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(MEETINGS OF JANUARY 10, 1907, TO DECEMBER 5, 1907.)

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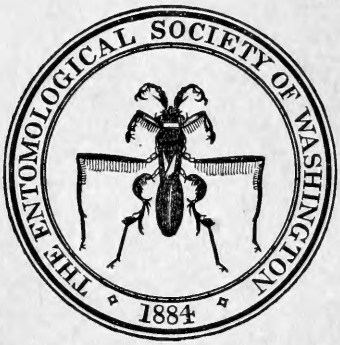

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. IX MARCH–DECEMBER, 1907 NOS. 1–4

JANUARY 10, 1907.

The 210th regular meeting was held at the Sængerbund Hall, 314 C street, N. W., President Hopkins in the chair. The following were present: Members, Messrs. Banks, Barber, Bishopp, Burke, Crawford, Currie, Dyar, Fiske, Heidemann, Hinds, Hooker, Hopkins, Knab, Patten, Pierce, Piper, Reeves, Sanders, Schwarz, Stiles, and Webster; visitors, Dr. A. K. Fisher, Dr. J. B. Smith, Mr. R. E. Snodgrass, Mr. J. F. Strauss, Mr. C. H. T. Townsend, and Mr. R. W. Van Horn.

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

Letters were read by the secretary from Mr. James Beattie, tendering his resignation as an active member of the Society, and from Mr. Charles Fuchs, thanking the Society for sets of its proceedings sent to replace those belonging to him and to the California Academy of Sciences, which were destroyed during the earthquake and fire at San Francisco.

Apropos of this last communication, Doctor Smith said that he had in his collection specimens of nearly all of the noctuids the types of which were destroyed in San Francisco at that time; these had been carefully compared with the types, and he considered them to be of nearly equal value. Mr. Banks stated that the same was true as regarded most of the species of spiders which had been described by him and of all of the

species of Neuroptera. Mr. Schwarz mentioned that the types of the Coleoptera from Lower California, described by Horn, had been saved.

—Doctor Stiles called the attention of the Society to the forthcoming meeting of the International Zoological Congress, which was to take place in Boston from the 19th to the 23rd of August. There would be a section of Entomology, as well as one of Applied Entomology. He, as secretary of the latter section, had requested Doctor Howard to give the sectional address.

—Mr. Banks, as retiring president, read the following paper as his presidential address:

ANNUAL ADDRESS OF THE PRESIDENT.

SOME PHASES OF PROTECTIVE RESEMBLANCE IN OUR SPIDERS.

By Nathan Banks.

There is nowadays much discussion concerning the value of mimicry and allied phenomena. Some of this, at least, is based on broad and general statements, which are more or less misleading. Some authors seem to think that most spiders are examples of mimicry or protective resemblance, and if these spiders are found in birds' stomachs it is evidence of the failure of such cryptic resemblance. Both of these ideas are entirely wrong. There are comparatively few cases of protective resemblance among spiders, and the capture by birds of any of these is not of itself any evidence as to the value of the protective device, for the chief enemies of spiders are not birds, but certain insects.

The subject of cryptic resemblances, as regards our spiders, may be divided into three groups: (1) Protective resemblance (2), mimicry, and (3) warning coloration. I shall here treat only of certain cases of protective resemblance. The examples of protective resemblance among spiders may be grouped in two classes. One class includes those cases

where the cryptic resemblance is intended to deceive possible prey, and perhaps incidentally to escape enemies; this is termed "anticryptic resemblance" by Poulton; the other class includes those cases where the cryptic resemblance is intended to deceive possible enemies, the "procryptic resemblance" of Poulton. The species belonging to the first class are often common, even abundant; and the success of their devices is shown by their abundance. To this class belong many spiders of the family Thomisidæ (Misumena, Runcinia, etc.). The species of the second class are rarely common in specimens. The success of their devices must be judged by the percentage that escape their enemies. Many authors reason that if a protected species is captured, the protective device is a failure. It is just the opposite. The success of their enemies was the cause of protective resemblance, and at least occasional captures must continue, not only to maintain the protective device at its present state, but to increase its effectiveness. And side by side with the development of the protective device in the prey, goes, in many cases, the increased power of detection in the enemy. Of course some species, by just the right method, may secure practical exemption from capture; and their former enemies must seek other food. But with the large majority of cases the protection is not perfect. It is simply a help in their struggle for existence, not always the main reliance, which may be in great fertility, or facility in obtaining food.

The chief enemies of spiders are insects, mostly certain Hymenoptera. Some authors take it for granted that birds are the great enemies of both insects and spiders. Such is not the case. Insects, as well as spiders, suffer mostly from the ravages of other insects. So to argue that since birds eat certain supposedly protected insects, the protection is of no value, is quite misleading; for the coloration may be effective against certain insect enemies. There are, as all know, certain families of insects which in their adult stage have more to fear from birds than from insects; but it is not the rule.

The principal insect enemies of spiders fall in three groups: Parasites, Pompilidæ, and mud-dauber wasps. I do not

know of any case where a parasite has been found on any spider belonging to any of the three classes of cryptic resemblance. The cocoons of spiders are often parasitized, and I know of two cases where parasites have been found in cocoons which might be called protected. These two examples are the egg-sac of a Cœlotes, and the cocoon of *Trachelas tranquilla*. On the other hand, I have examined many protectively colored cocoons without finding parasites. However, there are so few facts on this subject of parasitism that any opinion is of little value.

As regards the Pompilidæ, I have but few facts, occasional observations. Suffice to say that there is no record of their capturing any protectively colored spider.

With the mud-daubers there is an easy way to determine what they capture; simply to examine their nests. To know, however, what escaped the mud-daubers, one must be familiar with the spider fauna of the region at that time of the year. I have made an examination of mud-dauber nests in two localities where I am familiar with the spider fauna. First, let us consider that in any region there are many spiders that are not available as food for the mud-daubers. Certain warningly-colored spiders, such as the Acrosomas and allies, are not suitable, owing to their spines; they could not be easily packed into a mud-dauber nest. Especially long and long-legged spiders are hardly fit to pack in a cylindrical nest; so that the rarity of Tetragnathas in mud-dauber nests is not proof that the wasp does not see them, for it may be that the wasp does not care to block up her nest with such unsuitably shaped spiders. Likewise the mud-daubers can not use daddy-long-legs, unless by removing the legs. One must, therefore, in considering the available food of the mud-daubers, throw out a large number of species which the mud-dauber would not take, no matter how evident they were to her.

In tabulating the contents of these nests I have in many cases given the sex of the spider; this, in some cases, is quite useful.

Spider contents of mud-wasps' nests at Sea Cliff, N. Y.

June 15, two nests:
5 *Epeira strix*, 4 ♀.
1 *Epeira* sp., ♀.
1 *Philodromus vulgaris*, ♀.
1 *Epiblemum scenicum*, ♀.

June 15, two nests:
7 *Epeira parvula*, ♀.
1 *Phidippus audax*, young.
1 *Larinia borealis*, ♀.

June 15, one nest:
20 *Asagena americana*, ♀.

June 15, two nests:
11 *Asagena americana*, ♀.
4 *Theridium tepidariorum*, 3 ♀.
2 *Steatoda borealis*, ♀.

June 15, one nest:
1 *Epeira labyrinthea*, ♀.
5 *Xysticus gulosus*, 4 ♀.
14 *Epeira trivittata*, very young.

June 20, one nest:
3 *Phidippus audax*, 2 ♀.
9 *Epeira parvula*, very young.
1 *Epeira trivittata*, ♀.
2 *Epeira labyrinthea*, ♀.
4 *Xysticus triguttatus*, ♂.

June 20, one nest:
3 *Epeira trivittata*, ♀.
17 *Epeira parvula*, ♀.
1 *Xysticus triguttatus*, ♀.

June 20, one nest:
3 *Epeira trivittata*, ♀.
11 *Epeira* sp., very young.
2 *Epeira parvula*, ♀.
2 *Xysticus triguttatus*, 1 ♀.
1 *Xysticus nervosus*, 1 ♀.

July 10, two nests:
16 *Xysticus triguttatus*, 14 ♀.
7 *Epeira insularis*, young.
2 *Dendryphantes octavus*, ♀.
2 *Phidippus rufus*, 1 ♀.
2 *Xysticus nervosus*, ♀.

July 10, two nests:
26 *Epeira trivittata*, young, mostly ♀.
8 *Xysticus triguttatus*, 5 ♂, 3 ♀.
4 *Phidippus rufus*, 1 ♂, 3 young.

July 10, two nests:
2 *Xysticus gulosus*, ♀.
13 *Xysticus triguttatus*, ♀.
1 *Epeira trivittata*, ♀.
1 *Phidippus rufus*, young.
1 *Philæus militaris*, ♂.

Spider contents of mud-wasps' nests near Falls Church, Va.

July 12, one nest:
8 *Steatoda borealis*, ♀.
July 12, one nest:
4 *Oxyopes salticus*, 2 ♀.
4 *Misumena asperata*, ♀.
1 *Misumena americana*, ♀.
July 12, one nest:
6 *Misumena asperata*, ♀.
July 12, one nest:
1 *Phidippus audax*, ♂.
3 *Phidippus* sp., young.
4 *Misumena* sp., young.
July 12, one nest:
7 *Oxyopes salticus*, 5 ♂.
1 *Misumena* sp., young.
1 *Homalattus cyaneus*, ♀.
July 12, one nest:
1 *Xysticus triguttatus*, ♀.
2 *Plectana stellata*, ♀ young.
1 *Misumena americana*, ♀.
1 *Misumena* sp., young.
July 12, one nest:
1 *Phidippus audax*, ♂.
4 *Lycosa scutulata*, very young.
4 *Xysticus* sp., very young.
5 *Oxyopes salticus*, 4 ♀.
1 *Zygoballus sexpunctatus*, ♂.
1 *Homalattus cyaneus*, ♀.
2 *Salticus albocinctus*, ♂.
August 21, one nest:
20 *Argiope trifasciata*, young, 10 ♂.
2 *Epeira trivittata*, ♀ young.
August 21, one nest (perhaps same wasp):
12 *Argiope trifasciata*, all young.
1 *Epeira trivittata*, ♀.
August 21, one nest (perhaps same wasp):
11 *Argiope trifasciata*, young.
1 *Cyclosa caudata*, ♀.

August 21, one nest (perhaps same wasp):
14 *Argiope trifasciata,* young.
1 *Epeira trivittata,* ♀.
August 21, one nest (not same wasp):
7 *Argiope trifasciata,* several half grown.
1 *Epeira trivittata,* ♀.
August 21, one nest:
9 *Argiope trifasciata,* young.
4 *Epeira trivittata,* young.
July 27, three nests:
21 *Argiope aurantia,* young ♀.
1 *Argiope aurantia,* ♂.
3 *Argiope trifasciata,* young ♀.
1 *Mangora gibberosa,* ♀.
1 *Phidippus rimator,* ♂.
3 *Epeira insularis,* young ♀.
1 *Epeira trivittata,* young ♀.
1 *Runcinia aleatoria,* young ♀.
1 *Misumena asperata,* ♀.

Besides these records I have the following notes:

Brownwood, Texas.—The mud-daubers around here collect many *Lathrodectes mactans;* sometimes 10 are found in one cell; no other spider was seen in the nests.

Shreveport, La.—One mud-dauber nest contained 7 females and 3 males, *Philodromus vulgaris.* A young Lathrodectes was found in one nest. The Epeiridæ are the most common contents of the nests.

Guanajuato, Mexico.—A mud-dauber's nest from this place contained about 20 *Dictyna dugesi.*

In these lists of captured spiders are three species, each of one specimen, which are plainly protectively colored spiders. They are *Cyclosa caudata, Runcinia aleatoria,* and *Mangora gibberosa.* They can be classed as fairly common spiders—much more so than many of the other spiders taken by the wasps, such as *Plectana stellata, Zygoballus sexpunctatus, Homalattus cyaneus, Asagena americana,* and others. The presence of these spiders in the nests shows that the wasps are not adverse to using them as food for their young, and that they belong to the available food supply. The small percentage—only one of each—shows that the wasps did not see the great majority of specimens of these species. These three spiders live freely exposed during the day-time, and do not hide in retreats.

Moreover, there were several other protectively-colored spiders available while the mud-wasps were abroad, and yet not captured. For example, *Leucauge hortorum,* harmonizing with its surroundings in the same manner as *Mangora gibberosa,* and much more common than that species, was not in the mud-wasp cells examined by me. *Misumena vatia,* protected as is the *Runcinia aleatoria,* and fully as common, was not found, but has been recorded by McCook, although he may have confused it with an allied species. *Drapetisca socialis, Tmarus caudatus, Philodromus infuscatus, Hyptiotes cavatus, Epeira juniperi, Uloborus plumipes, Acacesia foliata* —all protectively-colored spiders and apparently available as food—were not taken by the wasps.

If we look again at the lists, we see that the great bulk of the mud-wasp captures are of spiders certainly not protected by resemblance to their surroundings. *Epeira trivittata, E. parvula,* the species of *Argiope,* and *Xysticus triguttatus,* especially in their immature stages, are entirely defenseless. These spiders are very fertile; a great many eggs are in each cocoon,[a] and it is by this means that they keep their position in nature. My experience in collecting in these localities is in line with this view. The adults of *Epeira trivittata* and *E. parvula* and of Argiope are not much more common than *Cyclosa caudata* or *Runcinia aleatoria,* but the young of the former spiders are very much more numerous than the young of the protectively-colored species.

Resemblance to escape enemies is apparently a last resort of a spider incapable of maintaining its position in nature by its fertility or its facility in the capture of prey. Cyclosa, for example, has less than 100 eggs, often but 50, in a cocoon, while the ant-like spiders have still fewer, one of them but 3 eggs in a cocoon.

This protectively-colored group of spiders could hardly exist were it not for the presence of the extremely fertile group, from which the mud-daubers and other enemies of spiders secure the bulk of their food. Like the farmer who plants ten kernels of corn in each hill, " two for the blackbird,

[a] Argiope, for example, has 1,000 to 2,000 eggs in a cocoon.

two for the crow, three for the cutworm, and three to grow," so nature calculates that in Argiope, for example, so many young are for the parasites, so many for mud-wasps, so many for the birds, and the rest to grow. The two groups are closely interrelated. For as the protectively-colored group becomes more definitely protected, so the extremely fertile group must become more fertile to supply the increasing amount of loss coming to it. It is evident, therefore, that there can be no final balance between the two groups, but rather a fluctuation, due largely to the varying abundance of their enemies from year to year. The success of the protectively-colored group must not be too pronounced, else it would become abundant and more liable to capture; but there must always be a few captured to maintain the protective device in its present condition, else there would be reversion to the more normal coloration.

As an appendix I might add that none of our spiders strongly resembling ants was found in any of the mud-wasp nests, the nearest approach to them being *Salticus albocinctus,* two specimens of which were taken by a wasp at Falls Church. *Synemosyna formica,* our most common ant-like spider, the species of Peckhamia, of Tutelina, of Castaneira, and of Micaria were not found in the cells. All are found running exposed in the day-time and resemble ants. Mud-daubers do not take ants, so that this form of mimicry is very valuable to these spiders; however, they become subject to the attacks of the enemies of ants, which include various birds. This also goes to show that these ant-like spiders are not trying to escape from birds, but from their more serious enemies, the wasps.

In the discussion which followed, Mr. Webster described a fly, a Trypeta, reared from galls in ragweed, which had come under his observation, and which closely mimicked a spider, the wings being so colored as to represent the legs. Not only in color, but also in its movements was the similarity very marked. He argued from this that the spider which

was mimicked must be distasteful. He also mentioned another which closely resembled bird droppings, the liquid portions being represented by the web.

Mr. Banks identified the last mentioned as *Philodromus ornatus* Bks., and stated in addition that, so far as he knew, none of the spiders was actually distasteful to its enemies.

—Doctor Stiles then addressed the Society on the subject of the stigmal plates of the genus Dermacentor, illustrating his talk by a series of fine drawings. He spoke of the difficulty of separating the species of this genus by means of the characters which have usually been employed for this purpose, and of his discovery that the microscopic structure of the stigmal plates show definite characters that can be depended on when all others fail. These characters are of a nature that they may be studied to advantage only by means of the compound microscope, and consist principally of the number and arrangement of certain goblet-shaped cells, the exact function of which in the economy of the animal he had not been able to determine. Each species of the genus was taken up in turn, mention of previous confusion in its determination was made, and the shape and character of the stigmal plate illustrated by means of drawings. While there is considerable individual variation in the plates from different specimens within a species, there are certain characters which can always be depended upon, and by means of these he had for the first time been able to determine the species of the genus to his continued satisfaction.

Considerable discussion followed, largely concerning the relative value of the stigmal plates and other characters for the determination of the species. In the course of this Doctor Stiles reaffirmed that his studies, which were based on the careful examination of hundreds of mounts, had fully convinced him that in many cases valid determinations of these ticks are impossible unless the stigmal plates are taken into consideration. He stated that in genera other than Dermacentor they appear to be of some value, but to what extent he had not determined. He described the technique by which the results were obtained. Mr. Banks stated that the shape

of the stigmal plates had been used for many years by various authors—Berlese, Canestrini, Stoll, etc.—and that Neumann, in his Revision of the Ixodidæ, had used the sculpture of these plates, as, for example, in *Dermacentor variegatus.* Mr. Banks also stated that the sculpture of the stigmal plates can usually be made out by the aid of a ¼-inch lens. He thought that other characters are of equal value and especially mentioned the porose areas. These, also, have been used by Neumann.

—Mr. Barber exhibited a microscopic mount of a species of the genus Polyctenes, collected at Sapucay, Paraguay, by Mr. W. T. Foster. These insects are parasitic on bats of the genus Molossus, and were taken by Mr. Foster on *M. rufus* and *M. cerastes.* The genus was proposed by Westwood,[a] who figured and described a species from Jamaica, *P. fumarius,* and another from China, placing it in the Family Polyctenidæ, of the order Anoplura. Waterhouse[b] considered the genus to be dipterous, and described two new species from Java and Madras, and a new genus, Euctenodes, which he placed in this family, but which is allied to the dipterous genus Strebla. A year later he described another species,[c] *P. longiceps,* from Guatemala, on *Molossus abrasus,* and at the same time recognized its affinity to the Hemiptera and the impossibility of placing it amongst the Diptera.

In spite of the remarkable superficial resemblance of these insects to certain of the pupiparous Diptera, there is no doubt as to their being true Hemiptera. The mouth parts, the antennæ, and legs all bear out this relationship, and the characters which they have in common with the pupipara are distinctly secondary in their nature, and are such as would naturally be developed through the peculiar habits of the insects. Such secondary characters are the combs on the head and thorax, the unusually formed tarsal claws, etc., which are very much the same in the fleas, the pupipara, and in this genus, and which are unquestionably of assistance in clinging

[a] Thesaurus Entomologicus Oxoniensis, 1874, p. 198, pls. 38, 39, 40.
[b] Trans. Ent. Soc. Lond., 1879, p. 309, pls. 9 and 10.
[c] Ibid., 1880, p. 319, pl. 10.

to the hairs and crawling about amongst them. It illustrates the general rule, that like necessities bring about like development of certain characters in order to meet them.

Mr. Banks noted that individuals belonging to the Polyctenidæ, Streblidæ, and Nycteribiidæ infest the same species of bats, and that all three may occur together.

—Mr. Schwarz, in the name of Mr. Caudell, exhibited a box containing specimens of a rare form of earwig,[a] belonging to the genus Discritina of Westwood. These insects were first described as larvæ, and differ so radically in form from other earwigs that they were supposed by Westwood to be the type of what might possibly be an order. Green, in Ceylon, was the first to rear them, and to determine their true affinity. The specimens exhibited were collected by Mr. Barber in Guatemala under old banana leaves. In this connection Mr. Schwarz spoke of the infinite number of forms of insects which were found under these leaves, including representatives of nearly all orders.

—Mr. Burke exhibited specimens of the large barkbeetles of the genus Dendroctonus, and remarked upon their peculiar ability to nip off hair. If held in the fingers, and a hair passed between their mandibles, they will cut it off cleanly, and continue to do so as fast as it is fed to them. This characteristic was discovered by the lumbermen, who have bestowed on these beetles the name "clipping bugs." Several species of the genus, including *D. monticola* Hopk., *D. valens* Lec. and *D. brevicomis* Lec., are possessed of the faculty.

February 7, 1907.

The 211th regular meeting was held at the residence of Mr. A. L. Quaintance, 1807 Phelps Place, N. W. President Hopkins was in the chair and there were present Messrs. Barber, Bishopp, Burke, Condit, Crawford, Davis, Dyar, Fiske, Gill, Howard, Hunter, Johnson, Knab, Lawford, Marlatt, Moulton, Pierce, Quaintance, Sanders, Sasscer, Schwarz, Spooner,

[a] Mr. Caudell has recorded this species as *Diplatys severa* Bormans (Proc. U. S. Nat. Mus., Vol. xxxiii, p. 169, 1907.)—Pub. Com.

Titus, Webb, and Webster, members, and Messrs. D. H. Clemons, R. E. Snodgrass, J. F. Strauss, C. H. T. Townsend, R. W. Van Horn, and G. S. Weldon, visitors.

Mr. Hunter exhibited a collection of South African ticks recently received from Mr. C. P. Lounsbury. Seven or eight genera were represented, several of which are concerned in the transmission of diseases of domestic animals, including horned cattle, horses, dogs, and fowls. Much interesting work has been done lately by several investigators connected with the School of Tropical Medicine in Liverpool, and notably by Mr. Lounsbury himself, and many curious facts concerning these ticks have been ascertained. One species, for instance, transmits two distinct diseases of the same host, one bacterial, the other caused by a protozoon. Others are concerned in the transmission of two distinct diseases of different animals. The same mode of transmission does not obtain in every case. In one the infection passes through the egg, but the animal does not become pathogenic until the adult stage is reached. In another, which resembles the Margaropus (Boophilus) causing Texas fever in this country, it passes through the egg, but it is the young larva which is pathogenic; in still others the young larva becomes infected and, during a subsequent moult, capable of transmitting the disease. An interesting fact concerning the nature of the organisms thus transmitted was recently discovered by a German investigator, who found that what was previously considered to be a bacterium was in fact but a stage in the metamorphosis of a protozoon. Although these conclusions have not been validated by other observers they seem to be well founded.

—Mr. Pierce exhibited drawings of the early stages of several species of the genus Anthonomus which had been reared by him. He pointed out that both larvæ and pupæ are easily separated by certain very distinct characters, and that in one instance it was evident that a species ordinarily considered as a close ally of certain others, actually belonged to an entirely distinct group, as indicated by its larval and pupal characters.

Considerable discussion followed, in the course of which Mr. Schwarz stated that he had had much to do in years past

in determining the species of Anthonomus. As long as there was only a short series of each species, the determination was in many cases easy, but as the collection grew it became more and more difficult to determine certain species properly. The adults vary greatly—much more than they were thought to do by Dietz, and it was found that no reliance could be placed on the pubescence or the color of the legs. Even the characters in the second and third joints of the funicle could not be relied upon, considerable individual variation being found. Doctor Hopkins stated that he had found many good characters in the larvæ and pupæ of Pissodes and in certain genera of the Scolytidæ. While in some cases the classification of the larvæ does not agree with that accepted for the adults, it does in others, and in such cases serves completely to validate the accepted system.

—Mr. Barber stated that a few years ago, while working upon certain of the Histeridæ, he was considerably struck by the great difference in the figures of *Hetærius brunnipennis* Rand. as published by Marseul and by Horn. Photographs of these figures, together with a drawing made under his supervision and a photograph of the beetle itself, were exhibited. The differences are so great that it would hardly be supposed that the different illustrations were intended to be of the same insect.

Mr. Schwarz, commenting upon this exhibit, spoke of the great difficulty of satisfactorily illustrating certain insects, especially the more convex beetles. Drawings are very apt to be of what the artist sees, rather than of the insect as it is, and photographs, especially of the polished forms, are the least satisfactory of all. In certain published drawings of Coccinellidæ, for instance, in which the elytra with their characteristic markings are shown, the subapical appears to be apical, because the true apex of the elytra is invisible from the viewpoint chosen by the artist.

Doctor Howard, in this connection, referred to the peculiar fact that illustrations of insects almost always appear smaller than the scale to which they are drawn. Some years ago, in order to demonstrate this, he caused to be prepared a series of

drawings of well-known insects, some of them life size, and others enlarged to varying proportions between one-fourth and two times. These were submitted to various entomologists for their opinion, and in nearly every instance those which were enlarged about one-fourth appeared to them to represent the natural size of the insect.

—Doctor Hopkins presented a paper entitled "Some Results of Anatomical Investigations of the Thoracic Segment of Insects." It was discussed by various members. Doctor Gill expressed his disapproval of the use in insect anatomy of terms used in the anatomy of vertebrates. Pieces which had been referred to as clavicle and scapula could not by any possibility be homologous to the bones so designated in the vertebrate skeleton, and the names were not only incorrectly used, but their use would almost certainly bring about some confusion eventually. The use of such terms as femur, tibia, and tarsus should not be considered as forming a precedent in this respect, and if it were practicable he thought that their continued use should be discouraged.

—Mr. Schwarz exhibited adults and larvæ of *Hilipus elegans* Guér. collected in Jamaica. He stated that the North American genera Pissodes and Hylobius were unknown in Cuba and the other West Indian islands, and that Hilipus was the nearest ally of these genera in the tropics. Of this there are very many species, there being about 80 from Mexico and Central America, and in the neighborhood of 200 from South America. While the genus is represented in the West Indies, the number of species found there is comparatively small. Unlike the related forms in the North, none of them, so far as known, breeds in pine, and in the case of the majority their geographical range makes it impossible that they should do so. Until the larva of *H. elegans* was discovered, however, the early stages of none were known. This species is injurious to camphor trees, boring in the inner bark, and scoring the surface of the wood in a manner very suggestive of Pissodes. It is of additional interest in this connection, as neither it nor its food plant is a native of Jamaica.

—Mr. Marlatt presented the following paper:

A SUCCESSFUL SEVENTEEN-YEAR BREEDING RECORD FOR THE PERIODICAL CICADA.

By C. L. Marlatt.

The long underground life of this most wonderful of American insects always arouses, in the minds of those who have not given the subject study, doubt as to the accuracy of the records. This doubt can exist in the mind of no one who has followed the history of this insect as recorded by Hildreth, Potter, and Smith, and many modern observers, but the proof for, respectively, the 17 and 13-year periods for the development of the cicada has hitherto been based, for the full term, solely on chronological records of occurrences. To silence the skepticism which arose from the lack of actual breeding records the late Professor Riley was for many years interested in demonstrating, by rearing experiments, the validity of the long underground development of this insect; in other words, to follow a particular generation throughout its subterranean life of 17 or 13 years, as the case might be, watching its development and preserving examples of the different stages. Many experiments were made, some of them being efforts to rear the insects about potted plants, and others to follow particular broods in the field. The difficulty of keeping potted plants in a healthy condition for so long a period, especially where examinations of the soil must needs be made from time to time, together with the unreliability of caretakers, led to an early failure of all such efforts. The first attempts to follow the development of the cicada in the field in Missouri were successful in a measure, but here again the experiment failed because of the difficulty of keeping up observations in a particular place over so long a period. Observations, however, were made on a brood in Missouri under Doctor Riley's direction by Mr. J. G. Barlow for a period of ten years. These observations related to the 13-year brood appearing in 1881, and during these ten years the larvæ of the cicada had slowly increased in size through the four larval stages, and were ready to enter the first pupal stage.

A much more careful series of experiments was instituted in connection with the 17-year brood making its appearance in 1885, and the 13-year brood of the same year. Quantities of eggs of the 17-year brood were collected in Virginia and distributed under certain linden and oak trees on the grounds of the Department of Agriculture at Washington, D. C. A very considerable quantity, also, of eggs of the same brood were

collected at various points in Indiana, Pennsylvania, and Michigan, and distributed to points in Georgia, Alabama, Mississippi, and Missouri. The object of the transfers made from northern to southern localities was to determine whether the 17-year period was governed by latitude and temperature. A large quantity of eggs of the 13-year brood, also, was collected in Mississippi and Missouri, and distributed to various observers in New York, Iowa, Massachusetts, and Maine, the intention being again to determine whether the 13-year period was merely a matter of temperature. All the transfer plantings of the 13-year brood failed, as did also the 17-year brood, including plantings in Washington. The difficulty in these cases seemed to have been in the lack of sufficient material and the natural accidents and reduction in numbers which go on steadily during the long 17-year or 13-year term. Nevertheless, it was possible to follow the plantings made in Washington for a considerable series of years before the larvæ in the soil practically disappeared. It is probable, however, that some few adults actually emerged at the end of the 17-year period, which, for the 17-year race experimented with in Washington, was in 1902.

A much more promising experiment, because of more abundant material, was instituted on the Department grounds in 1889 with the 17-year race which appeared in that year and which had its return appearance during May and June of last summer (1906). This brood is practically unrepresented in the District of Columbia, and did not occur at all on the Department grounds. A very large quantity of egg-infested twigs was obtained from North Carolina, Long Island, Kentucky, and Ohio—several cartloads altogether—and these were distributed under oak and other trees on the grounds of the Department of Agriculture. The eggs in most instances were hatching when received, and were placed under the trees in the very best condition for the larvæ to enter the soil, and many thousands—probably hundreds of thousands—of larvæ actually went into the soil under these trees. This experiment was made during the first year of the writer's connection with the Bureau of Entomology, and the later examinations were made chiefly under his direction. Three years after the planting, the soil under the trees where the egg-bearing twigs had been distributed was found to be thickly filled with larvæ, so much so that a single spadeful of earth would often turn up half a dozen or more. In the spring of 1897 the larvæ had reached the fourth stage and were still very abundant in the soil. Examinations were made from time to time showing these larvæ to be still present in the soil about the trees where the eggs had been distributed, going through the slow process

of growth and transformation which has been described elsewhere. That a successful outcome was sure to be had in this experiment was demonstrated in the early spring of 1906, the year for the appearance of this brood, the ground about the planted trees exhibiting many of the exit holes of the insects which are made to the surface long before the insect emerges. These holes under certain trees were so numerous as to indicate the emergence of thousands of cicadas. Under one tree a count and estimate were made of more than 5,000 openings, and under other trees the openings ranged from a few hundred to from one to three thousand. The actual emergence took place between May 14 and 21. The writer visited the grove on two evenings, and witnessed the issuance of numbers of cicadas and collected some specimens. In spite, however, of the considerable number of cicadas which emerged, none was seen on the trees during the days and weeks following. Each morning about the planted trees would be found a considerable group of blackbirds, which evidently had been feasting on the newly-issued cicadas. The cast pupal shells were numerous on the trunks of the trees and especially on the foliage, and also on the ground, but scarcely a single cicada escaped the sharp eyes of these birds, and the characteristic song was not heard during June in this grove, although thousands of adults had come forth.

At none of the examinations were cicadas of this brood found under any of the trees except where eggs had been distributed, and no emergence holes appeared under other trees. The record from the planting to the emergence of this insect is therefore complete, and gives the demonstration by actual transfer and breeding record of the long period of the 17-year brood, a demonstration which, as indicated at the outset, was entirely unnecessary to show the correctness of this extraordinary hypogeal term.

The absolute failure of these insects to establish themselves when planted in such enormous numbers, even when the underground period had been successfully passed, owing to the relentless onslaught of birds, is a striking illustration of what is happening every year with the different broods in nature, especially in thinly forested regions, and accounts for their great reduction in numbers and the practical disappearance of many local swarms formerly abundant. It also shows that there may be emergences in considerable numbers without their being reported, unless some observer chances on a pupal shell or notes the exit holes in the ground about the trees, and hence the little value of a negative report as opposed to a positive one.

Mr. Schwarz suggested the desirability of determining the periodicity of certain of the other native species of Cicadidæ for which it was not known. He mentioned especially *C. marginata* Say, a species which occurs only at rare intervals.

Mr. Titus said that *C. putnami* was probably a 2-year species. There was one locality in Colorado where it occurred on the even, and another where it occurred only on the odd year.

March 7, 1907.

The 212th regular meeting was held at the residence of Mr. C. L. Marlatt, 1440 Massachusetts avenue, N. W., President Hopkins in the chair. The following were present: Members, Messrs. Barber, Busck, Doolittle, Dyar, Fiske, Gill, Hopkins, Howard, Johnson, Knab, Marlatt, Patten, E. F. Phillips, W. J. Phillips, Quaintance, Reeves, Sanders, Sasscer, Schwarz, Titus, and Webster; visitors, Messrs. D. H. Clemons, C. S. Spooner, C. H. T. Townsend, R. W. Van Horn, and G. P. Weldon.

The recording secretary read an invitation to the Society to send delegates to the International Zoological Congress to meet in Boston in August. By vote, the president was directed to appoint such delegates at his discretion.

Mr. Schwarz called attention to the rediscovery of that peculiar beetle known under the name *Ignotus ænigmaticus,* specimens having been recently received from Mr. C. T. Brues, who found them in a box of insects in the Milwaukee Public Museum. Mr. Frederick Blanchard, who has females of this insect, has discovered that it belongs to the family Dermestidæ. The original home of this species must still remain in doubt, since it is hardly indigenous to our country. The history of this remarkable insect was recalled, and some discussion followed as to whom to credit the name. It was first collected by Mrs. A. T. Slosson, who submitted it to several specialists, none of whom had ever seen it before. The name was suggested by Doctor Dyar, and used by Mrs. Slosson in a short published note, which, it was held by Doctor Dyar,

served as a description. In the opinion of Mr. Schwarz the description was insufficient, and the name should either be credited to Doctor Dyar, who suggested it, or to Doctor Skinner, who figured the species on the cover of Entomological News.

—Mr. Schwarz called the attention of the members of the Society to the collection of Phengodini now in the National Museum, and invited such as so desired to examine it. It contains nearly all of the species described from this country, the representatives of certain of which had been loaned to the Museum and would soon have to be returned.

—Doctor Howard spoke of the death, on January 14, 1907, of a former member, Mr. C. B. Simpson, Entomologist of the Transvaal Department of Agriculture, South Africa, and read a part of the last letter he had received from him and which reached Washington after his death. The letter was dated November 21, 1906. At the suggestion of Mr. Schwarz it was voted that portions of it be published in the proceedings of the Society; they are given below:

ENTOMOLOGICAL NOTES FROM THE TRANSVAAL.

By C. B. Simpson.

I have before me the biggest locust campaign that I have ever undertaken—probably the largest that has been systematically taken in hand in the world.

In order to show you what we are doing I would say that I have 84 men and 20 paid Kaffirs in the field. The remainder are called Assistant District Officers, and it is their duty to actually kill locusts on Crown lands, native locations, and unoccupied farms. Most of these are hardy Boers of the type that kept Kitchener busy. In addition to the farm workers we have power to call out the natives and make them work without pay. We are using the arsenite of soda almost exclusively with most marvelous results. We had 16 English tons of it which is now exhausted, and a new supply of 2½ tons arrived today. In reserve we have about 5 tons of arsenic. We have about 1200 bucket spray pumps loaned out and a further 400 will arrive next week. To date we have used 25 tons of crude sugar. I was given £12,000 to carry out this

work—put in dollars this looks bigger ($60,000). I pay district officers £1 per day, and mule transport for same man costs from £1–5 to £2–5. My head office staff consists of 5 men. Our great difficulty is lack of water. We have about 20 water carts in use, and it is often necessary to draw water 8 to 20 miles.

Enclosed you will find a leaflet which gives a forecast, prepared August 6, of voetgangers which would hatch after October 1. You already know of my post card system of reports. Developments show that I made slight errors in two places, as I have indicated on the map. However, I think this good enough for a first attempt. This gave me time to travel about and give 47 lectures illustrated by lantern slides, and when the beginning of our campaign came—thanks to our preparations—things moved without a hitch, save in one instance. We will not finish until about December 15, at which time I expect that those locusts which have escaped will get away and fly southwest, thus leaving the colony for a few months. This infestation is the greatest in the memory of the oldest inhabitants. *Swarms* is not a proper term; *masses* is more nearly correct. Some of these swarms are from 2 to 7 miles long and from 100 to 1500 yards wide. The whole force of railway "gangers" (section hands) are at work killing the locusts on the railways in order to prevent them from entirely stopping the trains. The mail from the Cape was derailed by locusts once, and in both the Cape and the Orange River Colony it is the usual thing for trains to be late on this account.

In fact the most conservative districts have been carried by storm and are heartily in favor of having locust destruction made compulsory. The interest His Excellency the High Commissioner Lord Selbourne has taken in locust destruction has helped greatly. Day after tomorrow I will take out a large party of Government officials and prominent men by special train to show them how a swarm of voetgangers is destroyed.

The only drawback to this work is that the Orange River Colony and the Cape are not doing their duty in destroying the locusts in their territories and hence we may be forced to do the same next year as this. Some of our farmers are advocating a duty on Cape products sufficient to carry on our locust work and to compensate for their losses by the "fliers."

I note that the Association of Economic Entomologists is to have a symposium on Insect Legislation. I hope to do my share by sending a note of what we are doing in the Transvaal. After the locust campaign is over I hope to start work in Silk Culture and also to carry on investigations regarding Malaria and Mosquitoes.

I forgot to tell you that we expect to destroy all of the voetgangers this season in the inhabited areas of the Transvaal, while in the uninhabited areas we expect that many swarms will escape us.

I have devised a plan for showing living specimens of eggs, larvæ, pupæ, and adults of mosquitoes on the screen with a lantern. I tried it with success, on one occasion, before the Transvaal Medical Association. It is as follows: Take two glass plates slightly smaller than a lantern slide and put them together so that they will be about one-half an inch apart, making this waterproof with water glass. Or you may be able to buy a cell which will answer. Make a slide cover into which this cell will fit, and, upon placing it in the lantern and focusing, the insects will come out most distinctly and much enlarged. In a dry cell the adults can also be shown well. The unfortunate thing is that the picture is inverted, but I asked my audience to imagine that they were standing on their heads. During this lecture I had only one Anopheles larva. It stayed at the bottom for a full two minutes. I explained what it was expected to do, and when I had finished it came up to the surface and took its horizontal position as though it had been trained. Needless to say, it was watched with great interest by the audience and its good behavior was rewarded by cheers from the medicos.

I have little news to tell aside from that which relates to my work. There is great political activity here, but, much to our liking, all of the parties have agreed among themselves to keep the Agricultural Department entirely out of politics. My work here is most pleasant, and if the unexpected does not happen I shall probably spend the remainder of my life here, especially since I'm married here. I do want a vacation, as the work at present is most trying. One day last week I dictated 40 letters and 36 telegrams, very few being alike.

Doctor Howard spoke further upon the great work done by Mr. Simpson in South Africa, and especially upon his success in dealing with the locust problem, for which large sums were appropriated by the South African colonies.

—Mr. Barber spoke of a scolytid beetle resembling Phlœosinus which he had collected in the Southwest in pinyon. Doctor Hopkins stated that this insect probably belongs to the genus Carphoborus, several species of which are abundant in

pine and pinyon in the West, and bear some superficial resemblance to Phlœosinus.

—Mr. Knab exhibited a box containing a remarkably fine series of North American beetles of the genus Calligrapha, among which were several new species described in a paper in course of preparation. He called attention to the importance of knowing the plant on which insects were living as an aid to the determination of the species. Mr. Schwarz, in commending the work of Mr. Knab on this difficult genus, remarked on the great difficulty which has been experienced in preparing a synoptic table of the various genera of American Chrysomelini. The forms are numerous, and a table to be of value must be accompanied by figures of the species.

—Mr. Fiske presented the following paper:

NOTES ON INSECT ENEMIES OF WOOD BORING COLEOPTERA.

By W. F. Fiske.

During three seasons spent largely in the field upon forest insect investigations, many notes have been collected upon the natural enemies of the bark and wood-boring Coleoptera with which these investigations have principally had to do. The material thus collected, dealing, as it does, with many species of widely different habits, is particularly of value, as it serves to illustrate in a general way the existing relations between this class of hosts and their insect enemies, at the same time giving an idea of what developments may be expected along this line.

Early in the investigations it became apparent that there was a remarkable difference between insect parasitism as it existed in the wood-feeding Coleoptera, and in external-feeding insects in general. This is most strikingly brought out in the comparative importance of hyperparasitism. Dr. L. O. Howard, in a study of the parasites of *Hemerocampa* (*Orgyia*) *leucostigma* S. & A., estimated a total of 90 per cent of the larvæ and pupæ infested by parasites, while at times as high as 95 per cent of some parasites were destroyed by secondary enemies. In a similar study of the parasites of the common tent caterpillar (*Malacosoma americana* Fab.), made some years ago in New Hampshire, it was found, when it became a

question of the relative importance of parasites to host and of hyperparasites to primary enemies, that the latter far overshadowed the former. While the proportion of parasitized caterpillars varied but little from year to year, approximating each season from 15 to 20 per cent, at times as many as 90 per cent of the parasites were destroyed by secondary enemies. In contrast to this, out of several hundred breeding notes upon the parasites of wood-boring Coleoptera, there is but a single well-authenticated instance of hyperparasitism.

In view of this, it might at first glance appear as though many instances would show an influence of the parasites upon the abundance of the hosts greater than in the case of Malacosoma or Hemerocampa. The investigations so far made do not appear to confirm this theory to any great extent. Just why it does not hold, is rather difficult to explain satisfactorily in some instances, though in others apparent explanations are not difficult to find. One of these is the dependence of a great many species upon a suitable alternation or sequence of hosts. Take for example a parasite upon a barkbeetle having a well-defined life history with but a single annual generation such as *Bracon scolytivorus* Riley upon *Hylesinus aculeatus* Say in ash, which is able to make the attack upon its host only at a certain stage in the development of the latter. As it rapidly passes through its own transformations and emerges many months before this particular host is again ready to serve in that capacity, it becomes a necessity for the parasite to seek another that will be suitable. This is far from being the simple matter that it is with a great many of the parasites of the Lepidoptera, as it is not only necessary to find another host more or less closely related to the first, and with similar habits, but the nature of its surroundings must be approximately the same. A tree with thicker or harder bark may offer insuperable obstacles to oviposition.

It is only in rare instances that all the individuals of a brood of wood or bark borers are equally exposed to the attack of any one parasite, and a proportion will almost always escape. This condition has been at times strikingly illustrated by a study of the proportion of parasitized individuals of *Dendroctonus frontalis* Zimm. in different trees and different portions of the same tree. In the tops, or in small trees where the bark was thin, braconid parasites were once found to have attacked something like 45 per cent of the larvæ, while lower down on the same tree it was almost entirely absent. It is easy to see how conditions like these, which are, of course, intensified when different hosts in different species of trees are involved, have great influence upon the fortunes

of parasites. Then, too, though hyperparasites may not be a considerable factor, the various predatory enemies undoubtedly are, as it is certain that at times they will attack parasite and host with like freedom. When any species becomes as numerous as *Thanasimus dubius* Fab. occasionally does, in trees infested with Dendroctonus, not only a great many of the barkbeetles, but also an almost equal percentage of their parasites are destroyed.

A few very striking instances have come to my attention of parasites eminently capable of continuing indefinitely on one host only. Such a one is an apparently undescribed Spathius, a parasite of Hylesinus in ash. The host is single-brooded, for the most part entering branches and trunks of dying trees in the spring, and emerging in June and July. The parasite oviposits upon the larvæ in May and June, and its larvæ, after development, spin cocoons in which all or a large proportion remain until the May or June of the following season, when they emerge at the best possible time to attack the next succeeding brood of Hylesinus. Another species attacks the common Phlœosinus in Taxodium, and remains in its cocoon for the better portion of the year. As our knowledge increases, more and more species are added to this list, but the limitations of hymenopterous parasites as factors in the control of forest insects are probably narrow.

Another striking point of difference between the parasites of external feeders and of the wood-boring Coleoptera lies in the relative importance of predatory enemies. Among the insect enemies of the latter, predation is developed to a remarkable extent, at times approaching so closely to true parasitism as to render it practically impossible to draw a distinction between the two. That it is of relatively more importance than parasitism, becomes more and more evident as the habits, hitherto unknown, are revealed of one after another of numerous species of Coleoptera commonly found about dead and dying trees. The list of important predatory forms now includes many of the Elateridæ, Cucujidæ, Trogositidæ, Colydiidæ, Cleridæ, etc., among them species never before enumerated as such, and at the same time there is good reason to believe that the list is far from being complete. Many of these are predaceous as adults as well as in their larval stages, and by actively destroying the adults of the same destructive species upon which their larvæ prey are enabled to do double service.

As an illustration the clerid *Thanasimus dubius* may be mentioned, which among insects of a predatory nature unquestionably ranks among the most important. It is the particular enemy of the destructive pine barkbeetle (*Dendroctonus fron-*

talis), and it is not uncommon to find infested trees in which the brood has been almost entirely destroyed by it. No other species exhibits to a more striking extent the predatory habits of the adults, and when they are numerous the fragments of adult Dendroctonus and other barkbeetles destroyed by them will be found in quantities beneath the loose outer bark of trees in the early stages of attack.

Others, from their clumsy bearing or innocuous appearance as adults, give no hint of their true nature. As a notable example may be mentioned the large-eyed elaters of the genus Alaus, the larvæ of which are veritable dragons, and among the most voracious of insects. What their actual food capacity may be has never yet been determined, but some idea may be gained by the record of a single larva of *Alaus oculatus* L., which was collected in April, 1904, when apparently nearly full grown, and during May and June devoured in confinement no less than thirteen medium and large-sized cerambycid larvæ, pupæ, and adults, besides numbers of smaller larvæ not counted. No insect appears to be too large and strong to resist them. *Alaus myops* Fab., which is the principal enemy of Monohammus in pine, will not only prey on the young larvæ during its own early stages, but when approaching maturity will follow its prey to their pupal cells, deep in the wood, where it will even attack the fully formed and nearly hardened adults.

The adaptability of many predatory insects to various surroundings and their peculiar specialization along certain lines are very remarkable. As in the case of parasites, they are frequently dependent upon more than one species of host. *Thanasimus dubius,* for example, is unable to arrive at its full development upon the summer broods of *Dendroctonus frontalis,* since the barkbeetles will pass through their transformations and emerge before the larvæ of the clerid have reached their full growth. In spite of this, the latter rarely find difficulty in securing a sufficient food supply in the larvæ of the various secondary barkbeetles, as well as of cerambycids, etc.

Some are very general feeders and others are quite closely confined to certain families, genera, or even species, at least exhibiting marked preferences in this respect. In no instance are they deterred by the location of their prey to anything like the extent that obtains with the hymenopterous parasites.

Whether or not we may expect to receive practical benefit from a knowledge of the enemies of wood-boring Coleoptera is a question which must be decided by the future. With the exception of a few forms of hymenopterous parasites, which are principally confined to hosts of little economic importance,

the present state of knowledge does not offer any great hope of results of value so far as this class of enemies is concerned. In the case of predaceous enemies the case is different, and it may be that much benefit may yet be derived from them when their habits have become better known, and the possibilities and limitations of each species defined. The introduction of species into localities beyond their natural range is, of course, the most obvious method of utilizing them, and good opportunities exist for experimentation along this line without overstepping the limits of the United States. The most destructive enemies of the western forests are represented in the East by closely related forms. Both in the East and in the West these pests are partially controlled by natural enemies which are not the same in the two localities, and it is possible that a mutual interchange of these might result beneficially. Some years ago Dr. A. D. Hopkins introduced into West Virginia an important European enemy of barkbeetles, but the disappearance of the beetle which it was desired to control was brought about by other causes, and the success or failure of the experiment lost its significance. Attempts of this nature are, of course, very liable to failure, but the necessary expense is so small in comparison with the benefits possible if the results are successful, that very long chances may be taken and still leave good margin for profit. Other methods by which it might be possible to utilize a knowledge of parasites and enemies constantly suggest themselves as we determine definite facts in their habits and life history.

April 4, 1907.

The 213th regular meeting was held at the residence of Mr. J. D. Patten, 2212 R street, N. W., President Hopkins in the chair and the following members present: Messrs. Barber, Barrett, Benton, Burke, Banks, Caudell, Dyar, Heidemann, Hopkins, Howard, Knab, Marlatt, Morris, Patten, Sanders, Schwarz, Stiles, and Titus. Mr. J. H. Emerton, of Boston, was present as a visitor.

Mr. C. S. Spooner, of the Bureau of Entomology, U. S. Department of Agriculture, and Messrs. G. P. Weldon and A. B. Gahan, assistant entomologists of the Maryland Agricultural College Experiment Station, were elected active members.

Dr. Howard exhibited a number of new species and genera

of Aphelininæ and showed drawings of several of the specimens. This material had come from Nawa, Compere, Green, Lounsbury, Noack, Marlatt, and from others at Washington, D. C. He stated that the aphelinine fauna of the District of Columbia and all North America had been modified by the imported species, which were parasitic upon the scale insects. In many cases these had entirely replaced the native forms. He stated that the commercial distribution of scale parasites was first suggested by LeBaron in 1866. Although a number of workers have spent considerable time upon these interesting groups, there are still many undescribed species and genera. Among the forms exhibited was Azotus, an interesting genus which had been received from New Zealand; Paris, France; Ohio, U. S. A.; Cape of Good Hope; and Bathurst, Australia. Doctor Howard noted as of interest the finding in Mexico of specimens of Foerster's Genus Mesidia. This was described without type or species name by Foerster.

At the conclusion of Doctor Howard's talk a discussion came up regarding the question as to whether a genus must have a described type. Dr. Stiles maintained that it was not necessary, that the genus was mononomial and was valid even if no species had been named with it.

—Mr. Barber exhibited specimens of a peculiar fly which is attracted in large numbers to the moist patches on the leaves of the tree yucca at Hesperia, Cal., and presented the following note in regard to it:

NOTE ON OMOMYIA HIRSUTA COQUILLETT.

(DIPTERA, PHYCODROMIDÆ.)

By H. S. Barber.

On May 12, 1903, I spent a short time trying to collect the insects living on the tree yucca (*Yucca arborescens*) at Hesperia, Cal. Within a stone's throw of the railroad track and nearly opposite where the train stopped stood a large yucca that had recently died, having yellow leaves and slightly loosened bark which came off, leaving the wood moist in places.[a]

[a] On the same tree were found the very strange lampyrid larvæ previously described (Proc. Ent. Soc. Wash., Vol. VII, p. 117).

To these moist spots came flies in large numbers, apparently two species, one of which was large, 6 mm. in length, yellowish, covered with long yellowish hairs, and greatly resembling *Scatophaga furcata* in general appearance. The other was much smaller, black, shiny, with a distinct dark spot near the tip of the wing. The large woolly one appeared very aggressive, alighting often upon the black, shiny one and with his woolly legs outspread so as to hide his captive completely he would run about over the moist wood as if he were a single specimen. But at last I saw a very small woolly specimen alight upon a large black shiny one and in this case saw copulation take place. Then the true state of affairs dawned on me.

I collected a series of about 39 males and 12 females, and 3 pairs in copula. In this series there is enough variation among the males (in size, pubescence, length, and color of scutellum) to make half a dozen modern species, but the females appear to be much alike. The males vary in size from a 6½ millimeter specimen, which was covering a 4 millimeter female, to a 2½ millimeter specimen caught in copula with a 3½ millimeter female. The scutellum in large males is much elongate and yellow, while in small ones it is short and black, and there is an almost complete series of intergrades between these extremes.

Mr. Coquillett has recently published[a] the description of a new genus and species, *Omomyia hirsuta,* made from 8 specimens collected at Lancaster, Cal., by Mr. A. Koebele, in April, several years ago. One of these cotypes is labeled "*Yucca brevifolia.*" They are all large males, and only the large males in my series agree with the generic description. Through an oversight my series of over 50 specimens was not before Mr. Coquillett at the time his description was drawn up, but he tells me that he intends to publish in the Canadian Entomologist a generic diagnosis revised so as to include the females and depauperated males.

—Mr. Banks made some remarks upon a collection of insects which he had made in a locality in the open woods near Falls Church, Va. This collection showed a remarkable association of insects of varied forms and habits. In the discussion Mr. Schwarz made a strong plea for the collection of such associations, citing the interesting work of Hubbard and several others.

[a] Canadian Entomologist, 1907, p. 76.

—Mr. Emerton, upon invitation, gave a short talk, stating that he had come to Washington to work over some material in the Arachnida and to study the collection of Mr. Banks.

—Doctor Dyar exhibited specimens of mosquitoes belonging to the genus Deinocerites, and spoke of the fact that these are known to breed only in mangrove swamps at the tide-water level and in the holes of crabs.

—Mr. Quaintance spoke of the recent destructive outbreak of *Enarmonia prunivora* Walsh in apple orchards. This lepidopterous pest had been supposed to be connected in some way with the plum curculio (*Conotrachelus nenuphar* Hbst.) and had been bred from black knot. The first brood lives in the calyx of the apple and there pupates. The second brood often lives entirely outside. The species has been taken from Ontario south, and as far west as British Columbia.

—Mr. Burke exhibited four species of the coleopterous genus Trachykele. One of these was found in cedar of Lebanon at New Orleans. Another came from Mexico and a third from California; he gave notes upon the species and remarked that they all apparently feed upon cedar of some kind, one species ruining cedar which is used for fence posts.

—The following papers were offered for publication:

NEW TROPICAL AMERICAN NEUROPTERA.

By Nathan Banks.

About a year ago Prof. F. Campos, of Guayaquil, Ecuador, sent me a small collection of neuropteroid insects from that country. Several species in the collection are new, and the descriptions of these forms constitute this paper. I have added the description of a new ant-lion fly from Lower California. Three of the new species from Ecuador belong to the peculiar genus Dimares, only two species of which were previously known.

Dimares bellulus, n. sp.

Face yellowish, with a transverse brown band from eye to eye, connected in middle to the brown above, thus forming two pale spots below the antennæ; a large blackish spot between and above antennæ; vertex pale yellowish, with brown streaks, a median pair close together

and several oblique ones on the sides; antennæ black; palpi brown at tips of joints. Pronotum brown, a pale yellow spot each side in front and one each side behind; thorax dull brown, several pale spots, in pairs on mesoscutellum and metascutellum, and on anterior and lateral lobes of mesothorax; sides brown; abdomen dull brownish-black; legs pale yellowish, with many erect black bristles; tips of tarsal joints brown. Wings hyaline, mottled with brown; the fore pair with spots nearly all over, most prominent along the radial and cubital veins, and the apex rather broadly black, the posterior margin mostly black, none of the spots forming bands. Hind wings with the apex broadly brown, two costal spots before it, two median and two on hind margin just behind costals, and one median spot before all in basal half of wings. Venation mostly brown, but in the fore wings there are many white veins; the radial sector and its branches are more or less white.

Expanse 55 mm., width of fore wing 8 mm.

From Posorja, Ecuador (Campos).

Dimares venustus, n. sp.

Face and vertex mostly brownish black; two pale spots below antennæ, and some faint ones on the vertex; antennæ brown; palpi brown at tips of joints; thorax brown, spotted much as in *D. bellulus,* sides yellowish brown; abdomen yellowish on basal half, beyond brown; legs yellowish, tips of tibiæ and of tarsal articles brown, many black bristles. Wings hyaline, spotted with brown on apical half; fore wing with apex broadly brown, containing two small pale spots, and band before and narrowly separated from it; this band is broken in the middle behind; before this is another short band, more oblique, not reaching costal margin and behind much broken up; before this are two spots, one on the radius, the other just behind it, and many small spots elsewhere on the veins. Hind wings with a large apical spot, containing two pale spots; before this is a broad, irregular band apparently made of two or more spots united, and containing a hyaline median spot behind; before this is a subcostal spot, and a short band from middle to hind margin; basal half of wing unmarked; venation mostly brown, with some white veins as in *D. bellulus.*

Expanse 52 mm., width of fore wing 9 mm.

From Posorja, Ecuador (Campos).

Dimares formosus, n. sp.

Face yellowish, two brown spots below antennæ, and one on the base of clypeus; vertex brown; antennæ brown, apex black; palpi black on tips of joints, pronotum yellowish, with an elongate black streak each side, one across middle, and a spot on lower sides; thorax dull brown, with some inconspicuous paler spots, sides grayish; legs yellowish, with black bristles, tips of tarsal joints brown; abdomen

yellowish on basal third, beyond dull black. Wings hyaline, marked much as in *D. venustus;* fore wings with an apical black spot, containing two subapical pale spots, a large band before it, broken behind, another band before latter and reaching the costa, but much broken up behind, and before this last band is another, more oblique, not reaching costa, and broken up behind; on the basal part of wing are many small dots along the veins. Hind wings also marked like *D. venustus,* but the spots are larger and connected through the middle, the pale areas in apical spot are larger, and there is also a small but distinct spot in the middle of basal half of wing; venation brown, partly white as in the other species.

Expanse 76 mm., width of fore wing 13 mm.

From Posorja, Ecuador (Campos).

Eremoleon angustus, n. sp.

Face yellowish, with a dark-brown interantennal mark, from which a median projection extends down to the clypeus; above antennæ pale brown, with a median pale spot just above and between antennæ; vertex yellowish brown, with several black spots each side; pronotum brown, with a median yellowish stripe, and a slightly curved yellowish mark on each side; thorax brown, spotted with yellowish, a pair on anterior lobe of both mesothorax and metathorax more prominent than the others; venter mostly yellow; abdomen brown, most of the segments with a yellowish mark each side. Legs pale yellowish, tips of all joints black, and the femora and tibiæ heavily spotted with the same color, most prominently beneath. Wings hyaline, venation mostly brown, the subcosta, radius, radial sector, and median interruptedly white, some of the cross-veins also white, a short brown marginal streak on the anal angle of the fore-wings, the pterostigma slightly infuscated. Legs very slender, hind femora longer than mesothorax plus metathorax; spurs weak, and barely longer than the first tarsal joint, which is no longer than the next. Wings very narrow, hind ones only about one-half the width of the fore pair, and plainly shorter, fore wings subfalcate at the tips; radial sector arises beyond fork of the cubitus, but in hind wings plainly before the fork of cubitus, and with but one cross-vein before it.

Expanse 42 mm., width of fore wing 5 mm.

From Santa Elena, Ecuador. It differs from the type of Eremoleon in shorter spurs and narrower wings, but as it agrees in venation I will retain it there, since other species may yet be found intermediate in spur length and width of wings.

Acanthaclisis assimilis, n. sp.

Similar in general appearance to *A. fallax.* The markings of head and pronotum are as in that species; the palpi, however, are wholly

dark; the antennæ dark, and narrowly, indistinctly annulate with pale; the mesonotum is pale, with a median black stripe undivided by pale; the pleura are brown, with long white hair; the fore legs are mostly black, the tibiæ with some pale bands, other legs paler, and all thickly clothed with long white hair; abdomen dull black. Wings hyaline, in general appearance like *A. fallax,* the pterostigma being dark, and in the fore wings an oblique subapical mark, but the radius is not punctate, only interrupted at long intervals by black; there are nine cross-veins before radial sector in fore wings, none of them crossed (several crossed in *A. fallax*); there are two series of costals beyond the basal fourth of wing; in the hind wings there are six or seven cross-veins before the radial sector, and the anal runs into the branch of the cubitus.

Expanse 96 mm., width of fore wing 12 mm.

From Santa Elena, Ecuador.

Brachynemurus camposi, n. sp.

Face yellowish, a brown interantennal mark, vertex mostly brown; pronotum dark brown, with a narrow median yellow line, and a faint yellowish streak each side behind; thorax brown, with a narrow median yellow stripe, and some spots each side; abdomen yellowish brown, apparently unmarked; legs brownish yellow, the tarsi mostly black, the tips of the tibiæ infuscated, most of the bristles on front legs snow-white, some white ones on hind legs, others black. Wings hyaline, veins mostly brown, only indistinctly interrupted with pale, subcosta and radius not marked, pterostigma not prominent. Antennæ short, and with very large knobs; legs short, anterior tarsi fully as long as the tibiæ; the basal joint of tarsus short, but much longer than the middle ones, apical joint long, spurs as long as two tarsal joints. Wings extremely slender, subfalcate at tips, three cross-veins before radial sector in fore wings, in fore wings the anal runs by the branch of cubitus and ends near end of that vein, but in hind wings the anal turns down just beyond fork of cubitus.

Expanse 34 mm., width of fore wing 3.5 mm.

From Santa Elena, Ecuador.

Brachynemurus eiseni, n. sp.

Similar in many respects to *B. sackeni,* and in a paper on Neuroptera from Baja California I considered it that species. It differs, however, in a number of points, and especially in the male appendages. The vertex has three large spots behind, one of them median, and two each side in front; the thoracic marks are more united than in *B. sackeni,* but on the same plan, the dots on the mesoscutellum larger than in that species and situated more nearly in front; the abdomen has the pale spots of a snow-white color, and they are present on all

the segments, the last at base and tip; the apical white spot of each segment is divided by a black median line. The wings are not nearly as heavily marked as in *B. sackeni,* and the radial sector arises only a trifle in front of the fork of the cubitus. The male appendages are only about twice the length of the last segment, and the male abdomen is not as long as in *B. sackeni.*

Several specimens from San Jose del Cabo, Baja California (Eisen).

Ululodes flavistigma, n. sp.

Face with gray hairs, brown hair above, near eyes, and on vertex; antennæ yellowish, the articulations narrowly black, knob brown; thorax dark brown or dull black, pleura with gray hair; abdomen brown, more yellow above, and with a curved dark-brown spot each side on each segment; legs pale brownish, tips of the tibiæ black. Wings hyaline, pterostigma yellowish, inconspicuous on both pairs; venation yellowish brown, the costal veins darker than others, none marked with black. Wings rather long, but not slender; in the fore wing the anal vein does not run into branch of cubitus, but is connected thereto by a cross-vein; in the hind wings the anal cells are not more than one and one-half times as long as broad (in many species twice as long as broad).

Expanse 60 mm., width of fore wing 7.5 mm.

One specimen from Guayaquil, Ecuador.

A GALL-MAKER OF THE FAMILY AGROMYZIDÆ.

(*Agromyza tiliæ,* n. sp.)

By F. D. Couden.

During the spring of 1907 a correspondent forwarded to the Department of Agriculture some twigs of linden (*Tilia americana*) showing evidence of a "peculiar disease" for which a remedy was desired. An examination in the Bureau of Entomology showed the presence of small dipterous larvæ inside the galls with which the twigs were covered. They were at first supposed to belong to the family Cecidomyiidæ, although no one to whom the twigs were shown recalled having seen any cecidomyiid galls that in any way resembled these. Fortunatly I was able to breed adults from this material, and they proved to belong, not to the Cecidomyiidæ, but to the Agromyzidæ, a family the species of which greatly differ in their food habits, although there is no previous record of a gall-maker among them.

At first sight, Mr. Coquillett, to whom I took the specimens, determined them as belonging to *Agromyza simplex* Loew, the "asparagus root-miner," a species of no inconsiderable economic importance; but upon a more careful examination differences were noted by which a separate species may be distinguished from the adults alone. Mr. Coquillett is now inclined to think that this may be the species originally described as *simplex,* and that the asparagus miner should perhaps be described as new. Either will fit Loew's description, however, almost equally well; and, unless it is absolutely necessary, it does not seem desirable to change the name of an insect which has become so well known to economic workers. Moreover, *simplex* is described from the "Middle States;" the asparagus miner is common from New England to the District of Columbia, and is therefore much more likely to be the subject of that description than is the "linden gall-maker," which at present is known from a single locality, and that in Missouri.

There follows a description of the adult of the insect under discussion, the gall of which will be readily recognized by reference to figure 1.

Agromyza tiliæ, n. sp.

Color, including head and antennæ, shining black. Mesonotum and scutellum a little shiny; abdomen triangular, very shiny. Ocellar triangle with the sides forming the apex somewhat concave and longer than the third side, shiny. Wings hyaline, veins black; penultimate section of the fourth vein usually somewhat shorter[a] than the posterior cross-vein which is about one-half the length of the last section of the fifth vein. Length 2 to 2.5 mm.

Described from 10 specimens bred from galls collected by Mrs. T. F. Hickey in Jennings, Mo.

Type.—No. 10928, U. S. National Museum.

The adults may be distinguished from those of *simplex* by the size and shape of the ocellar triangle, and by the arrangement of the frontal bristles. These differences are plainly shown in figure 1 at *e* and *f*. It will be seen that the ocellar triangle is much larger in *tiliæ,* and that the sides forming the apex are somewhat concave rather than convex. The frontal bristles in *simplex* are almost equidistant, while in *tiliæ* the four lower ones are nearer together, and the fifth separated from the fourth by a distance almost twice as great as that between any two of the others.

[a] This character is variable. In one of the cotype specimens the penultimate section is only about one-half the length of the cross-vein, while in two other specimens they are approximately equal.

Two lots of these galls were received, on March 22, and April 2, 1907, respectively. On the latter date several of the galls were cut open and were found to contain puparia and,

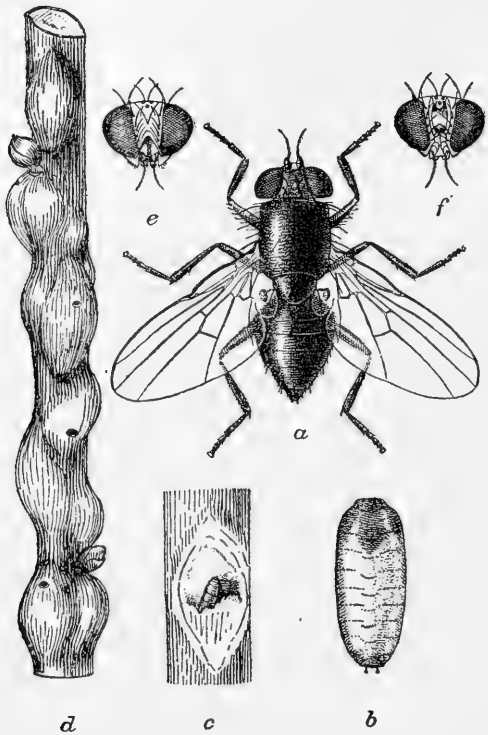


FIG. 1.—*Agromyza tiliæ: a,* Adult; *b,* puparium; *c,* section of gall showing puparium; *d,* galls on twig of *Tilia americana; e,* front view of head of adult, mouth parts open; *f,* front view of head of adult *Agromyza simplex,* mouth parts closed; *a, b,* much enlarged; *c, d,* somewhat enlarged; *e, f,* very greatly enlarged. (Drawings made in the Bureau of Entomology and published by permission of the Secretary of Agriculture.)

in a few cases, dead adults only partially emerged. The first living adults were obtained on April 4 and emergence continued for eight days. No further data on the life history were obtained.

THREE NEW SPECIES OF TROPICAL PHALANGIDA.

By Nathan Banks.

The following three new species of daddy-long-legs have been in my possession for some time, and since the collectors are anxious for the names, I present their descriptions. The Liobunum from Mexico is especially interesting since it has a color character not seen in any other species of the genus.

Liobunum dugesi, n. sp.

Body pale yellowish, a rather faint vase-shaped mark behind, sometimes indistinct; eye-tubercle white, with a median black streak; lateral margins of abdomen black above; trochanters broadly marked with brown in front and behind; femora brownish, with a narrow black line on basal fourth of lower sides, less distinct above on anterior pairs of legs; rest of legs brown, the tibiæ and tarsi nearly black toward the tips; a black mark on under side of palpus near tip. Body minutely and evenly granulate, the legs with rather more acute granules, and the coxæ with a marginal row in front and behind; venter smooth; palpi simple, patella spinulate above, the inner apical angle rather tumid, tarsus one and one-half times the length of tibia; femur I about twice as long as width of body.

Length of body 6 mm., femur I, 8 mm.

Many specimens from Puebla, Mexico, kindly sent me by the veteran Mexican entomologist, Dr. A. Dugès, of Guanajuato. Readily known from other Mexican species of the genus by the black lines under the femora.

Scotolemon flavipes, n. sp.

Body reddish yellow; legs, mandibles, and palpi pale yellow. Cephalothorax slightly broader than long, as broad in front as behind, eye-tubercle (fig. 2) occupying one-third of its width, rounded above; surface of cephalothorax roughened and granulate. Abdomen more than twice as long as the cephalothorax and nearly twice as wide in its broadest part, high and convex above, segmentation indistinct on the basal part, where there are about ten transverse rows of granules, each tipped by a short stiff bristle, somewhat curved backwards; segmented part of dorsum with two rows of granules and bristles to each segment. Venter with two rows of erect bristles on each segment, each from a small granule. Coxæ I and II with a row of granules on the anterior side, III on both sides, and IV on the posterior edge. Legs very slender, with granules on femora, patellæ, and tibiæ; metatarsi without false articulations. Femur II a little longer than the width of the cephalothorax; patella II fully one-half as long as tibia II, metatarsus

II longer than tibia II, tarsus II as long as metatarsus II. Leg IV is a little shorter than II. Leg I is much shorter than II, and in similar proportions, except that the tarsus is not as long as the metatarsus; all legs with many short fine hairs; tarsus I of 4 joints, tarsus II of 6 joints, tarsus IV of 4 joints. Palpi (fig. 2) of moderate length; a short spine below trochanter; two near base of femur and two toward tip; two on tibia, rather widely separate, and two on tarsus; claw nearly as long as tarsus. Basal joint of mandibles somewhat gibbous above.

FIG. 2.—*Scotolemon flavipes:* Eye tubercle and palpus.

Length of body 2 mm.

Near Havana, Cuba (C. F. Baker).

Scotolemon pictipes, n. sp.

Cephalothorax yellowish, marmorate with black: abdomen dark brown; palpi mostly black, heavily mottled with pale in form of rounded spots, most prominent above; legs blackish, finely marmorate with pale; I with tip of femur and the tarsus pale, II with tip of femur pale, III with tip of femur, patella, and tibia pale, IV with tip of all joints pale, and rather broadly so. Cephalothorax broader than long, broader in front than behind; eye-tubercle (fig. 3) in middle, very broad, above with a long procurved spine; surface roughened. Abdomen two and one-half times as long as cephalothorax, high and convex above, but scarcely twice as wide as cephalothorax; basal part of dorsum granulate, each granule tipped by a short bristle, each segment on apical part with a row of granules tipped by bristles. Coxæ granulate; ventral segments each with a row of large granules, tipped by bristles. Legs with fine hairs; leg IV rather longer and heavier than II, patella less than one-half as long as tibia, and the tarsus much shorter than metatarsus, except in leg II, where it is about as long. Tarsi I, III, and IV with four joints, II with seven joints, the basal always the

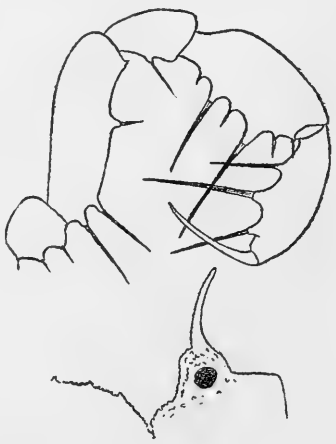


FIG. 3.—*Scotolemon pictipes:* Palpus and eye tubercle.

longest. Palpus (fig. 3) on inner side with two long spines toward apex of femur, one on patella, two on tibia, and three on the tarsus; on the outer side, one under trochanter, two near base of femur, and one near apical third, one on patella, two long, and three very short ones alternating on tibia, and three long ones on the tarsus; the claw fully two-thirds as long as the tarsus.

Length of body 2.8 mm.

From near Havana, Cuba (C. F. Baker).

NOTE ON THE GENUS DOLICHOPSELEPHUS, ASHMEAD (OPHIONIDÆ).

By T. D. A. Cockerell.

Szépligeti, in the Genera Insectorum, has placed Dolichopselephus as a synonym of Heterocola Förster, 1868. As the American genus was discovered by myself in Colorado many years ago, I feel a rather special interest in it, and have been led to investigate the reasons for the proposed synonymy. Ashmead, in his work on the genera of Ichneumonidæ, keeps the genera separate; but the difference seems to narrow down to a trifling one of the exact position of the metathoracic spiracles, and it may perhaps be admitted that Szépligeti is presumably right about the identity of the two. It does not appear to follow, however, that Heterocola should be adopted. That genus was not based on any described species, and in 1890, when Dolichopselephus was described, it does not appear that any species had been placed in it. It is true that two of the four known species of the genus were described by Thomson as early as 1889; but they were referred to Thersilochus. If I am correct in my view of the matter, we must write: *Dolichopselephus interstitialis* (Thoms.), Europe; *Dolichopselephus proboscidalis* (Thoms.), Europe; *Dolichopselephus punctulatus* (Szép.), Europe; *Dolichopselephus cockerelli* Ashm., Colorado.

May 2, 1907.

The 214th regular meeting was held in the rooms of the Washington Sængerbund, 314 C street, N. W., with the President, Dr. A. D. Hopkins, in the chair and the following persons present: Messrs. Barber, Barrett, Benton, Burke, Crawford, Dyar, Heidemann, Hopkins, Lawford, Quaintance, Sanders, Sasscer, Townsend, Webb, and Webster, members, and Messrs. H. M. Russell and R. W. VanHorn, visitors.

Mr. S. W. Foster, of the Bureau of Entomology, U. S. Department of Agriculture, was elected to active membership in the Society. Mr. C. H. T. Townsend was reinstated as an active member of the Society after a long absence from Washington.

—The secretary announced the death, at Cuyahoga Falls, Ohio, on April 23, of Mr. W. V. Warner, a corresponding member, and formerly an active member, of the Society.

Wallace Vincent Warner was born at Akron, Ohio, December 1, 1882. When he was four years of age his parents moved to Washington, D. C., but later returned to Ohio and lived in Akron and Columbus. In 1889 they settled in Cuyahoga Falls, where Vincent attended the public schools until 1898, when the family again moved to Washington. Here he entered the Central High School and became much interested in biology and entomology. During the summer of 1901 he became a volunteer assistant in the Division of Insects of the U. S. National Museum and later was appointed to a temporary position as a preparator of the exhibit of insects. While engaged in this work he interested himself in constructing groups of insects so as to show them in their natural surroundings. His groups showing the carpenter bees and their burrows, a hill of red ants, and a nest of yellow jackets display the results of much careful observation and painstaking work. Later Mr. Warner was appointed preparator in the Bureau of Entomology, U. S. Department of Agriculture, and was one of the two sent to St. Louis in 1904 to install and care for the exhibit of the Bureau at the Louisiana Purchase Exposition. From there he returned to his old home at Cuyahoga Falls, where his parents had again taken up their residence, and turned his attention to horticulture. His interest in entomology continued and, as a member of the Summit County Horticultural Society, he served as committee on entomology. Last summer his health, never very robust, began to fail, and as months passed he went slowly but steadily downward to the time of his death.

Mr. Warner had a personality which gained him many friends. He was unselfish and happy in disposition, witty

and a lover of innocent pranks, yet at the same time he possessed an ambition to excel and an earnestness which impressed all who knew him. In entomology he was especially interested in the Diptera and had intended to devote his leisure time to studies in that group. He was an enthusiastic collector, and on leaving Washington he gave his small collection to the National Museum.

—Mr. Webb presented the following note:

A NEW SPECIES OF LEPTURA.

(COLEOPTERA, CERAMBYCIDÆ.)

By J. L. Webb.

Leptura straussi, n. sp.

Length 8 mm. Head black, shining; mandibles, labrum, and clypeus usually ferruginous. Thorax red, shining, sparsely and very finely pubescent. Elytra black, with light-yellow vitta extending almost to tip, but abbreviated in some individuals, coarsely punctured, and covered with rather fine yellowish pubescence. Ventral aspect black, except prothorax, very finely pubescent.

Type.—No. 10345, U. S. National Museum. Tryon, N. C., April 25, 1904. Collected by Mr. W. F. Fiske. Eight specimens were taken by Mr. Fiske on the flowers of dogwood (*Cornus florida*) at an altitude of over 2,000 feet.

This species is related to *L. vibex*, which it resembles very closely in form and in the markings of the elytra. It differs from that species, however, in that the thorax is red and shining; in *L. vibex* the thorax is black, and neither thorax nor head is shining.

—Mr. Barber spoke of the finding, in Guatemala, of a luminous larva of the coleopterous group Phengodini which may possibly make a fourth section of this group. He reports as follows:

THE GLOW-WORM ASTRAPTOR.

By H. S. Barber.

Mr. E. A. Schwarz and the writer were sifting for insects beside a creek near Cacao, Finca Trece Aguas (between Pan-

zos and Senajú), in Alta Vera Paz, Guatemala, in April, 1906 (altitude between 800 and 900 feet), when we found a very small phengodid larva or adult female, about one-fourth of an inch long, bearing a ruby light in the head. This light seemed to be thrown directly forward so that it was not easily seen from above except when the head was raised or when the light was reflected from some object in front. No other lights were observed on our single specimen, but we only watched it for a short time, during daytime, having no facilities for keeping it alive with us, and no more examples were taken. No males referable to this species were found at that place, but at the coast, at Livingston, Guatemala, a few weeks later, a small male Mastinocerus(?), agreeing very closely with Gorham's figure and description of *Euryopa singularis* and description of *E. brunnea,*[a] was taken which gives the only clue to the possible adult male obtainable.

It was a pleasant surprise on our return to find that this larva (or adult female) agrees very closely with Murray's figures, and that there appears to be a chance of associating his name Astraptor with a genus of these queer beetles.

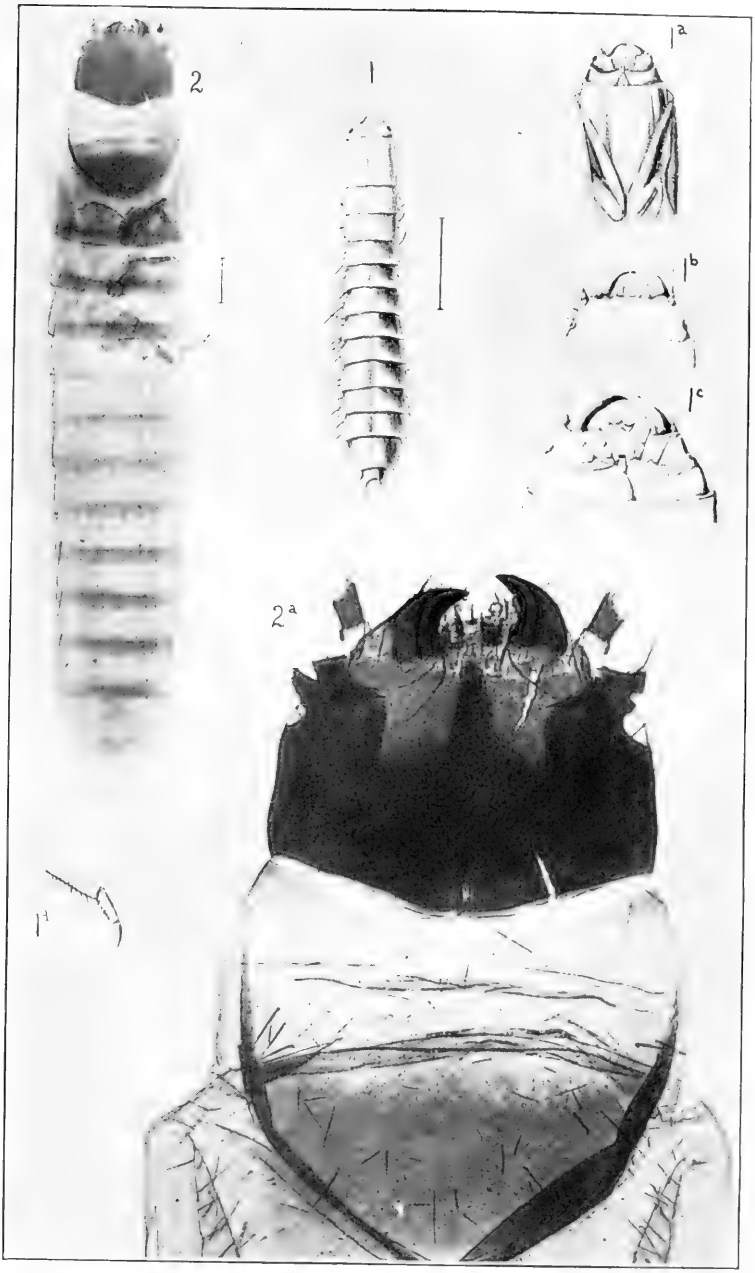
In 1868 Murray read a paper[b] "On an undescribed light-giving coleopterous larva (provisionally named *Astraptor illuminator*)" in which he discussed luminous larvæ in general and described, with figures (Pl. I, figs. 1–7, copied herewith as Pl. I, figs. 1, 1^{a-d}), the queer specimen found by Mr. Fry at Rio, which had "Red light in the head, white light in the tail, and one light on each side at each segment of the body. Light in head permanent, the others showing by flashes."

Our single specimen is much smaller than Mr. Murray's, being only 6 millimeters long as against nearly 12 millimeters. Its affinities with Mastinocerus are apparent, but the heavily chitinized head and the reduced size of the maxillary palpi, together with its more compact form, separate it as a fourth type of larvæ in the Phengodini, the other types being represented by Phengodes, Cenophengus, and Mastinocerus.

The specimen is mounted in balsam, and the accompanying photographs (Pl. I, figs. 2, 2^{a}) were made directly from it.

The synonymy of Astraptor cannot now be given, but the name must be used for a genus of the Phengodini closely related to Mastinocerus, and to which may belong Gorham's species *singularis* and *brunnea,* which he placed in his manifestly heterogeneous genus Euryopa; and also two undescribed species in the National Museum collection.

[a] Biol. Centr.-Am., Coleoptera, Vol. III, part 2, p. 109, pl. 6, fig. 4.
[b] Journ. Linn. Soc. London, Vol. X, p. 74.



THE GLOW-WORM ASTRAPTOR.

EXPLANATION OF PLATE I.

FIG. 1. *Astraptor illuminator*. (After Murray.)
a, head and prothorax from below.
b, head from above.
c, head from below.
d, leg.
2. *Astraptor* sp., from Guatemala. (Original.)
a, head.

—Professor Webster spoke on the spring grain-aphis (*Toxoptera graminum* Rond.) and the very great importance of the pest in the Middle West. This insect is probably a native of Europe and was introduced a number of years ago; he had himself worked on its life history, in 1884, in Northern Indiana. This insect has been found over a considerable area in the United States from latitude 41° south and in altitudes varying from 19 feet to 5000 feet above sea level. Weather conditions during winter and spring almost entirely control the destructive numbers of many pests, but in this case unfavorable weather seems to aid the multiplication of the pest. The Toxoptera will breed through the entire winter where the temperature is occasionally below the freezing point, while during this period the parasites are entirely dormant. It takes but a few warm sunshiny days for the parasites to appear and begin their telling work, multiplying enormously. It is a peculiar phenomenon that the Toxoptera should breed so prolifically in cold climates when it is a decided warm-climate species. Frequently the parasitized Toxoptera are so numerous that the entire field assumes a brownish color, since the parasites produce a brownish leathery appearance in the later stages.

Professor Quaintance reported that the black peach-aphis (*Aphis persicæ-niger* Er. Sm.) bred throughout the winter on peach trees in the insectary yard of the U. S. Department of Agriculture, although at times the trees were covered with sleet and ice. He spoke of his observations on the eggs of *Aphis mali* Fab., in which he found that less than 2 per cent of the many eggs laid preserved their form through the winter and were evidently fertile. Apparently over 98 per cent were infertile of the 2,000 or more examined.

Doctor Hopkins spoke of the urgent need of more careful observations on the effect of climate upon insects and plants. He had been a close observer of certain insects and their host plants for many years, but he considered this spring (1907) a remarkable one. In the case of the locust borer (*Cyllene robiniæ* Forst.), a certain stage which is ordinarily reached at the time of the opening of the buds was reached at least two weeks before this time, or in other words the insect had reached a later stage than usual before the opening of the buds.

Professor Quaintance reported that the peach-borer (*Sanninoidea exitiosa* Say) emerges four to six weeks later in the South and in the North than in the latitude of Washington. The time of emergence in Georgia and Western New York is about the same, although the period of pupation is of about the same duration in all latitudes.

—Doctor Dyar, under a question of nomenclature, said that of the three species of Tæniorhynchus, one old and two new, Theobald had selected the third as the type because the species *titillans* of Walker was the species wrongly determined as *tæniorhynchus*. Dr. Dyar said that here the question of the identification of the species had been raised. The species *tæniorhynchus* should be considered the type by the rule of tautonomy, but Theobald claimed that it was not the one really before the author and regarded himself at liberty to cite any species he chose. With this Doctor Dyar did not agree, but held that the type must be regarded as *tæniorhynchus* Wied., and the genus would thus fall as a synonym of Aëdes by Dyar and Knab's classification.

—The following papers have been presented for publication and accepted by the Publication Committee:

NOTES ON SOME SPECIES OF NOTODONTIDÆ IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES.

By Harrison G. Dyar.

Family NOTODONTIDÆ.

Malocampa puella, n. sp.

Thorax dark brown on the disk, the patagia silvery gray, tegulæ and vertex cinereous. Abdomen brown dorsally, pale beneath, the last segment silvery gray. Fore wings yellowish silvery-gray, a brown spot on costa at basal third, obsoletely connected to a large triangular patch on the middle of inner margin; a small costal patch at outer third, followed by three costal dots; a terminal row of brown spots in the fringe. Hind wings brown, irregularly yellowish towards the base. Beneath washed with brown, the hind wings yellowish except at the margins. Expanse 45 mm.

One male and 3 females, Aroa, Venezuela, and Orizaba, Mexico (collection of Wm. Schaus).

Type.—No. 11319, U. S. National Museum.

I have separated this species from the series of *Malocampa bolivari* Schaus in the Schaus collection. The types of *bolivari* consisted of a male and female, but in reality both are females, one with pectinated antennæ, the other with simple antennæ. I have restricted *bolivari* to the male type (really a female) and describe the species with simple antennæ in the female as *puella*.

Congruia congrua, n. gen. and sp.

Vein 5 of secondaries obsolete; accessory cell present on fore wings, small, vein 6 arising from its middle, 7 to 10 stalked, 10 arising near base of stalk; antennæ of male fasciculate on basal half; vein 8 of hind wings diverging from cell at middle, palpi upturned, exceeding the vertex, the second joint thickened with scales, the third long, slender, nude. Wings long and narrow. Thorax brown, with ocherous intermixture on patagia, a high backwardly-directed tuft on collar blackish-tipped behind; abdomen brown above, pale ochraceous below, a double brown dorsal line on the last two segments. Fore wing longitudinally lined; a heavy brown shade along median vein from base straight along vein 4 to margin; another line along vein 6 running to costa at base of this vein, the space between veins 4 and 6 beyond cell nearly continuously brown shaded; a similar shade along internal margin; faint tracings of fine lines on the outer third of wing, most distinct on costa; a waved, broken double line at the base of the fringe; a round

black discal point; hind wings whitish, with a dark brown, rather narrow border on outer margin and outer half of costa. Expanse 70 mm.

One male, Rio Janeiro, Brazil (collection of Wm. Schaus). *Type.*—No. 11320, U. S. National Museum.

Azaxia, n. gen.

Vein 5 of secondaries present; inner margin of primaries with a tuft of scales; primaries with areole; vein 5 from below angle of cell; outer margin crenulate; veins 7 to 9 stalked; vein 10 from the areole, which is long and narrow.

Type: Azaxia luteilinea = *Heterocampa luteilinea* Druce (Ann. Mag. Nat. Hist. (7), XIII, p. 249, 1904).

Eustemides, n. gen.

Vein 5 of secondaries present; inner margin of primaries without a tuft of scales; areole absent; veins 7 to 9 stalked.

Type: Eustemides carama = *Eustema carama* Druce (Ann. Mag. Nat. Hist. (7), XIII, p. 248, 1904).

Heterocampa puseyæ, n. sp.

Thorax and abdomen grayish brown, the thorax dark in front, the posterior tuft and ends of patagia lighter; beneath dull ochraceous. Fore wing light brown, broadly shaded with dark brown along the basal half of the costa and in an area beyond and below cell above vein 1, limited outwardly by a pale subterminal shade parallel to the outer margin; lines very faint, the outer traceable, pale, strongly dentate on the veins with pale points, single, excurved over cell, both lines more visible below cell, distinct on vein 1, relieved in a narrow brown-black marginal shading; two superposed small black discal dots; a terminal row of slender blackish dashes. Hind wing brown, the disk somewhat varied with ochraceous. Beneath the hind wings entirely pale, the fore wings shaded with brown except at the base. Expanse 37 mm.

One male, Callao, Peru (Mrs. M. J. Pusey, collector). *Type.*—No. 11331, U. S. National Museum.

Nearly allied to *H. mephitis* Schaus, but the discal dots both small and of equal size.

Pheosia rimosa Packard.

This species has been going under the wrong name of *dimidiata* Herr.-Sch. The figure does not fit our species, and no one would have thought of such an identification, but for Herrich-Schaeffer's locality "Am. sept." It is more probable

that the locality is an error, and Brazil should be substituted. See the following:

Rhuda dimidiata Herrich-Schæffer.

Drymonia dimidiata Herr.-Sch., Ausser. Schmett., p. 66, fig. 515, 1856.
Rhuda endymion Schaus, Proc. Zool. Soc. Lond., 1892, p. 340.
(Not *Pheosia dimidiata* of Bul. 52, U. S. Nat. Mus., No. 3118, etc.)

Herrich-Schæffer's figure obviously represents a female of this Brazilian species and not the North American one with which it has been identified.

Rhuda lesca, n. sp.

Head and thorax dark brown, the collar lighter, with a broken black line anteriorly, the square patagial tufts pinkish tipped; abdomen dark gray, yellowish at the base, with a small basal blackish tuft. Fore wing pinkish silvery-white in the middle, defining a large quadrate costal patch, sharply limited, following vein 4 from its origin to position of subterminal line where it runs to costa parallel to outer margin; inner margin of patch oblique to basal fourth of costa; the patch is nearly black below but fades out to nearly whitish along the costa. A dark shade from costa at base extends over the wing below vein 2, terminating in three sinuous black lines subterminally, the space beyond them again narrowly white, subocellate; a white line from base curves down and runs along vein 1 to beyond middle, below which the inner area is whitish and pale brown suffused, but without any gray irroration; outer margin faintly darker shaded. Hind wings largely fuscous, the disk about vein 2 and the inner margin pale yellowish. Expanse 50 mm. The fore wings are broad and squarely cut.

One female, Castro, Parana, Brazil (collection of Wm. Schaus).

Type.—No. 11333, U. S. National Museum.

Rhuda lorella, n. sp.

Markings essentially as in the preceding species. Abdomen brown, the two basal segments ocherous, without black basal tuft. Fore wings with the costal patch longer, its outer border somewhat excavated; basal line white, stopping before middle of wing and with silvery gray irrorations below it; outer line before tornus double, incurved and dentate on veins 1 and 2, followed by a blackish patch on vein 2 and a white dentate subterminal line, beyond which is a slender black line, very near the margin below, more remote above, and becoming quadrately produced between the veins above vein 4. Hind wings largely fuscous, the inner margin and a small space above vein 2 ocher-yellow. Expanse 55 mm. The fore wings are broad and squarely cut.

One female, Castro, Parana, Brazil (collection of Wm. Schaus).

Type.—No. 11334, U. S. National Museum.

Rhuda labella, n. sp.

Closely allied to *Rhuda minor* Schaus, the markings of the fore wings being almost identical. The species, however, is larger and the hind wings are differently colored, being ocherous, with a narrow outer fuscous border, the fringe again ocherous. Expanse 60 mm. The wings are long and pointed.

One male, Nova Friburgo, Brazil (collection of Wm. Schaus).

Type.—No. 11335, U. S. National Museum.

Synopsis of the Species of Rhuda Walker.

Fore wing with a dark narrow line from base to outer margin, *dimidiata* Herrich-Schaeffer.

Fore wing with a dark costal patch bordered below by a wide pinkish-white band.

Silvery basal dash projecting; hind wing ocherous, a broad outer and costal dark border, the disk unspotted to inner margin, *diffusum* Felder.

Silvery basal dash continued along vein 1, not projecting.

Line above vein 1 continued almost to anal angle; hind wing white..... *procas* Druce.

Line above vein 1 continued to middle of wing; hind wing fuscous, with a small whitish discal area..... *lesca* Dyar.

Line above vein 1 not continued to middle of wing, or, if so, diffused into a gray patch below.

Costal patch rounded; hind wing yellowish, with an apical shade and black spot at the pointed anal angle, *dissona* Schaus.

Costal patch truncate on vein 4.

A bluish-silvery irroration at base of inner margin.

Marking above anal angle macular, the preceding lines fine and broken.

Smaller; hind wing largely fuscous, *minor* Schaus.

Larger; hind wing ocherous, with a narrow fuscous outer border..... *labella* Dyar.

Marking above anal angle preceded by a distinct black line and followed by a white angulated one, *lorella* Dyar.

Irroration at base of inner margin without blue-gray tint.

Middle space of wing largely clear white, *geometrica* Schaus.

Middle white space largely encroached upon by lines and irrorations..... *focula* Cramer.

Brecontia plagipennis, n. gen. and sp.

Vein 5 of secondaries absent; areole present, vein 5 arising close to upper angle of cell, vein 6 from the middle of the areole, 7 from end of areole, 8 and 9 stalked, 10 from before end of areole, which is long and narrow; vein 8 of hind wings diverging from 7 at middle of cell, veins 3 and 4 separate, 6 and 7 shortly stalked. Antennæ pectinated on the basal portion. Wings broad, trigonate, normal, the inner margin without scale-tuft.

Center of thorax reddish brown, patagia grayish clay-color; abdomen brown above, the segmental rings lighter, beneath whitish clay-color. Fore wing whitish clay-color; a large chocolate-brown patch from base on costa to the outer line, reaching vein 1 to middle of wing, then obliquely waved to vein 3, on which and on vein 5 is a rounded projection; the inner line cuts this patch as a zigzag dash on the ground-color, widest on costa, sharply angled on subcostal and at origin of vein 2; a large rounded, cloudy-black discal spot; in the broad pale outer area a brown spot follows the projection of the basal patch on vein 3, its outer edge trilobate and followed by a long patch with dentate inner edge, following the outer margin and diminishing in width toward both apex and tornus. Hind wing brown, paler at the base, the fringe pale. Expanse 38 mm.

One female, Callao, Peru (Mrs. M. J. Pusey).
Type.—No. 11336, U. S. National Museum.

Nagidusa cinescens Schaus.

Nagidusa cinescens Schaus, Trans. Ent. Soc. Lond., p. 322, 1901.
Macrurocampa marthesia, var. *miranda* Dyar, Sci. Bul., Brookl. Inst., 1: 7, 185, 1905.

The above synonymy will obtain. *Nagidusa* Walker differs from *Macrurocampa* Dyar in having veins 3 and 4 of secondaries apart; otherwise the genera are closely allied. *N. cinescens* Schaus must be added to the North American list.

Gisara ambigua, n. sp.

Head soiled white on the vertex, including the tufts at base of antennæ, collar dark brown, patagia gray, variegated with brown; abdomen gray dorsally, the anal tuft somewhat ocherous. Fore wing gray-brown, tinged with reddish; base lighter, the subbasal line black, geminate; inner line faintly indicated by a fine zigzag black line; a small black discal point; outer line indicated, waved, brown-black, closely followed by a row of rounded black spots; a subterminal row of black spots between the veins. Hind wing fuscous. Expanse 65 mm.

One male, Callao, Peru (Mrs. M. J. Pusey).
Type.—No. 11337, U. S. National Museum.

Under *Gisara ionia* (*Heterocampa ionia* Druce, Ann. Mag. Nat. Hist. (7), v, p. 515, 1900) Druce describes the female as " without the bluish-gray patch at the anal angle." It seems probable that this female represents a distinct species, perhaps the one here described.

Hemiceras echo, n. sp.

Whitish gray, without rosy tint; three lines present on fore wings, white, straight, the basal with a dark border within, the inner one narrowly dark bordered without, the outer one broadly bordered within; spaces between rather heavily irrorated with brownish gray, leaving a pale space extending from anal angle; discal mark an oval cloud; subterminal line indicated, faint, wavy, limited within by dark shading. Hind wing whitish, the veins brown, the margins and the male stigma brown, the fringe whitish. Collar brown, vertex and thorax light gray, abdomen brownish dorsally. Expanse 40 to 50 mm.

Seven specimens, Callao, Peru (Mrs. M. J. Pusey); Omai, British Guiana (W. Schaus); St. Jean, Maroni River, French Guiana (W. Schaus).

Type.—No. 11342, U. S. National Museum.

Allied to *H. indistans* Guen., with which some of the specimens had been identified, but the color is whitish ashen, lacking the rosy brownish tint of that species.

Hemiceras buscki, n. sp.

Head, collar, and thorax light brownish-ocherous, with a rosy tint; abdomen more brownish above. Fore wing of the color of thorax, the lines straight and rigid, distant on costa, approximate on inner margin, narrow, dark brown, with narrow pale outer borders; discal dots two, oblique, distinct, small. Hind wing whitish, the stigma of the male large, dark brown. Expanse 37 mm.

One male, Tabernilla, Canal Zone, Panama (A. Busck).

Allied to *H. indigna* Schaus, but the hind wings much paler, so that the dark brown stigma strongly contrasts.

Type.—No. 11343, U. S. National Museum.

Hemiceras subdigna, n. sp.

Head, thorax, and dorsum of abdomen purplish brown, not very dark. Fore wing of the same color, lighter in the median space and at anal angle; lines straight and rigid, white, defined by narrow brown lines within, well separated on the costa which the outer line reaches well before apex; discal dots two, separated, oblique, clouded, the upper one faint; outer margin above tornus darkly shaded. Hind wings brown, the dark stigma not contrasted. Expanse 38 mm.

One male, St. Jean, Maroni River, French Guiana (W. Schaus).

Type.—No. 11344, U. S. National Museum.

Allied to *H. indigna* Schaus, but the subterminal line is entirely undefined, the margin being shaded with brown.

Hemiceras unimacula, n. sp.

Head with white tufts on the vertex, collar dark brown, thorax pinkish brown, the abdomen dorsally darker. Fore wing pinkish brown, finely and evenly irrorated with dark brown; lines divergent, ocherous, narrowly edged with dark brown towards the median space, the outer attaining the costa before apex; a large, rounded, blackish discal spot, very distinct in the male, clouded and fainter in the female; an obscure yellowish spot close to base; two small blackish dots connected by a shade on middle of terminal space. Hind wing dark brown, of the color of the abdomen, the male stigma large, not contrasted. Expanse 40 to 48 mm.

Two males, two females, St. Jean and St. Laurent, Maroni River, French Guiana; Rockstone, Essequebo River, Dutch Guiana (W. Schaus).

Type.—No. 11345, U. S. National Museum.

Hemiceras tricolora, n. sp.

Head with white tufts on the vertex, collar dark brown, thorax pinkish brown, the abdomen dorsally more reddish brown. Fore wing pinkish brown, finely and evenly irrorated with darker, the lines very distinct, oblique, not strongly divergent, the outer one reaching the costa at apex, three-colored, dark brown toward the median space, then red-brown, then ocherous; discal dots two, small, clouded, very obscure; two faint dark dots on middle of terminal space (on veins 3 and 4), connected by a shade; fringe dark brown. Hind wing whitish, the veins toward the margin and the male stigma brown as well as a narrow marginal line before the whitish fringe. Expanse 38 mm.

One male, Carabaya, Peru (Schaus collection).

Type.—No. 11346, U. S. National Museum.

This species somewhat suggests the description of *H. obliquicola* Walker, specimens of which are not before me.

Hemiceras astigma, n. sp.

Head with white tufts on the vertex; collar, thorax, and abdomen dorsally dark brown. Fore wing shining dark brown, the lines strongly divergent, the inner erect, the outer oblique to apex, pinkish brown, strongly edged with dark brown within; discal mark a round dark cloud; fringe and inner margin chocolate brown. Hind wing whitish

between the veins, the inner and outer margins suffused with brown, a brown marginal line, the fringe whitish. No stigma on vein 2. Hind wings beneath entirely yellowish white. Expanse 41 mm.

One male, Carabaya, Peru (Schaus collection).
Type.—No. 11347, U. S. National Museum.

Hemiceras colombia, n. sp.

Head with a few white hairs on the vertex, the collar, thorax, and abdomen dorsally unicolorous reddish brown, the patagia edged with dark purple. Fore wing reddish brown, the irrorations obscured; lines divergent, the inner one narrow and slender, slightly oblique, dark brown, the outer oblique to apex, distinct and broad, dark brown, ending in a blackish cloud at apex from which also runs a faint blackish, subterminal line, hardly waved; discal dot an oblique blackish bar, more distinct in the female. Hind wing brown, the male stigma large but not contrasted in color. Expanse 43 to 47 mm.

Two males, one female, Colombia (W. E. Pratt, collector, Schaus collection).
Type.—No. 11348, U. S. National Museum.

Hemiceras ochrospila, n. sp.

Head with white tufts at base on antennæ, collar dark brown, thorax and abdomen very pale ocherous. Fore wing very pale ocherous, finely, obscurely irrorated with darker, the lines divergent, straight, rigid, the outer running to apex, yellowish, edged within by brown, but entirely faint; a faint, double dark discal spot. Hind wing straw-yellow, the stigma very pale brown. In the single specimen there is a large semilunate black spot on the dorsum on the fifth segment of the abdomen, followed by two brown streaks, but this may be an imperfection. Expanse 47 mm.

One male, St. Laurent, Maroni River, French Guiana (W. Schaus).
Type.—No. 11349, U. S. National Museum.
Allied to *H. leucospila* Walker, but that has a rounded discal spot, and the lines are broader and more contrasted.

Hemiceras calaonis, n. sp.

Head and thorax dark pinkish brown, the collar and patagia narrowly lined with dark purple; abdomen dorsally darker, more brownish, beneath pale yellowish. Fore wing dark reddish brown, the lines straight, divergent, the inner nearly upright, dark brown, accompanied by white points, the outer oblique, running to apex, dark brown, edged without with golden ochraceous; subterminal line indicated by a golden shade, wavy, faint; two brown discal dots, obliquely placed. Hind wing pale brown, the veins dark, the male stigma very large and dark brown, the margin slightly dark shaded, the fringe paler. Expanse 40 mm.

One male, Callao, Peru (Mrs. M. J. Pusey).
Type.—No. 11352, U. S. National Museum.
Allied to *H. stupida* Schaus, but the inner line is distinct.

Hemiceras kearfotti, n. sp.

Head and thorax light pinkish brown, abdomen dark brown above, yellowish white below. Fore wing light pinkish brown, finely darker irrorate, the veins faintly darker lined outwardly; lines divergent, the inner nearly upright, yellowish brown, slender, accompanied by white points; outer line oblique, running to apex, yellowish brown, edged with golden yellow without; discal dots two, oblique, the lower one large and oval, the upper small; subterminal line faintly indicated, visible only in certain lights; costal edge yellowish white. Hind wing whitish on the disk between the veins, which are brown; margin narrowly brown shaded, the fringe white; male stigma large, very dark brown. Expanse 40 mm.

One male, Victoria, Brazil, received several years ago from Mr. W. D. Kearfott.
Type.—No. 11353, U. S. National Museum.
Distinguished by the white costal edge.

Hemiceras domingonis, n. sp.

Head and thorax dark pinkish brown, the abdomen dorsally a little lighter, pale yellowish beneath. Fore wing shining dark bronzy brown, minutely purplish irrorate; lines a shade paler than the ground color, distinct although but slightly contrasted in color, the inner arcuate, angled on submedian and discal folds, with black points on the veins towards median space; outer line straight, reaching costa well before apex, with black points on the veins within; a large oblique blackish discal cloud, somewhat trilobate; a faint dark cloud preceding the position of the subterminal line, which is however not indicated. Hind wing brown, pale at the base, beneath pale yellow. Expanse 40 mm.

One female, San Francisco Mts., Santo Domingo (A. Busck).
Type.—No. 11354, U. S. National Museum.
In the absence of a male this species may not be correctly referred generically.

Hemiceras singuloides, n. sp.

Head, thorax, and abdomen dark brownish purple, the vertex with a few white hairs; abdomen paler purplish above, yellowish on the sides, pale purplish ventrally; fore tibiæ outwardly dark purple. Fore wing shining dark brownish purple, a dark blackish bronzy shade on upper two-thirds of outer margin, running obliquely inward to the end of the cell; lines indicated only by a row of white points, the inner waved,

the outer reaching costa before apex. Hind wing uniform dark brown, the male stigma large, still darker brown, fringe pale at the tips. Expanse 47 mm.

One male, Colombia (W. E. Pratt, collector, collection of W. Schaus).

Type.—No. 11355, U. S. National Museum.

Allied to *H. violascens* Guen., but the fore wings darker and the hind wings dark brown instead of whitish. Also resembles *H. singula* Guen., but the shading of the fore wing differs.

Hemiceras pernubila, n. sp.

Base of antennæ white; head and thorax purplish brown; abdomen similar above, yellowish below, with a little ventral purplish shading. Fore wing shining purplish brown, the lines a shade paler than the ground color, crenulate, indicated by black points on the veins, the obsolete scallops filled in with bronzy ochraceous, the inner curved, indented on the folds, the outer reaching costa before apex; a rounded clouded blackish discal mark, somewhat trilobate; a blackish cloud in the subterminal space, scarcely defining the subterminal line. Hind wing brown, slightly whitish between the veins toward base, the male stigma large, dark brown, the fringe white. Expanse 38 to 45 mm.

Six males, one female, Cordoba, Mexico (R. Müller, No. 339); Jalapa, Mexico (W. Schaus); Costa Rica; Chiriqui, Panama (W. Schaus); Merida, Venezuela (S. Briceno); Zamora, Ecuador (P. Dognin).

Type.—No. 11356, U. S. National Museum.

Allied to *H. nubilata* Schaus, *H. subochraceum* Walk., and *H. lotula* Guen.; the ground color is less diversified than in *nubilata* and the pale color of the lines less extended, while these characters are more developed than in *subochraceum* or *lotula.* It may eventuate that there are too many names in this group, but, as they stand, this species seems as well defined as the others.

Hemiceras soso, n. sp.

Head white on the vertex, collar and thorax dark purplish. abdomen purplish brown above, whitish below. Fore wing shining brassy testaceous, irrorate with blackish, especially obliquely in the median space; lines slender, black, crenulate, dotted on the veins, the inner curved, angularly waved on the veins, the outer rather sharply dentate between the veins, both shaded with clearer testaceous away from the median space; discal mark large, oval, blackish, paler in the middle, subannular; a blackish shade in the subterminal space indistinctly forming a row of large rounded spots, the subterminal line not defined. Hind wing whitish, with a little brown shading on margin and above tornus, the male stigma distinct, dark brown. Expanse 40 mm.

One male, Orizaba, Mexico (R. Müller, No. 1293).
Type.—No. 11357, U. S. National Museum.
Allied to *H. pagana* Schaus, but the discal mark much less contrasted, while the lines are more continuous and distinct.

Hemiceras muscosa Schaus.

In a series of specimens the whitish purple irrorations of the type are gradually evanescent, till in the last they can scarcely be distinguished. The type is from Colombia. Others are before me from Brazil and Venezuela, all with less purplish than in the type.

Hemiceras evanescens, n. sp.

Vertex largely white, collar and thorax purplish brown, abdomen grayer above, yellowish below, with a slight ventral purplish tint. Fore wing shining purplish brown, rather dark, uniform; lines crenulate, subobsolete, indicated by blackish dots on the veins, the inner gently curved, with a slight bronzy ochraceous edging towards the base, outer oblique, reaching costa before apex, distinct below the submedian fold and edged within the black dots by a little white powdering and white dots on the veins; discal mark a faint dark rounded cloud; a large indeterminate dark shading on the outer margin reaching up centrally to the outer line. Hind wing dark brown. Expanse 44 mm.

One female, Tabernilla, Canal Zone, Panama (A. Busck).
Type.—No. 11358, U. S. National Museum.
Allied to *H. muscosa* Schaus, but without a tooth on the anal angle of the fore wings, the subbasal tooth also being slight. There is no male, so the generic reference may possibly be in error.

Hemiceras cotto, n. sp.

Head with a few whitish hairs, the collar and thorax purplish brown; abdomen grayer brown dorsally, the venter yellowish. Fore wing broad, trigonate, the teeth at anal angle and near base of inner margin strongly developed; color purplish brown, rather pale, marked by two bronzy shades, one in lower part of median space, crossing the outer line, the other extending from just beyond the discal mark to outer margin above tornus; a similar fainter shade defines the subterminal line above; lines slender, blackish, without pale edges, the inner strongly angled inwardly on both folds, the outer crenulate dentate, reaching costa before apex; discal mark a distinct, rounded blackish cloud. Hind wing brown shaded, paler toward the base, the male stigma dark brown, not contrasted, the fringe whitish. Expanse 34 mm.

One male, Orizaba, Mexico (W. Schaus).
Type.—No. 11359, U. S. National Museum.

The following table may assist in separating the species of Hemiceras at present described. *H. obliquicola* Walker, *H. pulverula* Guenée, *H. buckleyi* Druce, and *H. egregia* Dognin are not included, as there exist no figures and the several descriptions are not sufficiently detailed to enable me to place the species in the table. The species not referred to in Mr. Schaus's revision of the Notodontidæ were published in the Transactions of the American Entomological Society, Volume xxx, pp. 147–148, 1904.

Epicoria gemina Walker is referred to Hemiceras by Mr. Schaus; but as Walker states that the male antennæ are setose, it would seem better placed in another genus. I have no specimen certainly identified.

TABLE OF THE SPECIES OF HEMICERAS GUENÉE.

Fore wings with the lines rigid, at least the outer one.
Three lines present, subbasal, inner, and outer.
Inner line marked by a large white patch in cell, *gortynoides* Schaus.
No white spot in the cell.
Wing variegated in light and dark shades....*plusiata* Felder.
Ground color nearly uniform.
Color "pale moss-rose," discal spot large, reddish, *pogoda* Dognin.
Color light brown to gray.
Subterminal line whitish, dentate, defined by an outer pale shade .....*jejuna* Schaus.
Subterminal line not defined, or if faintly so, by black.
Darker, somewhat bronzed and variegated by lighter purplish patches .....*beata* Schaus.
Paler, scarcely bronzed, the light variegations not contrasted.
Color brownish gray, the hind wings tinged with brown .....*indistans* Guenée.
Color ashen, the hind wings tinged with fuscous, *echo* Dyar.
Color dark reddish or bronzy brown.
Basal and inner lines straight.
Outer line followed by a diffused pale gray shade, *satelles* Schaus.
Outer line not followed by a pale shade.*plana* Butler.
Basal and inner lines coarsely wavy....*striolata* Butler.
Two lines present, the subbasal one obsolete.
Outer line straight in its course.
Outer line terminating close to the apex on costa.
The inner line straight.

Under side of the thorax black.....*affinis* Druce.
Under side of the thorax pale.
Discal dots two, oblique, the upper sometimes small or obsolete, the lower then small and round.
Collar dark brown, discolorous, with pale thorax.
Fore wing dark brown, lines very distinct, of three colors .....*tricolora* Dyar.
Fore wing brownish clay-color, lines distinct, narrow, three-colored....*maronita* Schaus.
Pale straw-color, finely irrorate, lines faint, fine, two-colored.....*ochrospila* Dyar.
Collar concolorous with the thorax.
Hind wings of the male without a stigma on margin .....*linea* Guenée.
Hind wings of the male with a stigma.
Costa of fore wing concolorous.
Fore wing purplish brown; hind wing largely whitish over disk, *cayenennsis* Schaus.
Fore wing bronzy brown; hind wing all brown.
Inner line distinct.
Lines unaccompanied by white points; male stigma concolorous or paler than ground, *bilinea* Schaus.
Lines accompanied by white points; male stigma much darker than wing....*calaonis* Dyar.
Inner line very faint.*stupida* Schaus.
Costa of fore wing narrowly whitish on the edge and beneath.....*kearfotti* Dyar.
Discal dot single, a large rounded spot.
Collar dark brown, discolorous; male with a stigma.
Fore wing straw-color; discal spot large, round, brown-black, contrasted..*lissa* Druce.
Fore wing brown, grayish irrorate.
Discal spot round, blackish; hind wing brown; stigma dark....*unimacula* Dyar.
Discal spot obsolescent; hind wing pale straw-color, stigma pale, *leucospila* Walker.
Collar concolorous with the thorax; male without stigma.....*astigma* Dyar.

Discal dot an oblique linear bar.
Hind wings of the male with a stigma.
Fore wing gray powdery, the outer line white, *vecina* Schaus.
Fore wing brown, the outer line brown to a purplish apex ..... *colombia* Dyar.
Hind wing of the male without a stigma.
Brassy yellow, with broad streaks on the veins, *striata* Schaus.
Brown, varied, veins narrowly brown lined, *cadmia* Guenée.
The inner line flexuous or not reaching costa.
Vertex gray-white; wing concolorous.
Fore wing brownish ocherous; hind wing whitish, the stigma contrasted..... *aroensis* Schaus.
Fore wing dark bronzy brown.
Legs of male densely woolly..... *manora* Schaus.
Legs of male smoothly scaled. *laurentina* Schaus.
Vertex purplish; costa broadly bronzy-yellow, *flava* Schaus.
Outer line terminating on costa remote from apex.
Lines subparallel, the subterminal a distinct straight line, *ruizi* Dognin.
Lines divergent, the subterminal obsolescent.
Discal dots separated, oblique.
Hind wing brown, the male stigma not contrasted.
Subterminal line indicated, preceded by indistinct dark shading especially at veins 2 to 5 and on inner margin beyond outer line, *indigna* Schaus.
Subterminal line absent, a dark brown shade on outer margin, space beyond outer line on inner margin clear..... *subdigna* Dyar.
Hind wing whitish, the male stigma dark brown, strongly contrasted ..... *buscki* Dyar.
Discal dots joined into a single patch.
Outer line flexuous, crenulate, fine but continuous, *moresca* Schaus.
Outer line straight, pale, accompanied by a row of black points ..... *domingonis* Dyar.
Outer line more or less incurved below.
Outer line not ending on costa close to apex.
Two dark discal dots, obliquely placed.
Pale straw-color, inner line flexuous, obsolete, *serana* Schaus.

Fore wing brown; inner line like the outer one.
Line pale, with darker inner edge.
Larger, costa with a dark brown shade,
modesta Butler.
Smaller; costa without such a shade,
transducta Walker.
Lines pale, marked with a row of dark venular points ..... *nigrigutta* Schaus.
Three dark discal dots in a triangle..... *trinubila* Guenée.
Discal dots joined in an irregular bar.... *postica* Maassen.
A vague discal cloud; no tooth on internal margin,
barina Guenée.
Outer line flexuous, running to costa near apex.
Wings elongate, bronzy-yellow, outer margin brown; male with stigma ..... *longipennis* Schaus.
Wings broad, pale testaceous; male without a stigma on hind wing ..... *albulana* Druce.
Outer line gently outcurved, with an angle below costa.
Very dark brown, lines fine, the inner strongly angled in the disk ..... *crassa* Schaus.
Not very dark brown, the inner line undulate.
Outer line straight, with a white point at the angulation; antennæ of female simple..... *anguilinea* Schaus.
Outer line wavy flexuous but distinct, no white point at the angle; antennæ of female pectinated,
commentica Schaus.
Fore wings with the lines finely crenulate, dotted, or obsolete.
Outer line bent at an angle below costa.
Large, the wing truncate, discal mark a large ellipse,
truncata Schaus.
Small, the wing normal, discal dot an oblique cloud,
undilinea Schaus.
Outer line straight, not bent at an angle, or obsolete.
Ground of fore wing of two colors, contrasting.
Metallic olivaceous and purplish.
Costal area contrastingly pale.
Head white; dark inner area of forewing below median vein and vein 2..... *metallescens* Schaus.
Collar also white; dark inner area diffused above,
vinicosta Guenée.
Costal area essentially concolorous.
Basal area contrastingly pale yellowish.
Median area diffused purplish..... *maona* Cramer.
Median area coppery brown, sharply limited at discal mark ..... *splendens* Möschler.

Basal area concolorous.
Wings sharply trigonate, purplish; hind wing white on disk ..... *sabis* Guenée.
Wings normal, brownish; hind wing brown shaded, *deornata* Walker; *losa* Druce.
Yellowish and lilaceous or brownish lilaceous.
Costa broadly pale yellow, inner area lilacine, *pallidula* Guenée.
Costa essentially concolorous.
Lilacine purplish, a large oval yellowish mark in the cell ..... *ovalis* Schaus.
Without such a marking.
A stigma on the hind wing of the male.
Outer line dentate crenulate; wing showing a few small patches of yellowish between extensive cloudings of purplish brown, *nebulosa* Schaus.
Outer line crenulate dotted; wing even more suffused ..... *nubilata* Schaus.
No stigma on hind wing of male.
Outer line crenulate dotted.
Ground largely dark yellow; dots on the lines small, absent on the inner line, *flavescens* Schaus.
Ground largely dark brown; dots on both lines large and distinct..... *punctata* Dognin.
Dark purple-brown, with metallic, whitish, violaceous powdering or greenish metallic spotting.
A stigma on the hind wing of the male.
Whole wing except the outer margin and a ray from the cell shaded with metallic lilacine; hind wing white, with black stigma..... *carmelita* Maassen.
Wing dark, with metallic green marks on discal spots and about the lines..... *constellata* Dognin.
No stigma on the hind wing of the male.
Costal edge of fore wing white.... *sparsipennis* Walker.
Costal edge of the fore wing brown.
Marginal and discal dark shades united; hind wing largely whitish..... *muscosa* Schaus.
Marginal and discal dark shades separated; hind wing dark brown..... *evanescens* Dyar.
Ground of fore wing essentially uniform, at most clouded.
Fore wing bronzy, costa purplish discolorous to vein 12; hind wing white ..... *poulsoni* Schaus.
Fore wing without discolorous costal edge.

Hind wing of male without a stigma.
No distinct tooth on anal angle of fore wing,
brunnea Schaus.
A distinct tooth on anal angle of fore wing,
muscosa Schaus.
Hind wing of male with a stigma.
Costal edge white.
More reddish brown; hind wing largely white on the disk between the veins in male,
conspirata Schaus.
More darker brown; hind wing all dark brown in male .....*lavana* Druce.
Costal edge not white.
Outer line linear, black, contrasted, rather coarsely denticulate between the veins.
Hind wing brown; male stigma large.
Uniform dark tan-brown, discal spot large, lobed .....*magniplaga* Schaus.
Varied with bronzy shades on a more purplish ground; discal spot rounded....*cotto* Dyar.
Hind wing whitish; male stigma small,
punctilla Schaus.
Outer line dotted, finely crenulate or obsolete.
Discal spot large, oval, blackish, contrasted,
pagana Schaus.
Discal spot diffused or obsolete.
Fore wing pale gray .....*alba* Walker.
Fore wing dark ocherous to brown.
Middle space of fore wing darker, blackish,
nigrescens Schaus.
Costa blackish to vein 12.*nigricosta* Schaus.
Wing uniformly colored.
A distinct tooth on anal angle of fore wing.
Very dark umber brown, with blackish shading.
Marginal shade disconnected from discal dot; hind wing dark fuscous.....*singula* Guenée.
Marginal shade broadly joined to discal dot.
Hind wing largely white between the veins in male,
violascens Guenée.
Hind wing dark fuscous,
singuloides Dyar.

Dark reddish brown, basal and terminal areas more bronzy, shining, *sericita* Schaus.

Brown to ocherous, basal space concolorous.

Larger, the wing uniform, *micans* Schaus.

Smaller, the costal area paler shaded.

Pale, the male stigma small, reddish brown, *rufescens* Walker.

Darker, the male stigma dark brown.

Inner line continuous, curved, *metastigma* Walker.

Inner line finely angled or represented by dots, *walkeri* Schaus.

No distinct tooth on anal angle of fore wing.

Hind wing white, male stigma brown, contrasted.

Wing smooth and uniform, reddish brown, the lines faint. *velva* Schaus.

Wing varied, brassy luteous, the lines distinct..... *soso* Dyar.

Hind wing more or less brown shaded, the male stigma dark brown.

Fore wing reddish brown, without dark shadings... *quebra* Schaus.

Darker brown, with less red tint.

With broad reddish-ocherous shades bordering the lines.

These shades distinct. *nubilata* Schaus.

These shades dark, obscured. *pernubila* Dyar.

These shades absent or only faintly indicated.

Dark, very uniform (Mexico and Central America). *subochraceum* Walker.

Dark, the lines more relieved; hind wing paler (Venezuela to Brazil). *lotula* Guenée.

Smaller, more tan-colored, lines well relieved and with slight bordering shades.....*tulola* Schaus.

Hippia vittipalpis Walker.

This species was described from Santo Domingo (1857); *insularis* Grote from Cuba (1867); *packardii* Morrison from Texas (1875); *lignosa* Möschler from Jamaica (1886), and *mandela* Druce from Mexico (1887). Mr. Schaus placed *lignosa* and *mandela* as synonyms of *insularis* and let the others stand; but I am unable to distinguish any of them specifically from the material before me, unless it be *mandela*, which is larger and darker, the markings in the male less contrasted. I have, however, but one male of *mandela* and am inclined to let all the names fall into the synonymy of *vittipalpis* Walker. A larger series and knowledge of the life histories may possibly show distinctions, but I think it will not affect the synonymy of our North American species, which should be known as *vittipalpis*.

Hippia schausi, n. sp.

Antennæ of the male strongly roughened with scales on the basal half above; head and collar yellowish ochraceous mixed with brown; thorax and abdomen dark gray, the abdomen with a dark basal tuft and pale below. Fore wing dark gray, shaded with blackish at base on costa and in median space and terminally above tornus; a white band stained with brown runs along the costal edge from apex to middle of cell where it leaves the costa and curves to inner margin at base, becoming more diffused and stained with brown, relieving the crenulate curved inner line, which follows it outwardly obliquely, finally curving inward and cutting it on subcostal vein; discal mark small, semilunate, in a dull brown cloud followed by a small white cusp joined to costal band; outer line obsolete, defined by the termination of the dark shade in median space, a row of white points on the veins; subterminal line indicated, followed by a row of black points in brownish annuli; a row of whitish points in the fringe. Hind wing blackish brown, with yellowish white fringe. Expanse 42 to 44 mm.

One male, one female, St. Laurent, Maroni River, French Guiana (W. Schaus).

Type.—No. 11363, U. S. National Museum.

Allied to *H. matheis* Schaus, from which it differs in having the white costal band diffusedly produced to the base of the wing.

Arachia fascis Schaus.

This species is not a synonym of *A. combusta* H.-S., as referred in Mr. Schaus's paper on the Notodontidæ. It is stated to be described from two males (Ent. Amer., VI, p. 47, 1890), but both the types are before me and are females. The antennæ have very long pectinations, while in *combusta* H.-S. the antennæ of the female are simple. Two males before me, obtained from Aroa, Venezuela and Omai, British Guiana, by Mr. Schaus bear the name *A. meridionalis* Schaus, which must be considered a synonym of *fascis*. Mr. Schaus's remarks (Tr. Am. Ent. Soc., XXX, p. 145, 1904) imply that he knew both sexes of both *fascis* and *meridionalis*, but such does not appear in his collection, and I consider them sexes of one species.

Urgedra, n. gen.

Palpi porrect, exceeding the front, third joint short; antennæ of the male with long pectinations; legs with the tibiæ smoothly scaled; fore wings broadly trigonate, no tuft on the inner margin, the outer margin entire; vein 5 from the middle of the discocellulars, 6 from the long narrow areole at its basal third, 7 from the end of the areole, 8 to 10 stalked; hind wing rounded, veins 3 and 4 separated, 6 and 7 long-stalked, 8 diverging from the cell before the middle.

Type.—*Urgedra striata* Druce = *Heterocampa striata* Druce (Ann. Mag. Nat. Hist. (7), XVII, p. 410, 1906).

I have before me two specimens from Carabaya, Peru, which I have identified as Druce's species, as they agree well with the description. They belong, however, to a new genus.

Chadisra torresi Dognin.

Xylophasia torresi Dognin, Le Naturaliste, 1889, p. 82.

Heterocampa perilleus Schaus, Proc. Zool. Soc. Lond., 1892, p. 335.

The type of *perilleus* before me is a female, not a male. I cannot distinguish it specifically from Dognin's figure of *torresi*. The figure has somewhat darker hind wings, but there is practically no difference in the markings. *Perilleus* was described from Brazil, *torresi* from Ecuador. When the male is known positively the species may be found referable to another genus, although I have tentatively selected as the male a specimen from French Guiana that was under the label "*Blera arecosa* Druce."

Chadisra cacobule, n. sp.

Head yellowish brown on the vertex, collar dark brown, thorax and abdomen pale gray. Fore wing pale gray, shining; basal space clear gray, subbasal space filled in with dark brown shading, limited by the inner line, which is narrow, black, bent in below cell and outward below vein 1, subdislocated on the veins; a median gray line, dentate on the veins, preceded by a gray shade in the cell, in which the yellowish-white discal bar is relieved, bicusped, preceded by two small yellowish-white dots; outer line slender, in part black, in part gray, bent outward at vein 4, running inward along vein 3, subdislocated on the veins, flexuous between veins 1 and submedian fold, the fold and vein 3, veins 5 and 7, black and followed by a blackish brown cloud to the subterminal line; subterminal line distinct, black-brown, continuous and straight, curving inward at vein 2 and ending in a double spot; terminal line slender, black, forming angular semicircles between the veins. Hind wing whitish on disk, gray-shaded on the margin, the veins in that part dark; an angular black mark relieved by white above anal angle. Fringe white. Expanse 47 mm.

One female, Tabernilla, Canal Zone, Panama (A. Busck).

Type.—No. 11364, U. S. National Museum.

Allied to *C. torresi* Dognin, but the subterminal line is straight and continuous and the ground color lacks the olive tint. The species is no doubt congeneric with *torresi,* and will await a male for confirmation of the generic position.

The genus Blera Walker will, I think, prove to be a synonym of Chadisra Walker. Mr. Schaus separates them by the difference in wing shape, but this is no doubt only a sexual difference, as all the specimens of Blera before me are males except two, and these do not possess the required shape, but would fall into Chadisra, if put through the table without their males. Correspondingly many of the Chadisra before me are females (although in part wrongly described as males), and those of which there are males have the wings more pointed than in females. The difference is scarcely fundamental enough to hold both genera. Moreover, there is considerable dimorphism between the sexes, apparently, and I should not be surprised if *Chadisra cacobule,* described above, should prove to be the female of *Blera arecosa* Druce, described from Panama.

Chadisra (Blera) hymen, n. sp.

Head, collar, and anterior half of disk of thorax dark brown mixed with ochraceous brown; patagia and posterior half of thorax silvery gray, mixed with a little brown; basal abdominal tuft gray, abdomen dark brown dorsally except the posterior half which is gray, mixed

with brown; fore wing long and narrow, pale silvery gray, the subbasal space filled in with brown on the costal half, defined by two lines, broken-dislocated on the veins; three brown spots on the costa beyond; discal mark lunate, whiter than the ground; outer line represented by two black cusps between veins 4 and 6 and a wavy line below vein 3 to margin, a strong black dash below vein 3 continuing this line outwardly; beyond the outer line, except at the break between veins 3 and 4, filled in with brown to the faint white subterminal line; a brown spot between veins 4 and 5 near the margin; terminal line black, slender, forming angular cusps between the veins. Hind wing whitish over the disk, apex and outer margin brown shaded, especially on the veins; a small, double, angular white mark at anal angle. Expanse 45 mm.

One male, Omai, British Guiana (collection of Wm. Schaus).

Type.—No. 11365, U. S. National Museum.

Chadisra (Blera) infanta, n. sp.

Head yellowish brown, collar dark brown, disk of thorax narrowly yellowish brown in the middle, else silvery white, slightly tinted with gray; abdomen brown dorsally on the basal two-thirds, the terminal segments gray-white, the anal tuft mixed with brown; fore wing silvery gray-white, a costal, brown triangular spot in the subbasal space, edged by black lines which are obsolete below; discal mark white, faintly relieved; three brown angular marks on costal edge; outer line nearly absent, represented by two black marks between veins 4 and 6 and a black distinct L-shaped mark below vein 3, its long arm paralleling the vein, filled in below with brown, also a brown band from vein 4 to costa just beyond the remains of the outer line, edged with diffused black cusps next to the white, faintly relieved subterminal line; terminal line slender, black, forming arcs between the veins. Hind wing whitish, shaded with brown except in an outer mesial band and the fringe; an obscure angled mark at anal angle. Expanse 45 mm.

Two males, Carabaya, Peru (collection of Wm. Schaus).

Type.—No. 11366, U. S. National Museum.

Chadisra malocampoides, n. sp.

Head and thorax olive-brown, the patagia olive-green, probably all olive-green when fresh; abdomen dark gray, the tip olivaceous brown (green); fore wing grayish olive-green, a rounded elliptical clear spot of this color on inner margin at base, at anal angle, and on costa just before apex, the rest of the wing darker tinted, the veins lined with powdery blackish; lines faint, blackish, crenulate, the inner geminate, median and outer single, the outer with black points on the veins followed by light points on costal half; a round, punctiform, black discal dot, in a blackish brown pulverulent cloud; subterminal line indicated,

dark; a row of terminal, rounded light-olive spots, the fringe dark at ends of veins. Hind wing uniform dark brown, the fringe a shade lighter. Expanse 40 mm.

One male, Callao, Peru (Mrs. M. J. Pusey).

Type.—No. 11367, U. S. National Museum.

The following table will separate the species the males of which belong to Blera Walker. The species referred to Chadisra proper, namely *zabena* Schaus, *batama* Schaus, *zabenilla* Dognin, *multifida* Schaus, *cucullioides* Schaus, and *malocampoides* Dyar, are omitted from the table, as they have an entirely different facies and could not possibly be confused with these. *Chadisra verona* Schaus and *Blera pernuda* Druce may be sexes of one species. *Chadisra cacobule* Dyar is omitted, as there is no male, and the table is founded on that sex; as remarked above, it may be the female of *Blera arecosa* Druce.

TABLE OF THE MALES OF CHADISRA, SECTION BLERA.

Ground color of fore wing white or pale gray over median space.
- Outer line continuous, followed by unbroken shadings or parallel lines.
  - Outer line not followed by shadings, but by a brown line, *nitida* Schaus.
  - Outer line followed by brown shadings.
    - Outer line slightly bent outward below....*politia* Cramer.[a]
    - Outer line much bent outward below....*ceruroides* Walker.
- Outer line, or a least its following shade, broken into separate patches.
  - Following shade brown, edged by a row of rounded black spots, *tenuis* Schaus.
  - Following shade with its outer edge not forming rounded black spots.
    - A distinct black bar below vein 3, forming an angled mark with a fragment of the outer line.
      - Brown shadings reaching to inner margin.*hymen* Dyar.
      - Inner margin broadly silvery gray.....*infanta* Dyar.
    - Dash below vein 3 indistinct, not joined to a fragment of the outer line.
      - Subbasal space well filled in with brown.*arecosa* Druce.
      - Subbasal space filled in only on costal half, *torresi* Dognin.

[a] Mr. Schaus proposed the name *rogenhoferi* for Felder's figure of *politia* (not Cramer), but I am unable to distinguish it. On the other hand, *ceruroides* Walker seems separable, although placed as a synonym by Mr. Schaus.

Outer line obsolete, represented by a triangular costal patch.
Fore wing white; hind wing white.....*pernuda* Druce.
Fore wing olive-gray, basal space white; hind wing brown.
varona Schaus.
Ground suffused with dark over the median space, the terminal space discolorous, white.
A white patch on middle of inner margin.....*lauta* Schaus.
No such white patch.....*argentata* Druce.[b]

Psilacron Felder.

Psilacron Felder, Reise Novara, pl. 97, fig. 22, 1874.
Hardingia Schaus, Trans. Ent. Soc. Lond., 1901, p. 293.

There is an error in Mr. Schaus's characterization of Psilacron; it is stated that vein 7 arises from the areole, whereas it is really shortly stalked, in one of the specimens before me; in the other it arises from the base of the stalk. This is the only difference between Psilacron and Hardingia, and, as it is inconstant, I unite the genera.

Psilacron plagimargo, n. sp.

Antennæ simple; head and thorax olive-brown, intermixed with white hairs; abdomen olive-brown, shading to gray posteriorly. Fore wing olive-brown, shaded with purplish over inner margin and subterminal area, the veins outwardly lined in black; ordinary lines obsolete, except the median line, which is distinct, black, and bent at right angles on vein 4; a heavy black bar on submedian fold from base nearly to middle, edging the purple shade on inner margin; a rounded black mark on vein 2, touching the margin on the vein, followed by a white patch; another white patch above vein 4 on the margin; fringe spotted with blackish at the ends of the veins. Hind wing pale purplish, a faint whitish mesial shade; fringe spotted with blackish at the ends of the veins. Expanse 48 mm.

One female, Orizaba, Mexico (R. Müller, No. 970).
Type.—No. 11371, U. S. National Museum.

Psilacron agcistrum, n. sp.

Head and thorax olive-green, intermixed with purplish brown. Fore wing light purplish, the basal space darker; three small patches of olive green near the middle of the wing, one above vein 1, one at the origin of veins 3–4, and one below the costa at the outer third; inner line geminate, crenulate, purplish brown; discal mark faint, linear, lunate, dark; outer line crenulate, geminate, broken between veins 2–3 and 4–5, filled with white, the upper segment forming a hook; median

[b] This is described as a male, but the character of the markings causes me to suspect that an error may possibly have been made.

shade faint, strongly arcuate over cell but not angled; three white dots on vein 1 in median space; a row of subterminal rounded purplish spots, absent where the outer line is broken; a white spot between veins 3–4; an oblique white apical dash. Hind wing pale fuscous, reddish along the inner margin, the fringe whitish. Abdomen with a basal tuft like the thorax, the rest nearly black dorsally, whitish beneath. Wings beneath entirely testaceous whitish, the costa black shaded towards the base. Expanse 45 mm.

Two males, Carabaya, Peru (collection of Wm. Schaus).

Type.—No. 11372, U. S. National Museum.

The specimens were labelled *Psilacron luteovirens* Feld., but differ from that in many details.

Pseudodryas cosmipennis, n. sp.

Head, collar, and basal abdominal tuft olive-green; abdomen dark gray dorsally, the tip pale reddish, with two blackish marks. Fore wing with ground color soiled white shaded with olive-green along submedian fold centrally, on median vein, origin of veins 3–4, and on subcostal veins beyond cell, the whole ground sparsely irrorated with red-brown; inner line geminate, brown, crenulate, clouded with brown on costa to base; median line brown, bent at right angles on vein 3, crossing the brown lunate discal mark; outer line geminate, crenulate, brown; four brown specks subapically; a dark brown oblique shade from outer margin below apex inward to the outer line at vein 4; three submarginal brown spots below in the interspaces; fringe pale. Hind wing broadly red on the inner margin, shaded with fuscous, most strongly so beyond the faint pale outer mesial shade; fringe whitish. Expanse 42 mm. A second specimen has the ground shaded throughout with pale purple.

Two males, Carabaya, Peru (collection of Wm. Schaus).

Type.—No. 11373, U. S. National Museum.

The specimens were placed under *Psilacron luteovirens* Feld. in the collection, but they differ in venation, and fall by Mr. Schaus's table in Möschler's genus Pseudodryas, of which I have otherwise no specimens.

A NEW BARYTETTIX FROM ARIZONA.

By A. N. Caudell.

Some months ago, while transferring some ancient and discolored Orthoptera, I found, mixed with other unnamed material, a single female specimen that I at once recognized as a species unknown to our fauna. The specimen was without

antennæ and bore no label of any kind. It appeared valueless, being in poor condition and wholly without data, and I was tempted to consign it to the waste basket. Better judgment prevailed, however, and it was stuck in one corner of a drawer.

Recently Mr. J. L. Webb gave me for determination a few Orthoptera taken by him the past summer in Arizona. Among them were two male specimens which I recognized as the species represented by the female specimen above mentioned. They belong to Scudder's genus Barytettix, described from Lower California, and constitute a new species related to *B. crassus* of San Jose del Cabo. I call the species *borealis* and describe it as follows:

Barytettix borealis, n. sp.

Male.—Yellowish-brown, marked with black. Head very slightly darkened above and with a distinct piceous postocular band, fading below; frontal costa very shallowly sulcate, more distinctly so at the ocellus, the sides parallel; pronotum brown above, becoming yellowish-brown on the laterial lobes, the latter marked by a broad piceous band which terminates at the posterior sulcus and is obliquely interrupted anteriorly by a conspicuous light-yellow streak that almost or quite completely severs it; position of lateral carinæ indicated by yellowish slightly incurved lines which, like the piceous side bands, terminate at the posterior sulcus. Anteriorly the pronotum is truncate and posteriorly it is broadly concave; epimera of the metapleura black. Tegmina dark brown, apically rounded, widest beyond the middle, twice as long as broad, about three-fourths as long as the pronotum. Anterior and intermediate femora uniformly yellowish brown, distinctly swollen; posterior femora moderately heavy, lined with black above, the outer face longitudinally marked with black, a broad stripe on the upper part of the face and a narrower one below, the genicular arcs black; spines of the posterior tibia short and black, 9–10 in outer series; claws black in the apical half and the arolia are margined with black and about half as long as the last tarsal joint. Abdomen with a light dorsal stripe margined with black and each segment, especially the anterior ones, marked with an elongate, triangular black spot. Subgenital plate apically prolonged into a large tubercle, not so blunt as in *B. crassus* as figured by Scudder; supraanal plate triangular, longitudinally concave on each side of the middle, which is marked by a deep sulcus, somewhat narrowed centrally and extending nearly to the tip of the plate; furcula represented by a pair of short rounded lobes; cerci incurved, extending barely beyond the apex of the supraanal plate, mesially narrowed to about two-thirds the basal width and then expanded to a width somewhat greater than the basal width, the tip truncate, the lower apical angle acute, moderately produced, the upper apical angle rounded, not produced.

Female.—Entirely similar to the male except that the arolia between the claws are shorter and the color is generally lighter, the latter evidently due to discoloration.

Measurements: Length, pronotum, male, 5–5.25 mm., female, 7 mm.; elytra, male, 4 mm., female, 4.25; posterior femora, male 13.5–14 mm., female, 18 mm.; antennæ, male, 11 mm., female (?).

Two males, base of Santa Catalina Mountains in Arizona, August 16, 1907 (J. L. Webb), and one female with no data.

Type.—No. 1041, U. S. National Museum.

This species differs from *B. crassus* as described and figured by Scudder[a] in the less strongly sulcate frontal costa, the incised piceous stripe of the lateral lobes of the pronotum, and in the male genitalia, especially in the shape of the cerci. The size will serve for the ready differentiation of this species from Scudder's *B. peninsulæ,* which was described from Lower California without exact locality.

SOME BEES COLLECTED BY MR. F. C. PRATT IN TEXAS.

By T. D. A. Cockerell.

Some time ago I received from Mr. F. C. Pratt a small but interesting collection of Texan bees, concerning which the particulars are now given. Several are new to Texas, or otherwise noteworthy.

Xenoglossa strenua Cresson, and **X. patricia** Ckll.

Del Rio, May 1, 1907, both from flowers of *Cucurbita fœtidissima.*

Centris cæsalpiniæ Ckll.

Devil's River, May 3 and 7, 1907, female at flowers of *Monarda citriodora.*

Anthophora fedorica Ckll.

Cotulla, April 17, 1906, male at flowers of Opuntia, female at Lonicera. *A. fedorica* has hitherto been known from a single male. The female has the hair of thorax above brightly colored, and looks exactly like *Emphoropsis birkmanni;* but outer side of hind tibiæ is clothed with white hair (black in *E. birkmanni*), and hair of lower part of pleura is white (black in *E. birkmanni*); the hair of face and cheeks also is light.

[a] Rev. Melanopli in Proc. U. S. Nat. Mus., Vol. xx, p. 28, pl. 2, fig. 10 (1897).

In my table[a] female *A. fedorica* runs to 8, and runs out because it has no abdominal hair bands; first segment (as also thorax) with orange-fulvous hair; basal half of second with a pruinosity of short and thin white hair.

Melecta californica Cresson.

Devil's River, May 3 and 6, 1907 (Bishopp and Pratt). Both sexes at flowers of *Monarda citriodora.* The female is *M. miranda,* the male *californica,* but they are one species.

Anthidium lupinellum Ckll.

Kerrville, April 11, 1907, male at flowers of *Salvia pitcheri.* Previously known only from New Mexico.

Dianthidium (Anthidiellum) gilense Ckll.

Kerrville, April 11 to 13, at flowers of *Marrubium vulgare.*

Dianthidium simile Cresson.

Kerrville, April 12, 1907, at flowers of *Tetragonotheca ludoviciana.* The female has more black on the legs than is normal, and the insect may be subspecifically distinct.

Kerrville, according to Vernon Bailey, is in the Lower Austral, but immediately adjacent to the end of the tongue of Upper Austral, which penetrates south-central Texas from the north. The *A. lupinellum* and *D. gilense,* Upper Austral species in New Mexico, should here be at the very limit of their range in a southeasterly direction. Cotulla and Del Rio are strictly Lower Austral. *A. fedorica* is unknown in New Mexico.

October 3, 1907.

The 215th regular meeting was held in the Sængerbund Hall, President Hopkins in the chair and the following other members present: Messrs. Ainslie, Banks, Barber, Burgess, Caudell, Currie, Gill, Heidemann, Howard, Patten, Sanders, and Sasscer. Messrs. W. W. Froggatt, B. N. Gates, M. C. Hall, J. F. Strauss, and Prof. Manuel Rivera were present as visitors. In the absence of the recording secretary Mr. Banks was chosen recording secretary *pro tem.*

Mr. M. C. Hall, of the Zoology Division, Bureau of Animal Industry, and Messrs. A. F. Burgess and H. O. Marsh, of the

[a] Trans. Am. Ent. Soc., xxxii, p. 69.

Bureau of Entomology, U. S. Department of Agriculture, were elected active members.

The president referred to the fact that there were present two foreign entomologists from widely separated parts of the world, and requested them to favor the Society with an account of their work. Mr. W. W. Froggatt, of Sydney, New South Wales, responded by telling of the conditions in Australia. He stated that he was detailed by several of the Australian States on a trip around the world in search of information on economic entomology, especially in regard to fruit flies. He referred to the various scientific societies and museums in Australia, among societies mentioning in particular the Linnean Society of New South Wales, founded and richly endowed by William MacLeay. The MacLeay Museum is still the largest and best in Australia. In most of the States there are field naturalist societies which greatly assist in developing interest in entomology. Speaking of the various entomologists he mentioned Mr. Blackburn as one possessing an excellent collection, especially in Coleoptera. The insect fauna of Australia, although varied, is isolated and mostly peculiar, this being partly dependent on the abundance of eucalypts in the flora. Gall insects are especially abundant, mostly in the families Coccidæ, Psyllidæ, and Thripidæ. Many insects are to be found on certain flowers, and he instanced the buprestid genus Stigmodera, forty species of which could be taken on flowers in the neighborhood of Sydney. The hymenopterous fauna presents many anomalies; there are no Bombidæ, but many other bees; the sawflies are largely of the genus Perga; ants are abundant, and several of them are very pugnacious. He emphasized the difference between the fauna and flora of Australia and that of New Zealand; many of the remarkable genera of the latter country are not found in Australia.

Mr. Schwarz, in discussion, interrogated Mr. Froggatt in regard to the faunal regions of Australia. Mr. Froggatt explained the difference between East and West Australia by the geological history of the country. Doctor Gill referred to the fact that most of the fishes living in the fresh waters of Australia are not true fresh water fishes, but allied to the neighboring marine genera and species.

Mr. Rivera, speaking in French, stated that he was visiting the United States and Europe to study the methods of economic entomology with a view to fitting them to Chilean conditions. He remarked on the paucity of economic insects in Chile. The most injurious are introduced species. The codling moth is their principal injurious insect. *Schizoneura lanigera* is very abundant and destructive. The insects of the vine are prominent economically, especially Margarodes and cockchafers. Phylloxera has not yet been found in Chile. As the commerce of Chile increases, many of the insect pests of other countries will probably be introduced. In response to a question, he said that insects in fruit importations leaving Europe in the autumn would reach Chile in their spring—a time favorable for insect development. He also spoke of the great north and south length of Chile and the consequent diversity in fauna and flora, and also the difference between insects of the eastern mountains and those of the coast.

Mr. Schwarz, in discussion, spoke of the similarity between insects of arid California and of Chile, and referred to the presence in Chile of *Aramigus fulleri,* which might be native to Chile. He then gave an account of the discovery, ravages, and nearly complete disappearance of this insect in the United States. Mr. Rivera stated that the insect just mentioned had been in Chile about eight or ten years, and that it does great damage to cultivated strawberries, olives, etc.

Doctor Howard then gave an account of his recent trip in Europe, endeavoring to interest European entomologists in sending larvæ of gipsy and brown-tail moths to the United States for the purpose of introducing parasites. An especial effort was made to get larvæ in the first and second stages, in order to rear an Apanteles. Upon this trip he had taken with him sets of the parasitic Hymenoptera and Diptera which had been bred from imported larvæ of gipsy and brown-tail moths in Massachusetts. Great difficulty was experienced in obtaining identifications of these insects. Not one of the 24 ichneumonids and braconids could be found in any of the larger museums. Two of the chalcidids were found in a box in the laboratory of the Jardin des Plantes, Paris. These had

been bred by Sichel from the same host, and named and labeled by Dr. Arnold Foerster. Doctor Howard stated that three stations have been established in Russia and one in France for feeding gipsy and brown-tail moth larvæ in numbers in order to attract parasites to them. Doctor Howard then exhibited and explained an extensive series of photographs showing many of the interesting points along the journey.

The following papers have been presented and accepted for publication:

A PRELIMINARY REVIEW OF THE CLASSIFICATION OF THE ORDER STREPSIPTERA.

By W. Dwight Pierce.

Having practically completed the manuscript for my paper entitled "A monographic revision of the Order Strepsiptera Kirby" I am particularly desirous of paving the way for the classification therein proposed by publishing a brief synopsis of the general character of that classification.

The order was established by Kirby in 1813 and has subsequently been shifted from one position to another by various writers. The group has been placed in the Hymenoptera, Diptera, Coleoptera, and Neuroptera, and has been given ordinal value under the names of Rhipidoptera, Rhipiptera, and Rhiphiptera. The usual position has been to rank the group as the family Stylopidæ in the Coleoptera Heteromera. This is obviously false, for the Strepsiptera are all isomerous.

The Tertiary genus Mengea points out clearly the divergence of the group at that time and gives a strong basis for ordinal rank. The system of hypermetamorphosis, which is far more complicated than in any other order, the highly developed nervous system, the reduction of the prothorax, and many other characteristics, prove its claim to the highest rank. The proofs are given in detail in the forthcoming paper.

Order STREPSIPTERA Kirby, 1813.

An order of hypermetamorphic endoparasites with highly specialized reduction of certain functional organs, great spe-

cialization of other functional organs, and with dissimilar sexes.

♂.—Elytrophorous, winged, ephemeral, aerial. Head and thoracic segments united by elastic commissures. Head transverse, with eyes stalked and composed of regularly placed separated hexagonal ommatidia. Mouth parts specialized, rudimentary, vestigial, or lacking. Antennæ sensitive, with one or more joints laterally produced. Tarsi pulvilliform below; tarsal claws present only in genus Mengea.

♀.—Larviform, apodous, permanently endoparasitic, enclosed by the persistent skin of the pupa. Pupa larviform, apodous.

Reproduction prolific, ovoviviparous. Development endoparasitic and highly metamorphic. Alimentation osmotic. Hosts various, hexapodal.

TABLE OF SUPERFAMILIES—MALES.

1. Tarsi with five joints and two tarsal claws....MENGEOIDEA, n. superf.
   Tarsi with less than five joints.....2
2. Tarsi four-jointed; antennæ with third joint laterally produced, XENOIDEA, n. superf.
   Tarsi with less than four joints.....3
3. Tarsi three-jointed.....HALICTOPHAGOIDEA, n. superf.
   Tarsi two-jointed.....ELENCHOIDEA, n. superf.

TABLE OF FAMILIES—MALES.

Superfamily MENGEOIDEA Pierce.

Antennæ seven-jointed, third and fourth joints laterally produced, MENGEIDÆ, n. fam.

Superfamily XENOIDEA Pierce.

1. Antennæ seven-jointed, fourth joint short, others beyond elongate, MYRMECOLACIDÆ, n. fam.
   Antennæ not seven-jointed.....2
2. Antennæ six-jointed, last three joints not much surpassing the third, STYLOPIDÆ Kirby, redefined.
   Antennæ not six-jointed.....3
3. Antennæ five-jointed, with fourth joint very short, and fifth elongate, HYLECHTHRIDÆ, n. fam.
   Antennæ four-jointed, with third and fourth joints elongate, subequal, XENIDÆ Semenov, redefined.

Superfamily HALICTOPHAGOIDEA PIERCE.

Antennæ seven-jointed, having the third, fourth, fifth, and sixth joints produced laterally and the seventh elongate. HALICTOPHAGIDÆ, n. fam.
Antennæ four-jointed, with the third and fourth joints elongate, subequal.....DIOXOCERIDÆ, n. fam.

Superfamily ELENCHOIDEA Pierce.

Antennæ five-jointed, with third joint laterally produced, fourth and fifth elongate.....ELENCHIDÆ, n. fam.

TABLE OF GENERA—MALES.

Family I. MENGEIDÆ Pierce.

Mandibles, maxillæ, and maxillary palpi present, labial palpi absent; wings having eight primary veins from base, with one distal unattached vein between the second and third, and with the sixth and seventh apically united,

Mengea Grote, 1886 (*Triæna* Menge, 1866; nec Hübner, 1816).

Type of genus, *Mengea tertiaria* Menge, 1866, fossil in amber, Germany.

Family II. MYRMECOLACIDÆ Pierce.

Wings having eight primary veins from base, the fourth curved upward and branched at right angles.....*Myrmecolax* Westwood, 1858.

Type of genus, *Myrmecolax nietneri* Westwood, 1858, parasitic on a formicid, Ceylon.

Family III. STYLOPIDÆ Kirby, 1813.

Wings having eight primary veins from base, with two distal unattached veins between the third and fourth, and no distinct costal node.....*Stylops* Kirby, 1802.

Type of genus, *Stylops melittæ* Kirby, 1802, parasitic on *Andrena nigro-ænea* K., England, Germany, Hungary.

Described species:

kirbii Leach, 1814 = *melittæ* Kirby, 1802 (Saunders, 1872).

dalii Curtis, 1828, parasitic on *Andrena labialis* K., England.

hæworthi Stephens, 1829 = *melittæ* Kirby, 1802 (Saunders, 1872).

childreni Gray (Griffith, 1832), parasitic on *Andrena victima* Sm., Nova Scotia.

spencii Pickering, 1835, parasitic on *Andrena tibialis* K., England, Germany.

aterrima Newport, 1847, parasitic on *Andrena trimmerana* K., England.

trimmerana Smith, 1857 = *aterrima* Newport, 1847 (Saunders, 1872).

thwaitei Saunders, 1872, parasitic on *Andrena afzeliella* K., England, France, Germany, Switzerland, Hungary.

dahlii Friese, 1906 = *dalii* Curtis, 1828.

Family IV. Hylechthridæ Pierce.

Wings having seven primary veins from base, with two distal unattached veins between the third and fourth, and one between the fourth and fifth.....*Hylechthrus* Saunders, 1850.

Type of genus, *Hylechthrus rubi* Saunders, 1850, parasitic on *Prosopis rubicola* Saund., Epirus.

Described species:

quercus Saunders, 1850, parasitic on *Prosopis gibba* Saund., Epirus.

sieboldii Saunders, 1852, parasitic on *Prosopis variegata* Saund., Epirus.

rubi pustulatus Saunders, 1872.

Family V. Xenidæ Semenov, 1902.

1. Maxillæ unilobed.....2
   Maxillæ bilobed.....3
2. Maxillæ two-jointed.....Xeninæ, n. subfam., 4
   Maxillæ three-jointed.....Homilopinæ, n. subfam., 12
3. First lobe of maxillæ three-jointed, second one-jointed, Crawfordinæ, n. subfam., 13

Subfamily Xeninæ Pierce.

4. Wings having eight primary veins from base.....5
   Wings having seven primary veins from base.....11
5. Wings having two distal unattached veins between the third and fourth primaries.....6
   Wings having two distal unattached veins between the third and fourth primaries, and one unattached vein between the fourth and fifth primaries.....10
6. No distinct node on costal margin.....7
   Distinct node, or notch, on costal margin.....9
7. Antennæ tapering to tips of ramæ, short, hardly longer than head, ramæ equal, deflexed, compressed, somewhat ensiform; wings having eight primary veins from base, with two distal unattached veins between the third and fourth; œdeagus arising between two reflexed claws, broad at base, strongly reflexed toward apex, apically acute.....*Xenos* Rossi, 1790.

   Type of genus, *Xenos vesparum* Rossi, 1790, parasitic on *Polistes gallicus*, Italy.

   Described species:

   rossii Kirby, 1813 = *vesparum* Rossi, 1790.

   jurinei Saunders, 1872, n. nom. pro *vesparum* Jurine, 1818, parasitic on *Polistes gallicus*, Switzerland.

   Antennæ foliaceous, bluntly rounded at tips of ramæ (œdeagus not

bounded at base by two apical claws, simple, sinuate, reflexed); wings as in *Xenos*.....8

8. Palpi with basal joint short, robust, second elongate, subcylindrical, deflexed; œdeagus longitudinally ridged,
Pseudoxenos Saunders, 1872.

Type of genus, *Pseudoxenos schaumii* Saunders, 1872, parasitic on *Ancistrocerus parietum* L., Corcyra.

Described species:

klugii Saunders, 1852, parasitic on *Hoplomerus lævipes* Shuck., Epirus.

corcyricus Saunders, 1872, parasitic on *Hoplomerus spinipes* L., Corcyra.

heydenii Saunders, 1852, parasitic on *Odynerus deflendus* Saund., Epirus, Corcyra.

Palpi with basal joint crassate, arcuate, second cylindrical, deflexed,
Paraxenos Saunders, 1872.

Type of genus, *Paraxenos erberi* Saunders, 1872, parasitic on *Bembecinus peregrinus* Sm., Corcyra.

9. Œdeagus not arising between reflexed claws, short in proportion to the size of the ninth segment, not dilated near base, abruptly acute at apex; elytra longitudinally ridged,
Apractelytra, n. gen.

Type of genus, *Apractelytra schwarzi*, n. sp., Washington, D. C.

10. First distal vein double.....*Eupathocera*, n. gen.

Type of genus, *Eupathocera lugubris*, n. sp., parasitic on *Sphex* (*Ammophila*) *extremitatus* Cress; Cincinnati, Ohio.

Described species:

sphecidarum Dufour, 1837, parasitic on *Sphex* (*Ammophila*) *sabulosa* L., France, Germany.

? *sieboldii* Saunders, 1872, parasitic on *Miscus campestris* Latr., Germany.

11. Two distal unattached veins between third and fourth primaries, one between fourth and fifth.....*Ophthalmochlus*, n. gen.

Type of genus, *Ophthalmochlus duryi*, n. sp., parasitic on *Prionotyx atrata* Lep., Cincinnati, Ohio.

One distal unattached vein between third and fourth primaries, one between fourth and fifth; œdeagus considerably dilated at base, arising between two claws....*Acroschismus*, n. gen.

Type of genus, *Acroschismus hubbardi*, n. sp., parasitic on *Polistes crinitus* (*americanus*) Felt, Florida.

Described species:

X. nigrescens Brues, 1903, parasitic on *Polistes rubiginosus* Lep., Texas.

X. pallidus Brues, 1903, parasitic on *Polistes annularis* L., Texas.

wheeleri, n. nom. pro *Xenos peckii* Brues, 1903, nec Kirby, 1813, parasitic on *Polistes metricus* Say, Connecticut.

One distal unattached vein between third and fourth primaries, one between fourth and fifth; œdeagus cleft at apex, *Schistosiphon,* n. gen.

Type of genus, *Xenos peckii* Kirby, 1813, parasitic on *Polistes fuscatus* Fab., Newbury, Mass.

Subfamily Homilopinæ Pierce.

12. Genitalia consisting merely of a two-jointed plate-like exserted appendage (ninth and tenth segments), œdeagus not visible (according to Templeton).....*Homilops,* n. gen.

Type of genus, *Xenos westwoodi* Templeton, 1838, parasitic on *Proterosphex* (*Sphex*) *ichneumoneus auriſluus* Perty (*aurocapilla* Templ.), Brazil.

Subfamily Crawfordinæ Pierce.

13. Œdeagus not reflexed, nor bounded at base by claws, very narrow at base, vesiculate and bent at middle, tenuate and very acute at apex; wings having five primary veins from base, the fifth branched.....*Crawfordia,* n. gen.

Type of genus, *Xenos pulvinipes* Pierce, 1904, parasitic on *Panurginus* sp., West Point, Nebr.

Family VI. Halictophagidæ Pierce.

1. Prothorax band-like, not interrupted.....2

Prothorax disc-like, interrupted laterally by the mesothorax.....5

2. Prothorax simple, not arched forward; wings having six primary veins from base, with two distal unattached veins between the second and third.....3

Prothorax and mesothorax arched forward, fitting into excavation of head.....4

3. Third primary vein simple.....*Pentacladocera,* n. gen.

Type of genus, *Halictophagus schwarzi* Perkins, 1905, parasitic on *Agallia* sp., New South Wales.

Third primary vein broken, or with unattached vein commencing just before the apex on its anal side.*Halictophagus* Dale, 1832.

Type of genus, *Halictophagus curtisii* Dale, England.

4. Œdeagus large at base, acute and greatly reflexed at apex; wings with six primary veins from base, with two distal unattached veins between the second and third, and with the third primary vein branched apically. *Pentoxocera,* n. nom. pro *Bruesia* Perkins, 1905; nec Ashmead, 1903.

Type of genus, *Bruesia australensis* Perkins, 1905, parasitic on *Tettigonia parthaon* Kirk., Queensland.

Described species:

? *phæodes* Perkins, 1905, parasitic on *Hecalus immaculatus* Kirk., Queensland.

? *stenodes* Perkins, 1905, parasitic on *Paradorydium menalus* Kirk., Queensland.

5. Prothorax represented by a pronotal and prosternal disc placed in the excavation of the head and mesonotum; wings having six primary veins from base, with one distal unattached vein between the second and third.....*Anthericomma,* n. gen.

Type of genus, *Anthericomma barberi,* n. sp., New Mexico.

Family VII. Dioxoceridæ Pierce.

1. Thorax normal.....*Dioxocera,* n. gen.

Type of genus, *Dioxocera insularum,* n. sp., parasitic on *Xerophlæa viridis* Fab., Grenada, St. Vincent.

Family VIII. Elenchidæ Pierce.

1. Mouth parts consisting of mandibles and two-jointed maxillæ.....2

Mouth parts consisting of mandibles and two-jointed maxillæ, bearing on the first joint an elongate, knobbed, linear, chitinous filament 3

2. Species large; first antennal joint elongate, second very short and transverse; frontal process not prominent; oral cavity broad, semicircular .....*Deinelenchus* Perkins.

Type of genus, *Deinelenchus australensis* Perkins, 1905, parasitic on *Platybrachys* sp., Queensland.

Species small, first two antennal joints subequal; frontal process prominent; oral cavity triangular, wings having four primary veins from the base, with one distal unattached vein between the second and third, and two brief basal veins between the third and fourth.....*Elenchus* Curtis, 1831.

Type of genus, *Stylops walkeri* Curtis, 1829, England.

Described species:

tenuicornis Kirby, 1815, parasitic on Liburnia, England.

templetonii Westwood, 1835, Mauritius.

3. Species small; oral cavity triangular; wings having four primary veins from the base, with one distal unattached vein between the second and third; œdeagus somewhat dilated at base, very acute and with tip not greatly reflexed,

Mecynocera, n. gen.

Type of genus, *Mecynocera koebelei,* n. sp. (*Elenchus tenuicornis* Perkins, 1905, nec Kirby, 1815), parasitic on *Liburnia*

campestris Van Duzee, and *Liburnia lutulenta* Van Duzee, Columbus, Ohio.

TABLE OF SUPERFAMILIES—FEMALES.

1. Cephalothoracic spiracles more or less easily discernible, generally prominent; four or five median unpaired genital tubes entering brood canal .....Xenoidea, n. superf.
   Cephalothoracic spiracles not usually discernible, never prominent..2
2. Tubercles of head apical.....Halictophagoidea, n. superf.
   Tubercles of head more or less obsolete, ventral; only three genital tubes entering brood canal.....Elenchoidea, n. superf.

TABLE OF GENERA—FEMALES.

Superfamily Xenoidea Pierce.

1. Head considerably narrower than metathorax at spiracles.....2
   Head not considerably narrower than metathorax at spiracles.....5
2. Hylechthridæ. Head not more than one-half as wide as metathorax at spiracles; lateral lobes of mesothorax indicating presence of supposed mesothoracic spiracles (auct. Saunders); lower lip (ventral) overhanging transverse slit, mandibles merely lobes. *Hylechthrus* Saunders.
   Head often much less than one-half as wide as the metathorax; no lateral lobes indicating presence of suppressed mesothoracic spiracles 3
3. Head about one-third width of metathorax at spiracles.....4
   Stylopidæ. Cephalothorax broadly truncate or rounded at apex; head about one-half width of metathorax at spiracles; five genital tubes entering brood canal.....*Stylops* Kirby.
4. Xenidæ. Halictoxeninæ, n. subf. Cephalothorax almost triangular, lateral margins sinuate, five genital tubes entering brood canal.....*Halictoxenos,* n. gen.
   Type of genus, *Halictoxenos jonesi,* n. sp., parasitic on *Halictus* (*Chloralictus*) *sparsus* Rob., Louisiana.
5. ? Crawfordinæ, n. subf. Cephalothorax with lateral lines extending from mandibles to spiracles.....*Crawfordia,* n. gen.
   Xeninæ, Homilopinæ, n. subff. Cephalothorax with head extending laterally not more than two-thirds of the distance to the spiracles, four genital tubes entering brood canal, *Acroschismus, Homilops,* n. gg.

Superfamily Halictophagoidea Pierce.

1. Transverse slit on cephalothorax narrow.....2
   Head subtruncate at apex, transverse slit very broad, cutting a deep

three-sided emargination in the head. . *Agalliaphagus,* n. gen.
Type of genus, *Halictophagus americanus* Perkins, 1905, parasitic on *Agallia quadrinotata,* Ohio.

2. Mandibles prominent, toothed; thorax shorter than head, ventral slit turned posteriorly at sides..... *Dioxocera,* n. gen.
Mandibles mere lobes.....3

3. Thorax shorter than head, rather suddenly narrowed to base; sides of head oblique..... *Pentoxocera,* n. gen.
Thorax longer than head, gradually narrowed to base; sides of head convex..... *Megalechthrus* Perkins, 1905.
Type of genus *Megalechthrus tryoni* Perkins, 1905, parasitic on *Platybrachys?* sp., Queensland.

Superfamily ELENCHOIDEA Pierce.

Head trilobed, mouth seemingly on an elevation; transverse slit narrow, *Deinelenchus* Perkins.
Head presenting two obsolete areas; transverse slit very broad, deeply cutting a rounded emargination into the thorax; a thin curtain overhanging cavity at base..... *Mecynocera,* n. gen.

DESCRIPTIONS OF NEW SPECIES.

Apractelytra schwarzi, n. sp.

♂.—Length, 1.66 mm.; wing expanse, 4 mm.

Black, with whitish pubescence. Wings milky, very pubescent. Last ventral segment brownish; œdeagus yellow. Under parts lighter.

Genitalia consisting of tenth segment overlapping the trough-like cavity of the ninth segment, which is bounded by the flap-like edges of the last ventral segment and apically terminated by a short œdeagus. In the type specimen the œdeagus is not reflexed and shielded by the tenth segment, but is directed backward; the sinuation is slight until about the posterior one-fifth, where the tube is abruptly turned downward; the apex is abruptly acute.

Type.—No. 9827, U. S. National Museum. Two specimens.

Eupathocera lugubris, n. sp.

At present the only description which can be given this species is included in the generic table.

It is a parasite of *Sphex (Ammophila) fragilis* Sm., and was bred by Charles Dury at Cincinnati, Ohio, September 3 and October 2. The host defines the parasite.

Ophthalmochlus duryi, n. sp.

At present the only description which can be given this species is included in the generic table.

It is a parasite of *Priononyx atrata* Lep., Cincinnati, Ohio, and was bred by Charles Dury, August 16 and September 21.

Acroschismus hubbardi, n. sp.

Xenos, sp. Hubbard, 1892.

♂.—Wing expanse, 5.5. mm., length, 2–3 mm.

Color brown. Antennæ apparently brown, but on closer inspection transparent yellow with blackish-brown pubescence, first joint yellow. Face fulvous, pubescent; mandibles transparent yellowish, glabrous. Vertex dark, head brown, eyes black. Prothorax and mesothorax dark, with elytra yellowish, pubescent, darker at club. Metathorax lighter, brownish, with exception of postscutellum, which is dark brown. Wings milky white, hyaline, iridescent, with dark brown costal margin; veining delicate yellowish brown, pubescence gray; last three veins very light. Legs yellowish. Abdomen yellow, with black borders.

Genitalia with the ninth ventral segment apparently uncovered, and apically cleft, forming two claws, from between which the siphonated œdeagus arises. Œdeagus reflexed and apically protected by the overhanging tenth segment. The genital pore through which the slender penis finds exit is situated at the basal one-third of the upturned tip of the œdeagus on the inner angle.

Described from specimens bred from *Polistes (americanus) crinitus* Felt by H. G. Hubbard at Crescent City, Fla., April 6.

Type.—No. 9825, U. S. National Museum.

Anthericomma barberi, n. sp.

♂.—Length, 1.25 mm.

Species stout, compact, with very large wings. General color black, wings milky white.

Pronotum obovate, disc-like, not connected with the prosternum, projecting about equally into emarginations of the head and mesothorax, medianly depressed longitudinally and transversely. Mesonotum transverse, anteriorly broadly emarginate for the admission of the pronotum; transversely depressed near apical margin. Metanotum very long.

Described from a single specimen collected by H. S. Barber at Santa Fé, N. Mex., May 6, 1904.

Type.—No. 9829, U. S. National Museum.

Halictoxenos jonesi, n. sp.

The single male of this species known was extracted from its puparium, but the antennæ proved it to be a xenid. In the forthcoming paper this species will be separated very clearly from any others by descriptions and illustrations of the female.

Parasitic on *Halictus* (*Chloralictus*) *sparsus* Rob. at Mound and Logansport, La.

ANNOUNCEMENT.

The descriptions given herewith are all very short, but sufficient to establish the genera. The complete revision of the group contains full descriptions of all species and many new species throughout the entire order.

DESCRIPTIONS OF NORTH AMERICAN TINEINA.

By August Busck.

Atteva edithella, n. sp.

Labial palpi black, sprinkled with light yellow at base and on exterior side. Antennæ purplish black. Thorax golden ochre-yellow, with two straw-yellow spots followed by two dark purple dots; collar dark purple; underside of thorax dark purple, with large straw-yellow spots. Ground color of fore wings light straw-yellow, with dark blue markings, some of which enclose ochre-yellow spots; entire costal edge dark blue; extreme base of wings ochre-yellow, limited by a transverse, irregular dark-blue line, which emits a short, slightly forked central spur; at basal fourth is an irregular, transverse, dark-blue fascia, or rather, two dark-blue lines coalescent in the middle of the wing and on costa, and enclosing two ochre-yellow spots, one shortly below costal edge and one on the dorsal edge; on the middle of the wing is another narrow dark-blue fascia, enclosing a small ochre-yellow dot near costa and dividing into a fork near dorsal edge, where it encloses a large ochre-yellow dorsal spot; at apical third begins a transverse dark-blue line which encloses a small round ochre-yellow spot shortly below costa and then becomes attenuate and ends before reaching the dorsal edge; a little before tornus is a large dark-blue dorsal spot, enclosing a round ochre-yellow dot; apex dark blue, with an ochre-yellow spot; between and connecting these larger margins are several narrow transverse dark-blue lines, connected with short cross bars of the same color and forming a net-work on the straw-yellow ground color. Hind wings dark fuscous, semitransparent, with dark veins and black edge. Abdomen purplish black above, with a ventral row of five transverse light-yellow spots. Legs dark purplish, with light-yellow annulations.

Alar expanse, 26 mm.

Maverick Co., Texas (J. D. Mitchell).

Type.—No. 11362, U. S. National Museum.

A very distinct, beautiful species intermediate between the Cuban species *A. gemmata* Grote (*fastuosa* Zeller) and the common *A. punctella* Cramer, with the deep ocher-yellow ground color of the latter confined to the small dots enclosed in the blue markings.

Gnorimoschema graphicella, n. sp.

Labial palpi silvery white; second joint with a few black scales on the exterior side; terminal joint with a black annulation near base and one just before the tip. Antennæ strongly serrate towards the tip, white, with narrow brown annulations. Thorax white, sprinkled with brown anteriorly. Fore wings white, with two broad, transverse brown fasciæ; one nearly at the base of the wing, the other, which is nearly twice as broad, on the middle of the wing; both are nearly straight edged and perpendicular on the edge of the wing, though the outer one is slightly concave exteriorly; both fasciæ contain black raised scales, which in the outer fascia form four small tufts, one pair at the basal edge and one pair near the apical edge. Extreme base of costa black and tip of the wing suffused with light brown and fuscous scales. Cilia white, with a fuscous central line in the apical part, parallel with the edge of the wing. Hind wings whitish fuscous, cilia a shade lighter. Abdomen light gray, anal segment white. Legs whitish, tarsi faintly annulated with brown.

Alar expanse, 13 mm.

San Diego, Cal. (W. S. Wright).

Type.—No. 11321, U. S. National Museum. Cotype in the Merrick Museum, New Brighton, Pa.

A very pretty species, easily recognized by its striking pattern. Though quite different in ornamentation it comes probably nearest *Gnorimoschema octomaculella* Chambers, which it somewhat resembles in coloration and size.

Untomia albistrigella Chambers.

Gelechia albistrigella Chambers, Can. Ent., IV., p. 171, 1872; Dyar, List. N. Am. Lep., No. 5779, 1903; Busck, Proc. U. S. Nat. Mus., XXV, p. 890, 1903.

At the time of my revision of the Family Gelechiidæ this species was known only from Chambers's description and from the two imperfect types in the Cambridge Museum, and it could not be placed generically with any degree of safety. Thus I was obliged to leave it temporarily among the unrecognized species at the end of the genus Gelechia, though I pointed out that the peculiar venation, so far as it could be made out,

would exclude it from that genus and eventually be a means to the rediscovery of the species.

Lately I have obtained good specimens of this species through the kindness of Miss Annette F. Braun, whose excellent work on Chambers's old collecting grounds has done much to advance our knowledge of hitherto insufficiently known species of that author.

These specimens prove the species to belong to my genus Untomia (Proc. U. S. Nat. Mus., xxx, p. 727, 1907) as I had already suspected. The genus Untomia is correlated with Strobisia Clemens.

Gelechia branella, n. sp.

Antennæ light ochreous, annulated with black. Labial palpi light ochreous, suffused on the outer side with fuscous; terminal joint strongly suffused with fuscous, especially anteriorly. Face light ochreous. Head and thorax darker ochreous. Fore wings dull dirty ochreous, with black spots; extreme base of costa black; a few black scales opposite on the dorsal edge; a small black dot near base; another slightly larger on the middle of the wing; a third obliquely below on the fold, and a fourth black dot at the end of the cell; above this last is a small ill-defined blackish costal spot and around the apical edge is a series of small ill-defined black dots. Cilia ochreous. Hind wings shining whitish fuscous. Abdomen ochreous. Legs ochreous, with exterior side shaded with fuscous, and with dusky tarsi. Venation typical.

Alar expanse, 13 mm.

Plummers Island, Maryland (Busck).

Type.—No. 11322, U. S. National Museum.

A pretty little species unlike any described American species of the genus, but reminding one in color and pattern of *Aristotelia quinquepunctella* Busck.

Gelechia pseudofondella, n. sp.

Labial palpi ochreous white, very slightly mottled with black exteriorly and with a small black dot just before apex of terminal joint. Face and head iridescent white. Thorax ochreous white. Fore wings ochreous white, with dark blackish-brown markings; extreme base of costal and dorsal edge black; a small blackish-brown spot near base; a large outwardly-oblique costal streak from basal third of costa reaches to the fold; beyond the middle of the wing is an ill-defined dark-brown transverse fascia, reaching the dorsal edge. On the middle of the wing between these two large markings is a small blackish-brown spot. Apical fourth of the wing heavily overlaid with dark brown. Hind wings light fuscous. Abdomen ochreous fuscous. Legs light ochreous, mottled with black exteriorly. Venation typical.

Alar expanse, 14 mm.

New Brighton, Pa. (H. Engel).

Type.—No. 11323, U. S. National Museum. Cotype in the Merrick Museum.

Very similar to *Gelechia fondella* Busck; the different wing pattern easily separates it, and in the absence of connecting links it must be regarded as a good species.

Glyphidocera speratella, n. sp.

Antennæ light ochreous; in the males with a slight indication of a notch on the second point. Labial palpi ochreous, slightly sprinkled with fuscous exteriorly. Face and head light ochreous. Thorax ochreous fuscous. Fore wing light ochreous, thickly and evenly sprinkled with darker ochreous-fuscous scales and with four rather indistinct dark-fuscous spots, one near the base, another on the middle of the wing, a third on the fold obliquely below and before the second, and a fourth, which is the largest, at the end of the cell. Hind wings light fuscous; cilia ochreous. Abdomen ochreous. Legs ochreous, mottled with black exteriorly.

Veins 7 and 9 in the fore wings stalked; vein 4 separate from stalk of veins 2 and 3.

Alar expanse, 18 mm.

New Brighton, Pa. (H. Engel).

Type.—No. 11324, U. S. National Museum. Cotype in the Merrick collection.

A large bright-colored species, nearest in size to *Glyphidocera septentrionella* Busck, but lighter.

The species of this genus much resemble each other superficially and their determination requires careful discrimination. The safest guide lies in the specific differences of the venation and the secondary sexual character of the antennæ. The highly developed male genitalia are also a help in this genus.

Depressaria nigrinotella, n. sp.

Labial palpi light yellowish brown; terminal joint shaded with black on basal half and with extreme tip black. Head light reddish brown. Thorax yellowish brown, with the anterior edge and patagia somewhat darker brown and with extreme posterior tip blackish brown. Base of the fore wings concolorous with thorax, light yellowish brown, which color is continued on the basal half of the costal edge, gradually disappearing in the darker brownish-fuscous ground color of the wing. A single, first discal, deep-black round dot; second discal spot yellowish white, edged exteriorly with black scales. Extreme base of costal edge black and entire wing sparsely sprinkled with scattered black scales. Hind wings shining light yellowish fuscous. Abdomen

yellowish. Legs yellow, sprinkled with black, tarsi with ill-defined black annulations. Veins 2 and 3 in fore wings stalked.

Alar expanse, 22 mm.

Cincinnati, Ohio (Miss A. F. Braun); Chicago, Ill. (H. McElhose).

Type.—No. 11325, U. S. National Museum.

Nearest to *Depressaria walsinghami* Busck, and *D. psoraliella* Walsingham, but larger than either and without any white scaling on first discal spot.

Depressaria amissella, n. sp.

Labial palpi light ochreous brown; terminal joint with base and a broad ring near the tip black; extreme tip ochreous. Head and thorax light ochreous brown; posterior tip of thorax blackish. Fore wings ochreous brown, sparsely sprinkled with black scales, especially on costal apical part; extreme base somewhat lighter than the rest of the wing, and this light shade faintly continued along base of costal edge; basal area sharply limited by a short perpendicular black streak from the dorsal edge. In the middle of the disc are two round, deep-black dots, placed obliquely, the first nearer the costal edge, the second nearer the fold; just before the end of the cell is an ill-defined blackish-brown blotch. Hind wings light ochreous fuscous. Abdomen ochreous fuscous. Legs dark ochreous; tarsi faintly annulated with black. Veins 2 and 3 in the fore wings stalked.

Alar expanse, 17 mm.

Kissimmee, Florida (Wm. Beutenmüller).

Type.—No. 11326, U. S. National Museum.

Nearest *Depressaria propinquella* Treitschke, of Europe, but with the dark blotch before the end of the cell much less prominent than in that species.

Depressaria pergandeella, n. sp.

Labial palpi light ochreous; tip of brush and terminal joint darker. Face whitish ochreous. Head light ochreous brown. Thorax dark fuscous brown. Forewings light brown, sprinkled with sparse single black scales; basal area and basal part of costal edge hardly lighter than the rest of the wing; extreme base of costa and a small dorsal spot near base black. Two small round black dots on the middle of the disc are placed obliquely, the basal one nearest the costal edge, and are followed by a somewhat superiorly placed, ill-defined blackish-brown blotch. A small, single black dot at the end of the cell is also followed by a darker shadow. Around terminal and apical edge is a faint row of black spots. Hind wings shining light yellowish fuscous.

Abdomen dark yellowish fuscous. Legs ochreous, nearly unmottled. Veins 2 and 3 in fore wings stalked.

Alar expanse, 21 mm.

Nebraska.

Type.—No. 11327, U. S. National Museum.

The type of this species was sent to Prof. C. H. Fernald several years ago from Mr. Theo. Pergande for name; on a visit to Amherst in October, 1902, Professor Fernald gave me the specimen and asked me to describe it and to utilize his manuscript name, which I am pleased to do.

The specimen has remained a unique in the National Museum, but the species is very distinct from any described American species and may as well be published.

Depressaria gelidella, n. sp.

Labial palpi purplish black on the exterior side and touched with carmine; the inner side yellowish white, extreme tip of terminal joint white. Head light gray. Thorax dark purplish gray, patagia purplish black. Ground color of the fore wings dark purplish fuscous, sparsely sprinkled with black scales; near the base is a transverse yellowish-white streak from dorsal edge, not reaching costa. On the disc is a crescent-shaped black streak touched in the center with white and carmine. At the end of the cell is a small round black dot, heavily edged posteriorly with white. Costal edge mottled with black and yellowish white; terminal edge with a nearly continuous black line before the cilia. The entire dorsal and apical part of the wing is tinted with carmine, which is especially prominent just below apical third of costal edge and in a broad streak along the middle of the dorsal edge. Hind wings light yellowish fuscous. Legs yellowish white on the inner side, purplish black exteriorly.

Alar expanse, 20 mm.

Winnipeg, Manitoba, Canada (A. W. Hanham).

Type.—No. 11328, U. S. National Museum.

This species is very similar in coloration and markings to *Depressaria conterminella* Zeller, of Europe, except for its dark colored thorax.

Depressaria maculatella, n. sp.

Labial palpi ochreous white; brush short and even, slightly sprinkled with darker ochreous scales; terminal joint slightly thickened with scales in front, white, with dark-brown base and blackish tip. Antennæ dark brown. Face ochreous white; head and thorax mottled with ochreous; patagia brown. Ground color of fore wings ochreous white, thickly and evenly sprinkled with darker ochreous and fuscous scales; at ex-

treme base of costa is a short, transverse, oblique, blackish-brown line interrupted in the middle; both discal spots inconspicuous, white, edged with dark-brown scales; between and slightly above these spots is a blackish-brown longitudinal streak; above and somewhat outside of this streak are two smaller similarly colored streaks, the upper one touching costal edge and the interval between these three streaks light brown. The veins, especially 9 and 10, are more or less indicated by scattered longitudinal dark-brown scales; around entire apical and tornal edge is a row of well-defined short dark-brown spots. Hind wings light whitish fuscous; underside mottled with dark transverse striations and with interrupted black line before the cilia; cilia white. Abdomen ochreous. Legs light ochreous, tarsal joints annulated with dark brown. Veins 2 and 3 in fore wings separate.

Alar expanse, 22–23 mm.

New Brighton, Pa. (H. D. Merrick); Ontario, Canada (A. W. Hanham).

Type.—No. 11329, U. S. National Museum.

Nearest, though not very near, to *Depressaria heracliana* De Geer, with similar wing pattern, but of smaller size and with whiter ground color and hind wings.

Depressaria juliella, n. sp.

Second joint of labial palpi ochreous, brush tipped with brick-red and exterior side mottled with red; terminal joint red, shaded with black at base and just before the apex. Face iridescent white; head ochreous mixed with red. Thorax red. Ground color of the fore wings light ochreous, but so heavily overlaid with brick-red and reddish ochreous as to be nearly obscured, especially along the edges of the wing. Near base is a small, dorsal blackish spot. Both discal spots ill-defined, longitudinal, very dark red, nearly black; intervening space whitish ochreous, the terminal and apical veins faintly indicated by thin dark-red lines. Cilia red. Hind wings thin, transparent, light fuscous, whitish towards the base, reddish towards the tip, with a darker line around the edge before the reddish cilia. Abdomen ochreous. Legs ochreous mottled with red. Veins 2 and 3 in fore wing separate, veins 3 and 4 in hind wings stalked.

Alar expanse, 24 mm.

Pecos, N. Mex. (T. D. A. Cockerell).

Type.—No. 11330, U. S. National Museum.

This species is very near the European *Depressaria nervosa* Haworth, of which there is a good European series in the U. S. National Museum, and which Lord Walsingham recorded from southern Oregon. I omitted to take notes on Lord Walsingham's specimen thus determined, while I studied the types

in the British Museum, and I can offer no opinion on the determination, but I should not be surprised if it is referable to the present species, which has somewhat narrower and more pointed wings and a more vivid red coloration.

Ethmia lassenella, n. sp.

Labial palpi weakly developed, blackish fuscous, with a few whitish hairs at base of the brush. Antennæ blackish brown. Head and thorax dark fuscous, nearly black. Fore wings dark fuscous; near the base is a central, round orange-yellow and red dot; following this is a deep-black streak on the fold; on the middle of the fold is a similar, but larger, short, longitudinal black streak; on the middle of the wing is a round black dot, and at the end of the cell is an orange-yellow and red spot, edged anteriorly and posteriorly with black. Hind wings of the male white, with a broad dark-fuscous border and with a long pencil of soft yellow hairs at the base of costa; in the female the white is limited to a basal and costal diffused shade and there is no hair-pencil at base of costa. Abdomen dark bluish fuscous above and below; in the female with the extreme tip orange-red; in the male the anal tuft is concolorous with the abdomen. Legs blackish fuscous.

Alar expanse, 17–18 mm.

Redington, Arizona.

Type.—No. 11332, U. S. National Museum.

Named in honor of Miss Birgitte Lassen, whose conscientious work in mounting Microlepidoptera makes their study easy.

This species belongs in the same group as *umbrimarginella* Busck, *coquillettella* Busck, and *albitogata* Walsingham, and is intermediate between the two former; it is easily distinguished from the first by its smaller size and the absence of the central, longitudinal yellow streak as found in that species; from the second, by its orange spots and the dark underside of the abdomen.

Scardia caryophyllella, n. sp.

Labial palpi dark purplish brown, with inner side, apex of second joint, and base and apex of terminal joint light ochreous. Face and head light ochreous. Antennæ dark purplish brown, with narrow ochreous annulations. Thorax ochreous mixed with fuscous; patagia dark fuscous with ochreous tips. Ground color of fore wings light ochreous, extensively overlaid with dark purplish-brown markings. A large rectangular purplish-brown spot near base crosses the fold, but does not reach the costal edge; a similarly colored triangular spot has its base on the fold and one corner on the middle of the dorsal edge; a large four-cornered dark-brown spot on the middle of the

costal edge reaches with its outer edge nearly down to the fold; these three large spots are more or less confluent and inclose a basal and costal area which is rather more darkly mottled by transverse brown striation than the dorsal and apical part of the wing. At apical fourth begins a dark-brown transverse streak parallel with termen, with the rather sharply-defined outer edge undulate and emphasized by a light yellow line, while towards the base it is less sharply separated from the brown mottled ground color. Just before apex is a small, dark-brown costal spot and in the light spaces between these more pronounced costal spots are small, dark-brown costal dots. Along the terminal edge are two separated dark-brown lines parallel with the edge. Cilia ochreous mixed with dark brown. The entire wing has a strong purplish sheen. Hind wings light purplish fuscous. Legs light ochreous, the two anterior pairs with brown annulation on the tarsi.

Alar expanse, 32 mm.

Fieldbrook, Cal. (H. S. Barber). Larva in fungus on oak.
Type.—No. 11338, U. S. National Museum.

This large striking species resembles *Scardia coloradella* Dietz in size and form, but is easily separated by its pattern; the fore wings are more glossy than those of any other described American species.

Scardia fiskeella, n. sp.

Labial palpi dark brown, with tip of second joint and base and tip of apical joint light ochreous. Antennæ blackish brown, with narrow ochreous annulations. Face and head dirty yellow. Thorax dark purplish brown, with tip of patagia and posterior tuft ochreous. Fore wings comparatively broad and rounded at apex; light ochreous and dark purplish brown; the entire costal and basal area to down below the fold is dark brown; the dorsal and terminal part is ochreous and projects up into the dark color with two rounded lobes, one rather shallow near base, another smaller but deeper on the middle of the wing; on the costal edge are four faintly geminate ochreous spots; two on basal and two on the apical part of the costa; the ochreous dorsal and terminal area faintly mottled with short, transverse dark-brown striation; in the ochreous apical area are two small brown marginal spots and along the terminal edge is a row of four dark-brown spots, which emit dark streaks into the ochreous cilia. Hind wings light purplish fuscous. Abdomen ochreous. Legs ochreous, tarsi annulated with brown.

Alar expanse, 26 mm.

Tryon, N. Car. (W. F. Fiske).
Type.—No. 11339, U. S. National Museum.

Named in honor of the collector.

This species is intermediate in size and form of the wing between the next following species and *Scardia fuscofasciella* Chambers, but distinguished from both by the absence of transverse pattern.

Scardia pravatella, n. sp.

Labial palpi ochreous, mottled with dark brown exteriorly and on the brush and with a brown ring around the middle of the terminal joint. Antennæ yellowish fuscous, annulated with dark fuscous. Face and head dirty yellowish fuscous. Thorax dirty ochreous, sprinkled with fuscous anteriorly. Fore wings rather broad and rounded at apex, dirty ochreous, with a purplish sheen and with dark-brown markings. Basal third of the wing profusely mottled with brown and with a few large, ill-defined, confluent brown blotches; after this follows a broad, transverse, nearly unmottled dirty-yellow area, oblique nearest the base on dorsal side and sharply angulated outwardly, where it is limited by a broad, dark-brown transverse area; costal edge marked with many small brown dashes nearly equidistant and with three somewhat larger quadrate spots, one on basal third, one just outside the middle of the wing, and one before apex; the latter begins a transverse row of ill-defined brown spots parallel with the terminal edge; termen with one small and two larger dark-brown spots, which emit dark rays out into the otherwise light ochreous cilia. Hind wings light ochreous fuscous. Abdomen ochreous. Legs ochreous, anterior pairs mottled with dark brown exteriorly.

Alar expanse, 23 mm.

New Brighton, Pa. (H. D. Merrick).

Type.—No. 11340, U. S. National Museum.

This species is nearest to *Scardia fuscofasciella* Chambers and has nearly the same ornamentation and outline of wing, but it is considerably smaller and with more defined dark basal third of the fore wings.

Scardia errandella, n. sp.

I give this new name to the American species which has for many years been recorded as the European *Scardia tessulatella* Zeller, and which is well described by Doctor Dietz under that name (Trans. Am. Ent. Soc., XXXI, p. 26, 1905). Doctor Dietz did not have European specimens and made his identification of his British Columbia specimen from the description, with which it agrees in a general way. But the American species differs in several respects and is certainly distinct from *tessulatella,* though it eventually may prove only a small variety of

Scardia burkerella Busck, bred from a fungus in Washington. At present I prefer to retain it under a separate name.

Washington State (Wm. Beutenmüller).

Type.—No. 11341, U. S. National Museum.

A COMPARATIVE STUDY OF THE THORAX IN ORTHOPTERA, EUPLEXOPTERA AND COLEOPTERA.

By R. E. Snodgrass.

(Plates II–V.)

INTRODUCTORY.

The anatomical facts described and illustrated in this paper are presented simply on a basis of their own interest. In showing that there are certain points of resemblance between the Euplexoptera and the Orthoptera on the one hand and the Coleoptera on the other the author does not undertake to set forth the phylogeny of these orders. It is probably not impossible that the Coleoptera may have some relationship to the Euplexoptera, notwithstanding their metamorphosis, yet the characters here discussed do not constitute sufficient evidence for any theory of coleopteran descent.

The material made use of is selected from data accumulated by the author while working under Dr. A. D. Hopkins on the anatomy of the external parts of beetles in connection with Doctor Hopkins's systematic and economic work on the Scolytidæ. A more comprehensive and comparative account of the insect thorax and the wing articulation is reserved for future publication.

GENERAL.

Before going into the more special description of the forms discussed it will be well to review the general anatomy of the parts involved, *i. e.*, the microthorax and the notal and pleural regions of the other three thoracic segments. Probably the most extensive comparative studies of the external anatomy of the lower insects are those published by Verhoeff during the last few years. His monograph on the morphology of the insect thorax[a] is the only work that will be referred to in this paper.

[a] Verhoeff, K. W.—Beiträge zur vergleichenden Morphologie des Thorax der Insekten. < Nova Acta. Abh. der Kaiserl. Leop.-Carol. Deut. Akad. der Naturforscher, LXXXI, No. 2, pp. 63–109, Pls. VII–XIII.

The microthorax, or presumed segment formed by the neck sclerites, is a much neglected part of insect anatomy. It has recently, however, been well studied by Verhoeff and probably made too much of by him. It is best developed in the Blattidæ, Mantidæ, Gryllidæ, and Euplexoptera, and is now usually regarded as a rudimentary segment of the thorax. Many embryologists claim that the second maxillæ are its appendages and that the labium, resulting from the fusion of the latter, has secondarily moved forward and become an apparent appendage of the head. The articulation of the submentum in adults of Mantidæ and Gryllidæ certainly gives support to this idea, for in these insects (fig. 1) the labium is clearly suspended at its basal angles, not from the head but from the sternal and pleural sclerites of the microthorax. In most of the higher insects the microthoracic sclerites are rudimentary or absent and the labium is suspended from the head. In Coleoptera and in some other forms the submentum is far forward on the head and the cranium is closed behind it either by a gular sclerite or by the approximation of the lateral walls. In all Euplexoptera the microthorax is well developed and in Spongophora at least the submentum is distinctly articulated to the cranium (fig. 13) a considerable distance in front of the neck sclerites. Here the sternal plates of the microthorax are so large as to be strongly suggestive of the notion that they have followed the labium forward in the Coleoptera and formed the gula. The pleural and sternal sclerites of the microthorax are always much more developed than the dorsal. The last generally consist of two small median or convergent plates. Verhoeff has attempted to homologize the pleurites with those of the other thoracic segments. He describes only three in longitudinal series on each side, which he identifies as the katopleure, anopleure (epimerum), and coxopleure (episternum). Their relation to the submentum, however, would not bear out this interpretation and the number and position of the plates is so variable that an attempt at their homology appears too conjectural. Apparently embryologists have not attempted to elucidate the subject.

The thoracic nota or sclerites covering the back of the thoracic segments are nearly always very complex in the mesothorax and the metathorax of the adult. But in an orthopteran nymph they are simple undivided plates from the entire lateral margins of which the wings arise. As development proceeds the anterior and the posterior edges become thickened, forming an anterior and a posterior marginal ridge (fig. 7, *k* and *l*). From the anterior ridge a phragma may grow downward (figs.

14 and 25, *Ph*). The posterior edge usually becomes deflexed and folded forward forming a reduplication and consequent free posterior margin overlapping the following segment or the membrane going to it (figs. 7 and 14, *Rd*, and fig. 18, *g*). Each notum becomes divided into more or less definite areas through the formation of regional elevations and depressions and through the development of ridges on the ventral surface. Yet there are never true sutures formed in either the mesonotum or the metanotum nor any real divisions of the original plate into the traditional præscutum, scutum, scutellum, and postscutellum. In the pronotum of the Acridiidæ, however, there are three generally distinct transverse sutures defining four transverse subsclerites. But these sutures simply mark internal ridges which accommodate the leg muscles just as the internal pleural ridges of the mesothorax and metathorax accommodate the leg muscles of these segments. In the prothorax the notum has grown downward on the sides until it has all but crowded out the pleural plates. It is, hence, evident that the apparent division of the acridiid pronotum into the above mentioned regions is simply an acknowledgment on its part of the pleural function devolving upon it through its usurpation of the original pleural areas. Therefore, we may conclude that, in the Orthoptera at least, the præscutum, scutum, scutellum, and postscutellum are not primitive divisions of the notum.

In the base of the wing are developed articular sclerites, three of which are constant in all insects (figs. 15, 18, and 19, *x*, *y*, *z*). The first and third are articulated to special processes of the adult notum (figs. 6, 7, 14, 15, 18, 19, 24, and 25, *a*, *b*). The first (*a*) is at the anterior lateral angle of the notum, the third (*b*) occupies a varying position on the side, while between the two is the deep lateral emargination (*c*). From the posterior notal angles project processes that carry the axillary cord of the wing (*Ax*) which forms the posterior margin of the axillary or axillary and anal membrane of the wing.

Thus it is true that in all adult insects the wing arises from the entire lateral margin of the notum. But this does not always appear to be the case, for immediately behind the part bearing the axillary cords there is in many insects a large and distinct sclerite, especially in the metathorax. This is well developed in Ephemerida, Plecoptera, Isoptera, Euplexoptera, Neuroptera, and Coleoptera. It is not present in any Orthoptera, and an examination of nymphal specimens of Ephemerida and Plecoptera shows that in these orders it is an adult charac-

ter only and is developed in the membrane back of the true notum. Verhoeff has given the name of *pseudonotum* to this plate in the Euplexoptera (Dermaptera) and this is probably as good a name as can be suggested. It is well shown in figures 18, 24, and 25, *Pn*. In the Coleoptera the pseudonotum carries the posterior phragma.

The presence of the pseudonotum in the euplexopteran metathorax (fig. 18, *Pn*) is one of the principal points in the present discussion, for the pseudonotum of the metathorax is a prominent Coleopteran character (figs. 24, 25, *Pn*), but one that does not occur in the Orthoptera. It is absent in the mesothorax of both the Euplexoptera and the Coleoptera, unless in the latter the small sclerites (fig. 19, *q*) uniting the mesonotum to the metanotum are its representatives.

The sclerite in beetles here homologized with the pseudonotum of the Euplexoptera is the "tergum" of Straus-Durckheim, the "postscutellum" of Audouin and authors following him, and the "acrotergite" of the first abdominal segment as interpreted by Berlese.

The thoracic pleura are in each segment made up of several plates and, although they vary considerably in different orders, yet one fundamental plan is always evident. This plan is well illustrated by the mesopleurum of *Spodromantis guttata* (Mantidæ) (figs. 2 and 4), but the same structure is easily recognized in the other examples given, viz., the mesopleurum of *Ischnoptera hyalina* (Blattidæ) (fig. 3); the propleurum (fig. 8) and the mesopleurum (fig. 5) of *Byrsotria fumigata* (Blattidæ); the propleurum (fig. 10), the mesopleurum (fig. 9), and the metapleurum (figs. 11 and 12) of *Spongophora apicidentata* (Forficulidæ); the mesopleurum (figs. 16 and 17) and the metapleurum (figs. 20 and 22) of *Cyllene robiniæ* (Cerambycidæ), and the mesopleurum (figs. 21 and 23) and the metapleurum (figs. 26 and 27) of *Calosoma scrutator* (Carabidæ).

A typical pleurum, then, is constructed as follows: A thick internal vertical, oblique or horizontal ridge (*PR*) extends from the base of the coxa to the base of the wing. This is the *pleural ridge*. It is formed by the approximated, infolded, and united edges of two plates, one, the *epimerum* (*Epm*), lying above or behind the ridge and the other, the *episternum* (*Eps*), lying below or before it. The external *pleural suture* (*PS*) between these two plates of course marks the position of the internal ridge. The upper end of the pleural ridge projects as an arm supporting the costal head of the wing and is the *wing process* (*WP*) or *alar apophysis*. The lower end of the ridge nearly always projects as an arm, the *coxal process*

(*CxP*), bearing the dorsal coxal articulation. The coxal process is absent as a distinct arm in the metathorax of Coleoptera and of Spongophora (Euplexoptera), but the same pleural surface articulates with the coxa. The pleural ridge generally gives off internally a *pleural apodeme* (*PA*) which frequently unites with a corresponding apodeme from the sternum. All insects possess these parts or rudiments of them. Verhoeff uses the names *anopleure* and *coxopleure* to designate the two main pleural plates of the lower insects on the ground that they may not be homologous with the epimerum and episternum of the higher insects, but a complete uniformity can be traced in these parts throughout all insects.

In many of the lower insects a large plate (*K*) occurs anterior to the episternum and generally between the latter and the sternum. It has been termed the *katopleure* by Verhoeff and this name will be used in the present paper. The katopleure is well developed in the Blattidæ, the Mantidæ, and in the mesopleurum of the Euplexoptera, but in most other forms it is either rudimentary or absent or is fused with the episternum.

A very important pleural plate of the lower insects is the *trochantin* (*T*). This sclerite lies between the episternum and the coxa and its ventral end forms a second or ventral point of articulation of the coxa with the body. Hence, those insects possessing a well-developed trochantin have the coxa articulating to the trunk by a simple hinge joint, and its movement is thus limited. Amongst the Orthoptera the trochantin is well developed in the Blattidæ (figs. 3 and 8), the Mantidæ (figs. 2 and 4), the Locustidæ, and the Gryllidæ. It is absent as a functional sclerite in the Acridiidæ and here the coxa can rotate freely upon the coxal process as on a pivot. The trochantin is large in Euplexoptera. In the Coleoptera it is present only in the prothorax and the mesothorax. It is always small, sometimes fused with the coxa, and is generally concealed within the coxal cavity.

Lying between the trochantin and the coxa are often one or two small accessory plates. The one more closely associated with the trochantin may be termed the *accessory trochantin plate* (figs. 11 and 12, *T. a*) and the other the *accessory coxal plate* (figs. 9, 10, and 12, *Cx. a*). An accessory plate frequently lies also at each anterior angle of the sternum (figs. 9, 10, 12, and 13, *S. a*). This is called the *vorplatte* by Verhoeff and other German entomologists.

Nearly all winged insects, in addition to the above, have one or two plates at the dorsal end of the episternum connected

with the wing and bearing the insertion of the pronator wing muscles on their inner surfaces. These plates (*1P* and *2P*) are usually termed the *paraptera* (*pteropleure* of Verhoeff), and their modifications in different orders is of special importance. In most of the lower insects there are two for each pleurum and they can be seen best in Acridiidæ where they are situated one before the other just in front of the wing process (*WP*). In the mesothorax and metathorax of Mantidæ (figs. 2 and 4) the pleurum is horizontal, and consequently the paraptera (*1P* and *2P*) lie below the wing process (*WP*). The ventral one is much larger than the other and has a small neck at its anterior angle. In Spongophora (figs. 11 and 12) the metapleurum is similar in position to that of the mantid. The first, or here ventral, parapterum (*1P*) is, however, proportionately larger and is partially fused with the episternum. Its anterior end is produced into a slender arm parallel with the wing process (*WP*) and its lower edge is extended by a thin plate forming a circular disc internally (fig. 11, *MD*) for the pronator muscles of the wing. If we compare this structure now with the metapleurum of a cerambycid (figs. 20 and 22) the resemblance is certainly striking. The only difference is that the second parapterum is lacking and the first is more completely fused with the episternum. Any phylogenetic considerations based on this similarity of structure are invalidated, however, by the fact that in the lower beetles such as the Carabidæ and Dytiscidæ the parapterum is only articulated to the episternum and the resemblance to Euplexoptera is much less than in the higher beetles (compare figs. 26 and 27 with figs. 11 and 12, and figs. 20 and 22 with figs. 11 and 12). In the mesothorax of Coleoptera the parapterum is usually reduced to a small and very inconspicuous plate or bar lying near the wing process (figs. 16 and 17, *P*), but in *Cyllene robiniæ* (Cerambycidæ) it is prominent and bears a large disc (fig. 23, *P*).

THE ORTHOPTERA.

The illustrations in this order are taken principally from the Blattidæ and the Mantidæ. These two groups probably present more primitive characters than any of the other Orthoptera, but none of the orthopteran families are related serially to one another.

The microthorax of *Spodromantis guttata* is shown in fig. 1. The submentum (*Sm*) is here clearly articulated to the microthoracic sclerites by its basal angles. There are two sternal plates present and a pleural series of four plates on each side. The notum consists of two narrow median plates.

In Acridiidæ and Locustidæ the microthorax is rudimentary, consisting of only two or three small sclerites on each side of the neck. In Blattidæ and Gryllidæ it is well-developed.

The prothorax generally has an undivided notum, curved downward on the sides, partially or almost entirely crowding out the pleural sclerites. In the Acridiidæ it is marked by three transverse grooves externally and three corresponding ridges internally. This, as already shown, is due simply to the assumption of the pleural function by the lateral parts of the notum.

The propleurum is best developed in the Blattidæ (fig. 8), where all the parts are present that occur in the other segments except the paraptera and wing process, but these are exclusively wing accessories and hence not to be expected in any prothorax. The pleural suture (*PS*) is prominent and the epimerum (*Epm*), the plate usually suffering most from the encroachment of the notum, is actually larger than the episternum (*Eps*). Both katopleure (*K*) and trochantin (*T*) are well developed.

The mesothorax and metathorax are usually so similar that separate descriptions are not necessary. The principal differences that occur between them are in the notal plates but these are correlated with modifications of the wings. A very generalized adult notum is that of *Blattella germanica* (figs. 6 and 7). The anterior and posterior marginal thickenings (*k* and *l*) are simple. The posterior is folded forward on the ventral surface forming a reduplication (*Rd*) and consequent free posterior edge. The lines (fig. 6, *o* and *l*) apparent on the surface are simply the external marks of the apodemes (fig. 7, *o* and *l*).

The mesopleura and metapleura are sufficiently illustrated in their more generalized forms by *Ischnoptera hyalina* (fig. 3), *Byrsotria fumigata* (fig. 5), and *Spodromantis guttata* (figs. 2 and 4). In the Blattidæ only one parapterum is present. Figs. 4 and 5 show the internal surfaces with heavy pleural ridge (*PR*) and prominent pleural apodeme (*PA*) present in each case, with the wing process (*WP*) at one end and the coxal process (*Cx P*) at the other end of the ridge. Though the blattid episternum is irregular in shape and somewhat subdivided by incomplete lines, yet it can be unmistakably identified by its relation to the pleural suture and pleural ridge. In the Acridiidæ the trochantin is absent or rudimentary and the katopleure is fused with the episternum.

THE COLEOPTERA.

The Coleoptera will be described before the Euplexoptera in order to bring out more clearly the points by which the latter resemble in some cases the Orthoptera and in others the Coleoptera.

The microthorax is represented in many beetles but at best is poorly developed, consisting of one or two small sclerites on each side of the neck as in Acridiidæ. The labium is always solidly attached to the head, and the cranial walls are closed behind the submentum either by a gular sclerite or by an approximation of the lateral parts. The former condition is probably the original one in beetles, for in the latter case rudiments of the gula are present in some families.

The prothorax is large and its component sclerites when indistinguishable are so through fusion with one another and not through reduction. It is hence probable that the original beetles had the prothoracic pleurites as well developed as those of the succeeding two segments. The Coleoptera thus differ from the Orthoptera in which the prothoracic pleurites are always small and are usually rudimentary.

The mesothorax of beetles, though more closely united with the metathorax than with the prothorax, yet has in the higher beetles little similarity to the former and its pleura are actually more like those of the prothorax.

The mesonotum presents many variations in form, but that of *Calosoma scrutator* may be taken as a typical example (fig. 19). The flat triangular median shield with its apex projecting beyond the rest of the posterior margin is a characteristic feature. Anteriorly a phragma (*Ph*) projects downward and the posterior edge forms a high ventral ridge. The lateral parts are irregular but the two main processes (*a* and *b*) carrying the first and third articular sclerites of the wing (*x* and *z*) are present and likewise the posterior axillary arms carrying the axillary cords (*Ax*). Beneath the outer ends of these lie two little plates (*q*) that yoke the mesonotum to the metanotum. In some beetles these are fused with the mesonotum and in some cases their posterior ends are fused also with the metanotum. They are probably equivalent to the yoke plates of the cockroach (figs. 6 and 7, *j*). The third articular sclerite of the wing (*z*), which in all normal wings carries the anal veins, is here connected principally with the basal membranous fold of the elytron, and when the latter is folded its anal angle overlaps the sclerite.

The mesopleurum is sufficiently shown by figs. 16, 17, 21, and 23. Its form does not vary much and there are always

present an epimerum (*Epm*), an episternum (*Eps*), a pleural suture (*PS*), a pleural ridge internally (*PR*) under the suture between the epimerum and episternum, a wing process (*WP*), and usually a rudimentary parapterum (figs. 16 and 17, *P*) though sometimes a well-developed one (fig. 23, *P*). The coxal process is absent in the metathorax but is usually present though small in the prothorax and mesothorax.

The writer has not had the opportunity of making an exhaustive study of the trochantin in the Coleoptera, but in all forms examined it was found only in the prothorax and mesothorax, and in both of the latter is sometimes fused with the coxa. In the Silphidæ and Buprestidæ it is well developed as a distinct and exposed plate intermediating between the episternum and the coxa, and in these families, especially in the Silphidæ, has a distinctly orthopteran appearance. It is generally, however, much smaller and concealed within the coxal cavity as a small plate articulated to the head of the coxa in front of the articulation of the latter to the coxal process, and, moreover, in some cases it appears to take part in the formation of the socket receiving this process. It is thus in Carabidæ, Dytiscidæ, Cerambycidæ, and Scolytidæ.

There may be some question as to whether this sclerite is the homologue of the trochantin of the Orthoptera and the Euplexoptera. However, it is the plate originally named *trochantin* by Audouin, for he describes it specifically only in connection with *Buprestis gigas*. He states, however, that it lies between the coxa and the epimerum, but, undoubtedly, he regarded the posterior one of the several divisions of the episternum in Buprestis as a part of the epimerum.

The metathorax usually differs much in both its notal and pleural parts from the mesothorax. The metanotum is a large plate of definite and constant shape in all beetles. *Calosoma scrutator* (figs. 24 and 25) affords a typical example. There are apparent sutures on the dorsal surface but they are in all cases the external marks of ridges on the ventral surface (compare figs. 24 and 25, *l, n, p*). The anterior margin bears a phragma and the posterior is thickened into a small marginal ridge (*l*) which bears the axillary cords at its ends (*Ax*). A median dorsal groove is present though frequently interrupted by a membranous area. The same articular processes for the wing sclerites are present on each side as in the Orthoptera.

The most important point to notice on the back of the coleopteran metathorax is the pseudonotum (*Pn*), a plate lying behind the true notum, carrying a phragma ventrally, and

articulating by its lateral angles (*i*) with the posterior dorsal angles of the epimera.

The metapleurum in beetles is of special interest (figs. 20, 22, 26, and 27). An episternum and epimerum are always present and usually a postepimerum (figs. 20 and 22, *Pepm*) or small plate lying dorsal to the epimerum. In *Calosoma scrutator* (figs. 26 and 27) the wing process (*WP*) is clearly an arm derived from both the episternum and the epimerum and a continuation of the pleural ridge. Only one parapterum (*P*) is present, and this has the form of a short heavy arm lying in front of the wing process, movably articulated to the upper part of the episternum and bearing a large muscle disc internally. A few others of the lower beetles have a similar parapterum, but in most of the Coleoptera it is as shown by *Cyllene robiniæ* (figs. 20 and 22, *P*). Here the parapterum is solidly *fused* with the anterior part of the episternum and its exposed part looks like an arm of the latter equivalent to the wing process. But a careful study shows that the wing process (*WP*) still unites elements from both the episternum and epimerum and is continuous with the pleural ridge (*PR*).

THE EUPLEXOPTERA.

The illustrations presented in this order are based on two species: *Spongophora apicidentata* and *S. brunneipennis*. The resemblance of the Euplexoptera to the Orthoptera is of course well known, but in the thorax there is a fundamental departure from orthopteran characters and a marked similarity, though possibly an accidental one, to coleopteran structure.

The microthorax (fig. 13) is like that of those Orthoptera having this segment best developed. Its sternal plates are larger even than in Orthoptera. The submentum (*Sm*), however, is attached to the cranium far in front of the neck sclerites, a distinctly non-orthopteran character. Though there is no gula as in Coleoptera, yet the anterior sternal plate of the microthorax occupies a distinctly gular position.

The prothorax (fig. 10) is of special interest because its pleural parts closely resemble those of the mesothorax and are little inferior in size. A distinct katopleure is not present but all the other sclerites are well developed. On the other hand the metapleurum is very different from both the propleurum and the mesopleurum. Hence, we have here a prominent departure from the Orthoptera where the propleurum is invariably reduced and the mesopleurum and metapleurum are alike. On the other hand, the coleopteran structure is suggested, where the propleurum and mesopleurum resemble each other more than they do the metapleurum.

The mesothorax bears the elytra-like front wings, and a comparison of fig. 15 with fig. 19, representing the mesonotum of Spongophora and of Calosoma respectively, will show more points of resemblance than would a comparison of the euplexopteran mesonotum with the mesonotum of any orthopteron. There is present in Spongophora (fig. 15) the triangular median shield with its apex projecting over the posterior margin, and the elytral articulation is very suggestive of that of the beetles. There is an extra piece (*d*) present, however, which extends to the edge of the episternum, but this may be the parapteron, for otherwise mesothoracic paraptera are absent. Opposing this view is a corresponding sclerite (figs. 11 and 12, *e*) in the metathorax where both paraptera in addition are present. The ventral surface of the mesonotum (fig. 14) is very simple, presenting simply a median ridge, an anterior phragma (*Ph*), and a posterior reduplication (*Rd*).

The mesopleurum (fig. 9) is sufficiently shown by the illustration. It has all the parts of a perfect pleurum except paraptera. In Coleoptera the mesothoracic paraptera are always reduced, generally rudimentary, and often lacking, while in winged Orthoptera these plates are almost invariably present.

The metathorax differs strikingly from the mesothorax. The notum is large and irregular (fig. 18), composed of a main triangular plate (*N*) with its apex posterior, and of two bars (*f*) articulated to the apex of this plate and extending outward and posteriorly. The latter support the axillary regions of the wings and are followed by a free fold of membrane (*g*) which is the true caudal margin of the notum. The main notal plate presents dorsally a wide median groove (*G*) bordered on each side by a row of closely-set recurved spines. This groove reminds one of the groove of the coleopteran metanotum.

Behind the free membranous posterior edge (*g*) is a large pseudonotum partially divided into two plates by an imperfect median suture. This is a prominent coleopteran character. The plate can hardly be interpreted as an abdominal notum because the large first-abdominal spiracles (*Sp*) are attached to the following sclerite, evidently the true first-abdominal notum (*I. Ab. N*).

The metapleurum has a remarkably coleopteran appearance (figs. 11 and 12). In the first place the pleural suture (*PS*) is horizontal, and the episternum is much larger than the epimerum and is widest in front. The wing process (*WP*) is a slender continuation of the pleural ridge (*PR*). Though there are two paraptera present (*1P* and *2P*), the second is small, while the other is large, partially fused with the episternum, bears

an arm-like process anteriorly parallel with the wing process, and has an internal disc-like surface (*MD*) for the attachment of the principal pronator muscles of the wing. This is all strikingly coleopteran, but the resemblance is to the higher beetles, not to the lower ones in which the parapterum is free from the episternum. This consideration somewhat invalidates any phylogenetic considerations. A trochantin is present giving a ventral articulation to the coxa, an orthopteran character. The accessory plate *e* has already been mentioned and simply connects the second parapterum with the head of the wing.

SUMMARY.

The distribution amongst the three orders of the characters discussed may be shown by the following tabulation:

Orthoptera.	Euplexoptera.	Coleoptera.
Microthorax generally well developed.....	microthorax well developed	microthorax rudimentary or absent.
Labium attached to microthorax or to gular membrane...	labium attached to head	labium attached to head.
Gular sclerite absent.	first microthoracic sternal plate has gular position.....	gular sclerite present, closing head behind labium.
Prothoracic pleura reduced or rudimentary	prothoracic pleura not reduced	prothoracic pleura not reduced.
Mesothoracic pleura similar to the metathoracic pleura.....	mesothoracic pleura similar to the prothoracic pleura.....	mesothoracic pleura resembling the prothoracic more than they do the metathoracic pleura.
Mesothoracic and metathoracic pleurites oblique.....	mesothoracic pleurites oblique, metathoracic horizontal.	mesothoracic pleurites oblique, metathoracic horizontal.
Katopleure generally present	katopleure present in mesothorax	katopleure absent.
Trochantin generally present	trochantin present....	trochantin present in prothorax and mesothorax.
First and second paraptera usually present in both mesothorax and meta-	paraptera absent in mesothorax; both present in metathorax, the first	paraptera rudimentary or absent in mesothorax; the second absent in meta-

thorax, free from episternum	partially fused with episternum	thorax, the first nearly always fused with the episternum.
Metanotum without median groove.....	metanotum with median groove.....	metanotum with median groove.
Pseudonotum absent.	pseudonotum present in metathorax.....	pseudonotum present in metathorax.

EXPLANATION OF PLATES II–V.

(Drawings by the author.)

Ax, axillary cord or vein; *Cx*, coxa; *Cx. a*, accessory coxal plate; *Cx. P*, coxal process; *El*, elytron; *Epm*, epimerum; *Eps*, episternum; *F*, femur; *G*, median notal groove; *H*, posterior part of head; *I. Ab. N*, first abdominal notum; *K*, katopleure; *M*, base of intersegmental membrane; *MD*, muscle disc; *N*, notum; *P*, parapterum; 1*P*, first or anterior parapterum; 2*P*, second or posterior parapterum; *PA*, pleural apodeme; *Pepm*, postepimerum; *Ph*, phragma; *Pn*, pseudonotum; *PR*, internal pleural ridge; *PS*, plural suture; *Kd*, reduplication of posterior edge of notum; *S*, sternum; *S. a*, accessory sternal plate ("vorplatte"); *Sp*, first abdominal spiracle; *T*, trochantin; *T. a*, accessory plate of trochantin; *Tr*, trochanter; *WP*, wing process of pleurum.

a, Notal process of first articular wing sclerite; *b*, notal process of third articular wing sclerite; *c*, lateral emargination of notum; *d*, accessory plate of mesothoracic wing articulation; *e*, accessory plate of metathoracic wing articulation; *f*, posterior metanotal plates of Spongophora; *g*, posterior marginal membrane of metanotum of Spongophora; *h*, posterior plate of microthorax in fig. 8; *i*, point of articulation of pseudonotum to epimerum; *j*, yoke plates in Blattella between mesonotum and metanotum; *k*, anterior marginal ridge of notum; *l*, posterior marginal ridge of notum; *m*, anterior muscle disc of notum; *n*, *o*, *p*, ridges on ventral surface of notum; *q*, yoke plates of Calosoma between mesonotum and metanotum.

PLATE II.

FIG. 1. *Spodromantis guttata*, microthorax and submentum, ventral view.
2. *Spodromantis guttata*, mesopleurum.
3. *Ischnoptera hyalina*, mesopleurum.
4. *Spodromantis guttata*, mesopleurum, internal view.
5. *Byrsotria fumigata*, mesopleurum, internal view.
6. *Blattella germanica*, metanotum, dorsal view.
7. *Blattella germanica*, metanotum, ventral view.
8. *Byrsotria fumigata*, propleurum, external view.

PLATE III.

9. *Spongophora apicidentata,* mesosternum and mesopleura, ventral view.
10. *Spongophora apicidentata,* prosternum and propleurum, ventral view.
11. *Spongophora apicidentata,* metapleurum, internal view.
12. *Spongophora apicidentata,* metasternum and metapleurum, external view.
13. *Spongophora apicidentata,* microthorax and basal part of head and labium, ventral view.
14. *Spongophora apicidentata,* mesonotum, ventral view.
15. *Spongophora apicidentata,* mesonotum and base of right elytron, dorsal view.
16. *Calosoma scrutator,* mesopleurum, external view.

PLATE IV.

17. *Calosoma scrutator,* mesopleurum, internal view.
18. *Spongophora brunneipennis,* metanotum, pseudonotum, and first abdominal notum, dorsal view.
19. *Calosoma scrutator,* mesonotum, dorsal view.
20. *Cyllene robiniæ,* metapleurum, external view.
21. *Cyllene robiniæ* mesopleurum, external view.
22. *Cyllene robiniæ,* metapleurum, internal view.
23. *Cyllene robiniæ,* mesopleurum, internal view.

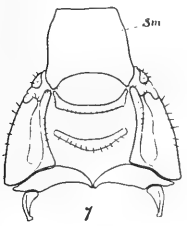
PLATE V.

24. *Calosoma scrutator,* metanotum, dorsal view.
25. *Calosoma scrutator,* metanotum, ventral view.
26. *Calosoma scrutator,* metapleurum, external view.
27. *Calosoma scrutator,* metapleurum, internal view.

NOVEMBER 7, 1907.

The 216th regular meeting was held at the Sængerbund Hall. President Hopkins presided, and the following persons were present: Messrs. Burgess, Burke, Busck, Crawford, Currie, Davis, Dyar, Gahan, Hall, Heidemann, Hopkins, Howard, Knab, Marsh, Patten, Sanders, Schwarz, Ulke, Webb, and Weldon, members, and Messrs. Mel. T. Cook, S. W. Foster, E. L. Jenne, E. J. Kraus, C. H. Popenoe, M. J. Rivera, and R. W. Van Horn, visitors. In the absence of the recording secretary Mr. Crawford was chosen secretary *pro tem.*

The corresponding secretary reported on the number of sets



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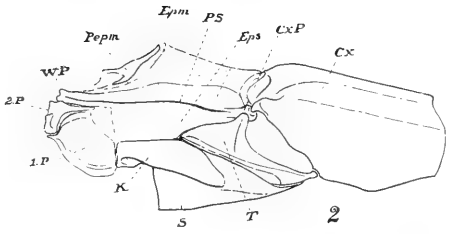

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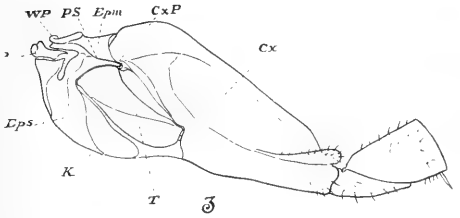

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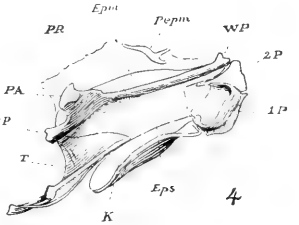

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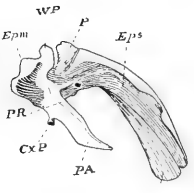

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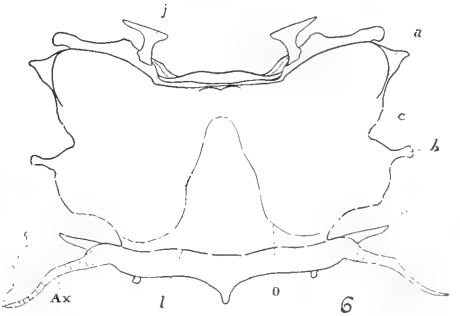

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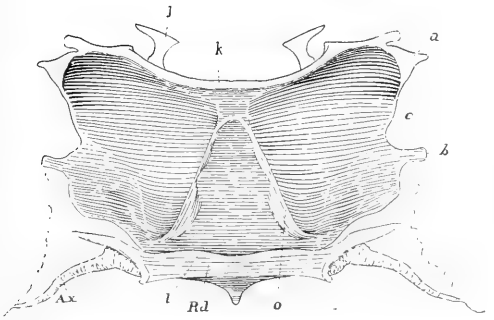

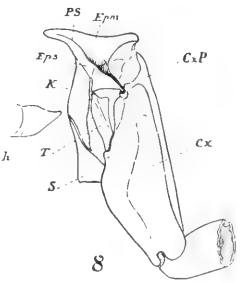

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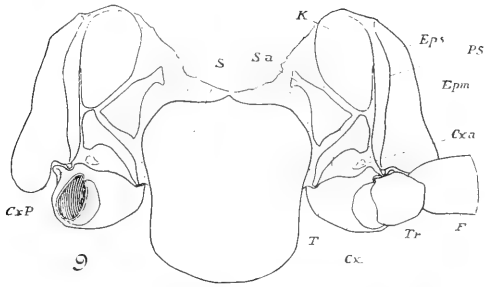
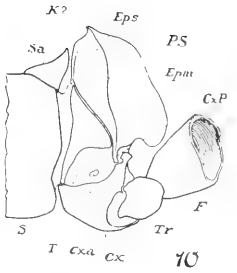
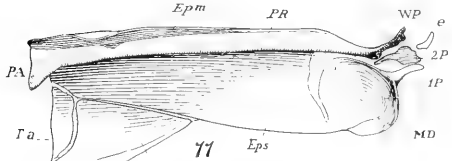
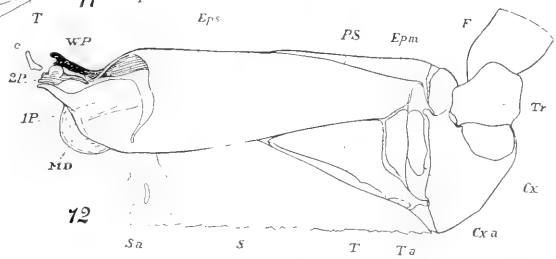
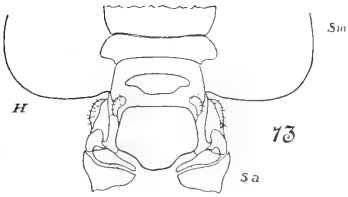
THE THORAX IN ORTHOPTERA, EUPLEXOPTERA, AND COLEOPTERA.

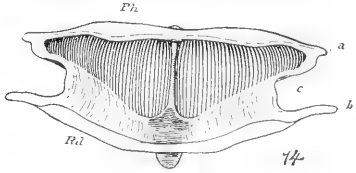


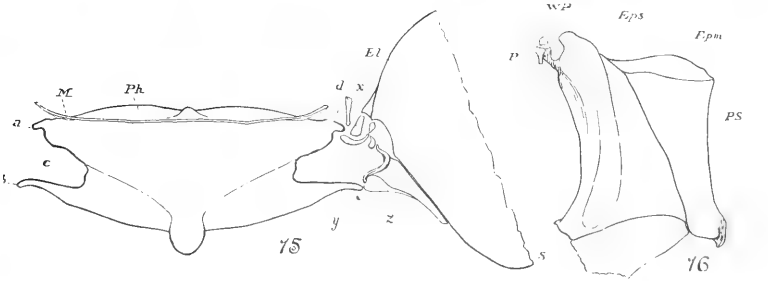




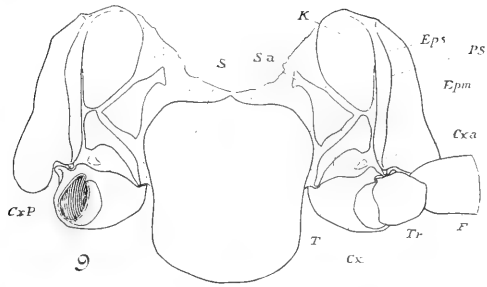


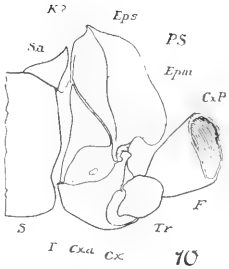


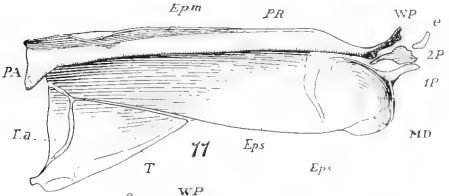


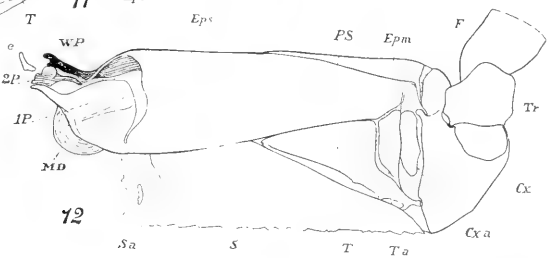


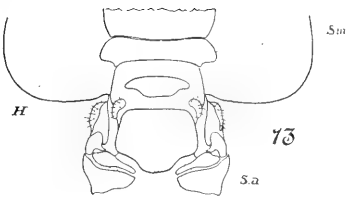
THE THORAX IN ORTHOPTERA, EUPLEXOPTERA, AND COLEOPTERA.

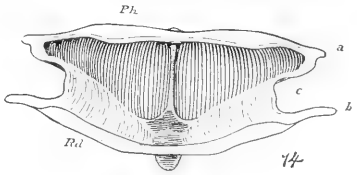


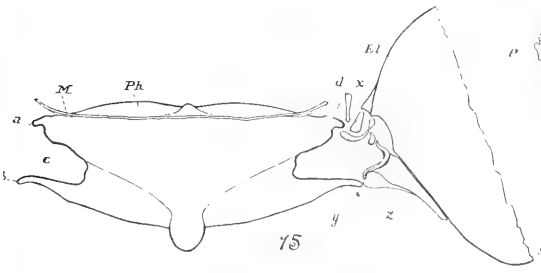


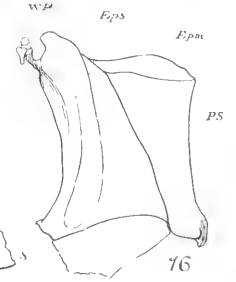












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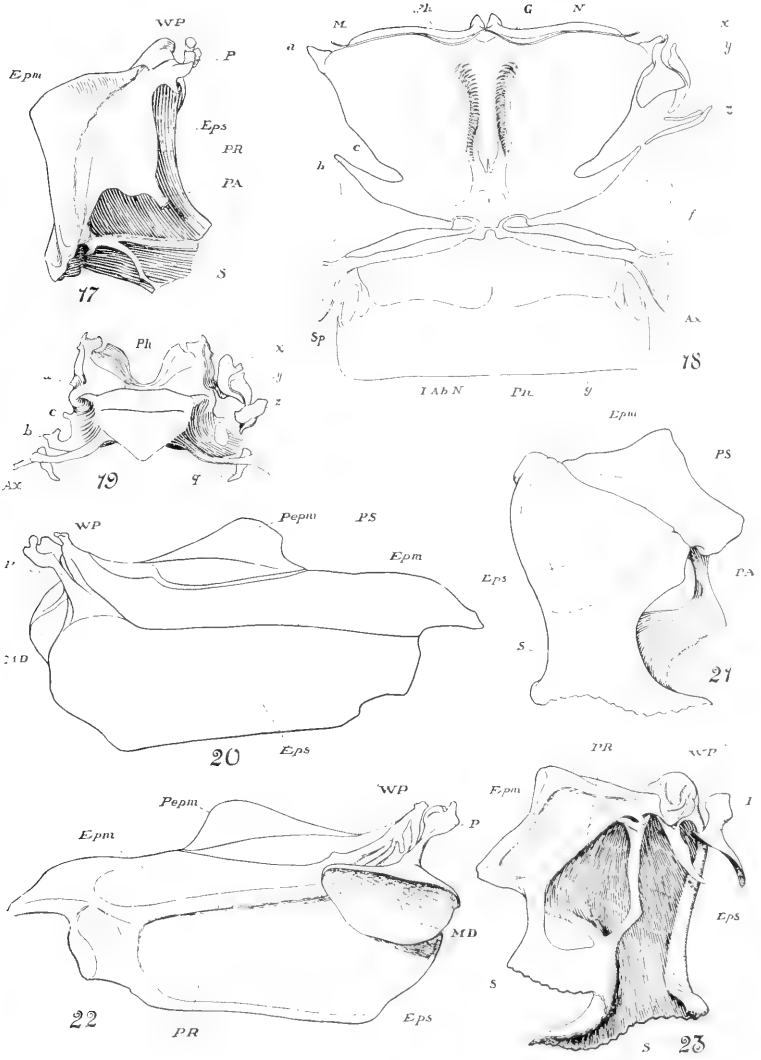

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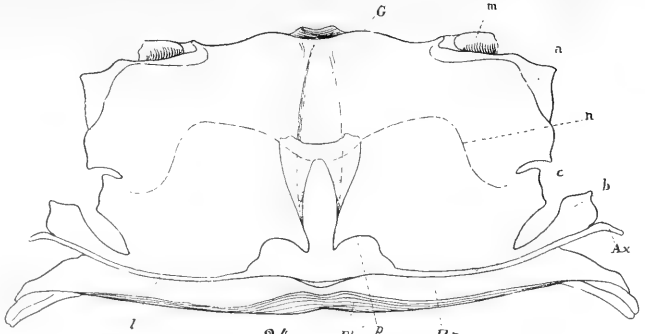

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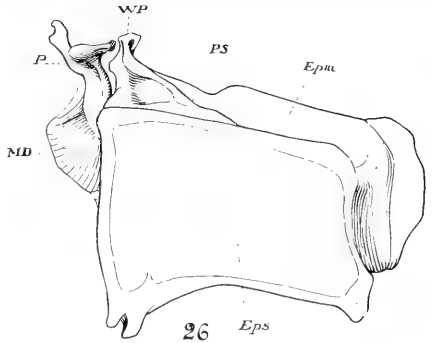

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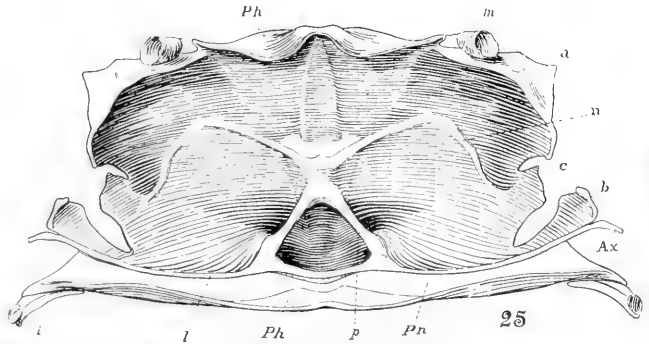

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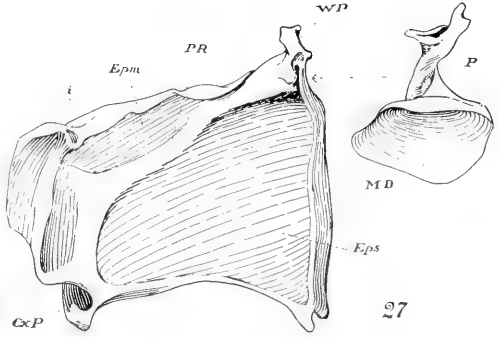

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THE THORAX IN ORTHOPTERA, EUPLEXOPTERA, AND COLEOPTERA.

of the PROCEEDINGS on hand and on the number of exchanges and authors' extras. The listing had been almost completed, and the separates were listed on cards so that it would be easy to arrange them for printing. It was then voted that a list of separates and exchanges be printed with the prices attached.

The President appointed Messrs. Currie, Banks, and Sanders as a committee of publication for Volume IX of the PROCEEDINGS.

Messrs. S. W. Foster, E. L. Jenne, and C. H. Popenoe—all of the Bureau of Entomology, U. S. Department of Agriculture—were elected active members of the Society.

It was voted that a complete set of the PROCEEDINGS be presented to the Newark Entomological Society in view of the fact that the entire library of that society had been destroyed by fire.

Mr. Mel. T. Cook, being called on by those present, gave some notes on his work on galls. He stated that the literature upon the subject is very scattered and that the great majority of workers have been interested in the insects rather than in the galls; this made the work very difficult. Interesting notes are frequently found in the most unexpected places, for example, as short paragraphs in long papers without anything in the title to indicate their presence. Frequently the data concerning the host plant are incomplete, or open to suspicion as to their correctness. The speaker had devoted much time to getting the literature and these miscellaneous notes together and in shape for a future publication upon insect galls from the standpoint of the botanist. Galls are produced by species in several distinct orders and families of insects, and we have reason to believe that the gall-making habit has arisen independently in each of these groups. However, the anatomy of the galls presents certain characters common in all galls regardless of the taxonomic position of the insects. Certain other anatomical characters are so distinct and clearly defined as to be of great value in systematic work. These anatomical characters depend upon the insects rather than upon the host plants. The stimulus which results in gall production is very imperfectly understood, but the speaker was inclined to believe that

it might be due in part to the excretory products of the insect.

Mr. Schwarz asked Mr. Cook whether he considered all galls injurious to the plants on which they occur, citing as cases which he did not consider injurious such leaf-galls as did not cause the leaves to fall off earlier than those leaves not infested. He gave also another case, namely, the Blastophaga galls in the fruits of *Ficus carica,* where the insects were necessary to the propagation of the plant. Mr. Cook replied that, while galls are often very injurious, it did not follow that in all cases they are materially so, but he did not think them often beneficial.

—Doctor Howard, apropos to the discussion on galls and to Professor Froggatt's remarks at the preceding meeting, called attention to an article by Dr. Gustav Mayr in the Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien for December 30, 1905, in which a remarkable gall made by a perilampine on the leaves of *Acacia pendula* sent him by Professor Froggatt from Australia is described. Doctor Howard stated that the Perilampinæ had previously been considered as purely parasitic forms, but that this insect described by Mayr as *Trichilogaster pendulæ* is undoubtedly a true gall-maker, and is very remarkable in that its gall contains two chambers—one, a large central chamber from which a female emerges, and the other a small peripheral chamber from which a single male emerges. Mayr suggests that the mother female lays two eggs, one female and the other male, and, since the female larva causes the formation of the globular gall, the male larva has to be satisfied with a more external gall.

—Professor Webster presented the following paper:

THE FASHIONING OF THE PUPAL ENVELOPE IN LYSIPHLEBUS TRITICI ASHM.

By F. M. Webster.

(Plate VI.)

Most insects with a complete metamorphosis, in view of their helplessness while passing from the larva to the adult, provide for their protection during this critical period by the construction of various forms of cocoons. Such as pass this

stage underground, however, rarely do more than work their bodies about until an earthen cell is formed, which is sometimes lined with silk, but in the Coleoptera even this is generally omitted. In all cases—at least so far as the author can call to mind—the cavity within which the transformation is to take place is the final work of, and is shaped by the movements of the fully developed larva.

That many of the internal parasites of Aphididæ pass their entire life cycle within the bodies of their hosts, the adults emerging from the dead and dried bodies of their victims, is well known. The peculiar rounded form taken on by a parasitized aphis after life has become extinct is also a matter of common observation, and, indeed, these nearly globular, brown corpses are usually to be expected wherever there are great numbers of aphides collected together, as with our grain-infesting species.

No one, it appears, has taken pains to observe the process of fashioning this pseudococoon by the parasite larva, whose habits in this respect do not differ materially from those of other insects, except in so far as is made necessary by the material used by the constructor.

The observations and drawings which form the basis of this paper were made with material furnished by and under the direction of the author by Miss E. Weeks, at Manhattan, Kans., in connection with investigations of *Toxoptera graminum* Rond. and its parasite, *Lysiphlebus tritici*. The living adult wingless female of *T. graminum* was taken from the field when beginning to take on the yellowish color which first denotes parasitism, and which precedes the amber color of the more advanced stage. Evidently this was on or about the sixth day from the time of oviposition by the Lysiphlebus, the larva being at the time quite full grown and occupying its normal position in the posterior part of the abdomen of the host insect (see Plate VI, fig. 1). From all that we have been able to learn, the very young parasite larva takes this position, and, refraining from moving about to any considerable degree, it does not come in contact with or injure any vital organ of its host, the effect being to reduce the period of reproduction of the Toxoptera to a very few days at most. But on reaching its full larval development, it seems suddenly to become more active, and with its first extended travels within the abdomen of its victim the last spark of life remaining in the latter is extinguished. It was just at this point that the observations herein recorded were made.

On bringing the female Toxoptera from the field and placing

it under the microscope, the Lysiphlebus larva was observed to work its way actively about as shown by the accompanying figures (Pl. VI), these movements being always forward and easily observed through the skin of the victim until this had become too opaque and the movements of the parasite larva too slow to detect. When these observations began, the movements of the parasite larva were accompanied, on the part of the victim, by a clutching of the leaf and a rigidity of the muscles of the limbs, and it is probable that the pain brought about by these movements led to the death grasp of the aphis, thus accounting for the tenacity with which the dead and dried empty skins of parasitized aphides remain attached to leaves and other objects to which the dying host has attached herself, long after the adult parasite has made its escape.

Taking up these observations in detail, fig. 1 (Pl. VI) shows the host as when first placed under the microscope at 11 a. m., while she was still alive and at a time when she seemed to tighten her grasp on the leaf with each movement of the parasite larva within her body. Between 11 a. m. and 11:35 a. m. the Lysiphlebus larva had made three complete revolutions in the body of its host, some of the different positions assumed, as also the gradual shaping of the skin of the now dead Toxoptera, being shown by figs. 2–7, Plate VI. Between 11:35 and 11:40 a. m. the larva had completed another revolution, probably the fourth from the beginning. The fifth revolution was completed at 11:50 a. m., and the sixth at 11:58 a. m., while the seventh was completed by 12:07 p. m. With the eighth revolution, shown by figs. 8 and 9, completed at 12:11 p. m., the skin of the host insect had been brought into its rotund shape and the larva had just begun to contract preparatory to pupation. At 12:15 the ninth rotation had been completed (fig. 10) and the larva had decidedly contracted. Fig. 11 shows the situation of both larva and pupal envelope at 12:20; fig. 12, at 12:22; fig. 13, at 12:27; fig. 14, at 12:32; and fig. 15, at 12:32½ p. m. At 12:35 p. m. there were apparent on the body of the parasite larva small, roundish cells of a yellow color. By this time the skin of the host had reached the semiglobular, typical form, which did not materially change afterward, though a slight movement in the larva could be detected

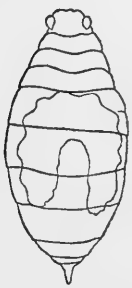


FIG. 4.—Unusual position of larva of *Lysiphlebus tritici* in body of *Toxoptera graminum*. (Drawing made for Bureau of Entomology and published by permission of the Secretary of Agriculture.)

up to 4 p. m., after which the covering had become too opaque to permit of further observations. Thus, within the space of five hours the living body of the host had been transformed into a tough, dried, hardened protective covering for the parasite during its short pupal stage, by a process of manipulation by the larva and a natural tanning process which renders the skin of the dead Toxoptera so impervious to the weather that these skins, so prepared, may be washed off the leaves by beating storms, yet do not become easily disintegrated, and may often be found in quantities on the ground underneath the infested grain plants.

While the normal position of the larva of the parasite in the abdomen of the host is indicated in Plate VI, fig. 1, there are exceptions, as shown by a case where, in a very young Toxoptera, the position illustrated in text figure 4 was assumed. This, however, is unusual. Again, while the transformation of Lysiphlebus from egg to adult takes place within the pupal envelope, as previously described, and the adult makes it way out by pushing out a small disc cut in the skin by the parasite larva, yet sometimes the larva works out of this case prema-

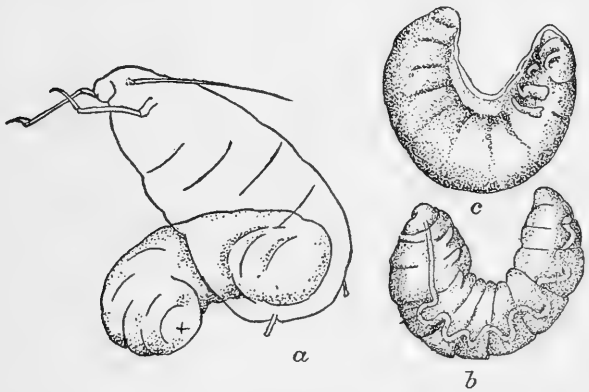


FIG. 5.—*a*, Larva of *Lysiphlebus tritici* working its way prematurely from body of *Toxoptera graminum; b*, same larva, somewhat further developed; *c*, same, still more developed. (Drawings made for the Bureau of Entomology and published by permission of the Secretary of Agriculture.)

turely, as shown in text figure 5. Mr. C. N. Ainslie found several of these prematurely issued larvæ on the ground in wheat fields in Kansas, under very seriously infested grain plants where the Toxoptera were very much parasitized.

EXPLANATION OF PLATE VI.

FIG. 1.—Position of larva of *Lysiphlebus tritici* in body of wingless adult female of *Toxoptera graminum,* just before beginning its revolutions for fashioning the body of the Toxoptera into a pupal envelope, 11 a. m.

FIGS. 2–7.—Some of the positions assumed by the Lysiphlebus larva between 11 a. m. and 11:35 a. m., during which time it made three complete revolutions.

FIGS. 8, 9.—Positions during and at completion of eighth revolution, 12:11 p. m.

FIG. 10.—Position at completion of ninth revolution, showing contraction of the larva, 12:15 p. m.

FIG. 11.—Position at 12:20 p. m.

FIG. 12.—Position at 12:22 p. m.

FIG. 13.—Position at 12:27 p. m.

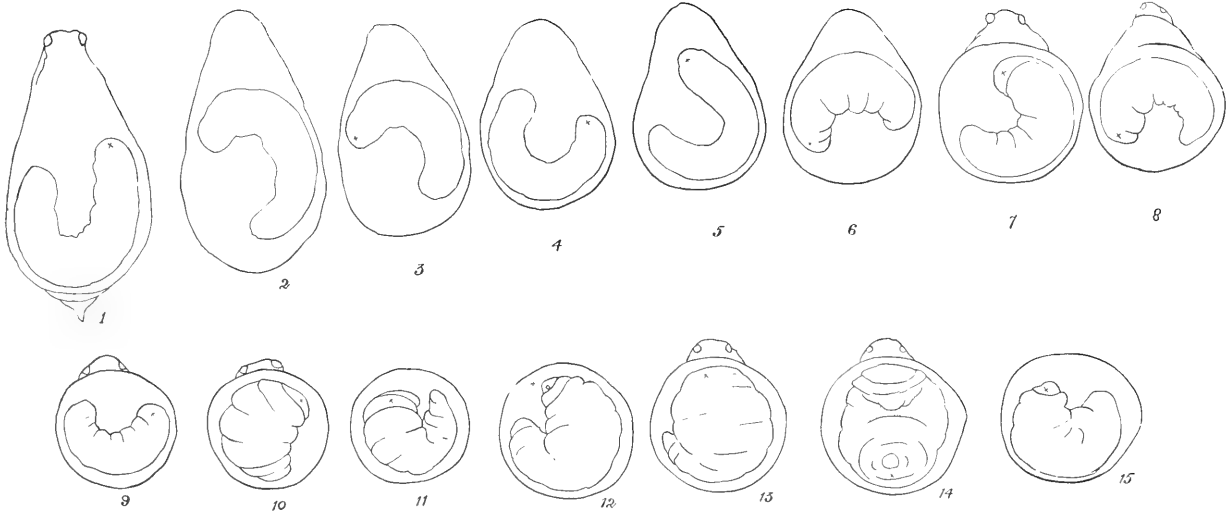
FIG. 14.—Position at 12:32 p. m.

FIG. 15.—Position at 12:32½ p. m.

—Mr. Schwarz exhibited and remarked upon some introduced Coleoptera to show the spread that had taken place lately. *Baris scolopacea* Germar, brought in some years ago, was known only from Philadelphia until this year, when it was found near Washington, D. C. As it is known to feed mostly on maritime plants it is not likely to be of economic importance in this country.

The second species, *Phytonomus nigrirostris* Fab., is either a circumpolar species or it was introduced into the northern States long ago, for as far back as the records go it has always been quite common, ranging from New England westward to Michigan and Minnesota. Some years ago it was found by Mr. Schwarz at Fortress Monroe, Va., and recently near Washington, D. C. (Fort Reno and Plummers Island) feeding on clover leaves. Species introduced into the Boreal zone have not, in his opinion, the power of spreading southward, as can be exemplified by a large number of species, including the gipsy moth. In this instance it seems that we have to do with another importation at some harbor south of New York.

The last species, *Aphodius prodromus* Brahm, was, like the preceding, not many years ago introduced into the New Eng-



THE FASHIONING OF THE PUPAL ENVELOPE IN LYSIPHLEBUS TRITICI ASHM.

(Drawings made for the Bureau of Entomology and published by permission of the Secretary of Agriculture.)

land States, and showed no tendency to spread. This year a number of specimens were found in stomachs of nighthawks shot near Denver, Colo., showing that the beetle must have spread along the northern States to the Rocky Mountain region.

—Mr. Schwarz exhibited some photomicrographs made by Mr. H. S. Barber of a species of Epimetopus (family Hydrophilidæ) from Hot Springs in Yavapai County, Arizona, showing the hind tarsi 5-jointed, instead of 4-jointed as given in various descriptions. The first joint is obscured by the long fringe of stiff spines at the apex of the tibia. The illustrations also show plainly the number and form of the antennal joints and other more or less disputed structural characters.

—Mr. Burke stated that he spent the summer of 1907 investigating the insect conditions in the national forests of Utah and Oregon for the Bureau of Entomology. In Utah most of the time was spent in the Uinta National Forest in the north-central part and the Sevier National Forest in the south-central part. The principal timber in the Uinta is the lodgepole pine (*Pinus murrayana*) and the alpine fir (*Abies lasiocarpa*). *Dendroctonus ponderosæ* Hopk. has been killing a number of lodgepole trees for the last three or four years and is still working. *Scolytus subscaber* Lec. is killing the fir in the same manner. The principal trees of the Sevier are the yellow pine (*Pinus ponderosa*) and the fir (*Abies lasiocarpa*). *Dendroctonus ponderosæ* has killed a number of the pines in the past, but the trouble now seems over and there was no evidence of fresh work. This Dendroctonus and *approximatus* Dietz, *convexifrons* Hopk., *barberi* Hopk., and *valens* Lec. attack lightning-struck and injured trees and prevent their recovery. The Scolytus, above mentioned, kills the fir as in the Uinta and is a destructive enemy of that tree.

In Oregon the time was spent in the Imnaha National Forest in the northeastern part. There Mr. Burke found the worst depredations by forest insects that he has ever seen. The principal trees are the lodgepole pine and the yellow pine. In the last three years, on an area of over 100,000 acres, *Dendroctonus monticola* Hopk., the mountain-pine beetle, has killed

from 90 to 95 per cent of all of the mature lodgepole pine and most of the yellow pine. It does not attack the young lodgepole pine but kills many of the young yellow pines. Nearly all of the remaining live lodgepole trees were attacked this summer in August and July, and by next year will be dead. The beetles enter the living bark of the trunk in July and August, and lay their eggs there. The eggs soon hatch and the larvæ feed in the bark until winter, and hibernate there in the large larval stage. They pupate and change to adults in the spring, and emerge during July and August, to attack fresh trees.

The destroyed area is brown, and looks as though scorched by fire. From it the beetles are scattering to other parts of the forest, and dead patches can be seen for miles around.

From a forester's standpoint, the conditions may not seem so bad, as there is a fine new growth coming up amongst the dead trees. But if a fire should get into the dead timber, which is very likely to happen unless carefully guarded against, this new growth would be destroyed and the ruin would be complete.

The dead timber is sixty to seventy miles from a railway, and is surrounded by private holdings. It is therefore inaccessible and can not be used, so must be left to decay, a complete loss.

—Mr. Currie stated that he had examined some remains of dragonflies taken from the stomachs of birds collected in Florida by the Biological Survey of the U. S. Department of Agriculture. These were remarkably well preserved and consisted in some cases of almost entire specimens. In the stomach of specimens of the chuck-wills-widow (*Antrostomus carolinensis*), a southern and larger relative of the whippoorwill, were a number of æshnines which he referred to Prof. E. M. Walker, of Toronto, who is making a special study of this group. The latter determined them as *Epiæschna heros* (Fab.) and *Coryphæschna ingens* (Rambur), two of the largest dragonflies in the North American fauna. The other dragonflies, determined by Mr. Currie, were small agrionines belonging to the species *Ischnura prognata* (Hagen) and were

from the stomach of a nighthawk (*Chordeiles virginianus*) collected on Amelia Island, Florida. It is true that nighthawks, whippoorwills, and other birds of this family have very large mouths adapted for capturing insects of large size. Nevertheless, it seems remarkable that they can swallow entire such large and powerful dragonflies as the two species first mentioned.

—Mr. Webb stated that he had spent the summer in investigations, for the Bureau of Entomology, of insects injurious to the forests of southern Arizona and New Mexico. In the White Mountains of New Mexico he found a large tract of dead Engelmann spruce killed several years ago by the Engelmann spruce barkbeetle, *Dendroctonus engelmanni* Hopk. No living examples of the insect were to be found, however, it having swept the forest and disappeared as *D. frontalis* did in Virginia and West Virginia several years ago.

Mr. Webb also exhibited a specimen of the work of a twig-girdler on alligator juniper found near Paradise, Ariz., and stated that he expected to breed out the adult of the larva which had done the girdling. He called attention to the fact that this is the first known instance of a twig-girdler having been found on juniper in North America, although Professor Froggatt had reported finding a girdler upon the juniper of Australia.

A specimen of the work of *Phlœosinus* sp., found on Arizona cypress near Paradise, Ariz., was exhibited, as also a collection of photographs illustrating various phases of Mr. Webb's summer work.

—The following two papers were presented for publication:

A NEW BUPRESTID ENEMY OF PINUS EDULIS.

(*Melanophila pini-edulis*, n. sp.)

By H. E. Burke.

♀.—Length, 6.5 mm.; breadth, 3 mm. Subfusiform, slender, moderately convex, bronzy, covered with a well-developed grayish pubescence which is lightest on the dorsal surface of the thorax; punctuation even

and quite dense. Head moderately convex, front finely and densely punctured, slightly strigose, clypeus moderately semicircularly emarginate. Thorax moderately convex, with parallel sides, basal angles acute, lateral margins entire, dorsal surface coppery, evenly and densely punctured, a slight oval depression near the basal angles, ventral surface rather coarsely punctured laterally and posteriorly but densely and finely punctured and rather strigose anteriorly, tip of prosternum constricted. Elytra moderately and evenly punctured, with basal depressions, the tips obtuse, separately rounded, the apical margin finely serrulate, each elytron with three lemon-colored spots arranged in a slight arc (fig. 6), anterior spot the largest, winged on the outer side, median spot next in size, slightly smaller, oval, posterior spot smallest, about one-fourth the size of the median, nearly oval. Ventral surface of the abdomen evenly and moderately punctured, quite pubescent, last (5th) ventral segment obtusely rounded, nearly subtruncate, with a strongly developed serrate ridge near the posterior margin (fig. 6).

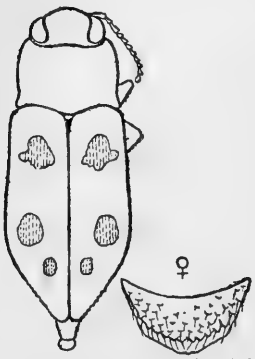


FIG. 6.—*Melanophila piniedulis*. Enlarged 7 times.

♂.—Resembles the female quite closely, but is much larger. Length, 9.5 mm.; breadth, 4 mm. Thorax slightly narrowed in front, sides slightly arcuate, lateral margins obliterated in front, tips of elytra more rounding, spots on the elytra the same as in the female, last (5th) ventral segment same, first joint of posterior tarsi not as long as next two joints together.

Type.—♀ and ♂, No. 11350, U. S. National Museum.

The species is easily distinguished by the spots on the elytra, which do not vary to any appreciable extent in the two specimens examined. It falls between *M. fulvoguttata* Harr. and *M. intrusa* Horn, but differs from both in having the serrate ridge near the posterior margin of the last (5th) ventral segment, and in the elytral spots.

One female taken by Mr. E. A. Schwarz from pinyon (*Pinus edulis*) at Bright Angel Hotel (Grand Canyon P. O.), Arizona, on July 11, 1902. One male and one imperfect female reared by the writer from larvæ taken July 5, 1907, from the pupal cells in the outer dead wood of the trunk of a dying pinyon at Panguitch, Utah. One larva pupated July 20 and one July 25, 1907. One pupa transformed to a male adult about September 1, 1907. The larvæ belong to the common Melanophila type and were found curled up in the pupal cells.

SOME BEES OF THE GENUS HALICTUS.

By T. D. A. Cockerell.

Halictus manitouellus, n. sp.

♀.—Length, 9 to 9.5 mm.; black; similar to *H. trizonatus* Cresson, but averaging a little larger, with decidedly darker wings, especially at apex, the stigma longer and redder; face broader; mesothorax dull, with the punctures as close as is possible, and the hair scanty and inconspicuous; area of metathorax with five longitudinal rugæ, much finer and closer than in *H. sisymbrii;* area with no sharp rim; truncation of metathorax with a very sharp rim below, but it fails above; abdomen closely and exceedingly minutely punctured, with no median band on first segment, nor any apical bands or discoloration; bases of segments 2 to 4 with broad bands of tawny felt-like pubescence, very conspicuous, narrowing medially on 2 and 3; apical segment with mostly black hair; legs black, with pale hair; hind spur finely serrate; tegulæ shining black, with the edge broadly pallid anteriorly. In Crawford's table (Jr. N. Y. Ent. Soc., Dec., 1907) it runs to *H. bardus* Cress., but hairs fringing apex of clypeus are fuscous, the scutellum is rather closely punctured, the stigma is not fuscous, and the abdominal bands are strongly tawny.

Cheyenne Cañon, Colorado Springs, Colo., two at flowers of Salix, May 18 (W. P. Cockerell); Manitou, Colo., April 29, one at Salix, one at *Ribes leptanthum* (T. D. A. and W. P. Ckll.). The same year, in April, *H. trizonatus* was common at flowers of Salix at Colorado Springs (W. P. Ckll.).

The wings of *H. manitouellus* are grayish, not yellowish.

Halictus galpinsiæ Ckll.

Boulder, Colo., at flowers of Gaura, June 12, 1905, 7:30 p. m. (W. P. Cockerell), 2 ♀. These specimens were unfortunately overlooked when I was preparing my tables of Boulder County bees (Univ. of Colo. Studies, 1907). The stigma is a lighter, brighter orange than that of *H. aberrans.*

Halictus cooleyi Crawford.

This recently described species proves to be one of the most abundant and characteristic bees of the front range and foothills in Colorado. Numerous specimens from Boulder, mostly taken by my wife, show dates from April 30 to July 3; and the females are recorded as visiting Hydrophyllum, *Viola nuttallii,* Ribes, Opuntia, Antennaria and Nothocalais. At Salina, Boulder County, females were taken at Salix and *Berberis*

repens, April 14. At Manitou, April 28, I took a female at Salix. At Florissant, in 1907, June to August, Mr. S. A. Rohwer took females at *Linum lewisii, Senecio tridenticulatus,* and *Taraxacum taraxacum.*

Halictus trizonatus Cresson.

Pecos, N. Mex., June 24, ♀ at flowers of Fallugia (W. P. Ckll.).

Halictus sisymbrii Ckll.

Pecos, N. Mex., July, females at flowers of *Clematis ligusticifolia* (W. P. Ckll.); Pecos Cañon, ♀ at flowers of *Lappula floribunda,* July 12 (Ckll.). Florissant, Colo., at flowers of *Salix brachycarpa,* June (S. A. Rohwer).

Halictus lerouxii Lep.

Colorado Springs, Colo., ♀ at flowers of Salix, April (W. P. Ckll.); Florissant, ♀ at *Taraxacum taraxacum,* June, 1907 (Rohwer).

Halictus farinosus Smith.

Mountain View, Cal. (Ehrhorn). Best distinguished from *H. lerouxii* by the large size and serrate (not dentate) hind spur; the color of the hair-bands is not reliable for separation.

Halictus armaticeps Cresson.

Mesilla Park, N. Mex., at flowers of peach, March 4, 1899 (Ckll.); Boulder, at flowers of Grindelia, Aug. 7 (W. P. Ckll.).

DECEMBER 5, 1907.

The 217th meeting was held at the Sængerbund Hall, 314 C street, N. W. President Hopkins presided and there were present Messrs. Burgess, Burke, Crawford, Davis, Foster, Gill, Girault, Hall, Heidemann, Howard, Hopkins, Jenne, Johnson, Marlatt, Marsh, Patten, Popenoe, Quaintance, Sanders, Sasscer, Schwarz, Scott, and Webb, members, and Messrs. Jones, Kraus, Shawhan, and Wilson, visitors.

Messrs. R. W. Van Horn and E. R. Jones, of the Bureau of Entomology, U. S. Department of Agriculture, were elected to active membership.

Mr. Marlatt presented the following paper:

REMARKS ON A RECENT TRIP TO THE CITRUS REGIONS OF CALIFORNIA AND FLORIDA.

By C. L. Marlatt.

(*Author's Abstract.*)

The primary object of the trip was to organize an experimental investigation of the hydrocyanic-acid gas process for the fumigation of citrus trees in California. Secondary objects were to note the conditions of the recent white fly invasion of certain California districts, and, on the return, to inspect and supervise the investigation of the white fly problem in Florida which is being conducted for the Bureau of Entomology under the general field direction of Dr. A. W. Morrill.

In May, 1907, the white fly (*Aleyrodes citri* R. & H.) was sent to the Bureau for identification by Mr. G. W. Harney, horticultural commissioner of Marysville. Later, additional samples from the same region were received from Mr. E. M. Ehrhorn. This insect was found well established at Marysville early in May by Mr. Harney, who identified it from descriptions as the Florida white fly, and submitted specimens also to Mr. Ehrhorn and later to this Bureau for confirmation of this identification. The discovery of the white fly at Marysville marked the first instance of the establishment of this pest in California—an event long feared by the citrus growers of that State. The natural range of the white fly in this country has for many years been confined practically to Florida and the States bordering the Gulf of Mexico, including the southern strip of Texas. Its range has extended fairly well north, however, and it has apparently been able to maintain itself out of doors at points in Georgia and possibly in South Carolina; but in greenhouses its range is practically unlimited, infesting principally dwarf citrus plants. The opportunity, therefore, for its carriage to California is ample, and it may have gained entrance with greenhouse stock from some northern source rather than from Florida or the South.

Marysville is situated a few miles north of Sacramento, and at first the infestation seemed limited to this town, but toward the end of the summer the white fly was discovered well established at Oroville, in Butte County, some twenty-six miles to the north of Marysville. The Marysville infestation was confined to the town, and to yard trees or small garden orchards. Oroville lies in a considerable orange district, and the white fly had been carried from the town into several of the adjacent

orchards and had become rather widely scattered. Shortly after the discovery of the white fly at Marysville it was found also to have established itself locally near Bakersfield, in the southern end of the San Joaquin Valley, and separated only by a mountain range from the main citrus districts of southern California.

The work of the State Board of Horticulture looking to the extermination of the white fly at these three points of infestation has been thoroughgoing and energetic, and if extermination be humanly possible, it will probably be effected, at least at Marysville and Bakersfield. The wider and orchard infestation at Oroville makes the problem here a more difficult one. The principal measure adopted at Marysville has been to cut the trees back to the trunk and strip the latter absolutely of foliage. A careful search was later made of the new foliage, and wherever the white fly reappeared, a second thorough stripping of leaves was made. The white fly is limited to the leaves of the plant, and this stripping, theoretically, should result in extermination. At Bakersfield and Oroville fumigation is being chiefly relied upon, and in all of the places the destruction of many possible host plants other than citrus has been carried out, such as the Chinaberry tree, cape Jasmine, Japanese persimmon, California privet, golden privet, mock orange, Osage orange, and lilac.

The belief hitherto held by the writer that the white fly could not maintain itself in the comparatively arid climate of California seems to be negatived, in a measure, by this recent experience. Nevertheless, the situation at Marysville is rather exceptional. The city is surrounded on three sides by the Yuba and Feather rivers and these have been so filled up as a result of mining operations that the city, to protect itself from overflow, is surrounded by high levees, and actually lies several feet below the river level, and has in this way much moister conditions than is normal for this section of the State. Moreover, both Marysville and Oroville enjoy a much heavier rainfall than occurs in the principal orange districts of southern California. The infestation at Bakersfield is in a very arid region, but occurs on the highly cultivated estate of Mr. Trevis where, by copious irrigation, a tropical garden is maintained, and the normal arid conditions are very considerably modified. Nevertheless, there is ample ground to fear an invasion or spread of the white fly into the citrus regions of southern California, and the effort to exterminate the pest at the outset of its invasion of the State is thoroughly warranted. That it probably will not be the same pest in California that

it is in Florida, however, is shown by the fact that during the dry season in Florida it receives a very notable check, and even the most protracted Florida drought is characterized by conditions of much greater moisture than the normal summer climate of southern California.

The fumigation project for southern California, under the field direction of Mr. R. S. Woglum, has been undertaken by the Bureau of Entomology in response to urgent demands from horticultural commissioners of the principal citrus-fruit producing counties of California and of many prominent growers. From a million and a half to two million dollars are spent every year in southern California in fumigating citrus trees, and while the process has been in successful operation for twenty years, it has never been scientifically investigated, and imperfect results or direct injuries to trees are sometimes experienced, the reasons for which are not fully understood. The purpose of the investigation of the Bureau is to standardize the process; in other words, to put it on an exact basis, and increase its efficiency and limit its cost. The scope of the work will cover (1) an investigation of the subject of dosage, or the amount of gas necessary for the destruction of different scale insects; (2) the physiological effect on trees and fruit; (3) the mechanical equipment, tents, and the methods of handling them, and (4) life history and other studies of the different insects involved.

In recent fumigation a possible physiological effect on the trees and fruit has been noted; in other words, the gas has seemed to show a distinct stimulating effect on the tree, resulting in more abundant setting of fruit the year following treatment. This result does not seem to have come from a checking of the vitality of the tree which is shown in the case noted; on the contrary, a greater vigor in general appearance as well as in the increased yield of fruit, and if true, this stimulating effect will have a very important bearing on the whole subject of fumigation.

The white-fly work in Florida, under the direction of Dr. A. W. Morrill, was found to be in a most satisfactory state of progress. The life history of the species has been worked out in the greatest detail by Doctor Morrill and Mr. E. A. Back, and means of control are under elaborate investigation. These are notably such natural means of control as the fungous diseases and parasites, and the artificial control by fumigation and insecticides.

Fumigation seems to be the most promising means of artificial control. The conditions for fumigation for this pest in

Florida are quite different from those obtaining in California for the common scale insects of citrus trees in that State. In Florida the white fly occurs in the winged state substantially during ten months of the year. There are no winged insects from the latter part of December till toward the end of February. Fumigation is only practicable during this brief period, because otherwise the flying insects would many of them escape and quickly reinfest the trees. Thoroughgoing experiments are under way this winter in fumigation as a continuation of those begun the season previous, and the process has been very fully worked out for the Florida conditions and the particular problem of the white fly.

No parasites of the white fly have been discovered, nor has it been possible up to the present time to introduce from other regions parasites of other species of white fly. Efforts to accomplish such introductions are, however, in progress.

The most important natural means of control of this pest are the fungous diseases which attack it, viz., the red, yellow, and brown fungi. A fourth fungus, known as the white fringe fungus (*Microcera* sp.) has recently been described by Prof. P. H. Rolfs. These fungi, notably the red, brown, and white fringe species, originated in the Manatee region, and have spread from this region now pretty well over the State, following the spread years ago from the same region of the white fly. In Manatee County, where the fungi are fully established, they are able practically to exterminate the white fly once in three years, so that every third year the fruit is clean and requires no washing. The following year the insect again flourishes because the white fly fungi have disappeared, having during the clean year nothing on which to develop. Toward the end of this year, however, the fungi again begin to operate, but not sufficiently to prevent the complete blackening of the foliage and fruit during the following or third year. Nevertheless, during this year the fly is again reduced to practical extinction, so that the year following is a year of clean foliage and fruit. Means of disseminating these fungi artificially have been extensively experimented with, and it seems possible that their beneficial action can be considerably increased by artificial means. Doctor Morrill has found that some of these beneficial fungi are themselves attacked and destroyed by secondary fungi, but it is not plain that these secondary fungi materially affect the efficiency of the primaries, as the former are more apt to develop after the primary fungus has pretty well exterminated the white fly for the time being. Still, they may at certain times have an important influence on the effect-

iveness of the beneficial fungi. The common means of distributing the fungous enemies of the white fly is by forming water decoctions from masses of leaves covered with the fungi, or by pinning infested leaves at different points on the trees to be inoculated.

In connection with this paper Mr. Marlatt exhibited photographs illustrating the white fly conditions and methods of extermination at Marysville, Cal., some views of San Francisco, and some showing the oil wells of Santa Barbara, where the insecticide oils are secured, and one of Salton Sea, where the fishes come to the railway bridges to feed. In connection with his remarks on the white fly of Florida he exhibited specimens of the beneficial fungi and also those fungi that are parasitic on the former.

In the discussion that followed, Doctor Howard remarked that the stimulation of the citrus trees by the fumigation with hydrocyanic acid gas might be caused because the plant was injured and was trying to reproduce itself before its powers failed. Mr. Burgess thought that the seemingly stimulated plants might seem to be stimulated because the fumigation had retarded their normal development. He stated that this was his experience with other trees.

Mr. Schwarz called attention to the fact that southern California, strictly speaking, was that part south of the San Bernardino Mountains, and should be so noted by entomologists, because it has a fauna peculiar to itself. Doctor Hopkins remarked that while the dry conditions in California are unfavorable for the white fly, it is not improbable that through natural selections of surviving individuals of such conditions the species may survive and become a dangerous pest. If it should survive it is evident that the conditions would be unfavorable for its control by the fungous disease. He said that entomologists should learn how fungous diseases are perpetuated and disseminated in nature, with a view of utilizing the facts obtained in controlling injurious insects. As an example, he cited the larch sawfly fungus of Europe and America, which seems to destroy immense numbers of this

insect in certain years and partially controls it, so that it is only periodically destructive.

Doctor Howard stated that it was remarkable that no hymenopterous parasite had yet been found to infest *Aleyrodes citri,* for parasites are common on the other species of Aleyrodes. He said that California was a heaven for such parasites, and he predicted that, if the white fly obtained a foothold there, some species would become parasitic upon it.

—Mr. Heidemann presented the following paper:

NOTES ON HEIDEMANNIA CIXIIFORMIS UHLER AND OTHER SPECIES OF ISOMETOPINÆ.

[HEMIPTERA—HETEROPTERA.]

By Otto Heidemann.

Years ago Prof. P. R. Uhler published a description of *Heidemannia cixiiformis,*[a] a new genus and species of the family Capsidæ. The description was taken from three specimens collected by Mr. E. A. Schwarz and myself near Washington, D. C., 1890; at Oakland, Md., and near Fort Pendleton, Md. This remarkable insect is very peculiar in form, and its whole habitus is somewhat distinct from that of a capsid. Professor Uhler remarks in his description that other specimens are needed for dissection to work out the elements and affinities of this antique pattern of the Capsidæ. No other specimens had been found, in spite of close searching during the summer seasons, until 1902, when Mr. N. Banks met with a single specimen that was perhaps resting on the bark of a maple tree at Falls Church, Va. But this summer, July 4, the much-wanted insect was again captured by Messrs. Schwarz and Barber at the famous collecting ground of Plummers Island, Maryland. A few days later I was so fortunate as to find the nymph form on the same tree from which the adults were taken. Recently I received the same species as an unnamed Capsus from Mrs. A. T. Slosson. She caught a single specimen near Delaware Water Gap, Pa.

The insect lives apparently in damp and shady places on the twigs of dead trees. It has the jumping habit, and Mr. Schwarz observed that it leaps for quite a remarkable distance.

[a] Observations on Some Remarkable Forms of Capsidæ. By P. R. Uhler. Proc. Ent. Soc. Washington, Vol. II, no. 1, p. 119 (1891).

The species is by no means commonly found, as in all these years only eight specimens are recorded.

A close examination of the specimens from this fresh material with a high-power microscope disclosed the presence of two distinct ocelli, which are placed very near together on the narrow vertex of the head. (In the engraving of the insect that accompanies Professor Uhler's paper the ocelli have been overlooked.) The possession of ocelli, besides the remarkably shaped and depressed head, makes it now evident that the species *Heidemannia cixiiformis* Uhler has to be placed in the subfamily Isometopinæ, probably near the genus Myiomma.

In the year 1860 Dr. F. Xaver Fieber founded the genus Isometopus,[a] based on two species, *Acanthia intrusa* Herrich-Schäffer[b] and *Isometopus alienus* Fieber. He raised the genus to the rank of a family next to the Capsidæ. Later on, in 1875, Prof. O. M. Reuter[c] treated it as a subfamily of the Capsidæ, which view is generally adopted now. The principal character of the Isometopinæ is the presence of two ocelli and the peculiar form of the head. In the Old World three species have been known and two genera, Isometopus Fieber and Myiomma Puton.[d] Recently Dr. W. L. Distant, in his Fauna of British India,[e] described three new species and two new genera, *Isometopus feanus, Turnebus cuneatus,* and *Sophianus alces.*

The occurrence of Isometopinæ in the New World has not been recorded before. The U. S. National Museum possesses a few examples, collected by Messrs. Schwarz and Barber at San Diego, Tex., Williams, Ariz., and Las Vegas Hot Springs, N. Mex. Others were taken in the East by Mr. N. Banks at Long Island, N. Y., Falls Church, Va., and by myself at Aurora, W. Va. The material now on hand comprises three new species, besides Uhler's *Heidemannia cixiiformis* and an undescribed nymph of the same. I think it advisable to place these new species in the old genus Isometopus, because our knowledge of the group from this continent is very limited on account of the small number of specimens secured up to the present time. Nevertheless, the description of these species now may induce other collectors of Hemiptera to hunt for these

[a] Fieber. — Exegesen. Wiener Ent. Monatschrift, IV, pp. 258–259 (1860); Europ. Hem. Wien, pp. 26, 237 (1861).

[b] Herrich-Schäffer.—Wanz. Ins., VI, p. 48, fig. 608 (1839).

[c] Reuter.—Bih. Vet. Ak. Handl., III, 1, p. 61 (1875).

[d] Puton.—Hemiptères. Ann. Soc. Ent. France, Vol. III, ser. 5, pp. 20–21 (1873).

[e] Distant.—Fauna Brit. Ind., Vol. II, pp. 483–486 (1904).

frail but interesting insects, and probably more new forms will be found.

Heidemannia cixiiformis, Uhler.

Description of the nymph.—General outline of a capsid larva. Head shaped as in the adult, deeply set into the thorax. Pronotum short but very broad; mesonotum large, a longitudinal sharply cut line in the middle. Wing pads broadly rounded at apex, reaching to the fourth abdominal segment; the third segment carries a small blackish tubercle. The whole body is covered but sparingly with short golden pubescence. Color yellowish brown, spotted with darker brown in irregular patterns. First antennal joint very short, yellowish, the second joint banded with brown towards the apex, third joint blackish. Some dark dots on each side of the abdominal segments dorsally. Legs black, with a yellowish band at base of tibiæ and before the apex; tarsal joints brownish. Sides of pronotum vividly yellowish marked. Ocelli very near together at the narrow vertex. Length, 2 mm.; width, 1.2 mm.

One specimen, Plummers Island, Maryland, July 6, 1907 (Heidemann).

Isometopus pulchellus, n. sp. (fig. 7, *a*).

Head, seen from above, very short, depressed and rounded in front; at the occiput two ocelli plainly visible, placed nearer to the eyes than to each other. Antennæ inserted on the underside of head, distant from the eyes, near the prominent, brownish tylus, as long as the distance from head to tip of scutellum; first joint very short; second joint longest, thickened towards the apical part; last two joints, taken together, only half the size of the preceding one and much thinner. Eyes reniform, somewhat flattened in front, very large, almost covering sides of head. Pronotum a little more than twice as broad as long, the sides quite broadly reflexed and rounded anteriorly; a transverse, narrow ridge before the anterior margin, not reaching the sides; the surface roughly, deeply punctured in irregular rows. Scutellum rather short, as broad as long, somewhat elevated above the elytra, a little excavated at base, the sides very steep. Elytra quite broad; costal margins evenly rounded, reflexed, and in their whole length somewhat grooved. Membrane with two cells, whitish, iridescent. Rostrum strong, long, reaching the abdomen. The whole body is covered with close, short hairs, those on the elytra very fine, appressed to the surface. Head, pronotum, scutellum, basal part of clavus, first antennal joint, and the two terminal ones, dorsal part of abdomen, base of venter, and all the sternal pieces glossy, dark-brown in color; there are also two brown spots on the tip of clavus and two other depressed spots on inner side of corium above cuneus. All other parts of body, elytra,

legs, coxæ, second joint of antennæ, last three segments of abdomen, and edge of same, also the rostrum except at tip, yellowish white. Length, 2.2 mm.; width, 1 mm.

Four female specimens. Falls Church, Va., July 15 and August 2, 1907 (Banks); Sea Cliff, N. Y. (Banks); Aurora W. Va., August 8, 1907 (Heidemann).

Type.—No. 11368, U. S. National Museum.

This species is easily recognizable by the contrasting colors of dark brown and yellowish white. In general appearance it looks much like *Isometopus intrusus* as figured by Herrich-Schäffer and Puton, with the difference, that in our species the scutellum is much shorter.

Isometopus signatus, n. sp. (fig. 7, *b*).

In form and color similar to the preceding species. Head a little broader, almost reaching the anterior angles of pronotum. Abdomen slightly longer, somewhat pointed towards apex, shining, brown and densely hairy. Rostrum brownish, darker at tip, reaching to the third abdominal segment. Antennæ yellowish brown; the second joint less thickened towards apex. Head and eyes dark brown; occiput and underside of head throughout and the tibiæ basally yellowish. Legs, coxæ, and tarsal joints yellowish white, the femora banded with dark brown. Sternum blackish; metasternum at the sides with the orifices yellowish, showing two narrow, longitudinal black stripes. Pronotal sides more rectangular, behind the callosities two small round tubercles; near the humeri and at anterior angles are two yellowish patches above and beneath. Pronotum and scutellum roughly punctured and glossy dark brown. Elytra yellowish white, ornamented with a brownish, broad zig-zag design, including the tip of clavus and the lower part of cuneus. Membrane whitish, translucent. The whole surface of the body beset with fine pale hairs. Length, 2.4 mm., width, 1 mm.

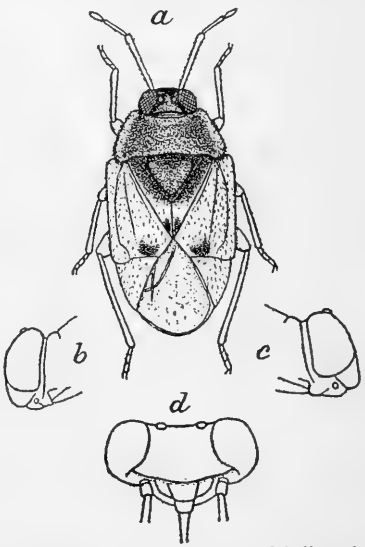


FIG. 7.—*a, Isometopus pulchellus; b, I. signatus,* side view of head; *c, I. unicolor,* side view of head; *d,* same, front view of head. Greatly enlarged.

Three female specimens. San Diego, Tex., April 29, May 25, and June 5 (Schwarz).

Type.—No. 11369, U. S. National Museum.

This species resembles *I. pulchellus,* but it is a trifle larger in body and has a different color pattern.

Isometopus unicolor, n. sp. (fig. 7, *c. d*).

Body more compact, broader, and somewhat larger than in the other two species. Head with the eyes not reaching the anteriorly rounded sides of pronotum; basal part and underside of head and the outer margins of the eyes narrowly yellowish white. Ocelli quite prominent. Antennæ blackish, with the apex of the joints whitish; the second joint a little swollen at tip. Elytra broad and strongly rounded at sides; the costal margins rather broadly expanded; cuneus slightly incised at the outer margins basally. Rostrum dark brown, touching the third abdominal segment. Underside of body brownish; venter and the last two segments partly yellowish. Legs dark brown; lower part of coxæ, apex of femora and tibiæ, and the tarsal joints yellowish white. Head, pronotum, and scutellum irregularly wrinkled and coarsely punctured, less so on the elytra; color uniformly dark brown and shining. The membrane smoky, at base darker, and near cuneus with a narrow, whitish stripe. Body very hairy. The males are not yet known. Length, 2.6 mm.; width, 1.2 mm.

Eleven female specimens. Williams, Ariz., July 9–27 (Barber and Schwarz).

Type.—No. 11370, U. S. National Museum.

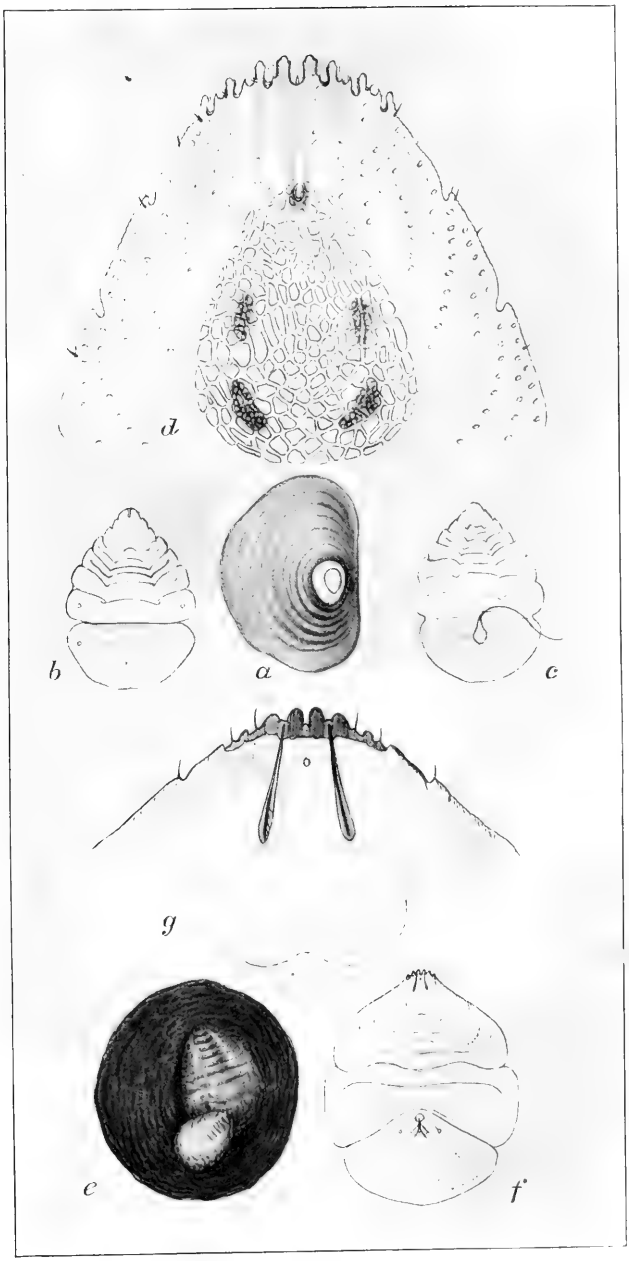
This species can be distinguished from the other two species by the somewhat larger size and the uniform dark-brown color.

Mr. Heidemann exhibited specimens of both adult and pupal forms of *Heidemannia cixiiformis,* and adults of the new species described in his paper.

Mr. Schwarz mentioned the jumping habit of Heidemannia. He said that adults could jump over 2 feet—farther than any of the other Hemiptera-Heteroptera except the Saldidæ.

—Mr. Webb exhibited specimens of the hemipteron *Pachylis gigas* Burm. which he found feeding on pods of mesquite in the foothills of the Santa Catalina Mountains, southern Arizona. These insects are interesting because of the greatly enlarged femora of the males. They do not seem to cause any serious damage to the plant.

—Doctor Hopkins presented a preliminary note and ex-



THE GENUS PSEUDAONIDIA.

hibited a number of specimens of several orders which he obtained from insect drift at Virginia Beach, Va., between 9:30 and 10 a. m., on November 11, 1907. Mr. Schwarz said that drift at such a late season was remarkable, and showed a late flight of all orders, the insects probably seeking winter quarters.

Doctor Hopkins stated that the region is remarkable as an intermediate region where the different faunal zones overlap. He found that most of the mature pines (*Pinus tæda*) nearest the ocean from Ocean View to beyond Virginia Beach were being killed by *Dendroctonus frontalis*. This condition is reported to prevail to Cape Hatteras and beyond. He thought that the reason for this killing of a strip of the timber nearest the ocean was that the swarms of the beetles in their eastward migrations could go no farther than the ocean and so settled on the surrounding timber.

Doctor Howard stated that although Mr. F. C. Pratt had found the yellow fever mosquito (*Stegomyia calopus* Meig.) common at Virginia Beach in 1902, Doctor Hopkins had not obtained a single specimen of it. This indicated that Stegomyia was not a regular inhabitant of the locality, but would, as at St. Louis, live there during favorable seasons.

—The following papers were presented for publication:

THE GENUS PSEUDAONIDIA

By C. L. Marlatt.

(Plate VII.)

In Technical Series No. 6, U. S. Department of Agriculture, p. 14, Prof. T. D. A. Cockerell designated Pseudaonidia as a subgenus of Aspidiotus, with the type species *A. duplex*, to include also *A. theæ* Maskell and *A. trilobitiformis* Green. The "latticework patch" is the character given, and the fact that this patch is shared by the genus Ischnaspis in an entirely different group is also alluded to. Other species have since been assigned to this group, and it is raised to the full generic rank in Mrs. Fernald's Catalogue of the Coccidæ of the World, the total number of species there assigned to it being 8, including 2 varieties.

The writer has recently made a careful study of the species

and varieties assigned to this genus, and of related species, and finds it necessary, as a result of these studies, to broaden and give a different basis to the characterization of the genus. The so-called lattice, or more properly tessellated patch, is a character of minor importance, and appears in some degree in almost all species which have a tendency to develop a strongly chitinized dorsal surface of the pygidium. A much better character found in all the species which have been assigned to this genus is the deep, sharply defined constriction dividing the body into two subequal sections; and if all the species already assigned to this genus and others having this character are brought together, an assemblage which seems to be justified is formed.

This character will include in this genus three or four species which have hitherto in literature, or by the writer at least, been assigned to the genus Targionia, and also *articulatus* Morgan, with variety *celastri,* the species hitherto referred to the monotypical genus Selenaspidus. Two new species have been added, viz., *lounsburyi,* closely allied to *articulatus,* but lacking the pygidial spur, and *greeni,* related to *trilobitiformis.*

With the exception of *articulatus* and allies, all of the species now assigned to Pseudaonidia show more or less of a dorsal

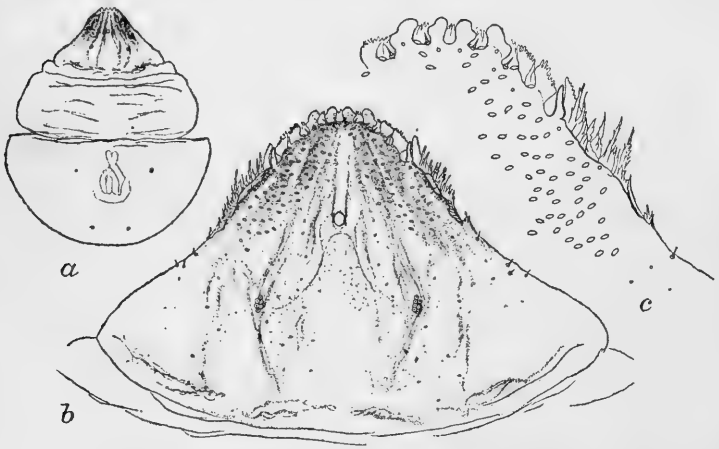


FIG. 8.—*Pseudaonidia articulatus: a,* Adult female, greatly enlarged; *b,* anal segment of same, more enlarged; *c,* tip of anal segment of same, still more enlarged. (Drawings made in the Bureau of Entomology and published by permission of the Secretary of Agriculture.)

chitinization of the pygidium, and in the case of most of them this chitinization takes the form of the so-called lattice patch. In *curculiginis* Green, which is in general closely related to

the type species, there is merely a strong uniform chitinization of the dorsum without any indication, in the specimens examined, of this chitinization being broken up into tessellated figures; and in my new species *greeni* the chitinized area is distinctly defined, but not especially tessellated. In the case of two of the species transferred from the genus Targionia, *moorei* Green and *eucalypti* Maskell, the chitinization is present and a distinct indication of breaking up into a figured arrangement is exhibited. The species *casuarinæ* Maskell, which is brought over with the other Targionias mentioned on the strength of Maskell's description and figure only, has not been seen by the writer, and its present assignment is therefore open to some question. Maskell says of it that it resembles *eucalypti* in the thoracic constriction, and his figure and description would indicate that it is allied to this species. In general this group of species is closely allied to those assigned by the writer to Targionia.

The genus Pseudaonidia may be divided into three natural groups of species. The first includes *articulatus* and variety *celastri,* and *lounsburyi,* n. sp. The cephalothoracic constriction is so marked a character as to justify the placing of these species in the genus Pseudaonidia. The most obvious character separating these from the following two groups of species is the short, stout lateral spur on the posterior margin of the cephalothorax. The curious pygidial spur of *articulatus* is homologous with the third lobe of *lounsburyi.*

The second group is represented by *duplex* Ckll. (=*theæ* Maskell) and is characterized by very prominent, strongly chitinized median lobes, by slender, hyaline lateral lobes with narrow branched plates filling the intervals between the lobes, and by lacking paraphyses or chitinous thickenings. The other species are *darutyi, trilobitiformis, curculiginis, pæoniæ,* and *greeni,* n. sp., and all are very closely allied, and particularly the first two, to *duplex,* and may perhaps be more properly considered as representing geographical varieties of the latter.

The third group, of which *eucalypti* Maskell may be taken as the typical species, has all of the lobes of the same general character, the laterals merely decreasing in size (as in the case of *pæoniæ* and *greeni* in the second group) but with plates wanting or very minute and inconspicuous. This division includes (in addition to *eucalypti*) *casuarinæ, claviger, tesserata,* and *moorei,* a series of species which connects the genus Pseudaonidia with Targionia.

Three species typical of the three groups are figured, viz., *articulatus* (text fig. 8), and *trilobitiformis* and *moorei* (Pl.

VII); the two latter copied from Green's Monograph of the Coccidæ of Ceylon.

TABLE OF SPECIES.

With a short, stout lateral spine, sometimes annulated, a little anterior to cephalothoracic suture (cephalothoracic section usually largest).

With prominent chitinized spur laterad of second lobe on edge of pygidium.

Paragenitals in two compact groups of 6 to 7 pores each; adult female not exceeding 1.5 mm. long....1. *articulatus* Morgan.

Paragenitals in four scattering groups of 6 to 9 pores each; adult female 1.5 to 2 mm. long,

2. *articulatus,* var. *celastri* Maskell.

Without such spur, but a third normal lobe in its place; no paragenitals.....3. *lounsburyi,* n. sp.

Without such spine, abdominal section of adult female usually the larger.

Plates well developed in intervals between the lobes and equaling or exceeding the lobes in length.

Median lobes large, strongly chitinized; second, third, and sometimes fourth lateral lobes slender and elongate, hyaline; paraphyses wanting or very short and inconspicuous; paragenitals present.

Dorsal pores large, numerous, in rows radiating from tip and sides of pygidium; lattice patch distinctly developed.

Median lobes projecting distinctly beyond laterals; lateral lobes very slender, less than one-fourth the width of median lobes; paragenitals 20 to 50 pores in each group; stigmatic pores 13 to 25,

4. *duplex* Ckll.

Median lobes not projecting and usually distinctly lower than laterals; lateral lobes about one-half width of median.

Adult female oval, not twice as long as wide; paragenitals, anterior laterals 23 to 25, posterior laterals 10 to 11; stigmatic pores 15 to 17,

5. *darutyi* de Ch.

Adult female elongate, twice as long as wide, tapering from thoracic constriction uniformly to tip; paragenitals in four groups ranging from 20 to 28 pores each; stigmatic pores 17 to 18,

6. *trilobitiformis* Green.

Dorsal pores very few and minute; lattice patch replaced by a general chitinous thickening of dorsum of pygidium;

lateral groups of paragenital pores merging more or less, with 35 to 40 pores on either side. .7.*curculiginis* Green.

Median and lateral lobes of the same general character, laterals merely decreasing in size; plates resembling *trilobitiformis* and *duplex*.

Adult female oval, not twice as long as wide; paragenitals numerous, arranged in a continuous mass of 50 to 75 pores on either side; patch distinctly tessellated; paraphyses variable, *i. e.*, present or absent....8. *pæoniæ* Ckll.

Adult female twice as long as wide; paragenitals wanting; patch present but not distinctly tessellated; paraphyses minute.....9. *greeni*, n. sp.

Plates wanting; lobes all of the same general character, laterals merely decreasing in size.

Paraphyses wanting; no paragenitals.

Constriction sharply marked, dorsal pores minute and limited to pygidium.

Median lobes separated; second and third lobes mere teeth.....10. *eucalypti* Maskell.

Median lobes contiguous along inner border, oblique exteriorly, giving the appearance of one lobe, 11. *junctiloba* Green (MS?).

Constriction not sharply defined, rounded; dorsal pores large and numerous and occurring on all the abdominal segments; stigmatic glands 6.....12. *casuarinæ* Maskell.

Paraphyses strongly developed.

Paraphyses ending in a distinct semidetached knob.

Paragenital glands present, anteriors and anterior laterals forming a continuous semicircle, 13. *claviger* Ckll.

Paragenital glands absent.....14. *tesserata* de Ch.

Paraphyses very long, heavy, club-shaped; no paragenitals; first and second pair of lobes subequal, third a mere tooth, 15. *moorei* Green.

ANNOTATED LIST OF SPECIES.

Genus PSEUDAONIDIA Cockerell.

Pseudaonidia Ckll. (subg.), Tech. Ser. 6, U. S. Dept. Agr., Div. Ent., p. 14 (1897); (gen.) The Entom., XXXIV, p. 226 (1901). (Type, *Aspidiotus duplex* Ckll.)

1. PSEUDAONIDIA ARTICULATUS (Morg.).

Aspidiotus articulatus Morg., Ent. Mo. Mag., XXV, p. 352 (1889).
Aspidiotus (*Selenaspidus*) *articulatus* Ckll., Tech. Ser. 6, U. S. Dept. Agr., Div. Ent., pp. 14–23 (1897).

Aspidiotus articulatus var. *simplex* (de Ch.), Pr. Soc. Amic. Scien., p. 20 (1889).

Habitat.—Africa, E. and W.; Brazil; Barbados, West Indies; Demerara; England (in greenhouses); Florida; Mexico; Nicaragua; Panama.

On *Artocarpus* sp.; *Celastrus laurinus*; Chrysophyllum; Citrus; cocoanut; coffee; *Cordyline terminalis*; *Dictyospermum album*; Ficus; Gardenia; guava; laurel; mango; "muniste;" oleander; olive; palm; "palo tincto" (logwood); Pandanus; pawpaw; rose; tamarind; *Vitis vinifera.*

This species is a very common and almost characteristic one of the West Indies, occurring also on the adjacent mainland. It is known from East and West Africa, and has in South Africa related species or varieties which would indicate, as early pointed out by Professor Cockerell, that Africa is its place of origin. De Charmoy's variety *simplex,* from Mauritius, is apparently a description of immature specimens, and hence the absence of paragenitals.

2. PSEUDAONIDIA ARTICULATUS var. CELASTRI Mask.

Aspidiotus articulatus var. *celastri* Mask., Trans. N. Z. Inst., XXIX, p. 297 (1897).

Habitat.—S. Africa.

On *Celastrus laurinus* and an undetermined plant.

Maskell's variety *celastri* is a large-sized *articulatus* with a greater development of plates and dorsal pores, as indicated from study of material corresponding closely with Maskell's description received from Lounsbury (1897), from Mitchell's Pass, South Africa. Maskell's material came from the Cape of Good Hope, and infested *Celastrus laurinus.*

3. PSEUDAONIDIA LOUNSBURYI, n. sp.

Habitat.—S. Africa (Ourling), C. P. Lounsbury, Coll.

On *Mesembryanthemum edule.*

This new species is evidently closely allied to *articulatus,* but the large lateral spine on the anal plate is replaced by a third normal lobe, and the paragenitals are wanting. This may be, therefore, the parent species of the group, as it diverges least from the normal Aspidiotus type.

4. PSEUDAONIDIA DUPLEX Ckll.

Aspidiotus theæ Mask., Ind. Mus. Notes, II, p. 59 (1891). Name preoccupied by *Aspidiotus theæ* Green (1890) = *Howardia biclavis* (Comst.).

Aspidiotus duplex Ckll., Psyche, VII, Suppl. 1, p. 20 (1896).

Aspidiotus (*Pseudaonidia*) *duplex* Ckll., Tech. Ser. 6, U. S. Dept. Agr., Div. Ent., pp. 14, 20 (1897).

Aspidiotus theæ (Mask.) var. *rhododendri* Green, Jn. Bomb. N. H. Soc., XIII, p. 67 (1900).

Pseudaonidia rhododendri thearum Ckll., Fernald, Cat. Coccidæ of the World, p. 283 (1903). New name for *Aspidiotus theæ* Mask.

Habitat.—California, on imported plants; Hawaiian Islands; India; Japan.

On *Camellia japonica*; camphor tree; *Eurya ochracea*; "kioku;" *Myrica rubra*; *Olea fragrans*; orange; *Rhus succedanea*; rhododendron; tea; "umame."

This, the type species of the genus, was originally described by Maskell in 1891 as *Aspidiotus theæ,* a name previously used by Green (1890) in redescribing the supposedly new *Howardia biclavis,* and therefore falls as a homonym. Cockerell's name *duplex* (1896) holds for the species, and the subsequent names *Aspidiotus theæ* var. *rhododendri* Green (1900), elevated to species *rhododendri* (Green) (Fernald Catalogue, 1903) and *Pseudaonidia rhododendri* (Green) var. *thearum* Cockerell, 1903, fall to *duplex.*

5. PSEUDAONIDIA DARUTYI (de Charm).

Aspidiotus darutyi de Charm., Bul. Soc. Ent. Fr., 1898, p. 278.

Habitat.—Brazil; Mauritius; Liberia; Seychelles.

On *Mangifera indica*; *Murraya exotica*; *Euphorbia longana.*

Scarcely more than a variety of *duplex.*

6. PSEUDAONIDIA TRILOBITIFORMIS (Green).

Aspidiotus trilobitiformis Green, Ind. Mus. Notes, IV, p. 4 (1896).

Aspidiotus (*Pseudaonidia*) *trilobitiformis* Ckll., Tech. Ser. 6, U. S. Dept. Agr., Div. Ent., p. 28 (1897).

Habitat.—British Columbia; Ceylon; East Indies; Japan; Java.

On *Dalbergia championi*; *Ficus scandens*; Myrtaceæ; *Nothopegia colebrookiana*; grape-fruit; orange peel; "umame;" mandarin.

Scarcely more than a variety of *duplex.*

7. PSEUDAONIDIA CURCULIGINIS Green.

Aspidiotus (*Pseudaonidia*) *curculiginis* Green, Ent. Mo. Mag., XL, p. 208 (1904).

Habitat.—Java.

On *Curculigo recurvata.*

8. PSEUDAONIDIA PÆONIÆ (Ckll.).

Aspidiotus duplex var. *pæoniæ* Ckll., Can. Ent., XXXI, p. 105 (1899).
Pseudaonidia pæoniæ Ckll., Fernald, Cat. Coccidæ of the World, p. 283 (1903).

Habitat.—Japan. (California, District of Columbia, Louisiana, and New York, on imported plants.)

On Azalea; *Camellia japonica*; *Ilex latifolia*; pæony from Japan; *Rhododendron* spp.; tea.

This species, as also *duplex,* has been rather widely distributed on ornamental plants from Japan, especially Azalea and Camellia.

9. PSEUDAONIDIA GREENI, n. sp.

Habitat.—Java.

On Mango; mangosteen.

As noted in the description, this species resembles *trilobitiformis* in general appearance, but differs in the character of the lobes and in the absence of the paragenitals and the very slight development of the tessellated patch.

10. PSEUDAONIDIA EUCALYPTI (Mask.).

Aspidiotus eucalypti (Mask.), Tr. Roy. Soc. S. Austr., p. 102 (1887–88).
Aspidiotus eucalypti var. *comatus* Mask., Trans. N. Z. Inst., XXVIII, p. 385 (1896).
Targionia eucalypti (Leon.) Gen. e Spec. Diaspiti, Asp., p. 193 (1900).

Habitat.—Australia, New South Wales.

On Casuarina; *Eucalyptus* sp.

This species was referred by Leonardi (1900) to Targionia, but properly belongs to Pseudaonidia. The variety *comatus* Maskell has no valid status, as determined by careful comparison of authentic material.

11. PSEUDAONIDIA JUNCTILOBA Green (MS?).

The material representing this species was received with a considerable collection of scale insects which came without letter four or five years ago, and afterwards determined as from Mr. Charles French, Department of Agriculture, Melbourne, Australia. One of the packages was labeled "*Aspidiotus junctiloba* Green on *Acacia,* Shepparton, Victoria." It represents a good species of Pseudaonidia, but no record of the publication of this species by Green is known to the writer.

12. PSEUDAONIDIA CASUARINÆ (Mask.).

Aspidiotus casuarinæ Mask., Trans. N. Z. Inst., XXVI, p. 66 (1893).
Targionia casuarinæ Leon., Riv. Pat. Veg., VIII, p. 314 (1900).

Habitat.—Australia.
On *Casuarina equisetifolia.*

Examples of this species have not been studied. It was very imperfectly described by Maskell. The constriction is indicated as similar to that of *eucalypti,* but in the drawing it is shown as not very sharply defined. It was referred to the genus Targionia by Leonardi, but seems rather to belong to Pseudaonidia.

13. PSEUDAONIDIA CLAVIGERA Ckll.

Pseudaonidia clavigera Ckll., The Entom., XXXIV, p. 226 (1901).

Habitat.—Natal.
On *Camellia* sp.

14. PSEUDAONIDIA TESSERATA (de Charm).

Aspidiotus (*Diaspidiotus*) *tesseratus* de Charm., Pr. Soc. Amic. Scien., p. 23 (1899).

Pseudaonidia tesseratus Ckll., Am. Nat., XXXIII, p. 900 (1899).

Habitat.—Antigua, B. W. Indies; Java; Mauritius; Mexico.
On *Malvaviscus* sp.; *Prunus* sp.; *Vitis vinifera.*

15. PSEUDAONIDIA MOOREI (Green).

Aspidiotus moorei Green, Ent. Mo. Mag., XXXII, p. 199 (1896).

Targionia moorei Leon., Gen. e Spec. Diaspiti, Asp., p. 195 (1900).

Habitat.—India.
On *Grislea tomentosa.*

NEW SPECIES OF PSEUDAONIDIA.

PSEUDAONIDIA (SELENASPIDUS) LOUNSBURYI, n. sp.

Female scale.—Scale of adult female flat, subcircular, 2–2.5 mm. in longest diameter; yellowish white but dense and opaque; exuviæ resinous to brown, covered with a very slight excretion; supplement usually three times diameter of second exuvium; thin but distinct ventral scale present which adheres to the leaf.

Male scale.—Similar, oval, 1.5 mm. long; exuvium near anterior end, brown.

Adult female.—Form oval, nearly 1.5 mm. long; strongly chitinized and brown in the case of old spent specimens; body divided into two subequal parts by a deep cephalothoracic suture; segments of abdomen indicated by distinct sutures but not marked by lateral incisions except in case of anal plate; a short, stout lateral spine, distinctly annulated in the more hardened specimens, a little anterior to cephalothoracic suture.

Anal plate.—Similar in general characteristics to *articulatus* but exhibiting important differences; lobes in three pairs, not very large, oval

in shape, and often distinctly striate; the two median subequal, the third smaller; lateral teeth wanting or represented by the broad plates laterad of the third lobe; incisions shallow, scarcely falling below the edge of the segment; paraphyses indistinct or wanting; interlobular plates narrow, two-forked at tip—two median, two in first lateral and three in second lateral incision; two obliquely truncated broad plates laterad of third lobe, with rudimentary third plate; spines minute and inconspicuous; anal opening narrow, oval, a little more than one-third from tip; vaginal opening very broad, more than one-third width of segment; dorsal pores numerous in radiating rows from tip, but smaller and less abundant than in *celastri;* basal thickenings a narrow line in four sections; ventral thickening not marked.

Type. — Bureau of Entomology No. 7693. Food plant *Mesembryanthemum edule.* Collected in Cape Town, South Africa, June 29, 1897, by C. P. Lounsbury.

Note.—This species, while resembling very closely *articulatus* and the South African variety of this species, *celastri,* differs in important characters, notably in the absence of the prominent lateral spine on the pygidium, in having three pairs of lobes instead of two, and in the presence of fewer and smaller plates, in the absence of paragenitals, and in more equal division of the body into two sections by the cephalothoracic suture. The curious lateral spine or spur on the cephalothorax near the suture is even more prominently developed in this species than in *articulatus.* Nevertheless the resemblance of this species as a whole to *articulatus* is striking.

PSEUDAONIDIA GREENI, n. sp.

Female scale.—Scale of adult female flat, long-oval, 3 to 3.5 mm. by 2 mm. (largest specimens); color opaque yellowish brown. Ventral scale distinctly present.

Male scale.—Similar in structure to that of female but much smaller.

Adult female.—Form elongate, in the larger specimens exceeding 2 mm., tapering regularly to tip. Segmentation distinctly marked, especially behind cephalothorax.

Anal plate.—Elongate; the lattice patch a slightly chitinized area not reticulated; four pairs of similar lobes, median projecting, laterals decreasing regularly in size; lateral teeth in three areas, the third or basal area probably belonging to the penultimate segment; incisions shallow; paraphyses mere chitinous thickenings of bases of incisions; plates narrow, three-branched at tip—two in median incision, lateral incisions with respectively 2, 3, and 4 plates; spines normal, anal opening one-third length of segment from tip; paragenitals wanting; parastigmatic pores 7 to 8; dorsal pores large and conspicuous, radiating in regular rows from tip and margin; basal thickenings wanting or inconspicuous, the ventral thickenings also wanting.

Type.—Bureau of Entomology No. 14095. Collected on mangosteen at Buitenzorg, Java, by Dr. Treub, and on mango at Boro Boedor, Java, by the writer December 13, 1901.

Note.—This species resembles *P. trilobitiformis* in general appearance, but differs in the character of the lobes and in the absence of paragenitals and in the very slight development of the tessellated patch.

EXPLANATION OF PLATE VII.

a, Pseudaonidia trilobitiformis, scale of female; *b,* same, dorsal view of female; *c,* same, ventral view of female; *d,* same, anal segment of female; *e, Pseudaonidia moorei,* scale of female; *f,* same, ventral view of female; *g,* same, anal segment of female. (From Green.)

THE SALT-MARSH GRASS SCALE.

(*Chionaspis spartinæ* Comst.)

By E. R. Sasscer.

The salt-marsh grass scale is a native of this country and was originally described[a] from specimens on *Spartina stricta* (=*glabra*) collected at Woods Holl, Mass., by Mr. Trelease. Subsequently it was received at the Bureau of Entomology, United States Department of Agriculture, on this grass from Bluffton, S. C., and on an undetermined species of grass from Cataumet, Mass., and Santa Clara County, California. On November 30, 1907, it was found in abundance on *Spartina glabra* Muhl, by the writer at Will's Island in the Port Tobacco Creek, Charles County, Maryland. These seem to be the only authentic records of the occurrence of this scale and are all represented by material in the collection of Coccidæ of the Bureau of Entomology.

This scale insect is of peculiar interest owing to its maritime habits, being exposed to salty sprays and frequent submergence in brackish water. The little island spoken of above is commonly covered with water at very high tide.

The scales of both males and females are situated on the inner side of the leaves, with exuviæ uppermost, often overlapping on account of the large number present.

[a] *Chionaspis spartinæ* Comst., 2d Rep. Dep. Ent. Cornell Univ., p. 106 (1883).

DESCRIPTION OF THE SPECIES.

Scale of female.—Snow-white, elongate, narrow, resembling a Mytilaspis in shape, 2 to 3.50 mm. in length and approximately 0.75 mm. in width. Ventral scale strongly developed, adhering to the dorsal parts when removed from the host plant. Exuviæ yellow to buff, about 0.50 mm. long, the second pellicle being slightly covered with a whitish secretion.

Scale of male.—Snow-white, narrow, sides nearly parallel, unicarinate though frequently appearing tricarinate. Exuviæ yellow to buff, about 0.25 mm. long.

Egg.—About 0.25 mm. in length, elliptical; color salmon; numbering from 5 to 43 under a scale.

Female.—Median lobes small, about as broad as long, triangular, mesal margins diverging, joined anteriorly by a chitinous process, lateral margins perpendicular. Second lobes small, incised, lobules rounded, the inner the longer and larger. Third lobes inconspicuous, broad, not at all produced. Gland-spines prominent and arranged as follows, 2, 2, 2, 2, 2. The two spines on the penultimate segment short. The median spine is the smaller. On the ventral surface there are two similar rows of minute spines; in the first row there is one spine at the base of each gland-spine. Second row of dorsal pores represented by anterior group 4–5 and posterior 4–7; third row, anterior 4–5 and posterior 9–10; fourth row, anterior 4–5 and posterior 8–9. Median group of paragenital pores 15–24; anterior lateral 42–44; posterior lateral 22–28.

A PYRALID INHABITING THE FUR OF THE LIVING SLOTH.

(*Cryptoses cholœpi,* n. gen. and sp.)

By Harrison G. Dyar.

It has been recorded that moths occur hidden in the fur of sloths and fly out when the animals are killed. Aug. Kappler, in Ausland, for 1885, No. 31, page 617, speaks of this phenomenon, referring to the moths as tineids. The matter is also referred to in the Cambridge Natural History, Vol. VI, page 430, 1899, where it is stated that a species of Tinea has been found in the hair of the living sloth, *Bradypus cuculliger.*

Mr. August Busck, when recently in Panama, observed a large sloth, *Cholœpus hoffmanni,* fall from a palm tree, the leaves of which broke with its weight. When the animal fell a number of small moths were dislodged by the shock and flew

out of its fur. They presently returned to their shelter, but Mr. Busck was able to secure several specimens. They were supposed to be tineids, but on examination proved to be pyralids, and Mr. Busck kindly turned them over to me.

The species, for which I propose the name *Cryptoses cholœpi,* new genus and species, does not fit well into any of the existing subfamilies of the Pyralidæ, although it does not contradict the characters of the Chrysauginæ. Referring to Sir George Hampson's key to the subfamilies (Proc. Zool. Soc. London, 1898, p. 591), the hind wing does not show any pecten on the

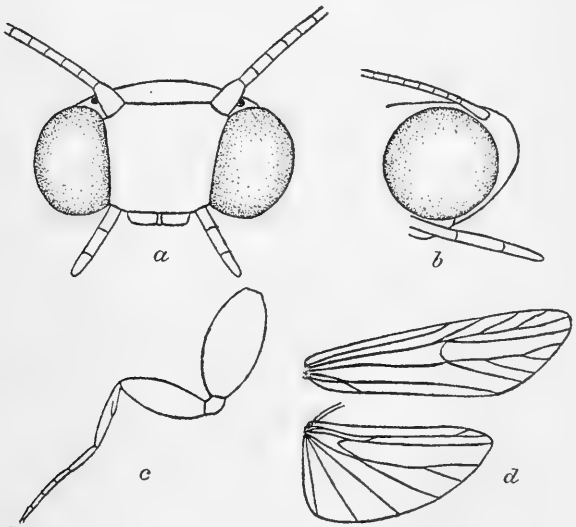


FIG. 9.—*Cryptoses cholœpi: a,* Head, front view; *b,* same, side view; *c,* fore leg; *d,* wing venation.

median nervure. The specimens are in very bad condition, being almost completely denuded of scales, but I think it impossible that the pecten could have been removed if originally present. The proboscis is present, though small; the fore wings have vein 7 stalked with 8 and 9. The next character in the key is whether or not there are tufts of raised scales in the cell. It is impossible to determine this from the specimens. If tufts are present it would fall in the Epipaschiinæ, from which it is excluded by the absence of the maxillary palpi, of which I can not discover any trace. If tufts are absent, it would fall in the Chrysauginæ, where, by the table, it would come next to Acutia Ragonot, being separated from that genus

by a number of characters, among which may be mentioned the stalking of vein 3 of fore wings, the short cell of the hind wings, and the short palpi, which exceed the head by less than its length. The accompanying figures (fig. 9) illustrate the venation, the head, and the fore leg, the latter showing greatly developed coxa and femur, which are very thick though flat, evidently used for grasping firmly the hairs of the host. Unfortunately it is impossible to give any description of the vestiture of the species, owing to the condition of the specimens, other than to say they are small dark-gray moths, expanding about 16 mm.

It is probable that the moths live continuously in the fur of the sloth, and no doubt the larvæ also, to whose work the matted condition of the animal's hair is in all probability due.

The specimens, three in number, have been marked with the U. S. National Museum type number 11500. They were collected at Tabernilla, in the Canal Zone, Panama, by Mr. August Busck, June, 1907.

NEW GENERA AND SPECIES OF DIPTERA.

By D. W. Coquillett.

Dicranomyia curvivena, n. sp.

Very near *cinerea,* but with no dark stripes on the pleura; both species are peculiar in having a very short second vein which is evenly arcuate and reaches the costa at a point less than one-third of the distance from apex of first vein to that of the third. Yellow, the antennæ and palpi brown, upper side of thorax reddish yellow, opaque, thinly grayish pruinose. Wings hyaline, stigma very pale; base of second vein midway between base of third vein and apex of the auxiliary, auxiliary cross-vein about one-third of this distance before apex of auxiliary vein; third vein toward its apex strongly converging with the fourth, first section of the third vein much shorter than the small cross-vein, the latter scarcely shorter than the hind cross-vein; discal cell closed, second posterior cell about twice as long as the discal. Length 3 mm.

Plummers Island, Maryland. A specimen of each sex collected July 15 and 24, 1903, by Mr. W. V. Warner.

Type.—No. 11506, U. S. National Museum.

Tanypus arietinus, n. sp.

Near *tenebrosus,* but much smaller and wholly black except the whitish stems of the halteres and the brown legs. Body polished, mesonotum not vittate. Legs short-haired, tarsi only pubescent, the fourth

joint slender and slightly longer than the fifth. Wings hyaline, cross-veins not darkened, first vein simple and terminating at four-fifths of the length of the wing. Length 2 to 2.75 mm.

Plattsburg, N. Y. Five males and 4 females bred from August 20 to September 1, 1905, by Dr. H. G. Dyar.

Type.—No. 11507, U. S. National Museum.

Chironomus compes, n. sp.

Brownish black, the scutellum and halteres yellow, basal half of front femora and a broad band before apex of each middle and hind femur yellow, tibiæ and first joint of middle and hind tarsi except at each end, also broad bases of other tarsal joints, whitish. Mesonotum largely gray-pruinose, hind margin of each segment of the abdomen except the last one gray-pruinose, hairs of body yellowish, front tarsi not fringed with hairs, first joint of front tarsi about one and one-half times as long as its tibia. Wings hyaline, veins yellow, the small cross-vein pale brown. Length 5 mm.

Plummers Island, Maryland. Nine males and two females collected by Messrs. E. A. Schwarz, H. S. Barber, and W. V. Warner, May 10 and 20, August 26 and 28, and September 3.

Type.—No. 11508, U. S. National Museum.

Chironomus fascipes, n. sp.

Head and antennæ yellow, mouth parts brown. Mesonotum yellow, gray-pruinose, and with three somewhat polished yellowish-brown vittæ, pleura and metanotum chiefly brown, scutellum yellow. Abdomen light yellow, the last three segments and the genitalia brown, gray-pruinose. Legs yellow, apices of front femora, a band beyond their middle, both ends of front tibiæ, and apices of joints of front tarsi, brown; front tarsi of male not fringed with hairs, the first joint only slightly longer than its tibia. Halteres yellow. Wings hyaline, the veins pale. Length 5 mm.

Riverton, New Jersey. A male specimen collected August 11 by Mr. C. W. Johnson.

Type.—No. 11509, U. S. National Museum.

Misgomyia, n. gen., Leptidæ.

Near Arthroceras, but the hind tibiæ two-spurred and the wings with only four posterior cells. Antennæ shorter than the head, the basal half broadly subconical, the remainder rather narrow, linear, annulate, the apex bearing a few short bristles. Eyes oval, not notched. Face bare. Proboscis short, fleshy, palpi large. Body and legs devoid of macrochæta, front tibiæ without spurs, the middle and hind tibiæ two-spurred, empodium and pulvilli pad-like. Third vein forked, four posterior cells, three veins extend from the discal cell to the wing margin, anal cell narrowly open. Calypteres minute.

Type.—The following species:

Misgomyia obscura, n. sp.

Black, including the halteres; head and thorax grayish-pruinose. Wings hyaline, the stigma pale brown. Length nearly 3 mm.

Virginia, opposite Plummers Island, Maryland. A female specimen collected April 28, 1907, by Mr. W. L. McAtee.

Type.—No. 11510, U. S. National Museum.

Scatophaga cerea, n. sp.

Yellow, the antennæ and all bristles black, the broad frontal vitta orange-yellow. Arista pubescent. Two bristles below each vibrissa, no others along the oral margin; one propleural bristle, one sternopleural, two or three mesopleural; sternopleura and mesopleura hairy, pteropleura bare. Scutellum bears four bristles. Femora without bristles except on the upper side; each tibia bears three or four besides those at the apex. Wings grayish-hyaline, the cross-veins not clouded. Length 4 mm.

Orange Mts., New Jersey. A female specimen collected in May by Mr. A. J. Weidt.

Type.—No. 11511, U. S. National Museum.

A male taken at the same time and place as the above female differs only in having the cheeks, face, and front, except the upper corners of the latter, black, and is evidently the opposite sex of the same species.

Omomyia hirsuta Coq.

This genus and species was founded on male specimens only (Can. Ent., March, 1907, page 76). The female is very dissimilar to the male, so much so that she would never be suspected of belonging to the same species. Instead of being very hairy she appears to be nearly glabrous, the hairs being short and sparse; the body is wholly black, the humeri being sometimes yellow; the scutellum is of the normal form, being wider than long. In the males these characters are variable, some of the smaller ones having the hairs almost as short and sparse as in the female, while the scutellum has the same form as in the female. The size is very variable in both sexes, the length ranging all the way from slightly over 2 mm. to 5 mm. Mr. H. S. Barber collected a fine series of this species at Hesperia, in the eastern end of the Mojave desert, California. Several pairs were captured *in coitu.* In both sexes the small cross-vein is at two-thirds of the length of the discal cell.

Rhagoletis grindeliæ, n. sp.

Distinguished by the wholly black scutellum and the markings on the wings. Black, the front deep brown, the face, antennæ, mouth parts,

cheeks, halteres, tibiæ, tarsi, and apices of femora, yellow. Proboscis very slender, the labella longer than the proboscis proper. Mesonotum opaque, grayish pruinose, pleura highly polished, the abdomen somewhat polished. Wings hyaline, stigma yellow, before its apex with a brown spot which extends to the second vein, a second spot midway between this and apex of second vein, crossing the marginal cell; one at apex of second, third, and fourth veins, at middle of last section of third vein and of penultimate section of the fifth; small and hind cross-veins narrowly bordered with brown; small cross-vein at middle of discal cell; veins except the first vein bare. Length 3 mm.

Clarendon, Tex. Two males bred June 2, 1906, from flower heads of *Grindelia squarrosa nuda* by Mr. W. D. Pierce, the flower heads having been collected September 19, 1905.

Type.—No. 10035, U. S. National Museum.

Three additional specimens which were also bred from flower heads of this plant indicate that the markings on the wings are somewhat variable, the brown stigmal spot sometimes extending to the small cross-vein, or even crossing the discal cell, while some of the other brown spots are more extended than in the type specimen.

Mutiloptera, n. gen., Geomyzidæ.

Readily recognized by the unusually narrow wings, which are over six times as long as wide. Third joint of antennæ oval, the arista subbasal, sparsely short-plumose. Two pairs of vertical bristles, one pair of fronto-orbital, ocellars present, postvertical wanting. Face in profile strongly concave, vibrissæ present, a stouter bristle a short distance behind each, cheeks less than one-fifth as wide as the eye-height, occiput convex. Proboscis short, robust, labella terminal, palpi clavate, well-developed. Thorax bears three pairs of dorsocentral bristles, three supra-alar, two notopleural, one humeral, one sternopleural; scutellum with only one pair. Tibiæ without bristles except at the apices of the inner side of the middle and hind pairs. Wings strongly convex on the costa, the latter not spined, hind margin of wings strongly curved inward in the middle, extending along the hind edge of the anal cell, thence to the middle of the hind edge of the discal cell which it follows to its apex, then extends parallel with the fourth vein, finally curving forward to meet the costa at the tip of the third vein; first vein reaches the costa at a point less than half way from the humeral to the small cross-vein, auxiliary vein ends in the first before the apex of the latter; basal, anal, and discal cells present, the latter unusually narrow.

Type.—The following species:

Mutiloptera apicalis, n. sp.

Yellow, the abdomen black, halteres white. Wings hyaline, the apex brown, which color extends half way to the hind cross-vein, the latter not longer than the small cross-vein and clouded with brown. Length slightly over 2 mm.

Tower City, N. Dak. Two females collected June 19, 1906, by Mr. G. I. Reeves.

Type.—No. 11512, U. S. National Museum.

Pseudiastata, n. gen., Geomyzidæ.

Near *Diastata,* but the second basal cell is coalescent with the discal, the three pairs of fronto-orbital bristles are arranged in a single row on either side of the front, etc. Third joint of the antennæ subelliptical, the arista basal and almost bare. Two pairs of vertical bristles, the postvertical and ocellar bristles present. Face concave, vibrissæ well-developed, cheeks less than one-eighth as wide as the eye-height. Proboscis short, robust, labella terminal, palpi clavate, well-developed. Thorax bears one pair of acrostichal bristles, two dorsocentrals, three supra-alars, two notopleurals, one humeral, and two sternopleural, scutellum with two pairs of nearly an equal size. Front and hind tibiæ with a short but stout preapical bristle, the middle tibiæ with a transverse pair. Wings broad, anal angle well-developed, auxiliary vein terminating in the first near its base, apex of first vein opposite the small cross-vein, anal cell present.

Type.—The following species:

Pseudiastata nebulosa, n. sp.

Yellow, the abdomen brown. Front sparsely covered with short hairs. Mesonotum densely covered with short hairs, not arranged in rows. Wings hyaline, marked with six brown bands; of these the first extends from the apex of the first vein over the small cross-vein and stops at the middle of the discal cell; the second extends from the costa to the discal cell a short distance before its apex; the third extends from the costa to the third vein; the fourth covers the hind cross-vein; the fifth extends from the costa to the middle of the first posterior cell and at its costal end is connected with the sixth, which extends from the costa to the third vein a short distance before its tip. Length slightly over 3 mm.

Plummers Island, Maryland. A single specimen collected August 1, 1902, by Mr. H. S. Barber.

Type.—No. 11513, U. S. National Museum.

A LIST OF NEUROPTEROID INSECTS FROM NORTH CAROLINA.

By Nathan Banks.

The following list is the result of an examination of several collections from North Carolina during the past few years. One of the most important was that made by Mr. Beutenmüller in the Black Mts., and all the specimens from that locality should be credited to him. Mr. W. F. Fiske gave me a small collection made at Tryon; Mrs. A. T. Slosson has sent a few from Lake Toxaway and Hot Springs, and Mr. A. H. Manee has collected many interesting species, especially myrmeleons, at Southern Pines. In the U. S. National Museum there is a number of small species labelled "N. Car." From the pinning I think they were taken by Morrison, and probably from near Morgantown. Practically all the other localities represent material taken by Mr. C. S. Brimley and Prof. Franklin Sherman, Jr., or his assistants. Professor Sherman has always been on the lookout for these insects in his travels through the State, so that to his efforts I am greatly indebted for the materials from which this list is made up.

This material is sufficient to indicate that North Carolina has a large and interesting neuropteroid fauna. The sandy regions have a great variety of myrmeleons, while the mountains have a varied and peculiar trichopterous fauna. The Panorpidæ are especially numerous, and of particular interest is the Panorpodes, a genus elsewhere known only from Oregon and Japan.

Altogether 114 species are recorded in this list. The Odonata and Termitidæ are not included.

Order CORRODENTIA.

Family PSOCIDÆ.

Pterodela rufus Walsh.
Raleigh.

Peripsocus madidus Hagen.
Raleigh.

Elipsocus conterminus Walsh.
Beaufort, June 6.

Polypsocus corruptus Hagen.
Raleigh, May 24; "N. Car." (Morrison), probably from Morgantown.

Myopsocus lugens Hagen.
Hendersonville, July.

Psocus hageni Banks.
Blowing Rock, July.

Psocus striatus Walker.
Raleigh, May 25.

Cerastipsocus trifasciatus Provancher.
Raleigh; Goldsboro, September.

Cerastipsocus venosus Burmeister.
Raleigh, June 30; "N. Car." (Morrison), probably from Morgantown.

Order ARCHIPTERA.

Family PERLIDÆ.

Acroneuria abnormis Newman.
Black Mts., June.

Acroneuria arenosa Pictet.
"N. Car."

Perla carolinensis Banks.
Black Mts., June.

Perla fumosa Banks.
Raleigh, June 21, July 28.

Perla immarginata Say.
Raleigh, June 11.

Perla valida Banks.
Waynesville, July.

Perla xanthenes Newman.
Tryon.

Perlesta placida Hagen.
"N. Car." (Morrison), probably near Morgantown.

Neoperla occipitalis Pictet.
Black Mts.

Isoperla guerini Pictet.
Hot Springs; Black Mts.; May.

Isoperla transmarina Newman.
Black Mts., May; "N. Car." (Morrison), probably Morgantown.

Alloperla imbecilla Say.
Black Mts., May.

Tæniopteryx frigida Hagen.
Raleigh, March 9.

Nemoura similis Hagen.
Raleigh, April 5.

Leuctra grandis Banks.
Black Mts., June.

Family EPHEMERIDÆ.

Hexagenia munda Eaton.
"N. Car."

Leptophlebia cupida Say.
Brinkleyville, April; Raleigh, April.

Leptophlebia sp.
"N. Car." (Morrison), probably from Morgantown.
Very near *L. præpedita,* but smaller.

Siphlonurus mirus Eaton.
Raleigh, March 31.

Heptagenia vicaria Walker.
Black Mts.

Order NEUROPTERA.

Family SIALIDÆ.

Corydalis cornuta Linnæus.
Raleigh, June, July.

Chauliodes pectinicornis Linnæus.
Raleigh, April, May, July.

Chauliodes rastricornis Rambur.
Raleigh, April, May.

Chauliodes serricornis Say.
Black Mts.

Sialis infumata Newman.
Southern Pines, March; Black Mts.

Family HEMEROBIIDÆ.

Lomamyia flavicornis Walker.
Tryon; Southern Pines; "N. Car." (Morrison), probably from Morgantown.

Hemerobius conjunctus Fitch.
Black Mts.

Hemerobius humuli Linnæus.
Raleigh, April, October; Black Mts.

Hemerobius marginatus Stephens.
Black Mts.

Hemerobius stigmaterus Fitch.
Raleigh, April.

Boriomyia fidelis Banks.
Rocky Point, May 18; Raleigh, June 21; Tryon.

Sympherobius amiculus Fitch.
Raleigh, June 14; Black Mts.; Tryon.

Micromus subanticus Walker.
Raleigh, May 4; Henrietta, December 9.

Micromus posticus Walker.
Raleigh, November 21, December 1; Black Mts.

Family CHRYSOPIDÆ.

Allochrysa virginica Fitch.
Raleigh, September 1; Lake Ellis, May.

Chrysopa albicornis Fitch.
Raleigh, July 8, May, June.

Chrysopa harrisi Fitch.
Southern Pines, September; Raleigh, November 18, September 17.

Chrysopa lateralis Guérin.
Raleigh, August 25, September 1.

Chrysopa nigricornis Burmeister.
Raleigh, August 6, October; Black Mts.

Chrysopa oculata Say.
Raleigh, June, July, September; Beaufort, May 15; Jefferson, August; Southern Pines, September; Hickory; Wilkesboro; Black Mts.

Chrysopa quadripunctata Burmeister.
Raleigh, April 11; Blowing Rock.

Chrysopa robusta Banks.
Tryon.

Chrysopa rufilabris Burmeister.
Raleigh, September, October; Greensboro, August; Hendersonville; Black Mts.

Family CONIOPTERYGIDÆ.

Coniopteryx vicina Hagen.
Highlands, July 6.

Family MYRMELEONIDÆ.

Acanthaclisis americana Drury.
Southern Pines, July; Beaufort, September.

Myrmeleon crudelis Walker.
Beaufort; Southern Pines, July; Raleigh, May 30 to September 22.

Myrmeleon immaculatus De Geer.
Black Mts.

Myrmeleon tectus Walker.
Southern Pines, May 27, 1 specimen.

Psammoleon guttipes Banks.
Southern Pines, July 20; Tryon.

Dendroleon obsoletum Say.
Raleigh, June 25; Tryon.

Dendroleon pumilis Burmeister.
Southern Pines, August 26.

Brachynemurus abdominalis Say.
Beaufort; Southern Pines, July; Raleigh, June, July, September.

Brachynemurus longicaudus Burmeister.
Beaufort; Southern Pines, July.

Brachynemurus ramburi Banks.
Southern Pines, August.

Cryptoleon nebulosum Olivier.
Southern Pines, May 25, June.

Family ASCALAPHIDÆ.

Neuroptynx appendiculatus Fabricius.
Raleigh, July 8.

Ululodes hyalina Latreille.
Beaufort; Greensboro.

Ululodes quadripunctata Burmeister.
Raleigh, August 27.

Colobopterus excisus Hagen.
Southern Pines, July 3.

Family PANORPIDÆ.

Panorpa lugubris Swederus.
Raleigh, October 10, November 2; Southern Pines, October, November.

Panorpa americana Swederus.
Raleigh, September, October; Southern Pines, October 11.

Panorpa nebulosa Westwood.
Black Mts., June; Hot Springs; Lake Toxaway; Highlands, June; Havelock, May.

Panorpa rufa Gray.
Wilmington, December 25; Southern Pines, October, November.

Panorpa carolinensis Banks.
Black Mts., June.

Panorpa confusa Westwood.
Blowing Rock, June, August; Black Mts.; Raleigh, May; Highlands, July.

Panorpa maculosa Hagen.
Blowing Rock, July; Highlands, July; Hendersonville, June.

Panorpa rufescens Rambur.
Wilkesboro, September; Wallace, April; Lake Ellis, May; Havelock, late May; Hendersonville, June.

Panorpa signifer Banks.
Blowing Rock, August.

Panorpa venosa Westwood.
Raleigh, September, October; Southern Pines, June.

Panorpa virginica Banks.
Highlands, September; Hendersonville, June; Boone, August.

Panorpodes carolinensis Banks.
Black Mts., May 26.

Bittacus occidentis Walker.
Raleigh, September.

Bittacus pilicornis Westwood.
Havelock, May; Black Mts., June.

Bittacus punctiger Westwood.
Raleigh, June; Havelock, May.

Order TRICHOPTERA.

Family PHRYGANEIDÆ.

Phryganea vestita Walker.
Southport, late October; Lake Ellis, May.

Neuronia postica Walker.
Raleigh, May, June, July; Lake Ellis, May 25.

Family LIMNEPHILIDÆ.

Colpotaulius medialis Banks.
Blowing Rock, August.

Pycnopsyche scabripennis Rambur.
Black Mts.; Lineville, August 19.

Platyphylax lepida Hagen.
Black Mts.

Family RHYACOPHILIDÆ.

Rhyacophila nigrita Banks.
Black Mts., June.

Chimarrha aterrima Hagen.
"N. Car." (Morrison), probably Morgantown.

Family SERICOSTOMATIDÆ.

Heteroplectron boreale Provancher.
Black Mts., June.

Atomyia modesta Banks.
Black Mts., May.

Goera calcarata Banks.
"N. Car." (Morrison), probably Morgantown.

Goera fuscula Banks.
Black Mts., May 21.

Notiopsyche latipennis Banks.
Black Mts., June.

Mormomyia vernalis Banks.
Tryon.

Family LEPTOCERIDÆ.

Leptocerus transversus Hagen.
"N. Car." (Morrison), probably from Morgantown.

Triænodes sp.
Lake Ellis. perhaps new.

Œcetina avara Banks.
"N. Car." (Morrison), probably from Morgantown.

Œcetina incerta Walker.
Lake Toxaway.

Œcetina parvula Banks.
"N. Car." (Morrison), probably from Morgantown.

Family HYDROPSYCHIDÆ.

Hydropsyche analis Banks.
"N. Car." (Morrison), probably Morgantown.

Hydropsyche alternans Walker.
Black Mts.; "N. Car." (Morrison), probably Morgantown.

Hydropsyche chlorotica Hagen.
"N. Car." (Morrison), probably Morgantown.

Hydropsyche hageni Banks.
Blowing Rock, July 22; Lake Ellis, May 23.

Hydropsyche scalaris Hagen.
Black Mts.

Hydropsyche sordida Hagen.
Hot Springs; Black Mts.; "N. Car." (Morrison), probably Morgantown.

Hydropsyche speciosa Banks.
Hot Springs; "N. Car." (Morrison), probably Morgantown.

Plectrocnemia auriceps Banks.
Black Mts.

Arctopsyche irrorata Banks.
Black Mts.

Polycentropus carolinensis Banks.
Black Mts.

Phylocentropus placidus Banks.
"N. Car." (Morrison), probably from Morgantown.

Nyctiophylax affinis Banks.
Hot Springs.

Nyctiophylax vestitus Hagen.
"N. Car." (Morrison), probably Morgantown.

A NEW GENUS AND SPECIES OF EUPELMINÆ.

By J. C. Crawford.

Zalophothrix, n. gen.

Type.—Z. mirum Crawford.

Head broader than the thorax, viewed laterally triangular, with the back of the head straight, the front forming the other two sides of the triangle (since from a point just below the level of the eyes the face recedes rapidly); antennæ inserted at the level of the eyes; eyes bare; antennal furrow deep, carinate at sides, the anterior ocellus placed above the furrow; furrow divided by a high vertical carina, making a separate compartment for each scape; scutellum with a median longitudinal row of coarse hairs; wings maculated; marginal vein long, postmarginal and stigmal short, subequal; front femora swollen; hind tibiæ flattened, with two apical spurs; hind tarsi with a row of fine short bristles on the basal segments; abdomen short, not longer than the thorax; ovipositor not exserted.

In Doctor Ashmead's classification of the Chalcidoidea this genus, owing to the swollen front femora, runs to Oodera, from which it at once differs by the non-exserted ovipositor, as well as by other characters.

Zalophothrix mirum, n. sp.

♀.—Length 2–3 mm. Head reddish, above the antennæ obscured with fuscous and metallic around the ocelli; scape reddish, rest of antennæ dark; mesothorax and pleuræ metallic, the scutellum reddish; median row of hairs on the scutellum black; anterior wings with a short dusky patch near base and a broad band extending from between the base of the marginal vein and the stigmal vein to the rear of the wing; legs dark, the femora with metallic luster, the anterior and middle tibiæ more or less reddish, hind tibiæ black, the flattened rear edge whitish; abdomen reddish with fuscous and the base metallic.

Barbados, West Indies, said to have been bred from *Saissetia nigra* Nietner. (Coccidæ.) (H. A. Ballou.)

Type.—No. 10061, U. S. National Museum.

SOME NEW CHALCIDOIDEA.

By J. C. Crawford.

With the exception of *Zatropis catalpæ,* the species described in this paper were bred by the members of the Cotton Boll Weevil Investigations force of the Bureau of Entomology in Texas.

Family ENCYRTIDÆ.

Subfamily Eupelminæ.

Tribe Eupelmini.

Genus CERAMBYCOBIUS Ashmead.

TABLE FOR THE SEPARATION OF THE SPECIES—FEMALES.

1. Postmarginal vein much longer than the stigmal.....2
   Postmarginal vein not or very slightly longer than the stigmal.....3
2. Sheaths of ovipositor linear, about the length of last three abdominal segments combined; sculpture of segments 1–4 finer than on rest, *cleri* Ashmead.
   Sheaths of ovipositor broad, hardly as long as last segment; sculpture of segments 1–2 finer than on rest.....*bruchivorus,* n. sp.
3. Sheaths of ovipositor hardly as long as last abdominal segment, *brevicaudus,* n. sp.
   Sheaths of ovipositor about as long as last three segments combined...4
4. Scape dark, metallic; face mostly blue; thorax dull, more bronzy, *cyaniceps* Ashmead.
   Scape reddish; thorax shiny, more green; face mostly green, *cushmani,* n. sp.

Cerambycobius bruchivorus, n. sp.

♀.—Length, 4.5 mm. Head and thorax blue, with purple tinges, face mostly purplish; antennæ dark, scape metallic; pubescence on eyes long, distinct; posterior ocelli closer to each other than to the anterior ocellus and separated from the eyes by less than one-half the diameter of the ocelli; abdomen bronzy, with bluish reflections, the first segment basally blue; legs dark, tibiæ with reddish, tarsi basally whitish.

Victoria, Tex., bred from *Bruchus* sp. on Vachellia.
Type.—No. 10064, U. S. National Museum.

Cerambycobius brevicauda, n. sp.

♀.—Length, 2–3 mm. Head and thorax green, thorax duller in color, more bronzy; antennæ dark, scape metallic; ocelli in an equilateral triangle; pubescence on eyes distinct; femora blackish or metallic, tibiæ dark medially, the apical part and the tarsi very light; abdomen æneous, first segment basally green.

Dallas, Tex., bred from *Bruchus exiguus* Horn.
Type.—No. 10065, U. S. National Museum.

Cerambycobius cushmani, n. sp.

♀.—Length, 2.5–4 mm. Very similar to *cyaniceps* Ashm., but separated by the characters given in the table; posterior ocelli farther from each other than from the anterior ocellus; pubescence on eyes short, indistinct.

Victoria, Tex., bred from *Anthonomus grandis* Boh.
Type.—No. 10066, U. S. National Museum.

Tribe Tanaostigmini.

Genus **EUTRICHOSOMA** Ashmead.

Eutrichosoma albipes, n. sp.

♀.—Length, 1.5–2 mm. Head and thorax dull green, abdomen basally green, the rest purplish-coppery; head and thorax closely covered with appressed white pubescence, abdomen with sparse pubescence; face wide, above antennæ finely roughened with vertical lines, below almost smooth; vertex back of the ocelli carinate, the carina running from a point back of one ocellus to behind the other; mesothorax closely finely punctured, the anterior part of the median lobe with fine transverse lines; metathorax very finely longitudinally wrinkled and with a strong median carina; wings whitish hyaline, nervures almost colorless; legs greenish, tarsi basally white.

♂.—Length 1.5–2 mm. Similar to the female except in sexual characters.

Dallas, Tex., bred from *Auleutes tenuipes* Lec. Also bred from *Smicronyx tychoides* Lec. at Victoria, Tex.

Type.—No. 10067, U. S. National Museum.

Differs from *E. mirabile* Ashm. in the white tarsi and in having the abdomen purplish.

Family PTEROMALIDÆ.

Subfamily PTEROMALINÆ.

Tribe Pteromalini.

Zatropis, n. gen.

Type.—*Z. catalpæ* Crawford.

Mandibles strongly four-toothed; head very thin antero-posteriorly, the lateral ocelli touching the vertex and at the upper angle the eyes almost touching; antennæ with three ring joints, the pedicel slightly longer than the first joint of the funicle, the first joint being the longest of the funicular joints; punctures of head and thorax small, thimble-like; postmarginal vein longer than stigmal; stigmal uncus long; neck of metathorax short; metathoracic spiracles large, long-oval; median carina of metathorax strong, on each side of it a depressed, V-shaped, punctured area bounded laterally by the lateral folds which posteriorly form carinæ running to the neck of the metathorax, the neck being a raised area; segments 1–5 of abdomen almost equal in length, 2, 3, and 4 slightly emarginate medially at apex.

In Doctor Ashmead's table of the Pteromalini this runs to No. 10, but does not agree with either alternate; going one way runs to number 17, a genus never described by Doctor Ashmead, and the other way it runs to 18, where none of the genera has three ring joints in the antennæ.

Zatropis catalpæ, n. sp.

♀.—Length, 2–3.5 mm. Head and thorax above æneous, pleuræ and beneath bluish; metathorax and abdomen greenish or bluish; head slightly broader than thorax; antennæ brown, scape light; head and thorax with scattered, appressed, scale-like white hairs; head and thorax covered with small thimble-like punctures, those of the scutellum the finest; wings clear; legs dark, the knees, anterior tibiæ almost entirely, middle and hind tibiæ apically, and tarsi light.

♂.—Unknown.

Type.—No. 10062, U. S. National Museum.

Wooster, Ohio (H. A. Gossard), bred from the buds of Catalpa bearing a species of Cecidomyia.

Genus CATOLACCUS Thomson.

This genus was founded for forms having two ring joints in the antennæ, but the American species which have been referred to the genus do not all come under this head. The

following table of females, which includes all of the North American species except *pallipes* Ashm. and *tepicensis* Ashm., shows the differences and indicates the location of a new species:

TABLE FOR THE SEPARATION OF THE NORTH AMERICAN SPECIES—FEMALES.

1. Antennæ with three ring joints.....5
   Antennæ with two ring joints.....2
2. Marginal vein distinctly longer than postmarginal.....3
   Marginal vein not distinctly longer than postmarginal.....4
3. First joint of funicle shorter than second, not longer than the pedicel .....(West Indies) *vulgaris* Ashm.
   First joint of funicle longer than second, longer than the pedicel, *hunteri*, n. sp.
4. Æneous .....*cerealellæ* Ashm.
   Green .....*anthonomi* Ashm.
5. Æneous, with purplish or bluish tinges.....7
   Greenish 6
6. First joint of funicle one and one-half times as long as the second; dull green.....(West Indies) *carinatus* How.
   First joint of funicle only slightly longer than the second; brighter green .....*incertus* Ashm.
7. *Cœliodis* Ashm. and *nigroæneus* Ashm. run here and are very close together.

Catolaccus hunteri, n. sp.

♀.—Length, 2.5–4 mm. Head and thorax æneous, with sparse white appressed pubescence; abdomen more bronzy or greenish; punctures of head and thorax deep; neck of metathorax set off by a furrow; metathorax with a median longitudinal carina and near base a transverse elevated fold, almost a carina in some specimens; metathorax between the lateral folds with fine thimble-like punctures, dull, laterad of the folds and the neck more shiny, finely reticulated; femora æneous, tarsi and tibiæ testaceous, the tibiæ apically more whitish.

♂.—Length, 2–2.5 mm. Similar to the female, abdomen near base with a whitish spot.

Mineola, Tex. (♀); Waco, Tex. (♂); bred from *Anthonomus grandis* Boh.

Type.—No. 10063, U. S. National Museum.

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