light.
comatulana Zell. (Det. W. D. Kearfott.) September at night taken
at trap light.
strennana Wk. August at night taken at trap light.
Thiodia spiculana Zell. (Det. W. G. Dietz.) September at night taken at
trap light.
Epinotia crispana Clem. (Det. W. G. Dietz.) July at night taken at trap light.
Platynota nigrocervina Walsm. (Det. W. G. Dietz.) July to September at night taken at trap light.

Family YPONOMEUTID.E.

Plutella maculipennis Curt. May at dusk in oat field.

Family GELECHIID.E.

Gelechia discoocellella Cham. August and September at night taken at trap light.

Family BLASTOASID.E.

Dryope ochreella Clem. (Det. W. G. Dietz.) October at night taken at trap light.

Family ELACHISTID.E.

Coleophora fuscostrigella Clem. (Det. W. G. Dietz.) October at night taken at trap light.
Seythris impositella Zell. November.

Family TINEID.E.

Tinea misella Zell. (Det. W. G. Dietz.) December twilight, in window.
Setomorpha rutella Zell., (♀ = operosella Zell.; ♂ = in amoenella Zell.).
August and September at night taken at trap light.
Acrolophus cervinus Walsm. May at night taken at trap light.
Anaphora popeanella Clem. July; July and August at night taken at trap light.
Ortholophus variabilis Walsm. July, resting under edge of clapboard on house, and at night taken at trap light.
NOTE ON THE BAG WORM, THYRIDOPTERIX.

BY J. ARTHUR HARRIS, COLD SPRING HARBOR, N. Y.

In an interesting memoir on the constriction of twigs by the Bag Worm, Dr. von Schrenk ¹ has presented certain data which seem to me to deserve consideration from a somewhat different point of view.

Dr. von Schrenk found that the insect attaches the bags almost without fail only to one-year-old twigs. Whether this is done because these are the twigs upon which the insect has been feeding, or whether because of their size he was unable to determine. But he did find, by an interesting experiment, that they would not form bands around very large twigs, but glued them to one side instead, although they always formed the band entirely around smaller twigs.

On page 176 Dr. von Schrenk remarks: "The first analysis of the measurements made deals with the size of the bands in their relation to the size of the twigs to which they were attached . . . On Table I the bands taken from maple twigs are arranged according to their width and according to the diameter of the twigs. It will be noted that the largest number of bands occurred on twigs 3 mm. in diameter, and that there is a regular falling off towards both sides; in other words, the insect seems to select twigs having a diameter of about 3 mm."

Now I think there are two points which may be given especial consideration from this table. These are the questions: —

a) Is there any selection of twigs according to size?

b) Is there any relationship between the size of the twig and the width of the band formed by the insect?

It is question a) which Dr. von Schrenk has in mind when he writes of "the size of the bands in their relation to the size of the twigs," I think. Possibly he had the second problem in view as well, but he does not draw especial attention to it.

Now as to question a) it seems to me that unfamiliarity with biometric methods has led Dr. von Schrenk into a slip in his consideration of this point. So far as I can see his data do not enable us to determine whether there has been a selection of twigs at all. It is well known that measurements made upon practically any plant organ vary around a modal condition, roughly speaking in accordance with some mathe-

metrical law of distribution. To find more bands on one sort of a twig than on another does not necessarily show that there has been any selection of twigs; it may indicate merely that there were more of that particular class of twigs available. To determine whether there has been any selection of twigs we must, in short, have measurements of series of twigs upon which the insects do not form bags as well as those upon which they do. The question which Dr. von Schrenk raises is one of very considerable biological interest, but for a trustworthy answer we should compare the means and variabilities of twigs bearing the bags with the same constants of those which do not. Naturally enough it would be necessary to confine attention to the one-year-old twigs in making the comparison. Perhaps the lengths of the twigs should be taken into consideration also, for other things being equal a larva would be more likely to form a bag upon a long twig than upon a short one. Actual data suitable to decide this interesting question should be collected by some one.

The second question seems to me to be of considerable interest as well. If the larvae refuse to form bands around large twigs, it seems quite natural to ask whether they modify the size of the bands according to the size of the twig to which they are attached. Even if the insect does not "purposely" make any modification in the size of the band, is it possible that the amount of material available has any influence upon the width of the bands formed upon relatively large or small twigs?

This question can be answered preliminarily by a proper statistical analysis of the data in the table given. The relationship between the size of the twigs and the width of the bands is satisfactorily shown by the coefficient of correlation.1 This constant may range from 0 to plus or minus 1. A coefficient of 1 denotes perfect relationship while a coefficient of 0 shows that there is no relationship between the magnitudes of two characters under consideration. Every statistical constant has a probable error which gives some indication of the significance which is to be attached to it. To be considered significant the coefficient of correlation should be at least two and one half times its probable error.

Calculating the correlation from the table given,2 and using Sheppard’s corrections for the second moment in calculating the standard deviations, I find that the interdependence of band width and twig diameter is represented by 0.016 with a

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1 For a discussion of the method of calculating the coefficient of correlation, see any of the textbooks on biometric methods, as Davenport’s Statistical Methods, Elderton’s Frequency Curves and Correlation, or Thorndyke’s Introduction to the Theory of Mental and Social Measurements.

2 The fewness of the bands recorded as 2.5 mm. in width as compared with those 2 and 3 mm. in width at once arouses the statistician’s suspicions that the result is not a biological condition but a result of the tendency of observers to read to whole numbers instead of fractions. In future work this point should be carefully watched.
probable error of 0.033. The correlation is only about half its probable error and consequently no significance at all can be attached to it. Clearly, therefore, there is no modification of the width of the band dependent upon the size of the twig upon which it is formed.

Of course this conclusion applies only to the present series of data; further measurements might yield different results. Dr. von Schrenk's series of measurements somewhat exceeds 400, however, and this may be regarded as a fairly satisfactory number for the solution of the second of the two problems. The first still remains for solution and collections of data towards this end ought to be made.

COLEOPTERA TAKEN AT FRAMINGHAM, MASS.

C. A. Frost.

The following species of Coleoptera have been taken during the past four seasons in this locality and some of them at least have never been recorded from New England.

*Cicindela purpurea*, var. *audubonii*, Lec. One ♀ specimen, Sept. 4, 1904. This has been recorded once before in *Psyche*, but it has recently been critically examined and compared with western *audubonii* by Mr. Edw. D. Harris who considers its capture in Mass. remarkable.

*Elaphrus cicatricosus*, Lec. One specimen, May 10, 1907, taken near a small brook when this was flooded by water from a cranberry bog. (One specimen of this species was taken at Monmouth, Maine, on lake shore during June, 1906.)

*Elaphrus clairvillei*, Kirby. Four specimens taken in the muddy bed of a dried up brook, Sept. 6, 1907.

*Lachnocrepis parallelus*, Say, and *Anatrichis minuta*, Dej. Mr. Frederick Blanchard, who identified them, writes me that he has one specimen of the former from Lowell, Mass., and a single specimen of the latter from Florida.

*Acilius fraternus*, Harr. Four specimens; *Acilius semisulcatus*, Aubé being the common species here. One specimen of *A. mediatus*, Say has been taken, Aug. 25, 1907.

*Limonius stigma*, Hbst. Two specimens, June 8, 1907, and May 27, 1908.

*Agrilus blanchardi*, Horn. One specimen, July 27, 1907. Probably this species is mixed with *A. anxius*, Gory in collections.
Strangalia faneaica, Newm. A small female, July 28, 1907.

Typocerus lugubris, Say. June 20, 1908.

Elytroleptus floridanus, Lec. This many-times recorded species is found here in numbers at times on the leaves of the red oak about the first week in June. Also taken in Middlesex Fell Reservation.

Leptura rubrica, Say. Bred from dead chestnut, June.

Cryptolephalus incertus, Oliv. Several specimens swept from Cranberry vines, Sept. 21, 1907.

Macrobasis torsa, Lec. Described from Texas, was taken first on June 17, 1904, and again on June 13 and 20, 1908, feeding on the black alder, Prinos verticillata. This species was determined for me by Prof. Fall, Pasadena, Cal. It was taken rather incidentally because of the numbers of small flies that were annoying the beetles while feeding. I supposed that it was Macrobasis unicolor and took a number to keep with the diptera for reference. Last season (1908) I found the flies still present with the beetles and also I made the discovery that the majority of the beetles were not torsa but unicolor. In 1904 there must have been more of the former, since nearly or quite all taken were torsa. M. unicolor is generally found feeding on Baptisia tinctoria, in Mass., but I have taken it in numbers at Wales, Maine, feeding on the Clematis and among them found a single specimen of Epicauta cinerea, Forst.

I also wish to record the occurrence of Stromatium pubescens Hald., at Bedford, Mass. two specimens of which have been taken by L. W. Swett at light.
Dr. O. STAUDINGER und Dr. H. REBEL,

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ON CERTAIN PIERIS CATERPILLARS.

BY WM. T. M. FORBES, WORCESTER, MASS.

Last spring while Instructor of Biology at Robert College, Constantinople, Turkey, the opportunity came to me to breed the caterpillars of Pieris daplidice, rapae and brassicae, side by side, and make comparison of them in all stages. During this time however I was away for more than a week, and was considerably interrupted by my regular work, with the result that there are several gaps in the descriptions.

I have come across no descriptions of P. rapae or brassicae, which take note of the tubercle arrangement. There is a quite full description of all the stages of daplidice in "The Entomologist" XXXIX, 193 (1906) by F. W. Frohawk, but this contains a few details not emphasized there, which may be useful in comparison with the other two. Judging by this description P. daplidice will have in stage II the tubercle arrangement of brassicae, rather than of rapae. It differs already of course rather widely in marking, showing the yellow subdorsal band.

The three species studied are of special interest as representing the three subgenera of Pieris. All three groups are represented in the Eastern States. Pieris (rapae) by rapae and the very rare oleracea; Pontia (daplidice) by protodice; and Mancipium (brassicae) by monuste, in the Southeast.

Two other species were captured in Constantinople, but males only; Pontia chloridice and Pieris (typical) napi.

I am especially indebted to Mr. J. W. H. Harrison for suggestions, and for the method of getting eggs.

An assortment of Cruciferous plants, most of them in flower, were placed in a bottle of water, with the space around their stems filled up with paper. Then a large bell jar was inverted over the whole, without any ventilation, the females were introduced and the whole set in the sun. The air inside became very damp, so much so that one female got stuck to the glass by her wings and had to be released. But
they laid freely and seemed to keep healthy. The jar was kept over till the eggs hatched, and then was removed.

The young daphidice caterpillars seemed to prefer the nearly ripe capsules of Cardamine, which fly apart suddenly when mature. Many of them were carried off on the lids of these capsules before I discovered it. *P. rapae* in the first stage rested persistently on the yellow half dead lower leaves which they matched perfectly. They seemed to feed on them also, at least they did not turn green as soon as those resting and feeding on green leaves.
The figures are mere sketches, taken from living caterpillars in part, and should not be entirely trusted. But they will probably come nearer the truth than a much better description would.

**Pontia daplidice.** (Pontia.)

About April 4 a female of the form with light markings and sage green under side was confined over Cardamine and other Cruciferae.

_April 9._ It has laid several bright orange eggs, of which a specimen was preserved in glycerine jelly (not satisfactory). (The fresh laid eggs are lemon yellow, changing later to orange).

_April 13._ About 2 eggs have been laid, of which 3 or 4 have hatched.

**Stage I.** Bright orange, but not as bright as eggs, brown powdered, with black head and setae and deep brown tubercles. The tubercles are black except under very strong illumination, but then the setae and head are visibly darker. Length 1.6 mm. The upper setae are glandular and shortly forked at the tip, the fork containing a drop of secretion. There is a lappet hanging down in front of the first legs. Setae in primitive arrangement (iv and v on a level). Five yellow eyes.

Cervical shield with three setae in a triangle, on each side; divided. Below it a tubercle with two setae, one of which is glandular. One before and two below the spiracle. The glandular tubercles are the two upper on thorax and the three upper on abdomen. On the abdomen i higher than ii, iv slightly higher than v on the leg bearing segments, level with v on the others. On ninth segment of abdomen iv is absent. Supra anal plate has four pair and anal leg plates each four setae. There are 3 setae below on the last segment (A10).

Diameter of head .39 mm.

**Stage II.** Missed.

**Stage III.** Moult April 22; but one larva remains. Head .8 mm., gray, so powdered with black as to appear dull green. The powdering is of two sizes, about 5 pair of dots on each segment in a zigzag row being visible to the naked eye. Yellow subdorsal and substigmatal lines are caused mostly by a lack of powdering. The dark bands twice as wide as the yellow ones. Head black, heavily spotted on a yellow background. Apparently two of the subdorsal hairs (i and ii ?), still are glandular. All the hairs are similar, strong and black. Some without tubercles are not shown on the diagrams.

**Stage IV.** Moulted April 25 after one day of rest. Head black powdered on
yellow. Primary hairs are now no longer glandular and tubercles are shaped as in brassicae. The subdorsal and stigmatal yellow bands are clearly caused by opaque pigment. The addorsal and lateral gray areas seem to have a transparent dark pigment. There is a faint pale dorsal line. The venter is without skin pigment and is therefore pale green.

The tubercles seem smaller in proportion. Tubercle iii is much smaller than in P. brassicae.

The specimen died in moult and females of the summer brood refused to lay eggs.

Pontia brassicae (Mancipium).

About April 4 two females were set over mixed Cruciferae.

April 13 they were examined and three clusters of eggs were found, numbering about 40, 100 and 28. Both females had died.

Eggs laid in clusters on the under side of a leaf or on the stem near a leaf. Pale yellow and superficially like P. daplidice.

A hatched specimen mounted dry was much more satisfactory than one in glycerine jelly. They do not change color.

First Stage. Each cluster of the eggs hatched entirely on one day, April 18, 19, 20. They eat the eggs except the base and live gregariously, unlike daplidice. They completely lack the glandular hairs. The tubercles are twice as high and two thirds the diameter of those of daplidice. But the arrangement is essentially the same.

Stage II. The first cluster was up for moult April 22, moulted April 23. They are still gregarious and to the naked eye unchanged except as to size of head. Pale greenish yellow with black dots and tubercles; paler beneath. The subdorsal tubercles are alternately 2 and 1. The stigmatal ones are small and all beneath them inconspicuous (unlike daplidice).

Dorsal line yellow, subdorsally pale green, much black dotted by the tubercles. Laterally paler, with minute tubercles. The subventral dots are again larger, and the venter is very green, immaculate.

Stage III. First larvae up for moult April 24, moulted April 25. Head black (it is spotted in this stage of daplidice). Body yellow-green, black-powdered, with a narrow yellow dorsal line (wanting in daplidice) the powdering becoming abruptly less at the substigmatal line. Tubercles are acute and some are large. The setae now are white.

Stage IV. Tubercle iii is now twice as large as ii or i and the latter are four times as large as one directly above ii, which begins to be prominent. The tubercles
seem to make squarish black lateral spots on each segment. On the thorax there is an exceedingly large tubercle laterally (iii ?). The head is still black.

Stage V. There is little change in the body. The head is now pale, spotted with black.

Pontia rapae. (Pieris)

April 20. Two females were set over Cruciferae for eggs.

May 3. There are a dozen or so eggs and five baby larvae.

Eggs differ from those of brassicace in being smaller, and being laid singly. Unlike those of daplidice they remain straw-yellow without any change of color till hatching.¹

The larvae at first are a pale deadleaf yellow, including their head and tubercles. They sometimes rest on withered leaves and are almost impossible to see.

In this stage the tubercles are conical as in brassicace, but they are proportionately much smaller, and the upper ones are glandular.

Stage II. The tubercles all look much alike and are pale with black setae. The primaries are lighter, larger and paler, and the upper ones have glandular setae. The setae are a little irregularly in about five transverse rows, the three major rows which show so prominently in P. daplidice not being distinct.

Stage III. The first larva changed May 7. Tubercles i to v are now all quite distinct and white, the others are more numerous than in stage II and not contrasting in color. The larva now appears green and velvety to the naked eye, like the full grown ones.

Stage IV. Tubercle iv is no longer white and contrasting, but i, ii, iii and v are still prominent, more so than before. There is a continuous yellow dorsal line and a very much broken substigmatal line. The hair is dark; that of i, ii and iii still glandular.

Stage V is the full grown larva and no description was taken. The white primary tubercles still show.

¹ American specimens bred this spring change color, but not so strikingly as P. daplidice.
### Tabular View of the Three Subgenera of Pieris.

<table>
<thead>
<tr>
<th><strong>PONTIA</strong> dapiadicus</th>
<th><strong>PIERIS</strong> rapae</th>
<th><strong>MANCIPIUM</strong> brassicae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg laid singly, yellow, changing to orange.</td>
<td>Laid singly, not changing color.</td>
<td>Laid in clusters of 30 to 100, not changing color.</td>
</tr>
</tbody>
</table>
| **Stage I.** With very large black tubercles; low, round, and flat at the edges. Head black. With forked glandular hairs. Larva looks dull gray-green. (Skin orange till fed.) Solitary. | Smaller white tubercles. Head pale. With glandular hairs. Larva looks pale yellow. Solitary. | Moderate, high-conical black tubercles.  
Head black.  
No glandular hairs.  
Larva looks dark gray, becoming greenish. Social. |
| **Stage II.** Missed. Tubercle arrangement of **brassicae** but with glandular hairs. Marks as in stage III. | As before the tubercles are paler, smaller; the primaries not very contrasting; i–iii forked, glandular. | As before the tubercles are black, the primaries much enlarged. No glandular hairs. |
| **Stage III.** Broad yellow subdorsal and stigmatal bands. All tubercles comparatively small, black. Tubercles ii very small but with glandular hair. | Green, no distinct marks. Tubercles very small; primaries (including iv & v) white, secondaries green. Primaries equal. | A narrow yellow dorsal and broad stigmatal bands, relatively higher than in **Pontia**. All tubercles very large, the secondaries also easily seen. Tubercle ii smaller than i but very conspicuous. |
| **Stage IV.** The conditions of the last stage exaggerated; the tubercles smaller, stripes brighter. A narrow yellow dorsal. The tubercle above ii is about as large as ii. | Conditions of last stage exaggerated; primaries white secondaries concolorous; yellow dorsal and stigmatal. Tubercles proportionately smaller than even in dapiadicus.  
As before.  
(Head green after first stage.) | On the mid-segments laterally there is more black than green, due mostly to iii, which is very large. i and ii are still as large as the tubercle above ii. |
| **Stage V.** As before. (Not seen). | | Very little change, head is now spotted as in **Pontia**. |

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1 From Frohawk, '06.
Explanation of Figures.

1 to 7. These are sketches showing roughly the position and size of the tubercles. No attempt was made to find all the minute setae not arising from tubercles, except in Fig. 2. They represent a single segment, as if it had been unrolled and spread out, in each case showing the part extending up from the leg, just beyond the mid-dorsum. An arrow indicates the middle line. The annulets are indicated in some of them.

Fig. 1. Metathorax of *Pieris daplidice*, stage III.

" 2. A middle abdominal segment of the same. The primary setae are numbered, and the glandular ones indicated.

Fig. 2. Metathorax of *Pieris daplidice*, stage IV.

" 4. Middle abdominal segment of the same. Tubercles iv and v are no longer distinct.

Fig. 5. Metathorax of *Pieris brassicae*, stage II.

" 6. Middle abdominal segment of the same.

" 7. Middle abdominal segment of *Pieris brassicae*, stage III.

" 8. A tubercle, with base of the seta, from stage I of *Pieris daplidice*.

" 9. A tubercle of *Pieris brassicae*. In *P. rapae* it is quite the same.

THE CHALCIDOID PARASITES OF THE COCCID *EULECANIUM NIGROFASCIATUM* (PERGANDE), WITH DESCRIPTIONS OF THREE NEW NORTH AMERICAN SPECIES OF THE SUBFAMILIES ENCYRTINAE AND APHELININAE FROM ILLINOIS.

BY A. A. GIRAUTL, URBANA, ILLINOIS.

The Terrapin Scale, *Eulecanium nigrofasciatum* (Pergande), since its recorded discovery in 1898 by Theodore Pergande, has become gradually more and more known in economic entomology, so that at present it is recognized as a pest of some importance. Although it has heretofore been known to be attacked by parasites, none of these have as yet been specifically recorded in the literature and therefore I
take pleasure in announcing the discovery in the State of Illinois of four encyrtine and aphelinine parasites new to this host and of the specific determination of one other, recorded by Gahan (1907) in Maryland. Three of these parasites proved to be new to science and are described in following. The other two are Coccophagus lecanii (Fitch) and Coccophagus longifasciatus Howard. The former is a common coccid parasite in the United States, attacking no less than eight or nine hosts; the latter was described in 1907 from Ceylonese specimens reared from (Lecanium) Saissetia nigra (Nietner) just ten years previously.

The parasites are described or listed in order of their systematic arrangement.

Family ENCYRTIDAE.
Subfamily Encyrtinae.
Tribe Ectromini.

1. *Anagyrus nubilipennis* species nova.

Normal position.

*Female:* — Length, 1.9 mm. Moderately large for the tribe.

General color shining black, with a metallic sheen; intermediate and posterior tarsi fuscous; anterior tarsi dusky; ventral aspect of scape fuscous. Wings normal, the oblique hairless line running from stigmal vein, proximo-ventrad to the posterior margin present and joined near that margin by another longer hairless line pointing distad, both together forming a broad "Y" marking whose mouth opens disto-cephalad into the wing; discal cilia moderately dense and uniform; marginal cilia short and close; an infuscation, rectangular in shape, extends transversely across the wing from the stigmal, marginal, and distal fourth of the submarginal veins to the posterior margin and includes most of the two hairless lines; the distal (or lateral) margin of this infuscation is somewhat convex; remainder of the wing hyaline; venation dusky or brownish black; marginal vein short and broad, darker, slightly longer and broader than the postmarginal vein but equal to the stigmal vein in length. Hind wings hyaline, discal cilia close, with a short curved hairless line at basal third, originating at the postmarginal vein.

Antennae clavate, the funicle cylindrical, inserted near the clypeal border. Scape long and slender, nearly reaching the vertex, nearly as long as the pedicel and first two funicle joints combined, very slightly compressed or dilated distad; pedicel obconic, over one-third shorter than funicle joint 1, the latter cylindrical and slightly longer than the next joint; funicle joint 2 broader; funicle joint 3 subequal to
funicle 2; funicle joints 4–6 subequal, gradually widening, subglobose; club 3-jointed, conical. Antennae 11-jointed, moderately pubescent. Scrobes oval.

Face with a metallic green lustre, sheened, beneath the eyes laterad of the scrobes with a number of large scattered punctures. Eyes dark garnet, prominent; ocelli rather large, in a triangle, the lateral ones near the eye margin; vertex also bearing moderately large scattered punctures. Thorax delicately sheened, with similar punctures; the mesoscutum bearing rather coarse setae, which are short however. Pleura delicately longitudinally rugulose. Abdomen with delicate polygonal sculpture. Tegulae prominent, concolorous. Ovipositor inconspicuous. Mesothorax and scutellum robust, the latter similarly sculptured. Axillae not quite approximate or confluent.

Male:—Length, 1.3 mm. The same, smaller. Antennae paler, dusky, subplumose or feathery. Anterior and intermediate tarsi pallid; posterior tarsi white, including tips of tibia; the infuscation of the wings absent. Antennae 9-jointed, filiform, their funicle joints long and slender and constricted at the middle, inserted in the middle of the face. Scape short and slightly dilated, darker, thrice the length of the pedicel, the latter short, conical; funicle joints 1–6 subequal, cylindrical, uneven, and over twice the length of the pedicel; all, including the club, bearing sparse, long, soft setae, and they are somewhat narrowed and lengthened distad; club single, similar to the funicle joints, but one-third longer, and tapering distad. Mandibles bidentate, one tooth broad and nearly truncate, but with a slight emargination at the centre of the apical margin; the other tooth obtuse and narrower. Genitalia long. (3-inch objective, 1-inch optic, Bausch and Lomb.)

Described from 23 ♀'s, and 1 ♂ reared June 9th, 10th, 15th and 20th, 1908, from overwintered females of Eucanum nigrofasciatum (Pergande) on peach, in the insectary of the office of the State Entomologist of Illinois.

Habitat:—Carbondale, Illinois (L. M. Smith).

Types:—Accession Nos. 37537, 37546 and 37550, Illinois State Laboratory of Natural History, Urbana, Illinois, 5 ♀'s, 1 ♂, tagmounted.


Tribe Mirini.

2. Aphycus stomachosus species nova.

Normal position.

Female:—Length, 1.25 mm. Moderate to small for the tribe.

General color, dark lemon yellow, with a tinge of greenish, the dorsum of the
whole of the mesothorax slightly darker, deep pale cadmium yellow, the dorsum of
the metathorax, cephalic aspect of pronotum and dorsum of abdomen slightly dusky,
legs (including coxae) paler, excepting the dusky apical tarsal joint of the cephalic
legs and the extreme tips of the others; mandibles fuscosus apically, the intermediate
tooth slightly the largest; ventum concolorous with body, paler; scape and pedicel
and the 2 apical funicle joints concolorous, the scape with some dusky above at distal
end, the funicle dusky yellow, the basal club joint black; venation pallid yellow;
wings hyaline, the discal cilia dense; postmarginal vein absent; incisions of ab-
dominal segments, dorsad, pale. At the caudo-lateral margin of the pronotum in
the dorso-lateral aspect, on each side, is a single small black dot. Eyes yellowish
green with scattered minute hairs; ocelli in an acute-angled triangle, ruby red, each
with a yellowish area; the distance between the lateral ocelli and the eye margin is
much less than that between them and the cephalic ocellus; the lateral ocelli are
much further from the occipital, than from the eye margin.

Vertex, pro-, and mesonotum delicately, hexagonally sculptured, the setae
arising from moderately large scattered punctures; the cheeks and face delicately
rugose, with punctures like that of the mesothorax; the sculpture of the vertex,
pronotum, and mesonotum sub-alutaceous; axillae transversely triangular, meeting
at the meson; scutellum peltate; mesopleura delicately, polygonally sculptured, in
balsam mounted specimens distinctly longitudinally striate.

Hypopygium projecting slightly beyond the abdomen; basal club joint deep
black.

Antennae eleven-jointed, the club being distinctly three-segmented. Scape,
pedicel, and two apical funicle joints concolorous, the penultimate distal funicle joint,
however, with some dusky, and the distal two club joints somewhat pallid. Scape
slightly dilated as in the male, at the center of one margin; pedicel and funicle the
same; funicle joints 1–4 subequal, globose or subglobose, funicle 1 slightly longer
than joints 2 and 3, and funicle 4 slightly longer than funicle 1, and more transverse;
funicle joints 5 and 6 much wider, 6 nearly one-third longer and wider than the
preceding joint. Club joints unequal, 1 longest and deep black, 2 nearly one-half
shorter than 1 and the distal joint conical and smaller; distal 2 club joints dusky.

(From many specimens, ⅜-inch objective, 1-inch optie, Bausch and Lomb).

Male: — Length, 0.90 mm. The same, more slender and smaller. Genitalia
not exserted.

Antennae 9-jointed, the club very indistinctly triparted by transverse sutures,
visible under high power; scape but slightly dilated; pedicel as long as the next two
joints combined; funicle moniliform, joints 1 and 2 subequal, smallest, 2 slightly
larger; 3 one-quarter larger; 4 and 5 subequal, one-third larger than 3; 6 largest, nearly twice the size of 4 and 5; unicle joints gradually enlarging to club; the latter cylindrical oval, much longer than the two preceding joints. Antennae pilose.

An oblique (proximo-caudad) hairless line on fore wings somewhat irregular, but narrow, widening gradually caudad at the posterior margin (normal position).

(From many specimens, ½-inch objective, 1-inch optic, Bausch and Lomb.)

Small, exceedingly active creatures resembling in general the Aphelininae and nearest to Aphycus cockerelli Howard and annulipes Ashmead. The position of the ocelli, coloration of the antennae, hyaline wings with the oblique hairless line and immaculate legs, are characters distinct from any of the described species. Reared from overwintered females of Eulecanium nigrofasciatum (Pergande) on peach twigs, June 20th, 22nd, 23d, 30th, 1908.


Types: — Accession Nos. 37551, 37552 and 37559 (10 ♂'s, 3 ♀'s in balsam) and No. 37550 (many ♂'s & ♀'s, tagmounted and in balsam), Illinois State Laboratory of Natural History, Urbana, Illinois.


Family EULOPHIDAE.

Subfamily Aphelininae.

Tribe Aphelinini.

3. Coccophagus cinguliventris species nova.

Normal position.

Female: — Moderate in size.

General color piceous black, shining: eyes and ocelli bright red, the former coarse, and bearing moderately thick whitish pubescence; legs pallid yellow, antennae the same but darker; the base of the abdomen with a broad belt of yellowish white, covering more than a third of the length of the abdomen, and very conspicuous; tip of abdomen pallid. Entire mesothorax moderately coarsely polygonally sculptured, nearly as coarse as the surface of the eyes, the sculpture however not uniform; metathorax apparently smooth, or slightly transversely rugulose. Base of the mesopostscutellum pallid; vertex and head rugose. Ventum, except basal third of abdomen, piceous. Coxae pallid. Abdomen smooth, shining. Ovipositor not exerted. Tegulae dark.

Wings hyaline, but slightly infuscated beneath the stigmal vein, the infuscation
extending across the wing and irregular in shape. Venation dusky; wing uniformly densely ciliate. Hairs of thorax dark, those of the abdomen lighter. Hind wings with discal cilia uniform.

Scape of antennae slender, much longer than the 2 following joints combined; pedicel shorter than funicle 1, subcuneate; funicle joint 1 cylindrical, shorter than the next joint; funicle joints 2 and 3 subequal, one-fourth longer than funicle 1, and slightly broader; club rather closely united, the basal and intermediate joints about subequal, the last joint conical, slightly, shorter; club not as long as the funicle. Antennae moderately, uniformly hairy, and with the usual longitudinal carinae. (\(\frac{3}{4}\) -inch objective, 1-inch optic, Bausch and Lomb.)

Male: — Unknown.

Described from two female specimens reared from overwintered females of Eulecanium nigrofasciatum (Pergande), June 7th, 1908, in the insectary of the office of the State Entomologist of Illinois. The host was on peach collected by Mr. L. M. Smith of the State Entomologist's office, at Carbondale, Illinois, June 4th, 1908.

From the naked eye black, with a white band around abdomen.

Type: — Accession No. 37536, Illinois State Laboratory of Natural History, Urbana, Illinois. One female mounted in balsam.

Different from all other described species in the genus in having the broad transverse whitish belt about the base of the abdomen and the infuscated forewings. The black color, the concelorous scutellum, the broad white band of the abdomen, the polygonal sculpture of the thorax, the infuscated wings, and palloid coxae are characteristics of the species.


Howard, 1907, pp. 80–81, fig. 17.

This striking species was described just recently by Howard (1907) from specimens reared from (Aecanium) Saissetia nigra (Nietner) in 1897 at Manaar, Ceylon. It was the first parasite reared from nigrofasciatum in Illinois, having emerged while the hosts were in transit from Carbondale to Urbana (June 15th, 1908). Subsequently, it was reared in large numbers from the same hosts June 7th to 20th, 1908, and again, abundantly, from the host on peach sent from Cobden, Illinois, by Mr. L. M. Smith, on July 14th to 19th, 1908. From the large number of specimens reared, the specific determinations of which have been most kindly confirmed by Dr. L. O. Howard, I draw up the following additional descriptive details:

Female: Scape of antennae as long as, or longer than, the united lengths of the next three joints; pedicel subconic, longer and broader than the first joint of the
funicle, which is cylindrical oval; joint 2 of the funicle nearly twice the length of the proximal funicle joint, cylindrical, wider than the proximal funicle joint; joint 3 of the funicle a third shorter and broader than funicle joint 2, subequal to the pedicel; club slightly shorter than the funicle, more compact and somewhat broader, its component joints subequal, the intermediate joint slightly the shortest, subequal to funicle joint 3, the terminal joint conical, subequal in length to the proximal joint of the club, but somewhat narrower. Setae of funicle longest.

Wings hyaline, both pairs uniformly ciliate in the disk, the hind wings less densely so. Proximal tarsal joint longest in the caudal legs a half again longer than the tibial spur, but not longer than the following three tarsal joints. The middle tibial spur a third longer than the proximal joint of the intermediate legs.

Male: Pedicel of antennae small, subtriangular, very much smaller than the first funicle joint; joints 1 to 3 of the funicle subequal, gradually, slightly enlarging cephalad, each at least thrice the size of the pedicel, their attachments lateral, the cephalic margin of the opposite halves of their apices conspicuously concaved, so that the opposite lateral angle is acute (not visible in some aspects); funicle joint 4 longest and broadest, its attachment central, a third longer than the proximal funicle joint and a fourth longer than the third funicle joint; joint 5 of the funicle distinctly narrower and shorter than joint 4, subequal in length to joint 3 but narrower; the club joint conic, much narrower, and subequal in length to funicle joints 3 and 5. Longitudinal carinæ prominent.

Longitudinal fasciation of the body not distinct as in the female, and therefore this sex is not very much like the female.

The species has not been mentioned in the literature other than as recorded in foregoing.

5. *Coccophagus lecanii* (Fitch).

This species was first described from New York State by Asa Fitch (1859) who placed it in the genus *Platygaster* Latreille. Just twenty years afterwards, Miss Emily A. Smith (1878a) redescribed it as new under the name *Coccophagus lecanii* from specimens reared in Illinois; and three years later, Howard (1881) again described it as new to science under the name *Coccophagus ater*; in the same publication, Howard established the identity of *Platygaster lecanii* (Fitch) and *Coccophagus lecanii* E. A. Smith, placing the species in the proper family and genus. Again, Howard (1895) established the identity of his species *ater* with *lecanii* (Fitch), and in addition expressed the opinion that *lecanii* (Fitch) may possibly be synonymous with the European *Coccophagus scutellaris* (Dalman), but that the existing descriptions
precluded conclusions in regard to that opinion. Previously, Putnam (1879, p. 332, footnote) had said: "I am very much inclined to think that Platygaster lecanii described by Fitch in his 5th New York Report, as infesting Lecanium quercitronis may prove to be really a Coecophagus nearly allied if not identical with this species. The description applies too well to easily believe that the two species belong to different families. In this event Dr. Fitch's reference to the Proctotrupidace is of course wrong."

In 1898, de Dalla Torre held Miss Smith responsible for the species, entirely overlooking the original description of Fitch's. In view of the foregoing, the following is the synonymy of the species:

*Platygaster lecanii* Fitch (1859).
*Cocophagus lecanii* E. A. Smith (1878a).
*Cocophagus alter* Howard (1881).
*Cocophagus lecanii* Smith (de Dalla Torre, 1898).
*Platygaster lecanii* Thomas, *nec* Thomson (de Dalla Torre, 1898, p. 474).

The following hosts of the species are now known, listed chronologically:


In addition to these nine specific records of hosts, it is recorded to have been reared from "Lecanium" on plum (Howard, Webster, 1895) and "Lecanium" on maple (Howard, 1881). De Dalla Torre (1898) gives additionally (to the first seven hosts listed) *Lecanium acericocetycicis* which is a synonym of *Pulvinaria innumerabilis* (Rathvon), but he omits mention of *Pulvinaria acericola* (Walsh and Riley). In regard to the latter, it seems strange that Miss E. A. Smith (1878 a, b) writing of the same parasite from the same locality at the same time, should record different specific hosts of the same genus; it is supposed by some to be synonymic with *innumerabilis*.

1 De Dalla Torre (1898, p. 474) also lists it as *Platygaster lecanii* Thomas, *sic* which therefore is a synonym of *C. lecanii* (Fitch). Smith (1881 b) mentioned and quoted Fitch's description, stated that it applied to her species but that the latter was chalcidoid not proctotyrpoid and hence new. De Dalla Torre credited the article to the wrong author.
The species of *Coccophagus* mentioned by J. G. Sanders (1907) in writing of *Eulecanium nigrofasciatum* (Pergande) is most probably this parasite and the "chaleid fly" recorded by A. B. Gahan (1907) from this same host in Maryland was later determined as *lecanii* (A. B. Gahan, *in litt.*, June 25th, 1908), making the first specific record of this host, here published for the first time. I did not meet with it in connection with the host under consideration in Illinois, but during 1908 reared it from young *Pulvinaria innumerabilis* (Rathvon) at Urbana, July 26th.

This coccid parasite is widely distributed in the United States having been reared in the following states — New York, Illinois, Iowa, District of Columbia, Maryland, Massachusetts, California, New Jersey, Colorado and Ohio. Of these, Maryland is a new locality. It has also been collected at St. Vincent, Windward Islands, West Indies (Howard, Riley, 1896) and has just been recorded from Ontario, Canada.

What is known of the biology of this species is recorded in Putnam (1879) and Howard (1881, 1895, 1900). A bibliography of the species is appended.

**Bibliography of Coccophagus lecanii** (Fitch).


Original description as *Platygaster lecanii*; host "*Lecanium quercitronis.*"

1878a. Smith, Emily A. American naturalist, Philadelphia, XII, p. 661, footnote; fig. 6, a–b.

Redescription as new under the name *Coccophagus lecanii*; host, female "*Lecanium acericorticis.*" Figure of female and pupa.


Description of a parasite of the forementioned coccid, quoting Fitch’s (1859) description and stating:

"This description answers as far as it goes for the parasite bred on the *acericola*, but instead of it belonging to the Proctotrupidæ family, it belongs to the Chalcididæ. I therefore record it as a new species."

Brief description; no name really given here. Cf. de Dalla Torre (1898, p. 474).
   Brief descriptions of the stages; apparent number of broods; method of emergence of the adult; parasitized hosts. *Coccophagus lecanii* Smith. Calls attention to its probable identity with Fitch's (1859) species.

   Brief description of both sexes; lists three hosts, Nos. 1, 2 and 4 of the foregoing list; synonymic with *C. lecanii* Smith (1878). Brief biological notes.
   Idem. Ibid., pp. 359-360.
   Redescription as new under the name of *Coccophagus ater* from "Lecanium" species on maple, Ithaca, N. Y.

   *C. lecanii* Fitch and *ater* Howard listed separately.

   Same as Howard (1885).

   A parasite of *Coccus hesperidum* Linnaeus in California.

   *C. lecanii* (Fitch) may prove a synonym of *C. seutellaris* (Dalman); host relations; synonymy and brief description, with list of 7 hosts.

   Reared from "plum scale" in Ohio.

   Recorded from St. Vincent, West Indies; synonymy and the 3 hosts previously given (Howard, 1881).

Riley, Charles Valentine. Ibid., p. 60.
   Listed from St. Vincent, Windward Islands, West Indies.
1898. de Dalla Torre, Carl G. Catalogus hymenopterorum hucusque descriptorum systematicus et synonymicus, Lipsiae, V. p. 225 and footnote.

*Coccophagus lecanii* Smith; synonymy. In the footnote, list of hosts as in Howard (1895), excepting substitutes "*Lecanium acericortieis*" for "*Lecanium on plum*".


*C. lecanii* (Fitch) and *atcr* Howard listed separately.


Very abundant on *Pulvinaria innumerabilis* in Washington City; 99% of the young killed; general biological notes.


Colonization in California; on *Coccus hesperidum* Linnaeus.

1903. Wall, W. B. California Fruit Grower, San Francisco and Los Angeles, XXVIII, p. 4 (June 13).

An efficient parasite of *Coccus hesperidum* Linnaeus.


On *Coccus hesperidum*. Colored, general figure of adult female, enlarged.


On *Pulvinaria innumerabilis* (Rathvon).


Notes on its occurrence in New Jersey as a parasite of *Pulvinaria innumerabilis* (Rathvon); figure of adult, enlarged.


Brief account of as a parasite of *Pulvinaria innumerabilis* (Rathvon).

On Pulvinaria innumerabilis and Coccus ventralis Ehrhorn in California.

On Pulvinaria innumerabilis (Robinson); figure from J. B. Smith (Dickerson, 1906).

Mentions a chalcidoid parasite of Eulecanium nigrofasciatum which is later determined as lecanii (Fitch).

Probably a species native to North America.


Mentioned as a parasite of Coccus hesperidum Linnaeus.

The same as Forbes (1907).

A parasite of Pulvinaria innumerabilis.

Literature referred to.

1907. Gahan, A. B.

Howard, L. O. See in foregoing bibliography.
SOME NEW CHRYSIDID WASPS FROM WESTERN UNITED STATES.

BY S. A. ROHWER, BOULDER, COLO.

Hedychridium polygoni n. sp.

Female: length 6.5 mm. Head about the same width and length as the pro- thorax, rather transverse; closely punctured and appearing granular. Anterior margin of the clypeus straight; the middle raised into a low rounded carina. The basal part of the mandibles punctured; malar space very narrow; cheeks narrow; orbital carina wanting;1 eyes converging below; eyes oval. Facial basin strongly transversely striated; in the middle there is a shallow longitudinal furrow. Third antennal joint distinctly longer than the fourth. Pronotum, mesonotum and scutellum punctured as the head; parapsidal furrows only faintly indicated, straight and parallel. Tegulae black, polished, impunctate. Postscutellum with large punctures, or more properly strongly reticulate; from the postscutellum there is a distinct carina running to the base of the abdomen; fovea of the metanotum irregularly striated; teeth of the metathorax sharp. Claws with a rather large inner tooth. Basal middle of the first abdominal segment with a narrow impression in addition to the usual broad depression; the middle of the first abdominal segment and the basal three-fourths of the second finely and rather sparsely punctured; sides of the first, and to some extent the sides of the second, the apical third of the second and all the third with larger, closer and somewhat confluent punctures. Posterior margin of the third segment evenly rounded, not notched. Color very dark blue, almost purple, without any green reflections; antennae beyond the scape, legs beyond the tibiae and the tegulae black or brownish. The entire insect covered rather sparsely with short black hair; tarsi with gray pubescence. Wings dusky, the apical third darker; venation brown or black.

Type locality: Boulder, Colo., Sept. 1, 1908, at flowers of Polygonum (S. A. Rohwer).

The ridge connecting the postscutellum and the metanotum, and the striated fovea, will make this species fall next to H. aeruleum Norton (Dak. and Mont.). It differs from Norton’s description of aeruleum as follows: facial basin striated, tegulae black, and the color is entirely dark blue. In the same locality and on the same day

1 The term “orbital carina” is used to denote the carina on the cheeks from the mandibles toward the top of the eye on the posterior margin of the head,
I collected specimens of *H. viride* Cresson. *H. polygoni* may be known from *H. viride* by the darker wings, the darker color, the strongly striated facial basin, and the presence of the carina from the postscutellum.

**Chrysis** (Tetrachrysis) *caeruleans nanula* n. subsp.

Female: length 5 mm. Facial carina\(^1\) distinct; malar space broad; clypeus transverse; radial cell almost closed at the apex. Apical teeth short, broadly triangular, obtuse at the apex, the emargination between the middle ones sub-V-shaped and narrower than the emargination between the middle and lateral ones. Lower lateral margin of the third segment straight. Apical groove distinct, with eight pits, the middle pits somewhat confluent. Blue; tarsi and the flagellum brownish. Wings slightly dusky, venation black. Sparsely clothed with a few long hairs.

Easily separated from *caeruleans* by the short obtuse teeth.

Type locality: Florissant, Colo., June 24, 1908, (T. D. A. Cockerell).

**Chrysis** (Tetrachrysis) *florissanticola* n. sp.

Male: length 7.5 mm. Clypeus transverse; facial carina wanting; facial basin punctured above, finely transversely striated below; a faint longitudinal furrow above; malar space less than the length of the second antennal joint; facial quadrangle narrowest a little below the top of the facial basin; cheeks very narrow at the mandibles; eyes rather large oval; the third antennal joint about one third longer than the fourth. Pronotum longer than the head, its apical middle dentate, very little if any shorter than the mesonotum; parapsidial furrows distinct, parallel; outside of these are two short rather indistinct ones; punctures of the head and thorax dense, those of the thorax larger than those of the head. Radial cell open at the apex. Abdomen shining, the punctures of the first two segments about the same size as those of the head, not confluent, the punctures of the second segment a little more separated than those of the first segment; the third segment has the punctures confluent. Pits rather small, distinct, more or less oval in outline, about fourteen in number. Lower lateral margin of the third segment is slightly bisinuate; teeth short, broad, obtusely triangular. Color bright green, with a very few purple reflections; antennae beyond the second segment black; tarsi brownish; tibial spurs yellowish. Facial basin with long, dense, white hair; head, thorax, legs and the abdomen (the hair of the abdomen is short) with long rather dense gray or whitish hair. Wings hyaline, beyond the stigma the radial cell is slightly cloudy, venation dark brown.

\(^1\) The facial carina is the transverse carina above the facial basin.
Type locality: Florissant, Colo., June 23, 1907 (S. A. Rohwer).

This species was sent to M. R. du Buysson who returned it labeled "n. sp.," and suggested I describe it. In Aaron's paper on North American Chrysidæ (Trans. Am. Ent. Soc. XXI, 1885, p. 233) this species runs to *laevis* Cresson, but the apical teeth are shorter and more obtuse than in that species, the facial quadrangle is different, and it is much more pubescent. The dense hair of the facial basin reminds one of *snowi* Viereck, but that species has a shorter prothorax. It differs from *tripartita* Aaron by the hyaline wings.

**Chrysis** (Tetrachrysis) **nokomis** n. sp.

Male: length 8 mm. Clypeus transverse; facial carina distinct and strong, bent in the middle; facial basin granular; malar space distinct, broad, about as long as the third antennal joint; third antennal joint very little longer than the fourth; orbital carina well defined; facial quadrangle very little narrower below. Head and thorax (the metathorax more coarsely so) punctato-granular. Pronotum shorter than the head; parapsidal furrows parallel; mesopleuræ with a distinct, slightly oblique, somewhat foveolated furrow, the lower part of this furrow changes into a carina. The radial cell is almost closed at the apex. The spines of the metathorax are large. The first two dorsal abdominal segments with distinct, rather large, separated punctures, the spaces between the punctures smooth; the third segment coarsely granular; the apical furrow not very deep; pits about six in number, most of them confluent; lower lateral margin of the third segment arched inwardly at about the middle. The teeth long, apices rounded, the sides subparallel; the middle teeth much closer together than the middle and the outer ones, the area between them angulate; the area between the middle and the lateral teeth semicircular. The upper figure of fig. 76, pl. X, Tr. Am. Ent. Soc. XII is much like the teeth of *nokomis*. Color dark purple with some green reflections; flagellum and tarsi black or brownish. The entire insect clothed with long shaggy, gray hair. Wings hyaline, venation black.

Female: The female differs from the male in having the third segment humped before the furrow; the apical teeth broader, triangular and bearing the same relation to the male as the female of *propria* does to the male according to Aaron's figure; the hair is not as dense as in the male; the wings are slightly dusky; and the radial cell is a little more open at the apex.

Type locality: The male, Denver, Colo.; the female Las Vegas, N. M. (T. D. A. Cockerell).

This species is superficially like *nortoni* Aaron, but the teeth are very different,
being longer and the middle ones much closer together. Its nearest ally is perhaps *montana* Aaron, but it differs from that species in the more coarsely sculptured facial basin, the much broader malar space, and the apical teeth are not so strongly curved. The teeth are much like those of *propria* Aaron, but the facial basin is not striated, and the pronotum is not as long as the head.

**Chrysis** (Tetrachrysis) *decepta* n. sp.

Female: length 6.5 mm. Clypeus transverse; malar space almost as long as the length of the third antennal joint; facial basin as coarsely sculptured as the rest of the head except in the middle where it is shining; facial carina wavy and not very strong; the orbital carina not well defined; the third antennal joint almost as long as the length of joints four plus five. Pronotum almost as long as the head; no distinct furrow on the mesopleurae; parapsidial furrows parallel; the upper of the U-shaped furrow of the metathorax finely transversely striated, the lower part hidden by the abdomen; hind basitarsus a little longer than the length of joints 2, 3, 4; radial cell completely closed at the apex. Head and tho ax very closely punctured. Abdomen a little longer than the head and thorax; the punctures more separated than those on the thorax, the spaces between them smooth and shining; the third segment more closely punctured. The lower lateral margin of the third segment bisinuate, more strongly so about the middle and gently so just before the apical teeth; above the third segment is depressed about the middle. The lateral teeth not so strongly curved downward as middle ones; the teeth sharp, triangular; the emargination between the middle ones deeper and broader than the emargination between the middle and lateral ones; all the emarginations evenly semicircular. The apical furrow rather deep, with ten deep pits. Color dark blue with a few green reflections; antennae beyond the third joint and the tarsi black. The entire insect with short gray hair. Wings hyaline, iridescent; venation black.

Type locality: Boulder, Colo., June 13 (G. M. Hite).

This species was determined for me as *montana* Aaron by M. R. du Buysson, but it does not agree with Aarons account of this species, and may be separated from it by the distinct malar space (the malar space of *montana* is very narrow, almost wanting); the middle teeth are much farther apart and the emargination between them is semicircular, not subtriangular. It is much like *frey-gessneri* Gribodo, but the apical pits are distinct and the facial basin is not striated or smooth.
Chrysis (Tetrachrysis) amala\(^1\) n. sp.

Female: length 5 to 5.5 mm. Clypeus transverse; the malar space about the same length as the pedicellum; facial basin punctured like the rest of the head, except in the middle where there is a finely transversely striated area; the facial carina straight, evident; the third antennal joint as long as the length of joints four plus five; orbital carina not very strong. Pronotum shorter than the head; parapsidial furrows distinct, parallel; the furrow on the mesopleure faint; the U-shaped furrow of the posterior face shining above; hind basitarsus as long as joints 2, 3 and 4; radial cell open at the apex; the head and thorax closely rather coarsely punctured. Abdomen not so closely punctured as the head and thorax; the third segment not more coarsely sculptured than the second; the spaces between the punctures smooth, shining. The lower lateral margin of the third segment bisinuate; the upper surface straight. The middle teeth more strongly curved downward than the outer ones; the emargination between the middle teeth deeper and wider than the emargination between the middle and lateral teeth; the emargination between the teeth semicircular; the teeth sharp triangular. The apical furrow rather deep, with eight to ten distinct pits. Blue with some greenish reflections; the antennae beyond the third joint and the tarsi brownish-black; the entire insect clothed with erect gray hair. Wings hyaline, iridescent; venation brownish.

Type locality: Florissant, Colo. The type collected June 19, 1908, by T. D. A. Cockerell; two paratypes collected June 12, 1908, by S. A. Rohwer, on sand.

Very much like decepta Roh., but it is smaller, the facial carina is straight, not wavy, and the radial cell is open at the apex.

Chrysis (Tetrachrysis) submontana n. sp.

Length 6 mm. Clypeus transverse, the upper surface rather finely punctured; malar space linear, not as long as the short pedicellum; facial basin in the central part finely transversely striated; facial carina wanting; orbital carina very faint; ocelli in a triangle, the anterior ocellus not hooded. Pronotum not quite as long as the head; parapsidial furrows parallel; the furrow on the mesopleure evident but not strong; the U-shaped furrow of the posterior face of the metathorax foveolated above, below with two large fossae; the teeth of the metathorax rather flattened, acute; head and thorax rather coarsely, closely punctured; hind basitarsus as long as joints 2, 3 and 4; radial cell open at the apex. Abdomen very closely, finely punctured, appearing granular; the first segment is more distinctly punctured than the following

\(^1\) Amala is a Malayan word for blue.
segments. The lower lateral margin of the third segment bisinuate; the dorsal surface evenly rounded to the furrow. The apical teeth rather obtuse, short, broadly triangular; the emargination between the middle ones triangular and narrower than the emargination between the middle ones and the lateral ones, which is semicircular. Apical furrow distinct, the pits somewhat confluent, about eight in number. Blue with some green reflections; the antennae beyond the fourth joint and the tarsi brownish-black. The insect is almost nude. Wings slightly dusky, brownish; venation black.

Type locality: Rifle, Colo. Two specimens collected July 2, 1908 (S. A. Rohwer).

This species is closest to montana Aaron, but the apical teeth are short, obtusely triangular, and the anterior ocellus is not hooded.

Many thanks are due to Prof. T. D. A. Cockerell for going over my manuscript.

THE ENVIRONMENT OF CALLICISTA INES, EDWARDS (DYAR), IN SOUTHERN CALIFORNIA.

BY FORDYCE GRINNELL, JR., PASADENA, CAL.

This pretty and delicate little Hair-streak was first described by W. H. Edwards in Papilio, II, 25, 1882, from a large number of specimens taken in Southern Arizona in October, 1881, by Jacob Doll. W. G. Wright in his "Butterflies of the West Coast" records it from the Santa Rita mountains, Arizona and Southern California in October; but he does not specify in what part of Southern California he took it. Mr. W. S. Wright in the Journal of the New York Entomological Society, XVI, Sept., 1908, p. 162, gives an interesting but short account of the butterfly. It was taken by Mr. G. H. Field in July at Jacumba, San Diego County, where he found it rather common. This is the first definite record for the state. He supposes there are two broods, one in July and the other in October. Jacumba is in the desert part of the county.

On May 30, 1908, I took seventeen specimens of Callicista ines near Black Mountain on the desert slope of the Santa Rosa mountains, flying around the small, scrubby Western Juniper (Juniperus occidentalis, Hooker).

The Santa Rosa mountains are really a continuation of the San Jacinto moun-
tains on the southeast, separated from the latter by the long, deep Palm cañon which extends from Santa Rosa Mountain to the desert. These mountains lie in Riverside county bordering the Conchilla desert on the west; the Colorado desert proper being below and the San Gorgonio pass above the Conchilla desert. The highest point of the range is Toro peak (8705 ft.), connected with Santa Rosa Mt. (8000 ft.) by a ridge; from this elevated portion these mountains slope more or less abruptly to the desert, only about ten miles distant, and 100 feet below sea-level. In this comparatively short distance the life conditions change from the Canadian zone marked by the Limber-pine (Pinus murrayana) through several intermediate conditions to the Lower Sonoran zone with its peculiar and highly adapted flora and fauna.

The party, consisting of three persons, was camped at Das Palmos Spring (3500 ft. alt.), about two miles from Black Mountain. This locality was strictly Lower Sonoran with such characteristic desert plants as: Ocotillo (Fouquieria spinosa), Creosote-bush (Covillea mexicana), Agave deserti, Yucca baccata, desert willow (Chilopsis salina), two or three species of Mesquite, Pinus monophylla, Eriogonum fasciculatum, several species of cacti, a scrubby and peculiar looking form of Quercus dumosa, and the Western Juniper (Juniperus occidentalis). This is the habitat and surroundings of Callicista ines in the Santa Rosa mountains. It was hot in the mornings of this our first visit, but towards noon a very strong and disagreeable wind blew, which interfered with work, continuing during the afternoon and well into the night. On our second visit in the middle of June the conditions were more quiet, the weather hot, and things, generally, dryer. C. ines was not rare, but it was not conspicuous; its swift flight to some outer, topmost branch takes careful watching on the part of the collector. On May 30, I took seventeen specimens. On the 31st I visited every Juniper of the day before, beat all around them and kept a careful look-out, but did not see one. June 1st went over the same route and took three specimens. On June 13, while on another trip, in the upper part of Palm cañon (3000 ft.) I saw a few more specimens around the Junipers, with practically the same surroundings. On June 14 we moved camp, with the pack burros, down to the celebrated palm grove (Washingtonia filifera), and on the way saw a number more of the butterflies around the Junipers, four or five miles from the grove. On June 18 we were back again at our Dos Palmos spring camp, and on the following day saw a few more ines near Black Mountain; this was my last experience with this butterfly.

The recorded seasonal range of C. ines is from the last of May to October in California. It would be difficult to say how many broods there are until more collecting and observing is done. But it seems as though it were on the wing continually between the two extremes of capture; the broods overlapping, as it seems to me, in the same way as with Phryganidia californica.
Mr. Victor L. Clémence of Pasadena found ines common in Southern Arizona during 1908, from the middle of May till the first of August, where their habits are quite different from the species in California. On the desert they fly around the Mesquite bushes, and from here they ascend to about 6000 feet altitude in the Chiricahua mountains, where they fly around a yellow flower, the name not ascertained, but probably a composite. Juniper is found here, but ines was not observed to frequent it. Mr. Clémence saw this butterfly continually while he was in Arizona, and it was undoubtedly breeding continuously, one brood overlapping the other; there being no really distinct brood. Nothing is yet known on the early stages of Callicista ines, and there is much to be learned concerning its biotic relations.

THE DECTICINEAN GENUS REHNI A CAUD. (ORTHOPTERA)

BY A. N. CAUDELL, U. S. NAT. MUSEUM.

The genus Rehnia was established upon two species, victoriae and spinosa, the first being designated as the type. Each species was known from the male only and was represented by the unique type, victoriae coming from Mexico and spinosa from the United States. Recently while studying the Orthoptera in the Museum of Comparative Zoology at Cambridge, Mass., I had the very good fortune to find female specimens of both the above species. Of R. victoriae I saw two females, one labelled "1221", indicating Monclova, Mexico, and one "Palmer's assorting No. 1090," meaning Eagle Pass, Texas. These localities, as well as the ones mentioned below under R. spinosa, are given on the authority of Mr. Henshaw, who took them from original note books.

Of Rehnia spinosa I saw one male and two females, Palmer's assorting No. 1012, Eagle Pass, Texas, all in fragments, and one perfect female labelled "Mexico, L. W. Sweet." Thus both species of this genus are seen to be represented in both Mexico and the United States.

In both the above species of Rehnia the ovipositor is long and curved gently downwards, as in Apote, apically unarmed, and margined with piceous at the tip. The abdomens of the females of both species bear a stout backwardly curved spine beneath towards the tip, probably on the seventh ventral plate. This spur is especially large and noticeable in spinosa. In general appearance and structure the sexes
of these species do not differ. The meso- and metasterni as well as the prosternum of both sexes are spinose in both species. The thorax of victoriae is very little elevated posteriorly, often scarcely at all. The basal spine of the anterior tibia of spinosa is often broken off, represented only by a scar.

The females of the two species show the following measurements:

Rehnia victoriae.

Length: pronotum, 8 mm.; elytra, 14 mm.; hind femora, 30–32 mm.; ovipositor, 35–38 mm.; width: pronotum at posterior border, 4 mm.; hind femora at widest part, 3.5–4 mm.

Rehnia spinosa.

Length: pronotum, 10.5–11 mm.; elytra, 21–22 mm.; hind femora, 39–40 mm.; ovipositor, 45–46 mm.; width: pronotum at posterior border, 7 mm.; hind femora at widest part, 5–5.5 mm.

Spiders in Winter Floods.—On February 10, 1909, there was a heavy rain which flooded low fields and the borders of swamps and ponds, and on the 12th I went to Tyngsboro, Mass., and joined Mr. Frederick Blanchard in a hunt for Spiders and Coleoptera on the ice. The thermometer had fallen to 14 in the night but the day was calm and became slowly warmer. In the open fields the water had partly drained away leaving thin ice on which spiders were scattered, most of them being near the line of dust that marked the highest water. On the larger ponds and swamps they were still more numerous around the banks and along lines of rubbish that had floated together on the ice. A few had died and were frozen in the ice, others were frozen down by the feet but were still alive and thawed out later in the day. Nearly all, however, were free in the ice, which along the edges of the floods had frozen under them. They were too cold to move but as the air became warmer revived and groped slowly about without any definite direction. By noon some of them became quite active and climbed grass and bushes and spun threads, the thermometer at this time being 35 in the shade and 40 to 50 in the sun. The most active species was the little Tmeticus terrestris, which was abundant in a maple swamp on the ice and in bushes up to a foot from the ground. The greater number of spiders were young Lycodidae of all the common species. With the spiders were great
numbers of Coleoptera and several species of Diptera. Following is a list of the spiders.

Adults. Pachygnatha brevis, Pedanostethus riparius, Pholcomma rostrata, Ceratinella lactabilis, Corniculoria indirceta, Grammonata ornata, Tmeticus plumosus, Tmeticus terrestris, Tmeticus concavus, Erigone dentigera, Bathypalntes zebra, Diplostyla nigrina.


J. H. Emerton.

A NEW VARIETY OF THE GEOMETRID MOTH

THERINA FISCELLARIA GN.

BY L. W. SWETT, MALDEN, MASS.

*Therina fiscellaria* peccataria n. var.

This is a good variety of *T. fiscellaria* Gn. which occurs late in the fall.

Expands 33–35 mm. Head ochre, with a tinge of orange. Palpi yellow, tipped with dark hairs, very short. Thorax golden yellow, as are all wings. Abdomen a little lighter yellow than thorax. Fore wings golden yellow minutely speckled with dark atoms; basal line curved outwardly like a bow from costa to inner margin, shaded inwardly with a deep smoky color much the same as the general color of *athasaria* Walk. Between basal line and extradiscal line, light golden yellow, with prominent linear discal spot. Extradiscal line runs straight from costa for 2 mm., then suddenly turns at an angle opposite the discal spot on median vein, whence it bends back to the fourth vein and then runs straight to inner margin. The basal and extradiscal line are fairly broad and shaded inwardly with a smoky tinge, and outwardly almost to border of wing, except at apex, which is in all my examples golden yellow, the smoky shading being especially broad at inner margin. Hind wings clear golden yellow to median brown line, which has a prominent angle opposite the fifth vein. This line is shaded outwardly with a smoky color nearly to edge of wing, it being widest near inner angle.
Beneath ochre, lines on fore wings (but not the smoky bands) faintly showing through, a lighter ochre color than above. On the hind wings the median line alone shows. The specimens vary somewhat in the sharpness of the angle of the extra-discal line of the fore wings, but are very distinct from all other species. Packard evidently recognized this, as he refers in his Monograph, page 494, to examples from Salem, Mass. The Vancouver Island specimens are not this, but somniaria Hulst.

This variety was found by my friend Mr. Reiff at rest on trees at Forest Hills, Boston, Mass., late in the fall. I am rather inclined to believe that fervidaria and fiscellaria are one variable species. Perccataria seems to be between these and athasaria Walk., and may be a form produced by climatic changes.

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C. V. BLACKBURN, (Member Cambridge Entomological Club)
STONEHAM, MASS.
In Volume XXVI, Nos. 13, 14, 15, and 16 of the "Biologisches Centralblatt" (Leipzig 1906) Dr. E. Fischer of Zürich has published some important studies on the susceptibility of caterpillars to diseases. In his investigations he has taken extraordinary care in establishing the primary causes leading to the disease variously known as "flacherie," "flaccidenza" and "caterpillar-cholera," a disease which deserves special attention on account of its extreme infectiousness. He has pointed out that the first tendency toward the disease lies in a decrease in the nutritive value of the food of the caterpillars, which suddenly induces a disturbance in metabolism. As a result the organisms responsible for the disease immediately find conditions suitable for their growth. One of the main causes of the disease is therefore to be sought in the susceptibility of the caterpillars, while the specific infection of flacherie is to be regarded as coming more or less secondarily; in other words, without susceptibility infection cannot take place, and this susceptibility can be brought about by insufficient nourishment. In his experiments Fischer produced the proper susceptibility by giving the caterpillars food which he placed in water and renewed only every three or four days. This treatment causes an injury to the leaf protoplasm resulting from the presence of too much water. Before the visible outbreak of the disease he could recognize as an early symptom, a characteristic sweet odor in the breeding cages, which could be compared to that of withered lilac blossoms. Whenever this odor was noticeable flacherie soon made its appearance and as it progressed the odor increased proportionately. It is a well known fact that in the occurrence of Psilura monacha, the Nun, ("die Nonne" of the Germans) in unusual numbers in Germany the only relief has come through the outbreaks of flacherie. Fischer therefore recommended, after the completion of his experiments, the artificial production of flacherie by intentionally giving the larvae poor food as soon as the abundance of Psilura monacha was noted in any particular locality.

1 Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 7.
Bearing in mind the close relationship existing between this pest and the Gypsy Moth, and realizing that, in the entire animal world, one of the greatest checks to over-production is the appearance of epidemic diseases, I attempted to put Fischer's conclusions regarding the artificial production of flacherie, to a practical test. This was done by the following series of experiments on the Gypsy Moth. Several thousand caterpillars from normal overwintered eggs were reared, from the time of hatching, under the best possible conditions, each egg-mass being kept separate. Immediately after the second molt, the larvae were removed, with the exception of small control series, and those from each egg-mass divided among isolated trees, in such a manner that each tree received caterpillars from only a single egg-mass. The isolation of the individual trees was accomplished by means of a board ring about ten centimeters high, smeared with tanglefoot to prevent the caterpillars from crawling over, and large enough to include all perpendicular lines dropped from the tips of the outermost branches. Previously, of course, each tree had been carefully cleared of any foreign caterpillars, and care was taken to utilize only such trees as had been only slightly or not at all damaged by caterpillars the previous year. Oaks, birches and apple trees were used. About four days after the second molt fifty caterpillars altogether were removed from these various trees and placed in a small breeding cage. There they were fed on their normal food plant, oak, but upon leaves which had been previously soaked with the attached small twigs in water for four days. After six days of such feeding, I recognized the sweet odor which is the early symptom of flacherie, and two days later the first dead caterpillars were to be seen. Two days later still, I counted twenty dead specimens, which I distributed, together with those still living, upon three isolated trees (oak, apple and birch). On the next day the first death on these trees occurred, and in this experiment by the time of pupation, the mortality had reached fifty-five to sixty percent.

In a similar way a second experiment was made, but with caterpillars which had not yet passed the fourth molt. Among these, the early symptoms of the disease were noticeable as early as the second day, and the first dead specimens were to be found two days later. With the dead and diseased larvae of this series, the caterpillars of the same age on three trees (oak, apple and birch) were infected. In this case the disease made more rapid headway, but the proportion of dead specimens at the time of pupation exceeded that of the first experiment by only five percent, that is to say, it amounted to sixty-five percent.

A third experiment was then undertaken in the following way: to twenty-five caterpillars, taken just after death at which time they turn into a thin semi-liquid or jelly-like mass, two liters of water containing a small quantity of glue were added.
With this mixture the trunks of three trees (oak, birch and apple) were painted with a ring about ten cm. in width, placed right under the lowest larger branches. The caterpillars on these trees had just passed the third molt. At the end of three days the first dead specimens were found, after which the disease spread in the same manner as in the second experiment. At the time of pupation about sixty-three percent of this series of larvae had fallen a prey to the flacherie.

As a fourth experiment, a mixture similar to the one just described was used and sprayed on the foliage of three more trees including oak, birch and apple, by means of a small "Spramotor" sprayer. To make the spray adhere better to the leaves a small quantity of glue was added. In this case also the larvae had recently undergone the third molt. At the end of two days the first dead specimens were observed and their number very rapidly increased from day to day, until at the time of pupation about seventy percent had succumbed to the disease.

In a fifth experiment twenty dead larvae were carefully dried, powdered in a mortar and then stirred into three liters of water. With this decoction three isolated trees were sprayed in the same manner as before, but this time the results were not very satisfactory, as before pupation only about forty percent of the larvae died. In this case the experiment also was begun after the caterpillars had already passed the third molt. It is possible that the lower percentage of deaths may have been due to the addition of too much water to the dried material.

In all these experiments the still remaining pupae were later looked for and it was found that an average of from ten to fifteen percent had died from flacherie. It must be expressly stated that the trees used in the experiment were regularly watered and their leaves sprinkled with ordinary tap water twice a week to counteract the effects of the unusually dry summer of 1909, and to keep them as nearly as possible in a normal condition. It is also to be noted that the possibility of transfer of the flacherie from one tree to another through the agency of wind was well-nigh precluded as only very slight winds occurred here, and besides, the trees treated were far removed from one another. Neither were any of the trees supplied with an unusually large number of larvae in order that the possibility of contact between them might not be made abnormally probable.

*All caterpillars which were kept apart for control remained healthy.* The control was managed in the following way. Ten caterpillars coming from each separate egg mass used in the experiments were separated after the second molt and each lot kept apart with great care. These were reared out of doors in special breeding cages which altered as little as possible the external conditions. They were fed on leaves from a small oak tree, especially selected for the purpose, which had been nearly free
from caterpillars the preceding year. In addition, the tree was very carefully pro-
tected from any foreign caterpillars or insects, and was carefully watered like the
other trees used in the experiments. The food was regularly renewed each morning
and evening, and the caterpillars themselves were sprayed one morning in each week
with ordinary tap water just before they were given fresh food.

From the foregoing results I have therefore been led to believe that the artifi-
cially produced flacherie can be utilized as a valuable aid in the destruction of Gypsy
Moth caterpillars. As is well known, the disease commonly appears in nature only
after the caterpillars are full grown, and even then only during unusually dry or very
damp seasons. The fact that I have now succeeded in rendering the caterpillars
susceptible to flacherie before the third molt (Experiment 1.) may be of importance
for the practical use of the disease, since by artificially inducing flacherie, relief might
be had weeks sooner than happens in nature. In addition to this my experiments
admit of the conclusion reached by Suzuki who experimented on mulberry trees in
p. 203–226, 5 Heft p. 258–278.) Suzuki found that in the case of insufficient nourish-
ment there was also a concomitant increase in the acidity of the leaves (p. 272).
If this be the case, it would seem that the alkaline reaction of the digestive juices
must be neutralized in order to bring on the first susceptibility of the disease. Full
grown caterpillars are most readily affected because at each stage of their growth the
alkalinity of their digestive fluid decreases. Normal young caterpillars have a strongly
alkaline fluid, which, according to the researches of Verson and Bolle, has the power
to destroy the "polyhedric corpuscles" which are very resistant to disinfectants
(Fischer, p. 542). That the alkalinity of the digestive juices of the young caterpillars
actually suffers a decrease through insufficient nourishment is indicated by my
experiments, since in these cases the young caterpillars succumbed to the disease.
Had the alkaline content of the digestive juices not decreased, the pathogenic or-
organisms should not have shown increased virulence.

In addition to the five experiments previously described, a sixth one was under-
taken in an open field containing a group of oak and another of willow trees each of
which was infested with about five thousand caterpillars. Upon each of these two
groups of trees one hundred sick caterpillars and fifty dead ones were distributed.
The larvae were ready for the fourth molt at the beginning of the experiment, and
even on the next day the count of dead specimens could be begun. The disease
spread with amazing rapidity till the time of pupation about four thousand cater-
pillars on each group of trees had succumbed. Two conditions, which did not enter
into my previous experiments, united to cause this unusual result. In the first place,
the two groups of trees had been badly infested and injured by Gypsy Moth caterpillars the previous season, as was evidence by the unhealthiness of the leaves during the summer of 1909, and the caterpillars had become predisposed to the disease on account of the resulting decrease in the value of their food. As a second very important factor may be mentioned the extremely dry weather, which by its desiccating effect on the leaves served to render the food for the caterpillars still worse. On this account, from the beginning there was a decreased vitality in the tissues and digestion was disturbed. In short, the caterpillars were already very susceptible to the disease at the time I introduced it among them. Conditions were therefore most suitable for the spread of flacherie. Apparently in the places that have been injured by Gypsy Moth caterpillars in previous years, there is also a predisposition on the part of caterpillars of the following year toward flacherie, and the organisms of the disease from the introduced dead and sick caterpillars will act readily upon the more healthy ones. Infection will take place even in cases where a locality is first badly infested by the caterpillars, because one can always find a large number of weakly specimens which lend themselves more readily to treatment. Then, as the disease progresses, it acquires such virulence that the previously healthy specimens become susceptible. If, however, unusual climatic conditions prevail the disease will find the environment already suitable for its dissemination. This ought to be particularly true, if the organisms causing the disease should be fungi. In the production of a purely bacterial disease the climatic conditions would hardly play such a highly important rôle.

There are some other peculiar habits of the larvae which may be important factors in the spread of the disease under conditions like those of the third experiment. Since the caterpillar is very active just before beginning to feed, and since it likes, when half or full-grown, to crawl up and down the tree trunk, it is forced to pass over the ring surrounding the trunk and infection results. Sucking also to hasten their destruction is their peculiar desire to suck the juices of other caterpillars which have died of flacherie. They are also very fond of sucking the ring placed on the tree and so imbibe directly the diseased material. In cases of extraordinarily dry weather one may renew the ring after about two days. The probability of infection between caterpillars themselves is also always very great. The disease is transmitted particularly during resting periods, for it very commonly happens that the caterpillars become gregarious at such times. Then the disease continues to spread when a healthy caterpillar feeds on that part of a leaf which has been previously tasted by a diseased one. The excrement of the diseased caterpillars is very moist on account of their digestive disturbances, and this infected matter commonly adheres to the leaves and twigs, where it readily comes in contact with healthy caterpillars, not to mention the fact that
it is seized upon with avidity by the caterpillars as long as it remains moist. Sick caterpillars also exude from the mouth liquids which may infect healthy specimens through the habit just mentioned.

In this connection certain other investigations made by Fischer also deserve notice. He found that caterpillars when sick with flacherie, if not too far gone, and if they are still able to feed, can be cured if they be separated from those already dead and given the very best of care, with extremely fresh food renewed possibly two or three times a day. During convalescence the peculiar sweet odor noticeable as an early symptom of flacherie disappears. I repeated Fischer's experiments with Gypsy Moth caterpillars after the third and fourth molts with the same successful result. This is of especial value to caterpillar breeders, for it often happens that whole series of larvae fall a prey to flacherie, without their knowing of any way to stop its progress. Further there is the erroneous opinion that in large breeding series the disease is very apt to break out spontaneously, but this, however, is not at all likely if fresh, sound food is given at least twice a day and the natural life conditions of the caterpillars are reproduced.

I must not forget to call especial attention to the fact that all the experiments here briefly described have required a great deal of time and attention. One must carefully look after every detail of the experiments daily from the time of the hatching of the Gypsy Moth eggs until pupation (from the end of May till the end of July) in order to avoid even slight mistakes or errors of apparently minor importance which might lessen the value of the work. One must also consider the various possibilities which count for or against the practical use of artificially produced Flacherie.

Although my experiments suggest the great probability of an economic value in this disease for destroying the Gypsy Moth, I must make it plain that the experiments of only a single year had best not be taken as a comprehensive method for the practical use of Flacherie, but that further experiments should be undertaken on a larger scale in the near future to substantiate the results I have obtained.

It goes also without saying that such work should be done only with great care to secure correct results, for it does not depend on the performance of experiments, but above all on how they are performed.

I may also mention that I performed experiments with the brown-tail moth (*Euproctis chrysorrhoea*), similar to those performed with the gypsy moth, but in this case successful results were not obtained, as only two percent of the caterpillars succumbed to the disease. I have, moreover, observed a similar percentage of dead chrysorrhoea caterpillars in nature near Raymond, N. H. There I found a wooded area where flacherie had broken out especially among the American tent caterpillars
(Malacosoma americanum Fabr.) and those of various Noctuidae, but in spite of the presence of brown-tail caterpillars in large numbers a mortality of only two percent by flacherie appeared among them. It is possible that the caterpillars of this species on account of the larger amount of tannin which they contain, may be almost immune against the organisms of flacherie and it may have been only the weakest individuals which fell a prey to the disease.

Whether flacherie is hereditary or not has not yet been positively established. Standfuss (Handbuch der palearktischen Gross-Schmetterlinge, 2. Auflage, Jena, 1896) leans toward the latter conclusion, assuming that infected caterpillars never survive until the adult stage (p. 160). Experiments would, however, be necessary to prove this hypothesis, for as already mentioned, it has been shown that caterpillars affected with flacherie can pupate, later dying in that stage. And further, in my experiments on Junonia coenia (Journ. Exper. Zool. Vol. VI, No. 4, June 1909, p. 13) this was shown where (p. 555) I referred to a pupa in which the body was decomposed by flacherie. It had died about six hours before the emergence of the butterfly, since all the parts of the specimen were entirely developed. The possibility of the inheritance of the disease cannot be cast aside therefore without further data.

As to the actual primary cause of flacherie but very little can as yet be stated with certainty. Fischer (l. c.) thought that several species of micro-organisms (bacilli) are concerned in the disease, while Dr. Hofmann (Insektentötende Pilze, Frankfurt, a. M. Peter Weber Verlagshandlung) as early as 1891 found present in the excrement and body cavities of caterpillars affected with the disease, extremely small bacilli, innumerable schizomycetes, and more particularly small strings of micrococci. The relationship of these micro-organisms to flacherie are still to be elucidated by the investigations of bacteriologists and pathologists.

I am especially indebted to Prof. W. M. Wheeler for many suggestions given me in the preparation of the foregoing account and for the encouragement he has given me in the work.

Bussey Institution, October 10th, 1909.
OLIGOSITA AMERIGANA ASHMEAD SPECIES NOVA, A NEW CHALCIDOID OF THE FAMILY TRICHOGRAMMIDAE FROM ILLINOIS.

BY A. A. GIRAULT, UNIVERSITY OF ILLINOIS.

I have been requested to draw up the following description of a species of Trichogrammidae, which, though undescribed, has been mentioned in the literature for several years past, in fact as far back as 1903. It is the first species of the genus Oligosita Haliday (Walker) to be described from North America and is parasitic on jassid eggs, as will be shown later. In 1903, Professor F. M. Webster published a brief paper entitled Some Insects Inhabitants of the Stems of Elymus canadensis (Webster, 1903 a) in which it is stated in regard to this species:

"*Oligosita americana Ashmead MS. nov. sp. Also reared from same species of grasses from Princeton, Ind., and in connection with Eurytomocharis eragrostidis Howard, at Urbana. This is the first time this genus has been recorded in America."

The species is marked with an asterisk to show that it also was reared from Elymus virginicus and the original rearings were made at Urbana and Champaign, Illinois, in connection with studies on species of Isosoma inhabiting the stems of various grains and grasses. In this way, the parasite became connected with Isosoma as host, and in the same year, Webster (1903 b) recorded it definitely from the eggs of Isosoma hordei (Harris) in these words: ‘‘There is little doubt that Oligosita americana Ashm. and Polynema citripes Ashm.¹ both attack and destroy the eggs, as I have reared them in numbers from stems of Elymus inhabited by the larvae, and also the stems of other grasses inhabited by other Isosoma larvae.” (p. 33). Webster adds further, in connection with Isosoma grande (Riley), “not with certainty from Isosoma grande Riley,” and also he indicates it to be an egg-parasite of Isosoma tritici (Fitch) and I. captivum Howard. The hosts of the parasite were therefore listed in accordance with the foregoing by Girault (1907). So far as I am able to find, it has not been mentioned again in the literature.

Recently, I have been informed by Mr. R. L. Webster of Ames, Iowa, who reared the species at Urbana, Illinois in 1905 from the eggs of a jassid determined by Herbert Osborn as being those probably of Dorycepalus platyrhynchus Osborn, that its previous record from the eggs of species of Isosoma by the elder Webster (1903; ¹ Polynema citripes Ashmead, a nomen nudum.
Girault, 1907) was based on error, the eggs of the jassid being found in the stems of Elymus along with the Isosoma larvae. Mr. Webster was kind enough to allow me to incorporate herewith the substance of a note which he had drawn up for publication with the view of rectifying matters. In this note, he states in part:

“In the spring of 1905 I reared this same species from jassid eggs deposited within the stems of Elymus found near Urbana, Illinois, on April 1, 1905. The jassid eggs were found while splitting stems of Elymus for larvae of Isosoma. The stems containing the jassid eggs was placed in a vial for further developments and on May 27th, 1905, the parasites emerged in abundance. Nearly every egg was parasitized.

Specimens were sent to Washington and the species was determined as Oligosita americana Ashmead MS. The jassid eggs were sent to Professor Herbert Osborn who replied that the eggs "looked very much like those of Dorycephalus platyrhynchus Osborn, and if occurring in Elymus I should think probably that species." According to Dr. Ashmead, another species of this genus is also parasitic on jassid eggs. From this, it would appear that Oligosita americana is to be regarded as a parasite of jassid eggs rather than on those of the genus Isosoma."

As a matter of general principle, I am greatly opposed to accepting names of species proposed in a manner similar to this, for they are merely nomina nuda; I therefore accept this name under protest and use it as a matter of expediency only, — tending to avoid confusion — on account of the fact that it has slipped inadvertently into the literature. The habit which prevails in Entomology of using manuscript names is a bad one; they are very liable to become obstructions, hence should be avoided. The usage seems to have been most prevalent in connection with the parasitic Hymenoptera, and it is not a difficult matter to point to many examples now existing in the literature, where the names alone exist, the description of the species having been subsequently neglected, or entirely overlooked.

Family TRICHOGRAMMAE.

Subfamily Oligositinae.

Genus Oligosita Haliday (Walker).

Oligosita americana Ashmead species nova.

Webster, 1903a, p. 92.
Idem, 1903b, pp. 22, 33.
Girault, 1907, p. 32.
Normal position.

Female: Length, 1.0 mm., average; moderate for the subfamily; visible to naked eye.

General color pallid lemon yellow, uniform; apical tarsal joint dusky; venation concolorous; legs and antennae pallid, with some silvery; wings hyaline, with the exception in the fore wing of a minute, but distinct, usually ovate but variable, fumated spot or dot projecting caudad (and slightly proximad) from the caudal apex of the stigmal vein, and embracing its knob. Abdomen with three conspicuous dusky bands encircling its center, all interrupted at the meson dorsad, the interruption broadest in the cephalic band, the caudal band of the three not very widely interrupted; these bands are along the caudal margins of the 4th, 5th and 6th abdominal segments and are less distinct ventrad. Ocelli and eyes deep red; mandibles fuscous.

Body impunctate, the vertex and dorsal aspect of the thorax delicately longitudinally striate, the abdomen showing distinct polygonal reticulation, which gives the appearance of longitudinal striation and scaliness. The striation of the vertex and thorax is fine.

Fore wings mostly without discal cilia, excepting in the apical fourth where they are not dense; the ciliate area is irregular, extending proximad to a point opposite the proximal end of the marginal vein in the caudal third of the wing, not near the caudal margin, in a line of paired setae, and again farther cephalad, spreading irregularly to the knob of the stigmal vein; there are also one or two scattered setae proximad of the stigmal knob, caudad of the marginal vein; discal cilia not arranged in regular rows. Apex of fore wing regularly, symmetrically rounded, the postmarginal vein absent, the stigmal vein short, thickened distad to form a triangular knob, the apex of which is obliquely truncate; stigmal vein forming a curved continuation of the marginal vein, the angle formed by them obtuse; marginal and submarginal veins long, subequal, the former thicker. Marginal cilia of the fore wing longest distad, the longest cilia not more than two-thirds the greatest width of the wing, which is at the distal fourth distant from the venation. Body of hind wing linear, with one principal longitudinal row of discal cilia, excluding the single row near the cephalic margin running along the bases or insertions of the marginal cilia; the usual row of discal cilia near the caudal wing margin obsolete. Marginal cilia of the cephalic margin of the hind wing short and delicate, but distinct, those of the caudal margin long and strong, about equal in size to the largest marginal cilia of the fore wing and distinctly twice longer than the greatest width of the hind wings.

Eyes coarse; ocelli in an acute-angled triangle in the center of the vertex, dis-
tant from the eye margins, the caudal ocelli slightly farther apart than either is from the respective eye margin or from the cephalic ocellus.

Legs normal, the intermediate tarsal joint of the intermediate and caudal legs slightly the shortest, the proximal and distal joints subequal; proximal and intermediate tarsal joints of the cephalic legs subequal, slightly shorter than the distal joint. Spurs inconspicuous, excepting on the caudal tibiae, single. Mandibles apparently tridentate, the two outer (lateral) teeth largest, subequal.

Antennae 7-jointed, with a single ring-joint, a 1-jointed funicle and a 3-jointed club, clothed with moderately long, sparse setae. Scape slightly convexed ventrad, somewhat longer than the pedicel, ring-joint and single funicle joint combined, subequal in length to the club; pedicel obconic, longer than the funicle joint or any of the club joints; ring-joint minute, transverse; funicle joint longer than wide, oval, longer than either of the club joints, excepting the distal one; the 3-jointed club ovate, the proximal and intermediate joints subequal in length, the intermediate joint widest, the distal joint slightly the longest, conical, intermediate in length between the funicle joint and the pedicel.

Abdomen moderately stout, longer than the thorax, ovate; ovipositor not exserted.

(From 5 specimens, 2-inch objective, 1-inch optic, Bausch and Lomb.)

Male: Unknown.

Described from five females mounted in balsam received from Mr. R. L. Webster, Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa, and labelled as follows: "Oligosita americana Ashmead MS. Urbana, Illinois, 1 April, 1905; emerged 27th May, 1905. R. L. Webster." The specimens were described while mounted in balsam; the character of the sculpture, however, was obtained afterwards by clearing in xylol, then REMOUNTING in xylol-balsam FOR permanent preservation.

Type: Accession No. 41078, Illinois State Laboratory of Natural History, Urbana, Illinois, 5 ♀’s in xylol-balsam (1 slide).

There are but three other species of the Genus Oligosita now known, all European, the second described species — *subfasciata* Westwood — having been removed in 1904 by Ashmead to form the type of the genus *Westwoodella* Ashmead. The three remaining European species are *collina* Haliday (Walker), *nodicornis* Westwood and *staniforthii* Westwood. The hosts of these species are as yet unknown and nothing is known concerning the biology of any species of the genus.
LITERATURE REFERRED TO.

1903.  


1907. Girault, Alecandrè Arsène. Hosts of insect egg-parasites in North and South America. Psyche, Boston, Massachusetts, XIV, p. 32.

NOTES ON THE EARLY STAGES OF DEILEPHILA INTERMEDIA.

BY ALLYN COX, WINDSOR, VT.

The eggs, laid June 17th, were small, oval, and green, turning dirty white before hatching.

Three caterpillars hatched in six days, two dying almost immediately. The remaining caterpillar was whitish, growing greener as it ate. It did not eat the shell, but attacked the leaves immediately. It had whitish lines between the segments, a fold of whitish skin behind the head, and a short whitish horn. The setae were invisible to the naked eye and the horn nearly so. It was about three sixteenths of an inch long. It spun threads of silk as it crawled. It ate evening primrose and wild grape, and ate small round holes in the leaves.

The first molt came in four days and the caterpillar was much more gaudy than before. The dorsum was blue-green with whitish green subdorsal lines. The sides were yellow-green with black spiracles. The venter was blue-green and the legs and props yellow-green. The head was small, round, bright green, and still had a fold of whitish skin behind it. In this molt the larva ate from the sides of the leaves.

The second molt came in nine days. The dorsum was blue-green, the sides were yellow-green granulated with white, and the venter was blue-green. There was a greenish white dorsal line and greenish white subdorsals which had on each segment a bright yellow dot. The stigmatal line was light green, but on the first two segments
it was yellow edged above with black. The dorsum of the eleventh segment was almost black running up to the short black horn. The spiracles were black with yellow centers, the last two being very large. There was a green spot on the stigmatal line under each spiracle. The head was green, small, and round. There was a whitish raised plate on the dorsum of the first segment.

The third molt followed in seven days. The head was leaf-green, with a black band above the mouth-parts. The dorsal plate was whitish green. The dorsum was dark velvety green with a light green dorsal line. On the eleventh segment the dorsum was black, and the whole dorsum shaded into black towards the subdorsals. The subdorsals were broken, being made up of small light green dots between the segments and large red spots on all the segments except the first two. There was a yellow spot on the second. The sides were lighter than the dorsum and covered with white dots. The spiracles were yellow with a black area around them. The stigmatal line was yellow and broken — disappearing between the segments. The venter was the same color as the sides, but the white spots were smaller and were only just above the legs and props. The legs were shiny black and the props were black with red plantae. The caudal horn was red at the base and black above. The anal plate was green with a brown tip and lighter edge. There was a light mark like a Greek phi [φ]. As the caterpillar grew larger the colors became paler and the subdorsal spots turned salmon pink.

The fourth molt came in five days and this time the caterpillar was greatly changed. The body was black and shiny. The head was slightly bilobed and pinkish brown, with a black line over the mouth-parts. The anal plate and props and dorsal plate were the same peculiar color as the head. There were large salmon pink spots edged below with white on every segment from three to eleven inclusive. The sides were dotted with yellow. The spiracles were large and white, turning pink the next day. The horn was bright-vermilion, granulated, and could be moved up and down. The legs were shiny black and the props were black with red plantae.

In this stage the whole caterpillar looked artificial as if made of wax. It had a peculiar habit of spinning a thread of silk as it brought its head up after eating a curve out of a leaf.

It fed for ten days, growing to the length of three inches. Then it stopped eating, grew shorter, the subdorsal spots turned purple and it crawled around very rapidly for a day. It then spun threads of silk to hold leaves together over it. Three days later (Aug. 1) it pupated, having had a larval life of thirty-eight days.

The pupa was about an inch and a quarter long and very slender. The head, and the antenna-, leg-, tongue-, and wing-cases, also the back of the thorax were
black, mottled with blackish yellow. The abdominal segments were orange-yellow, with small black spots. The head was prominent and the cremaster was long.

The moth is too well known to need description, as it is common, often flying in the daytime.

THE ARACHNIDA OF THE GALAPAGOS ISLANDS.

BY KARL R. COOLIDGE, PORTERVILLE, TULARE CO., CALIF.

The collection of Arachnida made by the California Academy of Sciences’s Galapagos Expedition in 1905-06, which is now in my hands, numbers one hundred and thirty-three specimens, not including the Scorpionida and the Acarina, which I have not yet seen. But seventeen of the forty-one species of Araneida recorded from the Islands are represented, and the Phrynida, Pseudoscorpionida and Solpugida include a single species each. Apparently none of the species warrant description as new, although the identity of the false-scorpion is somewhat doubtful.

The present collection is the second largest ever made on the Galapagos archipelago. The first collection of importance was made by the Petrel Expedition in 1875. Seven species were enumerated by Butler in his report of this collection (Proc. Zool. Soc. London, 1877). In 1887–88 the Albatross visited the Galapagos, and Marx (Proc. U. S. National Museum, vol. XII, 1889) reports ten species, three of which Butler had previously recorded. By far the largest and most complete collection was made by the Stanford-Hopkins Expedition in 1898–99, the results of which included about six hundred and fifty Arachnida. Bank’s report on these was published in the Proceedings of the Washington Academy of Science, vol. IV, 1902. Prof. V. L. Kellogg also published a briefer abstract of the entomological and arachnological collections in Pschye, vol. 9, p. 173, 1901. Perhaps the most interesting feature of the present collection is the series of Solpugids, Ammotrecha solitaria Banks, obtained, sixteen in number, from five different islands, Charles, Indefatigable, Chatham, Abington, and Wenman. Hitherto, A. solitaria has only been known from a single specimen, the type, from Iguana Cove, Albemarle Island. Banks, the author of solitaria, remarks, “the presence of a Solpugid is unexpected, and it must have been a rare accident that stranded one of these animals so far from the mainland.” But the fact that it is now known from six of the islands would indicate that it is not an introduced, but an endemic, species. The Academy’s expedition also made small collections in Arachnida on Cocos Island and in Lower California.
NOTES ON THE DISTRIBUTION OF SOME TRYPETIDAE WITH
DESCRIPTION OF A NEW SPECIES.

BY CHARLES W. JOHNSON.

Stenopa vulnerata Loew.

This species has a much greater distribution than has been recorded. I have
before me specimens from Cohasset, Mass., August 8 (Owen Bryant); South Kent,
Conn., August 21 (A. P. Morse); Mt. Taxoway, N. C. (F. M. Jones); Cranberry,
N. C., June 6 (H. W. Wenzel) and Eastern Tennessee (S. N. Rhoads).

Trypeta palposa Loew.

Common on thistle, Cnicus pumilus, at Hyannis Port, Mass., July 4, 1904. Mr.
J. A. Cushman also obtained specimens at Woods Hole, July 1, and at Nantucket,
July 4, 1905.

Trypeta ruficauda Fabr.

Collected by the writer at Capens, Moosehead Lake, July 21 and on Orr’s
Island, Maine, July 25, 1907, also taken by Mr. Owen Bryant on Mt. Greylock,
Mass., August 8, 1907. I also have specimens from Bolton, N. Y., and Oswego,

Aciura nigricornis Doane.

One specimen was obtained in sweeping at Amsden near Mt. Ascutney, Vermont,
July 10, 1908.

Rhagoletis cingulata Loew.

Two specimens, Boston (Dorchester) Mass., June 24 and July 2, 1903 (H. M.
Parshley).

Neaspilota achilleae Johnson.

One specimen was obtained on yarrow (Achillea millifolium) at Manomet,

Eurosta fenestrata Shaw.

A specimen referable to this species was collected at St. Augustine, Florida.

Urellia abstersa Loew.

One specimen of this widely distributed species was collected at Woods Hole,
Mass., July 25, 1903.

Another widely distributed obtained on Mt. Greylock, Mass., August 8, '07 (Owen Bryant), Kingston, R. I., Oct. 8, '05 (John Barlow).

Euaresta pura Loew.

This species I have thus far seen only from Massachusetts, with the following records:— Bridgewater, June 27, '03; and Nantucket, July 4, '05 (J. A. Cushman); Cohasset, May 29 (Owen Bryant) Auburndale, Aug. 16; Concord, July 18, '04, and Woods Hole, July 25, '03 (C. W. Johnson).

Euaresta subpura n. sp.

♀ Head light yellow, vertex slightly darker than the face, frontal bristles black, occipital bristles yellow; antennae yellow, aristae black, base yellow; eyes dark green or purplish in different lights. Thorax yellow, covered with short light yellow hairs, bristles black; scutellum yellow bearing four black bristles, metanotum brownish covered with a yellowish pollen. Abdomen yellow somewhat shining and covered with procumbent yellow hairs. Marginal bristles of the penultimate segment black, middle of the first and second segments more or less brownish, terminal segment dark brown, ovipositor reddish. Legs yellow with light yellow hairs; halteres light yellow. Wings whitish hyaline, the yellow veins of the basal half giving that portion a yellowish tinge, the markings and reticulations are similar to those of *E. pura* Loew. Length, 5 mm.

Two specimens collected by the writer at Wildwood, N. J., August 12, 1902, in sweeping over sea burweed (*Xanthium echinatum*). One specimen was also received from Professor John B. Smith, collected at Anglesea, N. J., July 12.

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**CONVOCATION WEEK MEETINGS IN BOSTON.**

The American Association for the Advancement of Science, and the Affiliated Societies, including the Entomological Society of America and the Association of Economic Entomologists, will meet in Boston during Convocation Week, December 27–31, 1909. Visiting Entomologists will be entertained by the Cambridge Entomological Club at a smoker to be given on some evening during the week. An exhibition, illustrative of recent progress in Entomology, is to be held in connection with these meetings. More detailed announcements will appear in the December number of *Psyche*. 
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With this number is issued a \textit{Supplement} giving detailed information concerning the entomological meetings in Boston during Convocation Week.
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C. V. BLACKBURN, (Member Cambridge Entomological Club)
STONEHAM, MASS.
THE RELATION OF SEX TO HELIOTROPISM IN THE BROWN-TAIL MOTH.¹

BY WILLIAM REIFF, HARVARD UNIVERSITY.

For the purpose of obtaining statistical data concerning the attractive power of electric light for the various orders of insects, during the spring of 1909 we had built upon the grounds of the Bussey Institution a light trap of large dimensions. A more detailed description of this trap will be given later after I have been able to gather together for publication the data concerning the various material collected, but for the present it will suffice to state that the source of light was an arc light consuming a current of seven and a half amperes. The light was burned regularly each evening from sunset until two hours before sunrise.

In connection with the amount of brown-tail moth material obtained it should be mentioned that all nests in the neighborhood of the Institution had been carefully removed during the spring so that the moths could not be present in abundance. The daily weather conditions were noted shortly after sunset. The results are indicated in the table on p. 116.

We can see from the table that during the first twelve days, only a single female flew to the light. During this time we had either moonlight nights, or when it was cloudy, an abnormally low temperature for this time of the year; then as the moonlight decreased and the temperature rose, a few females were attracted. The unusually warm 13th of June brought large numbers of both sexes on a night of feeble moonlight. While males of the brown-tail moth had appeared more or less regularly on all other days during the flying time, no females came when the temperature sank below 19° C. The proportionate numbers of the two sexes on the same days were extremely variable. An unusually warm night undoubtedly has the greatest influence in attracting both sexes to the electric light, but if there should be at the same time a very noticeable moonlight the number of females will remain far below that of

¹ Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 10.
<table>
<thead>
<tr>
<th>Date</th>
<th>Temperature (centigrade)</th>
<th>Barometer</th>
<th>Weather Conditions</th>
<th>Number of moths flying to light</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/29</td>
<td>21°</td>
<td>29.84</td>
<td>Bright moonlight, occasional light clouds, damp air.</td>
<td>1 1</td>
</tr>
<tr>
<td>6/30</td>
<td>23°</td>
<td>20.74</td>
<td>Very bright moonlight, clear.</td>
<td>4 4</td>
</tr>
<tr>
<td>7/1</td>
<td>23°</td>
<td>29.52</td>
<td>Very bright moonlight, clear.</td>
<td>4 4</td>
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<tr>
<td>7/2</td>
<td>21°</td>
<td>29.58</td>
<td>Cloudy sky.</td>
<td>4 4</td>
</tr>
<tr>
<td>7/3</td>
<td>19.5°</td>
<td>29.42</td>
<td>Very bright moonlight, clear, windy.</td>
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</tr>
<tr>
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<td>29.61</td>
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</tr>
<tr>
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<td>19°</td>
<td>29.82</td>
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<td>20 26 1 27</td>
</tr>
<tr>
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<td>15°</td>
<td>29.86</td>
<td>Bright moonlight, occasional light clouds.</td>
<td>20 20</td>
</tr>
<tr>
<td>7/7</td>
<td>11°</td>
<td>29.78</td>
<td>Cloudy sky.</td>
<td>12 12</td>
</tr>
<tr>
<td>7/8</td>
<td>10°</td>
<td>29.64</td>
<td>Light clouds.</td>
<td>20 20</td>
</tr>
<tr>
<td>7/9</td>
<td>19°</td>
<td>29.88</td>
<td>Weak moonlight, clear.</td>
<td>10 10</td>
</tr>
<tr>
<td>7/10</td>
<td>19°</td>
<td>30.01</td>
<td>“ ” “ ”</td>
<td>14 14</td>
</tr>
<tr>
<td>7/11</td>
<td>20°</td>
<td>29.94</td>
<td>“ ” “ ”</td>
<td>15 2 1 18</td>
</tr>
<tr>
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<td>23°</td>
<td>29.69</td>
<td>Cloudy sky.</td>
<td>11 2 1 14</td>
</tr>
<tr>
<td>7/13</td>
<td>26°</td>
<td>29.56</td>
<td>Very weak moonlight, clear.</td>
<td>117 100 11 228</td>
</tr>
<tr>
<td>7/14</td>
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<td>29.81</td>
<td>Cloudy sky.</td>
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</tr>
<tr>
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<td>29.93</td>
<td>“ ” “ ”</td>
<td>18 1 19</td>
</tr>
<tr>
<td>7/16</td>
<td>22°</td>
<td>29.68</td>
<td>Light clouds.</td>
<td>24 4 28</td>
</tr>
<tr>
<td>7/17</td>
<td>22.5°</td>
<td>29.76</td>
<td>New moon, clear.</td>
<td>30 15 45</td>
</tr>
<tr>
<td>7/18</td>
<td>22°</td>
<td>29.64</td>
<td>Rain till then, clear.</td>
<td>21 21</td>
</tr>
<tr>
<td>7/19</td>
<td>18.5°</td>
<td>29.74</td>
<td>New moon, clear.</td>
<td>12 12</td>
</tr>
<tr>
<td>7/20</td>
<td>19°</td>
<td>30.02</td>
<td>“ ” “ ”</td>
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<td>7/21</td>
<td>18°</td>
<td>30.03</td>
<td>“ ” “ ”</td>
<td>3 3</td>
</tr>
<tr>
<td>7/22</td>
<td>19°</td>
<td>29.92</td>
<td>Light clouds.</td>
<td>3 1 4</td>
</tr>
<tr>
<td>7/23</td>
<td>17°</td>
<td>29.66</td>
<td>Cloudy, rainy.</td>
<td>2 2</td>
</tr>
<tr>
<td>7/24</td>
<td>21°</td>
<td>29.71</td>
<td>Slight moonlight, clear.</td>
<td>1 1</td>
</tr>
<tr>
<td>7/25</td>
<td>21°</td>
<td>29.84</td>
<td>“ ” “ ”</td>
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<tr>
<td>7/26</td>
<td>24°</td>
<td>29.95</td>
<td>“ ” “ ”</td>
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<tr>
<td>7/27</td>
<td>25°</td>
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<tr>
<td>7/28</td>
<td>27°</td>
<td>29.99</td>
<td>Bright moonlight, clear.</td>
<td>1 1</td>
</tr>
<tr>
<td>7/29</td>
<td>26°</td>
<td>29.84</td>
<td>Very bright moonlight, occasional light clouds.</td>
<td>2 2</td>
</tr>
<tr>
<td>7/30</td>
<td>26°</td>
<td>29.63</td>
<td>Very bright moonlight, occasional light clouds.</td>
<td>2 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>401 138 13 552</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grand Total</td>
<td>552</td>
</tr>
</tbody>
</table>
males. Besides, the normal flying time of the males (June 29–July 30) is shown by the table to be nearly twice as long as that of the females (July 5–July 22). On this account the males have much more frequent opportunities to fly to light, aside from the fact that the males are produced in greater quantity than the females.—Only thirteen male specimens of the aberration punctigera Teich flew to the light.

It has often been said that the females of the brown-tail moth are attracted to electric lights in only very small numbers. The statistics obtained this year which I have given, show, however, that the attraction of females is dependent in great measure upon the weather conditions which prevail during the flying time, so that it may be different in successive years, and a proportion applicable to all years cannot be given. The foregoing table shows that the proportion of males to females for the flying period of 1909 is about 4:1, but the proportion of males and females on single days is extremely variable. Thus while the unpleasant 18th of July shows the greatest preponderance of males over females (21:9), the pleasant night of July 13th attracted the sexes in the ratio of 1.2:1. The 14th and 17th of July were also favorable for the flying of females and although the combined number of both sexes attracted on these nights was not much above the average, the ratio of males to females was 1.8:1 and 2:1 respectively.

I had the opportunity of observing a similarly favorable proportion of the two sexes about electric lights at Raymond, N. H., on the 17th of July, in a locality which had been badly damaged by the brown-tail moth. Although I do not know exactly what the temperature and pressure were at Raymond on the night of the 17th, the thermometer probably registered about 22°–23° C. and the barometer in the neighborhood of about 29.70. In addition the moon was new and the air still and dry. Immediately after dark both males and females came flying to the electric light in enormous numbers. The flight of each individual lasted for hardly a minute, for they almost immediately searched for a resting place close to the light, either on the light pole or the wires leading to the light. Here the most noticeable feature was the abundance of pairs in copulation; hardly had a female settled when she would be surrounded by numerous males seeking to unite with her. The female very quickly made her selection and remained with her mate during the whole night in the bright light. Even on the following morning, numerous pairs could be observed in the same places. As nearly as I could make out, every female which came to the light paired with a male, at least not one single female was observed which was not in copulation. The moths stopped coming to the light at about eleven o’clock. An exact count of the specimens could not be undertaken on account of the great abundance of the species, and also because many specimens on trees surrounding the
light escaped observation. The ratio of the sexes can therefore be given only in a general way from the notes which I made concerning three arc lights.

On lamp No. 1 were found about 530 ♂♂ and 350 ♀♀

\[ \begin{array}{ccc}
2 & 310 ♂♂ & 220 ♀♀ \\
3 & 300 ♂♂ & 240 ♀♀ \\
\end{array} \]

1230 ♂♂ 810 ♀♀

The ratio of males to females was therefore in this case 1.5 : 1. Strange to say, the aberration punctigera Teich was entirely absent among the large number of specimens. These observations at Raymond give further evidence for the statement that females of the brown-tail moth are attracted to electric lights almost as strongly as the males, although the flight of the female is particularly affected by the weather conditions which prevail at the time of emergence. That the females at Raymond had just emerged on the 17th of July is shown by the fact that they went into copulation at the light. They must undoubtedly have just emerged, for if the females had left the pupa cases one or more days before, they would have copulated previously, since it is known that members of the Liparidæ and related families copulate during the first twelve hours after emergence. The certainty that females of the brown-tail moth also fly in numbers to electric lights on favorable evenings, has therefore an economic value in the destruction of this species. As the females have naturally not laid eggs before the flight to the lights, the regular destruction each night of the adult females would prevent a possible later egg-laying on the trees in the neighborhood.

I might also mention a simple yet effective method which was utilized this year for the destruction of brown-tail moths in various places in New Hampshire. On still nights, during the flight of the moths they built under the electric arc-lights bonfires, which were well moistened before being lighted. The smoke thus produced did not ascend so far up as the height of the lamp so that the light was not obscured. The brown-tail moths circling about the light soon flew into the clouds of smoke, then falling into the fire to their death. As a result there were windrows of the brown-tail moths 4-5 cm. high about the periphery of the bonfire, and one can judge of the enormous numbers of moths which were killed by this means.
THE CHALCIDOID PARASITES OF THE COMMON HOUSE OR TYPHOID FLY (MUSCA DOMESTICA LINNAEUS) AND ITS ALLIES.

I. RECONSTRUCTION OF THE CHALCIDOID GENUS NASONIA ASHMED OF THE FAMILY PTEROMALIDAE, WITH DESCRIPTION AND BIOLOGY OF NASONIA BREVICORNIS ASHMED, SPECIES NOVA, ITS TYPE SPECIES FROM ILLINOIS.

BY A. A. GIRAULT AND GEORGE ETHELBERT SANDERS, UNIVERSITY OF ILLINOIS.

Introduction.

During the course of some investigations concerning the economy and biology of the common house, or typhoid fly as it is now being more appropriately called,—Musca domestica Linnaeus,—carried on in the insectary of the Office of the State Entomologist of Illinois in the late summer and early fall of 1908, a quite unexpected abundance of a number of hitherto unnoticed or little known parasites of that host and others of the higher Diptera occurred, among which three generic forms predominated—Spalangia Latreille, Muscidifurax Girault and Sanders MS.¹ and Nasonia Ashmead, all of the family Pteromalidae. The latter genus is now under consideration. In this paper, from a large number of specimens of both sexes, the genus is redescribed in detail and its type species described as new under the name originally given it by the late Dr. Ashmead (Ashmead, 1904). We enter into the status of the genus and its sole species beyond. Such biological facts as were learned concerning it are also incorporated herewith.

In the series of papers to follow, the genera of the parasites met with during the investigation are considered in detail, and finally, a list of the Chalcidoid parasites of the world's Muscoidous Diptera is given, as well as a summary of the whole.

History and Description of the Genus.

The genus Nasonia was based on specimens collected at Algonquin, Illinois, in 1894 and 1895 and sent to the United States National Museum by Dr. William A. Nason in whose honor it was named. It was proposed and described by Ashmead in 1904 (l. c.) in a table of the genera of the pteromaline tribe Eutelini and the undescribed Nasonia brevicornis was named in connection with it as type. The generic description is as follows, extracting from the table:

¹ Described in the third paper of this series.
Pteromalids with abdomen sessile, ovate, shorter than the thorax; metanotum not short, with spiracular sulci, median and lateral carinae, its spiracles oval; antennae 12- to 13-jointed, rather short, flagellum subclavate, the pedicel long and obconical, the funicle joints wider than long, inserted ventrad of the middle of the face about on an imaginary line drawn between the ventral ends of the eyes; thorax long; head with a broad vertex bearing large ocelli in an acute triangle; pronotum with the cephalic margin acute; marginal vein hardly longer than the stigmal vein.

The genus lay next to Platygerrma Walker and Mesopolobus Westwood from both of which it is separated in the table by the much shorter abdomen and its ovate shape.

We accept this genus, and especially the species under protest and merely because it is the wisest thing to do under the circumstances. From the standpoint of nomenclatorial science, the genus is proposed in an inexusable manner; aside from opinions and codes which do not as yet remedy effectually this kind of systematic obstruction, of itself, the generic description has no specific characters in it and not without imagination is it thinkable that the type species is also described by it. If one wishes to hold that the species is described by it, however, he must admit at once that since the time of Linnaeus, no improvements have been made in descriptive work, besides naively overreaching his own common sense. The code should prevent future cases of this kind.

The position of Nasonia in the Ashmeadean tribe Entelini of the Pteromalinae is not altogether tenable, for the spiracular sulci are obsolete or subobsolete, which would seem to ally the genus with the tribe Roptrocerini of the subfamily Merisinae. For the present, however, we leave the genus in the positionOriginally ascribed to it.

Family PTEROMALIDAE.
Subfamily Pteromalinae.
Tribe Eutelini.
Genus Nasonia Ashmead.

(Type: Nasonia brevicornis Ashmead, species nova, described beyond.)

Normal position; taken from the type species.

Female: Normal in size or stature and aspect for the tribe; size very variable; moderately robust, metallic aeneous, sheened.

Head (cephalic aspect) elliptical-oval with the long axis latero laterad, that is wider than long the eyes forming the apices, slightly bilobed, the median line of the face obtusely concaved or impressed, in which impression lie the scapes, the scrobes
obsolete; face broad; clypeus small, subquadrate, its ventral (apical) margin truncate, its sutures distinct; immediately ventrad of the antennal insertions, along the median line between them and the clypeus is an obtuse convexity (frontal prominence); genal sulcus obsolete; (lateral aspect) face subconvex, the genae nearly as long as the eyes, rounded, the scape of the antennae not reaching to the apex of the vertex or to the cephalic ocellus; eyes ovate, not in the direct lateral aspect, practically hairless; (dorsal aspect) head about two and a quarter times wider than long, the vertex broad, its cephalic margin broadly emarginate at the meson, the occipital margin obtuse, nearly straight; eyes wide apart, the ocelli in a flat, obtuse-angled triangle, not especially near the occipital margin and distant from the eyes. Head somewhat wider than the widest part of the thorax. Antennae inserted slightly below (ventrad) of the middle of the face, just dorsad (above) of a slight transverse facial prominence, slightly above (dorsad) an imaginary line drawn between the ventral ends of the eyes, but still ventrad of a line drawn through the middle of the eyes or not half way up the eye margins, compact and short, the flagellum clavate, the pedicel much longer than the proximal funicle joint, the funicle joints all wider than long, excepting perhaps the first, with two ring-joints, a 3-jointed club and a 6-jointed funicle and but moderately pubescent (Fig. 1). Right mandible 4-dentate, the left 3-dentate, nearly as in Stenomalus Thomson (1878). (Fig. 2.)

Pronotum visible, rounded, narrowed mesad, about a third the length of the mesoscutum, its cephalic margin subacute. The mesoscutum with the parapsidal furrows incomplete, but extending from the cephalic margin for more than half the length of the mesoscutum; from lateral aspect, thorax broadly, flatly convex; axillae widely separated; scutellum with a narrow, transverse, grooved line at the base of its apical (caudal) fourth, composed of minute punctures; median and lateral carinae of the metathorax distinct, the latter curved; spiracular sulcus absent; spiracle of metathorax subreniform, somewhat near the postscutellar margin, its axis oblique; metathorax punctate, with little or no neck.

Abdomen sessile, widest at the apex of the second segment (1st body segment),
robust, flat above, conic-ovate, shorter than the thorax and variably convex below (ventrad), sometimes not noticeably so; segment 2 nearly a half the total length of the abdomen, segment 3 next longest but only a third the length of segment 2, segments 4 and 5 subequal, very short, both together not quite as long as segment 3; segment 6 slightly longer than 4 or 5, the latter being intermediate in size between the two; segments 7 and 8 minute, the latter conic.

Wings hyaline, the fore wings (Fig. 3) rounded apically, without marginal

fringes, but usually ciliate in the disk, naked, however, proximad of the apical end of the submarginal vein, the latter over twice the length of the marginal vein which is slightly longer than the postmarginal vein and somewhat more so than the stigmal vein; postmarginal vein slenderer, slightly longer than the stigmal vein which is slightly curved with a small, truncate club and uncus. Submarginal vein of hind wings thickened and confluent with the costal margin proximad, for not half its length, then descending, twice or more longer than the marginal vein, the disk of the wing ciliate, and the caudal margin with short cilia.

Tarsi 5-jointed, the tibial spurs single. Marginal vein of fore wing normal, not thickened, uniform in width.

Last joint of maxillary palpi as long as the combined lengths of the other 3 joints, or nearly. Labial palpi 3-jointed, the intermediate joint minute, the others subequal but the distal joint somewhat the longest of either of the three.

Male: The same in general bodily structure as the female, but slenderer, smaller, the fore wings entirely differently shaped and smaller, being much the broadest just
apicad of the postmarginal vein in the female, but in the male slenderer and subfuscous, not subpyriform, rather, strongly clavate. Different in aspect.

Head (cephalic aspect) not noticeably impressed along the meson, more convex; (lateral aspect) the eyes more rounded and proportionately larger, the genae not as long as the eyes, the scape reaching to the apex of the vertex or slightly beyond; (dorsal aspect) head the same but much wider than the greatest width of the thorax, at least a third or more wider; antennae inserted slightly more dorsad, not quite half way up the eye margins, the flagellum slenderer, the funicle joints not quite as wide in proportion to their length as in the female, the proximal funicle joints quadrilateral or subquadrate (Fig. 4); mandibles as in the female. Genal sulcus absent.

Pronotum slightly longer in proportion to the length of the mesoscutum; the transverse groove before the apex of the scutellum more distinct; the lateral carinae of the metathorax complete, distinct, curved, the median carina distinct, but faint; metathoracic spiracles slightly smaller, farther caudad, elliptical. Metathorax punctate.

Abdomen the same, but depressed, concave dorsad (dead specimens), variable in length but usually not exceeding that of the thorax and from dorsal aspect ovate; segment 2 the longest and broadest segment, but not quite as long in relation to the length of the abdomen as in female, all of the caudal margins of the segments straight; segments 4 and 5 subequal, both together about equal to the length of segment 3, which is not quite a third of the length of segment 2; segments 6, 7, and 8 longer than segment 4 or 5, but not as long as segment 3, all subequal, the 8th the longest of the three and conic in shape. Genitalia exserted in death.

Fore wings (Fig. 5) different, more pubescent or ciliate in the apical half than in the female fore wing, subclavate, with a dusky hue due to the thick discal cilia and slightly fumated and opalescent. Venation the same but the knob of the stigmal vein is larger, more dilated.

A genus of rather short and stout parasites, not unusual for its family, excepting in the case of the wings of the male. If placed in the tribe Roptrocerini, it would be nearest to Uriella Ashmead, but differing from that genus in the shorter, broader, differently shaped abdomen, the entirely different, stouter and shorter, antennae, in the longer third abdominal segment and antennal pedicel, the shorter postmarginal vein, the larger metathoracic spiracles, the presence of the lateral carinae or folds of the metathorax and possibly in mandibular characters, those of Uriella being perhaps 3-dentate (Ashmead, 1896). The genus has also many of the characters of Mormoniella Ashmead of the tribe Rhaphitelini, another genus without a described type species.
Host Relations of the Genus.

Heretofore, nothing has been recorded concerning the hosts of this genus. Beyond, we give a record of a large series of rearings of the type species, all of which may be included in the following general statement: The genus attacks gregariously or "socially" the puparia of three or four genera of the higher Diptera — Chrysomyia (macellaria), Lucilia, Musca (domestica), Sarcophaga and Phormia (regina); also it may be found to attack Calliphora. All of these are forms of economic importance. In nature, the genus attacks mostly Chrysomyia (macellaria) and Phormia (regina), so far as is known. In confinement, it readily attacked the puparia of Cynomyia cadaverina Desvoidy, in addition to the others. Though gregarious, it is an external parasite, the larvae not penetrating the host's body.

Distribution of the Genus.

This genus appears to be very abundant, at least in the state of Illinois. It has not however been recorded from more than two localities in that state, namely Algonquin (Nason, 1906) where it was first discovered and Urbana and Champaign, two adjoining towns farther south in the state.

The Type Species of the Genus.

Nasonia brevicornis Ashmead, as previously stated, has never been described, merely being named in parentheses as type of the genus. Other than that, it has been mentioned but once in the literature, namely by Nason (1906), who records its first collection. Heretofore, its status has been that of a nomen nudum, or nearly.

1. Nasonia brevicornis Ashmead, species nova.

Ashmead, 1904, pp. 317-318.
Nason, 1906, p. 156.

Normal position.

Female: Length, very variable; maximum, 2.30 mm.; minimum, 1.0 mm.; range, 1.3 mm.; average, 1.75 mm.; mode, 2.0 mm. Usually stout.

General color metallic dark brassy green, the abdomen dark, less metallic, shining, the metathorax dull; scape and pedicel fuscesc, the latter often much darker, especially dorsad; flagellum neutral blackish, dusky; legs fuscesc with the following exceptions — coxae concolorous, metallic, the intermediate ones often fulvous at the apex or the entire joint dull blackish; apical tarsal joints dusky; most of the dorsal aspect of the caudal femora blackish. Eyes garnet; ocelli pinkish; tegulae
fulvous. Wings hyaline, the venation fulvous. Ventum concolorous, or sometimes, including the thoracic pleura, with a steel bluish color.

The whole of the head densely reticulated with polygonal figures similar to that of the mesothoracic dorsum and about of the same roughness as the surface of the eye, the surface of the clypeus, however, longitudinally rugulose; ocelli oval, the lateral ones with their apices oblique, the cephalic one with its axis transverse (lateral-laterad); lateral ocelli about the same distance from the cephalic ocellus as they are from the respective eye margins, but much wider apart from each other.

Pro- and mesonota polygonally sculptured like the head, not punctate, the former not as broad as the latter; cephalic and caudal margins of the scutum straight, the caudal margin slightly broken at the axillae; the axillar sutures, as usual, widening caudad and transversely carinate; scutellum widest at the transverse grooved line or suture, somewhat acorn-shaped, at its base against the mesoscutum, impressed transversely the impression or suture bearing short longitudinal carinae, closer and shorter than those on the surface of the mesopostscutellum; the latter sclerite transverse, slightly convexly curved, widening laterad, impressed and with longitudinal ridges, its caudal margin carinated; scutellum not as long as the scutum, but nearly so; cephalic margin of the mesopostscutellum carinated or acute in the direct dorsal aspect; sculpture of the metanotum coarser, punctate, especially the disk or that portion included between the lateral carinae; metanotum not as long as the scutellum but as wide as the widest portion of the mesothorax, its pleurum bearing a moderately large clump of stiff white hairs ventrad of the spiracle, its caudo-lateral angles subacute and at the caudal end of the median carina is a slight rising or neck just cephalad of which is a transverse line of a few large punctures or obscure depressions, extending from side to side. Pleura of thorax sculptured as the metanotum, but more coarsely, the intermediate and cephalic coxae nearly smooth, the caudal coxae reticulated. Hairs on body sparse, no conspicuous pubescence.

Abdomen delicately, minutely polygonally reticulated; tip of ovipositor fuscous. Proximal joint of the caudal tarsi longest, the apical joint next longest, the second joint third in length about a third shorter than the proximal joint and the third and fourth joints subequal, shortest, not quite half the length of the proximal joint. Caudal halves of segments 5–8 of abdomen with fine pubescence, less and less so on proximal segments.

Antennae short, stout, clavate, not compressed, flagellum (funicle + club) hystidipubescent, the pubescence dense enough to conceal the true surface of the joints or the sculpture of them. Scape slightly compressed, its margins nearly straight, very slightly convexed at their centers and slightly narrower distad, bearing minute, fine,
scattered hairs, moderately stout and as long as the united lengths of the pedicel, ring-joints and the 3 proximal funicel joints or about half the length of the flagellum (including pedicel); scape as long as the funicel and twice the length of the club. Pedicel narrower, obconic, with a moderately long, tapering neck, distinctly twice longer than the proximal funicel joint, slightly longer than the united lengths of the two proximal funicel joints, and much longer than any of the following joints; ring-joints small, the first smaller than the second, about half its size, the second distinctly three times smaller than the proximal funicel joint; funicel compact, the joints all wider than long and closely united, gradually widening distad and all about subequal, the funicel stout and nearly cylindrical; joints 1 and 2 of the funicel more nearly equal, longest, subquadrate; joint 3 slightly wider and shorter, joints 4, 5, 6 nearly equal, widest and shortest, each about a fourth shorter and a third wider than joints 1 or 2 of the funicel; club compact, wider, conic-ovate, not quite half as long as the funicel, its basal joint somewhat longer and slightly wider than the distal funicel joint, the intermediate joint longer but narrowing distad, the apical joint conic, distinctly shorter. Pubescence of pedicel and ring-joints longer and somewhat denser than that of the scape, but inconspicuous, that of the funicel and club similar, much denser, distinct and each joint has distinct longitudinal carinae, which appear in balsam-mounted specimens, high-power, as transverse rows of stout, flattened hairs attached caudad of the apical half of each respective joint and which may also give the appearance under high-power of whitened, longitudinal sulci. The pubescence of the flagellum is arranged in about two principal transverse rows, but not regularly so. Antennal bulbs separate for over their own widths.

Left mandible 3-dentate, the inner (mesal) tooth broad, truncate, the intermediate tooth obtuse, conic, the outer (lateral) tooth acute, slightly the longest. Right mandible 4-dentate, the mesal tooth broadest, broadly rounded at apex, the two intermediate teeth subequal, short, small, curved, obtuse, the outer (lateral) tooth acute, longest.

(From 447 specimens, 4-inch objective, 1-inch optic, Bausch and Lomb.)

**Male:** Length, very variable; maximum, 2.0 mm.; minimum, 0.60 mm.; range, 1.4 mm.; average, 1.32 mm.; mode, 1.3 mm. Usually appearing a third smaller than the female.

Aspect different, lighter in color, more brassy, metallic and green, the abdomen depressed, ovate to fusiform, usually concave dorsad, sometimes flat; rounded ventrad, rarely convexed, shorter than the thorax; the vertex decidedly brassy; legs and antennae honey-yellow, excepting the coxae; clypeus less longitudinally rugulose, glabrous at the extreme apical meson, wider than long; wings smaller, more densely
ciliate, somewhat clouded and with a distinct fumated area just caudal of the margi-
nal vein and the curved distal portion of the submarginal vein; grooved, punctate
transverse line of the scutellum curved convexly at the meson; metathorax with a
slightly larger neck. Eyes sometimes a brilliant carmine.

Antennae about the same shape as in the female, but slenderer, less densely
and more softly pubescent, the funicle joints relatively longer, the apical club joint
more pointed, the scape relatively stouter.

Ring-joints more nearly equal, the second longer than the first, however. First
funicle joint quadrate, sometimes longer than wide; pedicel stouter and shorter, but
distinctly much longer than the proximal funicle joint. Longitudinal carination
present on the club only.

(From 143 specimens, \frac{3}{2}-inch objective, 1-inch optic, Bausch and Lomb.)

Viewed with a hand-lens (Coddington, \frac{1}{2}-inch, Bausch and Lomb), the female
is a deep rich dark green, the abdomen nearly black, the head and thorax dorsad
reflecting brassy scintillations, in some lights entirely brassy; in the ventral aspect
and also the lateral, the thorax appears bluish; the antennae dark, the scape and
pedicel a rich brown, the legs mostly brown with darker femora. On the contrary,
the males appear a brilliant bright metallic green, reflecting brassiness, the antennae
and legs light yellowish brown, the wings small, clouded, with a soiled appearance;
the ventral aspect is the same but with slight traces of metallic bluish. The male is
noticeably more brilliant and bright than the female, which is somewhat sombre.

The appearance of the two sexes to the naked eye is also characteristic. The females
appear as comparatively large, stout, blackish gnats, with large, clear wings;
the males as a rule appear to be a half size smaller, the wings less conspicuous and
clouded, often not noticed at all, the bright greenness of the body and the light
yellowish antennae and legs being characteristic; further the females are distin-
guished by their comparative stoutness, the stout abdomen (and its usually triangular
shape, lateral aspect), while the abdomen of the male is flat, with the penis exserted
and curved. In life, however, it is not so easy to distinguish the sexes, as the abdomen
of the male is then decidedly stouter, thicker dorso-ventrad and the genitalia con-
cealed. As a matter of fact, the insect has a different appearance in life, and at a
casual glance, there is not very much difference between the sexes in abdominal
characters. The parasites are also noticeably larger in life than in death, and the
abdominal segments are then fully extended; at a casual glance the males appear to
be wingless. The following descriptive notes were made from specimens recently
emerged (after 2 hours) and stupefied with chloroform: Female — Segment 2 of
the abdomen longest, but only a fourth the total length of the abdomen; 3 next in
length, a third the length of 2; segments 4, 5, 6 and 7 subequal, slightly shorter than 3; segment 8 conic, shorter; abdomen flatly convex dorsad, about as long on the head and thorax combined. Male.—Abdomen nearly as in the female, stout, as long as the combined lengths of the head and thorax; segments 2, 3 and 4 subequal, and 5, 6 and 7 subequal, slightly shorter, the 7th somewhat shorter than 6, and segment 8 still smaller, conic. Highly convex above and flatly so ventrad; sometimes larger in proportion to the body than in the female.

Both sexes vary considerably in size as shown by the measurements given, so that size is not always indicative of sex. A number of males and a few females have been seen which were not much larger than some Mymaridae, not easily noticed with the naked eye, though distinct when once seen.


Described from the following series of 640 specimens, nearly all of which were reared from various muscid puparia in the insectary of the Office of the State Entomologist of Illinois, at Urbana, Illinois, during 1908, and now in the collections of the Illinois State Laboratory of Natural History; unless otherwise stated the specimens are mounted on tags. All of the host material was collected in the immediate vicinity of Urbana or its twin town, Champaign, Illinois, Champaign County:

(1.) Four females reared September 9th and two females September 11th, in a cage containing decomposed chicken viscera obtained from the city garbage grounds on August 22nd and infested with the maggots of the following Diptera — Chrysomyia macellaria (Fabricius), Sep. 7th, Calliphora erythrocephala (Meigen), Sep. 11th, and Sarcophaga species "k"2 (Sep. 22nd); one of the females observed ovipositing into a puparium of the Chrysomyia on the 9th of September; Accession Nos. 39912 (3 ♀'s xylol-balsam, 1 ♀ head, 1 slide) and 39921 (2 ♀'s); the latter issued in company with a single female of Pachycrepoides dubius Ashmead MS.3 (2.) 1 female captured at large in insectary around fly breeding-cages, September 12th; Accession No. 39925 (1 ♀). (3.) 7 females captured in the insectary some date

11 1 ♀, tagmounted, from the Nason collection, Algonquin, Illinois, labelled 6,18,95-114 and 4505. There are also 2 other tagmounted females from the same collection, designated as cotytypes and respectively labelled 6,24,95-114 and 4505, and 6,2,95-114 and 4044. These label numbers were made by Dr. Nason.

2 Species nova; designated thus for convenience. The Diptera mentioned throughout were determined by C. A. Hart.

3 This species is described in the second paper of this series.
around the breeding-cages; Accession Nos. 39925, 39927, 39928, 39933, 39934, 39935 and 39936 (7 ♀’s). (4.) 10 ♂’s, 1 female reared September 12th from putrefied meat from which the following host Diptera were also obtained—Chrysomyia macellaria (Fabricius), large numbers, Aug. 27th to Sep. 12th; Phormia regina (Meigen), large numbers, August 26th to Sep. 12th; Sarcophaga species “k”1, 5 specimens, Sep. 6th and 7th; Musca domestica Linnaeus,1 female, August 29th; 1 female of brevicornis was observed to emerge from a puparium of the Phormia. Accession No. 39938 (10 ♂’s, 1 ♀). (5.) 2 ♀’s captured in insectary around fly breeding-cage, Sep. 13th; Accession Nos. 39956 and 39958 (2 ♀’s). (6.) 7 ♀’s captured Sep. 9th about fly breeding-cages in insectary; Accession No. 39957 (7 ♀’s). (7.) 3 ♂’s, 3 ♀’s removed from the puparia of Phormia regina, Sep. 14th, the hosts reared in company with Chrysomyia macellaria, in large numbers from decayed meat; Accession No. 39959, (3 ♂’s, 3 ♀’s). (8.) 5 ♀’s collected from fly breeding-cages in insectary, Sep. 10th; Accession Nos. 39961, 39962, 39964, 39966 and 39967 (5 ♀’s). (9.) 1 ♂, 24 ♀’s + 22 reared Sep. 14th from an infested cadaver of a small pig from which the following possible hosts were reared—Musca domestica (Aug. 26 to Sep. 1, in large numbers), Chrysomyia macellaria (few, Aug. 27th to 30th), Phormia regina, Lucilia caesar (Linnaeus), Lucilia sericata (Meigen)—Aug. 30th to Sep. 6th, the former abundant; Accession No. 39972 (1 ♂, 24 ♀’s). (10.) 1 ♂, 6 ♀’s, reared in confinement from a puparium of Musca domestica, Sep. 25th, the progeny of a single female; Accession No. 40140 (1 ♂, 6 ♀’s). (11.) 9 ♂’s, 12 ♀’s, reared in confinement from 8 puparia of Musca domestica, Sep. 25th, the progeny of 2 females; Accession No. 40141 (9 ♂’s, 12 ♀’s). (12.) 6 ♂’s, 10 ♀’s reared in confinement from the puparia of the same host, Sep. 26th, the progeny of 7 females; Accession No. 40142 (6 ♂’s, 10 ♀’s). (13.) 1 female reared Sep. 22nd, from cage containing cadaver of a rabbit exposed for fly infestation and from which was reared the following possible hosts—Phormia regina and Lucilia sericata (Sep. 14th–22nd, the former abundantly), Chrysomyia macellaria (few, Sep. 14th–22nd) and Musca domestica (1 ♂, Sep. 22nd); Accession No. 40124 (1 ♀). (14.) 5 females reared from a puparium of Phormia regina, Sep. 25th; Accession No. 40147 (5 ♀’s). (15.) 1 male, 11 females reared Sep. 25th from a puparium of Phormia regina; Accession No. 40148 (1 ♂, 11 ♀’s). (16.) 1 ♀ captured Sep. 10th on fly breeding-cage in insectary; Accession No. 40149 (1 ♀). (17.) 1 ♂, 2 ♀’s reared in confinement Sep. 28th from a puparium of Musca domestica, the progeny of a single female; Accession No. 40151 (1 ♂, 2 ♀’s). (18.) 2 ♂’s, 17 ♀’s + 4 reared in confinement from 4 puparia of Musca domestica, Sep.

1 Species nova; designated thus for convenience. The Diptera mentioned throughout were determined by C. A. Hart.
28th, all the progeny of a single female; Accession No. 40152 (2  ♂’s, 17 ♀’s). (19.) 2 ♂’s, 8 ♀’s reared in confinement from a puparium of *Lucilia sericata* (Meigen), Oct. 1st, progeny of a single female; Accession No. 40158 (2 ♂’s, 8 ♀’s). (20.) 3 ♂’s, 7 ♀’s reared from a puparium of *Phormia*, Oct. 2nd; Accession No. 40165 (3 ♂’s, 7 ♀’s). (21.) 7 ♀’s reared from a puparium (*Phormia regina*), Oct. 13th; Accession No. 40215 (7 ♂’s). (22.) 38 ♂’s, 65 ♀’s reared in confinement Oct. 20th from 22 muscid puparia (*Phormia* etc.), all the progeny of a single female parasite; Accession No. 40232 (10 ♂’s, 10 ♀’s). (23.) 21 ♂’s, 57 ♀’s reared in confinement from 17 puparia of *Phormia regina* (Meigen), Oct. 20th, all the progeny of a single female; Accession No. 40233 (20 ♀’s). (24.) 12 ♂’s, 126 ♀’s reared Oct. 19th from puparia of *Phormia regina* (Meigen); Accession No. 40239 (12 ♂’s, 126 ♀’s). (25.) 1 parthenogenetic female reared Sep. 27th, from *Phormia* puparia; Accession No. 40260 (1 ♀). (26.) 17 ♂’s reared in confinement from a puparium of *Phormia regina* (Meigen), Oct. 15th, all the progeny of the unfertilized female of the preceding number; Accession No. 40261 (17 ♂’s). (27.) 1 ♀, parthenogenetic parent of the next number, reared from *Phormia* puparia, Sep. 27th; Accession No. 40262 (1 ♀). (28.) 15 ♂’s reared in confinement from a puparium of *Phormia regina* (Meigen) Oct. 15th, the progeny of the preceding number; Accession No. 40263 (15 ♂’s). (29.) 45 ♀’s + 24 reared from the same hosts as number 9 in preceding, Sep. 15th; Accession No. 41072 (45 ♀’s). (30.) 2 ♀’s in the Nason collection each labelled type, “Algonquin, Illinois, May 11th, July 3rd, 1895”; 1 ♂, 7 ♀’s, in the same collection wrongly determined as (*Pteromalus*) *Meroporus calandrae* (Howard); 1 ♀’s, June 9th, 30th, July 3rd, Sep. 5th, 10th, 17th, 1894–1895; ♂, Aug. 23rd, 1894. In addition, the following specimens were examined and discarded: 22 ♂’s, 4 ♀’s emerging during late September, 1908, from a single puparium of *Sarcophaga* sp. “e,” 2 reared from human excrement exposed for infestation. Altogether, we have critically examined five or six thousand specimens of this species.

**Biological Notes.**

During the late summer and early fall of 1908, *Nasonia brevicornis* Ashmead was exceedingly abundant in the insectary where the fly breeding-cages were located, but we did not have time or opportunity to give sufficient attention to it so that but few breeding experiments were undertaken. These few experiments, however,

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1 This species is not represented in the Nason collection at all. (Cf. Nason, 1906.)

2 See the previous footnote in regard to this designation.
brought out one or two points of interest and importance in its life-history and they are considered herewith, together with a number of miscellaneous observations of more or less significance.

In habit, this parasite is stolid and serious, little heeding external influences and disturbances, quietly, persistently giving its whole attention to reproduction. This habit of the adult female allowed us to breed it with facility; it offers, therefore, an excellent subject for the investigation of the biological problems connected with the parasitic Hymenoptera.

Both sexes crawl quite fast, and the female is able to fly, though crawling appears to be the favorite mode of locomotion; some males walk habitually with the small fore wings extended and directed ventrad, touching the surface upon which the insect happens to be walking over, the hind wings extending normally along the back; but in the majority of cases, this habit does not occur, the wings in their normal position and then not extending farther caudad than the third abdominal segment. The wings of the females are folded flat over the abdomen, normally, and extend slightly beyond the abdomen. We have never seen a male in flight, and their wings are non-functional apparently.

If violently disturbed with a camel's hair brush while walking the female simply wriggles free of it, but if the disturbance is continued, she may simulate death by suddenly falling over on her side or back and drawing in the legs, continuing for several seconds. On the other hand, on very slight disturbance, she may hop a short distance or assume the same attitude as formerly for several seconds. Apparently this attitude, which is not really the attitude of death, is never long continued and its use to the species is a matter of question. If the females are flung into the air from the end of a brush, they readily take to flight.

At first, we hastily summarize the few special experiments performed with this species.

I. On September 9th, 1908, 50 maggots and 10 puparia of Musca domestica Linnaeus were placed in a quantity of clean horse manure in a glass breeding-jar and 7 females of Nasonia brevicornis were added. The hosts were free from parasites. As a result, reproduction of the parasites occurred and on September 26th, 1908, 6 males and 10 females of the pteromalid emerged from puparia. The parasite attacks Musca domestica in confinement.

II. On September 12th, 1908, 8 female parasites were confined separately in small gelatine capsules, each with a single healthy puparium of Musca domestica. Apparent oviposition was observed in each case, but no parasites afterwards appeared; in half the cases the host flies emerged.
III. On September 13th, 1908, 8 female parasites were confined separately in small gelatine capsules, each with a single healthy puparium; of *Phormia regina* (Meigen); apparent oviposition was observed in each case. As a result, on October 1st, 1908, from one of the host puparia, there appeared 2 males and 8 females of the parasite. Other emergences did not occur. The parasite attacks *Phormia regina* in confinement.

IV. On September 27th, 1908, 12 virgin females of *brevicornis*, reared separately from puparia of *Phormia regina* and in no instance accessible to males, were confined separately, each in a small gelatine capsule with a single known healthy puparium of the *Phormia*; on September 29th at 11:30 A. M., in three cases females were observed ovipositing; on October 15th, 1908, the progeny of two of the virgin females emerged as follows—17 males (Accession No. 40260, parent and 40261, male progeny) and 15 males (Accession No. 40262 parent and 40263, male progeny). Other emergences did not occur, but in three instances the larvae of the parasites were found in the host puparia, all dying, however. Hence, this parasite is parthenogenetic.

The foregoing experiments unfortunately could not be extended and they merely indicate parthenogenesis (unverified) and the readiness with which this parasite attacks its various hosts in confinement.

*(To be continued.)*

The Rediscovery of *Glutops singularis* Burgess.—This interesting fly was described by Edward Burgess in the Proceedings of the Boston Society of Natural History, Vol. XIX, p. 322, pl. 1, figs. 2, a, b, c, d, 1878. It was collected by Dr. George Dimmock at Springfield, Mass., about 1872 near the United States armory, a section of the city now entirely built over, as are the surroundings for a long distance beyond; it is therefore doubtful if it will again be found near the type locality. The Burgess collection was obtained by Dr. C. V. Riley and the type of this species is now in the U. S. National Museum.

On April 18, 1909, Mr. William Reiff captured three males of this long lost species, near Purgatory Swamp, Norwood, Mass. Through the kindness of Professor William M. Wheeler one of the specimens has been placed in the New England Collection of the Boston Society of Natural History, and another will be placed in the Museum of Comparative Zoology, Cambridge. Now, that the time of its appearance is known, it is to be hoped that the female will soon be obtained, and perhaps the life history of this peculiar fly discovered.

C. W. Johnson.
A NEW PLATYCHOLEUS.

BY H. C. FALL.

While collecting at Lake Tahoe in the summer of 1897, a number of specimens of *Platyholeus leptinoides* were taken by the writer. Among these was a single female specimen of duller surface lustre, which was set apart to await the possible turning up of a similar male. During the past summer (1909) Dr. Fenyes took a good series of *Platyholeus* of both sexes, all alike, and all precisely similar to my dull female taken twelve years before. An examination of the male confirms my suspicion that we have here to do with a species quite distinct from *leptinoides*, and enables me to present a comparative description.

**Platycholeus opacellus** n. sp.

Of the same size and color as *leptinoides*, from which it differs in its duller surface lustre, the pronotum being only feebly shining and the elytra quite opaque. The elytra are also less pointed behind; the antennae less slender, the joints generally less elongate, the sixth but little longer than wide, the eighth slightly transverse. Secondary sexual characters of the legs less marked, the front tibiae of the male less suddenly dilated, the hind tibiae quite devoid of denticles along the inner margin. In *leptinoides* the entire upper surface is rather strongly shining, the elytra more acutely pointed behind, antennae more slender, joint 6 nearly twice as long as wide, S a little longer than wide.

The minute denticulation along the inner margin of the hind tibiae in the male of this species seems to have been overlooked by both Crotch and Horn. As observed by Horn, the middle tibiae are quite strongly arcuate in both sexes of *leptinoides*. This holds in *opacellus*, but the arcuation is somewhat less strongly and more even.

My specimens were taken in rotten wood in which termites were present. According to a published note by Mr. Schwarz, "specimens were obtained by Mr. H. G. Hubbard in July, 1891, at Lake Tahoe in a colony of *Termopsis angusticollis*, within the stump of a large pine tree; and other specimens found by Mr. Koebele in California with the same host are in the National Museum." This certainly would seem to prove conclusively that Platycholeus is Termitophilous. Dr. Fenyes however informs me that all his examples were found with a rather small yellowish brown ant under bark, an apparently sure indication of Myrmecophilous habits. While it is not impossible that Platycholeus may occur with both ants and Termites, the fact would be a very remarkable one, and further investigation may prove that in one case or the other the association was accidental.
NOTES ON A FEW OF THE RARER NEW ENGLAND LEPIDOPTERA.

BY WM. T. M. FORBES, WORCESTER, MASS.

These are odds and ends in the way of rarities picked up during several years of collecting. I am indebted to quite a number of entomologists for naming specimens for me, especially to Mr. Busck for naming my Micros.

Anosia plexippus fumosa; Worcester, fall of 1900. It was quite common here that year, but I have not seen it once since.


Argynnis cybele: At Crotch Island, near Friendship, Me., the dwarf form almost entirely replaced the usual ones.

Cinelidia harrisii: Worcester.

Basilarchia: The majority of astyanax (?) I have caught at Worcester show traces of arthemis characters, such as a bit of white band below, or red spots on the hind wing above.

Satyrus alope maritima: Commoner than the type at Friendship, Me.


Feniseca tarquinius is certainly not limited by the Connecticut valley. West Swanzey, N. H., Aug. 8, 16; Worcester, July 12; caterpillar webs common at Worcester.

Pieris oleracea hiemalis: Slaterville, N. Y.

"virginiensis: Mt. Killington, Vt., not rare.

Oleracea differs not only in looks but in manner of flight from P. napi of Europe.

P. rapae immaculata: Amherst, Mass., May 8; Worcester, May 20. Does not seem so common or so well marked as in Europe (Constantinople).

P. protodice: Worcester, August, 1901.

Eurema lisa: West Swanzey, N. H., Aug. 27, 1903.

Eurymus philodice: A specimen of the spring-brood albino female at Amherst, June 5, Eurymus eurytheme: A typical female (amphilusa) was caught at Seal Harbor, Me., by E. Q. Abbot of Worcester.

Papilio cresphontes: Amherst, Mass.

Lerema hianna: South Hadley, Mass., on the slope of the Holyoke range.

Eacles imperialis: South Hero, Vt. (caterpillar.) If what Packard writes is true, this will extend its range the whole length of a state (Monograph of the Bombycine moths, II, 126).
Anisota senatoria is common at South Hero, Vt. (caterpillars).

Apantesis phyllira: Amherst, June 5.


*Estigmene acraea*: I have bred a male in which all the white of the wings was slate gray, and the yellow was very dark and dull. The body is as bright as usual. (var. dubia?)


*Diacrisia latipennis*: Amherst, June 14; Worcester, June 29.

*Phragmatobia assimilans*: Worcester, May; found dead under a light.

*Panthea fuscilla*: West Swanzey, N. H., found dead.

*Charadra deridens*: Amherst, Mass., June 4.

*Baileya doubledayi*: Amherst, June 13; West Swanzey, Aug. 10.

*Adita chionanthi*: Amherst, Sept. 22.

*Caradrina miranda*: Amherst, May 12, 18.

*Crambodes talidiformis*: Amherst, June 20.

*Amolita fessa*: Worcester, July 8 and 10.

*Feralia joosoa*: Amherst, May 4.

*Ufeus satyricus*: Amherst, found dead.


*Papaipema rigida*: Amherst, Sept.

*P. inquaeite*: Amherst, Sept. 21 to Oct. 12. The commonest Gortynid there; both with and without the white spots.

*P. impuctuniosa*: Amherst, Sept. 21.

*P. limpidia*: Amherst, October.

*Xylopyge capax*: Amherst, Oct. 19.


*M. rubefacta*: Amherst, June 12.


*Erastri a abidula*: Looks almost exactly like the last on the wing, and flies with it, June 14 to July 27.

*Tarache terminimacula*: Worcester, July 23.

*Salia interpuncta*: Found dead in lights at Holyoke, Mass.

*Euedelina herminiata*: Amherst, May 18.

*Caladapteryx dryopterata*: Amherst, June 19.

*Nyctobia limitata*: Amherst, April 22.

*Phigalia titea*: Amherst, May 5.
Metrocampa praeclara: Amherst, June 11; Worcester, Sept 12.
Lagocrispata: caterpillar common at Amherst.
Blepharomastrix stenialis: Amherst, June 3.
Glyphodes hyalinata: Amherst, Oct. 4.
Phlyctaeniatertialis: Amherst, June 2, 4.
Pyrausta aeglealis: Amherst, June 11.
Nymphulabadiusalis: Westborough, July 19, common at Hockomocko pond.

CHERMES OF MAINE SPRUCES.

BY EDITH M. PATCH, ORONO, MAINE.

Six species of gall forming Chermes have been under observation on spruces in the vicinity of Orono during the season of 1909.

1. Chermes pinifoliae Fitch. This dark species develops in a cone-like gall on the black and red spruce (in which connection it was named abieticolen in 1879 by Thomas and subsequently merged by error with abietis in 1897) and migrates to the needles of the white pine to oviposit (in which connection it had been previously named pinifoliae by Fitch in 1858, and merged by error with pinicorticis in 1869). A historical discussion with full reasons for resurrecting this doubly merged species under the original name of pinifoliae, which has been discarded for about 40 years, will be published presently together with a technical description of the species, by the Maine Agricultural Experiment Station.
2. *Chermes abietis* Linn. This is a green-winged species developing in a "pineapple gall" particularly numerous on white and Norway spruces and ovipositing on the same species of tree on which the galls are found.

3. *Chermes similis* Gillette. A reddish brown species producing an irregular gall on Norway, black, red and white spruces in Maine and ovipositing on the same species of tree on which the galls are found.

4. *Chermes fuscus* n. sp. A species developing in a gall on black and red spruce and migrating to the needles of the white pine where it oviposits. A considerable amount of wax is secreted by this species and living specimens can readily be distinguished from *pinifoliæ* by this character alone. Both the galls and the insects are structurally very distinct from *pinifoliæ*. The antennæ of this species are characterized by the exceedingly large sensoria on joints III, IV, V. Each sensorium comprises the entire surface of the joint except the extreme proximal and distal portions and a narrow ridge connecting these.

5. *Chermes consolidatus* n. sp. This tiny species produces a small pale green or pinkish gall on the black or red spruce and migrates to the larch. It is the smallest of the *Chermes* found producing galls in Maine. The antennæ are distinctive, the constriction between joints III, IV and V not being so conspicuous as in the other five species, so that these three joints appear almost like a single joint in some specimens.

6. *Chermes lariciatus* n. sp. This species produces somewhat russet colored galls on white spruce and migrates to larch needles to oviposit. The freshly molted migrants have the prothorax and abdomen light yellowish brown, head and thoracic lobes dark, legs and antennæ greenish, wings conspicuously green with yellow proximal portion.

These six *Chermes* with galls and photographic details will be included in the exhibit of the Entomological Society of America in Boston.

**Spiders in Winter Floods.**—On February 10, 1909, there was a heavy rain which flooded low fields and the borders of swamps and ponds and on the 12th I went to Tyngsboro, Mass., and joined Mr. Frederick Blanchard in a hunt for spiders and Coleoptera on the ice. The thermometer had fallen to 14 in the night but the day was calm and became slowly warmer. In the open fields the water had partly drained away leaving thin ice on which spiders were scattered, most of them being near the line of dust that marked the highest water. On the larger ponds and swamps they
were still more numerous around the banks and along lines of rubbish that had floated together on the ice. A few had died and were frozen in the ice, others were frozen down by the feet but were still alive and thawed out later in the day. Nearly all however were free on the ice which along the edges of the floods had frozen under them. They were too cold to move but as the air became warmer revived and groped slowly about without any definite direction. By noon some of them became quite active and climbed grass and bushes and spun threads, the thermometer at this time being 35 in the shade and 40 to 50 in the sun. The most active species was the little Zmeticus terrestris which was abundant in a maple swamp on the ice and in bushes up to a foot from the ground. The greater number of spiders were young Lycosidae of all the common species. With the spiders were great numbers of Coleoptera and several species of Diptera. Following is a list of the Spiders.

**Adults.** Pachygnatha brevis, Pedanostethus riparius, Pholcomma rostrata, Ceratinella laetabilis, Carnicularia indirecta, Grammonata ornata, Tmeticus plumosus, Tmeticus terrestris, Tmeticus concavus, Erigone dentigera, Bathyphantes zebra, Diplostyla nigrina.

**Immature.** Singa variabilis, Linyphia clathrata, Tetragnatha extensa, Asageva americana, Pirata piraticus, Pardosa nigrapalpis, Pardosa glacialis, Lycosa frondicola, Lycosa kochii, Lycosa relucens, Lycosa lepida, Gnaphosa conspersa, Prosthesmia atra, Xysticus lunbatus, Dalomedes sexpunctatus.

J. H. Emerton.

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