PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON.

Volume XIII, 1911.

PUBLISHED BY THE SOCIETY,
QUARTERLY
CARLISLE, PA. WASHINGTON, D. C.
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CONTENTS OF VOLUME XIII.

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(MEETINGS OF MARCH 3, 1910, AND APRIL 7, 1910)

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Entered as second-class matter July 26, 1909,
at the post office at Carlisle, Pennsylvania, under the Act
of July 16, 1894.

THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON.

ORGANIZED MARCH 12, 1884.

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

Annual dues of active members, $3.00; of corresponding members, $2.00; initiation fee (for active members only), $1.00.

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published quarterly by the Society at No. 1 N. Pitt street, Carlisle, Pa., and Washington, D. C. Terms for subscription: Domestic, $2.00 per annum; foreign, $2.25 per annum; single numbers, 50 cents, foreign postage extra. Remittances should be made payable to the Entomological Society of Washington.

Authors of leading articles in the PROCEEDINGS shall be entitled to 25 separates of each contribution, free of charge. Additional copies may be had at cost by notifying the Publication Committee before the final page proof is returned to the printer.

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON.

VOL. XIII   JANUARY - MARCH, 1911   No. 1

MEETING OF MARCH 3, 1910.

The 238th meeting of the Society was entertained by Mr. Marlatt at his home, 1521 Sixteenth Street, NW., on the evening of March 3, 1910, and there were present Messrs. Barber, Burke, Caudell, Crawford, Crumb, Dyar, Gahan, Gill, Hammar, Heidemann, Hopkins, Howard, Knab, Marlatt, Morgan, Peairs, Popenoe, Rohwer, Runner, Sasscer, Schwarz, Walford, Webb, and Webster, members, and Messrs. N. Kourdumoff, P. R. Myers, W. Postiff, and E. W. Wall, visitors.

The minutes of the previous regular meeting and of the special meeting of February 19 were read and approved.

Mr. C. B. Hardenburg, of Pretoria, Transvaal, was proposed for corresponding membership and the name referred to the Executive Committee.

The President announced that he had appointed as a committee to draw up a biography of Mr. Ulke, Messrs. Howard, Schwarz, and Banks.

A letter from Mr. Titus Ulke expressing thanks for the action of the Society was read.

The first paper of the evening was "Trends of Diffusion in Insects," by Professor Webster.

The second paper was "Notes on the Grass-feeding Hemileucas and their Allies," by Dr. Dyar.

The last paper, "The Stridulations of some Cone-headed Grasshoppers," by Mr. Allard, was read by title.[1]

[1]Already published, Proc. Ent. Soc. Wash., XII, 121, 1910.

THE DIFFUSION OF INSECTS IN NORTH AMERICA.

[Author's Abstract.]

BY F. M. WEBSTER.

It does not appear necessary to at this time go into minute details with reference to the possible general trend of insect diffusion in North America, as this matter has been previously covered in a paper published by myself in Psyche for April, 1903.

Possibly it might, however, be well to call attention to some facts, notably the occurrence of European species on the northwest Pacific Coast, and the greater similarity between specimens found there and those taken in Europe than specimens of the same species taken in the Eastern United States. Also, to the well-known fact of a temperate or even tropical climate having once existed in what are now the cold and barren sections of the North. And, in the light of Lieutenant Shackleton's recent discoveries in the south polar regions, we may assume an almost parallel condition to have once obtained within the Antartic Circle, thus tending to prove what has previously been suspected, namely, a land connection between Australia, South America, and South Africa. What followed this period of warm temperature in the southern Antartic regions we do not know, but in the north we know that the ice sheets of the Glacial period crowded their way southward in many cases far into what is now the United States. Just what the effect of these immense ice sheets was beyond the southern extremities of the glaciers themselves we can only suspect, but judging from the fossil remains of insects found in the Tertiary rocks of Colorado, Wyoming, and British Columbia, we have every reason to suppose that northern species were driven far to the southward, and that, with the disappearance of the ice sheet and the recovering of the glaciated area with vegetation, these species, perhaps more or less modified in habits and appearance, would gradually drift back and reinhabit the glaciated territory.

This appears to be sufficient basis for assuming a post-Glacial trend of insect diffusion from the tropical regions northward. And it would seem that the species working their way northward from Central America through Mexico might in some cases become greatly changed both in appearance and habits, There seems, however, to be a factor in insect diffusion from the south northward that has heretofore escaped notice. Ordinarily, insects accidentally imported into the United States or Canada from foreign countries become established along the

Atlantic coast and gradually diffuse themselves inland, following, as I have indicated in the paper to which I have previously alluded, certain regular lines of progress. There are, however, a number of a species which occur inland that give no indication whatever of having been introduced through any of the seaports of eastern or, indeed, western United States. One of these is the now well-known *Toxoptera graminum*, which has spread generally over the United States west of a line drawn from northeastern Ohio approximately to Philadelphia, Pennsylvania. We have almost been able to trace the dispersion of this species in the Red River Valley of the North. While it occurs along the Mexican border from Brownsville, Texas, to the Imperial Valley of Southern California, in only one instance has it been reported throughout the territory northeast of the line to which I have just alluded. Mr. Hayhurst reports its occurrence in the vicinity of Boston, but no one else, with the most careful search, has been able to find it either in New York, New England, or New Jersey; only in southern Pennsylvania. It has not yet become destructive in the East to any extent north of the Carolinas, while in the West its ravages have extended as far north as Chicago and Omaha. Besides this, although Texas was one of the later States to be brought under cultivation, this pest began its ravages as early in that State as elsewhere in the country.

With the present information we have there is far more probability of its having been introduced into and made its way northward through Mexico into the southwestern portion of the country than there is of its having been imported into any of the coastal seaports.

Another case in point is that of *Meromyza pratorum*, a European species which during the last few years has been discovered in the mountainous regions from Mexico northward into northern Montana, Idaho, and Washington, and it now turns out that what has been going under the name of *Meromyza americana* is only a lowland form of the European species. As we find this also all along the Mexican border, it affords another illustration of a probable Mexican or Central American origin.

When we call to mind the more recent natural diffusions of two Mexican species, whose spread has been actually observed, viz, *Murgantia histrionica* and *Anthonomus grandis*, we find a great similarity between their known diffusion over the country and the apparent diffusion of the two species *Toxoptera graminum* and *Meromyza pratorum*.

All of this leads me call attention to a possible means of introduction and diffusion of insects imported from Europe, not into the United States direct, but into Mexico and Central America, possibly also into northern South America, at the time of or soon after the Spanish conquests. It is well known that the Catholic priests as they pushed their way outward among the natives established not only their churches among the aborigines, but also the fruits, vegetables, and grains of their native country. It appears to me that we are now getting the first intimation of an early introduction of destructive insects, either among these imported grains or plants themselves, or else in the material with which these were packed for their long voyage across the Atlantic. Possibly the recent introduction and spread of the alfalfa weevil (*Phytonomus murinus*) so far inland as about Salt Lake, Utah, may offer an lliustration of what might have occurred in the earlier days following the Spanish conquest of Mexico and the country to the southward.

Within the last year or two we have found insects in the grain fields of the Indians in southern New Mexico and Arizona, especially the latter, where these grains have been grown for hundreds of years, but surrounded by a desert country over which it would be impossible for these insects, unaided, to make their way. Only last year (June, 1909) Mr. C. N. Ainslie, on the Pima Indian Reservation at Sacaton, Arizona, discovered a gall fly whose larva attacks the seed pods of alfalfa and which can only be separated from *Asphondylia miki* Wacht., described as attacking alfalfa in Europe, by the shape of the galled pods.

The list of the species that might have been brought over and established in southern Mexico and Central and northern South America is not large, but the present indications are that as we become more intimately acquainted with the insect fauna of the country west of the one hundredth meridan, we shall find more foreign species, that, like those given in illustration, offer no possible explanation of their existence there on the score of having been imported into and spread inland from the seaports of the United States.

A PREOCCUPIED NAME IN WASPS.

Didineis vierecki, new name.

Didineis crassicornis Viereck, Tr. Am. Ent. Soc., vol. 32, 1906; p. 204; non *Didineis crassicornis* Handlirsch, Sitzber. Akad. Wiss. Wien., vol. 46, 1887, p. 267.

S. A. Rohwer.

NOTES ON THE GRASS-FEEDING HEMILEUCAS AND THEIR ALLIES.

[Lepidoptera; Saturniidæ.]

By Harrison G. Dyar.

The discovery by Professor Cockerell that a species of *Hemileuca* feeds upon grass in the larval state (Psyche, VIII, 298, 1898) was an interesting addition to our knowledge of the food-plants of species of this genus. Recently it has transpired that the species is of economic importance by destroying the pastures and so injuring the cattle industry. Considerable interest in the matter has therefore developed, and I have been asked by Mr. Webster to look into the specific identity of the form concerned. This has been described by Professor Cockerell as *Hemileuca sororia* race *oliviæ*, with its habitat in New Mexico. The species *sororius* was described by Henry Edwards from a single female from La Paz, Lower California. A third form, which has been listed also as a race of *sororius*, was described from a single female from southwestern Arizona under the name *hualapai* by B. Neumoegen. Allied forms extend well throughout Mexico as far south as the State of Vera Cruz, and one divergent form is before me from Paraná, Brazil. On comparison of all the known forms of *Hemileuca* allied to our grass-feeding species, I have reached the conclusion that the three names in our list, *sororius*, *hualapai*, and *oliviæ*, represent distinct species, not races of one species. Therefore the name *sororius* will hereafter be omitted from the North American list, while *hualapai* and *oliviæ* will be contained therein as distinct species. I am inclined to the opinion that all of the species here listed will be found to feed upon grass as larvæ, except perhaps the aberrant species *dukinfieldi* Schaus. The species referred to may be separated as follows:

Table of Species of the Hemileucæ Allied to Oliviæ.

Veins of the wings lined with ocher yellow:
  Ground-color of fore wing blackish, inner line absent. *dukinfieldi* Schaus
  Ground-color of fore wing pale gray, both lines present.
    Hind wing without submarginal pale band...... *rubridorsa* Felder
    Hind wing with submarginal pale whitish band.
      Larger: disk of thorax roseate; discal mark of fore wing narrow.. *norba* Druce
      Smaller: disk of thorax gray; discal mark of fore wing large, white.. *minette* Dyar

Veins of the wings concolorous:
  Costa of fore wing above ocher yellow.
    Secondaries pale, whitish in the male, rose-color in the female.
      Lines of the fore wing faint, the inner one obsolete. *hualapai* Neumoegen
      Lines of the fore wing distinct, both present.
        Hind wing of male with no, or very faint, mesial band. *mania* Druce
        Hind wing of male dusky shaded, with mesial and marginal bands rather distinct.................... *lares* Druce
    Secondaries dark rosy brown.
      Smaller, with much rosy tint.............................. *numa* Druce
      Larger, with little rosy tint................................ *nitria* Druce
  Costa of fore wing concolorous or partly whitish.
    Pale, the male largely whitish, the lines of fore wing diffused.. *oliviæ* Cockerell
    Darkly colored, the lines of the fore wing distinct.
      Inner line not angled in the middle.
        Discal mark yellowish brown........... *sororius* Hy. Edwards
        Discal mark white or whitish.
          With much rosy tint; discal mark narrow and clouded... *marillia* Dyar
          With little rosy tint; discal mark large, distinct.. *lex* Druce
      Inner line distinctly angled or the upper limb obsolete. *mexicana* Druce

Hemileuca dukinfieldi Schaus.

Hemileuca dukinfieldi Schaus, Proc. Zool. Soc. Lond., 1894, 235.

Described from Castro, Paraná, Brazil. The types are before me. This species is only distantly related to the forms here treated, and is included as the extreme development of this type.

Hemileuca rubridorsa Felder.

Hemileuca rubridorsa Felder, Reise der Novara, pl. 90, fig. 2, 1874.

Felder's description is without definite locality; his figure represents a female. A female specimen from the Schaus collection is before me labeled "Mexico," without definite locality. It is also labeled "*Euleucophæus norba* Druce," but it differs from that in the uniform gray hind wings without submarginal pale band and in the broader yellow costa. It agrees well with Felder's figure. A male also is before me, collected by Mr. R. Müller in Mexico City, which enables a definite location for the species.

Hemileuca norba Druce.

Euleucophæus norba Druce, Biol. Cent.-Am., Lep. Het., II, 420, 1897.

Described from Amecameca, State of Morelos, Mexico. The type is before me, but no other specimens.

Hemileuca minette, new species.

Front of head ocher, sides and behind crimson, thorax gray, abdomen dark red. Fore wing dark gray, the veins and costa dark ocher, fringe and inner margin pale; lines somewhat approximate, whitish, distinct, approximately parallel to outer margin, the outer wavy crenulate; discal mark a large, white, diffused patch, bare of scales centrally. Hind wing gray, a whitish ray through the cell, a broad, distinct, outer whitish band; fringe pale, veins lined with dark ocher. Beneath the ocher markings are broadened, but the lines of fore wing nearly obsolete. Discal mark and submarginal band of hind wing distinct; base of fore wing shaded with crimson. Expanse 40 mm.

One male, Mexico, without definite locality (Schaus collection), probably from near Mexico City.

Type: No. 12931, U. S. National Museum.

This species, together with the two preceding, may prove to be varieties of one species. All apparently come from the high Mexican plateau in the vicinity of Mexico City. A large series of specimens is needed to decide the matter.

Hemileuca hualapai Neumoegen.

Euleucophæus hualapai Neumogen, Papilio, III, 138, 1882.

Described from a single female from southwestern Arizona. So far as I am aware, no other specimens are known and the male is undescribed. According to the description, the moth has a yellow costa and is therefore not allied to the other North American species, *oliviæ* Cockerell. Its nearest ally is the following, which, however, has a widely separated distribution:

Hemileuca mania Druce.

Euleucophæus mania Druce, Biol. Cent.-Am., Lep. Het., II, 420, 1897.

Described from Orizaba, Mexico. I have specimens from this place (Schaus collection) and from Motzorongo (R. Müller), both localities in the State of Vera Cruz, in the hot, moist country. The females are very rosy in color and must be very similar to *hualapai* Neum., but on the fore wings both the lines are distinct. The males vary considerably in the amount of rosy tint on the wing, most of them being largely brown.

Hemileuca lares Druce.

Euleucophæus lares Druce, Biol. Cent.-Am., Lep. Het., II, 420, 1897.

This is known to me only by Druce's figure. It is described from a single male from Durango City. This is on the western edge of the high table-land, in a climate similar to that of Arizona. The species should be intermediate between *mania* and *hualapai*, but unfortunately only the male of *lares* is known and only the female of *hualapai*, so that no useful comparisons can be made.

Hemileuca numa Druce.

Euleucophæus numa Druce, Biol. Cent.-Am., Lep. Het., II, 421, 1897.

Described from Mexico City. I have specimens from there (Schaus collection) and also others sent by Mr. Müller from the same locality. The high table-land centering in the vicinity of Mexico City is evidently the stronghold of the species of *Hemileuca* of the grass-feeding group.

Hemileuca nitria Druce.

Euleucophæus nitria Druce, Biol. Cent.-Am., Lep. Het., II, 421, 1897.

Described from "Mexico" without definite locality. I have no specimens of the species. It is apparently closely allied to *numa*, and may be a variety of that. Its relations cannot be well discussed without more definite knowledge of the exact locality.

Hemileuca oliviæ Cockerell.

Hemileuca sororia, race *oliviæ* Cockerell, Psyche, VIII, 252, 1898.

Described from Santa Fé, New Mexico. A large series of specimens is before me. This species has been made the subject of a special bulletin by the Bureau of Entomology, U. S. Department of Agriculture.[1]

Hemileuca sororius Hy. Edwards.

Euleucophæus sororius Hy. Edwards, Papilio, I, 100, 1881.

Described from a single female from La Paz, Lower California, and otherwise unknown. It is very seldom that any

[1] Bul. 85, pt. v, Bureau of Entomology, U. S. Dept. of Agriculture, 1910.

specimens are received from this region, which accounts for the paucity of our knowledge of this form. It may be, and probably is, locally abundant.

Hemileuca marillia, new species.

Rosy brown to dull rose-color. Thorax rosy brown with whitish overcast. Fore wing with the costa more or less marked with whitish, but no ocherous; lines broad, distinct, whitish; discal mark narrow, whitish, obscure. Hind wing rosy brownish in both sexes, with an outer whitish diffused line. Beneath the lines faintly reproduced, the basal part of the fore wing red. Abdomen dark rose-red. Expanse: Male 50 mm.; female 60 mm.

Two males, two females, Tehuacan, State of Puebla, Mexico (R. Müller, No. 1753).

Type: No. 12932, U. S. National Museum.

This is closely allied to the following species, and may prove to be not specifically distinct therefrom. The present species comes from the southern end of the Mexican plateau, whereas *lex* has been found some 600 miles farther north. Specimens from intermediate points are needed to show the relationship of these forms.

Hemileuca lex Druce.

Euleucophæus lex Druce, Biol. Cent.-Am., Lep. Het., II, 420, 1897.

Described from a single male from Durango City at the foot of the Sierra Madre. The species is not before me, but it is interesting to note the similarity in location with that of the allied *oliviæ*. Both species inhabit high, arid land on the eastern slope of a mountain range.

Of the above twelve nominal species (not including the aberrant *dukinfieldi* Schaus), eight are from the Mexican plateau (two without exact localities), six (two doubtful) from the lower and best known part of that region, two from the central portion in State of Durango. Of the outlying forms, one is known from the peninsula of Lower California, one from southwestern Arizona, and one from New Mexico, while but a single species occurs outside of the high arid regions, namely, *mania* Druce, from the State of Vera Cruz. In the center of distribution several species may occur in the same general region, whether actually associated or not is not known; but in the outlying portions of the general area of distribution the species occur singly. Evidently the ancestor of these species was an inhabitant of the Mexican plateau, where the larvæ fed upon grass in the absence, practically, of all other vegetation. The group has in general confined itself to regions of the same general character Full data are not at hand concerning the single species known from the lower moist region in the State of Vera Cruz. Such data could not fail to be of interest.

Hemileuca mexicana Druce.

Metanastria mexicana Druce, Biol. Cent.-Am., Lep. Het., 1, 201, 1887.

Dendrolimus mexicana Kirby, Cat. Lep. Het., 1, 816, 1892.

This species was described as a lasiocampid, but, although no specimens are before me, it is evident from Druce's apparently excellent figures that it is a saturnian and a member of this genus. The species was described from two specimens in the collection of the late Dr. Staudinger, and are without exact locality. I have therefore left them out of consideration in the above, especially as it seems doubtful whether the two sexes are correctly associated. The male is represented with a dark discal mark, the female with a pale one, and there are other differences that would not be expected in sexes of one species. It is certainly regrettable that so many of the specimens in collections of this interesting group of *Hemileuca* should be without exact localities, as it so much increases the difficulty of the study of the geographical distribution of the forms.

A NOTE ON HALISIDOTA CINCTIPES GROTE.

Some years ago I placed *Halisidota davisii* of Henry Edwards from Arizona as a synonym of *H. cinctipes* Grote from Cuba, and in this course Sir G. F. Hampson followed me in the British Museum catalogue. Very recently, however, the Hon. Walter Rothschild has separated *davisii* and *cinctipes* as species and has further proposed the name *underwoodi* for the dominant continental form. Certain differences between these forms are apparent, and it may be a matter of opinion whether they should be treated as species or subspecies. *Cinctipes* occurs in Cuba and southern Florida. As compared with the continental *underwoodi*, the markings are thin and poorly contrasted, the black edgings powdery and with whitish edges. The discal markings have a tendency to obsolescence, breaking from the costal marks in the Cuban specimens and absent in some Florida specimens. In *davisii* from Arizona the markings that are present are well contrasted, but all those beyond the disk are obsolete or absent.

HARRISON G. DYAR.

In discussion of the first two papers on the regular program, Dr. Dyar said: In the fauna of North America there are two very distinct elements, one a descendant of the early circumpolar fauna and not introduced and the second coming up from the south. In the Noctuidæ, the Agrotinæ are dominant in America, but also well represented in Europe. This element of the fauna probably arose in pre-Glacial times and then was driven southward. In the Lepidoptera the species in temperate North America coming from the south are in the minority. *Arctia caja* is almost the same in Europe and North America, and the form on the Pacific coast is most like the European form. In Asia there is a form like that in the Rocky Mountains. *Halisidota* comes from the south and is not in Europe. The ancestors of *H. maculata* probably came up the west coast into California from Mexico, giving rise to another variety in the Canadian Rocky Mountains and from this the Eastern typical *maculata*. The Limacodidæ are both from the north and the south, but the latter dominant.

Mr. Rohwer said that in the Sphecoidea there are many examples. In *Trypoxylon* the *frigidum* group is found in both Europe and America and is a northern element, while the *rufocinctum* group found on both continents is apparently a southern element. The *excavatum* group found only in America is a southern element, and comes as far north as New York.

Dr. Howard remarked that Professor Webster was discussing a modern diffusion, while Messrs. Dyar and Rohwer were discussing the ancient lines. It must be remembered that insect diffusion depends to a large extent on food plants. The diffusion in the United States has followed the life zones and the insects have tended toward their normal zones. Horticulturists trying to broaden the habitat of plants have not been encouraged. *Meromyza* is one of a class of insects carried in packing and so easily introduced. Insects introduced into the United States from Europe spread to their normal life zone.

Dr. Hopkins said that we have to consider two factors very different—one influencing insects introduced and one influencing native species. Professor Webster is referring to introduced species. In that case a trend is to be considered. Too much stress has been laid on circumpolar faunæ. It is more natural to consider that insects have come up to us through geologic periods and palæontology gives us some knowledge of this. We must consider rather that it was similar climates producing similar species both in Europe and America due to this similar climate causing parallel development.

Mr. Knab said that climate was of more importance than plant distribution in considering the distribution of insects, and cited as an example the species of the genus *Melasoma* in North America which have gone under the name of *M. lapponica.* There are three distinct forms related to *lapponica* in the United States, the first occupying the region from Alaska to California, the second the Great Lakes region to New England, and the third the South Atlantic States and Middle West, northward to the lakes. Their food plants, the willows, however, go south to Patagonia, but the species of this group fade out to the south and do not occur in Mexico. They are closely related to forms occurring in Europe and Siberia and are clearly of circumpolar origin. In order to understand our own Southwest we must know more of the plateau region of Mexico, which is a flat, dismal region. The only part of Mexico that is well explored is the slope and the low coast region in the state of Vera Cruz, but the table-land is not touched.

Dr. Howard stated that the grasses were unimportant on the table-land.

Mr. Schwarz said that on the table-lands of Mexico there are three important factors in the flora: the cacti, the mesquite, and the grasses. In the state of Durango grass is important. The fauna and flora of the table-lands was found by Mr. Schwarz to extend almost to the City of Mexico and probably goes further. The fauna of the plateau region is separated from the tropical fauna by a sharply defined line. Under the name Tropics are mixed up a lot of elements. The forest region of Tampico is similar to that of Florida and Cuba, but not like that of eastern Guatemala.

Mr. Schwarz remarked that tropical appearance does not always depend on moisture, for in eastern Guatemala there is a large region with the appearance of the Potomac River region, but where it rains every day.

—Under the heading "Short Notes and Exhibition of Specimens" Dr. Dyar showed a copy of the first part of Lord Walsingham's portion of the Biologia Centrali-Americana, which is to comprise the Tineina. He said:

The part shown has 24 pages with one plate, embracing the Lavernidæ and part of the Gelechiidæ. Though but a small part of the work, it exhibits the general style and make-up to be expected of the whole. The general plan of treatment employed in the previous parts on the Lepidoptera Heterocera is continued, perhaps unavoidably. This excludes all tables of families, genera, and species, as well as all diagnoses of old species, leaving the descriptive matter confined to the characterization of new genera and species. The treatment is accidentally much more largely monographic than in previous sections of the Lepidoptera Heterocera, owing to the circumstance that a large majority of the forms treated are here first described. Each new genus is accompanied by a text-figure of venation and head structure, a most useful and commendable innovation. We wish these had been given for the type species of the old genera as well. Such figures would have largely replaced the missing synoptic tables. There are in the part 36 species treated in 20 genera. Of these over 80 per cent of the species and 30 per cent of the genera are "new." The colored figures on the plate are given much enlarged. The names of the authors and works quoted in the bibliography are too greatly abbreviated. The less familiar ones are quite unintelligible. The work on the whole is admirable, and in several important respects is an improvement on the previous volumes of the Lepidoptera. We desire to congratulate the eminent author on the appearance of the first part of this monumental work, which has been so long expected.

—Dr. Dyar read a communication[1] from Mr. R. Shelford, of the University Museum, Oxford, England, which was a reply to Mr. A. N. Caudell for certain criticisms of Mr. Shelford's work. Mr. Shelford objected to Mr. Caudell's quota-

[1]Not accepted for publication.—EDITOR.

tions from his letters on the ground that the letters were private ones. He said that his reasons for not using the new name *Blatella* instead of the preoccupied one *Phyllodromia* (for which he has been criticized) were that the genus contained a large number of heterogeneous species and needed revision, when the names would have to be greatly changed, while to change the generic name in the mean time would, he thought, only tend to increase the confusion. Mr. Shelford pointed out that his preoccupied name *Ceratinoptera castanea*, for which Mr. Caudell had proposed the new name *shelfordi*, had been already renamed by himself *Ceratinoptera usambarensis* (Genera Insectorum, fasc. 73, Blattidæ, Phyllodromiinæ, p. 19.)

Mr. Caudell said that he had not regarded Mr. Shelford's letter as private but as a scientific communication from a recognized authority, whose opinion would be a matter of general interest.

The following papers were accepted for publication:

A NEW DIANTHIDIUM FROM PARAGUAY.

[Hymenoptera; Apoidea.]

By Curt Schrottky.

Dianthidium vernoniæ, new species.

Female. Black with a few yellow marks on the head and the three terminal segments of abdomen with broad yellow bands.

Head a trifle broader than thorax, almost nude, only with a few very short yellowish bristles, all over coarsely and deeply punctured. Eyes a little convergent at base, their inner orbits with a narrow yellow line. Mandibles longitudinally striate, clypeus broader than long, with a shallow transverse depression before its apical margin. Scutum nasale trapesiform; malar space practically none. Two small yellow spots between the insertion of antennæ. Distance of hinder ocelli about one and a half diameters, distance from the eyes more than two diameters. A yellow line along the hinder margin of the head, this sharply truncate and deeply emarginate. Antennæ fuscous, scape black, stained apically with a little ferruginous.

Thorax robust, throughout covered with deep coarse punctures, except the vertical part of the median segment, which is minutely punctured above and smooth below. Pronotum very short, only its blunt lateral angles being visible. Mesonotum a little broader than long, with its lateral margin deeply depressed, the depression forming a narrow line, minutely punctured. Scutellum about four times broader than long, separated from the mesonotum by a very deep suture, its hinder margin sharp, overlapping considerably the median segment. Metanotum scarcely visible at the sides under the scutellum. Median segment coarsely punctured only at its base. Mesopleura anteriorly truncate, punctured like the rest.

Abdomen short, not longer than head + thorax, with large punctures on the sides of the first two body segments, decressing in size rapidly towards the middle and the apex. An indistinct ferruginous stain at the sides of first and second segments. A small linear yellow spot at each side of the third; the basal half of the fourth yellow and its apical half fuscous; the fifth with basal two-thirds yellow and the apical third ferruginous; the sixth segment yellow, with a very small fuscous apical spot. The pollen brush is yellowish white.

Wings dark, especially at the apex of the median cell and in the cubital cells, the radial cell almost black; the nervures and stigma deep fuscous; the transverse discoidal veins terminating *behind* the angles of the second cubital cell at equal distance.

Legs entirely dark, clothed with a thin griseous pubescence; that on the metatarsi dense, stouter, and reddish brown. Pulvilli short but distinct.

Length a little over 7 mm.; width of abdomen 2.5 mm.

A second specimen has no yellow line along the hinder margin of the head and the yellow spots between the insertion of the antennæ are scarcely distinguishable ; it has, however, an additional small yellow spot at each side of the clypeus; its length is 7.5 mm.

Paraguay, Tacurú-pucu, April 29, 1909 (type), and Puerto Bertoni, Alto Paraná. Taken in flowers of *Vernonia* sp. (Compositæ).

I considered this as *Dianthidium megachiloides* (Holmbg.) (=*Anthodioctes megachiloides*) but the description, imperfect as it is, does not agree with my specimens in some important points. It is also near *D. indescriptum* (D. T.) (=*Anthidium cognatum* F. Smith nec Cresson), but the abdomen of the atter is "pubescent, giving it a velvety blackness" and "the scutellum is orange-yellow," while *D. vernoniæ* has the abdomen nude and the scutellum black.

AN ARCTIAN NEW TO OUR FAUNA.

Mr. R. A. Vickery has collected *Halisidota annulosa* Walker at Brownville, Texas. The moth is common in Mexico and it is not surprising that it should appear at Brownsville, where so many southern forms occur.

HARRISON G. DYAR.

NOTES ON THE AMERICAN SPECIES OF OLENE HÜBNER.

[Lepidoptera; Liparidæ.]

By Harrison G. Dyar.

I have been asked for an exact determination of the pine-feeding species of *Olene* (*Parorgyia*) of northern distribution. It appears that the material before me is insufficient for a full comprehension of the subject. Especially material is needed from the Southern States, while a certain well-marked type of larva has never been associated with its proper adult. I have formerly reduced the number of species considerably, admitting but three in Bulletin 52, U. S. National Museum. I think that the number will have to be somewhat increased. I will consider the names in the order of Bulletin 52.

FEEDING ON DECIDUOUS TREES.

Olene achatina Smith and Abbot.

I have no material before me agreeing exactly with Abbot's figure. The form shown is like *obliquata*, with more of white, the brown markings distinct and broken into spots. It may be a southern race of *obliquata*, or distinct. The larva figured may be wrongly associated. It is very unlike the larva of *obliquata* as determined by Seifert and others. A larva agreeing with Abbot's figure has been bred by me, producing the form *basiflava*.

Olene obliquata Grote and Robinson.

This form, with its variety *parallela* G. & R., has been well worked out by Seifert. The adult is characterized by the subterminal markings of the fore wing, while the larva is very distinct, its long, dense hairs showing no contrast in the tufts of joints 5 to 8, only a single pair of hair pencils in front, none behind, and none accompanying the tuft on joint 12. The distribution of the material before me is from Maine to Maryland. I have placed this form as a synonym to *achatina*, which can only be maintained if Abbot's larva is wrongly associated. New material from Georgia is needed to settle the point.

Olene tephra Hübner.

I have no material agreeing certainly with Hübner's figure. In the male no white is shown, in the female only a little around the discal mark. The resemblance is toward *obliquata*, but the inner line is too distinct and its parts too well marked and separate, besides the distinct markings on the hind wing of the male, which occur in no *obliquata* before me. I have formerly referred the form as a variety of *achatina*, but fresh material from the Southern States is needed to positively identify this name.

Olene cinnamomea Grote and Robinson.

This is possibly only a variety of *obliquata*. It differs in the lines being brown, not black. It was described from a single female. I have males from Racine, Wisconsin; Poughkeepsie, New York, and Weekapaug, Rhode Island; females from Denster, Wisconsin, and Cocoanut Grove, Florida. The form is widely distributed, but rare, and has never been bred from larvæ.

Olene leucophæa Smith and Abbot.

In Bulletin 52 I gave three varieties of this species, but I believe now that they are all wrongly referred here. *Basiflava* is a form of *plagiata*; *atrivenosa* is a distinct species, and *manto* is referable to the pine-feeding forms more fully treated below. Concerning the true *leucophæa*, Abbot's figures are puzzling. I have some adults similar to them from Florida, though the base of the wing of the female is less invaded by white and the black horizontal bar is absent. The larvæ, however, are entirely dissimilar. Abbot's figure may be very faulty, but it shows a long hair pencil on joint 12 (shown double, which never occurs to my knowledge). In the Florida larvæ, however, there is only a short, square tuft on joint 12, besides other numerous minor differences.

I possess larvæ with a long, single hair pencil on joint 12, from deciduous trees, but they have not been bred. These are the nearest to Abbot's figure of anything known to me, but that is not saying they are very near. They are darkly colored and have plumed lateral hairs and only four dorsal tufts (Abbot's shows seven, another anomaly). These larvæ agree entirely with the pine-feeding ones and it may be that they have only accidentally been taken on deciduous trees.

Olene plagiata Walker.

I have no fresh notes on Walker's types of *plagiata* and *atomaria*, so let the synonymy stand as it is. The third synonym, *clintonii* G. & R., is well known. This is the only form extending its range into the West. I have specimens which I regard from present evidence as belonging to this species from Bellingham, Washington (R. H. Stretch), Seattle, Washington (O. B. Johnson), Winnipeg, Manitoba (A. W. Hanham), Colorado (D. Bruce), Glenwood Springs, Colorado (W. Barnes), besides an eastern distribution from Maine to Texas.

The form *basiflava* Packard is referable here. It differs by the yellow infusion at the base of fore wings. It is the dominant form in the southern part of the range of the species, my specimens being from New York to Florida and Texas. The larva agrees with Abbot's figure of *achatina*, and it may be that that name should be associated here rather than where I have attempted to place it. However the base of the wing is distinctly infiltrated with yellow, not white as in Abbot's figure of *achatina*, so I let the names stand as above until fuller material is forthcoming from Georgia. Also, the subterminal markings forbid this reference.

Olene atrivenosa Palm.

This form is really entirely distinct. Mr. Palm kindly allowed me to examine the male and female specimens in his collection. The published figure does not do justice to the black longitudinal lines, which are very distinct. There is no white on the wings.

FEEDING ON CONIFERS.

These forms are distinguishable in a general way from those feeding on deciduous trees by the more mottled character of the maculation and the predominance of brown in the ground-color. The species are in general smaller and there is less difference in size between the sexes.

Olene manto Strecker.

I have recently examined the unique male type now in the Field Columbian Museum in Chicago. It is closely allied to the following form, but less suffused with brown.

Olene interposita, new variety.

Similar to *manto* Streck., but more uniformly brown. Fore wing suffused with brown, the lines black, distinct, irregularly crenulate and rather broad. A white cloud in the discal area, defining the brown-filled oblique reniform; subterminal line pale, waved, followed by a grayer terminal area. In the female the median space is largely gray.

One male, one female, Tryon, North Carolina, August 1, 1903 (W. F. Fiske).

Type: No. 13465, U. S. National Museum.

In *manto* the terminal spece is nearly clear gray to the margin and a narrow, wavy white line crosses the basal space.

The discal region, lines, and brown ground are very similar in the two forms.

Olene montana Beutenmüller.

Mr. Beutenmüller has kindly shown me his types of this form. The specimens are entirely suffused with brown, without white, except at the discal area and tornus. The larva has four black pencils, a pencil accompanying the tuft of joint 12, the other tufts black. The specimens were bred from larvæ on balsam.

I am inclined to the view that the above three forms represent local races of one species, in which the tendency to brown suffusion is increased with the altitude. *Manto* was described from Stewart County, Georgia, which is in the western edge of the State at a low altitude; *interposita* comes from Tryon, North Carolina, which is at a considerable altitude in the foothills; *montana* is from the true mountain region of North Carolina.

Olene pini, new species.

Fore wing gray, dusted with black and lightened by white markings, shaded with brown in basal space and between the outer and subterminal lines; a small black line at the base; median lines black, distinct, crenulate, the outer angulated inward on vein 1; discal mark a black reniform, open and more or less broken into two black bars, lightened by white edgings; subterminal line white, waved, with a white spot above tornus; terminal line black, crenulate, somewhat drawn back from the margin; narrow white edgings to both the lines. Hind wings brown-gray, with discal mark and outer narrow line more or less well defined. Expanse: Male 30 mm.; female 35 mm.

Seven males and seven females, North Saugus, Massachusetts, bred from larvæ on pine by Mr. W. F. Fiske, Mr. H. M. Russell, and myself (Gipsy Moth Laboratory No. 1471). Also a male that I take to be the same species labeled "Corning's farm, Gray," that is probably from near Albany, New York. This specimen has a black submedian bar. Also a male and female, labeled "Sharon, August 1, 1873; July 20, 1874," which are brown and faded looking and without the sharp contrasts of the fresh specimens.

Type: No. 13466, U. S. National Museum.

The larva is red-brown or blackish gray, with many plumed white tufts and lateral plumed black hairs; a pair of pencils in front, a pair behind, and a single one accompanying the tuft of joint 12; tufts gray, intermixed with plumed white hairs.

Olene pinicola, new variety.

This form is similar to *pini*, but all the specimens are larger and darker. The brown shadings are weak or suppressed, being replaced by blackish. The hind wings show this tendency, being distinctly of a less brownish tint than in *pini*. The white markings are broader and more suffused, being at the same time more restricted, the median space showing white only about the reniform.

Eight males, fifteen females, Douglas County, Wisconsin (Hopkins, U. S. No. 8389; Gipsy Moth Laboratory Nos. 4657 and 4660).

Type: No. 13467, U. S. National Museum.

Olene grisefacta, new species.

Light gray, coarsely dusted with black on a nearly white ground, that is irregularly shaded with luteous; lines broad, black, the inner coarsely waved, the outer crenulate; discal mark broad, black-outlined, reniform, broken above; subterminal line lost in the general diffusion of the markings or indicated by black inner markings; white spot above tornus distinct but not contrasted, resembling the white about the discal mark; terminal line black, crenulated, receding from the margin. Hind wings rather light gray, with faint discal spot and outer line. Expanse: Male 40 mm.; female 45 mm.

Two males, three females, Glenwood Springs, Colorado (W. Barnes), and Colorado (D. Bruce).

Type: No. 13468, U. S. National Museum.

This is similar to *pinicola*, but larger and paler.

TWO NOCTUIDS NEW TO OUR FAUNA.

The peculiar noctuid *Peosina pandrosa* Cramer must be added to our list, as I have before me a specimen labeled "Miami, Florida." The moth has a geometriform appearance and the median vein is trifid on the forewings, although typically quadrifid on the hind wings. The very peculiar palpi with long slender end-joint and the large eyes are also characteristic.

Prodenia latifascia Walker also occurs with us. I have a specimen recently collected by R. A. Vickery at Brownsville, Texas. The moth resembles *eudiopta* Guenée of our lists (= *ornithogalli* Guen.) but may be distinguished by the ocherous median space, the color involving the stigmata.

HARRISON G. DYAR.

FACTS IN THE LIFE HISTORY OF GONIOPS CHRYSOCOMA.

[Diptera; Tabanidæ.]

BY W. L. MCATEE.

Interesting features of the behavior of the tabanid *Goniops chrysocoma* (Osten-Sacken) were observed on Plummer's Island, Maryland, during the season of 1910. While assembling this and other data for an article embodying all available information on this fly in the District of Columbia faunal region, it was found that Mr. Theodore Pergande had collected, years ago, two full-grown larvæ, which stage of *Goniops*, as well as the pupa, remain undescribed. One of these larvæ was preserved, the other allowed to pupate. The pupa was bred and preserved with the female imago which emerged. The instance adds but another to the long list of contributions to life histories made during a lifetime of enthusiastic collecting and careful breeding of insects by Mr. Pergande. Great credit is due him for valuable work in this much-neglected field.

Through the courtesy of Dr. L. O. Howard, Chief of the Bureau of Entomology, U. S. Department of Agriculture, I am enabled to describe and figure this larva and pupa.

The eggs and first-stage larvæ of *Goniops* were described and figured by W. R. Walton in the Entomological News for December, 1908 (vol. XIX, No. 10, pp. 464–465; pl. XXII), He concludes that the incubation period is from seven to ten days, although according to the dates given (July a misprint?) it would be much longer. The eggs of *Goniops* have been seen during each of the last three years on Plummer's Island, Maryland. On June 26, 1908, H. S. Barber collected a female and a large, greenish-white egg-mass which was laid on the underside of an oak leaf about 8 feet above the ground (See Pl. I, figs. 3, 4, 5). The larvæ hatched June 28.

In 1910 the writer found four egg-masses on July 3 and two on July 10. One of the first four egg-masses was collected. The larvæ hatched July 7. Another had been deserted by the female by July 10. The outer layers of eggs were black, and from them issued, on July 11, numerous proctrotrypids, which J. C. Crawford says are *Telenomus*, probably an undescribed species. The two remaining egg-masses of the lot found July 3 were covered by the females until July 10, a period of a week, during which time many eggs were added. These eggs, and the two masses discovered July 10 as well, were hatched by July 17. They were deposited on the undersides of *Eupatorium*, *Benzoin*, and *Hamamelis* leaves. Some of the empty egg-cases (Pl. I, fig. 6) usually clung to the leaf after hatching, but in one instance not the slightest trace remained of an egg-mass on a witch hazel leaf. A fly heard by E. A. Schwarz giving its peculiar buzz on July 13, and which undoubtedly was ovipositing then, was located by the writer on July 17. On July 24 the female was absent and the eggs were hatching. The larvæ, dropping to the ground, immediately burrowed in.

These observations show that the female *Goniops* guards the egg-mass sometimes for a week at least; that this precaution does not always prevent parasitism; that the period of incubation varies, and that the larvæ are fitted for a subterranean life, upon which they enter as soon as hatched. Eggs have hatched in from 2 to 11 days from the date of collection. But from the fact that eggs are added to the mass for several days, and that all hatch at the same time, it must be inferred that the eggs within the body of the female keep pace in development with those laid. To determine the true period of incubation, observations must cover the process from the laying of the first egg to hatching.

All of the egg-masses found on Plummer's Island in 1910 were on the steep north slope of the principal elevation of the island, which is a well-shaded, cool, and damp locality. The finding of seven egg-masses in this area of less than an acre in one season shows that *Goniops chrysocoma* is not uncommon locally, even though little is known of it and recorded captures are not numerous.

The buzzing noise made by the female *Goniops* is very characteristic and once learned will not be mistaken. The fly makes the sound periodically when ovipositing and guarding the egg-mass, and also usually makes it when disturbed by motion nearby. Hence the insect almost always betrays its presence to the passing collector. The sound is made frequently if one remains near. In describing the method of making the sound, Hine says[1] the wings "striking the leaf at each downward stroke make a rattling noise which could be heard plainly several feet away." According to the writer's observations, the sound is a true "buzz" and is made with the wings lifted up and forward, from which position they are rapidly vibrated, but not to such an extent as to touch the leaf. Hine speaks of finding the flies on the upper sides of leaves; we have always found them on the under sides.

[1] Ent. News, XI, 1900, p. 392.

The capture of *Goniops chrysocoma* has been recorded from the following localities: Trenton Falls, New York;[1] Delaware,[1] Dunfield and Delaware Water Gap, New Jersey;[2] Pittsburg,[3] Jeannette (type locality),[4] and Highspire,[5] Pennsylvania; and Hinckley and Vinton,[6] Ohio. A specimen in the National Museum collection was taken on the Peaks of Otter, Virginia, July 16, 1906, by William Palmer. On Plummer's Island, Maryland, the fly has been taken at the following dates, besides those previously mentioned: June 28, 1905; July 14, 1907; June 27 and July 11, 1909. Single males were taken on the first two dates; all other captures noted relate to females.

The remainder of this article will be devoted to descriptions of the newly hatched and full-grown larvæ and the pupa of *Goniops*. They are illustrated by figures 1 and 2, and by Plates I–III. An explanation of the plates will be found on page 29. In the descriptions of the larvæ the segments are numbered from the head backward. The writer is fully aware of the general use of the terms pro-, meso-, and metathorax for the three anterior segments, but they are here spoken of as the first, second, and third body-segments, which they really are. In the newly hatched larvæ they are scarcely differentiated from the following segments. In the full-grown larvæ, while distinguishable by the surface markings, their exterior features are homologous with those of more posterior body-rings. In comparing and describing them, therefore, it is more natural to use numerical designations.

FIRST-STAGE LARVÆ.

The average length of first-stage larvæ of *Goniops chrysocoma* which have been preserved in alcohol is about 1 mm. In life they are about twice as long. The larvæ are not tuberculate, but the margins of each segment from the third to the tenth, especially the front margins, are more or less raised into low rounded rings. On a larva with arched body definite transverse impressions behind the anterior fleshy annulus of each

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[1] Osten-Sacken, C. R. Mem. Bos. Soc. Nat. Hist., II, 1875, p. 368.

[2] Smith, J. B. Suppl. 27th Ann. Rep. N. J. State Bd. Agr. (1899), 1900, p. 640.

[3] Hine, J. S. Ent. News, XI, 1900, p. 192.

[4] Aldrich, J. M. Psyche, VI, 1892, pp. 236–237.

[5] Walton, W. R. Ent. News, XIX, 1908, p. 464.

[6] Hine, J. S. Ohio Nat., II, 1901, p. 169.

segment are apparent under magnification. They render the annuli conspicuous enough, in fact, to give an impression as of false feet to the naked eye observing the larvæ crawling.

The mouth-parts are exceedingly minute and hard to observe. In arrangement they suggest those of the full-grown larva (described below), and the homologies have been made out accordingly, and, it is hoped successfully. The drawing (fig. 1) is strictly diagrammatic and is made up from a number of studies of larval heads, none of which showed all the parts in the position used in the drawing.

Labrum (*lbr.*) short, pointed, black-tipped, and slightly curved downward. Labium triangular, not bifid as in full-grown larva. Maxillæ (*mx.*) fleshy, truncate-conical, with a short downwardly projecting lobe on inner side of distal end; palpus (*mx.p.*) arising from end of maxilla, first joint long, somewhat enlarged distally, tipped by a number of short rods or spines, one of which is larger and blunt. It may be considered a second palpal joint surrounded at the base by a group of spines. Mandibles (*md.*) fleshy, blunt-tipped, crenulate on lower edge, lying just inside of maxillæ. Antennæ (*an.*) straight, tapering, directed forward; basal joint as long as first palpal joint, somewhat expanded distally, second joint double, one of its divisions longer and apparently tipped with a seta.

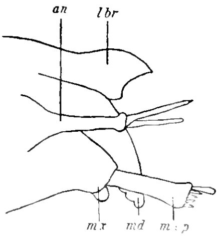
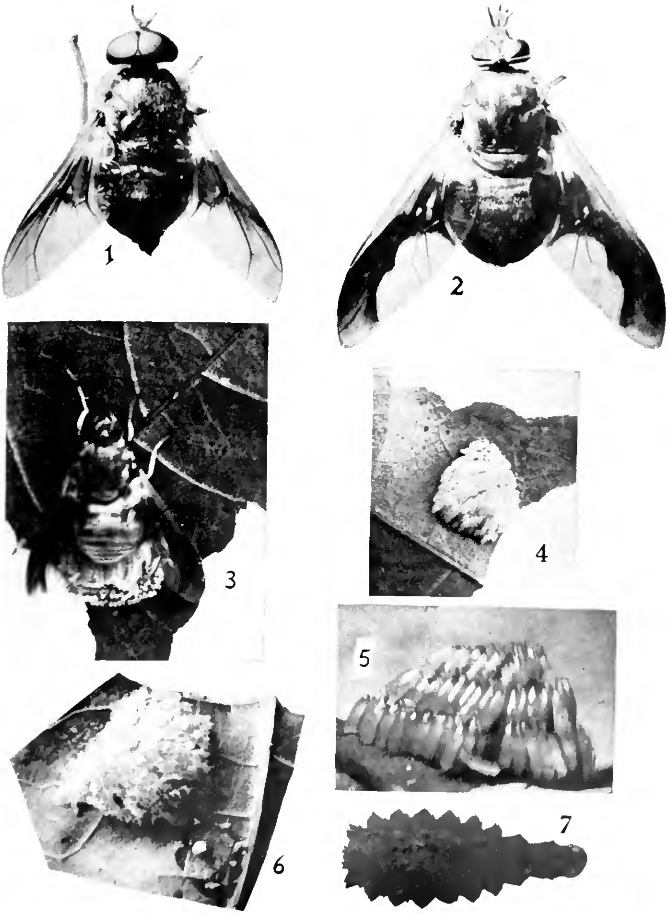


FIG. 1.

First segment of body slightly inflated; first and second segments convex above, flattened beneath, lower lateral edge rather prominent. Second and third segments with two or three longitudinal furrows on each side. Second segment with two conspicuous, well-separated, elongate brownish spots visible (apparently somewhat under the surface) on the dorsal aspect. Hind margins of segments becoming more undulate posteriorly, markedly so on ninth and tenth segments. Last segment with two round black spots (spiracles) set close together on median dorsal surface; this segment with two more prominent ventral tubercles, two similar lateral ones, and other minute tubercles.

FULL-GROWN LARVA.

The full-grown larva here described is one of two collected by Theodore Pergande, near Cabin John Bridge, Maryland, April 13, 1899. They were found under stones covering the openings of mouse burrows. The color in life was gray. The general color of the preserved specimen is dark brown; the head is black. The total length, when the head is retracted, is 17 mm., the greatest diameter 7.5 mm. With the head fully drawn out the larva measures 21 mm. long.



LIFE HISTORY OF GONIOPS CHRYSOCOMA.

Head convex above, flattened beneath, the lower lateral edge a well-marked ridge made by the stretching of the skin over the prolonged basal supports of mouth-parts. Anterior part of head marked off from posterior part by a band of very thin wrinkled skin; anterior fold of this band beginning dorsally just in front of two large lateral smooth areas containing the indefinite bluish-white eyespots; fold descending obliquely over side of head, ending ventrally between bases of maxillæ. Anterior part of head and areas surrounding eye-spots with glassy surface, remainder covered with thin, wrinkled skin.

Epistoma and labrum (*lbr.*) forming a thin, lance-like projection between upper paired parts of oral apparatus. Upper edge of labrum grooved from opposite middle of antennal flap (*an. f.*) to base of the mandibles (*md.*); provided with an unequally two-lobed caruncle just back of the upturned tip (*lbr.*). Higher lobe of caruncle and tip of labrum each bearing a solitary anteriorly directed seta. (See fig. 2.) Lower edge of labrum applied to labium (*lb.*). Latter flat; thin lateral strips diverging from a distinct ramus behind being chitinized, the remainder flexible. Labium ending in a pair of rounded, conical, fleshy lips; flexible portions closely set with short yellow hairs.

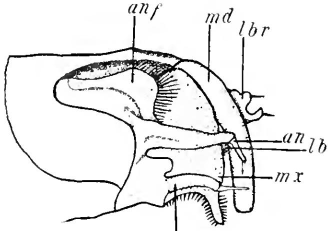


FIG. 2.

Mandibles (*md.*) black, claw-like, blunt, sheathed at base by lobes of maxillæ (*mx.*). The latter thin, flexible, following the curve of the mandibles, their slightly forward curved tips surpassing mandibles. Their lower edge and inner side provided with numerous yellow hairs.

Palpi (*mx. p.*) arising from external basal flaps of maxillæ. First palpal joint inwardly and downwardly curved, second setiform, slightly curved downward and overlapping mandible.

Arising in the arch between epistoma and side of head is a flap (*an. f.*) which seems to be part of the antennal apparatus. It follows edge of epistoma nearly to base of mandibles, and curving down is attached to the posterior third of first antennal joint. From this point clear around the curve to where it parallels the epistoma the flap is fringed with long yellow hairs. First joint of antenna (*an.*) slightly incurved (thus being directed outward), nearly three times as long as the two terminal joints together; second joint conical, tapering gradnally, directed forward and downward; third setiform and directed downward.

Anterior part of first segment very finely tesselated, the granules being arranged in irregular longitudinal rows. The head retracts into the posterior part of this segment, whose exterior is a longitudinally striate thin membrane inflated to gibbous barrel-shape. (Pl. I, fig. 7.)

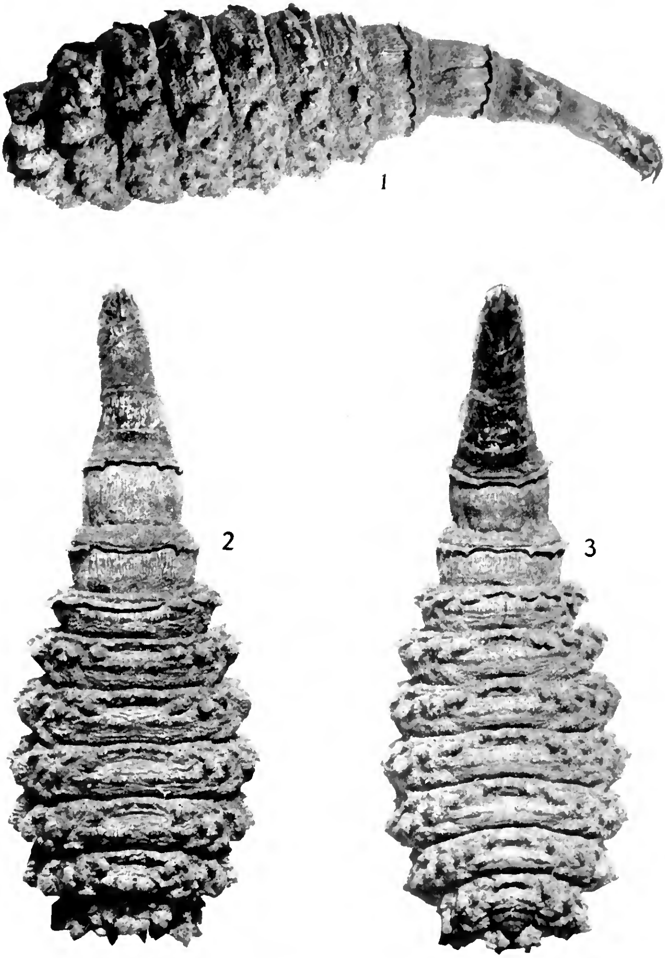
The line of separation between the parts of this segment is marked by a ring of fine fleshy crenulations.

Second and third segments surrounded about the middle by undulate, crinkly, thin-edged folds (Pl. II, figs. 1–3) with five symmetrically placed backward angulations in each fold on each side. Parts of these two segments posterior to the folds with as many longitudinal sulci as there are angles in the fold, and longitudinally striate with fine, irregular wavy ridges. Anterior third of second segment finely striate lengthwise. Part of second segment just in front of fold and anterior portion of third segment granular.

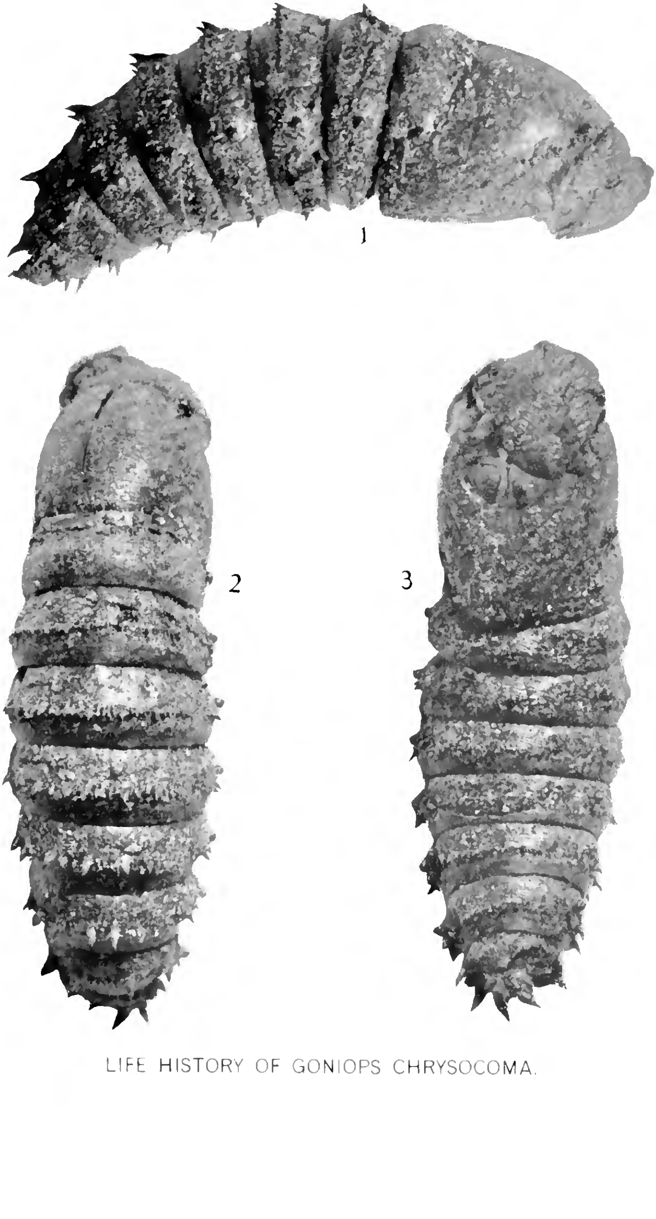
On fourth and following segments these folds broken up into series of fleshy tubercles, on both sides of which surface of segments is raised into low ridges, which on the anterior segments have few but on the posterior segments several low protuberances. Fourth and following segments more prominently ridged transversely on dorsal area and longitudinally on ventral area. A trace of longitudinal striation remains on posterior of the three ridges (on each segment as just described) or protuberances representing it. The fleshy teeth derived from the median segmental folds largest and most numerous on middle of lateral area of each segment, where they are heaped up into irregular elevations, with two more prominent points forming a series alongside; these elevations marked off by deep impressions both above and below and becoming more prominent posteriorly. There are three tubercles above (supralateral series) lateral prominences and about five below (infralateral series) on each segment behind fourth.

The fleshy fold continuous across the dorsal area of fourth segment; (Pl. II, fig. 2); back of this, dorsum of each segment marked by a depressed, comparatively smooth elliptical area. These areas bounded in front by a varying number of thin, fleshy teeth and posteriorly by a series of low, broad, longitudinally striate protuberances. Two of the latter fall into a series down the median line of the segments, on the ninth and tenth of which they become closely approximate, much more prominent, and round pointed. The first of the series (supralateral) of three tubercles above the prominent lateral elevations bound the dorsal depressions at the sides and stand in a series along the back.

Ventral series (Pl. II, fig. 3) of protuberances marked off from infralateral series by a hiatus, by lower and thinner teeth, and by the forward arching of the series. It consists essentially of two stronger lateral teeth with a varying number of less prominent ones between. On tenth segment the series is shortened and the middle elements are almost lacking. Between these arched series of teeth and posterior ridges on ventral surface of the segments (which are represented by about four low, round protuberances) are depressed areas similar to those of dorsal surface. These are bounded at sides by first protuberances of infralateral series. Each segment from fourth to tenth has a



LIFE HISTORY OF GONIOPS CHRYSOCOMA.



LIFE HISTORY OF GONIOPS CHRYSOCOMA.

pair of impressed dots on inner pair of elevations of the posterior longitudinally striate ridge. Segments 6 to 9 have four of these impressions, one outside of each of the median pair.

On the last or eleventh segment the anus is a semicircle with the convex side downward, overhung by four prominent tubercles in bilaterally symmetrical pairs. Mouth of the air-tube a smooth, oval surface just above the anal tubercles. It has a vertical slit and is surrounded by a projecting crenulate frill.

PUPA.

One of the two full-grown larvæ collected by Mr. Pergande pupated and female imago issued May 29, 1899.

Length of the pupa shell 19 mm.; greatest diameter 6.5 mm. Head and thorax of the pupa a lighter, abdomen a darker ferruginous. Head and thorax finely and irregularly wrinkled; anterior half of each abdominal segment (1–7) finely wrinkled transversely, posterior half with wrinkles less distinct or absent (especially on ventral surface), but very finely and closely punctuate. This makes the color appear more intense, in places almost orange. Middle of the segments, except 1, surrounded by an interrupted fringe of definitely grouped, sharp-pointed spines, the larger of which tend to be serrate (Pl. III).

Vertex of head marked by a narrow, rounded, longitudinally wrinkled, transverse ridge. In the depression between this ridge and the antennal prominences and in front of the extremities of the ridge are two outwardly-directed setæ. Antennal sheaths short, appressed, downwardly curved, conical, arising from two low wrinkly protuberances (the antennal prominences above mentioned), these prominences separated by a deep fold, and from them curved and diverging impressed lines run down the face. Below each antennal sheath is a widely separated vertical pair of setæ.

Prothorax longitudinally wrinkled, except for a smooth area behind and below each antennal sheath. A setiferous tubercle stands above each of these smooth areas. Prothorax angulate in the median line behind. Mesothorax three times as long as the prothorax, bearing two spiracular tubercles near anterior lateral angles (about opposite the middle of each lateral half of the prothorax). These tubercles similar to those described below, but complicated by flexures of the walls. They bear at the summit upwardly-arched, crescent-shaped rimæ or air-slits. The only setæ I can find on the mesothorax are one on each side directly back of these spiracular tubercles. Metathorax very short in the median line, but somewhat longer at the sides, which have two rounded angles anteriorly. Wing pads and leg sheaths, the latter slightly the longer, almost covering ventral surface of the first abdominal segment.

Middle of each side of first to seventh abdominal segments with elevated, round, polished knobs bearing on the posterior portion of their summits the posteriorly arched crescentic spiracles. Second to seventh segments with a sharp-pointed, backwardly-curved spine directly posterior to each spiracular tubercle. A short distance above this spine is a similar one, and between these two from one to four shorter ones. Some shorter teeth occur also both ventrally and dorsally from the stout spines. These lateral spines become stronger posteriorly.

There is a definite break between the groups of lateral spines and the weak spines forming the lateral elements of the dorsal series. This break is marked by sharply impressed lines on segments 2 to 7 (Pl. III, fig. 1). Dorsal series of spines on second to seventh segments consisting of a pair of stout spines on each side of the median line (Pl. III, fig. 2), the pair on the seventh segment being most widely separated. On each side of the mid-dorsal pair are about three other symmetrically placed strong spines. Between the larger spines are varying numbers of shorter ones and gradually diminishing small ones terminate the series on each side. All spines sharp pointed and curved backward. Ventral surface of the second to seventh segments with smaller spines, having median pairs of stronger teeth, most widely separated on the third segment and nearest together on the seventh. There is a tendency for one of the minor spines on each side of the median pair to be larger than its fellows. These smaller spines of varying number, but maintaining their series across venter of the segments, interrupted only by the stronger ones and diminishing gradually on each side. A wide hiatus exists between the last of the ventral series on each segment and the group of spines near the spiracular tubercle.

Eighth or terminal segment with three strong spines on each side, connected by series of weaker points (Pl. III, fig. 1). The pair made by the uppermost of these strong lateral teeth is more widely separated than the corresponding ventral pair. In each case the interspace (that is, the dorsal and the ventral area of the segment) is devoid of points, except for small ones immediately adjacent to the large spines. The location of the larval anus is marked by a rounded, transversely wrinkled knob, and the spiracular eminence consists of two conspicuous tuberculate projections surmounted by sharp-pointed downwardly curved spurs.

It will be of value, in concluding, to compare briefly the larva and pupa of *Goniops*, which so far as I know is the only native pangoniid these stages of which have been described, with the comparatively well-studied immature forms of the true tabanids, such as *Tabanus* and *Chrysops*. C. A. Hart says:[1]

[1]Bull. Ill. State Lab. Nat. Hist., IV, Art. VI, 1895, p. 221.

All the larvæ of Tabanidæ studied agree in the following general characters: Body tapering at both ends, which are somewhat pointed; skin shining and glassy, with opaque markings of a microscopic felted pubescence. The palpi have short, thick joints; the basal joint of the antenna is quite short, and there is a bunch of stiff, diverging, recurved hairs between each antenna and the median line above. The full-grown *Goniops* larva, on the other hand, is pyriform and not at all pointed at the ends. Its skin, except on the head and prothorax, is not shining, but everywhere opaque and wrinkled or tuberculate. The palpi have long, slender joints; the basal joint of the antenna is very long, much exceeding the two terminal joints, and the hairs on antennal flap are flexible and applied to the surface of the head. The double second joint of the antenna of first-stage larvæ is noteworthy.

Of the tabanid pupa Hart says:

The mesothorax is one-half longer than the prothorax, and the second to seventh abdominal segments are encircled by continuous fringes of slender spines. In *Goniops* the pupal mesothorax is three times longer than the prothorax, and the fringes of spines on the abdominal segments are not continuous, but interrupted and definitely grouped.

Explanation of Plates.

Plate I.—1, *Goniops* imago male; 2, female; 3, female ovipositing; 4, egg-mass from above; 5, egg-mass from side; 6, egg-mass after hatching; 7, silhouette of full-grown larva, with head retracted, showing inflated membranous portion of first segment. Figs. 1 and 2, nearly three times natural size; 3, twice natural size; 4, one and a half times natural size; 5 nearly four times natural size; 6 and 7 nearly three times natural size. Figs. 3, 4, and 5 from photos by H. S. Barber.

Plate II.—Figs. 1, 2, and 3 are lateral, dorsal, and ventral views, respectively, of the full-grown *Goniops* larva. All about five times natural size.

Plate III.—Figs. 1, 2, and 3 are lateral, dorsal, and ventral views, respectively, of the female pupa shell of *Goniops*. All about five and a half times natural size.

Addenda—Messrs. E. A. Schwarz and H. S. Barber obtained two larvæ of *Goniops* by sifting old leaves from a hollow in the ground on Plummer's Island, Maryland, November 1, 1910. Mr. Barber states that he has collected larvæ in the same manner at Rosslyn and other localities in Fairfax County, Virginia. He notes the habit of throwing out the mandibles with great rapidity and force, making a sharp sound on striking a hard object. Larvæ as usually found are much more contracted than is shown in Plate I, fig. 7.

TWO SPECIES OF PHYCITINÆ NEW TO OUR FAUNA.

[Lepidoptera; Pyralidæ.]

By Harrison G. Dyar.

Myelois oporedestella, new species.

Bluish gray, a little irregularly shaded with fuscous, especially at base and beyond inner line; inner line straight, oblique, whitish, with a slight point or projection outwardly at its middle; discal marks slightly indicated by several cloudy points; outer line crenulate, excurved mesially, whitish, slender, situated near the margin. Hind wing whitish, smoky along the veins and in a double marginal line. Expanse 16 to 22 mm.

One male, 10 females, bred from dried loquat fruits, Miami, Florida, by Mr. August Busck, who received the infested fruits from the Subtropical Garden of the Bureau of Plant Industry Department of Agriculture, through Mr. E. R. Sasscer.

Type: No. 13450, U. S. National Museum.

Ozamia lucidalis Walker.

Trachonitis lucidalis Walker, Cat. Lep. Het. B. M., XXVII, 39, 1863.

Ozamia lucidalis Hampson, in Ragonot, Romanoff Mem. Lep., VIII, 34, 1901.

This species was described from Santo Domingo, and occurs also in Jamaica and Mexico, according to labeled specimens before me. I have received two specimens from Texas, taken respectively by F. G. Schaupp and F. C. Pratt. The genus and species must therefore be added to our list. The Texas specimens, as would be expected, agree with the Mexican form rather than with the Antillean one. The species probably feeds on cactus in the larval state.

A SYNONYMIC NOTE.

The noctuid described by J. B. Smith as *Isogona reniformis*, from Texas, proves to have an earlier name and should be known as

Isogona agilaria Druce.

Metalectra agilaria Druce, Biol. Cent.-Am., Lep. Het., I, 405, 1890.

Isogona reniformis Smith, Trans. Am. Ent. Soc., XXIX, 214, 1903.

Harrison G. Dyar.

MEETING OF APRIL 7, 1910.

The 239th regular meeting of the Society was entertained by the bachelor members of the Society at the Saengerbund Hall, 314 C Street, on the evening of April 7, 1910, and there were present Messrs. Barber, Busck, Dyar, Ely, Gill, Hammar, Hopkins, Knab, Piper, Popenoe, Sasscer, Schwarz, Viereck, Webb, Webster, and Zimmer, members, and Dr. Mann, a visitor.

In the absence of the President, Vice-President Webster presided, and the Secretary being absent, Mr. Barber was made secretary pro tem. The reading of the minutes of the preceeding meeting was dispensed with.

Mr. Schwarz announced the death of Mr. D. H. Clemons, a member of the Society, at Riverside, California, on March 22, and on motion of the Society a committee consisting of Messrs. Schwarz, Busck, and Barber was appointed by the chair to draw up a formal notice for insertion in the Proceedings.

The first paper of the evening, entitled "New Hawaiian Microlepidoptera," by Mr. Busck, was then presented.[1]

The next paper, "Ecdysis in the Diptera," by Mr. Knab, was discussed by Messrs. Schwarz, Busck, Webster, Piper, Hopkins, and Gill.

Shorter notes were presented by Messrs. Busck, Dyar, Piper, Hammar, Knab, and Webster.

A PREOCCUPIED NAME IN SAW-FLIES.

Pteronus wrighti, new name.

> *Amauronematus californicus* Marlatt, Tech. Ser. 3, U. S. D. A., Div. Entom., 1896, p. 85, not *Pteronus californicus* Marlatt, p. 61.

Amauronematus californicus Marlatt belongs to *Pteronus*. The above new name is given as *californicus* had before been used in *Pteronus*. Named for Mr. W. G. Wright who has sent the species from Southern California.

S. A. ROHWER.

[1]Already published, Proc. Ent. Soc., Wash., XII, 132, 1910.

ECDYSIS IN THE DIPTERA.

By Frederick Knab.

In a previous paper[1] I discussed the application of pressure by means of imprisoned air by insects to effect their escape from the egg and from their exuviæ. I showed that the employment of air in these processes is very general among insects and perhaps common to the entire class. Since then other observations bearing on this subject have come to my notice and I have seen several publications which were not available to me at that time. There are a number of careful observations on the process of eclosion of the imago in different Diptera. These are of especial interest, as they bring out striking differences in the two great groups of Diptera. Besides most interesting differences of detail appear in the lesser groups and in individual genera, and as the process itself is not generally understood, it seems worth while to bring the data together.

In the paper referred to I already touched upon the fact that there are two different modes of eclosion in the two main groups of Diptera, the Orthorrhapha and the Cyclorrhapha. The presence in the higher flies of a protrusile bladder, the ptilinum, on the front of the head, and its function in bursting the puparium, have been known since the time of Réaumur. No such special organ exists in the Orthorrhapha, and I have already shown that in the case of the mosquito escape from the pupal skin is effected by inflation of the imprisoned imago's entire body. However, I had not made a detailed study of the process, or the manner in which the air is taken in and where it is stored. I have since found that the process has been well understood and carefully described by Dr. Adolph Eysell.[2] A translation of Dr. Eysell's description will be given elsewhere, so here it will only be necessary to indicate the essential features.

Some time before emergence a layer of air is deposited between the pupal skin and the enclosed imago. This layer of air gives the pupa the peculiar silvery appearance which is so characteristic of the end of the pupal period. Eysell states that the air forming this layer is pressed out through the stigmata of the imago; this is most probably true, as at the time of ecdysis the tracheæ contain no air. As the result of

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[1] The Rôle of Air in the Ecdysis of Insects. Proc. Ent. Soc. Wash., XI, 1909, pp. 68–72.

[2] Mense, C. Handbuch der Tropenkrankheiten, vol. 2, pp. 58–59, (1905).

the pressure from within the pupal skin bursts and the thorax of the imago begins to appear through a longitudinal slit. Now the imago is in direct communication with the outer air and at once begins to swallow great quantities of air. Eysell remarks that this can be distinctly observed by watching, through the at that time unpigmented clypeus, the movements of the pharynx pump.

Hereby the volume of the mosquito is considerably increased; the pupal case can no longer hold it, and, at a time when the hind end of the body still remains exactly in the same position as during the pupal stage, the greatly lengthened body is already forced a considerable distance forward through the slit in the thorax. Through the ingorged air the abdomen loses its limpness, it is stiffened like an air-inflated bladder, and continues to increase in volume proximally. The conical form of the body thus brought about causes it to glide forward in the apically narrowed pupal skin, and under normal conditions this motion needs hardly any assistance from the abdominal muscles.

The specific weight of the animal is greatly diminished by the taking in of great quantities of air, a circumstance which is equally important for the imago when issuing and immediately after.

The air swallowed by the insect is, of course, taken into the digestive tract. In the mosquito there are three large œsophageal diverticula, concerning the function of which there has been much conjecture. One of these diverticula is much the largest and extends ventrally far backward into the abdomen; the other two are dorsal in position. It is clear from the observations of Eysell that the diverticula receive the swallowed air. Christophers[1] already stated that the diverticula are generally found to be filled with air, although he erred in the statement that they are undistended in the newly emerged mosquito. Giles[2] was misled so far by this presence of air in the diverticula that, in his discussion of the anatomy of mosquitoes, he denies that they belong to the digestive system and in consequence calls them "aspiratory vesicle" and "pneumatic sacs." He defends this view at some length and claims that these organs are not connected with the digestive but with the tracheal system. Eysell calls the two dorsal diverticula "Flugblasen" (flight-bladders) and the large ventral one "Vorratsmagen" (reservoir-stomach). Christophers was of the opinion that no food is taken into this latter organ.

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[1] The Anatomy and Histology of the Adult Female Mosquito. Royal Society (London), Reports to the Malaria Committee, 4th ser., 1901.

[2] A Handbook of the Gnats or Mosquitoes, 2d ed., 1902, pp. 103–106.

The large œsophageal diverticulum probably acts, not only as an air chamber to specifically lighten the body of the mosquito, but also as an air pad to distribute the pressure of the large coagulum formed in the mid-gut after feeding. In a fed mosquito a transparent area is generally to be seen in front of the opaque mass of blood in the abdomen. This transparent area is the abdominal portion of the air-containing œsophageal diverticulum.[1]

Christophers' view, however, that food is not taken into the large diverticulum, is incorrect. Eysell has carefully studied the functions of the three diverticula and his terminology is based upon the results. He states that the two dorsal diverticula are always filled with air. The third diverticulum, or reservoir stomach, is generally also filled with air. However, after the insect has fed, the large diverticulum is found filled with nectar, fruit juice, or blood, which may be retained there for hours, and with low temperature even for days.

A solution of litmus with sugar and water is readily taken by mosquitoes. As long as it remains in the reservoir-stomach it retains its beautiful blue color. Taken into the mid-gut it reddens at once and also remains red in the hind-gut. Only when the blue color has completely given way to the red has the reservoir-stomach given up to the mid-gut the last vestiges of the solution. When the nourishing liquids have been given up by the reservoir-stomach, which is furnished with longitudinal and circular muscles and furthermore assisted by ventral pressure, to the mid-gut, air again takes its place.

Christophers examined his mosquitoes in this last condition when the blood had been transferred from the reservoir stomach to the mid-gut and again replaced by air in the former.

The process of ecdysis of the imago appears to be practically the same in all the Nemocera. Miall[2] mentions the secretion, through the spiracles of the enclosed imago, of a layer of air beneath the pupal skin in *Chironomus* and *Simulium*. In the case of *Simulium* the air accumulated inside the pupal skin performs still another function, namely, to carry the emerging imago uninjured from the submerged pupa to the surface of the water. When the pupal skin is ruptured the air and the fly escape together and the fly is carried rapidly to the surface within a ball of air. The escape of *Simulium* from the pupa, according to Osten Sacken,[3] seems to have been first described by Verdat in 1821.

[1] L. c., pp. 6–7.

[2] The Natural History of Aquatic Insects, 1895, p. 133, 187-188.

[3] On the Transformations of Simulium. Amer. Entom. and Botanist, vol. 2, pp. 229–231 (1870).

The escape from the pupa of the mosquitoes of the genus *Mansonia* has apparently never been observed, but it must occur in a manner similar to *Simulium*. The pupa of *Mansonia* lives submerged, attached to the roots of aquatic plants by its thoracic respiratory appendages and by their means extracting its supply of air from the plant. It would seem that the pupa does not even rise to the surface to free the imago, for the pupal exuviæ are not found floating on the surface in swamps where the larvæ abound.

According to the observations of Comstock[1] and Kellogg[2] the emergence of the Blepharoceridæ from their submerged pupæ is a far more imperfect process and indicates the primitive condition of the group. Similarly to the Simuliidæ, the pupæ are attached to the rocks in swiftly flowing streams. It would seem that the imagos only succeed in making their escape when the water is very shallow (from one-fourth to one-half inch in depth), and Comstock states that in the deeper water they are swept away by the current. He states that the fly forces its way out slowly, requiring from three to five minutes to free itself, and that its body is held vertically in spite of the swift current. This last fact points to the rigidity of an air-inflated condition. Kellogg states that he "has often watched the emergence of adults, and has been struck by the great loss (apparently) of life in the process. So many are swept away by the swift water before the wings can be unfolded or before the legs can be loosened from the pupal sheath that it seems no wonder that the family is a disappearing one. It is a case of the dangers of an extreme specialization. If the fixed pupæ lie in water too deep (easily occasioned by a sudden rise in the stream at the time for emergence), or, on the other hand, become wholly bereft of the life-giving water by a falling of the stream, there is no hope for the fly. The first contingency seems indeed to be somewhat provided for (as explained in the account, *postea*, of the life-history of the flies) by the apparent power of the insect of postponing for some time, if necessary, its emergence. Thus, in the event of a heavy rain and consequent rise of the stream, the too deeply submerged pupa may lie unchanged until the water has run off (a matter which happens speedily in swift streams) to a safe shallowness."

More careful observations on the emergence of these remarkable flies would be well worth while. Thus the question whether the flies that are swept away by the current are

[1] A manual for the study of insects, 1895, pp. 435–436.
[2] Proc. Cal. Acad. Sci., 3d Ser., Zool., vol. 3, pp. 213–215 (1903).

really lost or not should be investigated further. Kellogg points out that in this group the very unusual condition obtains of the wings becoming fully developed within the pupa.

> The fully developed wings lie in the pupal case folded both longitudinally and transversely, and only need to unfold to be ready to carry the fly into the safe air. It is this folding which produces the secondary veining of the wings characteristic of the family, this veining being simply the persisting creases and lines of the folding.

As already stated, in the Cyclorrhapha the escape of the imago is effected by means of the ptilinum or frontal bladder. This bladder is situated above the roots of the antennæ and is only inflatable in the immature fly. Later it is permanently retracted or disappears altogether. When the fly is ready to leave the puparium the bladder is alternately inflated and retracted until the front portion of the puparium, which has lines of weakness for this purpose, is forced off. Some indication of the pressure thus exerted is obtained from some experiments made by Michl with pupæ of *Muscina stabulans* Fallén.[1] When the fly which was about to emerge had burst off the lid of the puparium its escape was prevented by fastening a strip of paper across the opening, the puparium being fixed immovably. The fly would then endeavor, by inflating its ptilinum, to remove or perforate the obstacle. So great was the pressure exerted that in one case out of eleven the frontal bladder was ruptured.

The earlier authors supposed that the ptilinum is inflated with air, but Joly,[2] and independently Reissig,[3] showed that it is filled with blood forced from the body into the head. Reissig aptly compares the action to that of an hydraulic press. Through what channels the blood is forced forward has not been determined. Reissig suggested that special vessels, supplied with valves, existed. Weismann thought that it was accomplished by the dorsal vessel, as this is the main channel through which the blood is carried forward from the body-cavity.[4] Joly already showed that the ptilinum was inflated by violent contraction of the abdomen, thus forcing forward

[1] Einiges über das sogenannte Ptilinum der schizophoren Dipteren. Mitt. naturwiss. Ver. Univ. Wien., vol. 8, pp. 85-89 (1910).

[2] Recherches . . . sur les œstrides, etc. Ann. Sci. phys. et nat., agric. et indust. de Lyon, vol. 9 (1846), p. 204.

[3] Ueber das Herauskommen der Tachinen aus ihren Tönnchen und aus dicht verschlossenen Orten, an welchen diese oft sich befinden. Archiv f. Naturgesch., Jahrg. 21, vol. 1 (1855), pp. 189–196.

[4] Die Entwicklung der Dipteren, p. 227 (1864), reprint from Zeitschr. wiss. Zool., vols. 13 and 14.

the body fluids. The important part played by the abdominal and thoracic muscles in this process has been repeatedly pointed out, but no one seems to have suspected that air, ingested at this time, acts as an auxiliary. I have opened a newly emerged flesh-fly (*Calliphora*) and found that the paunch or food reservoir was filled with air. But it appears that in the Cyclorrhapha the presence of air plays but a very subordinate part in effecting the escape of the imago from the puparium; indeed, it is to be doubted if in those forms in which the food-reservoir is lacking (Hippoboscidæ) air is employed at all.

The process of emergence in the Cyclorrhapha is very fully described by Künckel d'Herculais in his great work on the Volucellas.[1] He points out that the action of the frontal bladder has been observed by Réaumur in *Calliphora vomitoria*; by Von Gleichen in *Musca domestica*, figuring the head in two different phases of the process; by Reissig in the Tachinidæ; by Weissman and by Lowne in several Muscidæ; and by himself in the Syrphidæ (*Volucella*, *Eristalis*, *Syrphus*) and the higher flies (*Anthomyia*, *Pegomyia*, *Calliphora*, *Lucilia*). To these must be added the observations of Joly on the emergence of the Oestridæ.

Künckel d'Herculais brings out the fact that, while the frontal bladder is present in all the Cyclorrhapha at the time of emergence, there are important differences between the lower forms, such as the Syrphidæ, and the higher or muscoidean forms. Upon these differences, although he understood them but imperfectly, Becher founded his two groups, the Aschiza and the Schizophora, groups which appear to be well founded, both on biological and structural characters.[2] The difference in the two groups consists in the disappearance of the frontal bladder with the hardening of the integument in the first group, while in the second the bladder persists in a retracted condition. Consequently a frontal suture is present in the Schizophora and absent in the Aschiza.

Künckel d'Herculais describes the emergence of *Volucella* as follows:

> Carefully enclosed in its nymphal envelope the fly is incapable of the least movement; its legs, its wings, the mouth-parts, the antennæ, are folded down upon the inferior region of the body in such a manner that the front protrudes as the most prominent part. If one opens a

[1] Recherches sur l'organisation et le développement des Volucelles, Paris, 1875, (atlas) 1881.

[2] Zur Kenntniss der Kopfbildung der Dipteren. Wiener entom. Zeitung, vol. 1, pp. 49–54 (1882).

pupa a little before its maturity one perceives that the front is still entirely soft; one even sees that the animal, disturbed in its repose and wishing to escape, strongly inflates its frontal region and causes a small bladder to come forth. By a violent effort the bladder becomes inflated, and, pressing upon the anterior part of the pupa, a faint, sharp report can be heard. A small anterior piece, corresponding to the upper part of the head and the two upper dorsal segments, is propelled forward, often several centimeters, the upper zonite bearing the [stigmatal] horns is raised, and the *Volucella* appears.[1]

Künckel d'Herculais points out that the ptilinum has a further function. After the front of the puparium has been forced off, the fly, in order to pass the narrow orifice of its prison, diminishes the volume of its thorax and abdomen by forcing the blood into the head. Reissig, much before this, had already shown that newly emerged Tachinidæ use the ptilinum to push obstacles out of their way.

Lowne makes the remarkable assertion that "Künckel d'Herculais says there is no frontal sac in *Volucella* or the Syrphidæ," which leads us to the assumption that he did not know the French investigator's remarkable work at first hand.[2]

Becher, on the other hand, disputes Künckel d'Herculais on the opposite grounds. He asserts that Künckel d'Herculais is in error and that there is no frontal bladder in the Syrphidæ, nor in Platypezidæ and Pipunculidæ. In fact, on this basis, he indicates a group for these families and the Phoridæ, calling them Aschiza, and designating the remaining Cyclorrhapha as the Schizophora. Before Künckel d'Herculais, Gerstaecker had already announced the presence of a frontal bladder in *Eristalis*, and he is quoted to that effect and disputed by Becher. The passage is from Gerstaecker's review of Brauer's "Monographie der Oestriden," and, translated, reads as follows:

That the Syrphidæ, in which the author has up to now missed the frontal bladder, possess such, may be frequently and easily established in the autumn on newly emerged specimens of *Eristalis tenax*.[3]

Becher based his assertions virtually on a study of the mature imago, as is apparent from the following statement:

Because the frontal bladder never disappears without leaving a trace in the mature insect, but remains within the frontal suture as

[1] L. c., p. 77.

[2] The Anatomy, Physiology, Morphology, and Development of the Blow-fly, vol. 1, pp. 125–126 (1892).

[3] Bericht über die wissensch. Leistungen im Gebiete d. Entom., 1863–1864, p. 395 (1867).

an invaginated and shrunken bladder, one can determine by the examination of the head of the imago whether the fly does or does not burst open the puparium by means of a frontal bladder without it being necessary to directly observe the emergence. One can best determine the conditions by longitudinal sections carried medianly through the head.[1]

He then makes comparison, accompanied by figures, of the structure in *Calliphora* on the one side and of various Syrphidæ on the other. He shows that while the invaginated ptilinum is present in *Calliphora* it is absent in the Syrphidæ, Pipunculidæ, Platypezidæ, and Phoridæ. He points out that the frontal lunule, which is still present and well marked in the Syrphidæ, is only indicated in the Pipunculidæ and Platypezidæ by somewhat heavier chitinization and darker coloring, while in *Phora* there is no indication whatever.

It appears, however that Becher, in criticizing the work of Künckel d'Herculais, had but a superficial knowledge of it. Künckel d'Herculais enters particularly into the transient character of the frontal bladder in the Syrphidæ and contrasts this with its persistence in the higher flies.

When the bladder is entirely inflated a well-marked circular ridge indicates the line which separates it from the vertex and the cheeks; when, on the contrary, it is completely withdrawn into the interior of the head, the fly having reached its full development and the antennæ having taken their normal position, there does not remain more than a slightly evident trace of this ridge. The outward projection of the frontal bladder is accompanied by a general dilation of the entire head, which at this time possesses a remarkable elasticity; the eyes themselves are alternately moved nearer together or farther apart, and, what is more incredible, undergo modifications in their curvature as they approach each other towards the median line in consequence of the tension or the relaxation of the vertex. The parts which support the base of the proboscis inflate also, and on each side one sees come forth from the interior of the mouth-frame (mouth-opening) a very small bladder; the inflation and retraction of these bladders is accompanied by the extension of the proboscis and by movements of the maxillary palpi. The inflation of the frontal bladder and the buccal bladders sometimes reaches such a volume in certain *Volucella* and some *Musca*, when an obstacle opposes their emergence, that the

[1] L. c., p. 50. The opinion that the frontal bladder is absent in the Syrphidæ is reaffirmed by Brauer, who evidently had inspired Becher. He states of the Syrphidæ: "Die Fliege sprengt die Tonne durch Ausdehnung und Entwicklung des meist langen Untergesichtes und hat keine Stirnblase (Brauer, Becher)." (Denkschr. d. math.-naturwiss. Classe d. kais. Akad. d. Wiss., Wien, vol. 47, 1883, p. 31.)

anterior region of the head surpasses the posterior in width and resembles a small bladder ready to burst, so much is it distended by the violent efforts of the insect.[1]

* * * * *

In *Volucella*, *Eristalis*, and *Syrphus* not a trace of the frontal bladder remains when the insect is ready to begin its flight; but in *Musca*, *Calliphora*, *Lucilia*, and *Sarcophaga* the bladder is found in the interior of the head as a fold of the skin having the form of a bag with a wrinkled and rumpled envelope; its structure, aside from its transparency and coloration, is identical with that of the surrounding integument: one sees the same lozenge-shaped scales.[2]

Künckel d'Herculais touches upon the transient character of the frontal bladder in the Syrphidæ again in criticizing Lowne, who attributed to the frontal bladder the seat of the olfactory sense and the faculty of producing the humming noise. Künckel d'Herculais points out that the integument of the sac is identical with that of the front of the head and that the Syrphidæ, while they have no frontal sac in the mature state, are nevertheless noted for their powers of sonefaction.

Becher, in addition to his studies on mature specimens, also observed some live pupæ and recently emerged Syrphidæ. While his conviction, gained from mature specimens, that there is no frontal bladder in the Syrphidæ and related families, led him into error, his observations nevertheless reveal some interesting peculiarities in the condition of the head at the time of emergence.

After the lid of the puparium is burst off the head of the fly appears and one can now see that, different from the remaining Cyclorrhapha, it is completely developed and closed in the region of the front and vertex, therefore above the antennæ. On the contrary, the lower face, which in the Eumyids remains unchanged, is here soft and translucent and, while in the developed animal it shows a convex, often face-like, profile, immediately after emergence it is concave and transversely split. On well-advanced pupæ the concavity and transverse folding can be seen very plainly. The lower face and the lateral parts of the head appear here by their expansion to assume the function of the frontal bladder, to burst off the lid of the puparium, and one also sees the lower face pulsate in a similar manner with the frontal bladder, but without ever swelling to such a degree as this. Only after the wings are expanded and hardened, and the proboscis, which in the beginning lies folded back upon the breast, is withdrawn

[1] L. c., p. 78.
[2] L. c., p. 80.

into the mouth-cavity, does the lower face finally harden and take on color and form.

If one compares pupæ of Muscidæ and Syrphidæ in an equally advanced state of development the difference is also very obvious, for in the former the head is conically inflated between the base of the antennæ and the vertex, which inflation represents the frontal bladder, while in the latter these parts already have the position which pertains to them in the emerged insect[1].

Thus it is seen that the Aschiza, in their mechanism for escaping from the puparium as in other respects, represent a less specialized type than do the Schizophora with their highly developed and persistent frontal bladder. This is supported by the fact, brought out in the anatomical investigations of Dufour,[2] that, as one follows the evolutional lines, there is a reduction in the size of the food-reservoir until finally, in the Hippoboscidæ, it is lost altogether; accompanying this there is a lengthening of the digestive tract itself. Dufour touches this point in discussing the conditions in the Hippoboscidæ.

The alimentary tube in them is the longest of all the Diptera, since it is from eight to nine times the length of the insect. That of the last genera of the acalypterates has already prepared us for the progressive increase in the length of this canal, together with a progressive reduction in its organization.[3]

A consideration of these conditions in the Phoridæ seems to throw some light on the position of the family, for after considerable discussion this seems to be still unsettled. The adult characters give opportunity for wide divergence of opinion and apparently present nothing that is decisive. Becher, as already stated, placed the Phoridæ in the Aschiza, in spite of the fact that there is no trace of a frontal lunule, and in this he is followed by the majority of dipterists. Osten Sacken, on the other hand, has shown that, if the larval and pupal conditions are properly understood, the family should be grouped in the Orthorrhapha, and a few authors have followed him.[4] Brues, in his Monograph of the North American Phoridæ[5] and in more recent papers, considers the systematic position of the

[1] L. c., pp. 51–52.

[2] Recherches anatomiques et physiologiques sur les diptères. Mém. Acad. Sci., vol. 11, pp. 171–360, pls. 1–11 (1851).

[3] L. c., p. 341.

[4] The position of Phora in the system of Diptera. Ent. Mo. Mag., vol. 38, pp. 204–205 (1902).

[5] Trans. Amer. Ent. Soc., vol. 29, pp. 331-404, pls. 5-9 (1903).

family problematical.[1] In such a case a study of the early stages, biology and internal anatomy should help to solve the problem. Perhaps the following data will stimulate some one to investigate the group more carefully from this side. Dufour calls special attention to the large size of the food-reservoir in *Phora* and states that he knows few Diptera in which it is proportionally larger; from his figure it is also evident that the digestive tract is short as compared with the higher flies.[2] Both these circumstances support the views of Osten Sacken. However, that the family is anomalous is well brought out in the anatomical studies of Dufour.

The following papers were accepted for publication:

DESCRIPTIONS OF SIX NEW AMERICAN HETEROCERA.

[Lepidoptera; Noctuidæ.]

By WILLIAM SCHAUS.

Casandria purpurascens, new species.

Female.—Palpi fuscous fringed with grayish white. Head mottled dark and light brown. Collar and thorax fuscous gray, the collar posteriorly and patagia shaded with opalescent scales. Abdomen fuscous gray above, with a large terminal light-brown space. Fore wings leaden black; the base brownish; a faint dark-brown antemedial line from subcostal, somewhat wavy and inwardly oblique, and inwardly shaded with brown from subcostal to submedian; reniform large, pointed towards base, brown edged by a fine dark velvety line; a brownish spot on costa above reniform edged with dark brown; postmedial remote from cell, wavy, inwardly oblique from vein 6, velvety fuscous brown, outwardly shaded with brown, and also broadly so shaded inwardly from vein 4 to inner margin; some small subterminal brownish spots; the veins terminally brown; a fine terminal black streak between 6 and 7, and 7 and 8; indistinct terminal dark spots between the veins; cilia spotted with brown at veins. Hind wings dull brown black; cilia tipped with white. Expanse 33 mm.

Habitat: Sixola River, Costa Rica.

Casandria steniptera, new species.

Male.—Palpi light brown. Head, collar, and thorax grayish brown. Fore wings grayish, shaded with brown along costa, in cell, and on

[1] Thh systematic affinities of the dipterous famlly Phoridæ, Biol. Bull., vol. 12, pp. 349-359 (1907); Some further remarks on the systematic affinities of the Phoridæ, with descriptions of two new North American species. Bull. Wisc. Nat. Hist. Soc., vol. 7, pp. 103-108 (1909).

[2] L. c., pp. 322-323, 341, pl. 11, fig. 134.

outer margin, irrorated with brown on inner margin; an antemedial fine dark shade, almost straight; a medial fine line, wavy, outset on inner margin; a dark point at end of cell, followed by a faint fuscous line along fold to subterminal; a fine postmedial line outcurved from middle of costa around cell followed by a faint line from costa, parallel with outer margin, the space between the two lines thickly irrorated with brown; a broad dentate subterminal fuscous gray shade; terminal dark spots. Hind wings dirty white at base shading to fuscous gray on outer margin; cilia white. Expanse 23 mm.

Habitat: St. Jean, French Guiana.

Paectes phæoplaga, new species.

Male.—Antennæ shortly pectinated on basal half. Palpi fuscous shaded with brown above. Head and collar velvety black tinged with brown, the collar posteriorly edged with lilacine; thorax lilacine gray, edged in front and behind with dark brown. Abdomen brownish irrorated with black; a geminate transverse white band at base. Fore wings light brown mottled with gray at base of cell, medially in cell and on inner margin, and on outer margin; a fine fuscous antemedial line curved from subcostal to submedian; a fine medial line curved below cell and on inner margin; orbicular round, brown; reniform oval longitudinally, pointed between 5 and 6, gray, edged with fuscous brown; postmedial fine, geminate, oblique from costa to vein 6, inbent to vein 2 and then straight to inner margin, dark brown, becoming velvety black-brown below 2; a subterminal brown shade followed by a fuscous line from costa to vein 7; marginal brown spots, and a terminal brown line; cilia grayish spotted with fuscous at veins. Hind wings: the veins and outer half black; the base shaded with light brown; the inner margin whitish crossed by four black lines; cilia whitish with large fuscous spots. Expanse 25 mm.

Habitat: St. Jean, French Guiana.

Paectes hæmatosema, new species.

Male.—Palpi white. Head white with a few brown irrorations. Collar dark brown, shaded and irrorated with lilacine. Thorax fuscous gray tinged with brown and lilacine. Abdomen above mottled brown and white. Fore wings: The basal area dark brown, limited by the antemedial, which is angled just below median, white from costa to that point, then velvety black-brown to inner margin, and with a wavy white basal line from costa to submedian; medial space leaden black; orbicular a white point; reniform light brown edged with white, medially constricted followed by a cluster of white scales; postmedial finely dentate, geminate, black, filled in and narrowly edged outwardly with white, followed by some light brown and then a steel-gray shade; a broad subterminal light-brown shade edged with white, widest on costa, terminating on inner margin in a bright red spot; apex to vein 6 leaden black: outer margin below vein 6 whitish buff crossed by an interrupted black line; cilia fuscous gray and brown. Hind wings white on basal half; the veins and outer half fuscous; inner margin white with some opalescent scales; a medial and a postmedial geminate dark streak; cilia buff and brown tipped with white. Expanse 26 mm.

Habitat: St. Jean, French Guiana.

Paectes eumicta, new species.

Female.—Antennæ with long curly and pubescent pectinations on basal half. Palpi light brown, tinged with lilacine and irrorated with black. Head and collar lilacine irrorated with black, the latter crossed by a transverse black and brown shade. Thorax mottled lilacine and brown. Abdomen fuscous gray; a geminate transverse buff line at base. Fore wings: Basal area olive-brown, with a fuscous gray spot on costa, a similar line in cell, one below cell, and suffusions on inner margin; medial fuscous gray shades, the costa olive-brown, also the orbicular, which is large, round, containing a darker point, and a large space at end of cell; a whitish shade across costa and before reniform, and a dark irregular line from cell to inner margin; reniform space fuscous gray edged with fuscous brown; the postmedial geminate, angled above vein 6, inwardly oblique, wavy, olive-brown, becoming dark velvety black-brown below submedian fold; from vein 4 to inner margin the postmedial is followed by a fuscous gray shade; a broad subterminal olive-brown shade, partly shaded with light gray, and followed by a fuscous gray line; outer margin grayish with a row of black intervenal spots, from which dark shades extend obliquely on cilia. Hind wings black shaded with dark brown; cilia whitish mottled with dark brown. Expanse 23 mm.

Habitat: St. Jean, French Guiana.

Paectes endochlora, new species.

Female.—Palpi outwardly bronze-brown irrorated with fuscous gray and white. Head, collar, and thorax fuscous gray, shaded with lilacine. Abdomen fuscous gray, irrorated with white laterally. Fore wings fuscous gray; some dark green at base, and along inner margin to postmedial; orbicular small, dark green; antemedial geminate, fuscous, forming four short curves; a medial line followed by a few whitish scales on median; postmedial geminate, excurved, filled in and preceded by some green and light gray scaling and followed to subterminal by a broad dull fuscous-brown space; the subterminal whitish gray, indistinct except at costa; marginal dark brown, transverse spots between the veins. Hind wings blackish brown; the cilia dark brown, tipped with white. Expanse 18 mm.

Habitat: Cayenne, French Guiana.

THE WEEVILS OF VICTORIA COUNTY, TEXAS.

By J. D. Mitchell and W. Dwight Pierce,
U. S. Bureau of Entomology.

Since the advent of the boll weevil (*Anthonomus grandis* Boheman) into Victoria County in 1894 many records have been made upon the weevils of the county. This county is very interesting from an entomological standpoint because of its great diversity of floral regions and the blending of eastern and western faunas. In addition to being able to present herewith an interestingly large list of weevils from a limited region, we are able to give biological notes on most of the species. Many of these records are here for the first time published and some have an important bearing upon the knowledge of our economic weevils. We believe that the possession of this useful knowledge warrants us in presenting a seemingly local list of insects. The senior writer, who has been a resident of Victoria for many years, is responsible for most of the original observations on the weevils. The junior writer has been familiarizing himself more or less with Victoria conditions since 1904 and is responsible for the determinations, arrangement, and description of the new species, as well as for the authenticity of the parasite records. The records have been made by the following agents of the Department of Agriculture: R. A. Cushman, W. E. Hinds, C. E. Hood, W. D. Hunter, C. R. Jones, A. McLachlan, J. D. Mitchell, A. C. Morgan, F. C. Pratt, W. D. Pierce, E. A. Schwarz, C. M. Walker, W. W. Yothers.

Victoria County is situated in central southern Texas, about 25 miles from the Gulf of Mexico, on the dividing line between the Austroriparian or humid division and the Lower Sonoran or semi-arid division of the Lower Austral life zone. It has an altitude of 90 to 200 feet above sea level. The Guadalupe River divides the county into nearly equal parts, eastern and western. The northwestern quarter of the county is sandy and well timbered with oaks; the northeastern quarter is a rolling sandy prairie with the Arenosa for its eastern border; the southeastern quarter is a level black prairie; and the southwestern quarter is a rolling black prairie bordered on the south and west by the San Antonio River. The county is drained by many creeks and branches, principal among which are the Garcitas, Placedo, and Colletto. The rich valley of the Guadalupe extends through the county and is about half a mile wide at the northern end and 2 miles at the southern end. Many bayous and sloughs, old beds of the river, traverse the valley, especially in its southern part, and are margined with a large variety of water and marsh vegetation.

The Austroriparian flora of the county is of three types—the oak belt, the river woodlands, and the marsh lands. In other words, it contains both mesophytes and hydrophytes. The Lower Sonoran flora is all xerophytic and either prairie or chaparral brush. Of course there are many transition areas where the timber of the two floras is intermingled. The trees of the river valleys include *Populus deltoides*, *Salix*, *Hicoria pecan*, *Quercus breviloba*, *Q. marilandica*, *Q. macrocarpa*, *Q. minor*, *Q. virginiana*, *Ulmus*, *Celtis*, *Morus*, *Cratægus mollis*, *Prunus*, *Gleditsia triacanthos*, *Bumelia lanuginosa*. *Tillandsia usneoides*, the Spanish moss, and mistletoe (*Phoradendron flavescens*) are common on the bottom-land timber. Among the mesophytic weeds and shrubs are to be included *Rubus*, *Cassia occidentalis*, *Cardiospermum halicacabum*, *Callirrhoe involucrata*, *C. lineariloba*, *Ipomœa sinuata*, *Convolvulus*, *Cuscuta*, *Solanum rostratum*, *Iva ciliata*, *Ambrosia psilostachya*, *A. trifida*, *Xanthium*, *Rudbeckia amplexicaulis*, *Helianthus*, *Verbesina virginica*. Of the hydrophytes the following require mention: Wild rice, joint-grass, *Cyperus virens*, *Rynchospora corniculata*, *Polygonum*, *Ludwigia natans*, *Pluchea camphorata*.

The commonest crops are cotton (*Gossypium hirsutum*), corn(*Zea mays*),canteloupes(*Cucumis melo*), and sweet potato (*Ipomœa batatas*). Pecans (*Hicoria pecan*) are grown very extensively, as are also figs (*Ficus*), and peaches (*Amygdalis perscia*). The chinaberry tree (*Melia azedarach*) is very common in yards, and the palma christi bean (*Ricinus communis*), is also an introduced plant.

The Lower Sonoran flora comprises the following chaparral timber: *Ehretia elliptica*, *Acacia rœmeriana*, *Vachellia farnesiana*, *Prosopis glandulosa*, *Zanthoxylum clavaherculis* (planted along fences), *Guajacum angustifolium*, with the characteristic bunch mosses, *Tillandsia baileyi* and *T. recurvata*. The prairie vegetation comprises *Yucca*, *Cassia chamæchrista*, *Croton capitatus*, *C. engelmanni*, *Opuntia* spp., *Euphorbia marginata*, *Solanum eleagnifolium*, *S. rostratum*, *Amphiachyris dracunculoides*, *Leucosyris spinosa*, *Carduus spinosissimus*.

On the following pages we present a list of the weevil records for the county.

ANTHRIBIDÆ.

Ormiscus fissunguis Le Conte (?) (**Gonops**).

A species of *Ormiscus* very close to *fissunguis* has been taken April 16, 1908 on *Xanthium* sp. (Mitchell); April 23, 1907 (Hinds); July 15, 1907 (Mitchell) bred from *Xanthium* stem April 7, 1908.

Euparius lunatus Fabricius (**Cratoparis**).

By river bottom near town, October, 1904; November 4, 1908 (Hunter); under bark, November 27 (Mitchell); November 19 (Pratt). It generally breeds in white tree-fungus.

Brachytarsus sp.

Breeding in beans of *Guajacum angustifolium*, February 14, 1907, Mission Valley (Mitchell).

Brachytarsus limbatus Say.

On *Rudbeckia amplexicaulis* April 23, 1907 (Cushman).

Toxotropis fasciatus Le Conte.

On dead branches of *Celtis*, March and April (Schwarz).

Aræcerus fasciculatus De Geer.

The ubiquitous coffee-bean weevil breeds abundantly in china berries (*Melia azedarach*) May 13, 1907 (Cushman); in palma christi beans (*Ricinus communis*); in corn (*Zea mays*); stalks and stems of various weeds; and in pods of huisache (*Vachellia farnesiana*), July 22 (Mitchell). Bred from old cotton bolls October 22, 1910 (Mitchell). The weevils in china berries are abundantly parasitized by *Cerambycobius cushmani* Crawford, and *Eurytoma tylodermatis* Ashmead (Pierce).

CURCULIONIDÆ (SENSU LATIORE).

CYLADINÆ.

Cylas formicarius Fabricius.

The sweet potato weevil is found commonly in Victoria County and is the great pest of the sweet potato (*Ipomœa batatas*) crops. It breeds natively in the roots of a *Convolvulvus* sp., commonly known as "tie-vine," in which it has been taken in all three stages in January. The weevil breeds in the sweet potato tubers in the field and continues its work all winter in the stored roots, until every potato is honeycombed with its cells. The larvæ give the potatoes a bitter flavor, rendering them unfit for food, even for hogs. The dult is a slow insect and is dependent largely upon the assistance of man for transportation to new territory.

APIONINÆ.

Apion aculeatum Fall.

Bred from flower-head of huisache (*Vachellia farnesiana*), March 17, 1908 (Mitchell).

Apion æneipennis Smith.

On *Helianthus*, October 16, 1907 (Mitchell).

Apion impunctistriatum Smith.

On *Rudbeckia amplexicaulis*, April 8, 29, 1907 (Mitchell); May 13 (Morgan).

Apion occidentale Fall.

On *Helianthus*, April 8, 1907; April 12 (Mitchell).

Apion subornatum Fall.

Feeding on black chaparral (*Acacia rœmeriana*), and breeding in the pods, March 26, 1908 (Mitchell).

Apion subcinctum Fall.

September 16, 1907; November 15, 1906 (Mitchell).

TANYMECINÆ.

Tanymecus confertus Gyllenhal.

On *Ambrosia psilostachya*, April 30, May 13 (Morgan).

BRACHYDERINÆ.

Compsus auricephalus Say.

On *Phoradendron flavescens*, March 8, 1909 (Mitchell); April 15, 1903; on *Ambrosia*, April 30 (Morgan); on cotton (*Gossypium*), May 10, November 24 (Hinds); on *Ambrosia*, June 4, 1905; on *Acacia*, July 8, 1907 (Mitchell); July 16, 1906 (McLachlan); November 15, 1903.

Mitostylus tenuis Horn.

Feeding in large numbers on *Amphiachyris dracunculoides*, October 14; November 14, 1906 (Mitchell).

Epicærus sulcatus Casey (?).

Feeding on bloom of *Acacia rœmeriana*, March 26, 1908 (Mitchell).

Epicærus texanus Casey.

On *Iva ciliata*, March 14, 1908; March 15, 1907 (Mitchell); on *Ambrosia*, April 30, May 13 (Morgan); June 4, 1905, July 22, 1907 (Mitchell); on cotton (*Gossypium*) November 1, 1902 (Hinds).

Artipus texanus, n. sp., Pierce.

Light gray with brown vittæ on median line and sides, of the size and shape of *floridanus;* surface covered with rounded ochreous, and truncate white scales. Length 5 to 6.5 mm. Beak quadrate, slightly narrowed to tip, shallowly emarginate at tip, with median impressed line, surface flat continuous with front; scrobes narrow and deep, passing beneath in front of eyes. Funicular joints elongate, the first and second subequal and twice as long as any of the following joints. Eyes convex, prominent. Prothorax cylindrical, a little wider than long, base and apex truncate, sides very feebly convex, forming with the head and beak almost a straight line from middle of prothorax to tip of beak; disk very minutely punctate; scaly vestiture even darker on median line. Elytra oval, without humeri; striæ barely indicated, punctures fine, bearing slender squamules; scaly vestiture even, with the ochreous and white scales evenly mixed, with brown scales on the median line and on the sides forming three narrow vittæ, edges of elytra ochreous. Undersides clothed as above, but with the white scales more elongate. Second abdominal segment barely as long as the two following segments.

Described from two specimens collected at Victoria, Texas, October 14, 1906, and November 10, 1907, by J. D. Mitchell.

Type: In U. S. National Museum, Cat. No. 13546.

The two species of *Artipus* may be distinguished by the following characters:

1. Scrobes broad; beak deeply triangularly emarginate, with an apical lunular scaly area inclosed by a transverse ridge; second abdominal plainly longer than the two following segments .... *floridanus* Horn
2. Scrobes narrow; beak shallowly emarginate, without transverse apical ridge; second abdominal barely as long as the two following segments.............................. *texanus* n. sp. Pierce

Aramigus tesselatus Say.

On weeds, July 15, 1905 (Mitchell).

Phacepholis elegans Horn.

On cotton (*Gossypium*) April 27, 1904 (Walker).

PACHYRHYNCHTIÆ.

Pandeleteius cavirostris Schaeffer.

On anachna tree (*Ehretia elliptica*), April, 1905 (Mitchell); on *Cratægus*, April 22, 1907 (Cushman); April 23, 1907; June 19, 1907 (Mitchell).

Pandeleteius ovipennis Schaeffer.

October 25, 1907 (Mitchell and Jones).

OTIORHYNCHINÆ.

Achrastenus griseus Horn.

On *Quercus*, March 26, 1908 (Mitchell).

PROMECOPINÆ.

Eudiagogus pulcher Fahræus.
Eudiagogus rosenschoeldi Fahræus.

These two species are always found in this county in abundance upon senna (*Cassia occidentalis*), which grows abundantly in the lowlands and on the prairies. They appear in such great abundance that they quickly defoliate the senna. Have also observed them defoliating prickly ash (*Xanthoxylum clavahercrulis*). They hibernate around the roots, and sometimes just under the ground around the senna plants; also under bark of live oak trees (*Quercus virginiana*), and in hollow twigs of dead *Xanthoxylum* (Mitchell).

RHYTIRHININÆ.

Thecesternus albidus Pierce.

Crawling on margin of ditch at Point Comfort, Calhoun County, June, 1902; crawling on ground at margin of water hole November, 1902, Victoria (Mitchell).

HYPERINÆ.

Listronotus callosus Le Conte.

June 18, 1904 (Walker).

Listronotus obliquus Le Conte.

Caught at light, City Hall, September, 1904 (Mitchell).

Listronotus rotundicollis Le Conte.

On cotton (*Gossypium*) May 23, 1904 (Walker); (Mitchell).

Hyperodes echinatus Dietz (**Macrops**).

September 16, 1907 (Mitchell); on *Ludwigia natans*, June 29, 1909 (Mitchell).

Hyperodes humilis Gyllenhal (**Macrops**).

At trap lantern in cotton field, October 1, 1897 (Mitchell); November 15, 1906 (Mitchell).

Hyperodes obscurellus Dietz (**Macrops**).

Seven specimens at trap lanterns in cotton field, October 1, 1897 (Mitchell).

Hyperodes vittaticollis Kirby (**Macrops**).

On cotton (*Gossypium*) April 8, 1904 (Walker).

Hyperodes ulkei Dietz (**Macrops**).

April 23, 1907 (Mitchell).

CLEONINÆ.

Lixus musculus Say.

November 1, 1907 (Mitchell). Bred from *Polygonum punctatum* and *P. portoricense* stems. September 20, 1910 (Mitchell).

Lixus scrobicollis Boheman.

Breeds abundantly in the stems of *Ambrosia trifida*, mating in July, breeding from thence on, and hibernating in the cells in the stems (Mitchell). Breeding in stems of *Verbesina virginica*, June 11, 1907 (Cushman); December 29, 1908 (Mitchell). On April 1, 1905, Dr. W. E. Hinds, isolated 15 parasites of this weevil found in stems of *Ambrosia psilostachya*, which proved to be *Glyptomorpha rugator* Say and *Horismenus lixivorus* Crawford. From a lot of stems collected December 12, 1908 (Mitchell and Cushman), 154 parasites were isolated and bred out during the following spring. These parasites were *Horismenus lixivorus* Crawford, *Glyptomorpha rugator* Say, *Cerambycobius cyaniceps* Ashmead, *Neocatolaccus tylodermæ* Ashmead, *Eurytoma tylodermatis* Ashmead, and *Sigalphus curculionis* Fitch. During the winter of 1909-1910, 439 parasites were isolated (Mitchell), which belonged to these same species, and also a few specimens of *Ptinobius magnificus* Ashmead (Pierce).

ERIRHININÆ.

Dorytomus parvicollis Le Conte.

Bred from willow (*Salix*) catkin, March 6, 1908; at light May 4, 1905 (Mitchell). Bred *Sigalphus curculionis* Fitch, April 11 (Pierce).

Lissorhoptrus simplex Say.

The rice weevil has been taken on *Baptisia*, March 30, 1905 (Hinds); breeds in the roots of rice (*Oryza sativa*) and other water vegetation; flies to light (Mitchell).

Endalus aeratus Le Conte.

At trap lantern in cotton field, October 1, 1897 (Mitchell); May 30, 1905 (Yothers).

Endalus setosus Le Conte.

Four specimens at trap lantern in cotton field, October 1, 1897 (Mitchell).

Pachyphanes discoideus Le Conte.

At trap lantern in cotton field, October, 1, 1897 (Mitchell).

Pachyphanes corpulentus Le Conte.

On *Helenium* sp., October 28, 1907 (Mitchell).

Pachyphanes triangularis Dietz.

On *Rudbeckia amplexicaulis*, April 23, 29, 1907; May 19, 1907 (Mitchell).

Pachyphanes amœnus Say.

On weeds, August 1905 (Mitchell).

Desmoris constrictus Say.

August 31, 1907; on *Helianthus*, September 8, 1907 (Mitchell).

Smicronyx corniculatus Fabricius.

August 19 (Hinds).

Smicronyx spretus Dietz.

On cotton (*Gossypium*) April 26, 1904 (Hinds).

Smicronyx tychoides Le Conte.

On *Cuscuta*, July 21, 1910 (Mitchell and Pierce); breeding in stem galls on *Cuscuta*, August 1, 1906 (Morgan) and parasited by *Eutrichosoma albipes* Crawford (Pierce).

OTIDOCEPHALINÆ.

Otidocephalus carinicollis Horn.

On *Callirrhoe involucrata*, March 27, 1908 (Mitchell).

Otidocephalus chevrolatii Horn.

Breeding in walls of twig galls formed by *Amphibolips* on live oak (*Quercus virginiana*) March 15-17, 1907, Jackson County; also found in Victoria (Mitchell).

MAGDALININAE.

Magdalis barbita Say.

In dry bark of elm (*Ulmus*) log, February 12, 1907, Stearn's Pasture (Mitchell and Yothers).

BALANINIINÆ.

Balaninus pardalis Chittenden.

September 29, (auth. Chittenden).

Balaninus parvidens Chittenden.

September, October (auth. Chittenden).

Balaninus victoriensis Chittenden.

Took 1,129 specimens at trap lantern in cotton field, October 1, 1897. Caught in large numbers in fire traps set for cotton boll weevil in July, 1903. On October 2, 1904, gathered 167 acorns of live oak (*Quercus virginiana*). The larvæ began to come out October 7 and continued emerging until October 14, when 266 larvæ had issued. They were placed in jars in loose earth and immediately began to burrow, going down 3 to 5 inches. Seventeen larvæ formed cells against the glass, where they could be observed. Half of the jars were kept indoors and half outdoors. On March 7, 1905, the larvæ were noticed moving, and exhibited the first signs of pupation. On March 15, the first pupa was observed. The pupæ formed almost simultaneously in the jars indoors and outdoors; they moved around a great deal in their cells. Adults began to be observed April 2. On April 22 put in leaves of white elm, ash, rose; the weevils fed heartily on the elm leaves and then went to sleep. They sleep with the bill and feet curled up as if dead. From another lot of acorns collected in October, 1904, the larvæ emerged in November, were pupating between June 23 and 30, 1905, and first became adult July 1. Specimens from black jack (*Quercus marilandica*) acorns collected October 29, 1905, matured in June, 1906. Specimens from live oak (*Quercus virginiana*) acorns collected November 5, 1906, were pupæ April 29, 1907, and adult May 26. This weevil has been found breeding also in post oak (*Quercus minor*) and pin oak (*Quercus breviloba*). As many as three larvæ have been found in a single acorn. While the larvæ usually leave the acorns in October and November, some will emerge in September and some in December. The pupal cell is not formed until spring after the winter sleep is over. They pupate in April and May, and become adult in May and June. They feed once in every four or six days, preferring oak leaves. Between meals they curl up and sleep in some hiding place. Active life begins in August (Mitchell).

ANTHONOMINÆ.

Tachypterellus quadrigibbus Say.

The apple weevil larvæ are found in fruit of red haw (*Cratægus mollis*); found larvæ April 23, 1907, pupated April 30, and matured May 7, passing all stages in the haw (Mitchell). This lot was parasitized by *Catolaccus incertus* Ashmead, and two unknown parasites (Pierce).

Macrorhoptus estriatus Le Conte.

On blooming anachua tree (*Ehretia elliptica*), April 19, 1905; feeding on *Callirrhoe*, April 30, 1905; it has since been found to breed in the pods of *Callirrhoe* (Mitchell).

Coccotorus scutellaris Le Conte.

Breeding in plums (*Prunus*), June 11, 1907 (Hood).

Anthonomus æneolus Dietz.

Breeds in the buds of *Solanum* spp.

Anthonomus albopilosus Dietz.

Larvæ in seeds of *Croton capitatus*, May 5, 1907, pupæ May 10, adults May 24 (Mitchell); on cotton (*Gossypium*) June 5, 1904 (Goes); breeding in seed of *Croton capitatus* and *C. engelmanni*, September 6, 1906 (Mitchell), and parasitized by *Bracon mellitor* Say (Pierce).

Anthonomus callirrhoe Pierce.

Breeding in the small buds of *Callirrhoe involucrata*, March 16, 1908 (Mitchell); on *Carduus spinosissimus*, April 17, 1907 (Hinds); on cotton (*Gossypium*), May 2, 1905 (Yothers).

Anthonomus fulvus Le Conte.

Larvæ in buds of *Callirrhoe involucrata*, March 4, 1907, pupæ March 17, adult April 1; April 23, 1907 (Mitchell); April 28 to May 15, 1906, on *Callirrhoe involucrata* (Morgan); in flowers of *Callirrhoe lineariloba*, May 21, 1905 (Mitchell).

Anthonomus grandis Boheman.

The cotton boll weevil first made its appearance in Victoria County in 1894, and has seriously injured cotton (*Gossypium*) culture ever since. In the winter of 1903-04 larvæ were found alive until February 7, 1904, and pupæ as late as February 14 (Mitchell). The following insects have been found to be enemies of the boll weevil at Victoria: *Bracon mellitor* Say, the most important parasite in south Texas; *Catolaccus hunteri* Crawford, also a good parasite; *Catolaccus incertus* Ashmead, equally good; *Cerambycobius cushmani* Crawford, attacking the weevil in great quantities some years; *Cerambycobius cyaniceps* Ashmead, less common; *Ectatomma tuberculata* Olivier, the Guatemalan kelep, which was unsuccessfully introduced as a predatory enemy, was first brought to Victoria; *Eurytoma*, new species, rare; *Eurytoma tylodermatis* Ashmead, a valuable parasite; *Hydnocera pubescens* Le Conte, a rather common predator on the immature stages; *Lariophagus texanus* Crawford, rather rare parasite; *Microdontomerus anthonomi* Crawford, not very common parasite; *Pediculoides ventricosus* Newport, a parasitic mite; *Spilochalcis* sp., rare; *Stagmomantis limbata* Hahn, a predator on the adult weevil; *Tyroglyphus breviceps* Banks, a parasitic mite (Pierce).

Anthonomus ligatus Dietz.

Breeding in stem galls on *Leucosyris spinosus*, a very common weed in this county, October 14, 1906 (Mitchell).

Anthonomus rufipennis Le Conte.

Bred from *Cassia chamæcrista*, August 9, 11, 1909 (Mitchell).

Anthonomus signatus Say.

The strawberry weevil breeds in buds of blackberry and dewberry (*Rubus* sp.) (Mitchell).

Anthonomus texanus Dietz.

November 6, 1906 (Mitchell).

Tachyerges niger Horn (**Orchestes**).

On willow (*Salix*) (Mitchell).

Elleschus ephippiatus Say.

Common under fallen willow leaves during winter (Schwarz).

TYCHIINÆ.

Tychius species.

Breeding in flower-heads of huisache (*Vachellia farnesiana*), March 17, 1908 (Mitchell).

Tychius sordidus Le Conte.

March 25, 1904 (Walker); from flowers of *Baptisia cuneata*, March 29, 1905 (Mitchell); breeding in seed-pods of *Baptisia*, May 23, 1905; larvæ emerged from pods until June 1, pupate in ground.

CRYPTORHYNCHINÆ.

Conotrachelus anaglypticus Fahræus.

June 11, 1903 (Hinds).

Conotrachelus affinis Boheman.

Larvæ in fallen pecans (*Hicoria pecan*), July 12, 1909; adults August 19–22, parasitized by *Sigalphus curculionis* Fitch (Mitchell).

Conotrachelus cratægi Walsh.

Larvæ in fruit of *Cratægus mollis* October 15, 1907; adults April 18, 1908 (Mitchell).

Conotrachelus elegans Boheman.

The pecan gall weevil was found on *Verbesina virginica*, April 5, 1907 (Cushman); deposits eggs in galls of *Phylloxera devastatrix* on leaves of pecan (*Hicoria pecan*); found larvæ in the galls April 23, 1907; larvæ entered ground April 30; adults May 7; also bred adults as late as May 24 from other lots; found larvæ in young green blasted pecans; entered ground July 11; adult July 14 (Mitchell). From the weevils in galls, *Sigalphus curculionis* Fitch, *Myiophasia æenea* Wiedemann, and *Eurytoma tylodermatis* Ashmead, were bred (Pierce).

Conotrachelus erinaceus Le Conte.

On cotton, September 14, 1907 (Mitchell).

Conotrachelus leucophæatus Fahræus.

On cotton (*Gossypium*) May 2, 1904 (Hinds); on a ripe fig (*Ficus*), July 20, 1905 (Mitchell); it normally breeds in the stems of *Euphorbia marginata*, a common weed in the Guadalupe bottoms (Pierce).

Conotrachelus naso Le Conte.

At trap lantern in cotton field, October 1, 1897; gathered a pint of acorns of pin oak (*Quercus breviloba*) at Pridham's Lake, October 15, 1904, larvæ issued November 1, began to change to pupa March 13, 1905, first perfect pupa March 21, adults April 4; gathered 167 acorns of live oak (*Quercus virginiana*) at Sutton Mott, October 2, 1904, from which up to October 14, 266 larvæ issued; in ground 150 to 200 days; taken at light at City Hall, September, 1904; larvæ in acorns of post oak (*Quercus minor*), November 11, 1905, adult June, 1906; have also found the species breeding in black jack (*Quercus marilandica*) acorns; it works side by side with *Balininus victoriensis*, and has substantially the same developmental periods; as many as 7 larvæ have been found in a single acorn; the summer sleeping and feeding habits are the same as those described for *Balaninus victoriensis* (Mitchell).

Conotrachelus nenuphar Herbst.

Gathered a dozen wild plums (*Prunus*) stung by this weevil, May 18, 1905,; six larvæ emerged May 26 to June 2, first larva began to pupate June 13; five pupæ became adult June 20 (Mitchell); September 1, 1903 (Hinds). It breeds at Victoria in both wild and cultivated plums and in peaches. It is sometimes a very serious pest.

Conotrachelus posticatus Boheman.

July 14, 1905.

Conotrachelus similis Boheman.

Breeds in the fruit of *Bumelia lanuginosa*, August 6, 1907 (Mitchell). Bred one male braconid from this lot.

Rhyssematus palmacollis Say.

Three specimens on sweet potato (*Ipomœa batatas*) on Mitchell farm, May 27, 1903; larvæ in seed of *Ipomœa sinuata*, July 12, 1907, entered ground July 21, adults August 13 (Mitchell).

Chalcodermus collaris Horn.

On cotton, May 9, 1904 (Walker); on *Cassia chamæchrista* flowers, banks Dry Creek, July 8, 1905, October 25, 1907 (Mitchell).

Chalcodermus vittatus Champion.

Breeding in the seed of balloon vine (*Cardiospermum halicacabum*), September 17, 1907 (Mitchell); larvæ October 8, 1907, adults December 2 (Mitchell and Cushman).

Gerstæckeria nobilis Le Conte (**Acalles**).

On *Opuntia*, April 17, 1908; breeds in flat cells in the joints of broad-leafed species of *Opuntia* (Mitchell).

Tyloderma baridium Le Conte.

April 10, June 1, 1907 (Mitchell).

Tyloderma foveolatum Say.

On flowers, Voit's pasture, May 28, 1905 (Mitchell).

Tyloderma subpubescens Casey.

November 19, (Pratt); bred from *Polygonum punctatum*, September 24, 1910 (Mitchell).

Cryptorhynchus fallax Le Conte.

Breeding in dry stems and stumps of *Cassia occidentalis*, in all stages, March 17, 1909 (Mitchell).

Cryptorhynchus obtentus Herbst.

Not rare in winter time under loose bark of felled trees (Schwarz).

Acamptus rigidus Le Conte.

In red-rotten wood of *Populus*, March 15 (Schwarz).

ZYGOPINÆ.

Cylindrocopturus adspersus Le Conte.

Bred from stems of *Xanthium* March 30, 1908; bred from stems of *Helianthus*, May 3, 1908; July 31, 1907 (Mitchell). Breeding in the stems of *Ambrosia trifida*, December 12, 1908 (Mitchell) and parasitized by *Cerambycobius cyaniceps* Ashmead, *Horismenus lixivorus* Crawford, and an undetermined braconid (Pierce). Breeding in the stems of *Xanthium*, December 12, 1909 (Mitchell) and parasitized by *Cerambycobius cushmani* Crawford and a braconid (Pierce).

Cylindrocopturus longulus Le Conte.

Bred from the stems of *Iva ciliata* May 3, 1908 (Mitchell), October 9, 1907 (Mitchell and Cushman). Parasitized during winter by *Cerambycobius cyaniceps* Ashmead, *Cerambycobius cushmani* Crawford, *Eurytoma tylodermatis* Ashmead, *Neocatolaccus tylodermæ* Ashmead, and a braconid (Pierce).

Cylindrocopturus mammillatus Le Conte.

Bred from the stems of *Verbesina virginica*, June 11, 1907 (Mitchell). Bred from stems of *Eupatorium alternifolium*, September 17, 1910 (Mitchell).

CEUTORHYNCHINÆ.

Acanthoscelis griseus Dietz.

May 3, 1907 (Mitchell).

Craponius inæqualis Say.

Beaten from grape-vines, April 4 (E. A. Schwarz).

Auleutes nebulosus Le Conte.

On seed of joint-grass in marshy place July 11, 1905; August 1905 (Mitchell).

Auleutes tenuipes Le Conte.

August, 1905 (Mitchell).

Rhinoncus pyrrhopus Boheman.

Breeds in *Polygonum*, Miracle Mud Marsh, larvæ June 21, 1909, adults July 1 (Mitchell). Parasitized by *Cerambycobius* (Pierce).

Rhinoncus longulus Le Conte.

August, 1905 (Mitchell).

Perigaster cretura Herbst.

Breeds on the leaves of water purslane (*Ludwigia natans*). The larvæ are first noticed near the bud; they feed externally on the foliage, exuding a sticky substance which holds them to the leaf; as they grow they work down the stem; when grown a dark shell grows over their back and finally covers them; they pupate in this cell (Mitchell).

BARIDIINÆ.

Baris ærea Boheman.

November 15, 1906 (Mitchell); November 18 (Pratt).

Baris subovalis Le Conte.

August 2, 1906 (Crawford).

Baris transversa Say.

On *Ambrosia* May 29, 1905 (Mitchell); May 30, 1905 (Yothers).

Onychobaris subtonsa Le Conte.

On *Ambrosia*, May 29, 1905 (Mitchell).

Madarellus undulatus Say.

November 3 (Schwarz).

Trichobaris texana Le Conte.

On cotton (*Gossypium*) April 20, 1904 (Walker); July 22, 1905 (Mitchell); breeds very commonly in the stems of *Solanum rostratum*. From a lot of infested stems of *Solanum rostratum* collected December 15, 1908 (Mitchell) there were bred during January, February, and March, 1909, many *Cerambycobius cushmani* Crawford, *Neocatolaccus tylodermæ* Ashmead, *Cerambycobius cyaniceps* Ashmead, *Eurytoma tylodermatis* Ashmead. During the winter of 1909–10, Mr. Mitchell isolated 424 parasites belonging to these four species (Pierce).

Stethobaris species.

September, 1905 (Mitchell).

Geræus albotectus Casey (**Centrinus**).

July 8, 1907, on *Acacia* (Mitchell).

Geræus penicellus Herbst (**Centrinus**).

On seed heads of joint-grass July 15, 1905 (Mitchell).

Geræus picumnus Herbst (**Centrinus**).

August, 1905 (Mitchell).

Odontocorynus denticornis Casey (**Centrinus**).

On seed heads of joint-grass, July 11, 1905 (Mitchell).

Odontocorynus scutellum-album Say (**Centrinus**).

Feeding on trailing mallow (*Callirrhoe lineariloba*), May 21, 1905, Stern's Pasture (Mitchell).

Limnobaris punctigera Le Conte.

In cotton field, September 1, 1902 (Hinds).

Barinus albescens Le Conte.

Breeds in stems of *Cyperus virens*, near the roots, July 19, 1909 (Mitchell).

Barinus squamolineatus Casey.

Breeding in the roots of *Rynchospora corniculata*, April 24, 1909 (Mitchell).

Zygobaris xanthoxyli Pierce.

Breeding in the seed of *Xanthoxylum clava-herculis*, July, 1910 (Mitchell and Pierce).

CALANDRINÆ.

Rhodobænus tredecimpunctatus Illiger.

On *Ambrosia*, April 30 (Morgan); May 13 (Morgan); breeding in *Helianthus* stalks, May 25; on *Ambrosia*, May 29 (Mitchell).

Sphenophorus compressirostris Say.

Found seven crawling on edge of ditch at Point Comfort, Calhoun County, June, 1902; they were mating when taken (Mitchell).

Sphenophorus ludovicianus Chittenden.

March 28, 1907 (Jones); April 8, 1907 (Mitchell); August 10, 1906 (Cushman); makes cells under logs in winter; is known as the chicken weevil because it is thought to kill chickens which try to eat it by getting stuck in their throats (Mitchell).

Sphenophorus pertinax Olivier.

Caught in cotton fields, rare (Mitchell).

Calandra oryza Linnæus.

Besides stored grain have found it breeding in overcup or bur oak acorns (*Quercus macrocarpa*). also found breeding in live oak acorns, November 12, 1909. Have found as many as 27 larvæ and pupæ in one acorn. Have also found them feeding on ripe peaches (*Amygdalis persica*), figs (*Ficus*), cantaloupes (*Cucumis*), and the pollen of many wild flowers. It is liable to be anywhere. Have collected them from oaks (*Quercus*), cottonwood (*Populus deltoides*), hackberry (*Celtis*), pecan (*Hicoria pecan*), locust (*Gleditsia triacanthos*), and mulberry (*Morus*) trees. In October and November, 1907, while collecting boll weevils for hibernation, large numbers of this weevil were found in cotton fields near Victoria. They were in the cotton (*Gossypium*) squares and often associated with the boll weevil. In 1860 on the plantation in Lavaca County, Texas, we built a crib 8 feet in the ground, walled up with rock, and 8 feet above ground of logs. When this crib was opened in the spring, it was found that the weevil had severely injured the corn (*Zea mays*) above the ground, while that which was below the surface was entirely free of weevil. In 1859, Mr. B. Q. Ward, of Jackson County, piled 100 bushels of corn on the ground, covered it with hay, then put 1 foot of earth over all, heaping it to a point for drainage. When opened in the spring not a sound grain was to be found. In the winter of 1895, when the temperature went to 10 degrees above zero, and again in 1899, when it went to 6 degrees above zero, all the weevils in my barn at Victoria were killed. The corn was in the second story of a wooden building. As a rule weevils get into corn in the field before it is gathered. Mild winters and wet summers are conducive to the increase of the weevil, while cold winters and dry summers hinder it. Have seen corn gathered in September and October so heavily infested that by January it was unfit to feed to stock. It is seldom that corn can be kept in cribs in southern Texas later than May on account of the damage of weevils (Mitchell). Bred from stems of *Ambrosia trifida* March 24, 1909 (Mitchell).

COSSONINÆ.

Parahornia quercicola Horn.

Found in large numbers in decayed willow (*Salix*) log, on bank of Guadalupe River near town, February 12, 1910. They were in cells, tunnels, and chambers made by large wood beetles; some had just matured. They did not leave the log until after March 2 (Mitchell),.

Pseudopentarthrum robustum Casey.

In cell of dead limb of mulberry (*Morus*), March 3, 1910 (Mitchell).

IPIDÆ.

Ips pini Say.

At trap lantern in cotton field, October 1, 1897 (Mitchell). (Undoubtedly carried in by the railroads.)

Hypothenemus, new species, Hopkins.

In old corn (*Zea mays*) stalks, March 6, 1909 (Mitchell).

Hypothenemus species.

In huisache (*Vachellia farnesiana*) pods, April 22, 1907 (Mitchell); on *Cratægus*, April 22, 1907 (Cushman).

Stephanoderes, new species, Hopkins.

In corn (*Zea mays*) stalks, March 6, 1909 (Mitchell).

NOTES ON PTEROSTICHUS JOHNSONI ULKE.

By C. V. Piper.

Pterostichus johnsoni was first collected in July, 1878, by Prof. O. B. Johnson, on Mill Creek, near Mehama, Oregon. He found but three specimens, crawling over wet moss on boulders in a cool, shady canyon. Though he searched for it many times again in likely places, he never found the insect again until August, 1888, when he collected seven specimens on Rock Creek, which flows into the Santiam 12 miles above Mill Creek. With this additional material Ulke described the species in the March, 1889, number of Entomologica Americana.

The beetle had never been collected at any other place excepting Horsetail Falls, Oregon, where I collected a single specimen in August, 1904. This individual was crawling over the wet moss in the spray of the fall. I recognized it at once, and knowing its rarity spent more than an hour in searching for others, but without success. Two years later I visited these falls again and searched assiduously for the beetle, but found none.

Last summer, while visiting Professor Johnson, he told me that he was exceedingly anxious to obtain additional specimens, as he had given all his away. He explained to me minutely the places where he had found the insects—on Mill Creek, one of which was at the falls about 3 miles up the creek, and the other on mossy rocks in the canyon of the creek, a half mile below the falls, where one could no longer follow its bed but had to clamber around. As I had to spend several days in the Willamette Valley, I promised Professor Johnson to visit the spot if I possibly could and try to find his namesake again. Mehama is easily reached, being only 1 mile distant from the railroad station of Lyons. I reached Mehama on a hot August day with no other equipment than the suit I was traveling in and a pair of leggings bought for the occasion. There was no trail up the creek, so that one had the choice of wading up the creek or crawling through brush so thick that the creek was usually the preferable path. Before reaching the creek, where I would have but five hours' time at most to spend, I decided to begin my search on the gravel bars of the creek, as it occurred to me that the beetle might be an ordinary gravel-bar insect like *Patrobus californicus*. This was really a reflection upon the collecting ability of "Bug" Johnson, and proved an unfortunate digression on my part. As it happened, the first pebble I turned over concealed a *P. johnsoni*. Immediately I had visions of collecting a quart or so. Of course, I searched at once for the mate of my specimen and immediately found it, but alas of another very common species. During the next fifteen minutes I scratched over every inch of that gravel bar, without success. Then I searched the adjacent woods—in every sort of place I could imagine a *Pterostichus* to live—but no luck. During the next two hours I trudged up the creek, scratching the gravel on every bar, looking under drift of various sorts, under the bark of logs in the creek, in wet moss, and in general defacing the landscape. It was now after noon and half of my five hours were gone. I estimated I was still a mile from the falls, so I went into the woods back from the creek, where the valley was less difficult, and tramped for half an hour, when I reached my objective point.

The beetles I was told would be found on the moss in the spray. The spray was there and the moss, but no beetles; and when I got through there was no moss left. Just before leaving the falls I espied a little patch of gravel in between the logs of drift—and here I found my second *P. johnsoni*. Three hours of hard work and two beetles! I was discouraged and started back, following the creek. On a particularly promising gravel bar I found two more specimens—total four. But the next half hour's work of scratching gravel gave no further results, and I decided to quit. In trudging through the woods I tried to solve the difficulty, wondering whether the beetles really were very rare like certain species of *Cychrus*, or whether I had not found their real habitat. Professor Johnson said he found his specimens on the wet mossy rocks while fishing up the creek. I thought it might have been a dull day and the beetles, therefore, out hunting, while on a bright day they would hide. With this idea I again went to the creek and reached it at the spot where Professor Johnson described it as impassable and with the bed filled with large, mossy boulders. If my theory was correct I should find the beetles hiding near the mossy rocks—as my previous work proved they did not hide in the moss. Such a place I found in a little patch of gravel not a foot square between two large, mossy boulders—and there I found a pair of *P. johnsoni* in coition. In the next fifteen minutes I found about ten more specimens, and think that there can be no further question about the natural habitat of this species. They probably feed on various larvæ that live in the wet moss.

As is well known, the insect life of the deep woods in Oregon is notoriously poor, and few entomologists would think of searching for beetles in the sort of places *P. johnsoni* prefers —wet, mossy boulders on a shady creek. The two streams from which this beetle is known are about 50 miles apart, and I have no doubt that it occurs in suitable places on most of the intermediate creeks. Unless one is searching particularly for this beetle he is not apt to find it—and I might add that if he finds it he need not expect to find other beetles—as this insect loves an environment that most others avoid.

Professor Johnson collected in his two trips ten specimens. Two of these are in the Philadelphia Academy of Sciences, two in the Ulke collection at Pittsburg, two at the University of California, and the remaining two Professor Johnson had in his own collection, but I believe gave them away a few years ago.

A NEW BASILODES FROM TEXAS.

[Lepidoptera; Noctuidæ.]

By Harrison G. Dyar.

Basilodes catharops, new species.

Basal area, terminal area towards apex, tornus, orbicular, and reniform shaded with golden; rest of fore wing light sandy brown; lines light brown, the inner limiting the basal golden area, angled subcostally, roundedly produced in submedian space, angled below vein 1; reniform and orbicular edged with brown lines; outer line angled at veins, but continued to near apex by a shade, oblique and rearly regular to inner margin, inflexed a little on submedian fold; subterminal line brown, scarcely waved. Hind wings pale clay color, a little shaded with brown outwardly. Expanse 40 mm.

Three males, San Diego, Texas, May 24, 1895 (E. A. Schwarz); Brownsville, Texas, May 17, 1904 (H. S. Barber).

Type: No. 13555, U. S. National Museum.

In appearance the species resembles *B. chrysopis* Grote. It lacks, however, the powdery appearance of that species, the golden areas being solid and the stigmata sharply limited by lines; the black point is absent from the reniform and the frontal prominence is somewhat more distinct.

Actual date of issue, March 31, 1911.

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THE CORNMAN PRINTING CO.,
Carlisle, Pa.

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON.

Volume XIII, No. 2.

APRIL-JUNE, 1911.

(MEETINGS OF MAY 5, 1910, TO MARCH 2, 1911)

PUBLISHED BY THE SOCIETY,

QUARTERLY

CARLISLE, PA. WASHINGTON, D. C.

1911.

Entered as second-class matter July 26, 1909,
at the post office at Carlisle, Pennsylvania, under the Act
of July 16, 1894.

THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON.

ORGANIZED MARCH 12, 1884.

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

Annual dues of active members, $3.00; of corresponding members, $2.00; initiation fee (for active members only), $1.00.

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published quarterly by the Society at No. 1 N. Pitt street, Carlisle, Pa., and Washington, D. C. Terms for subscription: Domestic, $2.00 per annum; foreign, $2.25 per annum; single numbers, 50 cents, foreign postage extra. Remittances should be made payable to the Entomological Society of Washington.

Authors of leading articles in the PROCEEDINGS shall be entitled to 25 separates of each contribution, free of charge. Additional copies may be had at cost by notifying the Publication Committee before the final page proof is returned to the printer.

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON.

VOL. XIII APRIL - JUNE, 1911 NO. 2

MEETING OF MAY 5, 1910.

The 240th regular meeting of the Society was entertained by Mr. Quaintance at the Saengerbund Hall, 314 C Street, on the evening of May 5, 1910, and there were present Messrs. Barber, Bourne, Caudell, Crawford, Gahan, Gill, Heidemann, W. A. Hooker, Hopkins, T. H. Jones, McAtee, Peairs, Popenoe, Quaintance, Rohwer, Sasscer, Schwarz, Viereck, and Zimmer, members, and Messrs. Cory, Myers, Snodgrass, and Wall, visitors.

The minutes of the preceding meeting were read and approved.

Mr. C. B. Hardenburg, of Pretoria, Transvaal, was elected a corresponding member.

The first paper of the evening, entitled "Literature on Ichneumonoidea and Apoidea in 1909," was given by Mr. Viereck.[1]

Under the title of "The Thorax of Hymenoptera, with Exhibition of Drawings," Mr. Snodgrass gave a synopsis of his recent work, which is to be published elsewhere.

The last paper of the evening, by Mr. Sasscer, was entitled "The Tea Scale, *Fiorinia theæ* Green."[2]

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[1]Withdrawn.

[2]Withdrawn for publication elsewhere.

The committee appointed at the last meeting to prepare a notice of the late D. H. Clemons reported as follows:

Douglas Harrison Clemons was born in southern California, but while he was still an infant his parents moved east, where both died, leaving him to the care of his older sister, whose limited means of support prevented his acquiring more than an elementary education. While still quite small he sought to earn his living as errand or cash boy in various stores in Washington, and even under these trying circumstances showed a very keen interest in nature, especially birds and insects, whenever he could get away from the city streets.

It was during this period that one of the younger members of this Society made his acquaintance and was struck with the pity of such unusual interest in natural history being smothered from lack of opportunity to develop. It happened at the time that there was great need of a preparator of insects in the National Museum, and through the interest of his new-found friends Clemons was given a temporary appointment there. His unusual keenness in the observation of life histories of insects and his natural bend for systematic entomology soon became evident to all with whom he came in contact and his work gave universal satisfaction. Dr. Howard took an interest in the boy and sent him to the Gipsy Moth Parasite Laboratory at Melrose Highlands, Massachusetts, where he proved to be of most valuable assistance in the intricate observations of the life histories of the imported Tachinid flies. His accuracy and ability in this work is attested to in the bulletin by Prof. C. H. T. Townsend, who was in charge of this branch of the work.

Returning to Washington in the fall of 1908, Clemons was appointed aid in the Division of Insects of the National Museum, but already in the spring of the following year he showed signs of failing health and in the early summer he broke completely down. In spite of all the efforts made by his Washington friends, the progress of the dreadful disease could not be arrested and after a vain effort to regain his health at a sanatorium in Colorado he died at the home of his sister in Riverside, California, on March 22, 1910.

Clemons did not know his exact birthday nor birth year, but was not much over twenty-one years old at the time of his death. He obviously could not have accomplished much in actual science, and he left nothing in published form as a record of his numerous observations of insect life; but to the small circle of entomologists with whom he came in contact he proved himself a true lover of the science, a thoroughly honest and cheerful companion, an unusually keen and capable worker, with a very special practical ability in devising means for observing insects or for preparing them for the Museum, and we feel his death a serious loss to ourselves and to our Society.

E. A. SCHWARZ,
A. BUSCK,
H. S. BARBER,
Committee.

MEETING OF JUNE 2, 1910.

The 241st regular meeting of the Society was entertained by Dr. Hopkins at the Saengerbund Hall, 314 C Street, on the evening of June 2, 1910, and there were present Messrs. Barber, Busck, Dyar, Ely, Gahan, Gill, Heidemann, Hopkins, Jones, Knab, Peairs, Quaintance, Rohwer, Schwarz, Viereck, and Zimmer, members, and Messrs. P. R. Myers and E. W. Wall, visitors.

In the absence of the Secretary, Mr. Barber was appointed secretary pro tem., and the reading of minutes of the previous meeting was dispensed with.

Dr. Hopkins reported on the recent activities of the Washington Academy of Sciences.

The first paper of the evening, "Literature on the Tenthredinoidea, Siricoidea, Vespoidea, and Sphecoidea in 1909," by Mr. Rohwer, was discussed by Messrs. Busck and Hopkins.[1]

The next paper, "Some Synonomy and Other Notes on Aphidiinæ," by Mr. Gahan, was discussed by Messrs. Quaintance, Hopkins, Viereck, Schwarz, and Rohwer.[2]

The last paper on the program, "Three New Species of Leptoglossus (Coreidæ) Occurring in the United States," by Mr. Heidemann, was discussed by Messrs. Busck, Hopkins, Schwarz, and Quaintance.[3]

Mr. Ely presented the descriptions of some new Lepidoptera.[4]

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[1] Withdrawn.
[2] Already published, Proc. Ent. Soc. Wash., XII, 179, 1910.
[3] Already published, Proc. Ent. Soc. Wash., XII, 191, 1910.
[4] Already published, Proc. Ent. Soc. Wash., XII, 202, 1910.

The following papers were accepted or publication:

TWO NEW NORTH AMERICAN SPECIES OF EUSTROTIA.

[Lepidoptera; Noctuidæ.]

By Harrison G. Dyar.

According to Sir G. F. Hampson's admirable Volume X of the "Catalogue Lepidoptera Phalænæ," our genus *Tripudia* is composed of two dissimilar groups, which he separates. The species allied to *quadrifera* Zeller remain in *Tripudia* Grote, which, however, becomes a synonym of *Cobubatha* Walker. The species allied to *basicincrea* Grote fall into the old genus *Eustrotia* Hübner. Of this particular group Hampson recognizes three species, all from the southwest. Two others before me appear distinct.

Eustrotia antonita, new species.

Basal part of fore wing clear gray with narrow blackish markings on the costa; medial band black, narrow, excavated in the cell and again below, the latter cutting through the black but not through the dull yellow outer border; space beyond this band reddish brown with a faint lighter annulus at reniform; three narrow blackish marks on costa; subterminal line irregular, whitish, waved, bent inward below cell, with a brown inner border; a black terminal line, broken below apex and near middle; fringe blackish. Hind wing fuscous brown, darker on the veins.

San Antonio, Texas (through Dr. W. Barnes), one specimen.

Type: No. 13676, U. S. National Museum.

Allied to *E. orthozona* Hampson, but with the outer part of the wing of a different color, the black band narrower and broken below.

Eustrotia santarita, new species.

Basal part of fore wing clear gray with black streaks on the costa; median black band rather broad, broadening below, straight, slightly bent on its narrower upper half, edged with bright silvery; outer space ocherous, with more or less reddish suffusion, especially over mesial area; reniform a broad diffused paler ringlet; subterminal line gray, twice excurved and arising from a dark wedged-shaped mark on costa; a terminal dark line twice interrupted by pale, the fringe dark except the pale spaces of terminal line. Hind wing brownish fuscous, the veins darker.

San Diego, Texas, May 28, 1896 (E. A. Schwarz); Alice, Texas, June 15, 1894 (H. S. Barber); Catalina Springs, Arizona, May 8, 1898 (E. A. Schwarz); Santa Rita, Mountains, Arizona, May 25 and June 14, 1898 (E. A. Schwarz); five specimens.

Type: No. 13677, U. S. National Museum.

Also allied to *E. orthozona*, but the mesial band is broad and straight, without excavations on the inner side.

A NEW GENUS FOR CIRRHOPHANUS DUPLICATUS.

[Lepidoptera; Noctuidæ.]

BY HARRISON G. DYAR.

In his last volume, Sir G. F. Hampson includes *Cirrhophanus duplicatus* Smith with a mark of doubt, and quotes characters that contradict the generic diagnosis. No specimens of this species appear to be known except the original female type, which is before me. This is clearly not referable to *Cirrhophanus*, and a new genus is required.

Phaiœcia, new genus.

Fore wing with an areole; fore tibiæ and tarsi unarmed, the tibiæ short and stout; frons with a rounded prominence with slight transverse ridge at its middle, where it is truncated, with a corneous plate below; abdomen with small dorsal crest at base only.

Type: Cirrhophanus duplicatus Smith.

The genus is allied to *Chalcœcia* Hampson (Cat. Lep. Phal., IX, 182, 1910), but the front is more prominent and distinctly truncated below at the ridge, while the abdominal tufting differs.

Sole species, *Phaiœcia duplicatus* Smith.

NOTE ON AN ARIZONA NOTODONTIAN.

[Lepidoptera; Notodontidæ.]

Notela angustiora Barnes and McDunnough.

Eunotela angustiora B. & McD., Can. Ent., XLII, 212, 1910.

This species was described from a single female. A male and female are before me, through the kindness of Mr. Doll. The male has the antennæ pectinated to the tips, and shows that the species is referable to the genus *Notela* rather than to *Eunotela*. The male is marked like the female, but the collar is entirely dark brown, not ocherous as in the female.

HARRISON G. DYAR.

Meeting of July 7, 1910.

The 242d regular meeting of the Washington Entomological Society was held at the Saengerbund Hall, 314 C Street, N. W. The following members were present: Messrs. Allard, Barber, Gill, Heidemann, Hopkins, Knab, McAtee, Phillips, Popenoe, Quaintance, Rohwer, Schwarz, and Dr. Arthur Neiva, of Brazil, a visitor.

In the absence of the Secretary, Mr. Popenoe was appointed secretary *pro tempore*, and the reading of the minutes of the previous meeting was dispensed with.

The evening was spent with short notes, in the absence of papers. Mr. McAtee presented notes on the oviposition and other habits of *Goniops chrysocoma* observed on Plummer's Island, Maryland, and exhibited photographs and specimens of the fly and its egg masses.[1] He referred to his previous communication concerning the habit of Empidæ in carrying prey while in copulation, and noted that the asilid *Promachus rufipes* sometimes does the same. The male of a pair captured near Afton, Virginia, September 19, 1909, was feeding on the large hymenopteron *Anoplius relativus*.

Mr. McAtee recorded a dragon fly (*Erythemis simplicicollis*) as a mosquito enemy. On Church's Island, North Carolina, September, 1909, this species was seen to pick *Anopheles quadrimaculatus* off the weatherboarding of a house. The same dragon fly was captured feeding on another dragon fly (*Enallgama durum*) which was almost its equal in bulk.

Mr. McAtee observed the jassid *Cœlidia subfasciata* ovipositing in a chestnut-rail fence in Rockfish Valley, Virginia, September 23, 1909. Each oviposition required from ten seconds to one minute and the intervals varied between the same limits. Specimens of all insects mentioned were shown.

Mr. McAtee's communications were discussed by Messrs. Knab, Barber, Schwarz, and Heidemann. Mr. Barber mentioned other observations regarding *Goniops*. Mr. Knab spoke of the habits of the Empidæ. He stated that the fact that, in certain species at least, the female feeds during copulation has been repeatedly recorded. The statement has also been made

[1]Already published, Proc. Ent. Soc. Wash., XIII, 21, 1911.

that in some cases mating only takes place while the female is feeding and that the male captures the prey for the female on these occasions.

Mr. Heidemann presented brief notes on the collection of some unusual Hemiptera in the vicinity of Washington. He exhibited specimens of an emesid (*Barce fraternus* Say) collected in a marsh near Chesapeake Beach, a reduviid (*Fitchia spinosula* Stal.), and a pentatomid (*Podops cinctipes* Say), likewise collected near the District of Columbia.

—Mr. Knab introduced Dr. Neiva, of the Instituto Oswaldo Cruz in Rio de Janeiro, and spoke of his investigations of a blood-sucking reduviid, *Conorhinus megistus* Burmeister. This insect has been found to transmit a trypanosome disease of man which nearly always terminates fatally. This bug lives only in association with man and is never found out-of-doors, all the stages being passed in human habitations. The eggs are laid in crevices in the walls and the young bugs suck blood from the beginning. A remarkable degree of adaptation is shown in the fact that the bite of this large bug, even when mature, is practically painless, so that a fairly sound sleeper is not awakened by its attack. It is well known that, as a rule, the bite of the Reduviidæ is very painful.

The parasite transmitted by this bug is a flagellate which has been described by Dr. Carlos Chagas, of the same institution, as *Schizotrypanum cruzi* and carefully studied by him. It is of special interest, as it is intermediate between the trypanosomes, which live free in the blood-plasm, and the malarial plasmodiæ, which are entirely intracorpuscular. *Schizotrypanum* has a free flagellate stage in the blood and another intracorpuscular one. These facts have shown that the trypanosomes and plasmodiæ are closely related and have led to a complete readjustment of the classification of the protozoa.

PARANTHACLISIS HAGENI IN TEXAS.

In examining recently a collection of Myrmeleonidæ from the Brooklyn Museum I found a specimen of this species taken at Brownsville, Texas. As it was previously only known from a few places in Arizona this indicates a considerable extension of its range.

N. Banks.

Meeting of October 6, 1910.

The 243d regular meeting of the Society was entertained by Mr. Banks at the Saengerbund Hall, 314 C Street, N. W., on the evening of October 6, 1910, and there were present Messrs. Banks, Barber, Bourne, Busck, Caudell, Crawford, Dyar, Gahan, Gill, Hall, Heidemann, T. H. Jones, Knab, McAtee, Quaintance, Rohwer, Sasscer, Schwarz, and Zimmer, members, and Messrs. A. H. Jennings, of Ancon, Panama, Parks, and Timberlake, visitors.

The minutes of the 240th and 241st meetings were read and approved.

Dr. Dyar reported that owing to the fact that the dues of the members for the present year had not been collected it would not be possible for the Publication Committee to continue publishing unless arrangements were made for the payment of the printers. The matter was referred to the Executive Committee with power to act.

Mr. Barber described an apparatus for collecting insects at night:

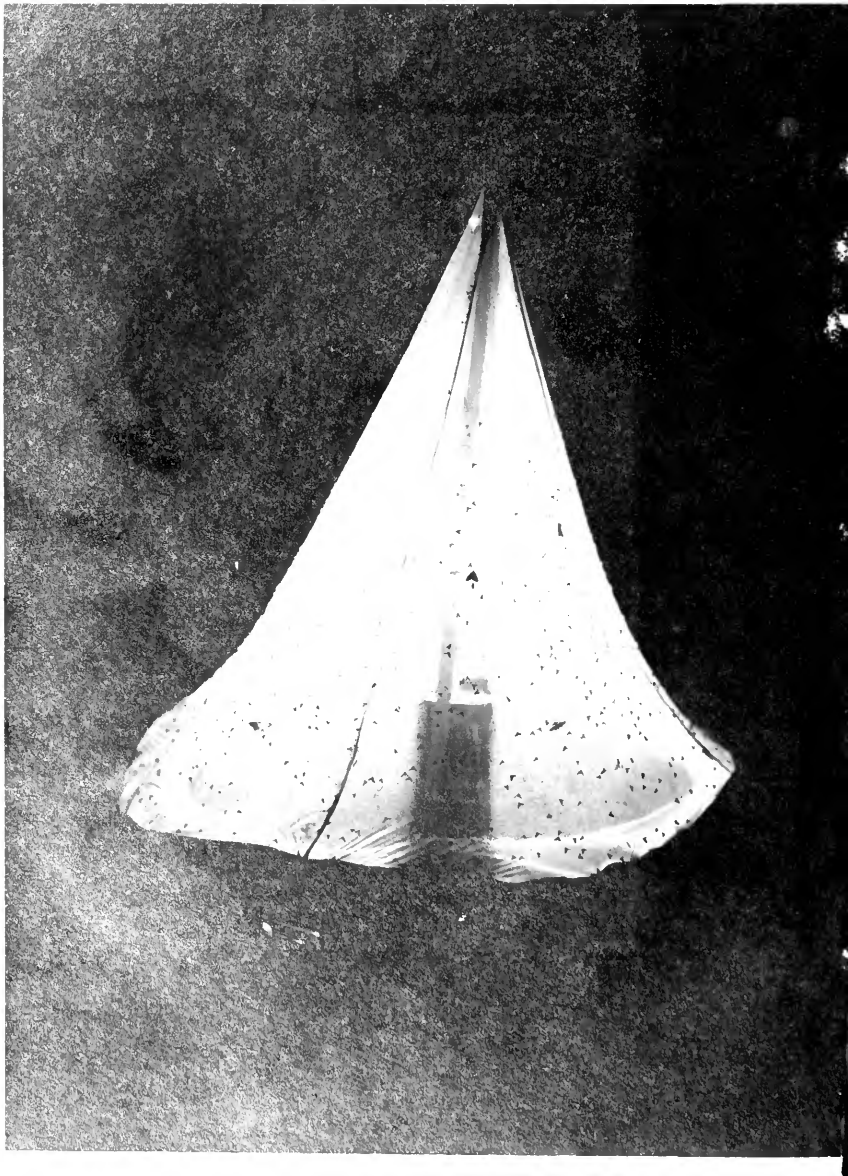
A SIMPLE TRAP-LIGHT DEVICE.

[Plate IV.]

By H. S. Barber.

Since the earliest history of entomology light-collecting has been recognized as one of the most prolific methods of securing specimens. Perhaps the commonest and most satisfactory method is to avail one's self of a convenient window overlooking brush or woodland, placing a lamp on a table within and watching for the desirables to come without. But in camp a very simple and much used method is to hang up a white cloth (like a sheet) and throw the light from the lantern upon it; the disadvantage, aside from the too frequent loss of specimens about the light itself, being that its efficiency is not the same in all directions.

Many devices have been used to facilitate the collecting of insects by light attraction at night. Various sorts of traps for killing all specimens, or even for sorting out and saving the specimens of a single group of insects, have been devised, but so far as is known the following described arrangement has not before been mentioned. Its object is not to entrap specimens, but to provide a simple, compact, and easily ar-



A SIMPLE TRAP-LIGHT DEVICE

ranged apparatus to aid the collector in selecting from the multitude of specimens that come to light such specimens as he may wish to save.

It consists of a cloth base, perhaps a yard square, and a cone of cheesecloth or other light fabric of about 30 inches base and perhaps of equal height, sewed onto the base, the center of which is then cut out. The apex of the cone is supported by a stake in the ground, and the cloth base is pegged out tight with the light inside the cone. Insects coming from all directions crawl about unable to reach the light itself, soon coming to rest on the cloth of the cone, and are easily secured.

The light used is an acetylene mine lamp of simple, durable construction, giving a very intense light from its one-half or three-quarters inch burner, and with this naked flame it was found expedient to use one of the so-called "fireproofing" treatments on the cloth of the cone. Very few experiments have been made on the relative attraction of portable lights, and it is probable that some other equally available illuminant may have more attractive value. But Mr. Schwarz reports that a portable acetylene lamp was tested in western Texas in 1907 and worked admirably, except that the form of the glass globe surrounding the light was such that many specimens were captured with difficulty. With a naked flame he also collected successfully at Cayamas, Cuba, but many specimens flew through the flame and were singed.

The bulk of the device, packed, is very little in excess of the lamp used; the cloth cone rolling up no larger than an ordinary napkin. Stakes can be found anywhere, but four large wire nails for corner pegs seem enough handier to warrant their addition to the outfit.

Insects are not always the only things attracted; toads have several times been found, after a short absence from the light, to be taking advantage of the aggregation of *Lachnosterna*, etc., about the base of the cone, sometimes even jumping for insects several inches up the sides.

The accompanying plate shows the arrangement by daylight as well as its appearance while in use at night. The small view illustrates the window method, which has proven so very effective where a house in the country is available.

Mr. Knab spoke of the results of Dr. Neiva's researches in malaria and of his demonstration of the production of a race of malarial parasites resistant to quinine. His work was done on the river Xerem, when water-works to supply the city of

Rio de Janeiro with drinking water were being constructed. On a previous occasion the severe epidemic of malaria which attacked the laborers had compelled the abandonment of the enterprise. Under the direction of Dr. Oswaldo Cruz it was now determined to carry out prophylaxis by the rigorously enforced use of quinine among the men. For a time excellent results were obtained, but finally cases of malaria appeared that failed to yield to the heaviest doses of quinine. Recently these results have been confirmed, on a larger scale and with still heavier doses of quinine, by Dr. Cruz, on the headwaters of the Madeira River. These results are of special interest to entomologists, as they indicate that, in a tropical climate, successful malaria control can only be hoped for through mosquito extermination.

Meeting of November 3, 1910.

The 244th regular meeting of the Society was entertained by Mr. Heidemann at the Saengerbund Hall, 314 C Street, N. W., on the evening of November 3, 1910, and there were present Messrs. Busck, Caudell, Crawford, Ely, Foster, Hall, Heidemann, Howard, Knab, Popenoe, E. F. Phillips, Schwarz, and Webb, members, and Messrs. J. B. Gill, C. Minot, P. R. Myers, Dr. A. Neiva, Straus, and W. R. Walton, visitors.

The Treasurer announced the sending out of the bills for the current and the following years.

Dr. Arthur Neiva, of the Instituto Oswaldo Cruz, Rio de Janeiro, Brazil, was proposed for corresponding membership and the name referred to the Executive Committee.

Dr. Neiva being called upon, gave a short talk to the members of the Society.

The first paper of the evening, "Note on an Epidemic of Fungous Disease among Soldier Beetles," by C. H. Popenoe, was discussed by Messrs. Caudell, Schwarz, Howard, Phillips, Busck, and Knab.

The next paper, "Brief Notes on Two Recent Trips," by Dr. L. O. Howard, was discussed by Messrs. Schwarz, Knab, and Foster.

The third paper of the evening, by Mr. A. N. Caudell, was entitled "A New Cactus-frequenting Orthopteron from Texas."

The last paper, "The Weevils of Victoria County, Texas," by Messrs. W. D. Pierce and J. D. Mitchell, was read by title.[1]

Short notes were presented by Messrs. Webb, Busck, and Heidemann.

AN EPIDEMIC OF FUNGOUS DISEASES AMONG SOLDIER BEETLES.

By C. H. Popenoe and E. G. Smyth.

Numerous adults of the soldier beetle (*Chauliognathus pennsylvanicus* DeG.) attacked by a fungous disease were observed September 25, 1909, on the blossoms of a *Eupatorium* (probably *perfoliatum*) at Diamond Springs, Virginia. The fungus seemed to attack first the abdomen of the adult, distending it abnormally, and producing white, greenish, or grayish rings of dense mycelial growth on the thin membranous body-wall between the segments. Often six or more beetles had attached themselves in their death struggle to a single small head of flowers. A peculiar posture was assumed by all, the body inclined upward at an angle of 45 degrees. the wings raised as in flight, and the mandibles firmly fastened into the calyx in a last grim death-grip.

A number of diseased beetles were referred to Mrs. Flora W. Patterson, Mycologist, Bureau of Plant Industry, U. S. Department of Agriculture, for determination of the fungus. Four genera of fungi were found present, namely, *Cladosporium*, *Macrosporium*, *Sporotrichum*, and *Fusarium*, "but no one species in sufficient quantity to be considered the probable first cause of the disease."

There is little doubt that the fungus responsible for the death of these beetles is identical with that described by Roland Thaxter[2] as *Empusa* (*Entomophthora*) *lampyridarum* from diseased adults of *Ch. pennsylvanicus* observed by him at Collowhee, North Carolina. The species was new to him, and was described without his having seen the resting spores.

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[1]Already published, Proc. Ent. Soc. Wash., XIII, 45, 1911.

[2]Mem. Boston Soc. Nat. Hist., vol. IV, No. 6, 1888.

In June of the previous year a similar epidemic of fungus among the related *Ch. marginatus* Fab. was observed, first by the senior author, and afterwards independently by F. H. Chittenden, on the experiment station farm at Norfolk, Virginia. A small chinquapin tree, which was at the time in full bloom, was noticed to be covered with thousands of these beetles. On closer examination the fact was disclosed that all were either dead or dying from the attacks of a fungus.

The beetles were attached by the tightly closed mandibles to the rachis of the catkin and held the wings raised as if about to fly. As many as six or seven were found on many of the catkins. Some were attached to the leaves, and like specimens were found on surrounding plants.

Identification of the fungus could not be obtained at that time.

In this connection it may be noted that, although the various species of *Chauliognathus* feed, as adults, almost entirely on the pollen of flowers, in the larval stage their food is composed of various small, soft-bodied insects, largely aphides and other forms living near the ground. The usual great abundance of these beetles no doubt acts as a check to the increase of several species of injurious aphides, such as the pea aphis (*Macrosiphum pisi* Kalt), and the two species mentioned may thus be considered of distinct economic value.

Epidemics of fungous disease may thus so decimate the numbers of these useful insects as to render possible such outbreaks of aphides as have been experienced in the tidewater region of Virginia in the last three years. There seems little doubt that wholesale destruction of the adults of *Chauliognathus* by fungous disease would destroy the balance maintained in insect relations and permit a great increase in the various aphides that are preyed upon by their larvæ.

REDISCOVERY OF RARE SPIDERS.

During a recent collecting trip in the vicinity of Ithaca, New York, in conjunction with Prof. J. H. Emerton, the writer took several specimens of two spiders that were described, each from one male specimen, from this region some years ago. *Erigonoplus gigas* was taken in swamps at Freeville and on South Hill. The female resembles the male in color, but lacks the enlarged white anterior metatarsi. *Habrocestum parvulus* was found among leaves in a small ravine (Coy Glen) near Ithaca. The female has a dull brown abdomen, but the marks of the cephalothorax are similar to the male.

N. BANKS.

BRIEF NOTES OF TWO RECENT TRIPS.

[Plate V.]

By L. O. Howard.

[Author's Abstract.]

The speaker mentioned a number of incidents of entomological interest in recent trips to portions of Europe and to California and the southwestern United States.

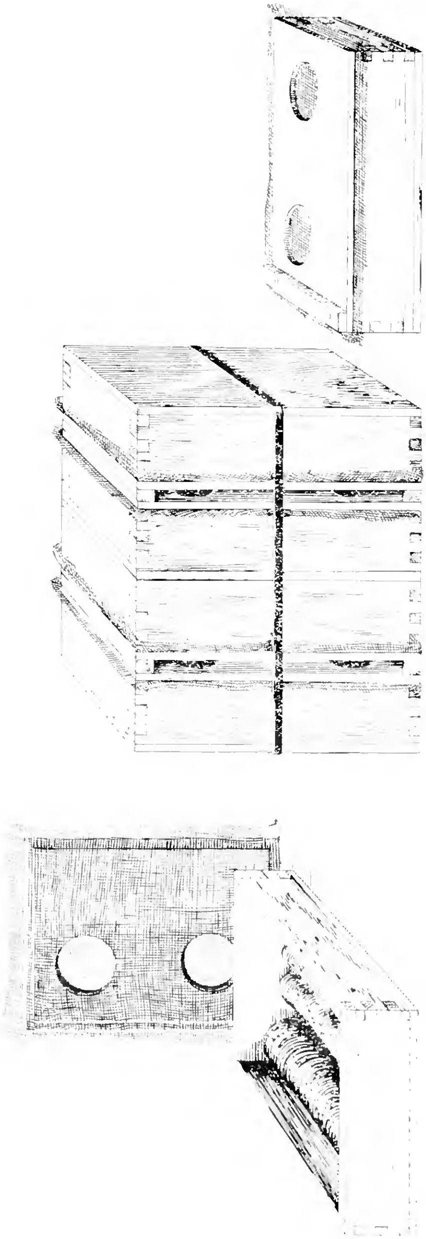
He stated that, sailing direct from New York to Naples the end of April, he carried with him some 200 living specimens of *Chilocorus bivulnerus* and *Microweisa misella*, packed with extreme care by Mr. Herbert Barber in a wooden box about a foot cube. (Plate V.) This contained wooden boxes (about 1 by 3 by 4 inches) with tight-fitting, rabbeted covers. Two large holes were made in the cover of each small box, and a small cleat (about one-fourth inch thick) was nailed across one end. Pieces of branches covered with scale were cut the length of the box inside and fastened with brads through the ends. In the case of branches too large for the thickness of the box they were split and the halves fastened as were the round ones. After the coccinellids were put in, a piece of bolting cloth or organdie was put over the top and held in place by the pressure of the cover, so as to allow free circulation of air through the ventilating holes. The boxes were tied up bottom to bottom and cover to cover with the cleats at opposite ends, leaving a free space between the covers. To further facilitate ventilation a narrow cleat was fastened along the sides of the pile of boxes and the whole was finally wrapped up for shipment. By the courtesy of the steamer officials this package was hung by a cord to a beam in the ceiling of the cold room of the steamer and there remained until landing at Naples. It was then carried soon to Silvestri's laboratory at Portici and opened. The journey had been perfectly successful, and practically all of the insects were alive. He exhibited photographs of Professor Silvestri and Doctor Leonardi and of the mulberry orchard in which Silvestri is liberating coccinellids imported from all parts of the world in order to feed on *Diaspis pentagona*. He also described the glass-cylinder method of rearing coccinellids in use in Silvestri's laboratory at Portici.

He further mentioned a visit to Rome, where he called upon Celli, Grassi, and Tiraboschi, and gave his impressions of the antimalarial work done in the Roman Campagna and of the great and enormously favorable contrast between the conditions existing there at present and those existing on the occasion of a former visit in the summer of 1902. He spoke in the highest praise of the results of the work of Celli and his associates. He also described briefly visits to Spain and Portugal, mentioning especially his conferences with Professor Ignacio Bolivar and Professor L. Navarro at Madrid, and also with Señor Alfredo Le Coq, Director of Agriculture of Portugal, and Professor A. de Seabra, in charge of the entomological work for the Ministry of Agriculture of Portugal.

He then mentioned briefly a visit to the great nursery-growing regions of France, especially those around Angers, Orleans, Versailles, and Ussy, and called attention to the curious fact that, although in the summer of 1909 both *Porthetria dispar* and *Euproctis chrysorrhœa* had been very abundant in these regions, in the corresponding week in 1910 hardly a lepidopterous larva of any kind was to be found, and the two species just mentioned were conspicuously absent. From these observations he concluded that nursery stock imported during the coming winter from Europe will be found to be practically uninfested. He also mentioned visits to Belgium and Holland, illustrating nursery conditions by photographs.

In September, in company with Dr. L. P. De Bussy, Biologist of the Tobacco Planters' Association of Deli, Sumatra, he proceeded from Washington to Sacramento, California. There they met Messrs. Carnes, Compere, and Bremner. The recent importations of Mr. George Compere from oriental regions were examined, and special mention was made of a new coccinellid of minute size which preys upon *Dactylopius* and which, in the opinion of Mr. Compere, will prove more valuable than *Cryptolæmus montrousieri*. Photographs were shown illustrating the collection of *Hippodamia convergens* in enormous numbers by the agents of the State Horticultural Commission. These specimens are packed in boxes each containing 60,000 individuals, the number being determined by weight. A photograph was shown of a series of boxes containing 5,860,000 of these coccinellids packed ready for shipment to truck growers and orchard growers in different parts of California. The comparative ease with which this species of coccidellid is collected was indicated by a photograph taken by the speaker in the Muir valley at the base of Mount Tamalpais. There the *Hippodamia* was found on the afternoon of September 18. clustering in enormous numbers about the nodes of a large species of *Equisetum* and in the slightly rolled leaves of a wild species of *Rubus*. Some thousands of specimens could readily have been collected from every specimen of either of these plants.

The party visited Mr. Moulton, the Deputy Horticultural



BOXES FOR PACKING COCCINELLIDAE

Commissioner in San Francisco, and witnessed the inspection of a large steamer from Japan.

Stanford University was visited, as well as Pomona College, at Claremont, California. Photographs were shown of Prof. V. L. Kellogg, Prof. A. J. Cook, and Prof. C. F. Baker.

A visit was made to the Southern California Phytopathological Laboratory of the University of California at Whittier. A photograph was shown of the laboratory and also of the great Leffingwell lemon orchard, where they were informed that the work of R. S. Woglum on the fumigation of citrus trees with hydrocyanic-acid gas had already saved the locality at least $250,000.

Visits following these to Dallas, Texas; College Station, Texas; Audubon Park, Louisiana; Baton Rouge, Louisiana; and Urbana, Illinois, were briefly mentioned, entomologists and entomological laboratories being illustrated by photographs.

A NEW CACTUS-FREQUENTING ORTHOPTERON FROM TEXAS.

By A. N. Caudell.

In their investigation of the insects of the cactus Messrs. Mitchell, Hunter, and Pratt have taken a number of interesting representatives of the subfamily Decticinæ. I have recently described one very distinct new species of the genus *Stipator*,[1] and I now present the description of another new species of this, the dominant, genus of Decticinæ. I take pleasure in naming the species *pratti* in honor of Mr. F. C. Pratt.

Stipator pratti, new species.

Male.—Allied to *mitchelli* in general appearance but differs from that species, as well as from *haldemanii*, its next nearest ally, in the shape of the cerci and that of the last abdominal segment, in which particulars it is more nearly allied to the much smaller *S. stevensoni*, as figured in my revision of the group.[2] Head moderate, well inserted into the ponotum; fastigium of the vertex slightly more than one-third as broad as the interocular space; front very broadly rounded; eyes moderate, a little longer than broad, somewhat larger than in *mitchelli;* antennæ as usual in the genus. Pronotum large and produced posteriorly considerably over the base of the abdomen; lateral lobes well developed but scarcely so deep as long, the posterior margin distinctly sinuate; lateral and median carinæ wholly absent; anterior margin of pronotum truncate, posterior margin rounded; prosternal spines moderate, sharp. Organs of flight not projecting from

[1]Can. Ent., vol. XLIII, p. 137 (1911).

[2]Proc. U. S. Nat. Mus., vol. XXXII, pp. 285-410 (1907).

beneath the pronotum. Legs long and stout; anterior tibiæ armed above with three spines on the outer side, the inner side unarmed; hind femora very heavy on the basal three-fifths, the apical portion slender, armed beneath with several short, stout, sharp, triangular, backward-directed spines; plantulæ of the posterior tarsi scarcely half as long as the basal segment of the tarsus, convex and black, beneath light in color and deeply concave. Abdomen large and plump, no dorsal carina evident; cerci about three times as long as broad, rounded and very slightly incurved, the inner tooth situated much beyond the middle near the tip; as compared with that portion of the cercus beyond it the tooth is about the same width basally, a little longer and much sharper, being acute apically and there curved a little inwards and considerably downwards; subgenital plate roundly notched apically, the styles stout, nearly four times as long as broad; last dorsal segment of the abdomen mesially projecting considerably backwards and deeply cleft, the angles long and slender, being fully four times as long as the mesial width; in the allied species *mitchelli* and *haldemanii* these angles are no longer than broad. General color yellowish brown, probably green in life. The pronotum is margined posteriorly above with a solid deep black band nearly 2 mm. broad; the abdominal segments, except the last, are margined posteriorly with reddish brown; all the spines of the legs with the tips black.

Female.—Very like the male in general structure, indeed almost exactly like that sex except that the pronotum is more generally infuscated above, not only behind on the disk as in the male. This is very probably a variable character. The ovipositor is stout, less than the hind femora in length and curved strongly upward, the apex blackish.

Measurements—Length, pronotum, male, 12 mm., female, 11 mm.: posterior femora, male, 31 mm., female, 31 mm; ovipositor, 19 mm.; width, hind femora at widest part, male, 7 mm., female, 7 mm.

Type: Male (Cat. No. 13554, U. S. Nat. Mus.), Alice, Texas, August 28, 1908, on *Opuntia*. J. D. Mitchell, collector.

Paratype: Female, same data.

Mr. Busck showed specimens of the common European tineid moth, *Swammerdamia pyrella* Villers, bred and collected at light by him at Monadnock Lake, New Hampshire, last summer, and stated that this is the record of this genus in America.

He also presented a series of the West Indian tineid moth *Ereunetis minuscula* Walsingham, which he had bred from mummy fruits of loquat, received through Mr. Sasscer from Miami, Florida. He stated that he had bred this species this fall also from dry cacao pods sent him from Trinidad by Mr. W. F. Urich, and that he had bred this same species in large numbers in 1902 from the sweepings and offal in a copra warehouse near Baracoa, Cuba. Mr. Busck said that he had also specimens labeled "rotten cottonboll" from Jamaica, others "in tamarind" from Nassau, and still others labeled "from *Diaspis lanatus*" from Barbadoes, which proves the species, the life history of which has not hitherto been recorded, to be a very general feeder on any kind of vegetable or animal refuse. The genus has not hitherto been recorded from the United States. In repose the tips of the wings of these small yellow and brown moths are bent up sharply at right angles with the plane of the moth and produce a curious resemblance to a bit of chaff. Mr. Busck said that he looked under the floor of the warehouse in Baracoa, which was elevated abouf 4 feet above the ground, and thought he saw merely the rough boards until a flying moth apparently disappeared through a crack; he then looked closer and realized that the rough appearance of the boards was effected by thousands of these moths resting close together under the floor, and he then found the cracks of the floor filled with the galleries of the larvæ.

A NEW SPECIES OF DIORYCTRIA.

[Lepidoptera; Pyralidæ.]

By Harrison G. Dyar.

Dioryctria xanthœnobares, new species.

Ferruginous yellow; fore wing with the inner line far from the base, oblique, white, ill defined; outer line rather near the margin, twice waved, white; a row of terminal elongated white spots; a white dash along median vein, joining the lunate discal mark; an oblique dark red shade at base and one on the inner half of terminal space. Hind wings thin, whitish, scarcely cinereous tinged. Expanse, 27 to 31 mm.

One male, two females. Kaslo, British Columbia, August 20, 1905 (W. T. Cockle); Seattle, Washington (O. B. Johnson); Pullman, Washington (C. V. Piper).

Type: No. 13825, U. S. Nat. Mus.

Allied to *D. aurantiacella* Grote, but larger, paler, the hind wings white instead of dark gray, the fore wings with much less of red.

MEETING OF DECEMBER 1, 1910.

The 245th regular meeting of the Society was entertained by Mr. Schwarz on the evening of December 1, 1910, at the Saengerbund Hall, 314 C Street, N. W., and there were present Messrs. Barber, Bourne, Busck, Caudell, Crawford, Dyar, Ely, T. Gill, Heidemann, Jenne, T. H. Jones, Knab, Myers, Neiva, E. F. Phillips, Popenoe, Quaintance, Rohwer, E. A. Schwarz, Walton, Webb and Webster, members, and Messrs. Beutenmüller, J. B. Gill, C. W. Hooker, Parks, Reeves, and Sanford, visitors.

The Treasurer presented his annual report, which was referred to an auditing committee and accepted.

The chairman of the Publication Committee reported that three numbers of the current volume of Proceedings had been issued and that the last was in the hands of the printer.

Dr. Arthur Neiva, of the Instituto Oswaldo Cruz, Rio de Janeiro, Brazil, was elected a corresponding member.

Mr. P. R. Myers, Division of Insects, U. S. National Museum, and Mr. W. R. Walton, Bureau of Entomology, Department of Agriculture, were elected active members.

On motion the Society decided to reprint and give Professor Cockerell 100 reprints of his paper on Three New Species of Nomada.

The Society voted to send to the University of Toulouse a set of the Proceedings to aid in the rebuilding of a library.

The election of officers resulted as follows:

F. M. WEBSTER, President.
A. L. QUAINTANCE, First Vice President.
E. F. PHILLIPS, Second Vice President.
S. A. ROHWER, Corresponding Secretary-Treasurer.
H. S. BARBER, Recording Secretary.
Members of the Executive Committee: E. A. SCHWARZ, L. O. HOWARD, H. G. DYAR.

The retiring President, Mr. Heidemann, then delivered his annual address, entitled "Remarks on the Eggs of North American Hemiptera."[1] This was discussed by Messrs. Caudell, Knab, Rohwer, Schwarz, Dyar, and Gill.

[1] To be published in the following number of this journal.

MEETING OF JANUARY 5, 1911.

The 246th regular meeting of the Entomological Society was held in the Saengerbund Hall, 314 C Street, N. W., January 5, 1911, President Webster in the chair, and Messrs. Barber, Crawford, Dyar, Ely, Foster, Heidemann, Hunter, Jenne, Fred Johnson, T. H. Jones, Kelly, Knab, Marlatt, Meyers, Parks, Quaintance, Rohwer, Sasscer, Viereck, Walton, and Zimmer, members, and Messrs. Ballard, J. B. Gill, C. W. Hooker and W. D. Richardson, visitors, present.

The minutes of the last meeting were read and approved.

Reports of the auditing and the publication committees were presented by Dr. Dyar and the Secretary-Treasurer made his report.

The name of Mr. Allan H. Jennings, of Ancon, Canal Zone, Panama, was proposed for corresponding membership by Messrs. Knab and Viereck.

The Publication Committee was named by the President, consisting of Messrs. Dyar, Quaintance, and Crawford.

The Secretary was instructed to cast the affirmative ballot for Dr. Hopkins (nominated by Mr. Crawford) to represent the Society before the Washington Academy of Science.

The Corresponding Secretary read letters asking exchanges of publications. He objected to the present methods of handling such transactions, and requested instruction by the Society. The matter was referred to the Executive Committee after some discussion.

The paper of the evening entitled "Xiphidion Stridulations," by H. A. Allard, was read by the Secretary.

A CORRECTION.

In volume XII, No. 4, the explanation of plates VII and VIII was omitted. The article was on new species of *Leptoglossus* from North America, by Mr. Heidemann. Plate VII represents *Leptoglossus magnoliæ* Heidm., adult, larva, and pupa. Plate VIII represents *L. occidentalis* Heidm. above, *L. clypealis* Heidm. below.

XIPHIDION STRIDULATIONS.

By H. A. Allard.

The smallest members of the Locustidæ are the xiphidions, strictly terrestial in their habits, and dwelling almost exclusively among grasses, reeds, and other tender herbage. They are especially common in the luxuriant meadow growth along the margins of ponds and sluggish streams. Some species, however, prefer the scanty vegetation of highest, driest, upland and mountain situations. Of all the Locustidæ the stridulations of the *Xiphidion* are the softest and least audible. Their soft, silken lispings are quite devoid of any tone-quality or harmony, as are the notes of all the Locustidæ. These insects, like the orchelimums, sing most persistently during the sunny hours of the day. Their notes, however, are too faint to add noticeably to the happy chorus of midsummer sounds. Patience and a keen ear are essential equipments of the student who cares to study the song-habits of these tiny insects.[1]

Xiphidion fasciatum De Geer is one of the most delicate and slender-bodied insects of all the Locustidæ. In general appearance and in the character of its song this little *Xiphidion* resembles a tiny *Orchelimum*. Its usual habitat is among the weeds and grasses in nearly all upland and lowland situations.

The stridulations of *Xiphidion fasciatum* are very faint and lisping. Their delivery, in nearly every respect, is extremely like the usual song of the orchelimums. The song invariably begins with a succession of very faint notes, *tse-tse-tse*, repeated very slowly and terminating with the phrase *tse-e-e-e-e-e-e-e-e-e-e-e-e-e-e-e*, which continues from five to twenty seconds. McNeill says of this species: "Its song is a faint echo of that of *Orchelimum vulgare*, with the *zip-zip* omitted." I have carefully studied the song habits of this *Xiphidion* both in the field and by confining it in suitable boxes. In no instance have I ever found wanting the short staccato lisps. So brief and faint are these preceding notes, however, that they may readily be overlooked. A record is here given of one individual and its successive stridulations:

14	staccato	lisps	which	preceded	a	monotone	of	20 seconds	duration.
5	"	"	"	"	"	"	"	10 "	"
8	"	"	"	"	"	"	"	10 "	"
3	"	"	"	"	"	"	"	5 "	"
1	"	"	"	"	"	"	"	5 "	"
71	"	"	with no monotone.						

[1] Mr. A. N. Caudell, of the U. S. National Museum, has kindly identified all the species mentioned in this paper.

Xiphidion fasciatum is a persistent singer by day and also at night. Individuals confined in my room sang persistently throughout the night as well as by day. Even in the quiet of the room their notes were barely audible 7 or 8 feet away. The stridulations are among the faintest produced by any locustid known to me.

Piers in Nova Scotia has very accurately described the stridulations of this *Xiphidion*. He says: "It frequents damp situations and numbers were observed among the rank marsh grass on Marsh Lake at Sackville, N. S., on November 3, 1895." At another time he says: "One observed in September produced a song which may be represented thus: *plee-e-e-e-e-e-e-e-e-e-e-e, tcit, tcit, tcit, tcit.*" [1]

This *Xiphidion* is a common insect at Thompson's Mills, north Georgia. Here my first record of its notes during the summer of 1909 was on July 31. During a walk in the low grounds of East Washington, D. C., on October 31, numbers of these insects were singing in the grass.

Around Washington, D. C., *Xiphidion nemorale* (Scudder) is a common insect. This form prefers the grass and weeds of fields in dry, upland situations nearly everywhere. Although this species usually dwells in the grass and herbage close to the ground, it is not infrequently found 5 or 6 feet from the ground in bushes bordering fields. This insect is common in the scanty grass in nearly every dry, upland, sunny spot on Plummer's Island, Maryland. Its song is strikingly unlike that of *Xiphidion fasciatum*. It begins with a number of brief staccato lisps, succeeding each other so rapidly as to produce an almost continuous sound. These are followed by from 2 to 32 brief phrases, *tseeeeee-tseeeeee-tseeeeee*, rapidly repeated. In the song of *Xiphidion fasciatum*, the staccato notes precede each lisping monotone, *tseeeeee*, which is considerably prolonged. The stridulations of *Xiphidion nemorale* are briefer, more hurried, and insistent than those of *fasciatum*. One individual of *X. nemorale* sang 60 phrases in a minute; another sang persistently 145 phrases in one minute. This species is most noisy during hot, sunny days.

The stridulations of *Xiphidion allardi*, a new species recently named by Mr. Caudell, are rather strikingly different from the notes of either of the preceding species, as no staccato lisps precede the lisping phrases. Its song consists of weak, lisping, more or less prolonged phrases *ssssss-ssssss-ssssss*, in tone quality recalling the song of *Orchelimum minor*. I

[1] "Preliminary Notes on the Orthoptera of Nova Scotia", by Harry Piers. In Proceedings and Transactions of Nova Scotia Institute of Science, vol. IX, 1895-96.

first heard and captured this insect at Indian Grave Gap, Towns County, north Georgia, in the scanty grass in sunny clearings in the woods. Later I captured it in similar situations on Blue and Tray mountains near by. It is possibly not an uncommon species in these mountains.

Xiphidion strictum (Scudder) is a rather common form in the grass and weeds around Washington, D. C. One of these insects, captured November 14, 1909, sang very persistently the lisping phrase, *s-s-s-s-s-s-s-s-s-s-s-s*, which was greatly prolonged. These phrases were without any preceding staccato lisps.

Xiphidion saltans Scudder is not uncommon at Thompson's Mills, Georgia. It prefers the luxuriant growths of weeds and grasses of moist bottom lands. It is not a very active insect, and for that reason may be easily captured. I have no record of its stridulations.

Xiphidion brevipenne Scudder and *Xiphidion ensifer* Scudder occur in the meadows around Washington, D. C. I found *Xiphidion ensifer* rather common at Thompson's Mills, Georgia, but have no definite knowledge of its stridulations.

In early September, 1910, I carefully studied the stridulations of *Xiphidion brevipenne* at Oxford, Massachusetts. Here I found this little insect nearly always in company with *X. fasciatum*. Its notes were so faint that I could not well distinguish them from other outdoor sounds. The notes are rather rapidly delivered, and consist of one or two brief, faint staccato lisps, *tip-tip*, which precede from one to three of the usual lisping phrases, *tseeeee*. The notes may be written thus: *tip-tseee . . . tip-tseee-tseeee . . . tip-tip-tseee-tseee-tseee . . . . tip-tsee*. The song reminds one more of the song of *X. nemorale* than of the other species.

The species of *Xiphidion* are all very persistent in their stridulations. These notes are so faint and attentuated, however, that they are rarely heard, except by the keenest observers. Rather dissimilar habits of stridulation prevail among the different species of *Xiphidion*. This is more noticeable for those tiny locusts than for the larger orchelimums. Among the xiphidions one species stridulates hurriedly, another very leisurely. The notes of some species are characterized by many short staccato lisps, *tip-tip*, which precede each phrase, *tseeeeeeeeeeeeee*. In the notes of other species one or two brief staccato notes, *tip-tip*, are followed by a quick succession of many short phrases, *tseee-tseee-tseee-tseee*. It is not easy to study the stridulations of these insects in their natural habitat among the grasses. Some species are very shy, and their faint lispings do not readily indicate their position amidst the grass stems. These little insects may easily be observed and their song-habits carefully noted if they are confined in suitable boxes.

Under the heading Notes and Exhibition of Specimens, Mr. Hunter mentioned the report of Dr. Darling relative to the humming of mosquitoes. Mr. Knab said that Landois has reported the sound as produced by the thoracic spiracles.

Mr. Rohwer exhibited a gynandomorphic wasp.

Dr. Dyar spoke of the troublesome genus *Diatræa* and announced his success in separating as two distinct species the forms feeding on corn and on sugar cane in the United States in characters of both the larvæ and the adults.

Mr. Webster said that both the spotted and the immaculate forms of larvæ occur in corn.

Mr. Kelly spoke of the known life history of an often troublesome chrysomelid beetle (*Myochrous denticollis*) of corn. The larvæ found in the ground feeding on the roots of cocklebur were exhibited. Discussed by Messrs. Webster and Knab.

Mr. W. D. Hunter exhibited a catalogue of the Coleoptera of Mexico which appears to have been overlooked by the compilers of the Zoölogical Record and other bibliographies. It is not referred to in connection with the treatment of the Coleoptera in the Biologia Centrali Americana. The full title of the paper is as follows:

Catálogo | de la | Colección de Coleópteros Mexicanos | Del Museo Nacional, | formada y clasificada | por el Dr. D. Eugenio Dugés. | (Salón de Entomología.) | Segunda Edición. | México | Imprenta del Museo Nacional. | 1901. |

The catalogue contains 148 pages and 12 colored plates of good execution. These plates cover 101 species. In five cases species are figured which do not appear in the list.

The catalogue contains a hundred or more manuscript names of Dr. Dugés. These are, in the most part, *nomina nuda*, but five of the species bearing Dugés's name, are illustrated in the plates and can probably be recognized. The work has a considerable number of incidental notes regarding food plants and altitudes in addition to localities. It is one of a series of catalogues illustrating the collections in the Mexican National Museum. An announcement on the cover states that it is for sale at 30 cents Mexican.

He also exhibited specimens of the deer botfly, reared by Pratt in Texas and identified by Mr. Coquillett as the European species of *Cephenomyia*. He mentioned the resemblance of this fly to certain of the Syrphidæ and remarked on the hosts of Oestridæ in general.

Mr. Knab stated that the family Oestridæ is no longer recognized as a valid family by the best systematists.

Mr. Knab showed specimens of a large buprestid, *Euchroma gigantea*, collected at Panama by Mr. A. H. Jennings, the entomologist of the Isthmian Canal Commission. One of these specimens showed the dense waxy secretion, similar to that of the weevils of the genus *Lixus*, with which the beetle is covered during life; this completely hides the metallic colors of the integument which are so familiar in cabinet specimens. The entire beetle is covered with this secretion, not only above and beneath, but even on the under surface of the elytra. The color of this coating on the elytra is a bright greenish yellow with an orange cast; on the head and thorax it is paler, the pronotum being broadly margined with creamy white. A similar efflorescence is present in many Buprestidæ of the tribes Chalcophorini and Buprestini, but is rarely mentioned in works on Coleoptera. In *Euchroma* it has been briefly mentioned by Lacordaire (Genera des Coléopteres, vol. 4, 1857, p. 21) and its nature understood. Recently it has been alluded to in some of our forms by Col. T. L. Casey, who speaks of the depressions which have remained unabraded as "pubescent areas." A coating of this kind may be observed in species of many of our genera, although it is seldom preserved in cabinet specimens. A hasty examination of the North American Buprestidæ in the National Museum collection showed traces of such a secretion in the following genera: *Hippomelas*, *Gyascutus*, *Chalcophora*, *Psiloptera*, *Dicerca*, *Pœcilonota*. A specimen of a species of *Pœcilonota*, in the Hubbard and Schwarz collection, from Tucson, Arizona, is particularly striking. Nearly the entire surface of the beetle is covered with a heavy white coating and the integument is only visible at a few prominences which have evidently been denuded. In the tribe Agrilini ornamentation of an entirely different character is often present. This consists of lines or patches of true scales, forming characteristic patterns in different species. This may be noted in certain species of *Agrilus*, *Taphrocerus*, *Brachys*, and *Pachyscelus*.

Mr. Jenne mentioned the rearing of a species of *Conotrachelus* (*C. anaglypticus*) in Georgia. The eggs are laid in the fuzz on the outside of peaches. The young larvæ are unable to penetrate the skin, but when an artificial or accidental puncture is made they develop successfully. The full-grown larva, on emerging, is able to jump.

Mr. Parks spoke of a leaf-mining fly (*Agromyza* sp.) in alfalfa in southern Kansas, and of its parasites.

The Secretary read a note by Mr. F. Alex. McDermott on the predaceous habits of a pentatomid larva upon caterpillars. The paper was discussed by Messrs. Webster and Heidemann.

A NEW COLORADIA.

[Lepidoptera; Saturniidæ.]

By Harrison G. Dyar.

Coloradia lois, new species.

Similar to *pandora* Blake and *doris* Barnes but smaller than either fore wing with the markings as in *pandora;* hind wing of a glossy, hyaline appearance in the male, with the markings largely lost; uniformly dark in the female, with rose color along the inner margin in both sexes.

Four males, one female, Miles City, Montana, June 10, 16, 1890; June 11, 1891 (C. A. Wiley).

Type: No. 14021, U. S. National Museum.

THE ATTACK OF A LARVAL HEMIPTER UPON A CATERPILLAR.

By F. Alex. McDermott.

The following observation is not claimed as especially new or remarkable, but presents some interest as a study of insect tactics.

Upon the trunk of a large poplar which was thickly beset with the tents or webs of *Hyphantria cunea*, I observed a larval hemipter, probably of the genus *Podisus*, with his beak extended and the point penetrating the side of one of the caterpillars inhabiting the nests. The caterpillar attacked was dead and quite limp, evidently being pretty thoroughly sucked out. With some difficulty I succeeded in separating the hemipter from his prey, though he was very loath to part with it, and held on like the proverbial bulldog. When first disturbed the hemipter ejected from the anal glands three drops of clear fluid which may have had an odor, although I could not detect it in the open air.

After removing the first caterpillar I secured a second fresh specimen of the same species, and placed it on the trunk near the hemipter. The latter immediately showed a fresh interest in proceedings and trailed the caterpillar up the bark, with his beak extended and close to the surface, as if following the "scent." Twice he ran alongside of the caterpillar, getting as close as the latter's hair would allow him, and inserted his beak beneath the caterpillar, evidently trying to puncture the abdomen. In both of these instances the caterpillar snapped its head around and the hemipter retreated rapidly, evidently fearing the caterpillar's jaws. On the third attempt he succeeded in inserting his beak through the skin, and though the caterpillar squirmed and snapped back for a few seconds, he did not release his hold. The caterpillar seemed to accept its fate after a few moments, perhaps poisoned by the hemipter, for it ceased to wriggle and twist. When placed in a test-tube the hemipter released his hold and the caterpillar crawled off as if uninjured, but it died shortly afterward. Later a smaller larva of the same species of hemipter was found holding a smaller caterpillar of the same species.

On account of the long time required for one hemipter to secure his meal from these caterpillars, it seems hardly likely that the pentatomid would prove very effective as a check to the prevalence of the webworm, though those observed were certainly doing their best to reduce the number. In captivity the hemipter shows a disinclination to feed, and the caterpillars did not show any especial dread of their enemy.

One more curious observation. These caterpillars are much attracted by something about the green pulp and brownish seeds of a broken seed-pod of the "Jamestown weed" (*Datura*). I had broken one of these open, and the broken ends and seeds were lying near where the caterpillars were crawling. Several of them walked over and investigated the broken pod and seeds with evident interest, mouthing the seeds over and nibbling at their edges and at the broken edges of the pod. Evidently the taste was disappointing to them, as they soon ceased nibbling and hurried on their way. But uninitiated caterpillars eagerly nibbled at the pod, and one even stopped in the midst of a headlong flight from pursuit to taste the dainty.

A cocoon of this moth was also found in which there was a dead pupa of a parasitic hymenopter, probably *Chalcis ovata*. There were also present living larvæ of some dermestid beetle, of the genus *Anthrenus* or *Cryptorhopalum* which appeared to have killed the *Chalcis* pupa. For the identification of these specimens, I am indebted to Mr. Barber of the U. S. National Museum.

A request by Mr. Quaintance for information on the green-plant food habits of white ants, and describing a peculiar case of injury to a healthy apple nursery in Kansas, induced some discussion by Messrs. Webster, Kelly, Hunter, and Marlatt. Mr. Hunter said that *T. flavipes* destroys living cotton plants in Texas. Mr. Marlatt stated the species is omnivorus, eating even potatoes in the fields and often injuring orange trees extensively.

Meeting of February 2, 1911.

The 247th regular meeting of the Society was entertained by the President February 2, 1911, in the lecture room of the Cosmos Club, with twenty-five members present (Messrs. Barber, Bishopp, Caudell, Dyar, Ely, Gahan, Gill, Hopkins, Howard, Hunter, Jenne, F. Johnson, T. H. Jones, Knab, Marlatt, A. C. Morgan, Nelson, E. F. Phillips, W. J. Phillips, Pierce, Rohwer, Sasscer, Smyth, Walton, and Webster), and fifteen visitors (Dr. K. C. Corley, G. G. Gandara, J. B. Gill, C. E. Hood, C. W. Hooker, J. R. Inda, T. H. Parks, Rutherford, Strickland, Sanford, Snyder, Strauss, W. D. Turner, E. W. Wall, and Dr. G. F. White).

The minutes of the last meeting were read and approved.

The name of Mr. Allan H. Jennings, Ancon, Canal Zone, Panama, was considered for corresponding membership, and the Secretary was instructed to cast the affirmative ballot.

The first paper of the evening, entitled "Bee Diseases and their Spread," was delivered by Dr. E. F. Phillips; the second was by Dr. G. F. White, and was on the "Causes of Bee Diseases." Both were illustrated with lantern slides.

The President called upon some of the foreign guests and was answered by Messrs. Rutherford and Strickland, of England, and Messrs. Inda and Gandara, of Mexico, who expressed their appreciation of the arrangements made for them by Dr. Howard and of their reception by the entomologists of this country. Dr. Howard replied that he appreciated the honor done this country by foreign economic entomologists in coming to study the methods here employed. He complimented Drs. Phillips and White for the thoroughness of their researches and their remarkable success in fixing the causes of bee diseases.

The third paper, "Remarks on Forest Insects," by Dr. Hopkins, was also illustrated with lantern slides.

None of the papers were presented for publication.

Meeting of March 2, 1911.

Mr. C. L. Marlatt entertained the Society at his home on the evening of March 2, 1911, on the occasion of its 248th regular meeting.

President Webster occupied the chair and there were present Messrs. Barber, Cushman, Dyar, Ely, Gill, Hopkins, Fred Johnson, Knab, Marlatt, Myers, Pierce, Popenoe, Quaintance, Rohwer, Sasscer, Smyth, Viereck, Walton, and Webb, members, and Messrs. J. B. Gill, Marshall, Stanford, J. F. Strauss, Urbans, and Wall, visitors.

The minutes of the last meeting were read and corrected.

As unfinished business it was reported that following a meeting of the Executive Committee a special sub-committee undertook the revision of the foreign mailing list, and its recommendation that all exchanges be discontinued except with certain societies, and that our publications be sent gratis to certain other institutions listed, has been approved. The report also recommends that if the exchanges received from the societies listed cannot be sold, they be presented either to the Library of the Bureau of Entomology or to the Smithsonian Institution.

—Mr. Viereck read his paper on the Hymenoptera in Smith's Insects of New Jersey, third edition, 1910.

HYMENOPTERA IN SMITH'S INSECTS OF NEW JERSEY, THIRD EDITION, 1910.

By H. L. Viereck.

In December, 1910, the New Jersey State Museum issued an annual report containing the Insects of New Jersey, being the third edition of Prof. J. B. Smith's well-known list of insects of this State.

The writer was invited to prepare the systematic portion of the part on Hymenoptera in this list, excepting the Cynipidæ and Formicoidea, but confined himself to the arrangement of the sequence of the superfamilies for the whole order and to the sequence of families, genera, and species under the Cynipoidea (with the exception of the Cynipidæ), the Ichneumonoidea, Proctotrypoidea, Vespoidea, Sphecoidea, and Apoidea. The understanding on the writer's part was that Dr. MacGillivray should be the author of the systematic portion in the Tenthredinoidea and Mr. J. C. Crawford in the Chalcidoidea in the same way as Mr. Beutenmüller became author of the Cynipidæ and Professor Wheeler of the Formicidæ or Formicoidea. These arrangements were entered into in order that this great complex, the Hymenoptera, might, as treated in "The New Jersey List," have the advantage of the scrutiny of specialists actively engaged in pursuing the study of the several groups. The advisability of such a course is naturally patent to anyone at all familiar with the rapid strides that are being made toward a more modern, searching, and exhaustive arrangement of our knowledge of entomology.

In the list cited Dr. MacGillivray is not credited with the Tenthredinoidea as he should have been. Inasmuch as several of his manuscript generic names are here for the first time given standing, owing to the inclusion of described species, I deem it necessary to state that Dr. A. D. MacGillivray should be cited as the author of the systematic portion of the Tenthredinoidea in the above list in spite of the fact that he is not so credited.

To the uninitiated it could easily appear that the third edition of the Insects of New Jersey was written by Mr. Silas R. Morse, Curator of the New Jersey State Museum. Be this as it may, it is necessary to call attention to a number of inaccuracies with reference to the systematic side of the groups in which the writer was to be author but of which he did not see proof sheets of any kind in which the matter might have been set straight. That even the notes not written by the specialists might have been improved had the specialists been allowed to read the proof becomes evident, for example, from a perusal of the introductory remarks to the list of Tenthredinoidea. In the former list Dr. Ashmead had two superfamilies, the Tenthredinoidea and Siricoidea, whereas in the present list Dr. MacGillivray has one only, namely, the Tenthredinoidea, and this to cover the groups formerly embraced by the terms Tenthredinoidea and Siricoidea, yet the almost unchanged wording that did service for the Tenthredinoidea in Dr. Ashmead's arrangement is made to serve as an introduction to Dr. MacGillivray's conception of the Tenthredinoidea, thus making it appear that the Siricoidea of Ashmead is made up of sawflies.

In the manuscript submitted by the writer the fact that a species had been referred from one genus to another was indicated by giving the old generic name within parentheses, with the sign of equality preceding the name within the parentheses; generic names regarded as subgenera, however, were given within parentheses along with the species involved, but without the use of the equality sign. This arrangement has been changed by entirely dropping out many of the generic names so enclosed or where the enclosed names occur they appear uniformly without the sign of equality, so that the intent is destroyed and they serve only to call attention to the fact that the immediately involved species and perhaps one or more following have been transferred from the genus in parentheses or take the name within parentheses as a subgeneric designation. To further complicate matters subgenera are in some cases given as headings the same as genera, but in different type from that used for genera, the subgeneric name being sometimes preceded by the word subgenus, again indicated merely by the difference in type.

Page 604. Stephanidæ should file in after Braconidæ; for *S. cinctipes* Cress. read *S.* (*Schlettererius*) *cinctipes* Cress.; (*Megischus*) should read (=*Megischus*).

Page 605. *A. Americanus* Ashm. should read (*A.*) *Praon americanus* (Ashm.), this species having been justly transferred to *Praon* by Gahan, 1910; (*A. brunneiventris* Ashm.) =*Praon americanus* (Ashm.); (*A. citraphis* Ashm.)= *Aphidius* (*Lysiphlebus*) *testaceipes* Cress.; (*A. myzi* Ashm.) =*A.* (*Lysiphlebus*) *myzi* Ashm.; (*A. salicaphis* Fitch)=*A.* (*Diæretus*) *salicaphis* Fitch (=*Adialytus*); (*A. populaphis* Fitch) =*A.* (*Adialytus*) *populaphis* Fitch; (*A. rapæ* Curt.) =*A.* (*Diæretus*) *rapæ* Curt. (=*Lipolexis*).

Page 606. Insert the sign of equality before *Aphidius*.

Page 607. *Cardiochiles populator*, *Blacus lithocolletidis*, and *B. lactucaphis* were not included in the manuscript furnished by the writer; the same is true of *Perilitus hopkinsi* Ashm. on page 609; *Chelonus fissus* on page 612; *Bracon dorsator* Say, which is now a *Habrobracon*, and *Bracon catochæ* on page 615; *Aphærete pegomyiæ* Brues, described from Minnesota, page 616; *Branchus* (sic) *Banchus cressonii* and *Exetastes propinquus*, page 618; *Ophion geminatus* Say, which is the same as *Paniscus geminatus*, and *Trichistus* (sic) *Triclistus pygmæus* Cress., page 621; *Mesostenus spinarius*, page 630; *Amblyteles innotabilis* Cress. page 633; *Ichneumon purpuripennis*, page 634; *Amblyteles* after *sublatus*, after *succinctus*, after *nubivagus*; *Probolus* after *rufizonatus*, page 635; *Ichneumon cinctitarsis*, page 636; *Loxotropa pegomyiæ* Brues, described from Minnesota, page 651. *Dasymutilla ferruginea* Fab.; there is no such species, the records belong to *ferrugata* under *Sphærophthalma* on the preceding page (page 664); *Anoplius maurus* Cress ♀ (*funereus* St. Farg. ♀), *A. pompilus*, page 674, *Halictus* (*Chloralictus*) *nymphalis*, page 687; *Halictus* (*Agapostemon*) *lerouxi* Lep (*parallelus* Say), which is a *Halictus* in the strict sense; *Halictus* (*Agapostemon*) *emarginata* Say; there is no such species, *Halictus* (*Agapostemon*) *pilosus* Cress., belongs to *Chloralictus* and was not described by Cresson, but by Frederick Smith, all these on page 668; *Melissodes trinodis* Rob., page 693; *Prosopis sayi* Rob , page 694; *Psithyrus elatus*, which is the male of *Bombus pennsylvanicus*, page 698. Of these species, as is evident from the foregoing, several are either wrongly cited and others should not have been included.

Page 607. (*Centistes americanus* Riley)=*Perilitus americanus* (Riley).

Page 608. For *Microtonus* read *Microctonus*.

Page 609. *Elasmosoma* should file in after *Agathis*.

Page 610. *Microgaster* and *Microplitis* should come in after *Apanteles*; *Microgaster brevicauda* Prov. should read *Microplitis* (*Diolcogaster*) *brevicauda* Prov.

Page 611. All species on this page excepting the last four belong to the subgenus *Protapanteles*; the excepted species belong to *Apanteles* in the strict sense, as does *Apanteles cacœcia*, which should read *Apanteles* (*Apanteles*) *cacœciæ* Riley.

Page 612. *Mirax* belongs between *Agathis* and *Apanteles*; *Sigalphus curculionis* is figured on page 617 as *Thersilochus conotracheli*; the last name on page 612 should be *rufipes* and not *rubripes*.

Page 613. For Wlsm. read Wesm.

Page 615. For *Cœliodis* read *Cœlodes*; after *Vipio* insert Stephanidæ.

Page 616. After *Cenocœlius rubriceps* Ratz. insert of Ashm.=*C. rubriceps* Prov., which is a synonym of *C. ashmeadi* D. T.

Page 617. The figure on this page belongs on page 612, as stated above; for *Leptopygas* read *Leptopygus*.

Page 618. For *Agathobranchus* read *Agathobanchus*, for *Branchus* read *Banchus*.

Page 619. *Amorphota* was dropped out from *L. orgyiæ* How., *Omorga* was dropped out from *L. liminitidis* How.

Page 620. For *E. nigrovarium* Prov. read *E. nigrovarium* (Brulle) Nort; for *A. pædiscæ* Ashm. read *A. prædiscæ* Ashm.

Page 624. (*Mesoleptus inseptus* Cress.)=*Hadrodactylus inceptus* Cress.

Page 625. (=*Euxorides* Cress.) was dropped out from under *Calliclisis* Foerst. In this connection it is well to call attention to the fact that Foerster abbreviated Först. should be abbreviated Foerst. throughout the order.

Page 627. Since sending in the manuscript the type locality of *Megarhyssa greenei* Vier., which has since been published in the Proc. U. S. Nat. Mus., was changed so that Boonton is not the type locality; the species *M. magnifica* Vier. is a *nomen nudum* and would have been dropped out had the writer seen proof.

Page 629. Read *Lampronota* (=*Meniscus*) *agilis* Cress., and *Lampronota* (*Harrimaniella*) *relativa* Vier.

Page 630. Read *M. delawarensis* D. T. (=*albopictus*

Cress.), *M.* (*Mesostenoideus*) *albomaculatus* Cress. and *Acroricnus* (=*Osprynchotus* Ashm. not of Spin.) *junceus* Cress.

Page 631. The species of *Pezomachus*, *Aptesis*, and *Hemiteles* are hyperparasites, and while recorded in the literature as primary parasites the inference is that there is confusion; to indicate this state of affairs the words *bred from* were employed in the sense of *reared in connection with*, but *bred from* was changed to *parasite of or on*; on the same page *Acnoplex* should occur as a subgenus of *Hemiteles*, and the same applies to *Acrolyta*.

Page 632. For (*P. fulvescens*, etc.) substitute *P.* (*Polytribax*) *pallescens* Vier., as the *flavescens* (sic) *fulvescens* of the New Jersey list is a new species which was recently described; for *P. alter* read *P. ater*.

Page 633. For *I. manis* read *I. maius*.

Page 634. The interrogation point preceding *I. nuncius* was dropped, but should be restored, as this is apparently a wrong determination.

Page 635. The determination of *I. solitus* was queried, but here again the interrogation point has been dropped out; the *vitalis* on this page is the *vitulis* (sic) of the former list; *I. nubivagus* should read *I.* (*Probolus*) *nubivagus*.

Page 637. For *Hyptis* read *Hyptia*, the subgenera of the species of *Pristaulacus* are *Oleisoprister* for *stigmaterus* and *subfirmus* and *Neaulacus* for *fasciatus*.

Page 651. New Jersey is the type locality for *Xenotoma xanthopus*.

Page 652. For *causatus* read *caudatus*; for *vernonia* read *vernoniae*; on this page *Proctotrypes quadriceps* Ashm., was omitted, although it has New Jersey for its type locality.

Page 653. *Teleas pallidipes* Ashm. was dropped out; its type locality is New Jersey; it should come in after *Caloteleia*; the genus *Teleas* was established by Latreille.

Page 654. *Ceraphron fuscipes* should read *C. fusciceps* Ashm. (=*secundus* D. T.)

Page 655. Superfamily Formicoidea should be entered between the title "The Insects of New Jersey" and the next line, otherwise it would appear that the Formicidæ is a family of the Proctotrypoidea. The heading Formicoidea was dropped out, the name occurring only under the remarks on Dr. Wheeler, page 848.

Page 667. Read *Parasicrola* Cam. for *Parasicrola* Carn.

Page 670. *Euancistrocerus* D. T. should read *Ancistrocerus* Wesm.

Page 673. The proper name for *Anoplius* LeP. is now *Psammochares* Latr., as the latter name has priority.

Page 675. *C. fraterna* should read *C. fraternus.*

Page 677. *C.* (*Sphex*) *ichneumoneum* should occur on this page in place of *C. ichneumonea.*

Page 678. *C. flavofasciata* should have H. S. Sm., as author, not simply Sm.

Page 681. *C. interruptulus* D. T. applies to an exotic species and should be replaced by *C.* (*Solenius*) *interruptus* LeP.; wherever Lep. occurs LeP. should be substituted; (*C. bisexmaculatus*)=*C. sayi* Ckll., Professor Cockerell having published a new name for the preoccupied *sexmaculatus* in February, 1910.

Page 688. (*H. æruginosus*)=*H. virescens*; Ocean City is the type locality of *H. marinus*; *H. dispar ilis* is not likely to occur; the determination was questioned in the case of *H. auratus*, *H. humeralis*, *H. cupreus*, and *H. sumptusous*, but the interrogation point was dropped out; *H. illinoisensis* should read *H. illinoensis*; Mr. Crawford vouches for the authenticity of *H. humeralis*; so this need not be questioned.

Page 689. (*bicolor* Fabr.) should read (=*bicolor* Fab. as determined by Rob.).

Page 690. For *A. hippotes* Ckll. read *A. hippotes* Rob.; for *A. daeckii* read *A. daeckei*; for *A. thaspis* read *A. thaspii*; for *A. bridewellii* read *A. bridewelli*; for *A. delawarearum* read *A. delawareorum* (this is a MSS. name); for *A. milwaukiensis* read *A. milwaukeeensis.*

Page 692. *N. festiva* belongs to the subgenus *Xanthidium*; *N. incerta* belongs to the subgenus *Centrias*; under *Triepeolus mercatus* it was suggested in the original cards that this might be the same as *Triepeolus cressoni* Rob., but no reference was made to *Nomada cressoni* Rob.

Page 693. The interrogation point is missing before *M. pennsylvanica.*

Page 697. *Coelioxys moesta* Cress. Pemberton, Sept. 1 (Harbeck) has been dropped out.

Page 698. *Psithrus* should read *Psithyrus.*

It may be of interest to the uninitiated to know that the manuscript submitted by the writer was in the form of 3 by 5 cards. This manuscript was used in making up the manuscript on sheets that were ultimately sent to the printer. The writer had been promised an opportunity to see the manuscript sheets, but this privilege was never granted. This was a most regrettable oversight, as it led to the creeping in of most of the errors above cited and corrected.

In the discussion Dr. Howard asked if the list contained only actual records, or species supposed to be found there. Mr. Viereck replied that the latter was still true to a limited extent; that the occurrence in the State of the host still results in the listing of its parasites even if they have been bred elsewhere. Dr. Hopkins said that while State lists are of some value in a way it would be much better for contiguous States to cooperate in the working up of faunal lists.

The second paper, "Notes on Indian Neuropteroid Insects," by Mr. Banks, was read by title.

NOTES ON INDIAN NEUROPTEROID INSECTS.

PLATE VI.

BY NATHAN BANKS.

Mr. H. M. Lefroy, of Pusa, India, has sent me some Neuropteroid insects from India. Among them were several new species, the descriptions of which are given here; notes on a few other species are added. A more extensive account will be furnished when other material has been worked over. It may be remarked that many of these species are in general appearance similar to those of the United States.

FAMILY SIALIDÆ.

Chauliodes simplex Walker.

A true *Chauliodes* in the restricted sense; the pronotum is a little longer than broad; the vertex has a submedian pair of long, smooth scars, and two smooth spots each side; the costal cells are broader than long; antennæ serrate. The head is black, the mandibles and part of clypeus yellowish; the wings are pale brown, banded and spotted with white; the stigma is dark brown, the costal cross-veins and many other cross-veins are margined with white; in apical part are a few narrow white bands extending part way across wing; hind wings less brown, especially the basal half mostly hyaline.

From Lebong, India, June, 5,000 feet.

FAMILY ASCALAPHIDÆ.

Ogcogaster tessellatus Westwood.

Wings hyaline, extreme base black, the stigma deep black, the mark continuing a little behind the stigma, also a dark spot on the median vein toward end, about three cells from margin; some veins near anal angle of hind wings are faintly margined with brown, and in both pairs some cross-veins in basal part of wing, the origin of radial sector and some costals are narrowly margined with pale brown.

From Vahan, Simla, September.

Family MYRMELEONIDÆ.

Palpares pardus partitus, n. var.

Near *P. pardus*, but the spots are much smaller and more broken up; the zigzag band near tip is much narrower, and in the hind wings the subapical band is broadly interrupted behind the middle. The face is brown, above the antennæ dull black; the vertex yellowish brown, a transverse row of erect curved black bristles at base of the clypeus connecting base of eyes, a whorl of black bristles on basal joint of antennæ, antennæ black except base; pronotum yellowish, with median black spot extending back on mesothorax; legs yellowish, the tarsi, spurs, and claws black, black bristles elsewhere, but the coxæ with long white hair, all the thorax clothed with dense white hair. The same size as *P. pardus*.

From Bassein Fort, Bombay, India, October.

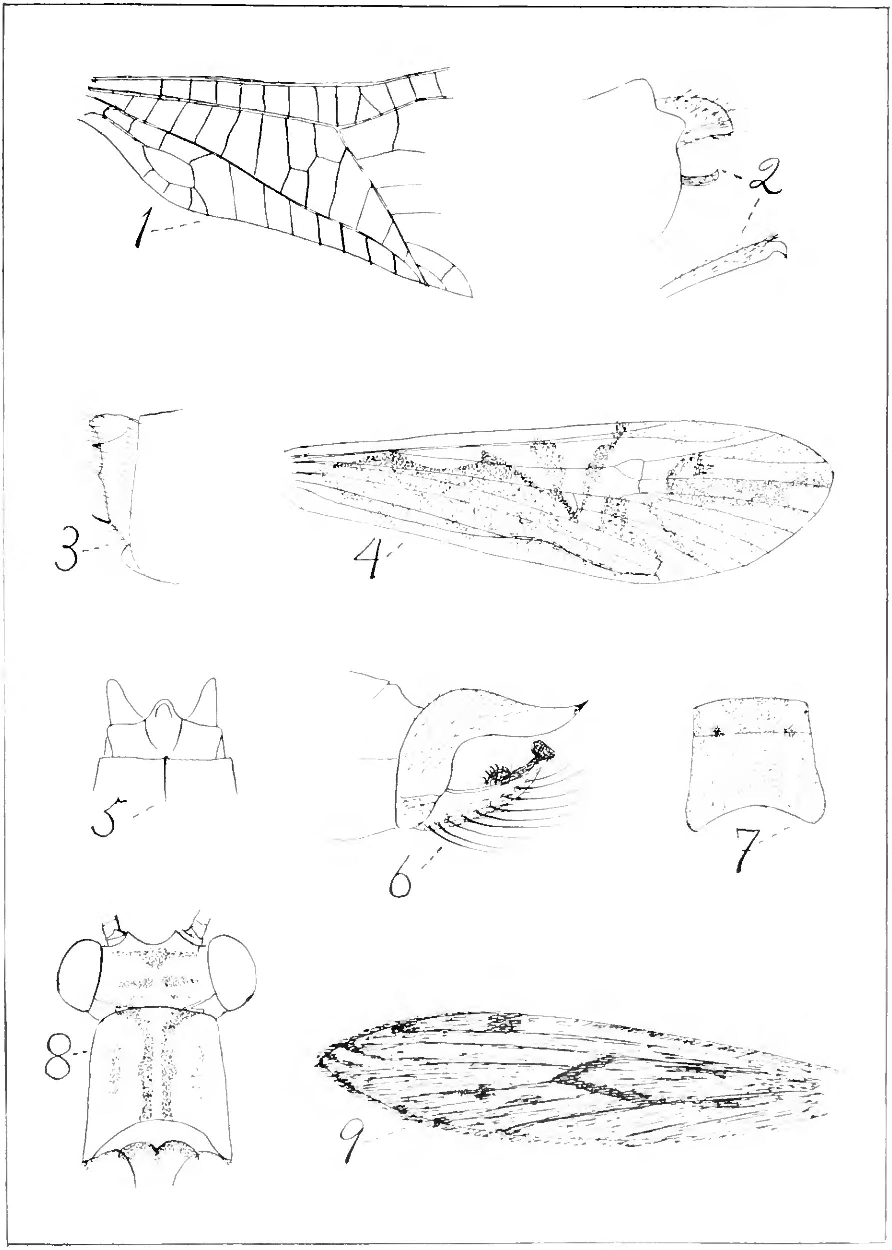
Acanthaclisis indica, new species.

Face pale yellowish, heavily clothed with white hair; vertex black, with two transverse rows of shining spots; antennæ pale brown, darker at tip; pronotum yellowish with broad black median stripe reaching back over rest of the thorax; on the anterior lobes it includes a pale spot each side, and on the mesoscutellum is divided by a narrow median line; rest of thorax gray, with faint dark stripes near base of wings; all with white hair. Sides of thorax densely long white-haired. Abdomen black, slightly paler above, white or gray hairs near base, at the tip on venter is dense black hair. Legs densely white-haired, femur yellowish, with black bristles beneath; tibiæ and tarsi brown to black, the tibiæ with short black hair beneath and some black bristles above; spurs strongly bent. Wings gray hyaline, veins pale, interruptedly dotted or spotted with black, the stigma rather dark, and near apex of wing one or two short dark streaks, but not prominent. Wings long, narrow, acute; fore-wings with costal series mostly simple; ten cross-veins before origin of radial sector, the latter with nine branches; in hind-wings seven cross-veins before origin of radial sector. Expanse 90 mm.

From Chapra, Bengal, India (Mackenzie).

Acanthaclisis horridus Walker.

Although this is quite different in appearance from the common forms of *Acanthaclisis*, it differs in few structural characters. The branches of the radial sector are bent as usual, the anal vein of hind wings runs into the cubital fork, the legs are normal, and the antennæ about one diameter apart at base. The pronotum, however, is longer than usual, and the wings are broader than in any other species known to me. The hind wings have an oblique mark beyond the stigma and one at the anal angle; the fore wings have dark marks both sides of the stigma, one near end of cubitus and median,



INDIAN NEUROPTEROID INSECTS

one on the end of cubitus, and one on hind margin toward base, also two short transverse lines near origin of the radial sector; there are nine veins before radial sector in fore wings, five in hind wings; some costals before middle are forked, and beyond are some crossed.

From Pusa, Bengal, India, September 16, at light.

Creagris parallela, new species.

Head pale, a large pale spot above antennæ and band-like marks on the vertex brown; antennæ rather pale; palpi pale; pronotum as long as broad, sides subparallel, pale yellow, with two submedian parallel dark lines and less distinct lateral marks; thorax dark, with large pale spots, none distinctly defined on the middle area; upper pleura pale, lower pleura dark; abdomen dark, pale at base; apical margin of segments pale; legs pale yellow; black dots on middle and hind femora, spurs as long as two tarsal joints, first tarsal joint not longer than the next two together; last joint as long as all others together. Wings hyaline, with yellowish venation, stigma indistinct, cubital fork connected to end of anal vein by a black cross-vein, a dark dot on median near its end, a few faint spots on cross-veins in apex of wing; both wings slender, very acute, hind wing falcate at tip; seven cross-veins before radial sector in fore wing, one in hind wing; the radial sector arises beyond fork of cubitus, but the first branch of radial sector arises much before the end of the anal vein; the anal vein runs parallel to cubitus for a distance equal to the width of the wing; nine branches to the radial sector in each wing. Expanse 65 mm.

From Pusa, Bengal, India, February 24.

Macronemurus trivittatus, new species.

Head black between eyes and up on the vertex, with four pale reddish spots on vertex, two submedian behind, and one each side near the eyes, face pale yellowish; pronotum with three black stripes, a broad median one, broadest behind, a narrow lateral one, also broadest behind, and a dot each side in the anterior part of the pale portion; thorax black, a few small pale reddish spots on middle, the scutelli pale each side; legs pale, femora with dark middle mark, anterior tibiæ dark outside, apex of tarsi black, with black and also white bristles, spurs nearly as long as two joints of tarsus, basal tarsal joint as long as next three together, fifth longer than first. Wings with black venation, subcosta and cubitus interrupted with pale, cross-veins pale in the middle, a black spot at stigma, and one near the end of the median vein, a short stripe at end of the anal vein, marginal forks with dark dots, hind wings with veins near end of median more heavily marked. Wings long and narrow; radial sector arises beyond fork of cubitus, first branch much before end of anal; six branches to radial sector in both wings. Expanse 43 mm.

From Pusa, Bengal, India, March 16.

Family HEMEROBIIDÆ.

Megalomus setulosus Walker.

Walker says his *Hemerobius setulosus* is near the European *H. hirta* (now *Megalomus*), so it cannot be a *Micromus* as considered by one author. This specimen agrees well with his description. The basal dark brown of fore-wing terminates obliquely at the inner gradate series; there are seven radial sectors, the first and last of which are soon forked; the costal area is very broad; in the hind wings are only a few brown spots near tip of the wing.

It has some resemblance to the *M. latus* of Arizona. It has recently been described by Longinos Navas as *M. nouhalieri*.

From Kasauli, India, April.

Family CHRYSOPIDÆ.

Table of Species of Chrysopa.

1. A narrow, black stripe under each eye, and stripe on basal joint of antennæ .... *orestes*
   No such marks 2
2. Practically all cross-veins black at each end .... *alcestes*
   Few cross-veins so marked 3
3. Costal margin rather suddenly swollen just before the stigma .... *madestes*
   Costal margin only gradually widened 4
4. Gradate veinlets black .... *virgestes*
   Gradate veinlets pale .... *scelestes*

Chrysopa orestes, new species.

Pale yellowish or green; tips of palpi black, a narrow black stripe under each eye to the mouth, and a dark stripe on outer side of basal joint of antennæ. Venation pale, but the gradate veinlets brown, and also the ends of some of the cross-veins. Antennæ longer than wings; pronotum broad, but little narrowed in front, with a transverse groove and ridge behind the middle. Fore wings rather short and broad, barely acute at tips, second cubital cell as long as third, latter very oblique at tip, being much longer below than above; divisory veinlet ends beyond the cross-vein; six branches of radial sector to the margin; four or five inner gradate veinlets, seven in outer series; the inner row plainly nearer to outer than to the radial sector. In hind wings the radial sector unites to median for more than a cell-length. Expanse 20 mm.

From Pusa, Bengal, India; on black orange mealy-wing, September 7.

Chrysopa alcestes, new species.

Pale yellowish or greenish, unmarked. Wings with most of the cross-veins dark or dark at ends. Fore-wings moderately broad, barely acute at tips; second cubital cell rather shorter than the third, the divisory veinlet ending at, or beyond, the cross-vein, but cutting off only a very small cell. Radial sector with six branches to margin; five inner gradate veinlets, six in the outer series, all dark; the inner row as near to the outer as to the radial sector. Hind wings acute at tips; costals, gradates, and a few cross-veins partly dark; radial sector unites to median for less than cell length; four veinlets in inner gradate series, five or six in the outer. Pronotum about as long as broad, slightly narrowed in front. Expanse 20 mm.

From Pusa, Bengal, India, October.

Chrysopa virgestes, new species.

Pale yellowish or greenish; immaculate. Wings with pale venation, but the gradate veinlets are dark. Fore wings rather slender, acute at tips; second cubital cell about as long as the third, the latter much broader at apex than at base; divisory veinlet ends beyond the cross-vein. Four inner gradate veinlets, six outer ones; the inner row is rather nearer to the outer row than to the radial sector. Hind wings slender acute; radial sector unites to median for a cell-length; two or three inner gradate veinlets, four or five outer ones. Expanse 20 to 22 mm.

From Pusa, Bengal, India, October 12, 13, November 7, at light.

Chrysopa madestes, new species.

Pale yellow or greenish, unmarked. Wings with pale venation, stigma indistinct. Fore wings moderately broad, not acute at tips; hind wings hardly acute. The costal area is moderately broad, but it broadens quite suddenly a little before the stigma and remains of a nearly equal width for some distance; second cubital cell about as long as the third; the divisory veinlet ends beyond the cross-vein; five or six inner gradate veinlets, six or seven in outer series; the inner row is nearer to the radial sector than to the outer row; the two rows are thus quite far apart. In hind wings the radial sector unites with the median for nearly a cell-length; four inner gradate veinlets, five in the outer series. Expanse 21 mm.

From Pusa, Bengal, India, on sweet potatoes, February 12.

Chrysopa scelestes, new species.

Pale yellowish or greenish; cheeks reddish. Wings with pale venation, unmarked. Fore wings slender, barely acute at tips; second cubital cell hardly as long as the third; both very slender; divisory veinlet ends before the cross-vein, or at it; five or six inner gradate veinlets, six in outer row; the inner row is a little nearer to outer row than to the radial sector. Hind wings slender, acute at tips; five or six inner gradate veinlets, and six or seven in outer row; the radial sector unites to the median for nearly a cell-length. Expanse 22 mm.

From Pusa, Bengal, India; in March and April; eating caterpillar on cabbage.

Family LEPTOCERIDÆ.

Œcetina insignis, new species.

Dark, heavily clothed with hair. Head with gray and black hair; palpi with long gray and some white hair; antennæ dark, narrowly annulate with white. Abdomen dull black; legs with some whitish and some iridescent appressed hair. Wings dark, with short golden or tawny hair, heavily marked with black spots on forkings of all veins on the tips of veins, on outer margin, a large long patch on basal part of costal margin, one beyond middle on costa, and the stigma black; on disk of wing is a zigzag streak over the basal part of the discal cell, then back on median vein, and then out on cubitus, making a very prominent marking; hind wings dusky with blackish fringe. Fore wings slender, with venation much as in *Œ. notata*, but the cross-veins behind discal cell are much dislocated, and fork 5 is longer than fork 1; in the hind wings the posterior fork is only one-third as long as anterior fork. Expanse 14 mm.

From Bassein Fort, Bombay, India, October.

Leptocella maculata, new species.

Yellowish white, with white hair, antennæ only very indistinctly annulate with brown; fore wings brownish hyaline, with a few brown spots on the forkings of the veins, the anastomosis partly brown, also the vein connecting discal cell to the radius, a hyaline whitish dot behind this cross-vein on the upper edge of the thyridial cell; the largest brown spot is on the forking of the median vein; hind wings wholly hyaline, with white fringe, the anterior veins only faintly indicated, but show a fork 1. In fore wings forks 1 and 3 are of equal length, while the second subapical cell is wider near base than at tip. Expanse 21 mm.

From Pusa, Bengal, July 30, on rice leaves.

Leptocerus indicus Walk. may belong to this genus but could not be this species, for the wings are evidently more heavily marked.

Setodes postica, new species.

Head with whitish gray hair; antennæ with black on apical part of each joint, broader on joints near middle of antennæ than elsewhere; palpi gray-haired; thorax with gray hairs; abdomen yellowish, legs pale yellowish, wings blackish on anterior part, the hind border darker than elsewhere; the posterior part of wing is pale gray and contains several black dots, one at the anal angle; beyond this the marginal fringe is very long; the anterior dark part is sometimes slightly streaked with paler, but not distinctly so; hind wings gray, tips darker and with long fringe. Expanse 11 mm.

From Bassein Fort, Bombay, September, October; and Chapra, Bengal (Mackenzie), India.

Leptocerus marginatus, new species.

Head with long white hair; palpi long, with gray and brown hair; antennæ white, annulate with dark brown, narrowly so on basal part; thorax with white hair; abdomen white above, brown on sides; legs pale yellowish; wings with short yellowish and black hair, giving a brownish appearance, much darker along the posterior margin than elsewhere, veins dark brown, apical fringe dark brown, hind wings whitish, with yellowish veins and white fringe. In fore wings fork 1 is two and a half times as long as pedicel, discal cell very long, the cross-vein behind discal cell is some distance before end of cell, but interstitial with cross-vein closing thyridial cell. In hind wings fork 1 is about as long as its pedicel, but fork 3 is absent; fork 5 large as usual. Expanse 15 mm.

From Pusa, Bengal, India, September 9, at light.

Family HYDROPSYCHIDÆ.

Polymorphanisus indicus, new species.

Whitish yellow throughout; wings whitish, with two black dots, one on middle of vein closing the discal cell, the other on lower part of vein closing the median cell, stigmal area yellowish; abdomen blackish; tips of antennal joints marked with brown. Wings are moderately slender, the cross-veins in costal area indistinct, the discal cell but little shorter than the median cell, plainly longer than broad; fork 1 reaches fully one-half way to the discal cell. In hind wings the tip is longer than in *P. nigricornis*, the apical cells being longer than the discal cell. In the female the middle tibia and three joints of the tarsi are very broad and flat. Expanse 34 mm.

From Pusa, Bengal, August 4, at light.

Dipseudopsis modestus, new species.

Yellowish; vertex often blackish; antennæ dark brown, except basal joints, wings yellowish brown, apex a trifle infuscated, stigma not distinct, veins pale yellowish. Second and third joints of palpi very heavy; head smooth; spurs of anterior tibia one-half as long as metatarsus, inner spur of hind tibia one-fourth shorter than outer, simple, slender, hairy, and with a minute claw at tip, very much as figured by Betten, but more slender. The wings are quite slender, the fork 1 is present, but very short, fork 2 reaches back to the discal cell, fork 3 is almost as far (much farther than in *D. indica*), fork 4 is back as far as discal cell, and fork 5 is back before discal cell; in hind wings the discal cell is only a little shorter than the median cell. Expanse 22 to 26 mm.

From Pusa, Bengal, September 21, at light.

Macronema indistincta, new species.

Yellowish; brown marks on the wings as in the figure, mostly pale brown and indistinct, but beyond the cell is a deep brown streak over most of third apical cell; the basal half of second apical cell is silvery, near base of wing the anterior margin of the brown is dark brown. The legs are very slender, the hind tibiæ with extremely long, fine white hair; the longer spur of hind tibia is nearly as long as the metatarsus. Expanse 24 mm.

From Pusa, Bengal, October.

EXPLANATION OF PLATE VI.

FIG. 1. Base of fore-wing of *Acanthaclisis horridus.*
2. *Dipseudopsis modesta.*
3. *Polymorphanisus indicus.*
4. *Macronema indistincta.*

FIG. 5. *Leptocerus marginatus.*
6. *Leptocella maculata.*
7. *Macronemurus trivittatus.*
8. *Creagris parallela.*
9. *Œcetina insignis.*

The third paper, "Notes on a Sawfly Injurious to Ash," by Mr. E. R. Sasscer, was illustrated by photographs, drawings, and specimens.

CHANGE OF GENUS FOR CERTAIN SPECIES OF COCHLIDIIDÆ.

In Proc. U. S. Nat. Mus., XXIX, 375–376, 1905, I placed several species of Cochlidiidæ in the genus *Sisyrosea* with doubt, as I had seen no male of any of them After waiting six years, a male of one of the species has at last been seen. It is an undoubted male of *Sisyrosea* (?) *phara* Druce, and was sent me for determination by Mr. Paul Dognin. The male has the structural characters of the genus *Euclea*. It will therefore be necessary to remove to *Euclea* the species *phara* Druce, *parva* Dyar, *flexilinea* Dyar, *assimilis* Dyar, and *columbiana* Dognin

HARRISON G. DYAR.

NOTES ON A SAWFLY INJURIOUS TO ASH.

(Hymenoptera; Tenthridinidæ.)

PLATE VII.

By E. R. Sasscer.

For several seasons the row of white ash, *Fraxinus americana*, located near the corner of Seventh and B streets N. W., Washington, D. C., has suffered more or less injury through the attacks of the larvæ of a sawfly. In the spring of 1909 they were present in great numbers, and in fact the abundance of the larvæ on some trees was such that the leaves, especially those on the upper branches, were completely devoured. The adults of this sawfly were issuing April 18 in quantities, and by the use of a collector's net they could be captured by the hundreds, fully 75 per cent of which were males. On the 19th they were even more conspicuous, but owing to a heavy precipitation on the two succeeding days no adults were observed. On the 22d they could be seen flying about the branches in limited numbers, and the issuing and oviposition continued until the first week of May.

In ovipositing the female sawfly, after careful deliberation, with head pointed downward, thrusts her ovipositor under the epidermis near the margin of the leaf, after which she usually flies to another leaf and repeats the operation. Although a number of leaves were examined, in only a few instances could more than one egg be found, and in every case it was inserted in the edge and not in the petiole or midrib, as is sometimes done by closely related species.

The egg is oval, transparent, and at first rather difficult to detect, but as the time for hatching approaches the dark color of the head becomes visible. On May 4 they were hatching in great numbers. The following is an illustration of the development of the larvæ for the brood of 1909:

May 4. First larvæ observed feeding on underside of leaves. Newly hatched larvæ are from 2 to 3 mm. in length, head 0.40 to 0.50 mm. in diameter, shiny and dark brown; body yellowish white with transverse wrinkles; thoracic legs brownish, abdominal legs whitish; thoracic segments a trifle larger than those on remainder of the body; eyes black.

May 5. First moult. Length of larvæ 3½ to 4 mm.; head 0.40 to 0.60 mm. in diameter. At this stage the larva is light greenish yellow, resembling in color somewhat the underside of the leaf; transparent, with alimentary canal plainly visible through the skin.

May 6. Second moult. Length of larva 4 to 5 mm.; head 0.75 to 0.80 mm. in diameter, color much the same as in previous stage.

May 7. Third moult. Length of larva 6 to 10 mm.; head 1 to 1.80 mm. in diameter. Body assuming a yellowish tinge with light lateral lines on either side of the dark dorsal area. At this age they look somewhat as though they had been covered with a fine white powder.

May 9. Fourth moult Length of larva 11 to 14 mm.; head 1.40 to 1.50 mm. in diameter. Dark dorsal area gradually disappearing.

May 12. Fifth moult. Length of larva 14 to 16 mm.; head 1.50 to 1.60 mm. in diameter. By this time the larvæ have assumed a bluish smoky color, darkest along the dorsal aspect, ventral lines and prolegs yellow, body distinctly transversely wrinkled, tips of thoracic legs brown, eyes black, head smoky white. After the fifth monlt the larva apparently does not feed again, but leaves the tree and enters the soil, where it constructs an earthen cocoon about one-half inch long, in which it remains unchanged until the spring of the following year.

Observations for four successive years prove this sawfly to be single brooded.

The species in question was first observed attacking ash at Manhattan, Kansas, in 1888, by Mr. C. L. Marlatt, while studying the life history of the ash sawfly *Tomostethus bardus* (Say). Mr. Marlatt recognized it to be an undescribed species and on page 195 of the First Annual Report of the Kansas Experimental Station, Division of Entomology, gives a good drawing illustrating two views of the head of the larva. Adults of this species, as well as those reared by the writer, have been examined by Mr. S. A. Rohwer, who identifies them as *Tomostethus multicinctus* (Roh.). In the original description[1] this species was described from material collected May 6 at Washington, D. C., and April 27, Falls Church, Virginia, by Mr. Nathan Banks.

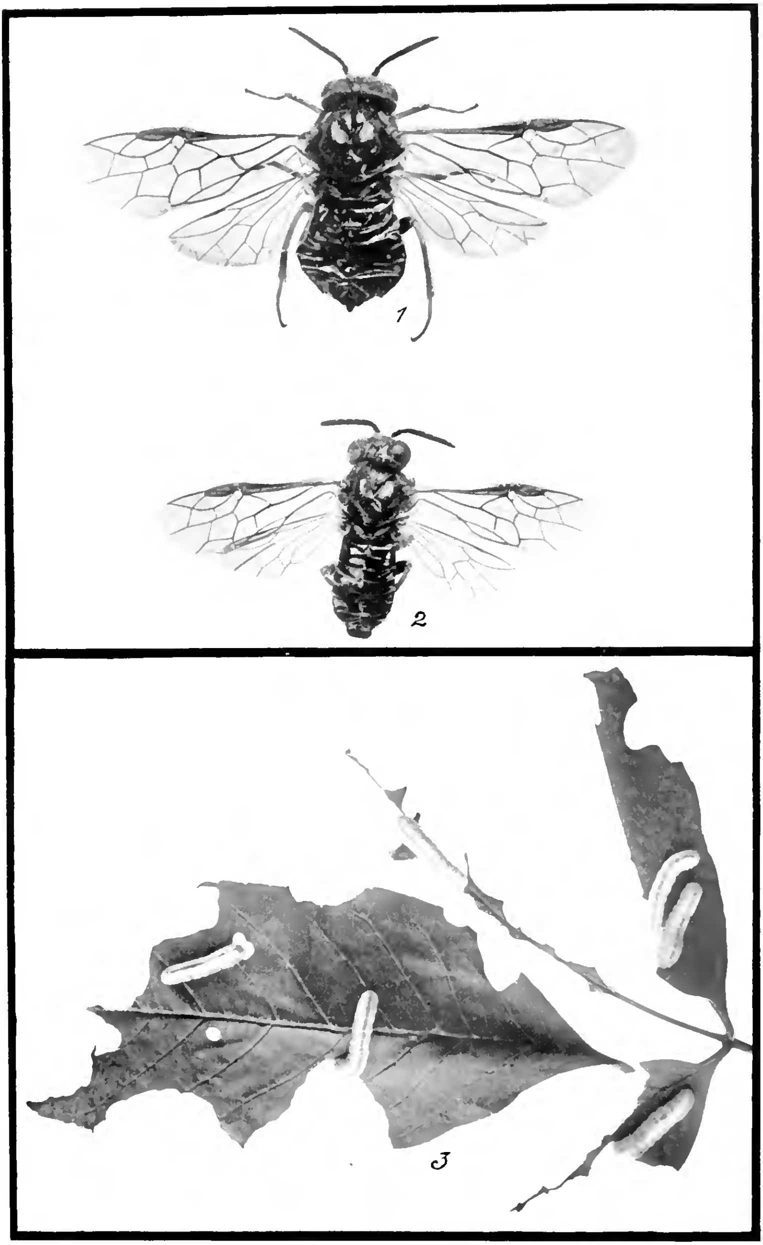
In studying the various stages of the sawfly it was soon observed that a great many of the larvæ were apparently sick and dropping from the trees. The trunks of the ash and sycamore, and in fact even stakes in close proximity to the trees from which they had fallen, were more or less whitened by the presence of sick larvæ which were attempting to get back on the foliage. So conspicuous were these larvæ that it was not uncommon to see groups of pedestrians gazing curiously at the infested trees. In order to ascertain if possible the cause of this apparent sickness, sawflies were submitted for examination to Mrs. Flora W. Patterson, who reported that the death of the larvæ had been brought about by one of the Entomophythoræ, but as the fungus was only present in the mycelial stage it was impossible to give a specific identification.

EXPLANATION OF PLATE VII.

Tomostethus multicinctus.

FIG. 1. Female.
2. Male.
FIG. 3. Larvæ feeding on leaves.

[1] Can. Ent., XLI, p. 90 (1909).



A SAW FLY INJURIOUS TO ASH.

Mr. Rohwer stated that of the four North American species of *Tomostethus* the habits of only two were known, and these feed in the larval stage on ash. In Europe the habits of three of the species are known. Two of these feed on the European ash (*Fraxinus excelsior* Linn.), and the other, *T. fuliginosus* Schrank, feeds on *Ranunculus scleratus* Linn. In Europe eight different sawflies attack the common ash. These are: *Crœsus septentrionalis* Linn., *Tomostethus melanopygus* Costa., *T. nigritus* Fabr., *Macrophya punctum-album* Linn., *Rhogogaster punctulata* Klug, *Pachyprotasis rapæ* Linn., *Tenthredo* (olim *Allantus*) *vespa* Linn. The American species of *Tomostethus* are abundantly different from the European ones. W. F. Kirby, Cameron, Dalla Torre, and Konow consider *Tomostethus bardus* (Say) to be the same as *Tenthredo cordigera* Pallisot de Beauvois. But although *bardus* agrees with the description and figure of *cordigera* it does not agree with the enlarged drawing of the antennæ. For this reason, and because Lepeletier (1823), who is the first reviser, considers *cordigera* to be a Central American species, the name *cordigera* has been restricted to those Central American specimens which answer not only the description and figure of the adult but also agree with the figure of the antennæ.

Mr. Marlatt stated that in 1886, 1897, and 1898 (and even earlier) at Manhattan, Kansas, he noticed almost complete defoliation of a dense clump of ash by a common ash sawfly, the entire grove of 15 or 20 acres being totally stripped. The eggs were laid on leaves, petioles, etc. Amongst the numerous larvæ were found some (about 2 or 3 per cent) with the head pale, the rest having the head black. These were collected, notes were made, and when the imagoes issued were found to be new. There was also a third species amongst these larvæ which was not reared, but must have belonged to a different genus, being similar to one of the spiny rose-feeding larvæ. Reared specimens were sent as a loan by Professor Popenoe, about ten years ago, from which a description was drawn up, but was never published, and he is now glad that Mr. Rohwer has given it a place.

Mr. Rohwer replied to a question by Dr. Howard, saying that the species had been found in Washington, D. C.; Falls Church, Virginia; Riley County, Kansas; and Texas, a female being in the Belfrage collection.

Mr. Marlatt thought the species as widely distributed as the host plant.

Mr. Rohwer said that most of the species of Blennocampinæ defoliated deciduous trees. That the species seemed to prefer the new young growth. That many of our native species defoliate various species of oaks, Dr. Dyar having bred many new species of *Periclista* and *Isodyctium* from larvæ on oaks.

In reply to a question by Mr. Webster about breeding sawflies, Dr. Dyar said that the only way was just to keep after them.

Mr. Cushman stated that during the course of some observations on a sawfly of the genus *Caliroa* which he conducted at Tallulah, Louisiana, during the past summer (1910), he had great difficulty in carrying the immature stages through to maturity. He therefore devised a combination feeding and pupating cage as follows: An ordinary tumbler was filled with earth, into which, at the center, was thrust a small phial, and at the side a glass tube open at both ends. The phial was for the reception of a peach twig and was filled with water to keep the food-supply fresh. The tube was for moistening the earth from the bottom instead of puddling the surface. An ordinary lantern globe, the top of which just fitted inside the tumbler, was inverted over the tumbler, and closed above with a square of cheesecloth. With this cage a large proportion of the larvæ confined were carried at least to the time of entrance into the ground and many matured under conditions as nearly natural as is possible to obtain in a breeding cage. It would probably be a successful cage for almost any ground-pupating insect.

The fourth paper on the program was by Mr. Pierce, entitled:

SOME FACTORS INFLUENCING THE DEVELOPMENT OF THE BOLL WEEVIL.

By W. Dwight Pierce.

For several years I have been endeavoring to find the law of effective temperature which governs the development of the boll weevil. Soon after beginning studies of the development of the insect, it was found that the use of 43 degrees as the zero of effective temperature was erroneous, but it has been a very difficult matter to find the correct substitute for this point. It has been more or less the fashion in entomological life-history studies to consider 43 degrees as the zero of effective temperature for all insects. The first authors that I can find who threw some doubt upon the validity of this law were Messrs, Quaintance and Brues, in their bulletin on the cotton bollworm. In this bulletin they stated that it appeared to them that between 58 and 60 degrees Fahrenheit was more nearly correct for the bollworm than 43 degrees. Later, Professor Sanderson, in a series of papers, pointed out the general fallacy of assuming that 43 degrees is the zero for all insects. He stated that it was his opinion that each insect was governed by its own climatic laws and that it would probably be found that a different zero of effective temperature held for each species of insect.

The usual method of obtaining the zero of effective temperature is by using the daily mean temperatures during the period of observations and the total length of the developmental period with a sufficient number of observations given under quite a range of temperatures. It is possible by means of frequent testings to ascertain the point above which an accumulation of daily units of temperature will give the least variation. This point is considered the zero and the total effective temperature is the product of the average daily mean temperature above the zero multiplied by the average number of days. In this manner it has been found that 56 degrees more nearly approximates the zero of effective temperature for the boll weevil than 43 degrees. The studies showed, however, that there was considerable variation in total effective temperature which must be due to some other cause, and it was also apparent that it would be necessary to ascertain a different zero of effective temperature for each locality unless it was possible that some other factor held a controlling influence in the development. In this manner the question rested for some time, as it appeared impossible to ascertain the variable elements.

A very recent study of the data on the development of the weevil brought out the fact that instead of there being only one factor in the development, there were several factors.

Observations of the egg stage at different localities in different months, but with a mean temperature within 1 degree of 80 degrees, gave a considerable variation in the length of the stage. At Alexandria, Louisiana, the incubation period was 1.9 days; at Tallulah, Louisiana, 2.6 days; at Victoria, Texas, 3.73 days; and at Dallas, Texas, 4.1 days; these differences corresponding quite regularly to the differences in the amount of humidity of the various places. The same differences have been found in the studies of the larval and pupal stages, so that it is quite apparent that the relative humidity at a given temperature is a controlling factor. It is impossible to state any particular formula for this control by humidity, but it may be said with truth that the length of the developmental period increases as the mean humidity decreases.

It is of course well known that the developmental period is greatly influenced by temperature. At Victoria, Texas, it was found that the egg period varied from 3.73 days at 81 degrees temperature to 13.9 days at 62 degrees. In like manner the larval stage at Victoria varied from 7.5 days at 78.7 degrees to 25 days at 62.5 degrees, and the pupal stage varied from 3.5 days at 82.65 degrees to 14 days at 61.55 degrees. These same variations in accord with the variations in the temperature have been found for all of the other places examined, but it is also impossible to give a definite formula for this variation, because it is impossible to carry on observations with temperature as the only variant. To give a formula, it would be necessary to include both humidity and temperature.

It was not thought that any other factor was likely to have a controlling influence in the development of the weevil, but Mr. Cushman, in his studies at Tallulah, Louisiana, in 1910, in which he had his squares under more or less even climatic conditions, found that 475 males averaged in development 13.88 days, while 393 females averaged 13.49 days. This variation is of course very small, but interesting, and might lead to considerable speculation.

In considering the development of the boll weevil it is always necessary to divide those stages which have developed from fallen squares from those which have developed in squares hanging on the plant. This has been necessary because the percentage of mortality is always different and also because the factors which cause the mortality are different.

It now appears that the average developmental period at Alexandria, Louisiana, in 1908, in August, was 15.3 days in fallen squares and 15.1 days in hanging squares. It is probable that in drier localities there would be still a greater difference in the average development.

It has always been necessary in our studies to separate our studies of weevils in the squares from those of weevils in bolls because the development in bolls is always much longer than in squares, in some cases being almost twice the average in squares. This may be considered as a combination of the factors of lower temperature, greater humidity and tougher food.

One of the most interesting factors which has been observed in the study is that of the period preceding the falling of the squares to the ground. It is of course apparent that when a cotton square hangs on the plant a little longer than other squares it becomes drier, as it has not the benefit of the shade and moisture of the ground. The effect of the period before falling upon the development is much stronger than would be expected. A few examples may be cited to illustrate this point. At Victoria, Texas, in 1904, in the first 15 days of July, the average developmental period was 12 days for squares falling in one day, 14 days for squares falling in 3 days, 14.1 days for squares falling in 5 days, 15.5 days for squares falling in 7 days, 18.3 days for squares falling in 9 days, 18.8 days for squares falling in 11 days, 20 days for squares falling in 13 days, 22 days for squares falling in 15 days, and 23 days for squares falling in 16 days. In August, 1906, at Dallas, Texas, it was found that the period ranged from 17.9 days for squares falling in 7 days to 36 days for squares falling in 22 days, with almost a perfect curve of increase. The figures for this series of observations, when considered by seasons, show also the effect of the mean temperature. Squares which fell in 7 days developed weevils in the latter part of June in 16.3 days, in the first of July in 16 days, the last part of July in 16.9 days and the middle of August in 17.9 days, and this variation is what might be expected from the differences in the temperature. Just as striking is the series of observations for squares falling in 11 days at Victoria in 1904. In June these squares averaged 17 days, the first half of July 18.8 days, the last half of July 20.6 days, the first half of August 21.5 days, and the last of September 25.5 days.

It may be seen from this brief discussion that it is impossible to frame any definite law of effective temperature without also including a law of effective humidity and giving due consideration to the quality of the food supply and the amount of moisture contained therein. Furthermore, it is obviously necessary, in order to get a perfect formula, to consider the sex of the developing weevils. The question has been put to a mathematician who has given considerable study to bionometrics and he stated that the only way that a formula could be derived for this condition and the only way that a curve could be plotted would be by the use of the three dimensions.

This paper has been introduced in order to warn other entomologists against coming to hasty conclusions about laws of development, and to urge those who have the time and inclination to make thorough studies of the various factors influencing the development of the insects which they can study.

During the very full discussion of this paper Mr. Pierce added that the minimum fatal temperature of the boll weevil seems to be 12° F. and the maximum fatal temperature 123° F.

In reply to Dr. Howard's question as to whether the weevil was not now able to stand colder temperatures than formerly Mr. Pierce stated he could not say definitely, but thought that certain apparent discrepancies in statements about minimum temperatures would be accounted for by the law of alternating temperature. It is well known that sudden alternation of otherwise harmless temperatures is frequently fatal.

Mr. Pierce stated that the minimum isotherm of 14° almost corresponded with the line of winter control of the boll weevil.

In reply to Dr. Howard's inquiry as to the extent of the use of 43° as the zero of effective temperature, Mr. Pierce stated that it first came into the literature of botany in France, but was adopted by Merriam in his study of life zones. Later on this zero was accepted without research for the codling moth, boll weevil, bollworm, cattle tick, and many minor insects. It is very important to understand the law of effective temperature. In the case of the cattle tick the recommendations were based on 43° where the zero should be nearer 50°, and this is a very important point.

Dr. Hopkins spoke of the difference in seasons, and said he had abandoned temperature records and now relied on the conditions of certain plants to indicate real time for action; that the temperature law governing insects also governs the plants, a striking example being *Chermes*, which is immune to treatment except during the short period when the new growth of the host tree is starting, dates being of no value.

Mr. Quaintance said that such laws may govern native insects, but that in the case of introduced insects and such as the codling moth, *Conotrachelus*, etc., temperature conditions sometimes affect the insects that do not seem to affect the host.

Dr. Hopkins replied that cultivated plants are not reliable as guides in any locality, but that native forest trees (white oak, tulip, etc.) should be considered.

In reply to Dr. Hopkins's remarks about phenology Mr. Pierce stated that in the case of the boll weevil the development of the host plant had absolutely nothing to do with the emergence of the adults from hibernation. They emerge during a period of three or four months and in accordance with the accumulation of effective temperature in their hibernation shelter.

Mr. Cushman remarked that in connection with the climatic effect on the boll weevil he had made a series of interesting observations at Tallulah, Louisiana. In 1909 the winter was warm and open, the weevils were out early and numerous, the weather hot and moist, stimulating rapid development of the cotton plants. A change then came to very hot, dry weather, which controlled the weevil so that a cotton crop was made. The following year the reverse conditions prevailed, but with the same effect. The winter was cold, resulting in a small survival, and was followed by a long, cold spring, so that many weevils that had hibernated successfully died. In May warm weather set in, the cotton grew rapidly, and the weevils multiplied rapidly, so that by the end of the season they had done practically the same amount of damage as in the preceding season. Thus we have opposite conditions giving the same results.

Dr. Howard stated that the results of Mr. Pierce's work were very significant. It is clear from the study of certain insect forms that Merriam's summation of mean daily temperatures during the active season will not hold perfectly as the controlling influence in distribution. Extremes of temperature must be considered, especially extremes of cold. He illustrated this in the case of the yellow fever mosquito. In a paper on the distribution of the yellow fever mosquito he had decided that this species would be found throughout the Tropical and Lower Austral life zones and the zone in the southern hemisphere corresponding to the Lower Austral Life Zone in the northern hemisphere, and he prophesied that in lower austral regions where this mosquito is not found it could undoubtedly establish itself when once introduced, provided the necessary water supply were present. Messrs. Dyar and Knab, however, had recently shown him that there exist regions in the Lower Austral Zone where the yellow fever mosquito has undoubtedly been frequently introduced and where it has not established itself, as, for example, in Southern California. Here, in the opinion of Dyar and Knab, the low temperature during night time has prevented the establishment of the species, and in this conclusion the speaker agreed. Winter cold also undoubtedly limits the northern distribution of many forms which hibernate as adults, as, for example, *Schistocerca americana*.

In reply to a question by Mr. Quaintance about determining the mean temperature, Mr. Pierce stated that he had made numerous computations of the mean of the curve on the thermograph sheet by the use of a polar planimeter and found that this mean corresponded to the fraction of a degree with that obtained by averaging the daily maximums and minimums.

Dr. Hopkins said he found the records of the Weather Bureau of no value in determining the laws in his subjects; the local conditions are too variable, and he would recommend experiments to determine the laws governing plants.

Mr. Pierce replied that all insect development records should be coordinated with thermohygrograph records taken on the spot. He stated that the botanists have worked out the zeros of effective temperature for different plants, and for different functions of the same plant.

Mr. Rohwer said that in Boulder, Colorado, the temperature varied two or three degrees between the different stations there. The U. S. Weather Bureau has one station there and the records from it did not agree with those made at a station on the campus of the university, nor did those of the university agree with those at a station on the mesa, which is about 50 feet above the campus. This shows the difficulty the Weather Bureau would have if they endeavored to give all the data necessary in a given locality.

Mr. Johnson spoke of the difficulty he had experienced in trying to correlate the emergence of the grape root-worm with plant conditions. There is great variation, a striking one having occurred in the spring of 1908, which was unusually cold but eventually warmed up in June. The cold May retarded pupation for about a month. Some individuals of the codling moth or plum curculio may hibernate in warmer places than others, and will naturally mature more rapidly.

Professor Webster said Mr. Reeves has found differences of emergence on the north and south slopes of hills.

Mr. Ely asked what attention has been paid to soil temperatures.

Mr. Pierce replied that very little had been done in this respect, but that it would be necessary in insect-development studies to obtain accurate records of the temperature at various depths in relation to soil moisture, texture, etc.; that the soil temperature in Texas often ran 40° higher than the air, according to its color and consistency.

Dr. Hopkins said this was of enormous importance; that he had studied the relation of exposures and other factors governing forest insects, but that other influences must be considered for insects living part of their time underground.

Mr. Pierce closed the discussion by stating that the purpose of his paper was to show that records and laws of development should consider air temperature and humidity; soil temperature, humidity, and texture; food moisture and texture; sex; phenology; and probably many other factors.

—The last paper of the program, "A Note on the Occurrence of *Chrysomyza demandata* Fabr.," by C. N. Ainslie, was read by the Secretary.

A NOTE ON THE OCCURRENCE OF CHRYSOMYZA DEMANDATA FABRICIUS.

By C. N. Ainslie.

About the middle of the month of June, 1909, during a week spent at Sacaton, Arizona, the agency village of the Pima tribe of Indians, I had occasion to investigate, among other things, a field of corn that was owned and cultivated by one of these Indians. The corn raised by this tribe is a peculiar dwarf variety that probably came from old Mexico many years, possibly centuries, ago. The particular field that I visited lay not far from the dry bed of the Gila River, and was badly overgrown with wild sunflowers and other weeds. It was also infested to a remarkable extent by *Heliothis obsoleta*, being by far the worst field, in this respect, that ever came under my observation. Every ear and nubbin appeared to be tenanted by from one to four or five of these repulsive larvæ, while the tassels, stalks, and even the suckers were, or had been, the home of multitudes more.

While examining some of these suckers that were in a decayed condition owing to the galleries having been filled with the abundant excrement voided by the *Heliothis* larvæ, I found a number of dipterous larvæ and pupæ inhabiting this damp and disagreeable situation. A few of these were collected and reared, the adults that emerged being subsequently determined by Mr. D. W. Coquillet as *Chrysomyza demandata* Fabr.

Mr. M. French Gilman, at that time in temporary charge of the experiment work on the agency farm and since then promoted to the post of assistant superintendent of the Pima Agency, a keen observer to whom I was indebted for many courtesies during my visit, told me he was sure he had seen the same dipterous larvæ in the stems of dead date palms on the farm. Repairing to the nursery where numerous small date palms a foot or more in height were growing, we had no difficulty in finding many full-grown dipterous larvæ in the heart of the dead stems and between the decaying leaves. A few of the palm plants were alive with the larvæ, dozens of them wriggling out when the stems were split. These larvæ were so nearly mature that when placed in a vial for rearing they promptly pupated. Confinement was too much for most of them, but enough of them survived to make it reasonably certain that this was the same species I had found in the decaying cornstalks. The palm nursery had been recently irrigated and the pith in the dead plants was saturated with water. The corn suckers inhabited by the Diptera were also very wet from the abundant juice of the wounded tissue.

Chrysomyza demandata is a European species and there appears to be but a single reference to it in American literature. This one item occurs in Entomological News, vol. XI, p. 609, where a report of the entomological section of the Philadelphia Academy of Sciences contains the following paragraph:

Mr. C. W. Johnson exhibited some flies he had found on the decayed berries of a vine at the grounds of the Biological School of the University of Pennsylvania. He also found one on decayed grapes at Riverton, N. J. Mr. Coquillet determined it to be *Chrysomyza demandata*, Fabr., a European species. Mr. Johnson did not know of any previous record for American specimens.

Mr. Quaintance remarked on the large scope of the Bureau of Entomology. Here was a paper based on an insect found in a corn plot of an American Indian!

Mr. Webster said the Pima Indians are remarkable, having raised corn and wheat from immemorial times, and that their gardens show a peculiar insect fauna. The fly was described from Sweden, but was here found in arid New Mexico.

Mr. Walton told of collecting the fly rarely near Harrisburg, Pennsylvania.

Mr. Knab remarked that judging from the habits, the species might enjoy a very extended range; it has been bred in Europe from manure, and also from the contents of a silo.

—Under the heading Short Notes and Exhibition of Specimens, Mr. Cushman described a peculiar spot of humid Texan fauna in the midst of typical arid country. In June of 1908 he spent some time collecting insects along the Rio Grande and in the Chisos Mountains in the extreme southern part of Brewster County, Texas. In a small area along the river, and which was subirrigated from the river, the vegetation was of much the same character as in the more humid portion of the State along the Gulf coast and the insects collected were not on the whole very different. But away from the river on the high mesas and in the mountains the vegetation was almost entirely xerophytic and the insect fauna, although abundant, was entirely different from that of the subirrigated area.

—The Secretary read a letter from Mr. Schwarz describing insect collecting in Panama.

—Mr. Smyth spoke of the superstitions amongst Arizonans about the "Campomoche" killing stock.

—Mr. Rohwer told of a recent paper by the Swedish entomologist, Mr. Tullgren, in which he showed that two European species of sawflies live inside the young fruit of plum and apple. These belong to the genus *Hoplocampa*, and it is probable that some day it will be found that some of the American species of *Hoplocampa* live inside of fruit.

Mr. Quaintance said that not long ago Mr. Rohwer determined a species of *Hoplocampa* from California which lives inside of cherries.

Mr. Rohwer stated that no economic data was sent with the specimens to him.

The following papers were accepted for publication:

THE OCCURRENCE OF THE MYMARID GENUS STETHYNIUM ENOCK IN WEST AUSTRALIA.

By A. A. Girault.

The genus *Stethynium* was recently described by Enock (Trans. Ent. Soc. Lond., Dec. 31, 1909, pp. 452-453, pl. xii, figs. 1-5) from an English species. It is a rather peculiar group characterized by bearing a well-defined, 3-jointed antennal club and peculiarly shaped fore wings which have the marginal cilia characteristically arranged. Elsewhere I record an American species of this genus, and just recently Dr. L. O. Howard has sent me a distinct form of it from West Australia, which I describe beyond. It might be well worth recording in this connection that the abnormally broad posterior wings which characterize this species are also borne by an *Anagrus* from the same locality. It remains to be seen what significance this fact has, but it may be that the forms with broad posterior wings are peculiar to the Australian region alone; an *Alaptus* from that region, however, has the usual slender caudal wings, and this is true of forms in other genera described from the Australian region.

I describe the West Australian species of *Stethynium* herewith and then give a diagnostic table of the few known species of the genus. Perhaps *Stethynium*, in regard to distribution, is typical of mymarid genera; thus, it is worldwide in its distribution, common to several continents, but its species appear to be restricted to the limits, at the most, of the continents to which they are indigenous; that is to say, the species indigenous to a continent are distinct from the native species of other continents.

Stethynium peregrinum, new species.

A species at once distinguished from the type species of the genus (*triclavatum* Enock) and the American species (*faunum* Girault) by bearing decidedly broader posterior wings which are very broad for a mymarid, nearly as broad as the fore wings of some Anagri (e. g., *Anagrus armatus* Ashmead). Comparing it with *faunum* (actual specimens), it is twice more robust (easily visible to the eye, for instance, *faunum* being minute thus) and distinctly different in color, being reddish brown (about Indian red), while *faunum* is yellow (gamboge); the antenna differs in bearing shorter funicle joints, the second funicle joint, for instance, not slender and relatively long, thrice longer than wide, but only about a third longer than wide and no longer than the third joint; also the antennal club is decidedly longer in *peregrinum*. The fore wings in this species are much broader than in *faunum* and differ in shape, in that the apex is not an obtuse point but regularly rounded; moreover the marginal cilia are decidedly shorter in *peregrinum*.

NORMAL POSITION.

Female.—Length 0.73 mm. Large for the genus.

General color uniformly reddish brown, the antennæ, venation, and legs dusky brown, the distal tarsal joints dusky. Eyes dark red. Fore wings irregularly, rather lightly, fumated proximad under the venation, especially at the dilatation or caudal lobe along the posterior margin, and both wings with a slight dusky appearance throughout. Pronotum and vertex occasionally fuscous.

Fore wings about as in the type species in regard to width, broad yet not especially large, densely and finely ciliate in the disk, the blade ovate in shape; bearing about from 30 to 34 lines of discal cilia across the widest portion; marginal cilia comparatively short, the longest only about a fifth the greatest wing width, short at the apex. Blade of the posterior wing broad (nearly as in *Gonatocerus dolichocerus* Ashmead, but broader), but not any broader across the apex of the venation, broadest somewhat beyond its middle, with a single line of discal cilia along the cephalic margin and a paired line along the caudal margin; within, the blade bears about three lines of discal cilia which are somewhat irregular; all discal ciliation fainter proximad. Marginal cilia of the caudal margin of the posterior wing long, distinctly longer than the longest cilia of the fore wing, about twice longer than the greatest width of the blade of the posterior wing, or not quite that long. In the fore wing there is a small naked area just out from the end of the marginal vein; this area is longer than wide.

Tarsi four-jointed, all the joints short, subequal, the proximal joint in the cephalic tarsi somewhat longer; tibial spurs single, acute, onger than the proximal tarsal joints, the cephalic spur forked, larger, curved, forming a strigil. Parapsidal furrows complete; mesophragma present. Abdomen small, ovate, smaller than thorax, the ovipositor not exserted.

Antennæ eleven-jointed, normal, but the funicle joints shorter than usual, all subquadrate, none twice longer than broad. Scape moderate; pedicel usual, rather large, distinctly larger than any of the funicle joints; funicle joint 1 smallest, barely longer than wide, 2 and 3 rectangular, each a third longer than wide, subequal; joint 4 somewhat shorter and broader, subquadrate; 5 like 4 but slightly larger; 6 as long as either 2 or 3 but somewhat broader; club with the two divisions curved but not as much so as in the other species; the distal or third club joint is conic and nearly as long as the combined length of the two proximal joints. Pubescence inconspicuous.

(From 4 specimens, ⅜-inch objective, 1-inch optic, Bausch and Lomb.)

Male.—Length, 0.70 mm. The same as the female. Abdomen still smaller. Marginal cilia of the fore wings longer, subequal in length to the longest marginal cilia of the posterior wing.

Antennæ 13-jointed, filiform, the joints of the flagellum longitudinally striate; club 2-jointed, the joints not different from those of the flagellum. Pedicel small, barely longer than wide, smaller than the first funicle joint; joints of funicle short, joint 1 shortest, somewhat rounded, but only a fourth shorter than the next joint; joints 2 to 9 subequal, not quite twice longer than wide; proximal club joint subequal to preceding joint, the last joint slightly shorter, narrower, bluntly conical. Pubescence inconspicuous, nearly if not quite absent.

(From 2 specimens, the same magnification.)

Described from two male and four female specimens sent for identification by Dr. L. O. Howard and bearing the label "919. Perth, W. Austr. G. Compere." Mounted in balsam.

Habitat: West Australia (Perth).

Types: No. 13824, United States National Museum, Washington, D. C., 2 males, 4 females, each sex on a single slide (2 slides).

The following table separates the few described species of *Stethynium:*

DIAGNOSTIC TABLE OF THE DESCRIBED SPECIES OF STETHYNIUM ENOCK.

1. Posterior wings slender, normal, their longest marginal cilia (caudad) no longer than the longest marginal cilia of the fore wing. Joints of antennal funicle longer, the second joint at least twice longer than wide. Abdomen short, but conic-ovate, the ovipositor slightly exserted. Fore wings obtusely pointed at apex.

a. Light testaceous; second funicle joint of antenna only about twice longer than wide, only slightly longer than the proximal joint; marginal cilia of fore wing along the cephalic margin moderately short, at the apex very short. A large species, the fore wings broad. *triclavatum* Enock

b. Gamboge to luteus; second funicle joint of antennæ thrice longer than wide, comparatively slender, distinctly longer than the proximal funicle joint; marginal cilia of fore wing along the cephalic margin moderate in length, not very short at extreme wing apex. Species small, the fore wings only moderate in width. *faunum* Girault

2. Posterior wings abnormally broadened, their longest marginal cilia (caudad) distinctly longer than the same cilia of the fore wing. None of the funicle joints of the antenna twice longer than wide. Abdomen ovate, short, the ovipositor not at all exserted. Fore wing regularly rounded at apex.

a. Indian red; fore wings broad; second funicle joint of antenna only a third longer than wide; distal club joint forming nearly half of the club........... *peregrinum* Girault

TWO GENERA OF ICHNEUMONOIDEA.

BY H. L. VIERECK.

Cardiochiles Nees.

Type: Ichneumon saltator F.

This is not the same as the *Cardiochiles* described by Szepligeti in the Genera Insectorum, unless we assume that the number of joints given is a typographical error for m. p. 6, l. p. 4 jointed.

Stantonia Ashmead.

Type: Stantonia flava Ashmead.

This is not *Microtypus* Ratzeburg as stated by Szepligeti. The latter genus, as shown in the original description, has a middle areola on the metathorax and the first discoidal cell hardly larger than the first cubital cell.

A NEW PELECINUS-LIKE GENUS AND SPECIES OF PLATYGASTERIDÆ.

PLATE VIII.

BY J. C. CRAWFORD AND J. C. BRADLEY.

DOLICHOTRYPES, new genus.

Antennæ inserted just above mouth parts, ten-segmented, with an apparent ring-joint; the scape long; the funicle three-segmented, the first segment being longest and the last shortest; the club four-segmented; lateral ocelli nearer to the compound eyes than to the front ocellus; parapsidal furrows complete or obsolete anteriorly; scutellum bifoveolate at base, produced at apex into a short, blunt spine; metapleuræ with a long slender spine on each side, more or less obscured by the vestiture; wings veinless; hind wings contracted at base; middle and posterior trochanters elongate, their femora spindle-shaped, the tibiæ strongly pedunculate; abdomen broadly sessile, that of the female with five segments, margined at the sides, the last three being greatly elongate and flattened, seven times as long as the first two together, the entire abdomen eight times as long as the thorax; abdomen of the male short, acute, five-segmented, the first segment as long as the rest taken together.

Type, the following new species.

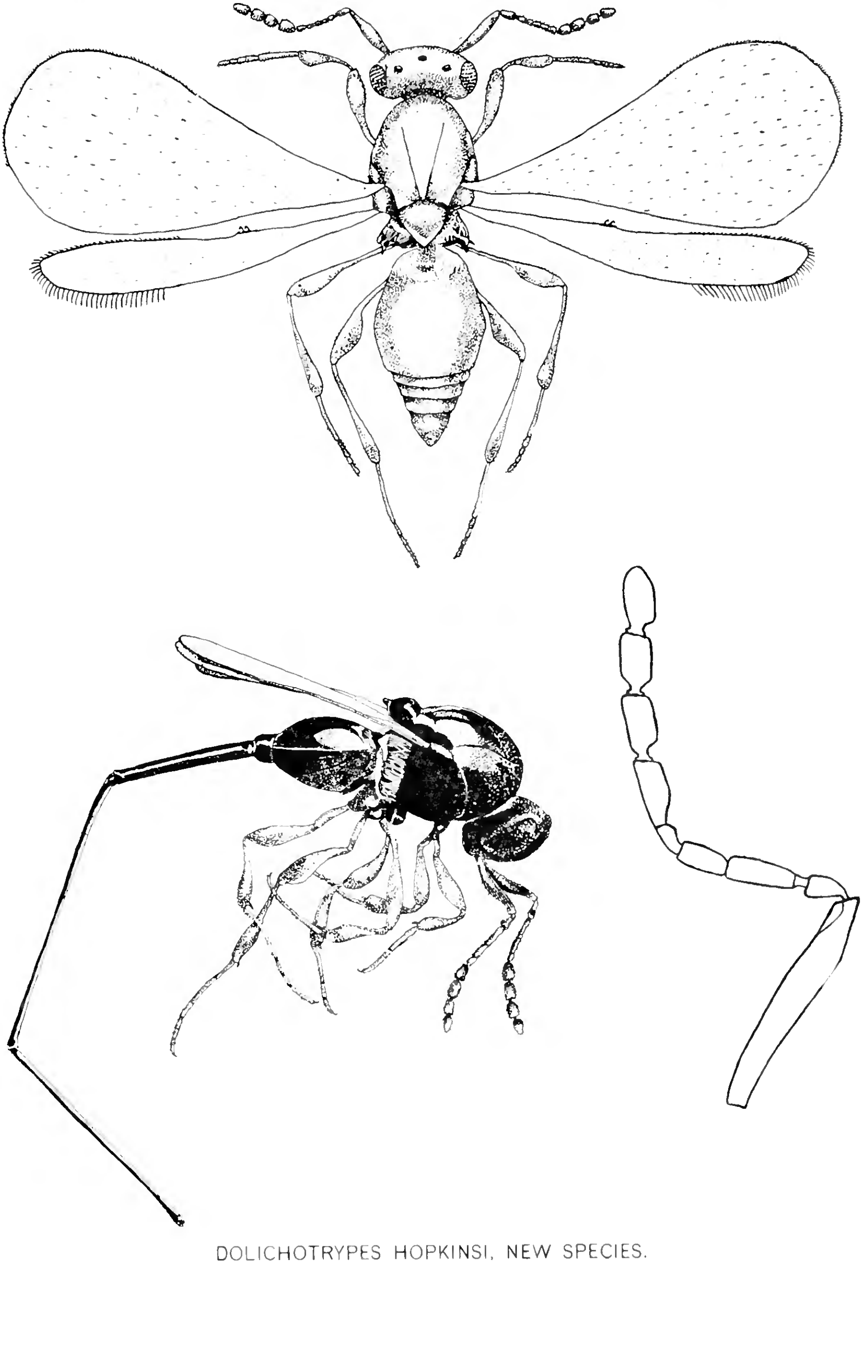
This genus belongs to the Platygasterinæ, and in Dr. Ashmead's table to the genera of that subfamily in the Journal of the New York Entomological Society, vol. XI, p. 96, the female will run to the second alternate of category 6 but differs at once from *Polymecus* Foerster as there defined by the fact that the club of the antennæ possesses but four segments and that the lateral ocelli are nearer to the compound eyes than to the front ocellus. The males of *Dolichotrypes* run in the key to *Sactogaster* Foerster.

The genus is evidently closely related to *Polymecus*, of which species are known with a four-segmented antennal club. *Polymecus compressiventris* is the species which approaches *Dolichotrypes* most closely. The males of *Polymecus* differ in having a six-segmented antennal club, the first segment of the funicle short, the second segment elongate and twisted. Both sexes differ in the proportions of the abdominal segments.

Dolichotrypes hopkinsi, new species.

Black, except base of scape and legs including coxæ, are brownish yellow and the rest of the antennæ are dark brown. Mostly smooth and highly polished.

Female.—Head finely reticulate; scape long and slender; thorax and abdomen smooth and polished; apex of median segment and base of



DOLICHOTRYPES HOPKINSI, NEW SPECIES.

the abdomen with long white pubescence concealing the surface and almost hiding the long lateral spines on the median segment; wings whitish hyaline, iridescent; posterior tarsi much longer than their tibiæ.

Measurements as follows: Total length 4.5 mm.; of the thorax alone 0.49 mm.; of the abdomen alone 3.99 mm.; of the first segment of the abdomen 0.41 mm.; of the second 0.1 mm.; of the third 0.73 mm.; of the fourth 1.43 mm.; of the fifth 1.32 mm.

Male.—Scape a little shorter and less slender than in the female, and first segment of the funicle a little shorter; parapsidal grooves a little less distinct than in the female; abdomen not extending as far as the apex of the hind wings, very acute, margined, five-segmented, the first segment equaling the remainder taken together, smooth and polished, the remainder minutely sculptured and opaque. Except in these respects and in the measurements given below the male agrees with the female.

Measurements as follows: Total length 1.09 mm.; of the abdomen 0.49 mm.

This species is described from females collected by Dr. A. D. Hopkins at Tibb's Run, near Dellslow, West Virginia (Hopkins West Va. No. 7070), and from males and females collected by Prof. J. H. Comstock at Ithaca, New York. The latter bear a number referring to the following note:

Cornell University No. 683. *Dolichotrypes hopkinsi* Ashmead (MSS.). Found in large numbers on a newly cut oak stump near Fall Creek. Females were busily inserting the long part of the abdomen into the intercellular spaces of the wood near the bark. They were confined to the outer 2 inches of the wood. July 21st, 1897. Professor J. H. Comstock collector. Named by Mr. W. H. Ashmead, who had previously received it from Morgantown, West Va., supposed to have been ovipositing in dipterous larvæ in a stump.

Professor C. R. Crosby informs us that he has taken additional specimens at Ithaca during the past summer (1910).

Type: Female, U. S. Nat. Mus. Cat. No. 13829; male, in the collection of Cornell University.

Paratypes of each sex in each and in other institutions.

The authors wish to express their indebtedness to Miss Carol H. Bradley for the figures of the adults.

DESCRIPTION OF PLATE VIII.

Above, adult male.
Below, adult female.
Antenna of female, made with a camera lucida.

A NEW SPECIES OF THE GENUS CHEILONEURUS.

[Hymenoptera; Encyrtidæ.]

BY J. C. CRAWFORD.

Cheiloneurus cushmani, new species.

Female.—Length about 1.75 mm. Varying shades of green, blue, and purplish, the face and rear of head largely reddish testaceous; pronotum, axillæ, and scutellum orange, suffused anteriorly with brown; scape whitish, rest of antennæ dark brown, first joint of funicle shorter than pedicel; all joints of funicle slightly longer than wide, antennal depression deep, sharply marked semi-circular, reaching about half way up scape, above this the face with fine shallow thimble-like punctures, at sides of antennal fossa becoming more like reticulations; ocelli in an equilateral triangle, the lateral ones about their own width from eyes; cheeks finely reticulated with raised lines; mesoscutum very finely longitudinally lineolate, with a silky lustre, and with many silver-white hairs; scutellum with thimble-like punctures; apical tuft black; wings, except the hyaline bases, strongly infuscated, the infuscation decreasing gradually toward tips of wings; front and hind legs basally translucent whitish, front legs beyond middle of femora light brownish; middle legs brownish, their tarsi whitish; hind femora and tibiæ brown, the tarsi whitish; abdomen reticulated with fine rugulose.

Male.—Length 1.5 mm. Similar to the female; the antennal depression not well marked, the sculpture coarser, especially in mesoscutum, where anteriorly it is finely longitudinally rugulose and posteriorly reticulate with fine rugulæ; entire insect varying shades of metallic with more greenish than in female; hairs of mesoscutum weaker and less numerous and therefore not so apparent; wings only slightly infuscated, with a deeply infuscated spot at marginal vein; scape whitish, rest of antennæ light brown; front and middle legs whitish, the apical part somewhat brownish; hind femora and tibiæ strongly brownish.

Habitat: Vienna, Virginia.

Type: No. 14097, U. S. National Museum.

Six female and five male specimens from a series reared May 24, 1911, from *Kermes* sp. by Mr. R. A. Cushman, Bureau of Entomology, U. S. Department of Agriculture, and recorded under Quaintance note No. 7038.

Related to *C. cupreicollis* Ashm., which has the ocelli in an equilateral triangle, but which has the joints of the funicle elongate, the first much longer than the pedicel and the mesoscutum is shiny and punctured.

Actual date of issue, June 19, 1911.

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THE CORNMAN PRINTING CO.,
Carlisle, Pa.

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON.

Volume XIII, No. 3.

JULY-SEPTEMBER, 1911.

(MEETINGS OF APRIL 6, 1911, TO JUNE 3, 1911)

PUBLISHED BY THE SOCIETY,

QUARTERLY

CARLISLE, PA. WASHINGTON, D. C.

1911.

Entered as second-class matter July 26, 1909,
at the post office at Carlisle, Pennsylvania, under the Act
of July 16, 1894.

THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON.

ORGANIZED MARCH 12, 1884.

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

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PROCEEDINGS OF THE

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Published quarterly by the Society at No. 1 N. Pitt street, Carlisle, Pa., and Washington, D. C. Terms for subscription: Domestic, $2.00 per annum; foreign, $2.25 per annum; single numbers, 50 cents, foreign postage extra. Remittances should be made payable to the Entomological Society of Washington.

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON.

VOL. XIII JULY - SEPTEMBER, 1911 No. 3

MEETING OF APRIL 6, 1911.

The 249th meeting was entertained by Prof. A. L. Quaintance on the evening of April 6, 1911, in the lecture room of the Cosmos Club. Twenty members, Messrs. Barber, Caudell, Crawford, Dyar, Ely, Gahan, Heidemann, Hooker, Howard, Knab, MacAtee, Myers, W. J. Phillips, Quaintance, Rohwer, Sasscer, Stanford, Walton, Webster, and Zimmer, and two guests, Messrs. O. G. Babcock and H. Watts, were present.

The minutes of the previous meeting were read and corrected.

The name of Mr. E. N. Cory, of the Maryland Agricultural College, was proposed by Mr. Gahan for active membership, and according to the rules was laid over for the next meeting.

The first paper of the evening by Mr. C. W. Hooker was entitled "Notes on Insects Injurious to Cranberries," and was illustrated by lantern slides. It was discussed by Messrs. Howard, Quaintance, and Caudell.

The second paper, "Notes on the Plum Curculio," by Professor Quaintance, was also illustrated.

On account of the lateness of the hour the third paper was postponed to the next meeting. Neither of the papers that was read was presented for publication.

SOME REMARKS ON THE EGGS OF NORTH AMERICAN SPECIES OF HEMIPTERA-HETEROPTERA.

PLATES IX—XII.

BY OTTO HEIDEMANN.

Eggs of Hemiptera-Heteroptera are exceedingly diverse in form. They vary from an oval, globular, or cylindrical shape to all sorts of modifications. Some eggs glisten in golden lustre or have other dainty coloring; many are ornamented with delicate, curious patterns, with short spines and long hair-like appendages. This strange appearance of the eggs makes their study very fascinating. Naturalists of former time have already called attention to these beautiful creations of nature, but it is to the credit of the investigators of our day that we have a more profound knowledge, in a morphological and biological sense, of the meaning and the various functions of some organs and appendages attached to these eggs.

Leuckart in his famous essay on the eggs of insects, published in Mueller's Archiv für Anatomie und Physiologie, 1855, considers certain peculiarly shaped organs about the upper pole of hemipterous eggs as a micropyle apparatus; he believed these had an opening through which the spermatozoa enter in order to fertilize the egg. He terms these organs seminal cups (Samenbecher). They are either microscopical in size or large enough to be seen even by the naked eye. Leuckart discovered five different types, which could be divided into two groups. In one group of eggs these organs stand free and erect on the outer surface around the rim towards the upper egg-pole; in the other group of eggs they are attached to the inner side of a band-like extension of the rim. (Fig. 1, *a* and *b*.)

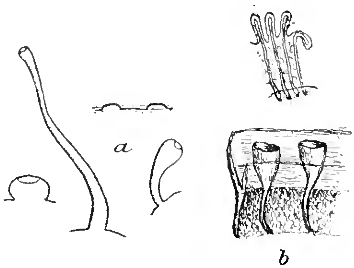


FIG. 1.

Julius Gross published an interesting paper on the ovaries of Hemiptera[1] wherein he disputes Leuckart's theory that these appendages are the transmitters of the sperm. He holds that they are a pneumatic device for ventilating the interior of the egg, keeping it in healthy condition. He calls these organs, being a part of the chorion, chorial processes

[1] Zeitschrift für wissenschaftliche Zoologie, p. 139, 1901.

(Chorion-Anhaenge). The well known biologist Heymons[1] expresses the same view in one of his papers. Some scientists still adhere to the older theory. It seems, therefore, that further research in this interesting matter may be necessary in order to state positively the real function of these peculiarly formed organs on the eggs of Hemiptera.

The egg-shell or chorion is formed, according to Dr. Korschelt,[2] by cuticular secretion of the epithelial cells in the oviduct. It consists usually of two layers, which differ in thickness and texture. The smaller eggs have the texture of the outer surface of the chorion more or less smooth or minutely granulated, while in the larger eggs it is very uneven, covered with polygonal cells, often spinous and tubercular, probably to give more consistency to the egg-shell. In the mature stage of the egg the head of the embryo is always directed towards the apical part or upper egg-pole, where in some groups of eggs a round or oval shaped lid or cap is noticeable; in other groups, mostly in those of a cylindrical form, this is absent. Globular eggs are affixed to their support often by a circular or bell-shaped plate; the round and oval forms in some of the groups are laid loose on the ground or in water, and the cylindrical eggs are usually deposited in the tissue of plants and in cracks.

According to Leuckart the shape of the processes before mentioned is characteristic for the eggs of certain groups and in doubtful cases may be of great value for the systematist.

Prof. O. M. Reuter[3] in a recent publication expressed repeatedly his opinion of the necessity also of studying the eggs as an aid to classification.

In recent years American writers, in working up the life history of hemipterous species, have greatly contributed to our knowledge of the eggs by publishing detailed accounts. There are, undoubtedly, several distinct types amongst these eggs whereby can be demonstrated the relationship of the species and genera to the families. For instance, all eggs of species belonging to the family Pentatomidæ are uniform, only slightly modified, generally barrel-shaped, or resembling very much the form of a tiny tin-can, as in *Pentatoma ligata*,[4] *Murgantia histrionica*,[5] and *Stiretrus anchorago*. All these eggs have a round apical

[1] Zeitschrift für wissenschaftliche Insectenbiologie, Band ii, 1906.

[2] Zur Bildung der Eihüllen der Micropylen und Chorionanhänge bei den Insecten. Nova Acta d. K. Leop. Carol. Acad., Bd. ii, 1887.

[3] O. M. Reuter, Phylogenie und Systematik der Miriden. Acta Societatis Scientiarum fennicae. Tom. XXXVII, No. 3, 1910.

[4] A. W. Morrill, U. S. Dept. of Agr., Bureau of Entomology, Bul. 64, Part I, pp. 4-8, 1907.

[5] C. V. Riley, 4 Ann. Report Ins. of Missouri, 1872, p. 37.

cap. Their color is usually whitish, sometimes a yellowish tint prevails. The harlequin cabbage-bug shows its fancy garment even on its eggs, which are decidedly ornamented in black and white; and in species of the genus *Podisus*[1] the eggs glitter in a metallic bronze color. A very interesting feature in the study of these eggs is the chorial processes, which always are present, and in this family they are placed in an upright position near the upper pole, where they are arranged around the circular cap.

On eggs of species of *Brochymena* these processes are microscopic in size; they stand singly, somewhat remote from each other, in number of about 30 to 40; the outer surface of the shell is strongly punctured in irregular rows (Pl. IX, fig. 3.)

In eggs of *Euschistus* the surface of the chorion is delicately punctuate; the processes are larger, abruptly thickened at the upper end, with a small opening; they number at least 60 or more (Pl. IX, fig. 4).

Eggs of *Thyanta custator* have the outer surface covered with minute, whitish, short bristles and the processes are less densely placed (Pl. IX, fig. 1).

The most characteristic shape of the chorial processes is exhibited on the eggs of the *Podisus* group and allied forms; they can even be observed by the naked eye and are about 1 mm. in length They are a little swollen at the base, then suddenly bent backward from the chorion, and taper gradually to the end; the tip is funnel-shaped.

Eggs of *Cosmopepla carnifex* are similarly formed, with the exception that the color is not of a deep bronze as in *Podisus* and the outer surface of the chorion less thorny in appearance (Pl. IX, fig. 2).

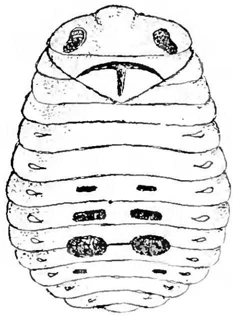
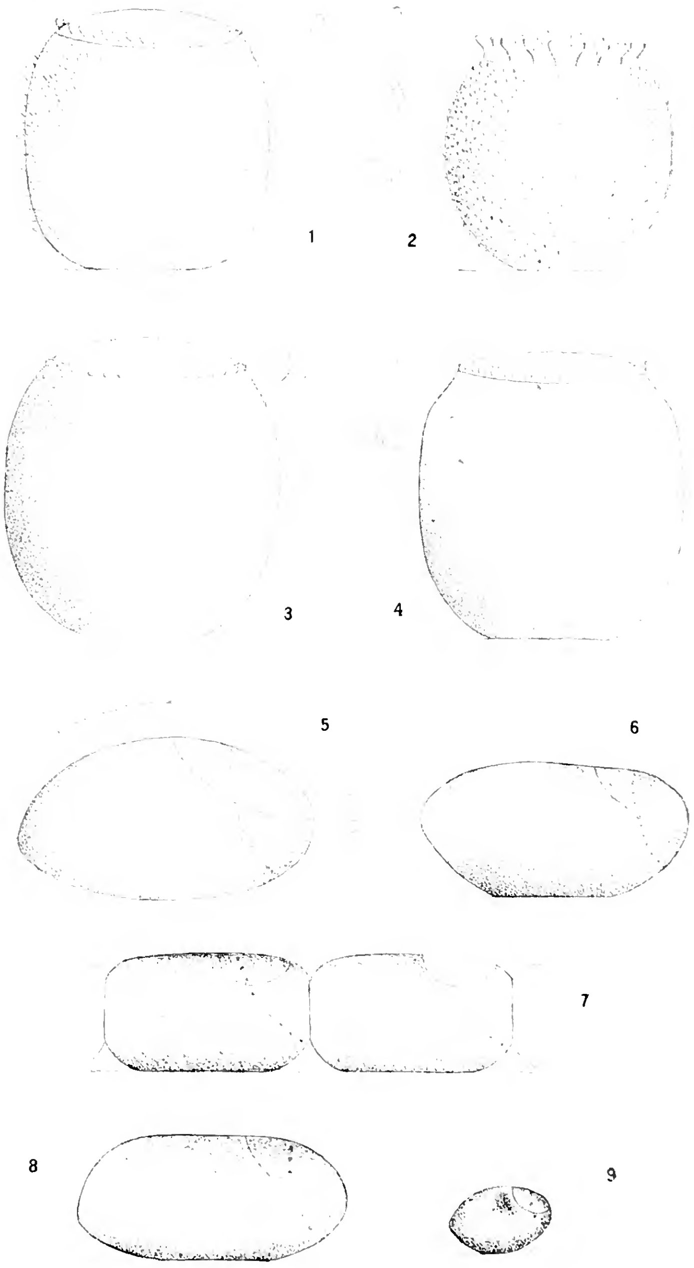


FIG. 2.

A striking feature in the hatched eggs of species of the family Pentatomidæ is the uniform presence of a little T-shaped instrument within the orifice. This has been left behind by the young larva; it seems to be attached dorsally at the pronotum to a delicate membrane which envelopes the young larva before its emergence from the egg (fig. 2). It is composed of a more or less convexly formed, transverse bar with a strong median spur, made of thickened layers of chitin and usually dark brown; the two points of the bar are connected with the

[1] C. V. Riley, 4 Ann. Report Ins. of Missouri, p. 20. A. H. Kirkland, Report of the Gypsy Moth Committee, Mass., 1896, p. 52.



EGGS OF HEMIPTERA-HETEROPTERA

end of the median spur by a rather stiff, glassy, chitinous skin. It seems to vary a little in shape and color in different species. In *Brochymena* species it is entirely dark brown, in other species whitish. This strange instrument is evidently an egg-burster. After it has performed its function it glides over the head of the emerging larva and is usually retained in the empty shell with parts of the shed larval skin (fig. 3).

Kirby and Spence, in their Introduction to Entomology, vol. III, 1826, were the first observers to notice this strange form of an egg-burster, which they named a crossbow. Dr. Richard Heymons[1] published a most accurate study of this egg-burster and its function in the eggs of species of the family Pentatomidæ. Very recently Dr. A. W. Morrill[2] has also given a full account of his observation on this interesting subject.

It may be of some value to record that the occurrence of this peculiar form of an egg-burster is not limited to the eggs of species belonging to the family Pentatomidæ. The writer has found the same instrument, with slight variation of shape, in the eggs of species of the Coreidæ, which indicates the near relationship of these two families.

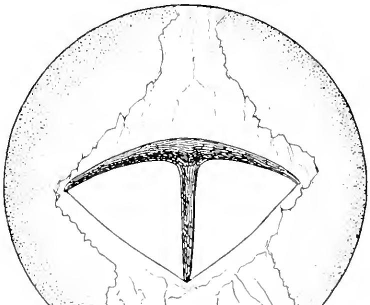


FIG. 3.

The eggs of the Coreidæ are another type of strange form. The species in this family deposit their eggs quite differently from those of the former. They are not laid in an upright position, as in the Pentatomidæ, but fastened lengthwise to the surface of the leaves. They are similar in form, mostly elliptical. Some resemble in outline a miniature oyster-shell, as in the genus *Anasa* and its allies. The cap is always present at one end of the upper side, somewhat oval shaped, and the rim that indicates the future opening of the egg is often quite indistinct in some species. The color of these eggs varies from a deep brown to a light reddish-brown or bronze; others are shining, brilliantly golden in hue, as in

[1] Zeitschrift für wissenschaftliche Insectenbiologie, Band ii, 1906, pp. 75-88.

[2] Plant-bugs Injurious to Cotton Bolls, U. S. Dept. Agr., Bureau of Entom., Bull. No. 86, 1910, pp. 38-39.

species of *Metapodius*[1] and in *Euthoctha galeator*.[2] It is interesting to note in this family the peculiar arrangement of the chorial processes, which encircle the egg so that they pass nearly midway over the cap as a row of small, extremely low knobs with a dark center.

In eggs of *Metapodius femoratus* these knobs are whitish and in the center reddish-brown; there are at least 40 such processes (Pl. IX, fig. 5). Those of *Euthoctha galeator* number about 22. The common squash-bug, *Anasa tristis*,[3] has 15 to 18. Eggs of *Spartocerus diffusus* (Pl. IX, fig. 6) and *Metapodius femoratus* are much alike; the former differs in having the chorial processes farther apart and, of course, less numerous. The surface of the eggs of the Coreidæ is usually finely reticulated. A somewhat aberrant form of a coreid egg appears in species of the genus *Leptoglossus*.[4] This probably is caused by the mode of laying the eggs in a string in firm contact with each other at the ends, whereby the sides of the egg become flattened. In *Leptoglossus magnoliæ*[5] the eggs have a metallic, copper-like lustre, and the surface of the chorion is finely shagreened. The chorial processes number from 16 to 18 (Pl. IX, fig. 7).

The eggs of *Archimerus calcarator* are laid in a row, but not joined at their ends; they are broader than high, nearly 3 mm. long and 1.5 mm. in width. The color is dark brown. The chorion very finely reticulated, with about 14 chorial processes, which are also dark brown (Pl. IX, fig. 8). These eggs seem to be an intermediate form towards the eggs of *Leptoglossus* species.

Very small eggs of a coreid are those in species of the genus *Corizus*. In *Corizus sidæ* these eggs are not quite 1 mm. in length. The general form is the same as in all eggs of this family, except that, seen from above, they have a somewhat triangular indentation just behind the cap. The color is dark brown, nearly black, with a few reddish marks, and the surface of the chorion irregular, strongly punctured; chorial processes are only a few (Pl. IX, fig. 9). The egg-burster in this family differs from that of the Pentatomidæ merely in having a more prominent dark tubercle at the middle of the crossbar.

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[1] H. G. Hubbard, Insects affecting Orange, 1885, p. 162.
[2] l. c. p. 163.
[3] F. H. Chittenden, U. S. Dept. Agr., Bu. Ento., new series, Bull. 19, 1899, p. 22.
[4] H. G. Hubbard, Insects affecting Orange, 1885, p. 168.
[5] O. Heidemann, Proc. Ent. Soc. Wash., vol. XII, pp. 191-197 (1910).

At the present time the eggs of only a few species, belonging to the family Lygæidæ are known. Their eggs are essentially distinct from those of the former families in lacking a defined cap, and in having a few, more or less upright, chorial processes around the upper pole. The two layers of the chorion are very thin, and the outer surface is hexagonal. The eggs are yellowish-white, becoming reddish as the embryo develops. The first account of a lygæid egg, that of our common chinch bug, *Blissus leucopterus*, was published by Riley in the American Entomologist, 1868.[1] The accompanying drawing shows plainly four chorial processes on the upper end of the egg. Another author described and figured the egg of the species *Pamera vincta*.[2] The figure is not clear enough, but the short, concise description leaves no doubt that the egg of this species is a typical lygæid egg and reads as follows:

Egg—Length 0.88 mm., width 0.43 mm.; elliptical in shape; no marking; on the apical end are five short processes, each process ending distally in a thick hook, the hook projecting outward.

Not long ago the writer secured eggs of the lygæid species *Belonochilus numenius*.[3] The eggs are laid on the fruit of sycamore trees, in the crevices among the ovaries, where they hibernate. Length of egg nearly 1.5 mm.; very elongated; the lower end somewhat pointed; no apical cap; chorial processes 5 to 6, encircling the upper pole of egg, and shaped like stout, round hooks bending towards the center. Surface of chorion ornamented with hexagonal cells longer than broad (Pl. X, fig. 1).

Oncopeltus fasciatus has oval-elongate eggs, a little shorter in size than those of the preceding species. The chorial process is very short and thin at base and the round, downward-bent portion quite big; there are 12 processes surrounding the upper end of the egg. The outer chorion smooth, yellowish-red (Pl. X, fig. 2).

The eggs of no more than two species belonging to the family Pyrrhocoridæ are described as yet. They are similar in shape to the foregoing family, except that the chorial processes are low and not narrowed toward the base. The egg of the cotton stainer, *Dysdercus suturellus*, is still a desideratum. In an exhaustive article on the life history of this species, by Riley and Howard,[4] it is stated that neither the

[1] C. V. Riley, The American Entomologist, vol. I, 1868, p. 173.

[2] A. L. Quaintance, Strawberry Insects, Florida Agr. Exp. Sta., Bull. No. 42, 1897.

[3] O. Heidemann, Proc. Ent. Soc. Wash., vol. v., No. 1, p. 11, 1902.

[4] Riley and Howard, Insect life, vol. IV, p. 346, 1892.

egg figured in Glover's manuscript notes nor Comstock's description of an egg, both referred to *Dysdercus suturellus*, are really the eggs of the cotton stainer, but belong to another family, probably Coreidæ. The only reliable source is a short note by Hubbard[1] in his report on the orange insects, 1885. Later, Morrill[2] gives an account on the same subject, but no special description of the egg.

Another pyrrhocorid egg is the species *Largus succinctus*.[3] Egg, 1.5 mm. in length; width 0.8 mm.; ovoid; chorion amber-colored, smooth, very delicate hexagonal; chorial processes small, white, cup-shaped tubercles with an opening on top. There are nine choral processes encircling the upper egg-pole (Pl. X, fig. 3).

The eggs of the family Aradidæ appear to be more nearly related to the two preceding families than to any of the others. They have quite the same shape, and are also without a defined cap. Eggs may be found during the time of hibernation under loose bark of trees or in rotten stumps.

Lugger has given a very short note on the eggs of *Aradus robustus*.[4] The writer has found the common species *Neuroctenus simplex* under bark of a pine-tree stump, literally covering the same. Among them were some clusters of eggs. Egg about 1 mm. long; 0.5 mm. width; laid in a heap, numbering from 20 to 60 or more. Chorion whitish, irregular, coarse, hexagonal; no apical cap; the chorial processes seem to be wanting. (Pl. X, fig. 4.)

The eggs of the Reduviidæ and related families show a very typical form, distinct from all the others. They form a group of eggs in which the chorial processes are placed inside the extended rim of the egg-shell and attached to its wall along their entire length (fig. 1, *b*). The eggs are mostly ovate-elongate and possess an apical cap; the color varies from clear white to a dark shaded brown; the eggs are usually laid in clusters, cemented together with a sticky secretion.

Conorhinus sanguisuga.[5]—Egg 1 mm. long; ovate; chorion somewhat flattened near lower end; the inner side of the

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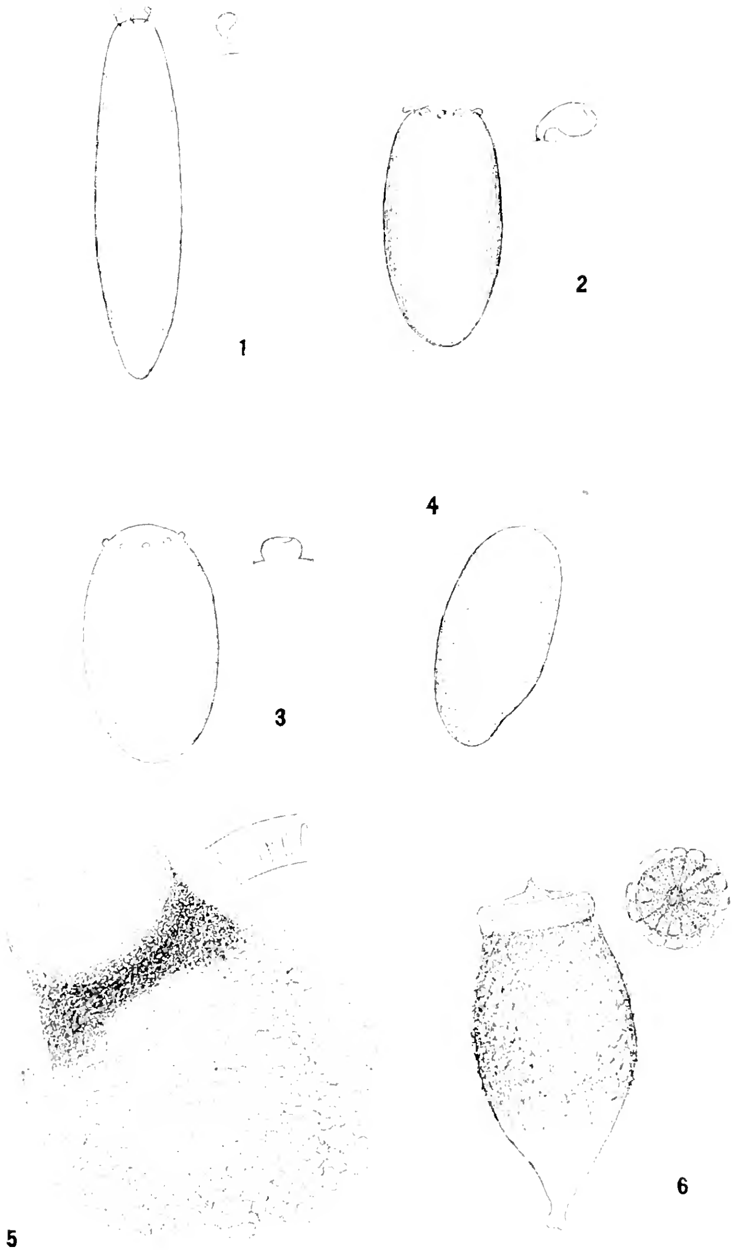
[1] H. G. Hubbard, Orange Insects, U. S. Dept. of Agr., Div. Ento., 1885, pp. 165-168.

[2] A. W. Morrill, Plant-bugs Injurious to Cotton Bolls, U. S. Dept. of Agr., Bu. Ento., Bull. No. 86, 1910.

[3] L. c., p. 94.

[4] O. Lugger, State Exp. Sta. of Minnesota, Sixth Ann. Rep., 1900, p. 43.

[5] C. L. Marlatt, Dept. Agr., Bur. Ent., Bull. 4, new series, p. 41, 1896.



EGGS OF HEMIPTERA-HETEROPTERA

extension of the rim shows the chorial processes plainly; outer surface very fine granulate, pearly white. (Pl. XII, fig. 5).

The egg of *Zelus luridus* is originally described and figured by Kirkland[1] in his notes on the life history and habits of certain predaceous Heteroptera. The sticky secretion the insect uses for protecting its eggs covers sometimes also the cap, leaving only in the center a small opening; chorial processes close together, club-shaped. (Pl. XI, fig. 3.)

Sinea diadema.—Egg 1 mm. in length; ovate-elongate; color light brown; outer surface fine granulated; the extension of the chorion at the outside rim consists of numerous yellowish, short and longer scales, turning down over the egg like a beautiful Dutch collar; cap considerably raised, narrowing and rounding at top, resembling somewhat the cap of an oak tingitid. (Pl. XII, fig. 4.)

Apiomerus crassipes.—Egg 1.8 mm., oval-elongate; color dark brown; the extension of the chorion at upper egg-pole composed of longitudinal fine scales connecting with each other, yellowish around the rim and white at the edge; the cap rather low, crowned with white scales, of which those on the inside circumference are brown. (Pl. XI, fig. 2.)

Eggs of *Arilus cristatus* have been described and figured by Glover in his manuscript notes, page 61, 1876 (Hemiptera-Heteroptera). The eggs are oval-elongate; dark brown; chorial processes inside of the extended rim, club-shaped. (Pl. XI, fig. 1.)

A most interesting article has been published by J. H. Fabre,[2] in his Souvenirs Entomologiques, on the egg of the cosmopolitan species *Reduvius personatus*. He observed a young larva in the act of emerging from its egg. The following is a translation.

". . . The opening of the cover widens and through the crack I perceive something shining. It is an iridescent skin, globe-like, that pushes the cover. Now emerges out of the shell a spherical vesicle, which, by degrees, enlarges itself like a soap-bubble, blown at the end of a straw. More and more, pushed by the enlargement of the bladder, the cover is displaced. Then the bomb explodes, that is to say that, swollen beyond the limits of its resistance, the bubble ruptures at its summit. This envelope-membrane of extreme tenuity remains, generally adhering to the brim of the orifice, where it makes a high and white margin. At other times the explosion detaches it and

[1] A. H. Kirkland, Rep. Gypsy Moth Committee, 1896, Appendix pp. 60.

[2] J. H. Fabre, Etudes sur l'Instinct et les moeurs des Insects, Souvenirs Entomologiques, 18 serie, p. 99, 1903.

throws it out of the shell. Now the way is free; the little one can come out either by breaking the skin set in the opening or by throwing it over, or else by finding the way out when the bursted bubble has detached itself from the egg. It is simply marvelous! To come out of its coffer the pentatomid has invented the mitre and the push of of the hydraulic ram. The reduviid has constructed the explosive engine.

This performance, going on in the egg at the time of hatching, acts as another style of an egg-burster and is accomplished evidently by the air pressure within. For further information on this subject one ought to read Frederick Knab's instructive paper on "The rôle of air in the ecdysis of insects," published in volume XI of the Proceedings of our Society.

Eggs of the family Phymatidæ (= Macrocephalidæ) are evidently related to those of the Reduviidæ. They have the same peculiar chorial processes, which are attached to the inner side of the egg-rim, instead of standing free upon the outside. (See fig. 1, *b*.)

Phymata erosa, subsp. *fasciata*.[5]—Egg, oval and stout; length 1.6 mm., covered with a sticky secretion nearly up to the neck; apical cap present, very thin and flat; outer surface of the chorion coarsely granulated, color black; chorial processes form numerous small channels on the chorion inside the extension of the rim. (Pl. X, fig. 5.)

Since studying the different types of egg forms, the writer has come to the conclusion that the family Tingitidæ ought really to be placed in the Reduviidæ group, after the Phymatidæ. The tingitid eggs have very much in common with the eggs of the Reduviidæ; they possess channel-formed chorial processes inside the extended rim of the egg-shell, and have also an apical cap.

The original description and figure of a tingitid egg of the species *Corythuca arcuata*, was published by Comstock.[1] Later Morrill[2] in his exact paper "On the immature stages of some tingitids of the genus *Corythuca*," pointed out the marked difference in the manner of depositing the eggs existing between the oak tingitid, that of the hawthorn, and that on the buttonwood.

In the Tingitidæ the depositing of the eggs occurs always on the underside of the leaves. In some species they are par-

[5] G. C. Champion, Biol. Centr. Amer., vol. II, p. 50 (1901.)

[1] J. H. Comstock, Rep. Comm. Agri. 1879, 1880, p. 221.

[2] C. A. Morrill, Psyche, 1903, p. 127.

tially inserted into the tissue and covered with a sticky, brown substance, as in the species *Corythuca arcuata cratægi* Morrill and in the Christmas berry tingitid,[1] *C. incurvata*. The oak tingitids lay their eggs free and erect, in smaller or larger groups, fastened to the surface of the leaves. The sycamore tingitid, *C. ciliata*, hides them beneath the pubescence on the leaf. Eggs of the rhododendron species *Leptobyrsa explanata*[2] are inserted entirely into the epidermis of the leaf, protected there while hibernating. Eggs of the species *C. marmorata*[3] are described as being thrust under the epidermis along the larger veins of the leaf, leaving only the small, yellowish, conical cap in sight.

Leptostyla clitoriæ, new species.

Egg about 0.5 mm. in length; laid singly, upright, on the underside of leaf; ovate, narrowing toward the lower egg pole; the chorion thick and hard, covered with numerous coarse granules; color black, except the lower end of the egg, which is whitish; chorial processes channel-formed, arranged vertically around the extension of the rim on inner side, continuing inside on the conical cap to its center. These processes may be noticed even on the outside bulging as corresponding narrow ripples, which are usually covered with a white substance. (Pl. X, fig. 6.)

Of the large family Capsidæ (= Miridæ) eggs of only three species are well known. The family is an ally of the Reduviidæ group, according to Leuckart, having the chorial processes channel-formed on the inner side of the extended rim. Slingerland, in his excellent essay on the life history of the four-lined leaf-bug *Pœcilocapsus lineatus*,[4] gives a detailed account of the eggs. They are laid in slits cut into the stems of the plants, closely packed together, usually in number of 6 to 8 eggs. The egg-scars, with the white tips of the eggs projecting from them, are quite easily seen. He describes the egg as follows:

Egg, 1.65 mm. in length, smooth, cylindrical, slightly curved or flask-shaped. and of a light yellow color with the upper third capped by a white, finely striated portion; the lower end is rounded and the upper irregularly flattened.

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[1] C. Pemberton, Journal of Economic Entomology, 1911.
[2] O. Heidemann, Proc. Ent. Soc. Wash., vol. x, p. 105, 1908.
[3] E. P. Felt, New York State Museum, Bull. 76, p. 125, 1903.
[4] M. V. Slingerland, Bull. 58, Cornell University Agr. Exp. Sta., 1893.

Lately eggs of the species *Lygidea mendax* and *Heterocordylus malinus* have been described by G. R. Crosby,[1] found on the leaves of the apple. The egg is rather strongly curved, slightly compressed, and dull whitish in color.

The representative of the family Cimicidæ is the worldwide-known *Cimex lectularius.* Leuckart in his account of the bedbug has proved, by the existence of chorial processes arranged on the inner side of rim, that the Cimicidæ belong to the group of the Reduviidæ. They are laid in concealed places in heaps of 6 to 50 eggs, color clearly white; terminated by a cap; chorion somewhat coarsely hexagonal; channel-shaped chorial processes.

In recent years several American authors[2] have given the life history of species of this family and have also described and figured the eggs.

Acanthia (=*Hæmatosiphon*) *indora.*—The egg was first described and figured by Dugès. Later described by Osborn[3] in his publication on "Insects affecting domestic animals." The eggs of this species are also mentioned by C. H. Tyler Townsend[4] in his "Note on the coruco, a hemipterous insect."

Cimex (=*Œciacus*) *hirundinus.*—Eggs are figured originally by Lugger in his Sixth Annual Report, Division of Entomology, Minnesota, 1900, page 50.

About the eggs of the Family Anthocoridæ we are not yet sufficiently informed. The family is considered by Reuter and other authors as being allied to the group of the Reduviidæ. The egg of *Triphleps insidiosus*[5] is figured in Folsom's Entomology. According to the illustration, the egg has a strong resemblance to the egg of *Cimex.* (Pl. XII, fig. 6.)

Eggs of the aquatic and semi-aquatic species of Hemiptera are ovate or more or less elongate. According to Prof. O. M. Reuter[6] these eggs of the aquatics have no apical cap, and at the upper egg-pole centrally two or more chorial processes.

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[1] C. R. Crosby, Notes on the life-history of two species of Capsidæ, Can. Ent., 1911, p. 17.

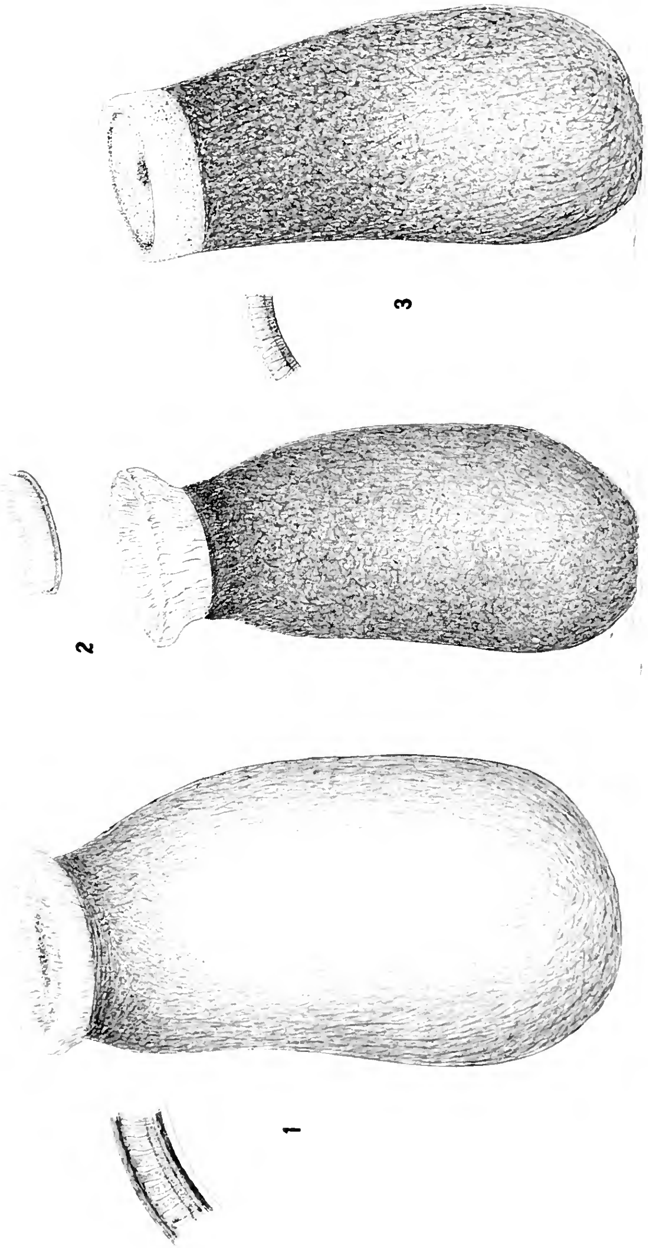
[2] O. Lugger, Sixth Ann. Rep. University Minnesota Agr. Exp. Sta., 1900; L. O. Howard, Insect book, 1901, p. 289; C. L. Marlatt, Bull. 4, n. ser., Div. Ent., Dept. Agr,; J. B. Smith, N. Jersey Agr. Exp. Sta., 1907, p. 20; C. V. Riley, Insect Life, II, p. 105, (1889-90); A. Girault, Psyche, 1905, p. 61; l. c., p. 117.

[3] H. Osborn, Bull. 5, n. s., U. S. Dept. of Agr., Div. Ent. 1896.

[4] C. H. Tyler Townsend, Proc. Ent. Soc. Wash., vol. III, No. 1, 1894, p. 40.

[5] Folsom's Entomology, p. 159, fig. 207 (1906).

[6] O. M. Reuter, Phylogenie and Systematik der Miriden, 1910, pp. 35, 60. (Act. Soc. Scie. Fenn., XXXVII, 3.)



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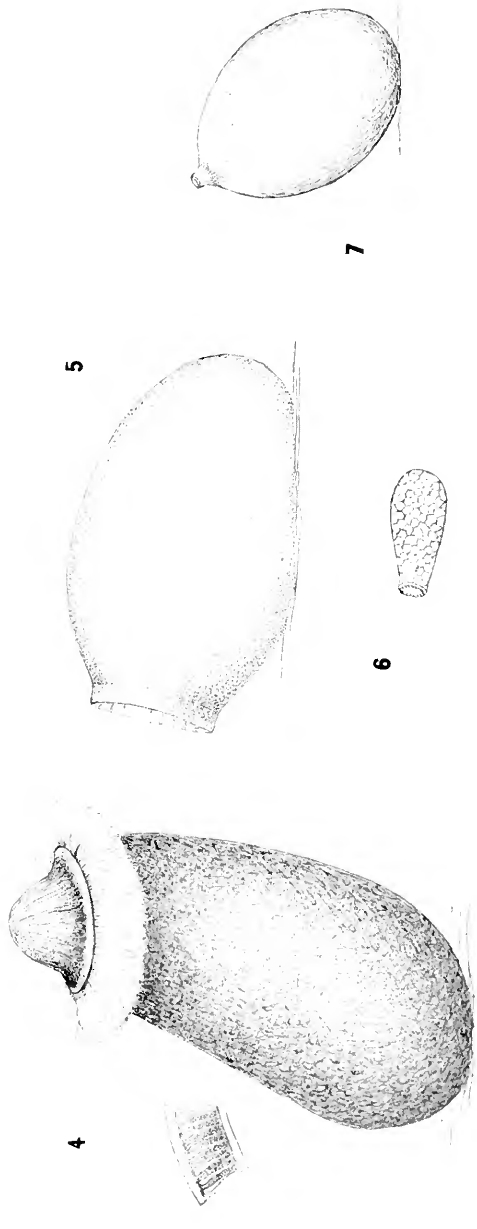
EGGS OF HEMIPTERA-HETEROPTERA



EGGS OF HEMIPTERA-HETEROPTERA

However, this does not hold good in our species of the family Belostomidæ, where the eggs show a distinct cap, which is somewhat obliquely placed at the upper egg-pole and pushed off at hatching, as stated by Needham in his description of the eggs of *Benacus*. Bueno also observed in his careful study of the life history of *Belostoma fluminea*, how the nymph comes out through a round lid that splits off the top of the egg and is attached thereto by a hinge extending about one-quarter the circumference.

In recent years some American authors, foremost among these J. R. de la Torre Bueno, a keen observer, interested themselves in the study of the formerly much neglected aquatics and semi-aquatics. Excellent accounts of the life-history and accurate descriptions of the eggs of water-bugs have been published; thus the writer will refrain from repeating the same and refers to the original descriptions, viz:

Family Hydrometridæ: The egg is described and figured by J. O. Martin in his "Study of *Hydrometra lineata*" = *martini* (Can. Ent., 1900, p. 75). In addition Bueno has given his observations in "Notes on *Hydrometra martini*" (Can. Ent., 1905, p. 13).

Family Gerridæ, subf. Veliaini: Description and figure of eggs of *Microvelia americana*. Life Histories of North American water-bugs, by Bueno (Can. Ent., 1910, p. 182).

Family Naucoridæ: Egg described and figured by Bueno in his publication "Brief notes toward the life history of *Pelocoris femorata*, with a few remarks on habits" (Journal N. Y. Ent. Soc., vol. XI, 3, 1903).

Family Belostomidæ: The egg of *Belostoma fluminea*, described in "Life-histories of North American water-bugs," by Bueno (Can. Ent., 1906, p. 193).

Pedinocoris macronyx: "A ferocious water-bug." Eggs described by G. W. Harvey. (Can. Ent., 1907, p. 19.)

"The eggs of *Benacus* and their hatching," by James G. Needham (Ent. News, 1907, vol. XVIII, No. 4, p. 114).

Eggs of *Lethocerus* (*Belostoma*) *grandis*: "Belostomidæ and some other fish-destroying bugs," by George Dimmock. (Ann. Rep. Fish and Game Commissioners, 1886).

Family Nepidæ: "The egg of the water scorpion" (*Ranatra fusca*), by R H. Pettit (Can. Ent., 1902, p. 213). An additional description of the egg of *Ranatra quadridentata*, by Bueno, in his Life histories of North American water-bugs. (Can. Ent., 1906, p. 247.)

Family Notonectidæ: "The genus *Notonecta* in America north of Mexico," by Bueno. Egg described of the species

Notonecta undulata. (Journal N. Y. Ent. Soc., vol. XIII, No. 3, 1905, p. 154.)

Family Corixidæ: "Egg of *Corixa mercenaria*," by L. O. Howard, Insect Book, 1901, p. 273. Egg ovate; chorion minutely chagreened, yellowish-white, shining; at the upper egg-pole, centrally, a short, but rather robust, conical-shaped chorial process. (Pl. XII, fig. 7.)

Some European entomologists are now adopting the characteristic egg-types as a medium for the phylogenetic and systematic arrangement of the families. Our authors, describing the life histories of North American hemipterous species, investigated the eggs mostly in relation to biological and economic entomology, overlooking the important rôle these remarkable egg-forms may play in the systematic study of the order. But neither part should be neglected. For this reason the writer thought it worth while to take an interest in the study of North American hemipterous eggs, and describe forms hitherto not known. This work is simply a summary, a step in the direction of finding some new and valuable characters for our classification. There opens a wide field for further investigations; and the writer hopes that young students may become interested in this subject, and fill up the gaps in our scant knowledge of these beautiful forms of hemipterous eggs.

Up to the present time no eggs have been observed of the following families:

Acanthiadæ = Saldidæ.	Nabidæ.
Ochteridæ = Pelogonidæ.	Dipsocoridæ = Ceratocombidæ.
Nerthridæ = Galgulidæ.	Isometopidæ.
Gerridæ.	Piesmidæ.
Mesoveliadæ.	Neididæ = Berytidæ.
Naeageidæ = Hebridæ.	Scutelleridæ.
Henicocephalidæ.	Cydnidæ.
Emesidæ.	Thyreocoridæ = Corimelænidæ.

The original descriptions in this paper and accompanying drawings are taken from eggs belonging to the U. S. National Museum collection, from material of my own, and from an additional, small, but valuable collection sent by Dr. W. D. Hunter, to whom I feel much indebted.

STUDYING THE STRIDULATIONS OF ORTHOPTERA.

By H. A. Allard.

Among the Orthoptera of the families Acridiidæ, Locustidæ, and Gryllidæ, stridulatory powers have been very highly developed. The simplest and least musical sounds are characteristic of the Acridiidæ. Among the Gryllidæ, however, highly specialized sound-organs have been developed capable of producing veritable musical tones.

The strident sounds produced by insects are always of an instrumental sort and are, for that reason, entirely unlike the true vocal sounds characteristic of birds. Insect stridulations, in the true sense, do not constitute real music, since, in most instances, musical tones are entirely absent. Even when musical tones are present, as in the trillings of the Gryllidæ (crickets), these trillings are almost wholly continued in a single monotonous tone.

With the exception of some of the Acridiidæ, which stridulate by movements of the hind legs, the stridulations of the musical Orthoptera are produced by definitely controlled movements of the tegmina, which have been more or less completely modified for sound-producing purposes. Among the Acridiidæ which stridulate during flight, the inner wings are brought in contact with the tegmina at will, so that a noisy clack may accompany flight. These harsh sounds, however, represent musical tendencies just as much as the calls of the katydids, since they are more or less within the control of the possessor, and not merely accidental noises attending every flight movement of the wings. The tegmina of these grasshoppers have been least modified for sound producing purposes. Among the more highly specialized Locustidæ, however, a portion of the base of the tegmina has undergone considerable modification to produce delicate, sound-producing surfaces, which, among the different species, are used to furnish a variety of sounds. The wings of the Gryllidæ show most complete modification for sound-producing purposes, and, consequently, these insects produce the most varied and most musical sounds of all the Orthoptera.

Entomologists, generally, have somewhat neglected the musical habits of the Orthoptera. Consequently, the stridulations of only the more common forms are definitely known. From some of the early descriptions it appears that the notes of different species have been somewhat confused. In some instances a portion of the characteristic stridulation of a species has been entirely overlooked, so that the description is noticeably incomplete. In other instances the descriptions are so vague that they have little or no meaning.

The student who undertakes a serious study of insect music meets with many difficulties. In the first place, the notes of many species are so similar that they can never be surely identified until the insect itself has been examined. For this reason no description of these, however careful, can ever be specific. Again, insect stridulations cannot readily be preserved or successfully reproduced, so that the only alternative is to depend upon a carefully trained memory and clear literary descriptions. It has been attempted to set the different insect sounds to music, giving them the values of true musical notes, but these efforts have been wholly inappropriate and unsuccessful. One could reproduce the musical compositions of Beethoven with the unmusical sounds of a taut string and comb quite as accurately as he could reproduce the absolutely unmusical and toneless stridulations of a katydid with the tones of a musical instrument.

A trained mind and a keen ear are essential to the student who undertakes the recognition and identification of insect notes in the field. While it may be true that the stridulations of a few insects may not come within the limits of audition of some ears, it is also true that many unaccustomed sounds are at first unrecorded by processes within the mind itself. In either case the effect is the same, so that these sounds practically do not exist for the listener. It follows that the inability at first of some persons to detect new sounds pointed out to them is no evidence whatever of really defective hearing.

In the field, considerable practice is required before the notes of a particular insect can readily be distinguished from the general medley of noises attending the midsummer days and nights. In order to distinguish the soft, lisping notes of many insects from other sounds of the same character, as the rustling of the wind in the grasses and foliage, a keen concentration of the auditory and mental faculties must be gained, which comes only with patient experience. At all times great care must be exercised in order to determine, without mistake, the notes of any singer. Every unfamiliar note must first be traced directly to the insect musician, which should always be observed in the very act of singing to render the identification of its notes unmistakably certain. Should the notes cease during one's approach, the presence of an insect in the vicinity is no evidence whatever that it was the musician. Any attempt to identify by such methods the notes of Xiphidiums, Orchelimums, or crickets, which, at all times freely intermingle in the grass and herbage, will result only in error and confusion.

Owing to the varied habits of different families and genera of the musical Orthoptera, somewhat different methods may be followed in a study of their stridulations. Among the acridiians two distinct methods of stridulation prevail. Some species stridulate while at rest, rubbing the inner surface of the thigh against the outer edges of the tegmina. Other species stridulate only during flight. Those grasshoppers which stridulate while at rest may readily be captured and confined in boxes, together with a little grass or herbage. In this way the stridulations of these insects may easily be determined, although in the field many species are shy and difficult to approach. Those acridiians which produce their characteristic notes only during more or less extended flights must be studied entirely in the field, since to confine them would prevent this freedom of flight by which their stridulations are produced. Nearly all our acridiians are strictly terrestrial and stridulate entirely by day. For these reasons these insects are less difficult to approach and observe than other Orthoptera of more arboreal habits.

Among the Locustidæ, many are strictly arboreal and can be approached only with great difficulty, owing to almost inaccessible positions among the foliage of trees.

The species of *Scudderia* are more or less terrestrial in their habits, dwelling among the tall grasses and low herbage. Some species stridulate only at long and irregular intervals, usually at night. The stridulations of these katydids are best studied by confining them in a room, placing them on a bough or bunch of grass by the screened window. In this way the notes of any individual are readily obtained as soon as darkness comes on, and it hears its fellows stridulating outdoors. I have found it more convenient to confine some nocturnal species of *Scudderia* in my sleeping-room, together with an abundance of the proper plants among which to conceal themselves. In this way I was afforded a chance to record any sounds which might be produced only at long intervals throughout the night.

The species of *Amblycorypha* are best studied by confining them on herbage in one's sleeping-room, since these insects are almost strictly night singers, and very persistent in their strident calls. Even in the field these katydids are confined almost entirely to the low herbage of the fields and roadsides-so that they are readily approached. *Amblycorypha oblongifolia* De Geer is a most persistent singer during confinement.

The species of *Microcentrum* also stridulate freely when confined in a room. The big, noisy katydid *Microcentrum* *laurifolium* Linnæus soon makes itself at home under such conditions, and continues its unmusical crepitations throughout the entire night in response to its fellows outside. This katydid is much more sedentary in its habits than *Microcentrum retinerve*, which ranges in the crowns of high forest trees, where it cannot be kept under observation. *Microcentrum laurifolium* Linnæus may readily be kept in the house for indefinite periods if fresh herbage is supplied it from day to day.

The katydids of the genus *Cyrtophyllus* are strictly arboreal in their habits and are rarely observed, although their notes are among the most rasping and persistent of any musical orthopteran. My own observations of these katydids, *Cyrtophyllus perspicillatus* Linnæus, have been made entirely in their native habitat among the crowns of forest trees. These katydids, however, could no doubt be confined on large boughs in one's room, so that their notes could more readily be studied.

The coneheaded grasshoppers of the genus *Conocephalus* and allied genera are mostly terrestrial in their habits, preferring the abundant herbage of fields and moist meadows. These beautiful insects are also more active at night, when their stridulations are usually heard. These locusts are capable of strong flight and are often so shy that they can be approached only with the greatest care. These insects are best studied in the field, for they are not readily induced to stridulate in close confinement. In the field these insects can readily be approached at night by the strong light of a lantern, by which, like most other nocturnal insects, they seem little disturbed.

The Xiphidiums and Orchelimums, which dwell under very similar conditions in the field, are readily confined in boxes in which they usually become very noisy. These insects, however, stridulate most readily when they are allowed considerable freedom and an abundance of their accustomed herbage. Species of both genera stridulate more or less by night, although most species are sun-loving insects. *Orchelimum minor* Davis is strictly arboreal in its habits, dwelling exclusively in pines, where it is not readily observed. The green coloration of this interesting little *Orchelimum* is remarkably similar to that of the pine foliage in which it dwells. In many instances I have at first been unable to distinguish it when only a few steps away, though the insect was stridulating all the while. The Xiphidiums are confined almost entirely to dense grasses and herbage, so that they are not readily detected. The tiny *Xiphidium fasciatum* DeGeer is a grass-dwelling insect whose grass-like form and coloration might be considered an excellent example of protective adaptation.

The species of *Atlanticus* which I have observed are terrestrial in their habits and sing mostly by night. Their brown and black admixtures of color serve to harmonize them with their usual environment of sticks, leaves, etc., on the ground in woods. These insects are said to accommodate themselves readily to confinement.

Among the musical Gryllidæ we find a wide range of habits, which serve to adapt these insects to widely different environmental conditions. The mole crickets (*Gryllotalpa*) are underground dwellers in wet soils. On the surface of the ground among the sticks, leaves, and grasses we find the large crickets (*Gryllus*) and the species of *Nemobius*, which are small, dark-colored terrestrial crickets. In the grass and herbage just above the ground the species of *Anaxipha* and *Phylloscirtus* dwell. The shrubs, trees, and vines are occupied by species of *Œcanthus*, *Cyrtoxipha*, *Orocharis*, and others.

Of all the stridulating Orthoptera, the Gryllidæ have attained the highest degree of musical ability. The stridulations of these insects, unlike the stridulations of the Acridiidæ and Locustidæ, are characterized by true musical tones.

The species of *Gryllus* and *Nemobius* are readily studied during captivity, and scarcely cease their persistent chirps and trillings while alive. The more arboreal tree crickets of the genera *Œcanthus*, *Crytoxipha*, and *Orocharis* in many instances are rather difficult to observe in the field, owing to their position among the leaves of tall trees and climbing vines. These insects, however, may be confined in a room with an abundance of foliage, which naturally conceals them, although under these conditions these arboreal crickets are not as contented and musical as the more hardy ground dwellers. The species of *Œcanthus* are most musical at night, and, at this time, may readily be observed in their natural haunts by the light of a lantern.

It is a well-known fact among entomologists that strong lights serve as a great attraction to nearly all kinds of nocturnal insects. In a study of those musical Orthoptera which stridulate at night, a light which can readily be carried is an indispensable part of one's outfit. This light should be strong and readily directed upon any particular spot. For this purpose a bull's eye lantern with a good reflector gives a most admirable light. It is an interesting fact that all the musical Orthoptera which stridulate at night have little fear of a light, whether these be species of *Orchelimum*, *Conocephalus*, *Amblycorypha*, or *Œcanthus*. In truth, in many instances, the stridulations of some insects are more persistent when the light is kept very near them.

In a study of the stridulations of Orthoptera throughout the season, it becomes evident that these creatures possess remarkably responsive sensibilities to variable weather conditions. Slight changes in light, temperature, moisture, and air-movements have their peculiar influence upon the character of their stridulations. It seems hardly probable that those species which stridulate during darkness have developed this habit to escape daylight enemies. If it were merely a question of darkness, why do most nocturnal katydids and crickets show no fear of a strong light? In our illuminated city parks these insects are just as noisy in the glare of electric lights as away from them. This is especially true of *Microcentrum laurifolium* Linnæus. Temperature and moisture changes attending darkness rather than darkness itself probably account for the musical activities of certain crickets and katydids at night. I have several times noted that those species which stridulate entirely during darkness in midsummer may, in the autumn, when the nights have become too cold, stridulate entirely by daylight. Observations of the stridulating habits of *Cyrtophyllus perspicillatus* in north Georgia at different times during the season have brought out very interesting facts of this kind. Throughout the warm summer nights in this region these noisy katydids keep up their incessant stridulations. I have rarely heard one stridulate during sunlight. However, late in September, during a brief period spent in the mountains of Towns County, north Georgia, I met these katydids stridulating under very unusual conditions. Following one of the earliest and most severe cold waves experienced in this region in many years the nights became so cold that all insect life was forced into silence. However, during the bright, sunny afternoons, at 2 o'clock, I heard the rasping notes of *Cyrtophyllus perspicillatus* in the tall trees, and captured one individual for identification, as I had suspected something different at this unusual hour. In this instance, notwithstanding the bright sunlight, the stridulatory activities of these katydids were a response to the more favorable temperatures of mid-afternoon. Throughout the summer I have many times noticed that the peculiar atmospheric conditions immediately preceding thunderstorms at night cause many stridulating Orthoptera to become very musical until the storm had passed.

In any locality the different species of Orthoptera, many of which persistently advertise their presence by their stridulations, are, for this reason, rather more readily determined than other insects which are unmusical. Even before a single insect has been collected one can, in a short time, by listening to their stridulations, determine a number of species with considerable certainty. The whereabouts of other species are also disclosed. so that they may be more readily taken. If it were not for their musical habits, the presence of many of the rarer and more seclusive Orthoptera would never be suspected in many localities.

A thorough knowledge of the stridulations of the musical Orthoptera throughout their range would undoubtedly assist the specialist in identifying and recognizing many local forms or minor varieties. Careful studies of a number of musical insects have shown the writer that very marked differences of stridulation may characterize certain species in different parts of their range. This has been found especially true of *Gryllus pennsylvanicus*. The sprightly intermittent chirps of the New England individuals no more resemble the weak, continuous *Œcanthus*-like trill of the northern Georgia individuals than the notes of *Œcanthus niveus* resemble the very dissimilar trill of *Œcanthus latipennis*. Not only is the stridulation very dissimilar, but the general habits are unlike. In New England *Gryllus pennsylvanicus* fairly swarms in the grass fields and pastures during the autumn, chirping everywhere in plain sight. In northern Georgia this cricket becomes exceedingly abundant in March, April, and May. In this region it is very shy and secluded in its habits, stridulating beneath matted leaves, clods of earth, and grass in fields, and oftentimes in deep burrows in pastures. It is rarely seen unless deliberately uncovered and unearthed. By midsummer its stridulations are rarely heard.

Apart from the scientific interest which the stridulations of our Orthoptera may afford, a study of those factors which contribute to our emotional life and buoyancy throughout the midsummer days and nights leads to the conclusion that this tenor of mind is largely inspired by the varied sounds of hosts of musical crickets and katydids. The stridulations of a single singer may appear monotonous, but the lispings and trillings of many species unite to produce expressive and soothing harmonies in the mind of the sympathetic listener. Different emotional moods and fancies are largely inspired and sustained by the music of different insects throughout the seasons. Their music becomes a part of the poetry of the summer time, and to understand it with sympathetic feelings increases our appreciation of much of the happiest poetry of our literature.

It is possible that the Oriental mind is more responsive to the touch of insect music. We are told by Lafcadio Hearn and others that many ages ago the Japanese learned to appreciate insect music. At the present time they cage and sell many of their most musical katydids in order to hear their varied calls as we cage birds for their songs. Hearn's peculiar respect for inherited memories led him to feel that the Japanese mind colored by the accumulated memories of many such happy experiences must find ineffable beauty and charm in the many musical crickets and locusts of that country.

In our own country the stridulations of insects have received but little attention. The notes of many species still remain undescribed, yet in most instances it is almost as easy to learn and to recognize different species by their notes as to recognize different birds by their songs. In the South the stridulations of insects have received but little attention. Throughout this region the writer has spent many spare moments both night and day trying to trace each unfamiliar note directly to the wings which produced it. Yet the work is never finished, and hosts of unfamiliar sounds emanate from inaccessible pines and oaks in every locality from early spring till late autumn. For years the writer has been utterly balked in his efforts to obtain even a glimpse of a number of these musical creatures. In some instances the season of song is exceedingly brief. Notwithstanding these diffculties, each summer's waiting and watching brings to light some new call which ever afterward becomes a familiar greeting from the insect which made it. The quest always allures toward the unseen and unknown, so that the writer each recurring season finds himself ever impelled to listen and to watch, ever hoping to acquaint himself with the maker of those unseen mysterious trills and chimes in the tree tops.

CORRECTIONS.

By H. L. Vierick.

Volume XIII, page 97, line 14, for "a" read "the preceding;" page 98, line 25, for *bridewelli* read *bridwelli*.

A NOTE ON ASCODIPTERON.

(Diptera.)

PLATE XIII.

BY NATHAN BANKS.

Recently Dr. Lyons, of the Department of Mammalogy of the U. S. National Museum, while examining Bornean bats of the genus *Emballonura*, came across some peculiar swellings on the body, which he concluded were insects, and brought them to the Section of Insects. These somewhat pear-shaped bodies were in a cavity of the skin of the bat, with the anal end of the body extruded. An examination of these specimens disclosed a head and thorax of very peculiar appearance, retracted within the sac-like body.

A survey of the literature showed that they belonged to the genus *Ascodipteron*, described in 1896 by Adensamer. The structure of the sternum places these forms as belonging to the Streblidæ. Now we learn that Muir has bred them and found that the winged specimens, male and female, are Streblidæ. He says that the female after mating breaks off her wings and legs and burrows into the skin of the bat, leaving only the anal end extruded. This agrees with what we have found—all six legs present, but of only two joints, the second with a black apical scar where the rest of leg was broken off. Monticelli in his figures shows the stumps of the wings, but did not recognize them. Monticelli's family Ascodipteridæ is thus a synonym of the Streblidæ.

There are now at least six lots of these creatures known. The one specimem upon which Adensamer formed the genus, from a *Phyllorhina* from Java; the Monticelli specimens from *Rhinolophus* from Abyssinia, *Asc. lophotes;* the two species described by Speiser, one from Siam, the other from Madagascar; the Muir specimens, upon which he has worked out the life history; and finally those taken on *Emballonura* from Borneo, shown here.

The winged Streblidæ are very rare; they have been taken in several cases from the same bats that harbor the *Ascodipteron*. It is therefore probable that *Ascodipteron* is but a stage in the life-history of most, if not all, Streblidæ, and that our form and Adensamer's species belong to *Nycteribosca*.

The species so beautifully figured by Monticelli is very different from that of Adensamer and the one shown here. The body is much more slender; the tip of the abdomen has the spiracles arranged differently; the mouth-armature is different, and the mesosternal sclerites are quite differently shaped, so that I doubt if *A. lophotes* will belong to *Nycteribosca*, but rather to the genus *Raymondia*.

I have made some drawings of these specimens from *Emballonura*, and wish to call attention especially to the furcate tip of the antennal arista, and the spines on the tip of the body, and to the chitin rings near the posterior spiracles; these rings bear bristles. These characters figured will serve to distinguish this species from those already known, so I propose to call this species *Ascodipteron emballonuræ*, athough I suspect that when its life-history is known it will be shown to be the same as some species of Streblidæ already described from Insulinde.

References to the various articles on this peculiar fly are as follows:

ADENSAMER, Th. Ueber *Ascodipteron phyllorhinæ*, eine eigenthümliche Pupiparenform. Sitzungsber. Kais. Akad. Wiss. Wien.; Math.-naturw. Cl., Bd. 105, pp. 400–416, 1896.

MONTICELLI, P. S. Di un altra specie del genere Ascodipteron, parassita del *Rhinolophus clivosus* Rüpp. Ricerche Laborat. Anat. R. Univ. Roma, vol. VI, pp. 201–230, 1898. (*A. lophotes*.)

SPEISER, P. Diptera pupipara. Fascic. Malay Zoolog., I, p. 125, 1903. (Describes *A. siamense*.)

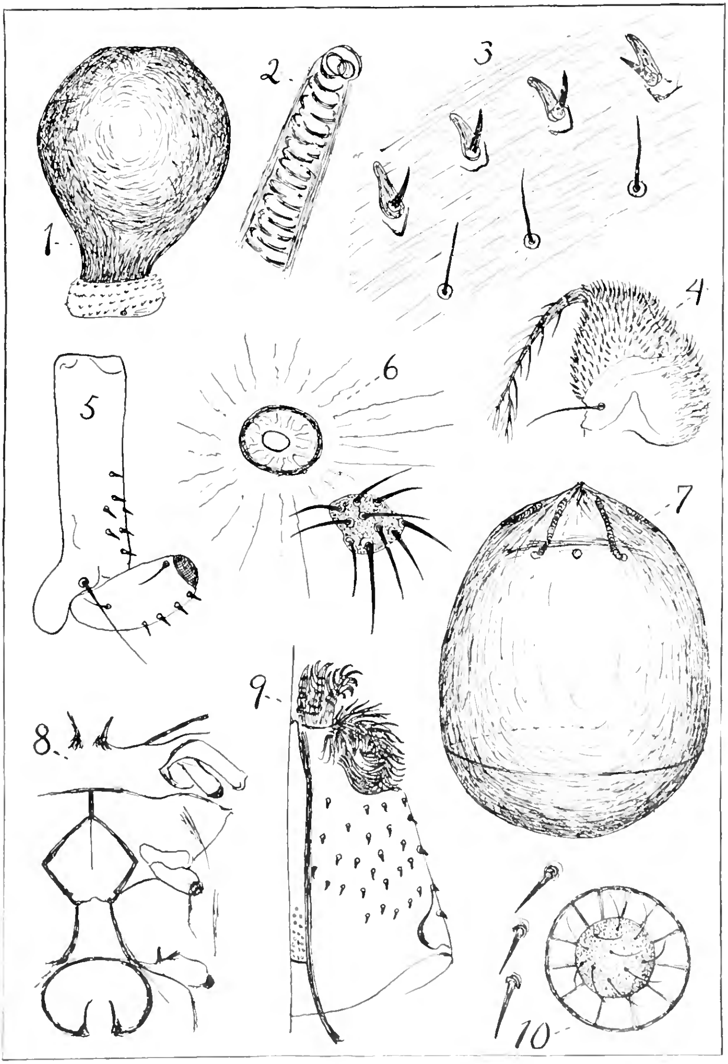
———. Diptera pupipara. Voelzkow, Reise Ostafrika, Bd. 2, p. 202, 1908. (Describes *A. labulatum*.)

BARBOUR, T. A note regarding the life history of Ascodipteron. Psyche, 1910, p. 168. (Brief summary of Muir's discovery of the life history.)

EXPLANATION OF PLATE XIII.

Ascodipteron emballonuræ Banks.

FIG. 1. Side view of the fly.
2. Spiracle of pupa.
3. Armature of skin on anal end of body.
4. Antenna.
5. Basal part of leg.
6. Posterior spiracle and chitin ring.
7. Puparium.
8. Mesosternum and metasternum.
9. One half of head from above.
10. Spiracle on thorax.



ASCODIPTERON EMBALLONURAE BANKS

REVIEW OF WORK BY PANTEL AND PORTCHINSKI ON REPRODUCTIVE AND EARLY STAGE CHARACTERS OF MUSCOID FLIES.

By Charles H. T. Townsend.

The very important recent contribution by J. Pantel, entitled "Recherches sur les Diptères a Larves Entomobies," is the first of three memoirs planned by its author to appear under that head, and bears the subtitle "Caractères parasitiques aux points de vue biologique, éthologique et histologique." It appeared in volume 26, first fascicule, of La Cellule, and comprises 165 pages of text proper, 2 pages of definition of terms, 6 pages of bibliography, 14 pages of explanation of plates, a four-page table of contents, 26 text figures, and 5 well-executed double plates. The text matter is arranged in four chapters, of which the first specially concerns us here, covering much ground upon which I have myself been engaged during the past four years, and adding no little to my own knowledge of the subject of the reproductive and early-stage characters. I should state at the outset that a copy of this publication sent by the author to me in Massachusetts failed to reach me here in Peru, and I had not seen the paper until a second copy reached me late in May, 1911. Thus my paper presented before the Entomological Society of America in 1910, about to be published with additions in the Annals of the Society, has been wholly prepared without knowledge of the results announced by Pantel in this work.

The author presents a table in which he defines ten groups founded on reproductive characters. Primary divisions are made on the form of the egg, the first group having a short, broad egg, to which I should add flattened; the second having a long egg. Two groups are distinguished in the first division, one with a macrotype, the other with a microtype egg. In the second division a group is cut off on the character of the pediceled egg. The remaining seven groups are divided primarily on presence or absence of chitinous terminations of the larvipositor or ovipositor for puncturing the skin of the host. The forms that do not so puncture the skin are then divided on the double-sac or coiled types of uterus, the latter forms separating into those having a delicate uniform chorion and a colored maggot fitted for remaining some time in the open, and those having a dorsally thickened chorion and an uncolored maggot deposited in chorion on host. The colored-maggot forms are divided into those with numerous ovarioles whose maggots are deposited on foliage in vicinity of the hosts, and those with few ovarioles whose maggots are indicated with a query as probably deposited in the vicinity of the host. Finally, the forms provided with chitinous piercing organs at the tip of the female abdomen are divided into those whose eggs are perceptibly tapered at the posterior end and which are credited with a habit of subcutaneous oviposition, and those whose eggs are the same at both ends and which have the habit of subcutaneous larviposition; the latter being divided again into those with piercer and larvipositor distinct, and those with the two combined.

This grouping becomes in a large measure a true and natural one, but a very considerable number of diverse types are left together in groups I, V, and VI especially. In order to preserve the relative proportions of the whole, these groups need splitting, on whatever characters are available; external adult characters to be used if the eggs, maggots, and reproductive organs do not show sufficient differences, for many of these types are pronounced in the adult. Separate mention of the ten groups follows below, with general mention of the forms referred to them.

Group I.—Species which glue a short flattened macrotype egg to the body of the host. Pantel recognizes the fact that the seventeen forms here grouped by him are of diverse types. While his groups are manifestly not intended by him as taxonomic divisions, I feel confident that proper taxonomic groups can be defined on the characters brought out by such work supported by others judiciously selected from the external anatomy of the adult. Thus we have the following: Phasiidæ: *Phasia crassipennis*, *P. rostrata*, *Cistogaster globosa*, (*Xysta*) *grandis* Egger, (*X.*) *semicana* Egger, and quite possibly *Gymnosoma rotundatum* and *Stylogymnomyia nitens*. Tachinidæ: *Tachina larvarum*, (*T.*) *rustica*, *Tricholyga major*, *Parasetigena segregata*, *Ptychomyia selecta*, *Winthemyia 4-pustulata*, *Nemorilla maculosa*, *Meigenia floralis*, *M. major*, *Thrixion halidayanum*. These further need subdivision into several tribes.

The two Eggerian species that have heretofore been referred to *Xysta* are manifestly not that genus, and may be referred to the new genus *Euxysta*, type *X. semicana* Egger, erected in this paper. (See Group IX for *Xysta*.)

Tachina rustica is the type of the genus *Chætotachina* B. B. Pantel's figure of the female reproductive system in this species shows a very distinct type from that of *Tricholyga* and *Euphorocera* (not *Euph. claripennis* Coq.), which I take to represent the tachinine type or group-unit. *Chætotachina* has the spermathecal duct extremely elongated and longer than the tubular glands, the latter being not only much shortened comparatively, but also very slender, much more slender than the spermathecal duct; moreover, there is only one spermatheca, according to Pantel, which seems to me most remarkable, since in all of my work I have never found any variation from three. Thus the chætotachinine group is a most distinct one.

The bulb-like enlargement in the spermathecal duct of *Chætotachina* noted and figured by Pantel is considered by him as perhaps a supplementary spermatic reservoir. This might well be the case in this form with only one spermatheca, but I find the same well developed in *Euphorocera peruviana* and *E. minor*, two Peruvian species, both of which have three spermathecæ. I think it more probable that these bulb like swellings of the ducts function alternately as air-exhausts for drawing the spermatozoa down from the spermathecæ through the very long ducts and as expellers for forcing them into the uterovagina. They are very marked and quite spherical in the Peruvian species mentioned, and strike me as being especially comparable to the bulb of a syringe. They may also function as spermatozoal inhibitors during copulation.

Of the forms above mentioned, so far as known, only *Meigenia* and *Thrixion* have a uterus in my sense, which is termed by Pantel "utérus incubateur" and "organe incubateur", and by Dufour "réservoir ovo-larvigere." Pantel considers the uterus present in all forms; I consider it present only in those forms which incubate the eggs. The corresponding organ in those forms which do not incubate the eggs I call the uterovagina, which has no incubating but only a fertilizing combined with a vaginal function; it thus can not properly be called either vagina or uterus, since it combines the functions of the two. The vagina is the more or less well-marked termination of the incubating tube or sac; thus the uterus plus the vagina in the incubating class are homologous with the uterovagina of the non-incubating class.

Pantel records his belief that incubation of the eggs in *Meigenia* and *Thrixion* is probably to be considered exceptional. I can hardly agree to this. I have found eggs in a number of these forms sufficiently developed to show the cephalopharyngeal skeleton of the maggot, and further the elongate coiled uterus would not be present, I believe, unless for the purpose of incubation. Similar incubation is known to occur normally in *Gastrophilus* and *Hypoderma*, and probably in other forms with thick chorion, as *Cuterebra* and *Dermatobia*.

Pantel points out and accounts for the mistake of Neilson in claiming larviposition for *Tachina larvarum*. Evidently the maggots which Neilson mistook for *larvarum* were destroyed by *larvarum* maggots hatched from the eggs covering the hosts, the *larvarum* maggots themselves being overlooked but the *larvarum* flies reared. This illustrates well what serious confusion may result during investigations that seem well guarded.

The form mentioned by Pantel as referred by me with doubt to *Hemimasicera* is *Cyclotaphrys anser* T.

An important point brought out by Pantel is that of accidental viviparity. Von Siebold has recorded such for *Calliphora vomitoria*. Pantel states that he has noted the same condition in *Euxysta grandis* and *Parasetigena segregata*. While I believe that this phenomenon may actually occur at times, I feel that the greatest caution is necessary in the determination of such individuals, which may in some cases represent other types very similar in external characters. Portchinski's work noted further on, while perhaps correct as to determinations, has an important bearing on this point.

Another point of interest brought out by Pantel's work is that the ovarioles of the muscoid flies are without alternate nutritive cells. I have independently noted this fact. There is a terminal chamber present surmounted by a filament, rather than a terminal filament alone, as in the ovarioles of Thysanura and Orthoptera; but this chamber, while perhaps nutritive in function, is not connected with each ovum by a separate strand-like duct as in the more specialized type of ovariole. I have noted this uniformly in many cases, and it shows throughout Pantel's figures of his ten groups.

In view of the more or less complete development, and oftentimes escape from the chorion, of the maggot in the uterus in a great part of the Muscoidea, it becomes clear that we must in some manner distinguish between oviposition and larviposition. In many cases the fully developed maggot is deposited in its chorion. This is the case with all the leaf-ovipositing species, or the forms with microtype egg. It is doubtless often the case, as Pantel suggests, with forms hitherto supposed to hatch the eggs or liberate the maggots in the uterus, these being deposited in their delicate and transparent choria, as I have several times observed with *Almugmyia arida* and *A. major*, two Peruvian species, the maggots immediately making their escape from the chorion and starting away in search of hosts. I have noted the same with *Varichæta ruficauda* in Massachusetts and with *Sarcophaga* in Peru. I believe that it will be at once most convenient and most truly representative of the actual conditions to consider the deposition of all tough or thick chorion eggs as *oviposition*, whether or not they contain the more or less developed maggot; and the deposition of maggots, whether naked or enveloped more or less fully in a delicate chorion, as *larviposition*. The first are always specially provided, either by flat ventral surface, by pedicel, or by heavy chorion carrying an abundance of cement (as in the cuterebrine flies), for outside deposition and attachment to surfaces as eggs. The last are not so provided in any way, the intent of the act in their case being certainly the deposition of living maggots for immediate activity. The membraneous base by which the maggots of the leaf-larvipositing forms are attached to plant surfaces probably consists of a part of the chorion, or perhaps the vitelline membrane, or both, which adheres to the anal end of the maggot at birth, being thus made use of by the maggot certainly at times, though the latter may leave this base in search of a host. The subcutaneous deposition of maggots is perhaps normally made in choria. The subcutaneous deposition of eggs, to be noted farther on, presumably made as eggs without any development of the maggot, is indicated only in those forms with an elongate egg and delicate chorion entirely unsuited for external attachment.

Group II.—Species depositing on the food of the host a microtype egg containing the developed maggot and destined to be swallowed. Fourteen identified species are mentioned here, including the following genotypes which I have not yet been able to dissect: *Baumhaueria goniæformis*, *Cnephalia bisetosa*, *Frontina læta*, *Spallanzania hebes*, *Sturmia pupiphaga*.

Myxexorista pexops B. B. is included and stated to have a shortened uterus with slate-gray eggs. It is thus clearly not the genus *Myxexorista*, which is apparently to be considered synonymous with *Zenillia*, and I propose for it in this paper the new genus *Myxexoristops*. *Zenillia libatrix* has black eggs of smaller size, a long uterus, and more numerous ovarioles.

Baumhaueria and *Frontina* both fall in the same group with *Myxexoristops*, so far as the egg, uterine, and ovarian characters pointed out by Pantel go. They may be found ultimately to need separate tribes, for the wealth of these forms and the variety of type exhibited by them are but little realized as yet.

Ceromasia rufipes B. B. is also included and stated to have a very small black egg, long uterus, and numerous ovarioles. It is certainly not *Ceromasia*, as the genotype, *Ceromasia florum*, has deep yellow eggs of good size. I propose the new genus *Ceromasiops* in this paper for its reception. Moreover, *Ceromasiops rufipes* is recorded as reared from forficulids, which causes Pantel to question whether the microtype eggs are always deposited on foliage. No doubt a reservation must be made in this respect, but it is quite safe to conclude that they are normally deposited on the food. The investigation of the host relations of *Ceromasiops* promises to be unusually interesting. But it must be observed that forficulids are not uniformly carnivorous and refuse-feeding. A species has been reported in Tasmania as extremely abundant eating into ripe fruits, and others have been found eating the buds of plants.

Brauer's record of *Gonia* parasitic in bees is based, I believe, on Zetterstedt's original record. *Gonia* has been reared in numerous cases in North America from noctuids. The Zetterstedt record may perhaps have been due to infested noctuid caterpillars crawling into *Bombus* nests to pupate. I have not seen the original record.

As to *Spallanzania hebes* having been reported viviparous by Dufour, it may exceptionally happen that a fly should contain in the lower part of the uterus overripe eggs, so to speak, or maggots in choria that have been carried overtime, from lack of finding suitable places for oviposition, and which may burst from their choria on the least provocation. The mere handling of the fly may cause this. I have noted the maggots burst from the choria during dissection of dried specimens of *Blepharipeza* and *Gonia* that have been relaxed, merely as the result of the mechanical effects of manipulation.

A most important point abundantly brought out in Pantel's work is the fact that the female reproductive system in the forms with uterus exhibits very different characters before and after the descent of the eggs. Many forms which possess a very long, coiled uterus at the full stage of gravidity show the uterus practically undeveloped at time of issuance from the puparium and until the descent of eggs from the ovaries has become well inaugurated. This may apparently go so far as to be very misleading, as I have shown with *Gonia*, provided I have not confused two distinct forms, individuals with a short uterus containing fully developed maggots. The one type shows a short uterus in only one or two coils, with very short oviducts and very large ovaries; the other a uterus in five or six coils, with long oviducts and smaller ovaries. Although I have so far been unable to find differences between either the flies or their eggs and maggots, I am not yet certain of their identity. The difference in the length of the oviducts and the size of the ovaries seems too great to explain by descent of the eggs contained in the uterus, while there are also quite important differences in the relative length of the tubular glands and the spermathecal ducts. The whole matter serves to emphasize the necessity for much care and judgment in the study of uterine characters. The delayed uterine development might be thought to afford a clue to the age of uterine specialization, indicating its comparatively recent acquirement. But it is evident, as suggested by Pantel, that the shortened condition of the uterus is essential to successful coition and the free passage of the male fluid into the spermathecæ. Therefore full uterine development is delayed to allow of copulation.

In this connection the author points out a very serviceable criterion, which is most conspicuous during dissection of the forms with much uterine development, and which serves to indicate such forms even in the newly issued flies before the descent of the eggs and the elongation of the uterus have begun. This is the fact that such forms have the uterus abundantly supplied with masses of minute tracheæ. These positively indicate incubation of the eggs and development of the maggots, and are often very troublesome by binding the coils and other reproductive organs into a close tangle.

Pantel calls attention to the idea advanced by Portchinski that in *Calliphora erythrocephala* only one egg in each ovariole develops. This is, I feel sure, a wholly mistaken idea. It may happen in countries with an extremely short breeding season, as in northern Russia perhaps, but in more southern climes it can hardly be the case. All muscoid flies may be easily divided into two grand categories on the character of continuous or discontinuous development of ova in the ovarioles. *Calliphora* belongs in the latter category. One set of ova develops at a time, the set being composed of the lowest ovum in each ovariole. When these are fully formed, and the fly has been fertilized, they are rapidly deposited in the case of *Calliphora*, *Musca*, *Stomoxys*, etc. In the case of *Sarcophaga*, *Metopia*, etc., the set when fully formed descends rapidly and practically at once into the uterus, where all develop together. Practically always the eggs or maggots in the uterus of these forms are all at the same stage of development. I have seen exceptional cases, but they are rare. When the maggots are fully developed they are rapidly deposited. As the maggots approach full development, another set of eggs forms in the ovarioles, and these descend as soon as the uterus has been emptied. I have found the ovaries filled with a set of full-sized eggs and a few perfect maggots in the uterus at the same time, showing that larviposition of one set of maggots was in progress. The leaf-ovipositing and leaf-larvipositing forms belong in the other category, where continuous and successive development and descent of eggs, development of maggots, and oviposition or larviposition take place, the latter depending only upon the finding of suitable conditions.

This second group of Pantel corresponds perfectly to my leaf-ovipositing forms, and seems a most compact and well-defined group, embracing all the microtype egg forms known, and easy of definition by dissection. Nevertheless, the indications are that at least some of these groups are of independent origin from the main stock, and it is quite probable that we shall ultimately find that the group is merely a collection of stocks of diverse origin. I have found types of slender, elongate, more or less pointed microtype eggs, as mentioned in my last paper, and many forms with a deep yellow instead of black or gray chorion, none of these having appeared in Pantel's material.

Group III.—Species extruding large and robust larvæ known as ordinary flesh maggots. This is the group of the sarcophagine, metopiine, etc., flies and their allies, a very natural one characterized by the double-sac form of uterus, termed by Pantel very aptly a twin-pouch incubator. The author does not distinguish between the cordate and V-shaped types of this form of uterus, which I have pointed out.

Pantel's dissection of *Macronychia agrestis*, the type of the genus, makes its reproductive system now for the first time known. The discovery that it possesses, as I had thought probable, the double-sac type of uterus calls for an important change in family nomenclature. Since rediscovering for myself the nature of the sarcophagine uterus, which it appears was described and figured as long ago as 1851 by Dufour, I have felt that the old family Sarcophagidæ should be revived. We are now able to separate these forms definitely from the rest of the Muscoidea. Moreover, other important characters indicate their compactness as a family group, notably the uniformly very generalized type of the cephalopharyngeal sclerites of the first-stage maggot and the position of the posterior stigmata at the bottom of an anal cavity in the maggot and puparium. To this family *Macronychia* is now known to belong, and in spite of its divergent facial plate development I believe that it will be found to exhibit the maggot characters just mentioned. It represents an extreme shortening of the facial plate in the sarcophagid stock already begun in the paramacronychiine and especially noticeable in the miltogrammine flies.

Macronychia is thus no longer tenable as the type of the family which I have called, in deference to Brauer, the Macronychiidæ, though realizing that *Megaprosopus* is the real type of the family. This is a natural family group distinguished by the shortened œstrid type of facial plate and the noticeably reduced mouthparts, combined with the presence of true abdominal macrochaetæ. The exclusion of *Macronychia* makes the group a more natural and easily defined one on external adult characters. *Aulacocephala* perhaps belongs here, and *Neophyto* probably goes in the Sarcophagidæ. As *Megaprosopus* is typical of the group, the family may now properly be called the Megaprosopidæ.

In a paper now in preparation I am discussing family characters and reviving both the Sarcophagidæ and Dexiidæ as families, though in a new sense, the Sarcophagidæ standing as above outlined, and the Dexiidæ forming a group with a facial plate, of which *Dexia* is typical. The possession by *Macronychia* of the megaprosopid type of facial plate and the double-sac type of uterus seems to indicate that the latter specialization is of longer standing than the shortening of the facial plate. *Macronychia* and its allies appear to be double-sac uterus stock that has developed the shortened facial plate by parallelism. The same parallel development shows a beginning in certain muscid if not tachinid stocks, as now restricted, and has proceeded far in the dexiid stock. It has progressed farther in this part of the sarcophagid stock. We thus find a successive shortening of the facial plate from the phasiid through the muscid, tachinid, dexiid, sarcophagid, and megaprosopid stocks to the œstrid type. This specialized facial shortening now seems to postdate the primary differentiation of uterine specialization into double-sac and coiled-gut types.

The Brazilian *Pseudogametes* and the Siberian *Microcephalus* both appear to be remnants of an old mesembrinine stock that has acquired a strong œstrid facies. Both have the mouth-parts much reduced and show evidences of a tendency toward a shortening of the facial plate, which is of very peculiar structure, while the cheeks are wide and concave. The well-developed antennæ have counteracted the tendency toward a shortening of the facial plate. Both forms are densely hairy and *Bombus*-like. These forms should throw much light on œstrid, megaprosopid, and sarcophagid relationships when they are more fully investigated.

Pantel quotes Künckel's observation of a female *Sarcophaga* depositing a maggot in the anus of the Morocco locust, and comments on the recent experiments of Lahille with *Sarcophaga* on crickets. I think there is no doubt that sarcophagid maggots do at times enter sound hosts either by body openings or through less chitinized parts, but in any event, though to all practical purposes true parasites, they live rather as scavengers in the host, as pointed out by Pantel. They have formed no habit of procuring air-supply through the skin or tracheæ of the host, as have the truly specialized parasites.

Group IV.—Species which deposit naked maggots or maggots in choria in the path of the host. This comprises the forms which larviposit upon plant surfaces in proximity to the host. It is a large and natural group of subfamily rank, easily dividing into at least nine group-units of tribal rank on maggot and adult characters. All possess a long, coiled, strap-like uterus in which develop colored maggots whose dorsum and sides are covered with minute subchitinous plates.

Pantel mentions that Réaumur described the uterus of *Echinomyia* in 1738, but does not state that he also gave an extremely recognizable figure of it. I believe that the species was *Echinomyia grossa*, which is a most prolific form and has an immense uterus 60 mm. long. I consider Réaumur's estimate of 20,000 maggots in one uterus, however, as rather too high. My own numerous dissections in this group have shown this species and the North American *Archytas hystricodes* to be the most prolific, but in no case have I been able to estimate a uterine content of more than 8,000 to 10,000 eggs and maggots, and this is much above the average. Yet this may exceptionally be exceeded by large flies which have not found suitable conditions for larviposition.

One century after Réaumur's work, in 1838, von Siebold enlarged upon this type of uterus, publishing a most important paper upon these forms. These two authors and their publications, with Sasaki's work on the leaf-ovipositing *Crossocosmia* in 1887, and Portchinski's work in 1885 on coprophagous and necrophagous forms, mark prominent epochs in our knowledge of muscoid reproduction and early stages. Since 1907, greatly renewed interest in this subject has sprung up, as shown by the published work of Hewitt on *Musca*, that of Pantel, Neilson, and myself on the general subject, and that of Austen, Roubaud, and others on *Glossina*.

Pantel figures some of the types of colored armature in the maggots of the present group, and calls attention to the similarity of *Steiniella*, but it should be observed that the armature of the latter is not of the *Varichæta* or *Micropalpus* type. *Steiniella* is approached in armature by *Glaucophana*, both possessing spined plates, but neither form falls in the present group.

The author questions whether the maggots of this group are always deposited on plant surfaces, and not sometimes directly on the host. The observations of Marchand are cited, who claims to have observed *Eupeleteria fera* deposit maggots on the host at the entrance of the spiracles. However this may be, I can only say that the flies of *Eudoromyia magnicornis* which we handled at the Gipsy Moth Laboratory manifested the greatest alarm when they found themselves in *close* proximity to caterpillars, but deposited their maggots on the leaves and stems in the general vicinity of the caterpillars, though always at a respectable distance from them, and at least in certain cases on the fresh silken strands left by them in traversing the plant surface to and from their nests. The caterpillars used were *Hyphantria* and *Euproctis*, which make webbed nests. Both the alarm of the flies when brought face to face with the hosts and the specialized armature of the maggots indicate that larviposition on the host is abnormal. If exceptional cases occur, each must be individually sought for the reason.

Group V.—Species depositing naked maggots or maggots in choria probably in the vicinity of the host. This is a most instructive group, but a heterogeneous one. It is a collection of extra-leaf-larvipositing forms with colored maggots. Five genera are mentioned: *Bigonichæta*, *Erithorix* (*Olivieria*), *Glaucophana*, *Macquartia*, and *Myiocera*, the maggots of none of which was before known to me, and all of which are of the greatest interest as throwing important light on the host relations of these forms. To these may be added *Ophirion*, *Steiniella*, *Gymnochæta*, and *Phasiopteryx*. No two of these nine genera probably fall in the same ultimate natural group-unit, while two families and four subfamilies are represented among them. All seem fitted to search for their hosts in the open or subopen.

Group VI.—Species depositing naked maggots or maggots in choria on the body of the host. Thirteen species are here named, all having uncolored maggots, nevertheless forming a heterogeneous assemblage. The author has evidently considered that these maggots, because they lack colored armature or chitinization for the protection of the integument in the open, are necessarily deposited on the body of the host. But there is a considerable class of hosts to which the fly is denied access, due to the nature of their habitats within substances that the fly can not penetrate. Such are wood-boring grubs within the trunks of trees, white grubs and others beneath the surface of the soil, weevil grubs and others within the various fruits of plants, borers and miners within the fleshy parts of plants, and various other protected hosts of a similar nature. The ingenuities of parasitism have triumphed over the isolation of these hosts, and the flies deposit their maggots as near to them as they are able to approach, leaving the rest to their progeny. The maggots reach the hosts for themselves either by penetrating the soil, following the galleries of borers, or burrowing into the substances of plants and their fruits, in short following the hosts where the flies cannot enter. As these maggots are not exposed to open conditions they do not need integumental specialization. Thus certain of the forms here grouped by Pantel, as for instance *Leskia aurea*, do not necessarily larviposit on the host. The true dexiine flies exhibit the largest number of forms parasitic upon hidden hosts, such as white grubs, woodborers, and weevil grubs in various pods, nuts, and fruits.

Pantel's consideration of the rôle of the maternal organs in intrauterine incubation is of interest. He considers the possibility of the tubular glands functioning as suppliers of nutriment, and the possibility of an osmotic supply through the walls of the uterus from the maternal blood. I believe that both of these methods may occur in the case of *Glossina* and other forms that carry the maggot through one or more stages in the uterus, but I do not think they occur during the development of the embryo. The uterus probably acts merely as a mechanical container during the latter period. The nutritive supply which provides for the development of the ova in the ovarioles must be derived either directly or indirectly from the blood, perhaps through the fat-body; once formed and fertilized, the egg probably contains all the elements and nutritive supply necessary for the full development of the maggot.

Group VII.—Species introducing into the body of the host, by means of separate instruments of perforation and injection, naked maggots or maggots in choria. This is the group of *Compsilura* and its allies, having the habit of subcutaneous larviposition. It is a very natural group, but with only the taxonomic rank of a tribe. I am inclined to consider it a group-unit of the subfamily Phaniinæ. In addition to *Compsilura* and *Dexodes*, Pantel gives here *Vibrissina demissa*. I can add *Eucelatoria* and American species of *Vibrissina* or closely allied forms, besides *Phorocera doryphoræ* Riley, whose generic reference is yet in doubt.

We are indebted to Pantel for first correctly defining and figuring the peculiar structure of the larvipositor and piercer in *Compsilura concinnata*. I have verified his results in a dissection of *Eucelatoria australis*. The piercer and larvipositor are separate structures, the latter fitting so closely into the base of the former dorsally and being so little chitinized ventrally as to obscure its form. There are heavy, thick muscles at the base of the piercer which move it, these being attached to the last ventral plates. The walls of the end of vagina possess muscles also for injecting the maggot. The larvipositor is a tapering tube, the main chitinized part forming the roof, the rest being membranous, with only a narrow longitudinal chitinous piece or rod forming the floor support and keeping the tube stretched properly below. The larvipositor is everywhere thickly studded inside with short, sharp spines or spine-like tubercles, which show conspicuously through the membranous portions and are for insuring the exit of the maggot, as they all point posteriorly. The propulsive force is furnished by the vaginal muscles.

The tip of the larvipositor certainly enters the puncture in the skin of the host made by the piercer. The piercer is grooved on its upper surface, the larvipositor lying in this groove. The upper or main chitinous portion of the larvipositor is rather sharply pointed at tip to insure entrance within the puncture, the tip of the ventral supporting rod of the membranous part less so, these two pieces doubtless not opening or separating at their tips until both are well within the puncture, their separation in that position opening the tube for the proper egress of the maggot therefrom within the skin of the host.

I find no mention by Pantel of the peculiar spinigerous ventral carina of the female, characteristic of all these forms, which appears to be primarily adapted for preventing the skin of the host from slipping forward during the forward thrust of the piercer, this action at the same time facilitating the opening of the puncture as widely as possible. The spines of the carina are directed posteriorly. The posterior part of the carina also receives and protects the sharp point of the piercer, the latter being so perfectly introduced within it and approximated to the fifth ventrite during a state of rest that it becomes almost invisible, even on close inspection with a lens.

Group VIII.—Species introducing naked maggots or maggots in choria into the body of the host by means of a combined instrument of perforation and injection. *Cercomyia curvicauda* is cited as the sole representative of this group. It is stated to have a uterus and maggots very similar to those of *Compsilura*, with the eggs and maggots in single file in the uterus. The terminal apparatus of the female abdomen is believed to signify subcutaneous larviposition by means of a slender organ which acts at the same time as piercer and injector.

Group IX.—Species deprived of incubating apparatus, but provided with chitinous ovipositor of variable form, apparently for introducing the undeveloped eggs into the host. The author here places three subgroups, the first including *Alophora*, *Hyalomyia*, and *Xysta*; the second comprising the Conopidæ, and the third doubtfully including *Ocyptera*. The Conopidæ are taxonomically outside of our subject, but their probable possession of such habit is of much interest. They are simply grouped here by the author for convenience of treatment from a parasitic point of view.

A dissection of *Alophora* which I made in 1908 suggested to me the very possibility here outlined by Pantel, that of subcutaneous oviposition. I have mentioned in my last paper that the female possessed in this case a piercer-like organ curved in the opposite direction from that of *Compsilura*. The eggs were undeveloped. Not having opportunity to dissect further material so as to demonstrate conclusively the uterine characters, I have been loath to advance the theory of subcutaneous oviposition. Pantel, however, has carefully dissected *Alophora*, *Hyalomyia*, and *Xysta*, and pronounces them without incubating uterus, thus excluding the possibility of larviposition. This being the case, it seems quite evident that subcutaneous oviposition is here the habit, since, as the author points out, the eggs are totally unadapted for external attachment to the host. Pantel deserves the credit for first suggesting if not establishing the existence of this type.

I can add that *Hemyda aurata* and *Penthosia satanica* both appear to have the same peculiar eggs, and I believe it probable that both have a subcutaneous oviposition habit.

I do not think that *Ocyptera* comes here. A female which I dissected in 1908 exhibited a uterus containing elongate eggs, some of which showed developing maggots.

It seems hardly possible that *Alophora* and *Hemyda* can belong to the same subfamily. I believe that *Alophora* is to be grouped with *Phasia* in the Phasiinæ, notwithstanding the very diverse reproductive characters of the two. *Hemyda* and *Cercomyia* I consider members of the subfamily Phaniinæ, in which I am also inclined to include *Compsilura* and its allies. All three, however, have certainly much affinity with the pseudodexiine and pyrrhosiine types, which I unite in the subfamily Pseudodexiinæ.

Group X.—Species depositing on the host a pediceled egg in which the maggot is already well developed. The author cites *Parexorista cheloniæ* as the sole representative. Nielsen has shown in his last paper (1911) that *Carcelia* has the same egg. Pantel considers both species as *Carcelia*, but it seems to me that *cheloniæ* is generically distinct on adult characters if not on others.

This group I consider as forming a tribe of the subfamily Hemimasiceratinæ.

It seems quite certain that normally the egg is not deposited until the maggot is well advanced in development, as with *Gastrophilus* and *Hypoderma* among pediceled-egg forms and *Meigenia* and *Thrixion* among flat-egg forms. But we noted positively at the Gipsy Moth Laboratory that both *Parexorista cheloniæ* and *Carcelia gnava* deposited undeveloped eggs, which I must consider exceptional.

A number of species of uncertain reference are mentioned by Pantel, which are of interest. They are as follows:

Ceromasia florum the author thinks may belong with *Blepharidea* in his Group VI. He had only undeveloped females for dissection. A dried specimen dissected by me, determined as this species by Brauer and von Bergenstamm, showed yellow microtype eggs. It thus belongs in Pantel's Group II, with the leaf-ovipositing forms.

Exorista westermanni the author believes to possess a microtype egg, and to have similar characters to *Frontina*. I hope that someone will soon dissect the type species, *crinita* Rdi., and thus establish the status of the genus *Exorista*. I have found the most widely divergent reproductive characters —flattened-oval macrotype eggs deposited on host, microtype eggs deposited on leaves, elongate maggots developing in uterus and deposited naked or in choria on or near host—in specimens which possess the external characters ordinarily considered as defining the genus *Exorista*. *Phorocera* similarly needs establishing on its type species *cilipeda* Rdi., which probably has a microtype egg. *Masicera* is already established as a microtype-egg form. These three genera, as commonly determined on external characters, show all three forms of reproductive habit above outlined. *Sturmia* is another mixed-reproduction genus, as heretofore accepted, but its type, *pupiphaga* Rdi., has been shown by Pantel to have the microtype egg, and thus its status is now established. Brauer and von Bergenstamm came nearer to separating these forms correctly on external characters than anyone else, and Coquillett came farthest from it.

Microphthalma europæa is mentioned by Pantel as having a very long, irregularly coiled, and convoluted uterus containing elongate irregularly disposed eggs. I have already published the fact that these develop in the uterus to very hairy maggots.

Psalida (*Leucostoma*) *analis* the author refers to his Group IX along with *Alophora* and *Xysta*. I believe that it falls in the Phaniinæ with *Hemyda*, *Penthosia*, and allies. I have noted the remarkable mandibuliform pincers of the female, but have not had material available for dissection.

Siphona cristata is referred to the author's Group VI. Dufour observed that it has an incubating uterus. It is remarkable as possessing only two spermathecæ.

Sturmia atropivora is referred also to Group VI. It is not a *Sturmia*, but has elongate macrotype eggs and probably deposits maggots. It was designated by Mik as the type of his genus *Zygobothria*.

The extremely interesting and instructive details of parasitism and host reaction detailed in Chapters II to IV are outside the province of this review, which is intended only to correlate the work of Pantel and Portchinski with the results so far secured by myself in the investigation of reproductive and early-stage characters that will indicate relationships.

Finally, the author advises me by letter that Kolodkovosky announced in 1909 the discovery of a second pair of glands arising from the vagina, but in what form or forms he does not state. I have not seen Kolodkovosky's paper. Pantel adds that he has not been able to find any indication of such additional glands in his dissections, and I can add that I have not met with any sign of them in my own work.

In this same connection it is fitting to refer back a full quarter century to J. Portchinski's work on necrophagous and coprophagous muscid larvæ published in 1885, and reviewed by Osten-Sacken in 1887, in the Berliner Entomologische Zeitschrift. Several most important points in the reproduction of groups of Muscidæ are there brought out.

Cynomyia, type *mortuorum*, long classed with the Sarcophagidæ and even continued so to the present day by many authors, was shown by Portchinski to belong unmistakably to the calliphorine flies. Its maggots are almost identical with those of *Calliphora*, it is oviparous, and evidently lacks uterus. It thus goes in the subfamily Calliphorinæ.

The reproductive habits in the important subfamily Mesembrininæ are well set forth by Portchinski. *Mesembrina*, type *mystacea*, deposits on dung not over two dozen large eggs, which are 4 mm. in length. These eggs, which look more like small pupæ, hatch in about twenty-four hours into maggots with anal stigmata characteristic of the first stage. These, Portchinski states, shortly change directly to the third stage, entirely omitting the second stage, the stages being identified on the characters of the anal stigmata. The maggot period is very short.

Metamesembrina, type *meridiana*, is larviparous, depositing large maggots in dung. It was investigated in the Crimea. A female was found to contain a large maggot 3 mm. long, and alongside of it an egg of the same size. It was not followed further apparently, but probably has the same habit as *Dasyphora* next to be considered.

Dasyphora, type *pratorum*, was found to have a remarkable style of reproduction, then for the first time made known outside of the *Pupipara*, and thus announced before this habit was known to exist in *Glossina*. One large egg at a time is retained in the uterus, and not only is it developed to the maggot, but the latter is carried through its first and second stages in the uterus and deposited in its third stage on dung. It feeds to some extent before pupating, thus differing from the deposited maggot of *Glossina*, which is said to feed not at all outside.

Here then are several types of reproduction in the subfamily Mesembrininæ, and the most specialized showing a remarkably close approach to that of the tsetse-flies, *Glossina* and perhaps *Glossinella*, which I have considered a group of the subfamily Muscinæ, but which may yet prove to be more closely related with the Mesembrininæ. At all events it is well established by Portchinski's work that the mesembrinine flies, unlike the calliphorine, possess a true or incubating uterus.

Remarkable indeed are the results secured by Portchinski in his investigation of *Musca corvina*, which show beyond doubt that this species is not congeneric with *Musca domestica*. It becomes necessary to found a new genus for its reception, and *Eumusca* is proposed for it in this paper. Moreover the form is indicated as belonging with the Mesembrininæ rather than with the Muscinæ.

Eumusca corvina was found in the north of Russia to deposit not over two dozen large eggs on dung. These eggs are about 1.5 mm. long, not including an elongated curved appendage about two-thirds as long as the egg proper, which acquires a dark color before hatching. The hatched maggot is first stage, and it transforms directly to the third stage, omitting the second stage, in the same manner as *Mesembrina mystacea*. In the south of Russia this species was found to breed in exactly the same manner during early spring and rarely in summer, but almost exclusively in summer it was found to have a different style of egg, lacking the appendage and like that of *Dasyphora*, but proportionately much larger, which it hatches in the uterus, and further carries the maggot in uterus to third stage, omitting the second stage entirely, as before, and practically in this point only differing from *Dasyphora*. I am inclined to believe in Portchinski's observation that two species are not mixed here, but I cannot suppress a strong doubt due to the total difference in the egg. I might admit oviposition under cool conditions and larviposition under warm conditions in the same species, perhaps, provided the form of egg were similar in both cases, and this of itself seems a great deal to assume in these flies. But with the difference in the eggs it seems almost insuperable. Yet the muscoid flies have specialized in all sorts of directions to an extent hardly to be dreamed of by those who have not paid great attention to their study, and for this very reason I do not dare to denounce any observation, however extraordinary, without the most thorough investigation beforehand. The extreme similarity of the two forms in the adult proves nothing, as we know. Thus there is a very large possibility that two forms are confused here, and that the females believed to be *Eumusca corvina* and which carried the maggot in uterus to the third stage, are a distinct form that appears in the south of Russia only after warm weather sets in. *Eumusca corvina* is known to be a northern form of boreal tendency, and is not recorded to my knowledge from more southern regions than central Europe, except in the present instance and excluding a doubtful Egyptian record, but if so the southern form may just as well be distinct. Robineau-Desvoidy describes three species in his posthumous work which were so similar to *corvina* that he acknowledges himself uncertain as to their distinctness. One of these might easily be the Crimean and Caucasian form observed by Portchinski as carrying the maggot to the third stage in the uterus. The fact that this form omitted the second maggot stage in utero, on the contrary, makes it possible that both were the same. At all events, *Eumusca corvina* is established as possessing an incubating uterus, and is thus entirely distinct from *Musca*. I believe that it forms a connecting link between the Muscinæ and the Mesembrininæ.

Portchinski further found that *Pyrellia serena* and *Graphomyia maculata* deposit a small number of large eggs, which he states not to exceed 44 in number. Both evidently belong to the Mesembrininæ.

Myiospila meditabunda and *Spilogaster angelicæ* lay not over two dozen large eggs, while *Spilogaster divisa* and *Hylemyia strigosa* are viviparous. The egg of *Myiospila meditabunda* at least has the curved appendage noted in the deposited egg of *Eumusca corvina*. The maggot of *Hylemyia strigosa* develops singly, rarely two at a time, in the uterus and is deposited in its first stage, but as a very large maggot which passes rapidly through its second and third stages. These are all coprophagous and seem to belong in the Anthomyioidea, but may yet prove to have greater affinity with the Muscoidea.

Portchinski also states that what has been called *Dasyphora lasiophthalma* deposits eggs. It is therefore not *Dasyphora*, and may be called *Eudasyphora*. Most of the species of *Hylemyia* deposit eggs, and if the type species, *strenua* R. D., is among these then *strigosa* will need a new generic name. I am perfectly aware that coprophagousness tends toward viviparousness, as witness the case of *Chironomus stercorarius*, now referred to *Orthocladius*, which is coprophagous, and one of the few viviparous Nemocera. Other coprophagous Nemocera, however, appear to retain the habit of oviposition. In any event, such wide deviation in reproductive habit implies at least generic distinctness, if not tribal.

Portchinski's work marks an extremely important epoch in the progress of muscoid investigations.

I give below formal announcement of the new genera mentioned in the preceding remarks, with their type species.

Euxysta, nov. gen.

Proposed for *Xysta semicana* Egger in the sense of Pantel (1910). Believed to deposit flattened oval macrotype eggs on host.

Ceromasiops, nov. gen.

Proposed for *Ceromasia rufipes* B. B. in the sense of Pantel (1910). Deposits small black microtype eggs, presumably on plants but almost certainly on food of host. Has presumably an elongate uterus. Forms have been recorded under this specific name as reared from Forficulidæ.

Myxexoristops, nov. gen.

Proposed for *Myxexorista pexops* B. B. in the sense of Pantel (1910). Deposits large slate-gray microtype eggs, presumably on plants. Has a shortened uterus and a less number of ovarioles than the forms with more elongated uterus.

Eumusca, nov. gen.

Proposed for *Musca corvina* Fab. in the sense of Portchinski (1885) for his egg-depositing form, whose enlarged eggs are provided with an elongated curved appendage and deposited evidently after having been incubated in the uterus.

Eudasyphora, nov. gen.

Proposed for *Dasyphora lasiophthalma* in the sense of Portchinski (1885). Deposits eggs.

HOW EMPHOR DRINKS.

On August 19 I was collecting insects in the marshes of the Eastern Branch, on the outskirts of Washington. At the edge of the marsh some large holes had been dug, apparently to furnish drinking-water for cattle. On approaching one of these water-holes I found large bees rapidly descending directly to the water-surface and others rising from it. The bees alighted unhesitatingly upon the water and rested upon the water-surface with legs spread wide and the wings folded upon the back. In this position the bees usually remained about ten seconds; the proboscis was in contact with the water and they were evidently drinking. New individuals were constantly arriving and sometimes four or five bees rested upon the water-surface at one time. All the visitors appeared to belong to one species, which Mr. Crawford has kindly determined as *Emphor bombiformis* Cresson.

FREDERICK KNAB.

Meeting of May 4, 1911.

The 250th regular meeting of the Society was entertained May 4, 1911, in the Saengerbund Hall, by Mr. Frederick Knab, Vice-president Quaintance presiding, and Messrs. Banks, Barber, Crawford, Dyar, Gahan, Gill, Hopkins, Howard, T. H. Jones, Knab, McAtee, Myers, Rohwer, Sasscer, Sanford, Scott, Viereck, Webb, and Zimmer, members, and Messrs. O. G. Babcock, Heinrich, Snyder, and Tracy, visitors, present.

The minutes of the previous meeting were read and corrected.

Dr. Hopkins proposed the name of Mr. ~~W.~~ T. E. Snyder, of the Bureau of Entomology, for active membership, and a motion to suspend the rules and instruct the Secretary to cast the affirmative ballot of the Society for Messrs. Cory and Snyder was carried.

The Society greatly appreciated the extracts from the forthcoming book on the house-fly which were presented by Dr. Howard as the first paper of the evening. A lively discussion followed between Messrs. Quaintance, Hopkins, Banks, Gill, Knab, and Howard, emphasizing the economic importance of the fly question (the estimated annual loss in United States being about $10,000,000 plus perhaps $100,000,000 loss in efficiency), the excessive abundance of flies in the temperate regions, and relative scarcity in the tropics (tropical India perhaps being excepted), and their ability to breed in any fermenting organic material.

—Mr. Banks presented his paper on the tendency towards posterior erythrization in Psammocharidæ.[1] This was discussed by Messrs. Quaintance, Howard, Rohwer, Knab, Gahan, Gill, and Banks.

—Mr. Snyder gave a note on the finding of the true queen of *Termes flavipes* Kol.,[1] and mentioned the finding of other insects among their galleries. Mr. Banks made some brief remarks on the two local species of termites, spoke of the great difficulty in finding the real or supplementary queens, and of some of the differences between them.

[1] Not presented for publication.

—The last paper of the program was a review of "Dr. Lutz's studies of Brazillian Simuliidæ," by Mr. Knab. The habits of the local species of this genus and of some of the more peculiar species of other states were discussed by Messrs. Howard, Banks, McAtee, and Knab.

DR. A. LUTZ'S STUDIES OF BRAZILIAN SIMULIIDÆ.[1]

By Frederick Knab.

The two papers by Dr. Adolpho Lutz on the Simuliidæ of Brazil constitute by far the most thorough study that this interesting and economically important group of Diptera has thus far received. It marks a decided advance in our knowledge of the group, particularly from the systematic standpoint, and the thoroughness and industry of the author make his work convincing. It is, moreover, gratifying to find that Dr. Lutz is not a systematist of the old school, but approaches his subject from every side. He gives full value to the data obtained from the early stages and biology, coordinating them with the characters of the imagos, at the same time carefully considering the possible sources of error.

Dr. Lutz's first paper may be called a preliminary study, based almost wholly on the imagos collected by himself in São Paulo and in the vicinity of Rio de Janeiro. It opens with a general consideration of the group biologically and structurally, and this is followed by a systematic study of his material. The second paper is principally systematic and is based upon painstaking studies of a very large material accumulated after the first paper had gone to press.

Before discussing the systematic portion it seems worth while to give some of Dr. Lutz's more interesting biological observations. In a general way the habits of the Simuliidæ are pretty well known and the group is so homogeneous that we can expect little that is novel even from a good observer in another part of the globe. However, some of Dr. Lutz's observations on the habits of the imagos are of interest and should be suggestive to other observers. This is particularly the case with the feeding habits.

[1] Contribuição para o conhecimento das especies brazileiras do genero "Simulium". Beitrag zur Kenntniss der brasilianischen Simuliumarten. Memorias Inst. Oswaldo Cruz, vol. 1, no. 2, pp. 124–146 (1909).

Segunda contribuição para o conhecimento das especies brazileiras do genero "Simulium". Zweiter Beitrag zur Kenntniss der brasilianischen Simuliumarten. Mem. Inst. Osw. Cruz, vol. 2, no. 2, pp. 213–267, pls. 18–21 (1910).

Dr. Lutz thinks that the females of all the species observed by him suck blood and that they require this food for the development of the eggs. He finds, however, that the different species behave very differently in this respect, some showing a preference for man, others for horses or other animals. Dr. Lutz found that only one species is at all troublesome to man and on this account he identifies it with the otherwise unrecognizably described *Simulium pertinax* of Kollar. Coquillett pronounced this form identical with the North American *Simulium venustum* of Say; Lutz tentatively accepted this synonymy, but rejected it in the second paper. This form is found in great abundance throughout the coast ranges of the states of Rio de Janeiro and São Paulo. Lutz states that in behavior it resembles somewhat the yellow-fever mosquito (*Aëdes calopus*), being at the same time aggressive and wary. It constantly hovers about a person, but only attacks in unguarded moments, so that by many the fly and the bite are not associated, particularly as the resulting irritation does not become apparent at once. As already stated, other species show a distinct preference for animals other than man. Thus what he calls alternately *Simulium albimanum* and *S. nigrimanum* will hardly attack man in the presence of horses. In attacking these it mostly selects the orbital margins of the eyes, where the sucking females often form a complete ring.

A remarkable circumstance noted by Dr. Lutz is that certain species behave differently in different localities or at different altitudes. Along the railway between Santos and São Paulo, when the train stops at the stations at the foot of the slope, *Simulium pertinax* regularly enters the cars and attacks the passengers. It shows a marked preference for very small children, as becomes apparent by the crying of these, often inexplicable to their parents. However, at the city of São Paulo, lying at an altitude of 700 to 800 meters, Dr. Lutz found that what he considered to be this same species does not show the least tendency to attack man, even in close proximity to its breeding-places. Dr. Lutz does not think that this difference in behavior is due to difference in altitude or temperature and he points out that he has found *Simulium rubrithorax* and *S. montanum* still attacking man at the height of 1,500 meters. Likewise *Simulium perflavum*, which is common in São Paulo, there ignores man altogether, while Dr. Lutz has received blood-filled specimens from a remote locality. Lutz seeks to account for these differences in habits, which he claims to have observed also in certain mosquitoes, in that these forms in such localities were accustomed to obtain their blood-supply from other sources. He states that *Simulium pertinax* molests not only horses but also dogs and probably other domestic animals and that originally all the species must have depended upon native animals, particularly the larger mammals. The assumption of such diversification of habits in the same species is hardly in accord with the specialization of the different species in this respect, which Dr. Lutz himself sets forth. The reviewer is inclined to think that such differences in behavior may be due to the fact that similar species have been confused. This view is given some support by the fact that Dr. Lutz, after more careful study, narrowed his specific concepts and increased the number of species. Therefore it will be necessary to readjust his observations on the feeding habits from this new viewpoint.

In the second paper we have some additional notes on the biting habits. We find here the interesting statement that most of the species found in a given region, including those which do not molest man, can be captured on horses and mules if one seeks on the proper parts—the belly and inside the ears. Thus certain species almost exclusively infest the interior of the ear and their presence results in an eczematous condition of the skin, from which, in some localities, all horses and mules suffer. Even when no blood-sucking insects are in evidence a few well-filled individuals often may be found inside the ears. On the belly the *Simulium* settle mostly near the median line and not far from the hind legs; in lesser numbers the same species go to the breast, between the fore legs and near them. Still other species swarm about the mane and penetrate among its hairs.

None of the Brazilian species are a menace in any such degree as has been reported with *Simulium* in Hungary and North America; but they are sufficiently troublesome to cause man to avoid certain regions and their bites often help to produce ulcerating swellings.

The Simuliidæ are not, strictly speaking, diurnal. While a few individuals are in evidence throughout the day, *Simulium* is nevertheless adjusted to a certain strength of light. They are most abundant shortly before twilight. However, the number of individuals of the different species at this time by no means corresponds in every case with the abundance of their larvæ and pupæ in nearby breeding places. Lutz states that sometimes *Simulium* of both sexes are found at considerable distances from their breeding-places, their presence being clearly traceable to the direction of the wind.

Systematically Dr. Lutz's papers are of greatest interest. They demonstrate in a striking manner how very different are the results when a group is studied intensively. In the first paper Lutz did not depart from the traditional methods of the systematist and worked with the characters which had been generally employed in the differentiation of the species. In the second paper he takes into consideration the early stages, particularly the pupæ. These last he finds have very definite and reliable characters and they show very clearly that the number of species is much larger than was indicated by the study of the imagos alone. In the first paper Lutz was able to recognize only ten species and one variety; in the second paper, it is true with a much larger material, he differentiates no less than twenty-nine species.

To the degree then, in which the material increased and the perception was sharpened, an increasing number of new species had to be differentiated. The separation of many which are very similar is connected with great difficulties and soon it became apparent that, in consequence of slight variations and imperfections of some specimens, a differentiation based upon size, color, and markings could not be carried through. Rather, in searching for better anatomical differences, the microscope had to be constantly employed; hand-lenses prove themselves inadequate, as strong magnification is often necessary. Only through entirely disproportionate labor and countless microscopic examinations was I able to obtain the present results, still incomplete in some respects.

The employment of the early stages in the differentiation of species of *Simulium* is not new, but Dr. Lutz appears to be the first one who has carried such studies through on a large scale and in a logical and thorough manner. The following elucidates Dr. Lutz's methods in working with the early stages:

Generally in waters which are suitable for breeding several species commonly occur associated, which makes more difficult the differentiation in the separate larvæ. Although apparently the body coloration of some species is constant throughout their entire development and can be employed to a limited degree, one must take into consideration that the filled alimentary canal shows through and that the coloration of its contents is subject to great variation. The mental plate shows but insignificant differences in most of the species, and moreover in preparations but seldom assumes an entirely favorable position. Therefore in determination one best holds to individuals which are already near the last moult and show a dark spot on both sides near the head, produced by the respiratory appendages of the pupa showing through the skin. It is true that these tubular structures are crowded into a small space and their ends folded over or coiled spirally; they can, however, be dissected out pretty readily and unfolded far enough so that one can recognize the type of branching. The hairs and hooklets of the pupa are visible without further trouble and one even discerns the rudiments of the legs, however without the later coloring. The branching of the gill-tubes is constant in each species and nearly always suffices for the recognition of the species. When an unknown species is concerned one selects suitable pupæ which contain a fully or nearly mature imago, which is easily recognized. One can then again dissect these out and use them for determination. In this manner, with sufficient patience, one obtains clews which are the more valuable, as even species of which the imagos are very similar are plainly distinct in the pupa stage.

Lutz considers the gill-appendages on the thorax of the pupæ of the first importance in specific diagnosis.

These consist of an outwardly closed system of branched tubes which show somewhat irregular and indistinct rings or spiral threads, generally to near their bases, on account of which they somewhat remind one of tracheæ. Only in *Simulium botulibranchium*, n. sp., they are entirely without rings, but chagreened with the finest scale-spines, like the basal portion of the other species; nevertheless they also are branched, but their entire form is so distinct and apparently irregular that they are comparable with no other species.

In all the other species examined by Lutz the number and arrangement of the branches was found to be a constant and reliable character. Among hundreds of pupæ he found only one in which a branch was obsolete on one side, and this he considered an abnormality. Only when the number of branches reaches near twenty is there some fluctuation, and moreover counting them then becomes difficult. Lutz discusses at some length the various details of structure of these appendages and their range of variation. As of minor significance he calls attention to the numerous spines and hooks upon the abdomen. He thinks that a terminal pair of hooks which is present in some species may prove important. Anteriorly there are small discs covered with hair-like structures which he calls *trichomes*. These hairs are rarely simple or dichotomous; more frequently they are many-branched, and their structure is of some value. Many of the pupal characters can be made out even more satisfactorily on the empty pupa skin, which remains uninjured within the cocoon for a considerable time. Lutz finds that even the cocoons present a variety of types which are characteristic of species or group of species.

Dr. Lutz then discusses in detail the structures of the imago. He dwells at some length on the finer structure of the integumentary surface, which on the head and the thorax produces the spots of pearly luster, or the white incrustation and the like, which are constant for the species and therefore valuable for classification. One must, however, guard against poorly preserved specimens.

The palpi of the imago are generally considered four-jointed; only Schrottky indicates five segments. Lutz very rightly takes exception to this view. Lutz finds that in the species examined by him the basal segment is often partly or wholly divided by flexible integument and for this reason has been considered as two segments. Similar conditions occur in the Culicidæ, but they have not the deep significance which, *a priori*, one would be inclined to give them.

As in many other blood-sucking insects, the abdomen is capable of extraordinary distension. This is made possible in two ways. When unexpanded the abdomen is strongly folded, either longitudinally or transversely, The longitudinal folds are not present in all the species, although in many of them. Therefore they may serve occasionally as a distinguishing character. The folds are generally most plainly visible on the under side of the basal segments. These folds already are present when the imago is still within the pupa; therefore they are not due, as one might suppose, to shrinkage following extreme expansion. Transverse folds, like the bellows of a camera, are brought about by very deep constrictions between the segments. The margins of the segments, which are thus hidden in the contracted condition of the abdomen, are often lighter colored and become plainly visible when the abdomen is distended. Generally one or the other type of folds predominates, but also they can be developed equally.

Lutz states that the coloration of the body is fairly constant. Owing to the fact that the imagos issue from the pupa fully developed and ready to fly no immature specimens are met with. Still, there is some variation in certain species. Occasionally very dark specimens occur, which he thinks may be due to previous blood-meals. In some living specimens of *Simulium scutistriatum* he observed that after they had been fed with blood the entire body, inclusive of the legs, became considerably darker.

For the determination of species the character of the hair and scale vestiture has proved of the greatest value. However, Lutz protests against the possible employment of these characters to create genera or subgenera. Hairs and scales show a variety of intergrading forms which are only distinguishable under the microscope. Some species have broader scales upon the legs, mostly of lanceolate or spatulate form. They may be keeled or terminate in fine points and their appearance has suggested the term *petaloid*. When of light color these scales are best seen on dry specimens, while the dark scales become better visible in microscopic preparations. On the mesonotum the scales are always narrow and rarely petaloid; in the latter case, however, they extend onto the frons and clypeus and thus furnish a good character. Other characters are the grouping of the scales into rows or tufts. The scales of the legs may be already distinguished within the pupa when the inclosed imago is well advanced. As they are rather perishable good specimens always should be preferred and can be told by the presence of the thoracic vestiture.

The males are generally so much like the females that they can be associated without difficulty. They are always smaller and sometimes distinguished by livelier color-ornamentation and by hairier legs. Their claws are always three-toothed.

With the claws of the females careful and repeated examination is necessary, because the secondary tooth is not obvious and furthermore the projecting basal angle, or the tip of the other claw, can be mistaken for the absent tooth. The tooth is rarely absent, however, and on this account its presence or absence constitutes a good specific character.

Such painstaking work would result in discoveries anywhere; it is therefore not surprising that in a fauna as poorly known as the South American the majority of the species have proved to be new. Lutz, in his second paper, deals with twenty-nine species, and of these twenty-six are described by himself. Ten species, of which one is referred to the synonymy in a supplementary note, are described on pupal characters alone. They are forms of which the imagos are unknown or have not been associated. It should be noted that of the forms described in the imago the pupæ of all but seven are known.

As a result of Lutz's endeavor to identify his specimens with described species some synonymy has come about. Following determinations by Coquillett the names of two forms described from remote localities are introduced into his first paper, but abandoned afterwards. One of these is *Simulium montanum*, described by Philippi from Chile. The other one is our North American *Simulium venustum*, of which *S. pertinax* Kollar is made a synonym. Lutz was reluctant to accept this synonymy, as the occurrence of the same species in such widely separated localities seemed to him improbable; but he admitted in his first paper that he could not find good distinguishing characters between the Brazilian and North American specimens. In the second paper Lutz calls the Brazilian form *pertinax*; he states that owing to the great resemblance of the imagos of certain species the identity of forms from such widely separated localities can be considered established only by comparison of the pupæ. Lutz points out further that specimens sent to him from Washington as *venustum* do not agree with Johannsen's description for the same species and that there is every reason to believe that a number of species have been confused under this name by North American entomologists. *Simulium perflavum* Rouband was determined by Coquillett as *S. ochraceum* Walker, described from Mexico, but Lutz discarded this synonymy because his specimens would not agree with the description of Walker. The following synonymy results from Dr. Lutz's two papers:

S. montanum Lutz, 1909 (not Philippi) = *pernigrum* Lutz, 1910.
S. venustum Lutz, 1909 (not Say) = *pertinax* Kollar.
S. venustum var. *infuscata* Lutz, 1909 = *infuscatum* Lutz, 1910.
S. nigrimanum Lutz, 1909 (not Macquart) + "*albimanum*" = *orbitale* Lutz, 1910.
S. incertum Lutz (pupa) = *paraguayense* Schrottky.
S. hebeticolor Lutz = *simplicicolor* Lutz.

Lutz suggests the possibility of the following synonymy; this must not be considered established until more carefully investigated:

S. inexorabile Schrottky (? = "*venustum*" = *pertinax* Kollar.)
S. minusculum Lutz (? = *amazonicum* Goeldi).
S. æquifurcatum Lutz (? = *incrustatum* Lutz, var.)
S. diversibranchium Lutz (? = *infuscatum* Lutz).
S. spinibranchium Lutz (? = *subpallidum* Lutz).
S. botulibranchium Lutz (? = *distinctum* Lutz).
S. diversifurcatum Lutz (? = *subnigrum* Lutz. var.).
S. brevifurcatum Lutz (? = *auristriatum* Lutz).

A NEW SPECIES OF NORTH AMERICAN TINGITIDÆ.

BY O. HEIDEMANN.

Leptostyla clitoriæ, new species.

Body black, rather short, ovate, moderately elongate; fresh specimens somewhat pruinose on the underside; head black, in front two small, white spines converging, behind them a little black spur bent forward; at base of head between the eyes two other short white spines; bucculæ a little distended, yellowish, the edge somewhat upturned, uniseriate; rostrum yellow, reaching to the middle of mesosternum; metasternum transverse, flat; antennæ slender, the two basal joints dark yellowish, both together about as long as the fourth, which is black toward apex; the third joint yellowish-white, nearly three times as long as the terminal.

Thorax black, finely punctured; anterior margin and the hood whitish, the latter small, short, and oval, a little depressed near the tip with a sharp, black keel at top; lateral membranous margins narrow; white, with two rows of small cells, at base a few nervures black; the triangular portion of pronotum toward apex yellowish, reticulate; the three carinæ very feebly raised, whitish, uniseriate, continuing over the whole thorax.

Elytra ovate, somewhat elongate, considerably longer than the abdomen, feebly rounded near the base, moderately sinuate just behind the middle and rounded at apex; discoidal area and subcostal dark yellowish, or blackish with the nervures black, closely reticulated; the basal and median part of costal margins translucent, entirely white, with two rows of some large cells; a broad black band across the costal margins before the middle; the elytra toward the apex and the sutural area infuscated, except three or four very large areoles, which are translucent and whitish; nervures black. Legs yellowish-white, nails infuscated.

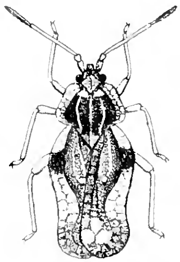


FIG. 4.—*Leptostyla clitoriæ.*

Length, 2.2 mm.; width across the widest part of the elytra, 0.8 mm.

Described from several specimens, males and females. Rock Creek, D. C., June 26, 1897 (Heidemann); Washington, D. C., August 9, 1910; Plummer's Island, Maryland, October 14, 1906 (E. A. Schwarz); Plummer's Island, Maryland, July 4, 1908; Rock Creek, D. C., September, 1901 (Heidemann). Columbus, Texas, March 8 (Collection Riley).

Type: No. 14241, U. S. National Museum Collection.

This pretty North American species has a striking resemblance to *Leptostyla constricta* Champ., described from Guatemala and Panama. It differs, however, in having the costal margins less sinuate behind the middle and the elytra not narrowing toward the apex; besides, it seems to be even smaller than Champion's species. At the present time the species is known only from this region and from Texas. It is found close to the ground on a small Leguminosæ, *Clitoria mariana*, from the month of June to October.

MEETING OF JUNE 1, 1911.

The 251st regular meeting of the Society was entertained in the Saengerbund Hall, June 1, 1911, by Dr. Howard, with Messrs. Barber, Crawford, Dyar, Ely, Foster, Gahan, Gill, Howard, Knab, McAtee, Myers, Quaintance, Rohwer, Schwarz, Snyder, and Walton, members, and Messrs. Baker, McDermott and Sanford, visitors, present.

The minutes of the previous meeting were read and corrected.

Mr. Schwarz moved that a meeting be held in July. Carried.

—The Secretary read a letter from Mr. Pierce, proposing the name of Mr. Thomas E. Halloway, P. O. box 559, Brownsville, Texas, as an active member. His election was moved, seconded, and carried.

—Mr. McAtee exhibited specimens of three species of galls from the bald cypress, which are extensively eaten by wild ducks. He also showed a female seventeen-year Cicada, to which a hind part of the abdomen of a male was still coupled, which had been caught in Arlington, some bird having probably been responsible for the tragedy.

—Dr. Gill then presented his interesting paper on taxonomic groups,[1] which was discussed by Dr. Howard and Mr. Rohwer.

—Dr. Howard spoke of the great uncertainty which had always existed regarding the biology of the cluster fly (*Pollenia rudis*), and stated that his attention had just been called

[1]Not presented for publication.

by Mr. Banks to an important paper by D. Keilin, which was of such very great and widespread interest that he presented a free translation, as follows:

ON THE PARASITISM OF THE LARVÆ OF POLLENIA RUDIS FAB. IN ALLOLOBOPHORA CHLOROTICA SAVIGNY.

By D. Keilin.[1]

Pollenia rudis Fab. is a very common fly in our regions, but down to the present time we have been ignorant of the conditions under which it lives and under which its larva develops.

I have been able to prove that this larva lives as a parasite in the general body cavity of *Allolobophora chlorotica* Savigny.

My first observations were made at the beginning of November, from material collected in the garden of the Laboratory of Evolution. At this time the larva lodged in the general cavity of the genital segments or in the interior of the seminal vesicles of the worm, is transparent, and hardly a millimeter long.

The larva bathes in the liquid of the general cavity of the host; it stays there all through the winter, and during that period grows very slowly. Its spiracles are probably closed.

A single individual of *Allolobophora chlorotica* can support from one to four larvæ.

Very often by the side of the living larva are to be found the débris of a destroyed larvæ, either the skin and the mouthpieces or simply the mouthpieces alone, and surrounded by amœbocytes.

The ensemble is constituted of brownish masses, which indicate a reaction of the host against the parasite. It is easy to follow all the stages of this trouble. The living larva is first surrounded by leucocytes, which form several layers and render the larva completely motionless. If this gang of amœbocytes is pulled away, the larva, formerly motionless, commences to move and to travel. Other larvæ have survived the beginning of a kind of digestion by the leucocytes. These are always spotted with yellow granulations. One finds the brown masses with the débris of larvæ either in the seminal vesicles or in the general cavity of the genital segments or in the general cavity of the terminal segment. From November until the middle of April there is no appre-

[1] Translated from an article in Comptes Rendus de la Société de Biologie de France, vol. 67, pp. 101-103, by L. O. H.

ciable change. The larvæ which have resisted the reaction of the host show no special modification, either in form or in size or in the position which they occupy in the body of the host. The number of parasites is quite large. In 107 worms dissected I found 74 parasitized by 87 larvæ.

Toward the end of April the larva is found in the general cavity or in the seminal vesicles or in the pharnyx, making a rupture by the mouth opening. From this time on, fewer and fewer larvæ are found internally and more and more in the mouth. The last are noticeably larger. Their head end is turned to the posterior end of the host, while their anal segments with their spines and two spiracles stick out. Under these conditions the worm can hardly move itself. If it is accidentally thrown out on the surface of the earth, it remains there, curled on itself; it cannot nourish itself; its intestine is empty, and the whole body becomes clearer and more transparent.

The contact of the larva of the fly with the walls of the mouth and the pharnyx of the host brings about an inflammatory reaction of the tissues of the worm, which results in the destruction of several of the anterior segments. During this time the larva of the fly increases, distending the body wall of the host, which gives the whole thing a characteristic aspect. When the larva has reached 10 or 12 millimeters in length, its transverse diameter is greater than that of the host. It rests then attached by the mouthparts and two or three anterior segments, which are plunged in the remains of the worm. During the period of this rapid growth the larva is plainly more active. Finally, it abandons the remains of the worm, burrows deep into the earth, and at the end of three or four days of free life transforms into a pupa. The imago issues at the end of thirty-five to forty-two days.

The mouthpieces of the internal larva and when it is in the pharnyx plainly differ. In the latter case the median unpaired piece is lacking, but the whole of the mouth armature has become more complex and resembles a typical structure of the fly larva.

The different series of spines, well developed on the skin of the internal larva, become less and less apparent, and finish by disappearing at the moment of pupation. The lines between the segments become less marked; finally the spiracles are very visible, and the respiratory apparatus begins to function.

It is undoubtedly the same larva which is at first an internal parasite and becomes afterwards external. I have taken, in fact, thirty individuals of the worm, each one having a larva in the general cavity;[1] I had placed them separately in earth previously sterilized; at the end of time varying with different individuals, I have noticed the presence of 25 larvæ of the pharynx; the other five had died.

I have not yet had enough material to find out the beginning of the life cycle; I have simply observed that the larva taken from the general cavity of the worm and placed by the side of the male genital orifice of another worm penetrated by this orifice at the end of an hour into the seminal canal and passed in that way into the general cavity.

Several other important questions remain to be solved. I have indicated only the principal lines of the observations which I have followed out.

These facts elicited a lively discussion by Messrs. Gill, Schwarz, Knab, McAtee, Walton, Rohwer, and Webster.

—Mr. Schwarz asked that his paper be postponed to the July meeting and that the remaining time be used in the exhibition of specimens.

—Mr. Barber exhibited live specimens of males and females of the malacoderm beetle *Phengodes laticollis* Lec.

—Mr. Rohwer asked if the various broods of the seventeen-year *Cicada* overlap in the same exact locality. Mr. Schwarz thought there were such records. Mr. Quaintance spoke of the remarkable local occurrence this year. Further discussed by Messrs. Gill, McDermott, Barber, Rohwer, Walton, and Schwarz.

—Mr. Rohwer also gave a note on the breeding of *Cryptus* from a nest of *Ancistrocerus birenimaculatus*.

—Mr. Knab spoke of the occurrence in America of the European beetle *Chrysomela staphylea*. Mr. Schwarz said this occurrence was known by the early Massachusetts entomologists, but has been lost sight of. He also compared its occurrence with that of *Tropinota hirtella* in that State. There is also a specimen of *Chrysomela staphylea* in the National Museum collection taken by Dr. L. Stejneger at Kluchavski in Kamchatka.

[1] The observations were made with a binocular, the worm being compressed between two plates; the transparency of the worm allowed all contents to be seen.

A NEW MYMARID GENUS AND SPECIES FROM NORTH AMERICA ALLIED WITH ANTHEMUS HOWARD.

By A. A. Girault.

The genus *Anthemus* Howard of the chalcidoid family Mymaridæ is represented thus far by but a single species which occurs in Ceylon. This species has never been retaken since its original description, and so far as I have been able to ascertain from the literature no other representative of the genus has ever been recorded or described. It is pleasing to me, therefore, to be able to describe the following allied North American species which I captured from the glass sides of a greenhouse on the campus of the University of Illinois, but which I think must be considered as typical of a new segregate of subgeneric or generic rank. This capture was made so casually that it goes far to show that our fauna as represented by the Mymaridæ must still be largely unknown and that a serious study of the group as it occurs in North America will still be amply rewarded.

Family MYMARIDÆ.

Subfamily Mymarinæ.

Tribe ANAPHINI.

ANTHEMIELLA, new genus.

The type species is described first, then the generic diagnosis given.

Normal position.

1. *Anthemiella rex*, new species.

Female.—Length, 0.50 mm. Minute but visible to unaided eye.

General color sooty black, marked with golden yellow as follows: The proximal half of the abdomen, margins of the eyes narrowly (lateral aspect), and a portion of the mesonotum caudad of the insertions of the cephalic wings (the mesoscutellum) to the metathorax. Thus, the body is black with a portion of the dorsal aspect of the mesonotum and the basal half of the abdomen contrasting and golden yellow. Legs dusky or smoky, nearly concolorous with the general body color, excepting the trochanters, knees, and tips of all tibiæ, which are yellowish; tarsi dusky, but the two intermediate joints somewhat lighter. Antennæ concolorous with the legs, the club and scape darker. Eyes ruby red. Fore wings hyaline, but their basal fourth distinctly fumated (out nearly to the end of the venation, the distal margin of the fumation concave). Venation dusky yellowish. Caudal wings lightly splotched with dusky.

With the general aspect of those species of *Anagrus* and *Anaphes* having slender bodies and more or less naked fore wings (for example, *Anaphes gracilis* Howard and *pallipes* Ashmead; *Anagrus io* Girault and *agilis* Enock). Body with a rather long thorax and a conic-ovate, sessile abdomen, the tip of the ovipositor slightly exserted and the valves sheathlike and acute at tip. Fore wings rather slender, with nearly parallel margins, practically naked, with only these discal cilia —a longitudinal but somewhat crooked line of about eight minute cilia near the caudal wing margin originating caudad of the distal half of the marginal vein just distad of the edge of the fumated area and a paired line of nearly similar cilia along the costal margin from apex of the venation to the wing apex or nearly (but the outer or cephalic line of cilia absent proximad, some distance distad of the apex of the venation). Fore wings not margined with dusky or yellowish. Marginal cilia of the fore wing long and slender, moderately fine, longest around the apex (especially caudo-distad), the longest cilia about twice the greatest wing width. Marginal vein narrow, long and straight, tapering off at apex, nearly as long as the very narrow submarginal and bearing two long, fine setæ from its surface. Caudal wings straight and narrow, their marginal cilia likewise long but that of the cephalic margin much shorter (moderately short), the marginal ciliation distinctly shorter than that of the fore wings, yet the longest (disto-caudad) are about four and a half times the greatest width of the blade of the posterior wings or somewhat longer. The blade of the posterior wings is devoid of discal ciliation excepting a paired line of minute cilia along the cephalic margin distad of the venation and a single short line along the caudal margin distad of the venation. The latter line does not extend by far half way out to the apex of the blade.

Tarsi 4-jointed, the joints moderate in length, the proximal joint longest. Tibial spurs single, minute, short, those of the cephalic legs longer, curved, fimbriate or provided with spines along its ventral side like *Signiphora* and forming a strigil.

Antennæ 8-jointed, somewhat abnormal, the distal or fifth funicle joint abruptly lengthened, appearing somewhat like a proximal joint of the club, the latter only a third longer than it and no broader yet very much larger than any of the other funicle joints. Scape slightly shorter than the club, moderately long; pedicel short obconic, longer and much wider than the first funicle joint; funicle joints 1–4 cylindrical, all longer than wide, increasing in length distad, joint 1 shortest, not much longer than wide, 2 a fourth longer, 3 slightly longer than the pedicel, twice the length of 1; joint 4 of the funicle a fourth longer than 3, somewhat more than twice longer than wide; remaining portion of antenna like a long, plainly and loosely divided two-jointed club but in reality composed of funicle joint 5 and a solid club. Joint 5 of the funicle about twice the length of joint 4 and nearly one and a half times broader, cylindrical ovate, two-thirds the length of the club and as broad. Club solid, long ovate, bearing several longitudinal grooves or sulci, nearly as long as the two preceding joints combined (funicle joints 4 and 5). Pubescence of antennæ very sparse, nearly absent. Body bearing a few scattered bristles but the legs in places more closely pubescent.

Male.—Unknown.

Described from a single female specimen captured in a greenhouse at Urbana, Illinois, August 28, 1911, in the afternoon (A. A. Girault).

Habitat: United States—Urbana, Illinois.

Type: Cat. No. 14232, United States National Museum, Washington. D. C., one female in balsam (mounted on a slide with *Westwoodella sanguinea* and a *Gonatocerus*, captured at the same time.

This species is unique for *Anthemus* Howard, as I find by comparing it with some descriptive notes taken from the type species of that genus. The unusually long distal joint of the funicle should make it easily known if care is taken not to confuse this joint with the club and thus consider the latter two-jointed. I do not believe that this is so, but only appears so at a first glance. In the type species of the genus the pedicel is distinctly much longer than any of the funicle joints, while the distal funicle joint is scarcely longer than the proximal one. The species *rex* differs so much in venation from the type species of *Anthemus* that I herewith propose the following new generic name for it (see above):

ANTHEMIELLA new genus.

(*Type*: *A. rex*, described in foregoing.)

A genus in most essential structures agreeing with *Anthemus* Howard, but differing in bearing a long marginal vein (only about twice longer than wide in *Anthemus*, here about seven times longer than wide); in having most of the funicle joints of the antenna as long as or longer than the pedicel and in bearing practically naked fore wings.

The separation of this segregate from *Anthemus* is not analogous to the separation by Enock of *Enasius* and *Erythmelus* of that author from *Anagrus* Haliday, since the two latter agree with *Anagrus* in *all* essential structures and differ only in habitus. *Anthemus* and *Anthemiella* are separated mostly on differences in venation.

SPECIAL MEETING OF JUNE 3, 1911.

A joint meeting of the Entomological Society of Washington and members of the force of the Bureau of Entomology, U. S. Department of Agriculture, was called to order at 4:20 p. m., Mr. F. M. Webster, President of the Entomological Society of Washington, in the chair.

The Chairman stated that the meeting was called for the purpose of taking action concerning the death of Frederick C. Pratt, a former member of the Society and for sixteen years an assistant in the Bureau of Entomology.

A letter from Mr. F. H. Chittenden was read.

Mr. E. A. Schwarz and Mr. L. O. Howard made remarks concerning the career and the character of Mr. Pratt, and, on motion, a committee on resolutions was appointed, consisting of Messrs. Howard, Banks, and Currie.

The committee presented the following resolutions, which were unanimously adopted:

Whereas, after a long decline, during which he maintained an indomitable industry and hopeful spirit, our colleague, Frederick C. Pratt, finally passed away at Dallas, Texas, May 27, 1911; and

Whereas, we all admired his ability as a collector and preparator and his broad knowledge of insect life, as well as his cheerful, helpful disposition; and

Whereas, many of us have profited by his valuable assistance in investigations of importance and have been impressed by his energy and resourceful mind; therefore be it

Resolved, That the Entomological Society of Washington and the force of the Bureau of Entomology of the United States Department of Agriculture deeply regret his loss and realize that his death has made a gap in our ranks which it will be difficult to fill. Be it further

Resolved, That we deeply sympathize with his surviving wife and children and that we authorize the sending of copies of these resolutions to them as an expression of this sympathy. Further

Resolved, That a memorandum of this action be published in the Proceedings of the Entomological Society of Washington.

L. O. HOWARD,
NATHAN BANKS,
R. P. CURRIE,
Committee.

Subsequent to this meeting the following obituary note, written by Dr. W. D. Hunter, was received:

FREDERICK C. PRATT.

Mr. Frederick C. Pratt, an assistant entomologist in the Bureau of Entomology, died at Dallas, Texas, on May 27, 1911, after such a fight against pulmonary tuberculosis as his physician states is very rarely equaled.

Mr. Pratt was born in London, England, on November 25, 1869, and was educated in the parochial schools of Chelsea. At a very early age he showed deep interest in entomology. When fourteen years old he became an assistant in the Insect Room in the British Museum and remained there for seven years. He then became curator of the Rothschild Museum at Tring, England. He left that position to come to the United States in 1892. When he arrived in this country Dr. C. V. Riley, who had become acquainted with him on one of his trips to England, took Mr. Pratt into the entomological service of the Department of Agriculture, where he remained until his death nineteen years later.

He was first employed as a preparator. The neatness and rapidity with which he did his work immediately caused him to be recognized as a very valuable man in the service. Later he did notable work in connection with the investigation of insects concerned in disease transmission. The character of this work is indicated by the following quotation from Dr. L. O. Howard's paper on the fauna of human excrement:

> To Mr. Pratt more than to any one else is due the large amount of material studied. Undeterred by the extremely disagreeable nature of the investigation and with a rare enthusiasm, he devoted himself indefatigably to the work during the summer of 1899, making collections and conducting rearing experiments. In the autumn Mr. Pratt developed a severe case of typhoid fever and was confined in the hospital for more than six weeks. This fact may be coincidental, but it is possible also that the fever may have been contracted as a result to his investigations.

About the same time Mr. Pratt made important contributions to the knowledge of mosquitoes in the vicinity of Washington. He was one of the first workers on this subject in the United States. Later he was engaged in the investigation of insects affecting truck crops. In this work he accumulated a large amount of information.

In 1905 Mr. Pratt became connected with the investigation of southern field crop insects. Soon after that date he was assigned to work on cactus insects In this investigation he did what was undoubtedly the best work of his life. In about two years time, despite interruptions necessitated by other work and by his rapidly waning health, he accumulated a mass of information regarding cactus insects that is perhaps as complete as that regarding the insects of any one plant. It was the intention to have the results of this work appear in a bulletin some months ago, but Mr. Pratt's rapid decline prevented this. The work is in such shape, however, as will allow publication within a few months.

The most notable characteristic of Mr. Pratt as an entomologist was his deep and sincere love for the science. He showed such enthusiasm in the collection, preparation, and study of insects as is rarely seen. It was always evident that he would rather be an entomologist than anything else. An equally striking characteristtc was his remarkably good memory for insects. As a matter of fact, this was only one indication of a generally highly developed power of recollection. His associates were frequently surprised at the accuracy of his recollection of faces, athletic records, train schedules, and miscellaneous matters, as well as of insects and their names. When he once saw an insect and learned its name, a picture of the species and its name seemed to be indelibly impressed upon his memory. This quality made him a compendium of entomological information in which anything that had ever come to his attention was certain to be found.

As a preparator Mr. Pratt was probably unexcelled. He took a great pride in the quality and the quantity of the work of this kind he could do. Its high grade may be judged from the plates in Dr. L. O. Howard's Insect Book, which were made from specimens reset and arranged by Mr. Pratt.

W. D. HUNTER.

Actual date of issue, September 30, 1911.

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OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON.

Volume XIII, No. 4.

OCTOBER - DECEMBER, 1911.

(Meetings of July 6, 1911, to October 5, 1911)

Published by the Society,

quarterly

CARLISLE, PA.   WASHINGTON, D. C.

1911.

Entered as second-class matter July 26, 1909,
at the post office at Carlisle, Pennsylvania, under the Act
of July 16, 1894.

THE
ENTOMOLOGICAL SOCIETY
OF WASHINGTON.

ORGANIZED MARCH 12, 1884.

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

Annual dues of active members, $3.00; of corresponding members, $2.00; initiation fee (for active members only), $1.00.

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PROCEEDINGS OF THE
ENTOMOLOGICAL SOCIETY OF WASHINGTON.

Published quarterly by the Society at No. 1 N. Pitt street, Carlisle, Pa., and Washington, D. C. Terms for subscription: Domestic, $2.00 per annum; foreign, $2.25 per annum; single numbers, 50 cents, foreign postage extra. Remittances should be made payable to the Entomological Society of Washington.

Authors of leading articles in the PROCEEDINGS shall be entitled to 25 separates of each contribution, free of charge. Additional copies may be had at cost by notifying the Publication Committee before the final page proof is returned to the printer.

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON.

VOL. XIII OCTOBER - DECEMBER, 1911 No. 4

MEETING OF JULY 6, 1911.

Mr. E. A. Schwarz entertained the special summer meeting of the Society in the Saengerbund Hall on July 6, and there were present Messrs. Barber, Busck, Cushman, Gahan, Gill, Heidemann, T. H. Jones, Knab, McAtee, Myers, Quaintance, Rohwer, Schwarz, Viereck, and Walton, members, and Messrs. Sanford and Wall, visitors (and also two other gentlemen whose names the secretary did not ascertain). First Vice President Quaintance occupied the chair.

The previous minutes were read and approved.

Under "Notes and exhibitions of specimens," Mr. Viereck started the discussion of the approximate number of insects by stating that the latest estimate seems to show that there are close to 75,000 species of described Hymenoptera, a third of this number being found in the Tenthredinoidea, Siricoidea, Vespoidea, Formicoidea, and Sphecoidea; about another third, comprising the Cynipoidea, Chalcidoidea, Proctotrypoidea, and Apoidea, while the remaining third belongs to the Ichneumonoidæ. This grand total evidently represents only a small percentage of species in this order, as the majority of the superfamilies continue to yield increasing numbers of new species as explorations are carried into fields and countries hitherto unexplored hymenopterologically.

Mr. Rohwer stated that the number of undescribed species of Ichneumonoidea was probably many times greater than the number of undescribed species of Vespoidea or Sphecoidea. The reasons for this are the lack of revisions of the Ichneumonoidea, and the difficulties encountered in placing the species in the genera to which they belong. The genera of the Ichneumonoidea are more closely defined than those of the other superfamilies in question, and the characters used in their classification are often difficult to understand.

Mr. Schwarz said that the Gemminger and Harold Catalogue of the Coleoptera of the World, published in 1868 to 1876, contained 77,008 species. Since then about 3,000 species have been added each year, making roughly nearly 200,000 species. The number of synonyms is, however, astonishing. The fauna is only tolerably well explored in Europe and in North America; elsewhere the work is very fragmentary, Australia being the only other country where a fair proportion of the smaller species are known. The next best known region is Central America, in which the collecting of the smaller species is practically the work of but one man, Mr. George C. Champion. The fauna of Africa is only "skimmed" for the larger species.

Mr. Knab remarked that the conception of the term "species" differed with different workers and would considerably reduce or increase the number, according to the standpoint taken. There are many species which are not so considered by systematists simply because they have no tangible characters for differentiation; yet when one studies these forms in nature it is clear that they have a separate existence and are therefore species in the final analysis. An example is found in the two forms of *Prionus imbricornis*, one a large, nearly black form inhabiting the forested regions of the East, the other a dwarf form of light color and restricted to the prairies of the Middle West.

Dr. Gill said the estimate given by Dr. P. L. Sclater in 1878 (Proc. Zool. Soc. Lond.) of all animals was something like 385,000.

—Mr. McAtee reported two interesting observations he had made at Big Lake, Arkansas, June 20–23, 1911, as follows:

There were three or four *Emesa longipes* on each window screen of the house in which I stayed at Big Lake, Arkansas. Mosquitoes would accumulate on these screens each evening and be eaten the next day by the Emesas. I picked up some *Anopheles* that had been sucked dry by the bugs.

On a rainy day a large number of *Anopheles quadrimaculatus* were found sitting on a spider web in a hollow tree. Thinking they must be at least slightly entangled, I counted on capturing them easily. Upon putting my cyanide bottle near one, the whole swarm rose lightly on the wing, not sticking to the web at all. By further tests I found they were perfectly at home on the web.

Mr. Knab mentioned a cecidomyid having a similar habit, but did not know its name.

—Mr. Gahan spoke of the nesting habit of *Xylocrabro stirpicola* Pack. in *Catalpa*.

Mr. Walton said he had collected the species in stalks of *Sambucus*, with a trypetid fly, *Eurosthia æqualis*, as host.

Mr. Rohwer stated that *Xylocrabro stirpicola* used at least five different species of flies as food for its larvæ.

—Mr. Schwarz gave in an informal way an account of his trip to the Isthmus of Panama as a member of the expedition sent out by the Smithsonian Institution to make a biological survey of the Canal Zone. He was on the isthmus from the middle of January to the middle of May. He gave a historical review of the entomological investigations made in Panama, commencing with the old "Herald" expedition in 1819, dwelling further on Col. Motschulsky's visit there in 1853, and his explorations at Bas Obisbo. Dr. John L. LeConte's crossing of the isthmus in 1850 and 1851 was mentioned, and the work of the explorers for the "Biologia Centrali-Americana" was commented upon. Finally the contributions to the knowledge of the insects of that region made by the officers of the Sanitary Department of the Isthmian Canal Commission and the results of the expeditions sent out by the Bureau of Entomology of the U. S. Department of Agriculture was commented upon.

Mr. Schwarz established his headquarters at Paraiso, which is situated on the Pacific slope, and here the bulk of his collection was made, but from this place nearly all stations along the old Panama Railroad were visited. A longer excursion of nearly four weeks' duration was made to Porto Bello, which is situated on the Atlantic Coast, about 22 miles east of Colon. Mr. Schwarz confined his attention to the Coleoptera and

Heteroptera, but he reviewed briefly the salient characteristics of the more important families in other orders as he observed them.

It appears that owing to its extremely pronounced dry season, which makes its influence felt throughout the whole width of the isthmus, as well as the deforestation of that region which has been going on since the building of the Panama Railroad, and finally on account of the operations of the Sanitary Department, the fauna of the Canal Zone proper is certainly less rich in species than the region to the east and west. At Porto Bello, where there is no dry season and where the rainfall is much heavier than on the Canal Zone, the insect fauna is correspondingly much richer in species and specimens.

Within the Canal Zone there are, of course, differences in the fauna at the various places; thus in the low, swampy woods which extend from Colon to Bohio, a large number of insects can be found which do not occur in other parts of the Zone; the sand and gravel bars of the middle Chagres River furnish many peculiar species, and so do the higher hills adjacent to the famous cut through the divide, known as the Culebra Cut. As a whole, the fauna of the Canal Zone presents a uniform character, excepting a narrow strip on the Pacific shore, where both flora and fauna differ radically from the rest of the Zone.

Since by far the greatest bulk of the Coleoptera and Hemiptera are arboreal species and show an immensely greater agility than our more northern insects, our accustomed implements for collecting proved very inadequate. The large collection made by him is not yet mounted and no especial notes could be given at present.

Finally, he remarked that in his opinion the future artificial lake, known as Gatun Lake, will not make a material change in the composition of the insect fauna of the region.

SPECIAL MEETING OF JULY 14, 1911.

A special meeting was held in Room 2 of the Bureau of Entomology to take action on the death of Mr. D. W. Coquillett. The meeting was called to order by President Webster. Several of the members present spoke of the character and work of Mr. Coquillett. A committee was appointed, consisting of Messrs. Banks, Currie, and Walton, to prepare a biographical sketch of Mr. Coquillett. The following resolutions were adopted :

Whereas, the Entomological Society of Washington has lost by death one of its former Presidents, Daniel William Coquillett; and

Whereas, Mr. Coquillett was one of the oldest members of the Society and had, by his painstaking work, particularly in the study of Diptera, done much to advance our knowledge of this group, and published largely in the Proceedings of the Society; and

Whereas, by reason of the very important work which he accomplished in economic entomology, notably the introduction and perfection of the hydrocyanic-acid gas treatment for the disinfection of citrus and other plants, perhaps the most important means of controlling scale insects known; and for the important part played by him in the colonization and establishment, in California, of scale enemies imported by Mr. Koebele, notably the *Vedalia cardinalis;* and

Whereas, his devotion to his work, his earnestness, and his uniformly kind and helpful character had gained him a high place in the esteem of the members of the Society; therefore,

Be it resolved, That in the death of Mr. Coquillett the Society has suffered a very great loss, and that the field of systematic Diptera has been deprived of one of its most prominent workers; and

Be it further resolved, That a committee be appointed to prepare a sketch of Mr. Coquillett's life, including a bibliography of his writings, for publication in the Proceedings of this Society.

DANIEL WILLIAM COQUILLETTE.

Mr. Coquillett (he always dropped the final e in his surname) was born on a farm at Pleasant Valley, near Woodstock, Illinois, on the 23d of January, 1856. He was the sixth child of Francis Marquis Lafayette and Sara Ann Coquillette, evidently of French origin. His education was at the country school, and later he taught there one or two terms. As a young man he helped his father on the farm and even at this early period was energetic in collecting, rearing, and studying insects. At first he gathered butterflies and moths and their larvæ, and would utilize his noon hour, after hastily eating lunch, to repair to the nearby woods, where he would secure larvæ, which he kept in small boxes. He bought books on entomology with all his spare money, and spent his evenings eagerly reading them. Many of his captures he sent to Prof. A. R. Grote, of Buffalo, for identification. He recognized the importance of studying the early stages of Lepidoptera, and drew up descriptions of the caterpillars, which were later published in entomological journals and reports. He was also interested in birds, and prepared and, with the help of his brother, privately printed (on a small hand press), a little book on "The Oology of Illinois," Woodstock, 1876. In this, besides the descriptions of eggs and nesting habits, are various observations on the insect food of certain birds. In 1880 he published his first paper on entomology, entitled, "On the early stages of some moths" (Canadian Entomologist, 1880, pp 43–46). He gave names to the lines and spaces on the caterpillar, and recognized the need of accuracy in describing the immature stages.

His articles brought him to the attention of Prof. Cyrus Thomas, then State entomologist of Illinois, who requested him to prepare an article on lepidopterous larvæ for publication in the annual report. Mr. Coquillett's article was published in the Tenth Report, and contained descriptions of the larvæ of 88 species, mostly bred by himself. The arrangement was entirely artificial, with analytical tables that would enable one to name the larva without a knowledge of the family.

The next year, although still residing at Woodstock, Mr. Coquillett was employed in various lines of economic work for Professor Thomas, mostly relating to the army worm.

His report on the army worm, published in the Eleventh Report of the State Entomologist of Illinois, definitely settled some doubtful points in the life-history of this insect.

For several years he had written replies to entomological questions in a local newspaper, the Germantown Telegraph.

In 1882 his health failed, perhaps from an attack of tuberculosis, and his parents took him to Anaheim, California, where he rapidly regained his health, and continued the collection and study of insects. He began to specialize in Diptera, especially the family Bombyliidæ, which were very abundant in Southern California. He sent many insects to eastern entomologists, particularly to Provancher and to LeConte and Horn. In 1893 Dr. Horn visited Mr. Coquillett and found, among other interesting material, that Coquillett had the sexes of a species of *Calospasta*, a discovery that overturned the previous classification of the Meloidæ. Mr. Coquillett had at that time a very good knowledge of Californian Coleoptera. He was also interested in the scale insects and published in a local journal an article on the species occurring in Southern California.

In 1885 Coquillett was appointed a field agent of the Division of Entomology of the United States Department of Agriculture, and (except for a brief period in 1886) was continuously connected with it till his death. It was during this short absence from the Department in 1886 that he began experimenting with hydrocyanic-acid gas as a remedy for scale insects, and perfected the methods of its use. These methods, improved in later years, are still the most reliable for destroying scale insects on citrus trees, and have been of enormous value to the orange growers of California. In 1887 he received from Mr. Albert Koebele the first shipments of *Vedalia* or *Novius cardinalis* and had charge of rearing them. So successful was he in this that in a few months there was an abundance of this ladybird for distribution, and the orange groves were soon free of the dreaded *Icerya* Mr. Coquillett's share in this, the most notable introduction of an insect enemy in the history of entomology, can scarcely be considered less important than that of Mr. Koebele.

During his California residence Mr. Coquillett published revisions of various genera in the Bombyliidæ and Asilidæ, and became well known as a dipterist.

In 1893 the system of field agents was abolished, and Mr. Coquillett came to Washington. He was employed in general economic work, being the first to study the San Jose scale in the East. Soon, however, he was detailed to study and identify Diptera, and in 1896 was appointed Custodian of Diptera in the United States National Museum, which position he held at his death.

His first important work on Diptera at Washington was on the Tachinidæ, perhaps the most difficult family in the order.

His pioneer work in getting our forms on a definite basis, in interpreting the many poor descriptions, and in presenting a workable synopsis of the family will ever be of the most lasting benefit to American Dipterology.

He was essentially a "lumper," very loath to divide a series of specimens unless the evidence was very strong. Adhering to the older ideas of specific values, he failed to recognize the slight differences between species in certain groups, and his summary treatment of the work of others soon brought him much criticism, which he bore with stoicism. Many times he was undoubtedly right, but he did not care to enter into discussion, preferring simply to present his results.

In one of his papers he devised a system of classification of the Diptera in which he employed the idea of the superfamily, and so some of his names will be largely adopted in the future. He was not strong, however, in the broader classification of genera and families, and presented few new ideas.

As the scope of the Division of Entomology broadened Mr. Coquillett was requested to identify exotic Diptera, and he was able to enter into this new field with confidence and success, describing a hundred or more exotic flies. Altogether Mr. Coquillett described about 1,000 species of flies as new to science.

In his later years he became interested in nomenclatorial questions, and his last important paper, on the genotypes of American Diptera, fittingly rounds out his dipterological work.

When Mr. Coquillett became Custodian of Diptera the national collection was very small, unarranged, and the only types were Williston's in the Syrphidæ; he leaves it well arranged in large drawers, with hundreds of types scattered through almost all families. From 1895 to 1902 he donated to the National Museum his private collection, containing the types of his early work on Bombyliidæ and Asilidæ.

In the fall of 1910 and spring of 1911 it was seen that he was not well; gradually he became worse, and the end came at Atlantic City on the 8th of July. His remains were interred by the side of his parents at Marengo, Illinois.

In 1896 he married Miss Anna Chew Dorsey, of Washington, who survives him. He was an active member of the Association of Economic Entomologists, of the Washington Academy of Sciences, and a Fellow of the Entomological Society of America. He was President of our Society during 1903 and 1904. His natural diffidence prevented him from public speaking, so that he rarely attended any meetings, although presenting many papers for publication. He traveled very little, and never visited other museums for study.

Personally Mr. Coquillett was an ascetic. Rarely did he speak of his past, or home life, and only occasionally would he discuss with his associates matters of scientific interest. He was always on time at the office in the morning, worked steadily till the closing hour, and then was lost to his associates. It is now known that he did much in helping the poor and unfortunate, and in aiding charitable work.

Quiet and unassuming, he sought no help from others, but always worked out everything for himself, and abided by that result. Among the younger entomologists and collectors he was popular from the fact that he was prompt in describing new species in the collections made by them and referred to him for determination, thus encouraging them in making further collections of the groups in which he was working. Ever courteous and kind to others, he willingly neglected his own work to help them in the identification of Diptera, and his loss in this respect leaves a serious gap in American Entomology.

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Corrections to my paper on the type species of the North American genera of Diptera. Can. Ent., vol. 42, p. 375. 1910.

New genera and species of North American Diptera. Proc. Ent. Soc. Wash., vol. XII, pp. 124-131. 1910.

A decision on Meigen's 1800 paper. Can. Ent., vol. 43, p. 66. 1911.

DESCRIPTION OF THE LARVA OF MONOLEUCA SEMIFASCIA WALKER.

(Lepidoptera; Cochlidiidæ.)

By the late Charles Valentine Riley.

Larva.—Somewhat resembling *Euclea delphinii* Boisd. Length, 0.60 inch. General color vermilion-red. Four prominent longitudinal ridged, vermilion bands, edged or margined with yellow, from each of which on every segment springs a small rounded tubercle of the same vermilion color, thickly covered with short, stiff whitish bristles. On segment 2 these tubercles are more conical, larger, and the bristles springing from them are tipped with black. On segment 4 the lateral ones are replaced by spiracles, and on segment 11 there are but two such tubercles, of the same appearance, but slightly longer, and directed in opposite directions to the dorsal ones on segment 2. Above the lateral rounded tubercle on segment 10 and above the conical tubercle on segment 11 are two dark-brown fuzzy patches, showing relationship to *Sibine stimulea* Clem. Between these rows of tubercles are three striped bands—one dorsal and two lateral—consisting each of three deep blue-black lines, the central one straight, the outer ones undulating, the middle of each segment within this band being flesh-colored and occupied by two paler somewhat elevated spots, each with a central sunken spot. Below the lateral row of tubercles is a band composed of but two blue-black lines, containing the stigmata, except the second pair, which are, as in the other species, placed between the second and third lateral tubercles. Still below these two lines is a pale strip with a carneous tint. Venter, head, and thoracic legs like thin glue.

Larvæ from Springfield, Missouri, September 8, 1869 (J. F. Waters).

MEETING OF OCTOBER 5, 1911.

The 252d meeting was entertained by Mr. E. A. Schwarz in the Saengerbund Hall, on October 5, 1911, Vice-President Quaintance in the chair, and seventeen other members (Messrs. Banks, Barber, Busck, Cushman, Dyar, Ely, Gahan, Gill, Heidemann, Hopkins, Knab, Myers, Quaintance, Rohwer, Sasscer, Schwarz, Viereck, and Walton), and as visitors Messrs. Baker, Grovener, Sanford, Simonds, and W. H. Sill.

The minutes of the previous meeting were read and approved.

The Secretary-Treasurer made his report, which was freely discussed.

The report of the Publication Committee was heard.

Mr. Gahan proposed the name of Mr. O. G. Babcock for active membership.

Professor Quaintance proposed Mr. A. C. Baker, of the Bureau of Entomology, and Mr. Sasscer proposed Mr. H. L. Sanford, also of the Bureau, for active membership. The rules were suspended and all three were elected.

As unfinished business Mr. Rohwer brought up the question of the proposed amendment to the Constitution. After some adverse discussion by Dr. Dyar and Mr. Banks, Mr. Schwarz moved the adoption of the amendment as proposed. Mr. Gahan seconded Mr. Schwarz's motion, but at the vote the amendment was lost. Mr. Rohwer then moved that the matter be referred to the Committee on the Revision of the Constitution.

The Secretary-Treasurer read a letter from the editors of the Washington Academy of Sciences urging the subscription to the new journal of that organization. A long and lively discussion ensued.

The Secretary-Treasurer spoke of the courtesy of the Saengerbund in letting the Society meet in its hall, and suggested that a letter of thanks be sent. After the reading of the draft he had prepared a motion to send the letter was carried.

The first paper was by Mr. Banks, "A curious habit of one of our phorid flies."

A CURIOUS HABIT OF ONE OF OUR PHORID FLIES.

By Nathan Banks.

One day last summer, while walking in the woods near my home, I saw a myriopod (*Parajulus* sp.) wriggling and twisting on the dead leaves in a most excited and erratic fashion. Bending down, I saw that a number of tiny flies were darting at the myriopod, which was trying to keep them off and to hide in the leaves. I swept with my midget net and caught one of the flies, the others and the myriopod disappearing among the dead leaves. In a moment they reappeared, the myriopod as excited as ever, and endeavoring to escape his tormentors. I swept again and secured a second fly, but this frightened the others away, and I did not see them again.

On examination the flies were found to belong to the phorid genus *Aphiochæta*, near to *A. nigriceps* or *A. picta*, but distinct from both.

The habits of *Aphiochæta* are various. Several have been bred from fungi, others from dead or decaying insects, but there is no record of this or any other phorid attacking a myriopod. It, however, is not certain that the fly breeds in the myriopod, either dead or alive; it may be that it is attracted by the exudation of these myriopods, which they secrete when disturbed.

Fig. 1.—*Aphiochæta xantippe* Banks, and bristles on the front of head.

After this I learned that Mr. Barber and Dr. A. K. Fisher had this year also observed the same habit in the same species of fly; Dr. Fisher with the same myriopod; Mr. Barber with a species of *Spirobolus*.

I describe the phorid as follows:

Aphiochæta xantippe, new species.

Female.—Yellowish; head and thoracic notum yellowish brown, abdomen dark brown above, except the tips of segments pale, last two segments blackish; hind femora dark at tips, hind tibia with a dark line above; the thorax, from above, shows two parallel pale stripes. Antennal arista long, pubescent; bristles on front as figured (fig. 1); stiff bristles below eyes; four bristles each side on thorax from base of wing toward head, and one lower down about midway from wing to head; a bristle each side near base of scutellum, four sub-equal bristles on scutellar margin; bristles on costal edge of wing about three-fifths the width of the costal cell; hind tibia with a row of short bristles above, and lower inner edge of the hind metatarsus with a row of about 15 short, stiff bristles in an even row. Segments of abdomen with two rows of bristles above, and marginal hairs. Length 2 mm.

From Falls Church, Virginia, July 8, pestering a myriopod (*Parajulus* sp.)

Differs from *A. nigriceps* in pale head, and no marks on pleura; from *A. picta* in absence of dots below base of wings, and in the hyaline wings.

—Mr. Barber said that on June 25 he saw a large *Spirobolus* writhing in the little-used wood-road on the Virginia shore opposite Plummers Island, Maryland, with a swarm of ten or a dozen phorid flies alighting upon it whenever opportunity offered. Thinking they were ovipositing, the centipede was saved for breeding, but no flies could be caught and none issued from the myriopod, which died after about three weeks in a breeding-jar. In July this year Dr. A. K. Fisher saw a small julid at Sandy Springs, Maryland, acting strangely, and observed a small fly riding upon its back, except during the worst of its contortions. Both specimens were taken and appear to be the same as those described by Mr. Banks. In September another specimen of the same fly was observed dividing its attentions between a large and apparently healthy *Spirobolus* and a smaller one that had been partly crushed on a path, near where he had seen the specimens in June. Both myriopods were much annoyed by the fly, but the injured one being less able to defend itself, was collected after half an hour's observation, for breeding. Nothing, however, issued.

Mr. Schwarz spoke of the observations by the late Mr. Hubbard on a small black fly, perhaps not a phorid, attacking spiders. Mr. Barber spoke of Mrs. Slosson's account of *Ceratopogon* attacking caterpillars.

Mr. Cushman said that in the work on the parasites of the boll weevil two species of *Aphiochæta* had been bred under conditions indicating parasitism.

Mr. Banks replied, mentioning the long discussion before *Phora aletiæ* was proven not parasitic, and therefore he hesitates to claim parasitism until positive.

—After a very interesting outline by Mr. Busck of his collecting experiences in Panama, the chair called on Mr. Grovener, of Oxford, England, who made some remarks on his impressions of entomology in this country.

The following papers were accepted for publication:

A NOTE ON A GENUS OF TENTHREDINIDÆ.

By S. A. Rohwer.

Genus ENISCIA Thomson.

Rohwer[1] designated the type of *Eniscia* Thomson as *Tenthredo consobina* Klug, but in so doing overlooked Konow's[2] remarks on the subject, in which he indicates that the type of Thomson's genus should be the second species, *artica* Thomson. Although Konow does not definitely designate the type, the fact that he indicates such a designation combined with elimination (*consobina* had been placed in *Sciapteryx*) will, no doubt, serve to fix *arctica* as the type of *Eniscia*. The *Ischyroceræa hyperborea* Kiaer has been shown to be a synonym of *Eniscia arctica* Thomson, so the synonymy is:

Eniscia Thomson.
Type: *Eniscia arctica* Thomson.
Syn: *Ischyroceræa* Kiaer.
Type: (*Ischyroceræa hyperborea* Kiaer) = *Eniscia artica* Thomson.

[1] Tech. Ser. 20, pt. 2, U. S. Dep't. Agr., Bur. Ent., 1911, p. 79.

[2] Zeit. syst. Hym. Dipt., vol. 3, 1908, pp. 87–88.

A CLASSIFICATION OF THE SUBORDER CHALASTOGASTRA OF THE HYMENOPTERA.

By S. A. Rohwer.

That the morphological characters exhibited by the most useful organs were least important as exhibiting relationship, for the reason that such characters were most subject to variation, whereas structures of less use and importance were necessarily less subject to variation and hence more indicative of affinities. (Dr. T. N. Gill, 1901.)

The name "Chalastogastra" is used, as the best one that has been proposed, and it has been in use for a number of years in Europe. Many other names have been given to this group of insects, but most of them are based on their habits.

The nomenclature of the thorax and anterior wing is that given by Snodgrass.[1] The nomenclature of the posterior wing is that used by Cresson. The first dorsal abdominal segment (basal plates of authors) is called the propodeum.

The present paper does not deal with groups lower than tribes. Genera not known from specimens are not placed. All species known to the writer can easily be placed in the tribe to which they belong. It would be a great favor to the writer if other workers would place the genera, not placed and known to them, into the division to which they belong.

Suborder CHALASTOGASTRA.

Table to the Superfamilies.

Posterior margin of the pronotum straight or nearly so, being nearly the shortest distance between the anterior margins of the tegulæ; mesonotum very short and never extending much beyond the anterior margins of the tegulæ; proepimeron wanting........ *Megalodontoidea*

Posterior margin of the pronotum strongly curved; mesonotum longer and extending well beyond the anterior margins of the tegulæ.. 1

1. Metanotum concealed, but the metapostnotum is present and large; antennæ inserted much below the lower margins of the eyes, and below the apparent clypeus; propodeum not divided; proepimeron wanting; anterior wings with two cubital cells.................... *Oryssoidea*

   Metanotum always present, although the metapostnotum is sometimes concealed; antennæ inserted well above the clypeus; anterior wings with more than two cubital cells.. 2

[1] The thorax of the Hymenoptera, Proc. U. S. Nat. Mus., vol. 39, no. 1774, pp. 37–91, plates 1–16. 1910.

2. Scutellum completely separated from the mesoscutum by a suture; proepimeron wanting; anterior tibiæ with one apical spur; sheath very long and exserted beyond the tip of the abdomen; cubitus joining the basal vein much below the costa........................ *Sirecoidea*

Scutellum never completely separated from the mesoscutum by a suture, the suture always wanting laterally; proepimeron present; anterior tibiæ with two apical spurs; cubitus joining the costa or touching the basal vein very close to the costa; mesoprescutum always present .... *Tenthredinoidea*

Superfamily MEGALODONTOIDEA.

Table to the Families.

First perapterum wanting; anterior tibiæ with two calcaria *Megalodontidæ*

First perapterum present, seen a short distance below the tegulæ as a small free plate....................................... 1

1. Anterior tibiæ with one calcaria; basal joints of the flagellum separate; intercostal vein wanting; radial cell with one cross-vein; slender, elongate species...... *Cephidæ*

Anterior tibiæ with two calcaria; basal joints of the flagellum consolidated into a long basal joint; intercostal vein present; radial cell with two cross-veins; species robust .... *Xyelidæ*

Family MEGALODONTIDÆ.

Table to the Subfamilies.

Scutellar lobe rudimentary or wanting; transverse median and basal veins interstitial or nearly so; intercostal vein wanting .... *Megalodontinæ*

Scutellar lobe large; transverse median vein received near the middle of the first discoidal cell; intercostal vein present... *Pamphiliinæ*

Family XYELIDÆ.

This family contains five genera which are so closely related that smaller divisions cannot well be made.

Family CEPHIDÆ.

This group has long been recognized as a family. Konow indicates two tribes in his Cephini, but these divisions are hardly of subfamily value; and until these insects have been more carefully studied I prefer not to make any division into subfamilies. At some time it may be advisable to unite the Cephidæ and Xyelidæ into one family, treating the groups here indicated as families as subfamilies.

Superfamily ORYSSOIDEA.

Family ORYSSIDÆ.

This family, which has the first perapterum wanting, has been recognized for a number of years. It has been divided into five genera, which, judging from the descriptions and a small amount of exotic material, are so closely related as to make a division into subfamilies unadvisable.

Superfamily SIRECOIDEA.

Table to the Families.

Notauli present; mesoscutum without oblique sutures from the tegulæ to the anterior margin of the scutellum; pronotum very short medially and not angulate laterally; apex of the abdomen normal; anterior wings with an intercostal vein.. *Xiphydriidæ*

Notauli wanting; mesoscutum with oblique sutures from the tegulæ to the anterior margin of the scutellum; pronotum large, perpendicular anteriorly and angulate laterally; apex of the abdomen with a triangular-shaped plate; anterior wings without an intercostal vein... *Sirecidæ*

Family XIPHYDRIIDÆ.

In the presence of notauli, the indication of the first perapterum, and the venation this family is more generalized than the Sirecidæ.

Table to the Subfamilies.

Pronotum without a distinct dorsal surface laterally, and when seen from above deeply emarginate anteriorly; radial cell with a cross vein...................................... *Xiphydriinæ*

Pronotum with a distinct dorsal surface laterally, and when seen from above not deeply emarginate anteriorly; radial cell without a cross-vein................................ *Derecystinæ*

Family SIRECIDÆ.

Table to the Subfamilies.

Antennæ long and slender, basal vein received near the middle of the first discoidal cell; second transverse cubitus present.. *Sirecinæ*

Antennæ short and stout; basal vein and transverse median interstitial, or nearly so; second transverse cubitus wanting.. *Tremecinæ*

Subfamily SIRECINÆ.

Table to the Tribes.

Hind tibiæ with two calcaria; humerus (2d A) and transverse median of the hind wings present........................ *Sirecini*

Hind tibiæ with one calcaria: humerus (2d A) and transverse median of the hind wings wanting......... .... *Xeriini*

Superfamily TENTHREDINOIDEA.

Table to the Families.

First perapterum present................. 1

First perapterum wanting.. 6

1. Abdomen sharply angled laterally so the dorsal sclerites are sharply divided into a dorsal and ventral surface; antennæ clavate.. *Cimbecidæ*

   Abdomen not sharply angled laterally; antennæ not clavate.. 2

2. Sternauli (a suture separating the mesosternum from the mesoepisternum) present...... 3

   Sternauli wanting.. 4

3. Posterior coxæ well separated; antennæ many-jointed *Perreyiidæ*

   Posterior coxæ contiguous, or nearly so; antennæ three-jointed.. .... *Argidæ*

4. Posterior coxæ well separated; antennæ four-jointed; first discoidal cell petiolate............................. *Blasticomidæ*

   Posterior coxæ contiguous, or nearly so; antennæ more than six-jointed; first discoidal cell not petiolate........ 5

5. Mesoepimeron divided into two plates, the dorsal one sculptured similar to the mesoepisternum; proepisternum not divided into two plates; antennæ many-jointed, serrate in the female, pectinate in the male *Diprionidæ*

   Mesoepisternum not divided into two plates; proepisternum divided into two plates; antennæ seven to twelve-jointed, never serrate or pectinate............. *Tenthredinidæ*

6. Sternauli (a suture separating the mesosternum from the mesoepisternum) wanting........................ *Pterygophoridæ*

   Sternauli present.. 7

7. Posterior coxæ well separated; propodeum not divided; antennæ short, clavate; transverse median and basal veins interstitial or nearly.................................. *Pergidæ*

   Posterior coxæ contiguous or nearly so; propodeum divided; antennæ longer, not clavate; transverse median vein received well removed from the basal........ *Loboceridæ*

Family CIMBECIDÆ.

The genera *Praiá* André, *Plagiocera* Klug, and *Pachylostictia* Klug are known only from literature and cannot be placed.

Table to the Subfamilies.

Sternauli represented externally by a carina but not present internally; posterior coxæ well separated............ *Cimbecinæ*
Sternauli entirely wanting; posterior coxæ contiguous or nearly so... *Zaræinæ*

Subfamily CIMBECINÆ.

The placing of the fossil group here is done mostly by deduction, but the general form of the fossil insects is that of Cimbecini and they no doubt belong here.

Table to the Tribes.

Radial cross-vein present; modern insects.......................... *Cimbecini*
Radial cross-vein wanting; fossil insects.................... *Phenacopergini*

Tribe CIMBECINI

Contains *Cimbex* Olivier and *Trichiosoma* Leach.

Tribe PHENACOPERGINI.

Includes *Phenacoperga* Cockerell and *Pseudocimbex* Rohwer.

Subfamily ZARÆINÆ.

Anal cell of the fore wings with a straight cross-vein. *Pseudoclavellariini*
Anal cell of the fore wings broadly contracted in the middle. *Zaræini*

Tribe PSEUDOCLAVELLARIINI.

Includes *Pseudoclavellaria* Schulz, *Agenocimbex* Rohwer, and, probably, *Euclavellaria* Enslin.

Tribe ZARÆINI.

Includes *Zaræa* Leach, *Abia* Leach, *Parabia* Semenow, *Amisa* Leach, and *Trichiosomites* Brues.

Family PERREYIIDÆ.

If *Decameria* dates from Lepeletier, and belongs here, the name of the family should be Decameriidæ.

Syzygonia Klug, and allies, are known only from descriptions and figures. They may belong here and may form a group in *Philomastiginæ*.

TABLE TO THE SUBFAMILIES.

Anal cell of fore wings present; propodeum divided......... *Perreyiinæ*
Anal cell of fore wings wanting; propodeum not divided *Philomastiginæ*

SUBFAMILY PERREYIINÆ.

The only genus known to occur here is *Perreyia* Brullé.

SUBFAMILY PHILOMASTIGINÆ.

Founded for *Philomastix* Froggart, but may include other genera.

FAMILY ARGIDÆ.

The proepisternum is not divided. For the time being this family may be divided into two subfamilies by the characters used by Konow and other authors.

TABLE TO THE SUBFAMILIES.

Fore wings with an intercostal vein.................................. *Arginæ*
Fore wings without an intercostal vein.................... *Sterictiphorinæ*

FAMILY BLASTICOMIDÆ.

Founded for *Blasticoma filiceti* Klug.

FAMILY DIPRIONIDÆ.

The same as *Lophyrides* Konow (Genera Insectorum, fas. 29, 1905, p. 41).

FAMILY TENTHREDINIDÆ.

Prepectus wanting (in some species of *Allantus* there is an obscure lip, but in these the proepisternum meets ventrally).. 1
Prepectus present (in Strongylogasterini narrow, but in these the proepisternum does not meet ventrally)............... 6
1. Proepisternum ventrally very large and meeting in the middle where it is usually truncate; prosternum usually triangular; mandibles long, strongly falcate; metapostnotum large; elongate species.................... 2
Proepisternum ventrally small and widely separated; prosternum T-shaped; mandibles short, not strongly falcate; metapostnotum short; robust species........... 4
2. Basal vein joining the costa at or very near the origin of the cubitus (in some species in this group the basal vein is strongly curved and is close to costa without joining it so superficially the basal vein appears to join the costa removed from the cubitus).................. *Allantinæ*
Basal vein joining the costa much basad of the origin of the cubitus.. 3

3. Third pleural suture strongly curved, the upper part of the metaepisternum very narrow; mesoepimeron with an oblique carina dorsally; anal cell of the fore wings contracted basally and with an oblique cross-vein; second transverse cubitus normally wanting......... *Dolerinæ*
   Third suture straight; mesoepimeron without an oblique dorsal carina; anal cell of the fore wings not contracted basally, and either meeting near the middle or with a straight cross-vein; all the transverse cubiti normally present.. *Tenthredininæ*
4. Basal vein and first recurrent vein sub-parallel, the first recurrent being subequal in length with the basal vein......... 5
   Basal vein and first recurrent vein strongly diverging, the first recurrent being much shorter than the basal vein .... *Messinæ*
5. Third plural suture biangulate; metaepisternum Z-shaped, very narrow; metaepimeron very large, rectangular with the wing process projecting anteriorly; antennæ more than 10-jointed; labrum very long........... *Athaliinæ*
   Third plural suture straight or nearly so; metaepisternum and metaepimeron of a normal type; antennæ 9-jointed; labrum normal...... .... *Empriinæ*
6. Basal vein and first recurrent vein subparallel, the basal vein and first recurrent vein being subequal in length 7
   Basal vein and first recurrent vein strongly diverging, the first recurrent being much shorter than the basal.. 8
7. Metapostnotum linear, usually concealed medially; anal cell of the fore wings petiolate (first anal cell only present) .... *Phymatocerinæ*
   Metapostnotum large, present medially; anal cell of the fore wings complete, open or with a cross-vein (first and second anal cells present)........................ *Selandriinæ*
8. Basal vein joining the costa at or close to the origin of the cubitus.. *Cladiinæ*
   Basal vein joining the costa remote from the origin of the cubitus... 9
9. Metaepimeron with a small, curved dorsal plate which usually projects laterally beyond the lower part of the small plate; third pleural suture strongly curved... *Nematinæ*
   Metaepimeron without a dorsal plate; third pleural suture straight; (transverse radius present; anal cell contracted in the middle; second and third cubital cells each receiving a recurrent vein)................ *Hoplocampinæ*

SUBFAMILY ALLANTINÆ.

TABLE TO THE TRIBES.

Hind basitarsis distinctly longer than the following joints; posterior calcaria long; pronotum with very large lateral lobes; postnotum of metathorax large and nearly flat.......... *Taxonini*

Hind basitarsis shorter than or subequal with the following joints; posterior calcaria short, robust; pronotum laterally small; postnotum of the metathorax shorter.. 1

1. Metascutellum densely, coarsely punctured; head and thorax coarsely punctured; basal vein slightly basad to the origin of the cubitus; postnotum of the metathorax oblique.......... *Eriocampini*

Metascutellum without punctures; head and thorax finely sculptured or impunctate; basal vein joining the costa at the origin of the cubitus; postnotum of the metathorax flat.......... *Allantini*

Tribe TAXONINI.

Includes *Taxonus* Hartig, *Macremphytus* MacGillivray, *Dimorphopteryx* Ashmead, and *Athlophorus* Burmeister.

Tribe ERICOCAMPINI.

Includes *Eriocampa* Hartig.

Tribe ALLANTIN

Includes *Allantus* Panzer, *Aphilodyctium* Ashmead, *Ametastegia* Costa, *Emphytina* Rohwer, *Monsoma* MacGillivray, *Protoemphytus* Rohwer, and *Monostegia* Costa.

SUBFAMILY DOLERINÆ.

Includes *Dolerus* Panzer and *Loderus* Konow.

SUBFAMILY TENTHREDININÆ.

TABLE TO THE TRIBES.

Propodeal spiracle placed near the middle lateral margin, and often on the ventral aspect; anterior margin of the scutellum sharply angular, its cephal-caudad length greater than or subequal with its width (in cases where it is subequal the clypeus is truncate); space between the eyes at the antennæ always greater than the length of the eye.......... *Perineurini*

Propodeal spiracle placed at, or near, the lateral, dorsal basal angle; anterior margin of the scutellum truncate or nearly so, its cephal-caudad length much shorter than the width; facial quadrangle variable.......... *Tenthredinini*

Tribe PERINEURINI.

Includes *Zaschizonyx* Ashmead, *Tenthredopsis* Costa, *Perineura* Hartig, *Laurentia* Costa, and *Bivena* MacGillivray.

Tribe TENTHREDININI.

Includes *Sciapteryx* Stephens, *Eniscia* Thomson, *Lagium* Konow, *Pachyprotasis* Hartig, *Rhogogaster* Konow, *Macrophya* Dahlbom, *Tenthredella* Rohwer, *Tenthredo* Linnæus, *Labidia* Provancher, *Tenthredina* Rohwer, and *Jermakia* Jakowlew.

SUBFAMILY MESSINÆ.

TABLE TO THE TRIBES.

Anal cell of the fore wings contracted basally and with an oblique cross-vein .... *Phyllotomini*
Anal cell of the fore wings petiolate.................................. *Messini*

Tribe PHYLLOTOMINI.

Includes *Phyllotoma* Fallén, *Caliroa* Costa, *Eriocampoides* Konow, *Phlebatrophia* MacGillivray.

Tribe MESSINI.

Includes *Messa* Leach, *Fenusa* Leach, *Kalionusa* MacGillivray, *Scolioneura* Konow, *Entodecta* Konow, *Metallus* Forbes, *Parabates* MacGillivray, and *Polybates* MacGillivray.

SUBFAMILY ATHALIINÆ.

Founded for *Athalia* Leach.

SUBFAMILY EMPRIINÆ.

TABLE TO THE TRIBES.

Anal cell of the fore wings contracted basally and with an oblique cross-vein; metapostnotum larger; metaepimeron large.. *Empriini*
Anal cell of the fore wings not contracted basally and without a cross-vein; metapostnotum smaller; metaepimeron narrow.. 1

1. Anal cell of the fore wings medially contracted and closed .... *Lycaotini*
   Lanceolate cell petiolate .... *Blennocampini*

Tribe EMPRIINI.

Founded for *Empria* Lepeletier.

Tribe LYCAOTINI.

Founded for *Lycaota* Konow.

Tribe BLENNOCAMPINI.

Includes *Blennocampa* Hartig, *Parophora* Konow, *Rhadinocera* Konow, *Ardis* Konow, *Periclista* Konow, *Isodyctium* Ashmead, *Monophadnoides* Ashmead, *Ceratulus* MacGillivray, *Clarmontia* Rohwer, *Erythraspides* Ashmead, *Monophadnus* Hartig, *Aphanisus* MacGillivray, *Nesotomostethus* Rohwer, *Neocharactus* MacGillivray, *Paracharactus* MacGillivray.

Subfamily PHYMATOCERINÆ.

Founded for *Phymatocera* Dahlbom and *Tomostethus* Konow, but probably includes *Neotomostethus* MacGillivray and certain Neotropical genera.

Subfamily SELANDRIINÆ.

Table to the Tribes.

Prepectal suture complete, the prepectus large and extending almost to the dorsal margin of the mesoepisternum *Selandriini*

Prepectal suture incomplete, never extending above the ventral margin of the first perapterum, the prepectus smaller *Strongylogasterini*

Tribe SELANDRIINI.

Includes *Selandria* Leach, *Selandridea* Rohwer, *Hemitaxonus* Ashmead, *Aneugmenus* Hartig, *Eriocampidea* Ashmead, and *Nesoselandria* Rohwer.

Tribe STRONGYLOGASTERINI.

Includes *Strongylogaster* Dahlbom, *Prototaxonus* Rohwer, *Thrinax* Konow, *Stromboceros* Konow, *Stromboceridea* Rohwer, and *Eustromboceros* Rohwer.

Subfamily CLADIINÆ.

Includes *Cladius* Rossi, *Priophorus* Dahlbom, and *Trichiocampus* Hartig.

Subfamily NEMATINÆ.

Table to the Tribes.

Anal cell of the fore wings petiolate................................. *Nematini*

Anal cell of the fore wings contracted and closed in the middle *Hemichroini*

Tribe NEMATINI.

The transverse radius may be present or wanting, even in the same specimen. In most genera it is wanting.

Includes *Nematus* Panzer, *Amauronematus* Konow, *Brachycolus* Konow, *Crœsus* Leach, *Euura* Newman, *Dineura* Dahlbom, *Diphadnus* Hartig, *Nematinus* Rohwer, *Lygæonematus* Konow, *Mesoneura* Hartig, *Micronematus* Konow, *Pachynematus* Konow, *Pontania* Costa, *Pristiphora* Latreille, *Pteronidea* Rohwer, and *Hypolæpus* Kirby. Does *Pseudodineura* Konow belong here?

Tribe HEMICHROINI.

Includes *Marlattia* Ashmead, *Cerateroceru*s Rohwer, *Hemichroa* Stephens, *Platycampus* Schiödte, and *Anophlonyx* Marlatt.

SUBFAMILY HOPLOCAMPINÆ.

Includes *Hoplocampa* Hartig and *Macgillivrayella* Ashmead.

FAMILY PTERYGOPHORIDÆ.

TABLE TO THE SUBFAMILIES.

Third pleural suture straight.. 1
Third pleural suture strongly curved.. 2

1. Dorsal margin of mesoepimeron strongly concave; metapleuræ with a cephal-caudad suture which makes a fold, the dorsal part curved outwardly; propodeum not emarginate posteriorly; (pronotum with an accessory suture posteriorly; anal cell wanting) *Pterygophorinæ*
   Dorsal margin of mesoepimeron straight or nearly so; metapleuræ without a suture or a fold; propodeum deeply emarginate posteriorly .... *Acorduleccrinæ*
2. Abdomen long, tapering posteriorly, ninth dorsal segment elongate in female; anal cell wanting; head about twice as broad as high.......................... *Phylacteophaginæ*
   Abdomen normal; and cell petiolate; head normal.... *Euriinæ*

SUBFAMILY PTERYGOPHORINÆ.

Founded for *Pterygophorus* Klug. Does *Cerospastus* Konow belong here?

SUBFAMILY ACORDULECERINÆ.

TABLE TO THE TRIBES.

Anal cell wanting, metaepisternum smaller than the metaepimeron; pronotum without an accessory suture posteriorly.. *Acordulecerini*
Anal cell incomplete, but present; metaepisternum larger than the metaepimeron; pronotum with an accessory suture posteriorly .... *Conocoxini*

Tribe ACORDULECERINI.

Includes *Acordulecera* Say and *Parantherix* Westwood. *Thulea* Say *may* belong here.

Tribe CONOCOXINI.

Founded for *Conocoxa* Rohwer and *Nithulea* Rohwer.

Subfamily PHYLACTOPHAGINÆ.

Founded for *Phylactophaga eucalypti* Froggartt. *Cladomacra* Smith may belong here.

Subfamily EURIINÆ.

The remarks about the position of the members of this subfamily (p. 473, Ent. N., vol. 21, 1910) are not in accord with the present arrangement.

Table to the Tribes.

Labrum longer than the short clypeus; antennæ inserted close to the clypeus, the distance subequal with the length of the scape; antennæ 15-jointed.............. *Diphamorphini*
Labrum shorter than the long clypeus; antennæ inserted well above the clypeus; antennæ less than 15-jointed..... *Euriini*

Tribe DIPHAMORPHINI.

Founded for *Diphamorphos* Rohwer.

Tribe EURIINI.

Includes *Eurys* Newman, *Neoeurys* Rohwer, *Europsis* Kirby, and *Clarissa* Kirby.

Family PERGIDÆ.

In this family belong *Ceralces* Kirby and *Perga* Leach (with its recent segregates).

Family LOBOCERIDÆ.

Other than *Loboceras* Kirby and *Haplostegus* Konow no other genera known from specimens occur here. Perhaps a number of the genera in *Lobocerotides* Konow belong here.

DESCRIPTIONS OF THE LARVÆ OF SOME MEXICAN LEPIDOPTERA.

By Harrison G. Dyar.

The larvæ of the tropical American Lepidoptera have been almost wholly neglected. The crude early figures of Sepp and Cramer are available, but the figures of Cramer are improperly associated with the adults. Some of the Brazilian butterflies have been ably dealt with by Fritz Müller, and there exist some scattered descriptions. The condition seems to warrant any contribution to the subject, however slight, and as the Department of Agriculture has come into the possession of several species of inflated larvæ prepared by Mr. W. Gugelmann, brief descriptions of them are herewith presented. The specimens are deposited in the National Museum.

Family PAPILIONIDÆ.

Papilio polydamas Linnæus.

Larva.—Head rounded, bilobed, dull black with short black secondary hairs, a pale line in the median suture. Body enlarged a little at joints 4–5, and tapering on the thorax; a subdorsal row of short papillose processes and a lateral row on joints 2 to 5, 11 and 12, the laterals on 2 and 11 longer than the others. Purplish, with oblique black lines, about four on each segment, short, separated and a little curved, more oblique on the sides than on the dorsum, finally forming a nearly straight series of lines above the bases of the feet. Bases of the feet blackish; feet black; papillose processes black.

Papilio anchisiades idæus Fabricius.

Larva.—Head rounded, bilobed, yellow-brown, paler behind and flecked with pale on the vertex; numerous secondary hairs whitish. Body cylindrical, a little enlarged at joints 3–5, with a subdorsal row of short conical tubercles. Colors mottled brown and creamy white; general color brown, the white prevailing laterally on joint 7 and to a less extent on 11–12; surface finely dotted with creamy, ring-shaped markings of this color posteriorly on the segments; a waved and broken subdorsal line; several irregular light bands along the bases of the feet, reducing the ground color to a series of spots; tubercles more rich brown than the general color, marked with small creamy crescents.

Feeds on Citrus.

Family PIERIDÆ.

Pereute charops Boisduval.

Larva.—Head rounded, higher than wide, dull black. Body cylindrical, uniform, clothed with rather long and coarse white secondary hair, from white tubercles, the hairs scattered sparsely and in groups; general color uniform purplish brown. Thoracic feet black; abdominal ones and anal shield dark brown.

Feeds on *Anona* and other plants.

Family DANIDÆ.

Lycorea atergatis Doubleday & Hewitson.

Larva.—Head rounded, higher than wide, shining black, labrum whitish. Body cylindrical, with a pair of long, fleshy black processes subdorsally on joint 3. Colors yellowish white and deep black, transversely banded; anterior halves of the segments black above, venter entirely black; joint 2 is all white; on 3 and 4 the black bands run evenly to join the ventral color; on the abdomen the bands divide, the posterior limb is short and covers the spiracle, the anterior one joins the ventral color; on joint 12 the band is narrow and interrupted laterally; on 13 it runs evenly across, covering the anal shield. Feet all black.

Family NYMPHALIDÆ.

Synchloe janais Drury.

Larva.—Head somewhat squarely angled, distinctly bilobed, rounded, without processes, covered with coarse secondary hairs from distinct tubercles; orange red, the lower half black. Body cylindrical, uniform, with rows of spine-like processes bearing stiff hairs; dorsal row single, on joints 5 to 12, there being two processes on joint 12; subdorsal row on joints 3 to 13, two on 13; lateral row on joints 2 to 12; substigmatal row on joints 2 to 12; subventral row on 2 to 12, double on the segments with feet. Color whitish with transverse black bands joining the processes; a dorsal black line, broadly broken in the incisures; a lateral black band, narrowly broken; subventral region less distinctly white.

Synchloe lacania Geyer.

Larva.—Head rounded, bilobed, with coarse black setæ from distinct tubercles; black, the apices of the lobes slightly pale. Body cylindrical, with short black spines with stiff hairs; joint 2 with a dorsal shield, a spine below the spiracle and a subventral one; a single dorsal row on joints 5 to 12, two on joint 12, all arranged as in the preceding species. Body red-brown, marked transversely with black lines, two on each segment behind the spines; subventral region irregularly and indistinctly marked with black. Feet and leg shields black. There are a few scattered secondary hairs on the body.

FAMILY LITHOSIIDÆ.

Cisthene menea Druce.

Larva.—Head rounded, flat before with a slight notch at vertex; pale reddish brown, the sutures paler. Body cylindrical, tapering a little before and somewhat flattened; pale yellow, marked with crimson. Irregular crimson transverse bands, four or five to a segment, partly confluent and with indented edges, the broadest one in the incisure, all becoming irregularly confluent subventrally; venter pale with a crimson tint spreading from the subventral area. Warts small, with very long spreading and curving pale yellow hairs; one wart above the stigmatal wart on joints 3 and 4; wart i of the abdomen two-haired; wart iv single-haired, placed directly below the spiracle. Feet normal, pale.

FAMILY ARCTIIDÆ.

Ammalo helops Cramer.

Larva.—Head rounded, about as wide as high, considerably larger than joint 2; shining mahogany red, the sutures paler. Body dull reddish without markings, densely clothed with thick tufts of rather short stiff black hairs. Thoracic feet pale brown; abdominal ones vinous. Two warts above the stigmatal wart on joints 3 and 4; wart iv of the abdomen above and behind the spiracle, a little smaller than the others.

Euchætias albicosta Walker.

Larva.—Head rounded, shining black with the sutures pale. Body dull purplish with irregular light markings stigmatally, densely clothed with tufts of hairs. The general hair covering is black, including long slender black pencils subdorsally from joints 4 and 12; long white pencils from warts ii and iii on joints 5 and 11; a series of alternating white and orange short tufts subdorsally on joints 6 to 11. Warts rather small, normal. Hairs finely, shortly feathered, especially the plumed subdorsal white and orange ones.

The larva is much like that of *Euchætias egle* Drury.

FAMILY HYPSIDÆ (PERICOPIDÆ).

Pericopis leucophæa Walker.

Larva.—Head rounded, flat before, as large as joint 2, shining black with a pale line down the median suture to clypeus. Body cylindrical, joint 12 slightly enlarged; warts large, with numerous hairs, but these fine and thin, not obscuring the body. Pale straw color, with dorsal, lateral, pedal, and ventral lines of purple brown, dotted and powdery; traces of subdorsal and stigmatal similar lines, broad blotched transverse deep purple bands on joints 3, 5, 11 and 13, with a lateral blotch on joint 6. Feet all black. Warts dull orange; one wart about the stigmatal wart on joints 3 and 4; wart iv of the abdomen smaller than the others, situated behind the spiracle. Hairs black, some on joints 3 and 4 longer than the others; those on 12 and 13 also longer.

Phaloesia saucia Walker.

Larva.—Head rounded, nearly as large as joint 2, shining blue-black, the bases of antennæ and epistoma pale. Body cylindrical, joint 12 scarcely enlarged; warts low-conical rather than high, but proportionately large, approximating each other, the pair i on each side contiguous, appressed, almost consolidated, showing only a central groove in a single dorsal wart; one wart above the stigmatal wart on joints 3 and 4; wart iv of the abdomen small, contiguous to iii and appressed against it. Body dull ocher, the warts shining blue-black, forming transverse bands; double transverse black streaks in the segmental incisures and small irregular lateral spots; a continuous subventral stripe; feet and leg plates shining blue-black. Hairs thin, black; a single longer white one from the subdorsal wart on joints 3 and 4, and from wart iii on joint 12.

Cocoon.—An open network of yellowish silk, somewhat irregular in shape, higher in front, roomy, containing the cast skin.

Pupa.—Light brown, with numerous blue-black spottings and streaks on the wing cases.

These two larvæ are entirely normal for the Pericopidæ, as exemplified by the North American species known to us.

Doa raspa Druce.

Cycnia (?) *raspa* Druce, Ann. Mag. Nat. Hist. (6), XIII, 354. 1894.
Cycnia (?) *raspa* Druce, Biol. Cent. Am., Lep. Het., II, 393. 1897.

This species was placed by Druce doubtfully in the Arctiidæ. It has been till now at the National Museum in the Liparidæ, in the genus *Trochuda*, where I put it according to lists that Mr. Schaus had prepared at the British Museum. I presume, therefore, that it is in the Liparidæ at the British Museum; but this is certainly wrong. The species belongs to the genus *Doa* Neum. & Dyar in the Hypsidæ.

Larva.—Head rather small, rounded, slightly notched at the vertex behind, flat in front, pale reddish brown. Body with the thorax slightly swollen, joint 12 also a little enlarged; yellow, with transverse black bands. There are three bands on each segment, the anterior one rather broad, the others linear; the subventral ends of the bands are bent laterally or joined to short longitudinal lines; feet pale; venter unmarked, except on the legless segments, where the anterior band runs across. Tubercles and setæ minute, indistinguishable.

Cocoon double, an open mesh of pale brown silk, within a similar, larger outer envelope. The pair come together at the anterior end where the adult emerges.

Pupa pale with transverse black lines on the abdomen and black lines on the veins of the wing-cases.

Family NOCTUIDÆ.

Erebus odora Linnæus.

Mr. Gugelmann has sent three stages of the larva, presumably the last three. The small larva is pale yellow with broad black transverse bands on the anterior thirds of the segments; a continuous black shade below the subventral fold; head, feet, and shields dull red. A long black subdorsal filament, or "horn" on joints 3 and 4, and a single dorsal one on joint 12.

The next stage is colored like the fully grown larva, though the secondary hairs and granular markings are less conspicuous. The five black horns are present.

Last stage.—Head rounded, wider than high, flat across the mouth, shining dark brown, covered with short coarse pale secondary hairs. Body cylindrical, uniform, without a trace of the black "horns" of the previous stages. Anterior thirds of the segments dorsally black, middle thirds red-brown, posterior thirds yellowish, the coloration consisting of dense, flat, secondary granules; these cover the sides, except for large black spots at the middle of the abdominal clasps; thoracic feet and their bases black, anal shield and leg shield red-brown. The granules are crinkled, annular and subconfluent. Skin densely covered with short pale secondary hairs, evenly throughout all the markings.

This large and conspicuous larva has a structure resembling that of the Ceratocampidæ in its younger stages. It would be interesting to get the first stage of this larva and observe the relations of these filamentous horns to the primary tubercles.

Family NOTODONTIDÆ.

Dicentria laciniosa Hy. Edwards.

Larva.—Head high, tapering a little above, with a small vertical notch, much higher than joint 2; shining, creamy white with black spots at the tubercles; the black forms a patch at vertex, a bilobed mark across the face, a band above the mouth and a ring-spot on the side. Body cylindrical, the anal feet small and apparently not used. General color ocher yellow; a short bright red prominence on joint 5, bearing tubercles i; slightly elevated red dorsal areas on joints 6 to 9 and on 12, the latter the most prominent; dorsal and subdorsal black lines, broken into spots and angles, shaded across with blackish on joints 9–10; entirely confused on joints 11 to 13 and filled in nearly to a broad band on joints 2 to 4; two lateral black lines, more nearly continuous, especially centrally; a broad stigmatal band composed of three confused lines; bases of all the feet broadly vinous red; feet and shields blackish. Tubercles black, prominent, tubercles i on joints 5 to 12 elongated into short cones; setæ distinct, single, pale; tubercle iv below and behind the spiracle, close to it.

This larva resembles the North American *Schizura concinna* Smith and Abbot, but is less specialized. There is a hint of the usual *Schizura* white V-mark in the dark shade on joint 10. The white head is peculiar.

NOTES ON APANTESIS FIGURATA DRURY.

By S. D. Nixon, *Mt. Olivet Cemetery, Baltimore, Md.*

In April, 1911, I was out hunting larvæ of *Apantesis anna* and among the lot that I found I noticed several of the larvæ that were a little smaller than the *anna* and different. One kind of them was black with a stripe the length of the back; so I kept this kind by itself. When the larvæ pupated the pupa was much smaller than the *anna*, reddish in color, frosted the same as *anna*. In eighteen days one of them came out *excelsa* female, with the upper wing marked with two cross lines converging below and a complete W-mark; the other one came out *excelsa* male, the upper wing marked same as female. The lower wing is marked a little different from the type *figurata*. It has a dot in the red, also a black dash. The third one, all that I had at that time, came out male *figurata*, with the lower wing black and yellow. I am going to name this form *Apantesis figurata* var. *preciosa* Nixon. In a few days I found some more larvæ of *figurata* and they pupated and came out as follows: first was male and female typical *figurata*; next female type, and the last two came out male and female var. *excelsa*, only the markings on the upper wing were marked with two parallel bars, the outer one irregular and no W-mark, same as *figurata*. The first pair of *excelsa* had the red dot in the lower wing in a large irregular square, while in the other female *excelsa* the mark was small, rounded. The larva is about one and one half inches long, varying in color from coal black to rusty brown. It feeds on any plant in the locality where it is to be found, generally on hillsides where there is plenty of undergrowth. Some larvæ have a lemon stripe on the back.

TWO NEW HYMENOPTERA.

By J. C. Crawford.

THRIPOCTENUS, new genus.

Belongs to the tribe Tetrastichini; antennæ with two joints in the funicle, one very small ring joint, club three-jointed, the joints fused (fig. 2); parapsidal furrows indistinct, incomplete; mesonotum without a median groove; scutellum without longitudinal grooves; propodeum without a median carina; spiracles round; submarginal vein very short, marginal vein long, stigmal short, the knob almost subsessile; postmarginal vein developed (fig. 3) though not showing distinctly, as it is, as are the other veins, colorless; marginal fringes of anterior wings almost two-thirds as long as the greatest width of the wings.

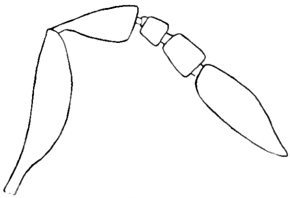

Fig. 2.—Antenna of *Thripoctenus.*

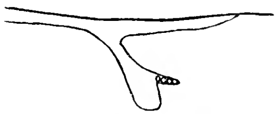

Fig. 3.—Postmarginal vein of *Thripoctenus.*

The only other genus in this tribe known to me which has two joints in the funicle (*Winnemana*) is readily separated by the presence of two longitudinal grooves on the scutellum.

Thripoctenus russelli, new species.

Female.—Length about 0.6 mm. Head and thorax black, the abdomen brown with a large basal flavous spot; head thin anterioposteriorly, collapsing after death; antennæ testaceous, the pedicel longer than the two joints of the funicle combined; second joint of the funicle longer than the first (see fig. 2) hairs on antennæ long; head and thorax smooth, polished; legs including the coxæ testaceous; wings hyaline, the veins colorless.

Male unknown.

Habitat: Compton, California.

Type: Cat. No. 14353, U. S. Nat. Mus.

Described from specimens reared from *Heliothrips fasciatus* by H. M. Russell and J. E. Graf and sent under number 618°.

The species is named in honor of Mr. Russell, who first found it.

Tetrastichus doteni, new species.

Female.—Length about 2 mm. Dark olive green, shining; the face collapsing after death; antennæ brown, joints of funicle subequal in length, the first about as long as the pedicel; mesoscutum finely lineolated, the lines mostly longitudinal; scutellum with similar but much finer sculpture; parapsidal furrows very deep; median lobe of mesoscutum with setigerous punctures, arranged in three more of less distinct rows along each lateral margin, the outer line near the parapsidal furrow; disk of metanotum finely reticulately lineolated; median groove of mesoscutum distinct; the pair of grooves on the scutellum more distinct; median carina of propodeum developed into a broadened plate, widening behind, its apex being the median portion of the apical carina of the propodeum; on each side of this plate the surface is sculptured to resemble faintly developed, thimble-like punctures; prepectus lineolated; mesopleuræ in part faintly lineolated, the rest smooth, polished; metapleuræ with sculpture similar to that on the propodeum, but stronger; marginal vein not much longer than the submarginal, stigmal less than half as long as marginal; coxæ and femora greenish, tibiæ bark brown, with more or less metallic reflections; knees, tips of tibiæ, and the tarsi testaceous; last joint of tarsi dark; abdomen longer than the head and thorax combined.

Male.—Length about 1.25 mm. Similar to the female, but the tibæ with more testaceous; joints 2-4 of funicle subequal in length, the first shorter; pedicel about as long as the second joint of funicle; sculpture of propodeum more indistinct than in female.

Habitat: Reno, Nevada.

Type: Cat No. 14362, U. S. National Museum.

From a series reared by Mr. S. B. Doten a type female and a type male and five paratypes of each sex have been selected. Mr. Doten writes that in cages the larvæ of this parasite feed readily on *Habrobracon hebetor* and on *Meraporus*, and occasionally on *Pteromalus*.

A PREOCCUPIED NAME IN SPHECOIDEA.

Notogonidea, new name.

Notogonia Costa, Ann. mus. zool. Napoli vol. 4, 1867 (1864) p. 82; not *Notogonia* Perty, Mitth. Naturf. Ges. Bern, 1850, p. 20.

Type: (*Tachytes nigra* Van de Linden) = *Larra pompiliformis* Panzer.

S. A. Rohwer.

A TRUE INTERNAL PARASITE OF THYSANOPTERA.

By H. M. Russell.

In view of the recent interest manifested in the order Thysanoptera and the tremendous importance several species of this group have assumed economically, it is of interest to record, at this time, the rearing of a parasite from a number of different species of thrips. At Compton, California, on December 10, 1910, four specimens of the prepupal stage of *Heliothrips fasciatus* Perg. gave unmistakable signs of parasitism. These were among a lot that had been collected in the larval stage on November 10, 1910, in order to ascertain how this thrips passes the winter, and this lot comprised the last that the writer was able to find that fall. By December 13, two of these prepupæ had been killed, while from the others parasitic larvæ had emerged and changed to naked pupæ. These were sent to the Bureau of Entomology of the U. S. Department of Agriculture, in the hope that the adult could be reared and determined, but unfortunately both died and this was impossible. As soon as the weather permitted, the author again took up the work of collecting the larval form of this thrips, in order to rear the parasite. Although this work was begun in February, 1911, it was not until June 15 that any parasitized specimens were found. Then a collection of four larval forms was made at Compton, California, one of which was parasitized. On July 3, 1911, one prepupa showed plainly that it was parasitized, but died without changing to pupa.

While collecting thrips material at Hollywood, California, on June 29, the author observed a very minute hymenopteron on the under side of a bean leaf in company with larvæ of *Heliothrips fasciatus* and, impressed with the idea that this was the parasite of the thrips, it was carefully watched through a small hand lens and appeared to oviposit once in a thrips larva. After this, the insect was not again observed to come in contact with thrips larva, so it was very carefully captured and put in 50 per cent alcohol. Later it was sent to the Bureau of Entomology in Washington and determined to be one of the Tetrastichinæ. Because of the minute size of this insect it was at once evident that it must be reared from the thrips themselves to bear out the doubtful case of oviposition noted. Therefore it was a source of great gratification to the writer to successfully rear this parasite July 29, from material collected at Hollywood on June 29. This insect is described as a new genus and species on page 233 of these Proceedings by Mr. J. C. Crawford, of the United States National

Museum, under the name *Thripoctenus russelli*. The following is a brief summary of the life history and habits of this insect as observed by the writer and his assistant, Mr. J. E. Graf. It may also be added that every important fact discovered concerning this insect has been independently observed and checked up by either the writer or Mr. Graf.

This parasitism first becomes evident two or three days after the thrips larvæ have changed to the prepupal stage and often after the normal insects have further changed to the pupal stage. The first indication is an extracting of color from the antennæ, head, and anal end of the thrips, leaving these hyaline, and an evidence of a deepening color in the center of the body. The attacked insect still has the power of motion, but as the feeding continues the color is more and more drawn to the center of the host and the edges of the body begin to appear hyaline, then the limbs collapse and sprawl in all directions, and the thrips loses all power of motion. Within a few hours after the parasitism is first noticed the insect has become shortened and more rounded and entirely hyaline or colorless, with the exception of an inner cylinder of deep crimson color in *Heliothrips fasciatus* or yellow in *Thrips tabaci* Lind. or *Euthrips tritici* Fitch. The parasitic larvæ emerge and pupate within from 2 to 11 days after the parasitism becomes evident, but, in over 66 per cent of the cases observed, in from 3 to 4 days. When the parasite is ready to pupate, the skin of the host is split and gradually worked off at the anal extremity and the parasite pupates in front of this cast skin, in whatever location the host had sought to change to a pupa.[1] The pupa is more or less of a flattened oval, 0.78 to 0.85 mm. in length and 0.30 to 0.32 mm. in width at the shoulders. The head is rounded in front and is followed by a distinct neck behind which the body is abruptly widened to its fullest extent. Posterior to this the sides, at first more or less parallel, converge very evenly to the posterior extremity. The newly formed pupa is almost white, except for the crimson cylinder in the center of the body, but in a short time it becomes gradually darker until it changes to shining black. During the summer the pupal stage varied in length from 16 to 28 days, but over 66 per cent of the specimens reared completed this stage in from 17 to 20 days.

The adult in emerging breaks off the covering of the face and splits the pupa case down the back, after which it frees its fore legs and by means of these slowly pushes the case

[1] *H. fasciatus* in some cases pupates in a curled-up leaf, but more often has been observed in rubbish or in cracks or under lumps of earth.

from the body. In a short time the adult begins to crawl over the foliage in search of host insects. Up to the present time every one of the many hundreds of adults reared have been females and these have reproduced parthenogenetically in all cases observed. In fact, at the present writing two generations have been reared from an unfertilized female.

The live adult is a beautiful little creature, about 0.60 to 0.75 mm. in length, having a black head, bluish black thorax, and hyaline wings; the antennæ, legs, and abdomen are light yellow; the posterior part of the abdomen more or less blackish.

The female parasite, while flying readily when disturbed, on most occasions, crawls over the surface of the leaf very slowly and deliberately or at other times with astounding speed, the antennæ in constant motion, first turned to one side and then to the other. When a thrips larva is encountered the hymenopteron stops, then very gently strokes it from end to end with her antennæ, and, if satisfied, she bends the abdomen under her body and exserts an extremely long and slender ovipositor. This is deliberately thrust into the body of the thrips larva and in most cases into the side of the abdomen. Generally this process occupies only a few seconds and then the search is continued for other larvæ, or in a few cases she returns to the same larva and oviposits in it for the second or third time.

Up to the present writing this insect has been reared in the laboratory from its original host, *Heliothrips fasciatus*, from *Thrips tabaci* (the onion thrips), and from *Euthrips tritici* (the wheat thrips). Field collections, this past summer (1911), have shown it to be breeding extensively in the onion thrips and bean thrips (*Heliothrips fasciatus*), the parasitism in some cases running as high as 70 per cent. The greatest number of adults reared from the eggs deposited by a single female so far has been 91 specimens.

The time from the laying of the egg until the parasitism is indicated in the host prepupa varies from 6 to 15 days, but is 7 days in the greater number of cases. The time required from oviposition to the pupation of the parasite varies from 8 days in the case of a very few, to 24 days in a few cases, but over 56 per cent change in from 10 to 14 days. The whole life cycle, then, requires from 28 to 48 days, with a mean average temperature of about 65°F. The winter is undoubtedly passed in the pupa stage, but the writer hopes to settle this point definitely during the coming winter.

At present this parasite is known to occur at Compton, Whittier, Puente, and Hollywood, all situated in Los Angeles County, California, and making up an area of nearly 150 square miles. As an example of its abundance, Mr. Graf, while recently at Puente, counted between 40 and 50 adults on a single plant of *Nicotiana glauca* infested by the bean thrips and it is now almost impossible to collect *Heliothrips fasciatus* at Compton, where this parasite was first discovered.

A TENDENCY TOWARDS POSTERIOR ERYTHRIZATION IN THE PSAMMOCHARIDÆ.

(Hymenoptera.)

By Nathan Banks.

Recently in examining some of our psammocharid wasps I noticed that there were forms that were practically mutants of the typical form of the species, and that in all cases this mutant was distinguished by having more red on the hind legs or abdomen than in the normal form of the species. I exhibit seven examples of this in six genera.

(1) *Psammochares fuscipennis*, and a mutant, var. *georgiana*, which has the abdomen all red and the hind legs reddish.

(2) *Aporinellus fasciatus*, a common black species, and a form, *A. ferrugineipes*, with reddish legs.

(3) *Ceropales bipunctata*, which normally has hind femora red, and a variety (*tibialis*) in which the hind tibiæ are also reddish.

(4) *Pseudagenia mexicana*, which typically has black coxæ, and a variety (*flavicoxæ*) in which the coxæ are yellowish red.

(5) *Pseudagenia mellipes*, with normally black coxæ, and a variety (*adjuncta*) with the coxæ II and III reddish.

(6) *Episyron atrytone*, all black, and a species almost exactly the same, except with reddish hind femora (*E. posterus*).

(7) *Batazonus algidus*, with black legs, and a variety with reddish legs.

These are not examples of extremes of variation; I have seen several of each, always alike, and without gradations. The species or varieties differ from each other in scarcely any character except this increase of red; therefore it seems evident that in this family there is a tendency to produce mutants with more red posteriorly than in the typical form.

I have not noticed such a form of mutation in any other group, although doubtless there are such.

Various spiders that in the East are green become more or less marked with red in the West, but the amount of red is extremely variable.

These mutants of the Psammocharidæ all come from the South, while the typical form occurs much farther north, as well as in the South.

ZWEI NEUE AFRIKANISCHE ARTEN DES GENUS TRIATOMA (ODER CONORHINUS) LAPORTE.

[Beitrag zur Kenntnis der blutsaugenden Hemipteren.]

von DR. ARTHUR NEIVA, *Assistent am Institute Oswaldo Cruz, Rio de Janeiro, Brasilien.*

Zum Zwecke einer Revision des Genus *Triatoma* Lap., welches, durch das von Carlos Chagas entdeckte Faktum der Übertragung einer neuen Trypanosomiasis durch die Art *T. megistus* Burm., für die Medizin neuerdings ein hervorragendes Interesse gewonnen hat, besuchte ich verschiedne amerikanische und europäische Museen und studierte das daselbst vorhandene Material.

Das *Naturhistoriska Riksmuseet* in Stockholm und das *Kgl. Zoologische Museum* in Berlin boten ein besonderes Interesse, weil dieselben die Typen des berühmten Hemipterologen C. Stal enthielten. Im letzteren fand ich auch die hier beschriebenen Arten.

Bis jetzt war die einzige in Afrika beobachtete Art *Triatoma rubrofasciata* De Geer; da dieselbe aber als kosmopolitische gelten kann, so ist die Entdeckung zweier neuen afrikanischen Arten von besonderem Interesse für die geographische Verbreitung des Genus.

Die Arten wurden durch die von Emin Pascha dirigierte Expedition gesammelt und tragen die Etikette: Tropisches Afrika—Emin Pascha.

Triatoma africana, n. sp.

Rüssel, Antennen und Kopf braun, letzterer etwas dunkler; Ocellen sehr deutlich. Pronotum im vorderen Teile mit zwei grossen Hockern, welche durch ziemlich auffällige Chitinbänder mit dem hinteren Teile verbunden sind, und verschiedenen Läppchen, von dennen 4 sehr deutlich hervortreten. Hinterer Teil des Pronotums weniger dunkel mit vier hellen Flecken, zwei an den hinteren Ecken und zwei in der Mitte gelegen.

Scutellum braun mit heller Spitze. Flügel an Corium und Membranen braun. Abdomen braun; Connexivum mit dunkelbraunen Flecken und apikalen, ockergelben Querbinden; Bauchseite braun; die Beine von derselben Färbung, nur die Tarsen heller; vordere Schenkel mit wenig auffälligen Dornen.

Länge 26 mm.; Breite 8, 5 mm.

Beschreibung nach einem gut erhaltenen Exemplare.

Typus im Kgl. Zool. Museum von Berlin.

Triatoma howardi, n. sp.

Rüssel, erste Antennenglieder und Kopf schwarz.

Vorderer Teil des Pronotums sehr deutlich, mit schwarzem Grunde und 6 braunen Höckern; hinterer Abschnitt ebenfalls schwarz, aber die Hinterecken braun und stark hervortretend; in der Mitte zwei braune Flecken, durch die zwei erhabene Linien ziehen, welche, an ihrem Ursprung im hinteren Teile des Pronotums braun sind, während sie nach vorne zu konvergiren und eine schwarze Farbe annehmen.

Scutellum schwarz, mit brauner Spitze. Corium und Membranen bräunlich. Abdomen oben hellbraun; Connexivum mit kleinen schwarzen, basalen Flecken; Unterseite in der Mitte dunkelbraun, was mit den hellbraunen Seitenpartien kontrastiert. Beine von derselben Farbe, wie die Mitte des Bauches, nur die Tarsen etwas heller. Vordere Schenkel ohne Dornen, mit leichten, kaum wahrnehmbaren Erhebungen.

Länge 25 mm.; Breite 9 mm.

Beschreibung nach einem sehr gut erhaltenen Exemplare.

Typus im Kgl. Zool. Museum in Berlin.

Die Art ist Dr. L. O. Howard, Chef des entomologischen Bureaus des Department of Agriculture der Ver. Staaten gewidmet.

Ich benutze die Gelegenheit, um Herrn Prof. R. Heymons für die Erlaubniss, in seiner Sektion zu arbeiten, bestens zu danken and ebenso Dr. W. La Baume, dem ich für seine unermüdliche Teilnahme sehr verpflichtet bin.

THE SYNONYMY OF A THYNNID GENUS.

Genus THYNNOTURNERIA Rohwer.

Æolothynnus Turner, Proc. Linn. Soc. N. S. W., vol. 33, 1908, p. 113 (in part); Genera Insectorum, fas. 105, 1910, p. 30 [not Ashmead].

Turnerella Rohwer, Ent. N., vol. 21, 1910, p. 349 [not Cockerell].

Thynnoturneria Rohwer, Ent. N., vol. 21, 1910, p. 474.

Eurohweria Turner, Ann. Mag. Nat. Hist., ser. 3, vol. 8, 1911, p. 308.

Mr. Turner has recently proposed a new name for this genus, but his name is unnecessary as the preoccupification was changed in 1910. S. A. ROHWER.

Actual date of issue, December 29, 1911.

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THE CORNMAN PRINTING CO.,
Carlisle, Pa.