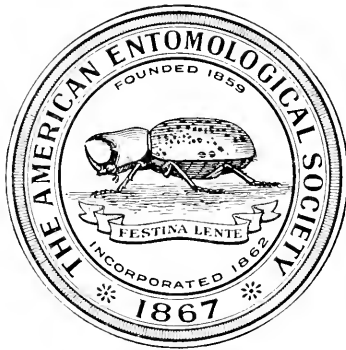






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VOLUME XLV

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THE DIPTEROUS FAMILY CYRTIDAE IN NORTH  
AMERICA

BY F. R. COLE

*U. S. Bureau of Entomology*<sup>1</sup>

*Introduction*

This paper is the result of about two years interrupted study of the dipterous family *Cyrtidae*. It is an interesting little group of insects with a remarkable range of variation in structure. The collecting of more material will no doubt cause some changes to be made in the status of a few species, and further study will reveal other characters for the separation of the different forms.

The species of *Cyrtidae* are very rare, at least until their local haunts are known. In several places along the Pacific Coast large series of *Eulonchus* have been collected, but these are rarely found in any great numbers. The family is a small one and some species are known from only one or two specimens. Few collectors have any large number of these flies, and even those who have made a search for them have found them only at rare intervals. The species are not economically important, those in which the early stages are known being parasitic in the egg cases or in the bodies of spiders. In only a few species have the early stages been found and we know nothing of the life histories of some genera.

Several entomologists have at one time or another made a

<sup>1</sup>Published by permission of the Secretary of Agriculture.

special study of the group and, as some of the articles are not easily accessible, notes from these have been incorporated in this paper.

Life history and habit notes are included in this synopsis, as they are of general interest and a great aid to the knowledge of the species; the larval and pupal characters may, when known, serve to separate some of the closely allied species and establish the relationships of the genera.

The writer wishes to acknowledge the generous loan of material by the following: the late Mr. Frederick Knab of the National Museum; Mr. C. W. Johnson of the Boston Society of Natural History, who also loaned his large personal collection; Mr. M. C. Van Duzee; Dr. J. M. Aldrich; Prof. A. L. Melander; Mr. W. R. Walton; Mr. C. T. Greene; Mr. E. T. Cresson, Jr. and Prof. R. W. Doane. The Cornell University collection was obtained through the kindness of Mr. R. C. Shannon and Professor Bradley. Mr. Nathan Banks loaned his private collection and a number of specimens from the Museum of Comparative Zoology at Cambridge. I am also indebted to Prof. S. J. Hunter for the loan of the Kansas University material. Even with all these collections material is all too scarce and I cannot establish some of the species to my entire satisfaction. The types should all be examined and compared, especially the types of Westwood's species, of which one cannot be certain because of the two or three line descriptions.

Parasitism, among other agencies, has produced some curious modifications of the family type in the Cyrtidae and we see marks of degeneration. Wiedemann gave them the name of "fat-flies," because of their generally inflated balloon-like bodies. The common name of "small-headed flies" was given them by Comstock in his Manual; they might well be called "Swollen-bodied flies."

The drawings have been made from specimens, using a binocular microscope, and care has been taken to make them as accurate as possible, so that they would supplement the descriptions and aid in establishing some of the uncertain species. There is often quite a variation in marking and color, but most of the species have a "habitus." Important characters may be found in the genitalia when more work is done and dissections made.

*History of the Family*

Meigen in his "Klassifikation" first designated this group of Diptera. There has been much difference of opinion as to the correct name of the family, but it appears to me that the term Cyrtidae has the best claims for its adoption; *Cyrtus* is the oldest genus, having been described by Latreille in 1796. The name *Acroceridae* Leach (in *Somouelles Compendium*) is a very widely used term. Newman in 1841 used the term *Cyrtites*. Walker, in his "Revision of the Acroceridae,"<sup>2</sup> gives a list of fourteen names which have been used for this family: *Acroceridae* Leach; *Acrocerides* Leach; *Bombyliarii*, p. Lam.; *Aplocera*, p. Dumeril; *Inflatae* Latr.; *Inflata* Meig.; *Stratiomyidae*, p. Rafinesq.; *Cyrtites* Newman; *Ogcodina* Rond.; *Inflata* (Henopii) Agassiz; *Acrocerinae* Zett., and *Cyrtidii* Bigot., instead Kertész in his "Katalog" (1909) used *Oncodidae*. The term Cyrtidae means hump-backed, a good éral characterization of the family. *Acroceridae* (from *akros*-summit and *keras*-horn) is derived from the character of the insertion of the antennae on the vertex, which is not a universal character by any means. *Henopidae* comes from a word meaning "one-eyed," and was used by Erichson in his "Monograph" of thə family in 1840, after the name had been given up by others.

The family is remarkable for the singularly swollen body, especially the abdomen, and Latreille gave it the name of *Vesiculosa* for that reason. Meigen in 1822 (102), called the species of *Henops* "Mundhornfliege." Wiedemann in his "Aussereuropäische Zweiflügelege Insecten," in 1830, gave them the name "Feistfliegen," literally fat flies. Latreille maintained that the name *Henops* should be changed to *Ogcodes* (better *Oncodes*). Meigen, in 1822 (102), gave the first synopsis of the family under the name *Inflatae*. He gave a generic description of *Cyrtus*, but stated that he could not give a general survey of the family because he was familiar with only one species—*gibbus*. He gave the main characters of *Acrocera*, enumerating five species, and mentioning that all were rare and that he had never collected any. The next important paper on the *Cyrtidae* was by Wiedemann in 1830 (156), who used the name *Inflatae*. There were four species of *Cyrtus* enumerated, two species of *Acrocera* (including *A. fasciata* from Georgia), one species of *Philopota* from Brazil

<sup>2</sup>List-Supplement, part II, p. 331, 1854.

and the genus *Panops*. Wiedemann made two divisions: those with, and those without ocelli.

Erichson's "Monograph of the Henopidae" was published in the "Entomographien" in 1840. A very good synopsis of the family is given in this paper. Erichson made three subdivisions: the first division with a long thin *Bombylius*-like proboscis, carried pointed back under the body when at rest and not porrect; in the second division, those species having only a stump of a proboscis were included. The third division contained only those having absolutely no mouth-parts, a membrane closing the mouth opening. The genus *Ogcodes* was the only member of this last group.

Erichson noted the importance of the antennae in classification, their structure and the position occupied on the head. He stated that the eyes are most broadly separated in *Pialea*, which has two ocelli; *Astomella* has none. The structure of the antennae and their position on the head formed the basis of the separation of the different forms, thirteen genera being included in the table: *Panops*, *Lasia*, *Cyrtus*, *Psilodera*, *Thyllis*, *Philopota*, *Oenaea*, *Astomella*, *Pialea*, *Pterodontia*, *Aerocera*, *Terphis* and *Ogcodes*. In these genera forty-seven species were known at that time. Dr. Erichson, in discussing the systematic relation of the family, stated that he thought the Cyrtidae (Henopidae as he called them) might be limited on the one side by the Syrphidae, and on the other by *Conops*, *Myopa* and perhaps *Oestrus*.

In 1851, Walker gave some notes on the family in "British Diptera," adopting the name *Aeroceridae*. Only two genera were known from England, *Aerocera* and *Henops*, and both were briefly described. In 1854, Walker published a short revision of the family, with a table of eighteen genera, *Pteropevus*, *Exetaxis*, *Eriosoma*, *Physegaster* and *Sphaerogaster* having been added since Erichson's "Monograph." Walker gave only a short Latin description of the species and a description of the wing venation of each genus in English.

In 1856, Gerstaecker made a valuable contribution to the knowledge of the family in his paper, "Beitrag zur Kenntnis der Henopier" (42). In 1862, Schiner gave a short synopsis of the family



in his "Fauna Austriaca," which contained an outline description of the genera known from Austria. In this article he stated that the metamorphoses of these flies were unknown. In 1868, Schiner made several observations on the Cyrtidae in the "Reise der Novara," making the following synonymy: *Henops* Fabricius referred to *Ogcodes* Latreille; *Eriosoma* Macquart and *Exetaxis* Walker to *Ocuaca* Erichson; *Pithogaster* Loew to *Opsebina* Costa; *Platygaster* Zetterstedt to *Sphaerogaster* Zetterstedt; *Mesocera* Macquart to *Psilodera* Gray; *Mesophysa* Macquart to *Panops* Lamarek and *Megalybus* Philippi to *Thyllis* Erichson. Loew in "Fauna Sudafrikas," in 1860, proposed a division of the Cyrtidae into two sections—*Oncodina* and *Cyrtina*, and he held to this in his Monographs. The subdivisions were based merely on wing venation and of course proved a failure. Schiner's proposed system was much more satisfactory and he adopted the natural group Philopotina. He took as the basis of his classification the structure of the thorax. In the Philopotinae the prothoracic lobes are greatly developed and meet above. The other forms are divided into two groups: the Acrocerinae with the short third antennal joint and a terminal arista, and the Panopinae, in which the third antennal joint is long or very long and never furnished with an apical arista. Schiner recorded one hundred and three described species of Cyrtidae, distributed as follows: Europe 22, Asia 4, Africa 13, America 57, Australia 6, and one unknown. *Sphaerogaster* was the only genus peculiar to Europe, nine genera being exclusively American and one (*Psilodera*) peculiar to Africa.

Very little has been written on this family in America, the species being so rare. In 1902, Professor Melander published a short paper on some of the species. Osten Sacken had always been very much interested in the family and had started a monograph in 1895. When he heard that Wandolleck was working on one at this time, he turned over the work to this dipterist, but it seems that circumstances prevented the finishing of the monograph. Mr. C. W. Johnson's paper on the genus *Acrocera* has many valuable notes on several of the species. In twenty years of collecting Mr. Johnson has been able to get seventeen species of Cyrtidae, and this is, I believe, the best collection in the country.

*Structural Characters*

Osten Sacken noted the fact that a considerable number of the archaic forms occurred in the Eremochaeta, "survivals of bygone zoological horizons" as he aptly terms them. The genera near the Nemestrinidae in venation and with a long proboscis are the oldest, one species of this type having been recently described by Meunier from Baltic amber. In the Cyrtidae we have a family which has been modified by parasitism; undoubtedly those genera having a long proboscis and a complex wing venation are the oldest forms and the others have become curiously degraded by their mode of life.

These very interesting flies vary in size; the smallest one known to me being 2.5 millimeters long and the largest about 17 mm. They belong to the Orthorrhapha brachycera and are devoid of bristles. The head is small and composed almost entirely of the huge rounded eyes. Both sexes are holoptic or nearly so, and the face is small and situated almost on the under side of the head. There are usually three ocelli, but some forms have two and the European *Astomella* none; *Lasia ocelliger* is said to have one ocellus. The proboscis in one group is so small as to be hardly visible (with the mouth opening closed by a membrane in one genus), and in the others is long and slender. The eyes may be hairy or bare, with all the facets equal. The antennae are three jointed, although there are at times apparently only two joints, the first being sunken in the head. The antennae are usually short, close together at the base (in *Piatca* grown together), and in varying positions on the head; they may be just below the ocelli on the vertex, in the middle of the head or far down on the rim of the mouth. In one group the third joint is short and with a long, thin apical arista; in another group elongate and strap-shaped, and in *Pterodontia* with three apical setae.

The thorax is humped and rounded and much wider than the head. In the Philopotinae the prothoracic lobes are abnormally enlarged and meet above to form a shield on the prothorax. The pubescence is very thick in some species, but there are never any bristles. The scutellum is large, usually concealing the metanotum.

The abdomen is usually globose or balloon-shaped, appearing swollen, and there are usually five segments. The abdomen in *Eutonchus* is longer and not so distended, and in some foreign genera, such as *Thyllis*, the shape is quite different. The pubescence may be thick or sparse. The female genitalia are most conspicuous in *Acroccera*, and the male genitalia are easily made out in *Ogcodes*. Male specimens of *Eutonchus tristis* and *E. sapphirinus* taken by the writer during the breeding season had the male genitalia protruding, and in some specimens quite prominent.

The legs are of medium length and strength and there are no spines or bristles, although there are often tibial spurs; these are really sharp projections of the tips of the tibiae, however, and are quite short. The empodia are developed pulvilliform and pad-like; the claws and pulvilli are well developed and there appears to be no sticky secretion on the pads, which enables most flies to cling to a smooth surface.

When at rest the wings are deflexed and lie against the abdomen roof-like. The wings are longer and usually broader in the female than in the male. The venation is often puzzling and difficult of interpretation, and to add to the difficulty the veins are often weak. The costal vein may not reach the wing-tip or it may continue all the way around the margin. The praefureca starts about opposite the discal cell, and the discal cross-vein (absent in some) is placed close to the praefureca and near the base of the discal cell. Another cross-vein often occurs near the end of the discal cell, causing a supernumerary cell. Osten Sacken considered this outer division a posterior cell and not an outer part of the first basal cell, which Verrall thought it to be; I am inclined to adopt Verrall's viewpoint. These veins may be obsolete in some and the number of posterior cells reduced. The second longitudinal vein may be absent. The branch of the third longitudinal may be long and normal, including the wing-tip, or both branches may curve up and run parallel to the margin before the wing-tip. In *Acroccera* there is a wide open, spurious, third longitudinal fork, and the lower branch, I believe, a part of the fourth vein. There is a spurious cross-vein which is really the upper branch of the fifth longitudinal fork. The wing membrane is usually bare and in most species rippled.

The alulae vary in size; the thoracal squamae are always large and are one of the striking characters of the family, the margins being thickened and with a fringe, in some forms with a hairy surface. The alar squamae are not abnormally developed, with a short fringe or bare. The halteres are small and entirely covered by the bulging squamae.

The venation is very important, although the classification cannot be based on this alone, as has been proven. *Lasia*, which is represented in the United States by two species, has a venation very near the Nemestrinidae (see Plate I, fig. 1). In *Hirmoncurea* (Nemestrinidae) the discal cell is absent but otherwise the venation corresponds to *Lasia*. Verrall says: "It would appear that an absolutely different principle has been adopted (in two allied groups) to strengthen the wings; in the Nemestrinidae by tying the elongate end veins together, but in the Cyrtidae by connecting the anterior and posterior parts of the wing by a strong tie near the base and also (in *Lasia*, etc.) by a second tie near the end of the wing." When the Cyrtidae adopted the floating flight which some of them have, the second tie was allowed to die out and the outer veins to become obsolete. The venation of *Eulonchus* is very near *Lasia*, but the third longitudinal fork is less like the Nemestrinidae and the axillary vein is not so strong.

*Thyllis* gives a clue to the venation of *Oncodes* and *Acrocera*. The fork of the third longitudinal vein has disappeared and, in one species of that genus (*T. crassus*), the third veinlet from the discal cell has been obliterated, thus there is no closed fourth posterior cell. In *T. tristis* the third vein seems to exist and is a continuation of the fifth longitudinal vein which has disappeared. The venation of *Pteropexus* is near that of *Eulonchus*. *Opsebius* (Plate I, fig. 8) and *Cyrtus* have a venation very near alike; the third longitudinal fork is still present in these two genera. There is quite a variation in the former; in some the anal cell is closed and petiolate and in others wide open. Perhaps the venation of *Opsebius* is a modification of that of *Cyrtus*. Loew in figuring the wing of *Opsebius inflatus* left out the characteristic cross-vein which forms the outer first basal cell; Osten Sacken discovered this in examining the type. The venation of *Ocnaca* (Plate I, fig. 3) is very near that of the South American *Holops* and varies

considerably. The fork of the third longitudinal vein is present, but in one species from North America (*O. locwi*) the lower branch does not reach the wing margin. In *O. schwarzi* new species, from Cuba, this is not the case, but the vein from the outer first basal is only a stump.

The genus *Astomella*, which does not occur in North America, is intermediate between *Thyllis* and *Pterodontia*; the unforked third longitudinal vein can be traced; the closed fourth posterior cell remains (actually the third), and a fifth longitudinal fork, but the second veinlet from the discal has disappeared and the number of posterior cells has been reduced. It becomes clear that the wide open space at the wing tip is the first posterior and not a submarginal cell.

*Pterodontia* (Plate I, figs. 6 and 7) shows a great change in the development of the third (discal) vein. The second longitudinal vein curves up into an enlargement of the costa. *P. analis* shows the continued presence of two discal cross-veins, and also shows that the so-called outer first basal cell has merged with the discal cell, thus the upper branch of the fourth vein has disappeared, but the upper veinlet of the discal cell remains, the lower branch of the fourth longitudinal bends sharply downwards and meets the upper branch of the fifth vein, going to the wing margin. In *P. analis* there are three posterior cells and in *P. flavipes* two.

In *Ogcodes* (Plate I, fig. 2) the discal cross-vein is still apparent, but is very faint. The first basal cell is much longer, and thus the discal cell is much farther from the base of the wing, and consequently, as the supernumerary discal cross-vein is not required it has disappeared. The shape of the anal cell indicates a degraded form of *Astomella* as Verrall noticed. The outer cross-vein has disappeared, so the lower one of the three vague veins between the third vein and the lower branch of the fifth longitudinal would be a branch of the fourth longitudinal.

*Philopota* (Plate I, fig. 5), one species of which (*truquii* Bellardi) was described from Mexico, shows the auxiliary, first and second veins clearly, but the next (incomplete) vein may be the upper branch of the third vein, and if so the discal cross-vein is absent. The apparent cross-vein will be (as in *Acrocera*) the beginning of the upper branch of the fourth longitudinal, and there are two rather undefined basal cells.

In *Acrocera* (Plate I, figs. 4 and 9) there is a great reduction and transposing of veins. The origin of the first, fourth and fifth longitudinal veins can be clearly traced, but their subsequent development is confused because of the suppressions of long veins and cross-veins. The praefurca arises from the first longitudinal vein and the second longitudinal is present in some and lacking in others. The majority of Cyrtidae have the second vein complete, in some it is missing and in some represented by a stump, either at the distal or the proximal end. Thus at times there is one, and in other cases no submarginal cell. *Acrocera bimaculata* is the best example of stunting, the stump being in the wing margin. This proves that the total disappearance is not a consequence of coalescence with the first vein, but of obliteration. Osten Sacken thus correctly infers that the obliteration of the second vein in *Acrocera* is not a deep-seated character at all, and not an index of a corresponding change in the rest of the organism. Dr. Griffini expressed this opinion when he cast the genus *Paracrocera* into synonymy. Mik united the species of *Acrocera* which lacked the second vein into a new genus which he called *Paracrocera*. There is no discal cross-vein, the almost upright vein just after the middle of the wing is a portion of the fourth longitudinal vein (as in *Pterodontia*). The almost upright vein connecting the fourth and fifth longitudinal veins is the upper branch of the fifth vein.

A few Bombyliidae (such as the genus *Glabella*) have at times been mistakenly placed in the Cyrtidae. There are analogous insects as far as shape goes in Coleoptera, Homoptera and Orthoptera, and affinities can be seen with the hump-backed Bombyliidae in some instances. Like the parasitic Oestridae and Tachinidae these flies have very large thoracal squamae. Aldrich placed the Cyrtidae between the Nemestrinidae and the Bombyliidae in his "Catalogue," and I believe this is their proper position in the system.

#### *Habits of the Cyrtidae*

The adults of *Lasia* and *Eulonchus* are known to suck the nectar of flowers, but most of the genera, having undeveloped mouth-parts, can take no nourishment. Philippi mentions the finding of adults of *Megalobus* on flowers—"the larvae live, it seems, in wood, at least my son Karl in Dec. 1863 found a fly of this species

just crawling out of a tree." Two specimens of *Holops cyaneus* were found in the summer of 1859 on the window of his house in San Juan. They flew heavily and allowed themselves to be caught easily. Philippi says of *Panops nigriventris*: "This magnificent fly is not rare in the province of Valdivia; they fly uncommonly fast, as do the others of their genus, and buzz as strong as a bumble bee; by preference they sink their long proboscis in the flowers of *Alstromeria aurantiaca*, and they are then easy to seize, when they are busy with sucking." He speaks of finding *Panops aeneus* almost every year near Santiago at the foot of Cerro San Cristoval, in the month of November, and feeding on the flowers of *Silybum marianum*.

Most of the species of the family are considered rare, but Osten Sacken states that they are numerous in parts of Australia. Schiner speaks of finding *Aerocera globulus* in swarms at Trieste in 1862, when they alighted on the visor of his cap and swarmed like Anthomyiids. In 1851, Walker in speaking of the habits says: "The *Aerocerae* are very sluggish, and are often seated in groups on the withered trunks and branches of oaks and other trees, about which they fly when the sun shines in warm weather, they also frequent thickets and herbage beneath trees."

The observations of Gerstaecker on some European species are interesting. He and Stein found great numbers of Cyrtidae in the Brieslanger forest, the adults being collected in a meadow with scattered willows and blackthorn bushes, most of them on the dry leafless branches of *Equisetum limosum*. As many as fifteen or twenty were observed on a single blackthorn bush in the hot sun, and they could usually be picked up in the fingers, only flying a short distance in any case. A trip was made later in the season and only a few living females were found in the spider's webs; Gerstaecker not knowing their habits did not think of their being parasitic on the spiders. A few dead ones, *apparently in good shape*, were found. This is an interesting observation, and the writer has found *Opscbius diligens* in a spider's web untouched, with two large spiders in the web. Gerstaecker remarked that the males of *Ogcodes zonatus* flew oftener and were more lively than the females. Great numbers of the males played about on the plum bushes, the females never joining in the play.

A pair was observed in copulation, the male bracing itself with its hind legs on the costal border of the long wings of the female.

Westwood, Van Heyden and M. V. Audouin all observed that a certain species of *Crabro* invariably selected *Ogcodes gibbosus* to store its burrows in the brambles. Rev. H. S. Gorham observed this same thing; he noticed a thistle (*Cnicus palustris*) with a hole in it about three feet from the ground, around which several spiders seemed watching. On investigating he found the hollow stem which led to the hole filled for about eight inches with the rare fly *Ogcodes gibbosus*. There were twenty-five or thirty flies, then a wad of frass or débris, and then another segment and a wad. In some a hymenopterous larva was engaged in devouring the stored-up flies. The spiders remarkably resembled the Cyrtids and Dr. Sharp pointed out that they were undoubtedly hosts of the flies; the mimicry never having been noticed before. In all more than fifty flies were found in the burrows, dead but quite fresh. Another Cyrtid, *Helle longirostris* Hudson, from Australia, is "an extraordinary and very rare species, occurring among white rata (*Metrosideros scandens*) blossoms in February."

The Cyrtidae are very clumsy and sluggish when walking, some of them falling over easily. *Pterodontia* is described as having a balloon-like flight. *Opscbius diligens* has a floating sort of flight, rather undulating and uncertain. It has the habit of buzzing around in circles when it falls over on its back on a smooth surface, often doing this for some time before it can regain its feet; most of the time it is making a high, thin humming sound. When walking the long wings drag on the ground. I collected a number of specimens in Southern California on warm sunny days, flying around vines which contained spider's webs. They seemed to have no fear of anything and could be easily approached. They differ in this respect from *Eulonchus tristis* and *E. sapphirinus*, both of which are quite wary, especially in the heat of the day. The species of *Eulonchus* are very quick of wing and are not sluggish when captured, although they are a little clumsy. When caught in the net they hum like a Syrphid, but make no noise when flying. Several specimens were taken near Parkdale, Oregon, and were kept alive for a short time, but none lived longer than forty hours and the females did not lay



eggs. A specimen of *E. tristis* was found in the clutches of a yellow crab spider, which had been lying in ambush on one of the flowers frequently visited by this fly. This is of interest in view of the behavior of spiders when confronted with specimens of *Opsebius diligens*. If this spider was a host of the fly it was not aware of the fact. It is possible that other spiders might not act the same, and it is also possible that the flies of this genus are not parasitic on spiders.

In England, Standish speaks of having beaten a species of *Ogcodes* from old white-thorn bushes. They were sluggish in the net and laid with their wings closed. The slightest pressure destroyed the rotundity of their bodies. Mr. J. L. King, in Ohio, observed *Pterodontia flavipes* hovering around the trunks of trees and ovipositing; they were very sluggish and easily captured.

#### *Early Stages and Life History*

Gerstaecker first observed one of the larvae of the Cyrtidae in 1856 and reported it. Stein, according to Gerstaecker, had found them several years before, and had discovered *Ogcodes fuliginosa* ovipositing on *Equisetum limosum*. There were spots and round holes on the branches of this plant which Gerstaecker believed to be the dwelling places of the larvae. On the pin with a specimen of *Ogcodes zonatus* he found a great mass of black eggs, long egg-shaped, somewhat flattened and about one-sixth of a millimeter long. The plants in a certain meadow were covered with these eggs.

Menge (105) was the first to record the Cyrtidae as parasitic in the bodies of spiders. *Ogcodes pallipes* (*Henops marginatus*) Erichson, was bred from *Clubonia putris* Koch, the spider being found with a large hole on the under side of the abdomen. Brauer, in 1869 (18), published a paper, "Beitrag zur Biologie der Acroceriden," in which he described and figured the larva and pupa of *Astomella lindenbergii*, found in the burrow of a spider (*Ctenziana ariana*). Brauer stated that Gerstaecker had found a pupa of *Ogcodes fumatus* Erichson in a web near a dead spider. Brauer gives good figures and descriptions of the early stages of *Astomella lindenbergii*, which came from one of a number of nests of the spider *Ctenzia ariana* Koch collected in Corfu: In 1883, Brauer made further discoveries, finding that the larvae, while lodged

in the abdomen of the host breathe by placing their caudal spiracles in one of the lung chambers of the spider. The larvae were about ten millimeters long and rather thick, the body composed of twelve segments; the head small and fitted with maxillae. They were amphineustic, having prothoracic and caudal spiracles.

Mr. J. H. Emerton (33) was the first to record the finding of a Cyrtid larva in America. Mr. C. W. Johnson, in 1903, reported rearing *Acrocera fasciata* from *Lycosa stonci* Montgomery, twenty-five per cent of the spiders being parasitized. Montgomery, in his paper on the habits of spiders, in 1903, reported rearing the same species from *Lycosa stonci*. One spider contained two and the others one each of the larvae. The parasite was very large and ate most of the soft parts of the spider, emerging from a hole in the abdominal wall, thus killing the host. "A short time before the parasite escapes the spider acts in a peculiar manner walking about spasmodically and often spinning aimlessly."

Verrall said that the larvae of the Cyrtidae were parasitic on such spiders as the Aviculariidae, Theridae and Drassidae. Wandolleck described a new species of *Ogcodes* which he received from North Queensland, Australia, collected by Mr. Dodd, who supplied the following notes: "In crevices of the leaf nests of the green ant (*Oecophylla virescens* Fabr.) a pretty jumping spider lives and breeds. The nests are generally abandoned. A bulky female of the spider was left in a box so it could be observed, and was soon found dead with the abdomen small and shrunken and a peculiar dark object in the web. Later in the day it became lighter in color and was made out to be a short thick pupa, which emerged in about twelve days. The spider was *Cosmophasia bitaeniata* Keyserling, and the fly determined as *Oncodes* [*Ogcodes*] *doddi*. Two more spiders bred out this *Oncodes*."

In 1894, König published an article on the eggs and first stage larvae of an *Ogcodes*. The material was collected by Brauer in a meadow in Gmunden, Upper Austria, early in August. Both *Ogcodes gibbosus* and *O. zonatus* were collected nearby, so the identity of the larvae is not certain. The young *Ogcodes* larvae were found by Brauer on dry bushes. "The smallest twigs were regularly covered with black dots in rows . . . the pear-shaped eggs colored deep blackish brown and fastened tight to the twigs by the small end, opening with a small lid. What appear

to be fine dark erect bristles between the eggs are larvae. Webs of orb weavers are often seen in the branches. The larvae are three to four millimetres long, dark brown and with numerous bristles. There is no head proper and eleven segments in all, each segment projecting over the next following a little. The larva normally holds fast by the clasping apparatus and stands out straight from the branch, pulling its body together if disturbed and moving forward with the support of the springing bristles, although it can crawl or move by stretching." Brauer found some of the larvae fastened on Podurids with the clasping apparatus. König gives a full description of the larva. The mouth-parts are spoken of as complicated and hard to work with, and they are singularly like those of Bombylid and Nemestrinid larvae, if one can trust in comparison the drawings by Brauer. This is very important in the establishment of the systematic position of the family.

Mr. J. L. King gives the most complete life history yet published, in his article on *Pterodontia flavipes* Gray (62). The pupa has no setae or spines except a V-shaped crest on the head, and the various adult parts are defined. The abdomen has eight segments, the anterior three each bearing a pair of elevated spiracles. The pupa of *Astomella lindemii*, as figured by Brauer, has a prominent head and no crest of spines. The abdomen shows seven segments, with spiracles on the anterior six, and the thorax bears a row of spines on the mesonotum. Malloch has described the pupa of *Ogcodes costatus* from a pupal exuvium which was in rather bad condition (97). There are no spines on any part and the thorax has a wart-like protuberance on each side of the disc anteriorly. The abdomen has wart-like protuberances on the spiracular areas of segments one to four.

Mr. J. L. King, in the above mentioned paper, recorded the oviposition of *Pterodontia flavipes* on the trunks of old hickory trees. One female laid 2,300 eggs in forty-five minutes, the largest total number being 3,977. The eggs were .18 mm. long and .15 mm. wide, pear-shaped, slightly compressed and black.

In the early summer of 1915 I was able to get some notes on *Opsobius diligens* O. S. while at Pasadena, California. On June 6, I placed a female in a glass jar and she at once commenced laying eggs, discharging them rapidly from the ovipositor, even when on

the wing. These eggs were black, papillose and pear-shaped, and did not hatch until forty-nine days later. This female laid eight hundred and nine eggs, another nine hundred and five. One lot of eggs laid April 12 hatched June 2. I placed some of the minute larvae on spiders (*Theridium tepidariorum* Koch) and they at once attached themselves to the legs and body of the host. The spiders scratched frantically at first and were seen to kill some of the larvae with their jaws. The larvae when attached would usually stand out straight from the body of the spider, resembling erect bristles. They were gray in color, twelve-segmented, including the head, and with whitish bands between the segments and black bristly hairs. When not attached they were very active. They were able to follow along a single thread of a spider web, usually proceeding like a looper. Only one mature larva was found in a spider web and this one died as it was pupating. The work on *Opsebius* was interrupted before any mature larvae could be reared and all of the material was lost.

I have found nothing in literature in regard to the behavior of spiders when confronted with one of these Cyrtid parasites and it is interesting to note their actions. I placed an adult female of *Opsebius diligens* in a battery jar, with a large female spider which had filled the bottom of the jar, with its web and was standing guard over its egg case. The fly paid no attention to the spider and kept on floundering through the web, scattering eggs as it went. The spider appeared quite disturbed and would run up to it and then turn and run back to the egg case. On one occasion the fly approached very near this treasure and I prepared to rescue it when the spider came rushing out, but no interruption was necessary. The spider tried to scare away the little intruder by nipping at it but soon lost courage and ran back in her tunnel. This is all the more remarkable in view of the fact that the spider had not been fed for two or three days. To test her I threw in a couple of house flies and saw them crushed and carried into her parlor without any hesitation; a large blue bottle fly met the same fate. There seems to be some recognition on the part of the spider that this small fly is something out of the ordinary. It may have an instinctive dread of its parasite and recognize it at once. The continual humming noise made by this fly was not the cause of this fear, for the body of a freshly killed specimen was

placed in a web with two spiders and was approached warily but not touched. It may be that all spiders would not show such consideration for this fly. It would be reasonable to suppose that it would arouse fear in only those spiders which were parasitized by it.

In the case of *Pterodontia flavipes* the period of incubation was recorded by King as thirty-two and thirty-three days, the larvae emerging from a lid-like opening at the pointed end of the egg. These first stage larvae are campodeiform, dark brown or black in color and about 0.25 mm. long, the body composed of twelve segments including the head. The caudal end of the eighth abdominal segment has a sucker or disk which serves for attachment. On each side of the caudal disk is a long stiff spring-bristle used in leaping. There are no spiracles. On the caudal margin of the eighth segment are two crescentic areas resembling spiracles; these are notches in which the caudal setae, or spring-bristles, rest when the larva stands erect. The larvae are quite active, particularly at night, and leap five or six millimeters. They crawl by extending and contracting the body segments.

### Classification

#### Key to the Subfamilies

- Prothorax abnormally enlarged and meeting above in front of the mesonotum.  
Wing venation more or less complete, but never complex, and the cross-veins may be lacking. Proboscis short or moderately long, never entirely aborted. Abdomen never abnormally inflated, in some cases rather slender.  
Tropical species. . . . . **Philopotinae**
- Prothorax normal, not unusually developed. Third antennal joint long, often laterally compressed; North American forms, except *Palaeoidea*, with no apical arista or hair-like rays. Venation complete, often complex. Proboscis short or long, in some species longer than the body. . . . . **Panopinae**
- Prothorax not unusually developed. Wing venation often much reduced. Antennae small, inconspicuous, and with a terminal arista or hair-like rays. Abdomen usually swollen in appearance or balloon-shaped. . . . . **Cyrtinae**

#### Table of North American Genera

1. Prothoracic lobes greatly enlarged, meeting in front of the thorax. Proboscis elongate. . . . . **Philopota**
- Prothoracic lobes not forming a shield in front of the thorax. . . . . 2
2. Proboscis small, aborted. . . . . 3
- Proboscis elongate. . . . . 9

TRANS. AM. ENT. SOC., XLV.

3. Antennae elongate, the third joint large . . . . . 7  
 Antennae short and inconspicuous . . . . . 4
4. Antennae inserted below middle of head in profile . . . . . 5  
 Antennae inserted above middle of head in profile . . . . . 6
5. Third joint of antennae with three terminal setae. Wing with costalmargin enlarged near the tip of the first vein, with a spur in the male.
- Pterodontia**
- Third antennal joint with a slender terminal arista. No tooth on the costal margin . . . . . **Ogcodes**
6. Venation complete; usually quite thickly pilose species with pilose eyes.
- Opsebius**
- Venation more or less modified, some of the veins obliterated or rudimentary. Thinly pilose species with bare eyes . . . . . **Acrocera**
7. Eyes bare . . . . . **Apellela**  
 Eyes pilose or pubescent . . . . . 8
8. Third antennal joint large and without terminal bristles . . . . . **Ocnaea**  
 Third antennal joint with terminal bristly hairs . . . . . **Pialeoidea**
9. Large flies with no palpi and usually two ocelli. Proboscis very long.
- Lasia**
- Moderately large flies with distinct palpi and three ocelli on a more or less prominent tubercle . . . . . **Eulonchus**

The Australian genus *Nothra* probably does not occur in North America. Dr. Williston in his Manual states the following: "The occurrence of *Nothra americana* Bigot in North America is doubtful. If, however, Bigot correctly recognized it, the species should be sought for under *Oncodes* [*Ogcodes*]." I believe that Bigot had before him a female of *Pterodontia misella* O. S. when he wrote this description.

#### PHILOPOTINAE

The Philopotinae are not represented in America north of Mexico. There are three species described from Mexico, all in the genus *Philopota*. (This group is typically South American.)

#### PHILOPOTA

Wiedemann, Aussereurop. zweiff. Ins., ii, p. 17, (1830).

Erichson, Entomographien, p. 152, (1840).

Bigot, Ann. Soc. Ent. Fr., ser. 5, viii, Bull. p. lxxi, (1878), *Oligoneura*.

Antennae perfect and approximate, inserted far down on the head, just above the proboscis. The proboscis elongate and carried back beneath the body. Eyes contiguous and hairy. Ocelli three. The prothoracic lobes, as in others of the subfamily,

are extraordinarily developed, being contiguous in front of the thorax; thus differing from all other Diptera. The abdomen is conical in shape.

The venation is quite simple and is put between *Ogcodes* and *Aerocera* by Verrall, who described the venation of *Philopota truquii* Bellardi. He was not sure of some of the veins. The vein following the second longitudinal is incomplete and may be the upper branch of the third vein, and in that case there is no discal cell. The almost complete branch of the fourth vein can be made out, and the fifth longitudinal and anal veins. Verrall considers the cross-vein a beginning of the upper branch of the fourth vein. The two basal cells are not distinct.

Type.—*P. conica* Wiedemann from Brazil.

#### *Synopsis of Species*

1. Black species, with yellow markings and silvery-white pubescence . . . . . 2  
Dark brown species, bronze pilose . . . . . **truquii** Bellardi
2. Strongly marked with yellow on thorax and abdomen . . . **lugubris** Williston  
Species with few yellow markings, abdomen black except narrow yellow lateral margins . . . . . **dolorosa** Williston

#### **Philopota lugubris**

*Philopota lugubris* Williston, *Biologia, Dipt.*, p. 297.

"Deep black with yellow markings. Frontal triangle silvery-white pubescent. Antennae black. Labium short, black, the proboscis otherwise light yellow. Prothorax above yellow, its median line brown. Mesonotum and scutellum brassy black, finely punctulate, moderately shining; on either side of the mesonotum in front a yellow spot connecting with the yellow of the pronotum; post-alar callosities yellow. Mesopleura silvery pubescent. Abdomen black, silvery pubescent; first four segments with an interrupted yellow band on the posterior part, that on the second forming two large sub-concentric spots, the others narrower; on the fifth segment a narrow yellow hind border; all these segments with the posterior angle broadly yellow. Femora black; their tip, the tip of the tibiae, and the basal joints of the tarsi, yellow; tibiae and tarsi otherwise reddish or brownish. Wings tinged with yellowish. Length 6-7 mm.

"Hab. Mexico, Xucamanatlan and Amula in Guerrero at 6,000 to 7,000 feet (H. H. Smith).

"Four specimens. In one of them the yellow on the margin of the fourth and fifth abdominal segments is wanting. Although the markings are very similar to those of *P. truquii* and *P. conica*, the present species cannot be identified with the former on account of its black color, nor with the latter by reason of yet more pronounced differences."

**Philopota dolorosa**

*Philopota dolorosa* Williston, *Biologia*, Dipt., p. 298.

"Very much like *P. lugubris*; but the frontal triangler is larger, reaching midway to the ocelli; the abdomen is wholly without yellow, save the very narrow lateral margins of the segments; the mesothorax also lacks the large yellow spots, and there is only a small yellow spot on each side of the posterior margin of the pronotum. The legs are black, with the knees and basal joints of the tarsi reddish. Length 6-7 mm.

"Hab. Mexico, Amula in Guerrero (H. H. Smith).

"One specimen. I cannot believe that the strongly marked differences between this and the preceding species are merely varietal, though such is possibly the case. I am unable to determine the sex; it appears to be the same in our examples in both forms."

**Philopota truquii**

*Philopota truquii* Bellardi, *Saggio*, i, p. 77, pl. 2, f. 20.

(Transl.) "Dark brown, yellow, and ashy, everywhere dense bronze pilose. Head small and subspherical; the occiput fuscous; the frons is dense golden pilose; the antennae are black. The face is black, shining and bare. The proboscis is long and light yellow in color. Thorax very gibbous, the prothoracic lobes on the anterior margin and inner side spotted and marked. The sides of the thorax and scutellum are fuscous, bronze pilose, in zig-zag lines; prothoracic lobes contiguous; spots and vittae rufous rose. Abdomen ovate, incrassate; all of the segments with posterior margins and sides rufous rose-colored, bands slightly interrupted dorsally, dentate on the edges; venter colored and marked as the dorsum of the abdomen. The femora shining black, at the base and below irregularly marked reddish-brown and banded. The knees, tibiae and tarsi at base flavous, tibiae and tarsi pale. Wings long, anterior margin yellowish; the veins brown-black. Calypters broad, whitish and white pilose with yellow margins.

Length of body, 8 mm.; of wings, 19 mm."

*Habitat*.—Mexico, Cuazimalpa (Truquii).

## PANOPINAE

There are several genera in this group in North America: *Pialeoides*, *Apelicia*, *Oenaca*, *Lasia* and *Eulonchus*.

**PIALEOIDEA**

*Pialeoides* Westwood, *Trans. Ent. Soc. London*, p. 514, (1876).

*Pialeoides*, Aldrich in *Catalogue*, 1904.

"Head small, eyes very nearly contiguous, hairy; two ocelli on vertex. Proboscis short. Antennae longer than head, inserted on a tubercle before and near the ocelli, the bases contiguous, three-jointed; the two basal joints short, third joint long,



subcylindrical, the apex with setae. Scutellum transverse; abdomen ovate, thorax barely wider; wings short, the venation as in *Pialea*; middle longitudinal veins extending straight to posterior margin of wing, however. Near the genus *Pialea*, differs in the insertion of the antennae and also in the median longitudinal veins."

### **Pialeoidea magna**

*Pialeoidea magna* Walker.

*Crytus magnus* Walker, List.

"Dark luteous, disc of thorax and transverse spot on abdomen black. Length 7 lines. Expanse 13 lines.

"Dark luteous, luteous pilose. Head black, luteous pilose, antennae piceous, third joint (except base) black. Disc of thorax and transverse bands to base of abdominal segments bronzy-black. Tarsi pale, the unguis black. Tegulae pale fuscous. Wings lutescent, veins brownish."

*Habitat*.—Georgia. Type in British Museum.

### **Pialeoidea metallica**

*Pialeoidea metallica* Williston, *Biologia*, Dipt., i, p. 165.

"Thorax metallic green; abdomen brown, shining, the segments with paler hind margins; legs reddish yellow; wings brownish. Length 5-6 mm.

"Hab. Guatemala, Antigua (Stoll).

"The third joint of the antennae is broken and for that reason I cannot refer the species to the genus *Pialeoidea* Westwood, with certainty. The head is remarkably small, the eyes separated by a narrow front, and the wings very near like those figured by Westwood; the scutellum is rather broad; but there are three instead of two ocelli; and the occiput is very much developed (as in Westw., l. c., fig. 3a), and if seen from the side it occupies one half of the breadth of the head (differing therefore from l. c., fig. 3b). The venation differs in the following principal points: the second basal cell is connected with the margin of the wing by a vein running between the fifth posterior cell and the anal cell (in the figure quoted this vein is omitted, and these cells coalesce; is not this omission accidental?); the fourth posterior cell is not in contact with the second basal cell; and the second submarginal cell is of a different shape, *c. g.*, longer and broader at the base.

"The vertical triangle is large, somewhat protuberant; the ocelli equidistant. The eyes pubescent; beneath the vertical triangle approximate but without coming in contact; below the antennae almost touching. The antennae are inserted in the middle of the head, within a space formed by an emargination of the eyes; their basal joints in close contact. Proboscis short.

"Head black; basal joints of the antennae brown; the vertical triangle greenish metallescent. Thorax metallic green, beset with scattered, erect, moderately long, yellowish hairs; scutellum more bluish metallic. Abdomen brown, hind margins of the segments with a whitish border, both on the dorsal

and on the ventral sides; pubescence short, dark, and little conspicuous on the upper side; paler hairs toward the tip and on the venter. Stem of the halteres brownish; knob whitish yellow. Tegulae pale with a pale brownish border. Coxae blackish, paler at the tip; legs brownish-yellow; ungues black. Wings pale brownish, somewhat darker along the costa, and lighter within the basal cells; costal and first veins dark brown; the first vein becoming perceptibly stouter toward the tip. A single female.

"N. B. The hind part of the mesonotum being injured by the pin, I cannot describe the praescutellar callosities, etc."

#### **APELLEIA**

*Apelleia* Bellardi, Saggio di Ditt. Messic., Append., p. 17, (1862).

Osten Sacken published a note on *Apelleia*,<sup>3</sup> and it appears

<sup>3</sup>Berlin. Ent. Zeitschrift, xvii, p. 297.

that the genus holds a rather precarious position. *Apelleia* differs from *Ocnaca* Erichson in its glabrous eyes only. *Exetaxis* Walker also has glabrous eyes (judging from the plate, the author making no mention of it), and shows other differences, especially in the venation, and yet is considered a synonym of *Ocnaca*. The genus *Ocnaca*, however, shows considerable variation in venation. Osten Sacken had a new species from Central America at the time of writing the above article which was an *Ocnaca*, except for its glabrous eyes, and therefore agreed with *Apelleia*. Professor Bellardi correctly compared *Apelleia* to *Eriosoma* Macquart and *Exetaxis* Walker and gave the differences, but both of these genera are now considered synonyms of *Ocnaca*.

(Transl.) "Body pilose. Eyes bare, very finely and uniformly reticulated. Two ocelli, moderately distant. Antennae inserted on the vertex, exceeding the head in length, and almost contiguous at the base; three joints, the first short, the second a little longer, third much longer and linear, without a style. Proboscis short. Abdomen subspherical. Femora incrassate, the tibiae large (swollen) at apex, spurred. The first joint of the tarsi longest; the second, third and fourth joints of the posterior tarsi long but not equal to the first. The second, third, fourth, and fifth joints of the anterior tarsi short, subequal. Two submarginal and five posterior cells, the first posterior divided by a cross-vein and closed in the margin."

**Apelleia vittata**

*Apelleia vittata* Bellardi, l. c.

(Transl.) "Male. Fuscous, yellow vittate. Head small, depressed in front. The eyes are finely and uniformly reticulated, contiguous at the base of the antennae and at the epistoma. Vertex small, dark brown, rather long brown pilose. First and second joints of antennae short and subequal, the third twice the length of the first two. The palpi yellowish pilose. Thorax convex and covered with dense yellowish pile, yellow in ground color. Three large longitudinal fuscous vittae, the median reaching from anterior margin to scutellum, those on the sides not reaching the anterior margin and joined with the median vitta at the base. Pleura flavous, pectus dark brown. The scutellum is large, yellow and with yellow pile. Halteres luteous, knobs fuscous. Abdomen large, short, broad and rather rounded; very convex, and with yellowish pile. The abdominal segments all fuscous, with stripe on posterior margin, the band about equal in width to one-third of the segment; yellowish red in color, the posterior and lateral margins contiguous. Venter concolorous, in small part fuscous, the bands largely yellow. Legs all yellowish brown, except the apex of the fifth joint of the tarsi of anterior legs, and second, third, fourth and fifth joints of posterior tarsi which are black. Posterior claws long, pointed and black; the anterior claws mostly rufous. Wings yellowish, at base subhyaline, longer than the abdomen.

Length of body, 11 mm. Wing expanse, 26 mm."

*Habitat*.—Playa Vicente, Mexico (Sallé). Coll. Bellardi.

**OCNAEA**

*Ocnaca* Erichson, Entomographien, p. 155, (1840).

?*Eriosoma* Macquart, Dipt. Exot.

*Exetaris* Walker, Insecta Saunders.

*Ochaca* Hunter, Trans. Amer. Ent. Soc. Phila., xxii, p. 151.

Head rather short and occiput not swollen. Proboscis very short, covered by the lower point of the face. The antennae are placed on the vertex, almost erect, longer than the head, three jointed, the first two joints short and the third long and varying in shape. The second joint with a few hairs above. The eyes are rather long and dense pilose and meet below the antennae. Erichson in his description of the genus, noted that by close observation a small line-like space was seen between the eyes in the whole length from the vertex to the face. In the known species from North America there are two ocelli on the vertex, placed on the front rim of a rather broad tubercle. The thorax and abdomen are thickly and finely, almost silky haired. Humeral callosities large. Scutellum short. Abdomen rather short and broad, but not greatly swollen as in some genera. In the female

the wings reach a little beyond the tip of the abdomen. The venation varies somewhat in different species but the general type is the same.

According to Erichson this genus comes near *Astomella*, the resemblance being like that of *Lasia* and *Panops*. The species are of good size for this family.

### *Synopsis of Species*

1. Species without black markings.....**micans** Erichson  
Marked with black on the abdomen .....2
2. All longitudinal veins reach the wing margin.....4  
Some of the longitudinal veins do not reach the margin.....3
3. First posterior cell closed; lateral margins of abdominal segments yellow.  
**helluo** O. S.  
First posterior cell open; lateral margins of abdominal segments black.  
**coerulea** new species
4. Thorax and scutellum black.....**schwarzi** new species  
Thorax and scutellum largely yellow; third antennal joint club-shaped.  
**loewi** new species

#### **Ocnaea micans**

*Ocnaea micans* Erichson, Entomographien, p. 155, (1840)

(Transl.) "Fuscous, thorax shining and with ashy hair, second and third segments of abdomen testaceous. Length  $4\frac{1}{2}$  lines.

"Antennae black, the base testaceous, third joint elongate, linear, before apex enlarged, apex pointed (third joint club-shaped). Head black, black pilose, hypostoma acuminate. Thorax fuscous, dorsal prothoracic lobes and mesothoracic callosities before scutellum testaceous, clothed with thin ashy hair, silky, shining. Abdomen thinly gold pubescent, fuscous, below concolorous, above the second and third segments testaceous, small triangular basal spots are fuscous, apex of fourth and fifth margined testaceous. Legs fuscous, base of femora, knees and tarsi testaceous. Wings yellowish hyaline, two submarginal cells, five posterior, three discoidal. Squamae hyaline, margined brown. Halteres blackish."

*Habitat*.—Mexico. Collected by Deppe.

#### **Ocnaea helluo**

*Ocnaea helluo* O. S., Western Dipt., p. 278, (1876).

"Two submarginal cells; five posterior cells, the first divided in two by a cross-vein, and the second half of it closed and petiolate; all the longitudinal veins reach the margin; body black, beset with short yellowish pile; hind margins of the abdominal segments with broad yellow borders, expanding along the lateral margins; legs yellow, including the coxae. Length 13-14 mm.

"The venation is like that of *O. calida* Wiedemann<sup>4</sup> with the following modifications: 1. The third vein emits a branch some distance beyond the cross-

<sup>4</sup> Auss. Zweifl., ii, tab. VII, f. 2b.

vein dividing the posterior cell; thus a second submarginal cell is formed; 2. The cross-vein in the first posterior cell is just opposite the cross-vein at the base of the second posterior cell, and not far beyond it as in Wiedemann's figure; 3. The vein between the second and third posterior cell reaches the margin; 4. The fourth posterior cell, which is closed, is much longer, forming an irregular parallelogram with a cross-vein at its base. Antennae dark brown, basal joints reddish, the elongated third joint also somewhat reddish on the inner side. Thorax black, shining, and clothed with dense and soft yellowish gray pile, almost rendering it opaque; humeral callosities whitish yellow; antealar callosities brownish. Abdomen black, densely clothed with short, erect, yellow pile; all the segments with broad, clay-yellow hind borders. Legs including coxae yellow, the extreme end of the last tarsal segment and ungues black. Wings very slightly tinged with brownish; costal cells a little more saturate.

"Hab. Dallas, Texas (Boll). One specimen.

"Observation.—This fine species is not unlike Erichson's figure of *O. longicornis* (Entomographien), but the venation is different, the black on the abdomen occupies more space, the hind tibiae are brown, the abdomen much stouter; the size is larger by one-half than the figure."

Dr. Williston published a note on this species in these TRANSACTIONS. In this specimen the outer first posterior cell was but slightly coarctate, not closed and petiolate; otherwise it agreed well with the description.

**Oenaea schwarzi** new species (Plate III, fig. 13.)

Head black, the mouth opening apparent; short yellowish palpi. Thorax and scutellum metallic blue black, clothed with silky brown pile which has yellowish gray reflections in certain lights. Antennae black with dull reddish color in places, the third joint velvety. Humeral callosities yellowish, a small obscure reddish yellow spot on the thorax just back of them. Squamae grayish hyaline with blackish brown margins.

First segment of abdomen short and bulging out above the second. The posterior half and sides of the abdomen brownish yellow; the basal cross bands metallic blue black with soft brown pile. On the fifth segment the black is confined to a median spot. Venter yellowish with the bases of the segments broadly brown. Pleura blackish brown, the color extending down on the coxae.

Legs brownish yellow; the tibiae with two spurs, the outer one large. Tips of tarsi and claws black, the pulvilli rather small and with longer fringe than usual. Pile of legs short, yellowish gray and shining. Wing veins strong and black, the membrane gray hyaline, a little brown along the costa. The vein between first and second posterior cells does not reach half way to the margin. In one wing the vein between the second and third posterior cells stops a little short of the margin. Length, 9.5 mm.

*Habitat*.—Cayamas, Cuba. (Schwarz coll.)

The holotype, a male, is No. 21207 in the United States National Museum.

**Ocnaea loewi** new species (Plate III, fig. 12.)

Head blackish brown, vertex lighter. Eyes black. Body dull yellow, brownish in places. The face reduced to a small protuberant triangle, black in color and very short. Mouth opening apparent; mouth-parts rudimentary as in others of the genus and yellow in color. Eyes with rather long, yellowish brown hair. First two joints of antennae short and brownish yellow, the third joint except the brownish base, and club-shaped (see fig. 12b). The inner side of the third joint with a yellow longitudinal stripe and with a few short hairs at the tip.

Thorax brownish yellow. A dark brown wedge-shaped mark on dorsum, broad anteriorly and narrowing to a point a little beyond the center. On each side of this, above the root of the wings is a dark brown spot of irregular shape. Thorax with rather long golden yellow pile, blackish brown around bases of coxae. Scutellum yellowish brown with yellow pile.

Abdomen very broad and brownish yellow in color, with yellow pile. Segments two, three, four and five with basal black bands which do not reach margins; on third, fourth and fifth they are broader in the middle. Venter brownish yellow, the first three segments mostly blackish, and as on the chest (pectus) with thin gray pollen. Posterior margins of the first three segments irregularly and narrowly yellowish.

Legs quite strong and yellow in color. Tibial spurs brown and claws black. Tip of last tarsal joint dark brown. Legs with short yellow pile. Wing venation conforming to the general type. Anal cell very short petiolate. Lower branch of third vein does not reach wing margin. Fifth posterior cell closed in the margin, not long petiolate as in *O. schwarzi*. The costal, subcostal, marginal, most of submarginal and upper half of first posterior cell thickly covered with minute hairs. This is an unusual thing in the Cyrtidae. Length, 9 mm.; wing, 9 mm.

Holotype, a female, in the Museum of Comparative Zoology at Cambridge. The specimen is labelled "Loew" and with a square orange label, which denotes that it was collected in Texas. This species must be near *O. micans* Erichson.

**Ocnaea coerulea** new species (Plate IV, fig. 14.)

Head black and very short (see fig. 14a). Eyes thickly black pilose. Palpi yellow with yellow hair. Antennae blackish brown, the third joint very long and grooved or hollowed out on the outside as in *O. schwarzi* (see fig. 14b).

Thorax, scutellum, pleura and coxae thickly covered with silky, yellowish gray, erect pile. Thorax and abdomen very dark metallic blue, almost black. Pleura and coxae brownish black with a purplish luster. Fore coxae marked with yellow. The humeral callosities yellow and some brownish yellow color on the praescutellar callosities. Hind margin of scutellum yellowish. Squamae hyaline, with whitish yellow pile and yellow brown margins.

Abdomen thickly clothed with a yellowish gray, silky pile, which has a purplish brown sheen in certain lights. Hind margins of segments two, three and four yellow, the yellow not meeting in the center; on the third segment the yellow is quite widely separated. The yellow does not attain the lateral margins (see fig. 14). Venter black with purplish metallic reflections and irregular yellow spots near the lateral margins of the segments. Genitalia yellowish.

Legs yellowish, the two front pair with brown below. Hind legs dark brown above. Claws and tips of last tarsal joints black. Wings hyaline, the veins brown and distinct. The longitudinal veins reach the wing margin. The cross-vein in the first posterior cell is beyond the cross-vein at the base of the second posterior, thus differing from *helluo* O. S., from which it also differs in having the first cell widely open. The fork at the end of the third vein is very wide. Length, 12.5 mm.

One specimen, a male, collected at Austin, Texas, November 11, 1899.

*Type*.—In the collection of Prof. A. L. Melander.

There are six other species of this genus: *calida* Wiedemann, *longicornis* Erichson, *lugubris* Gerstaecker, and *tumens* Walker from Brazil; one species, *trichocera* O. S., from Panama; one species, *grossa* O. S., described from Costa Rica. The last named species is figured on Plate IV, figure 15; being redrawn from Van der Wulp's figure in the *Biologia*.

### LASIA

*Lasia* Wiedemann, Anal. Ent., p. ii. Ausser. Zweifl. Ins., i, p. 329, (1824).

Flies of good size, some of the species being very large. The proboscis is very long, projecting beyond the tip of the abdomen when at rest. The base of the proboscis is covered with a prominent shield; the labellae are slender and scarcely to be distinguished from the rest of the proboscis. Apparently there is no face, the proboscis coming out about the middle of the head, in profile just below the antennae. Head composed almost entirely of the eyes, the occiput even more restricted than is usual in the family. Frontal triangle very small. First joint of the antennae almost buried in the head, second joint short and cylindrical, third long and cylindrical, or more or less compressed, usually pointed. The eyes are pilose and are contiguous above the antennae (see Plate II, fig. 11a). The ocellar tubercle is said to be very prominent in a few species, as in *L. ocelliger*, which is described as having one ocellus. The usual number of ocelli is two.

The body is more inflated than in *Eulonchus* as a rule (see Plate II, fig. 11). Pleura inflated, the humeral calli quite large. Thorax and scutellum distinctly pilose in most species. Scutellum rather short and wide. Abdomen large and swollen. Male genitalia of the same general type as found in the other genera of the family. The female genitalia are retracted. Legs moderately strong, with a tooth-like apical spur above and a sharp projection below. Wings rather long and narrow with a very complex venation. (See Plate I, fig. 1.)

Wiedemann described three species in two genera, of which he placed the one in the Bombyliidae, the others in the Cyrtidae (Henopier). The latter he took as identical with *Panops* Lamarek, with which it undoubtedly agreed in the long proboscis and the three-jointed antennae, but in the location of the latter it differed. Macquart correctly recognized the relation of Wiedemann's *Panops* and *Lasia*, but followed Wiedemann in that he placed the Brazilian species under *Panops* Lamarek; their proper place is in the genus *Lasia*.

The venation of *Lasia*, which has been explained in the general summary of the family, is very close to that of the Nemestrinidae. The auxiliary, first, second and third veins are simple, the first and auxiliary veins being long. The third vein has a short praefurca, a thick discal cross-vein arising near it, running almost parallel with the upper branch of the third vein until near its end where it goes into a fork, the branches about equal and ending before the wing tip. At the fork is a supernumerary cross-vein tying the third vein to the upper branch of the fourth longitudinal near the end of the discal cell. The discal cell is very long and narrow and emits three veinlets, the upper in line with the upper side of the discal cell, the second sloping down somewhat, the third recurrent and closing the fourth posterior cell. The fifth vein is forked in almost the usual way and the upper branch just connects with the discal cell (no cross-vein), then diverges until caught by third vein from discal cell, bends down to wing margin. Lower branch of fifth longitudinal slopes down and joins anal vein, closing anal cell considerably before margin. First basal cell short and broad, but the long cell above the discal cell is really a portion of the first basal and not a portion of the first posterior cell. Second basal rather long and narrow. The discal cell is absent in *Hirmoncurea* (Nemestrinidae).



The species in this genus are distinguished from *Panops* by their geographical range, metallic colors and the position of the antennae. They differ from *Eulonchus* in the structure of the proboscis, the absence of the palpi and there is a slight difference in the venation. The eyes are widely separated below the antennae.

### **Lasia klettii**

*Lasia klettii* O. S., Report on Wheeler's Survey, v, Zoology, p. 804, (1873).

"Metallic green; feet black. Length, 17 mm. (through body end to end). Altogether metallic green, with golden reflections, the upper side finely and evenly punctured; venter more bluish; feet altogether brownish black, by one half longer than the body; antennae very short, black; base of third joint slightly reddish; this joint more than twice as long as the first two together, gradually tapering toward the tip. Wings distinctly infuscated; tegulae brownish, bordered black. Alcohol took off all pubescence; some vestige on thorax proves that it was clothed with short pale hairs.

"Camp Apache, Ariz., September, 1873. Collected by Francis Klett.

"Observation—I place this species provisionally in the genus *Lasia*, to which it is related. It differs from Wiedemann's figure of *Lasia* in the fact that the second longitudinal vein ends in the first and not in the costa. It differs from *Eulonchus* in the eyes being contiguous between the antennae and the vertex only, and not above and below the antennae. The abdomen is very convex; it is broad and cut squarely at the base; broad and blunt at the tip (not tapering as in *Eulonchus*). In the figure the hind tarsi are broken off."

Dr. Williston published on this species in these TRANSACTIONS. He had two specimens of a large and beautiful Cyrtid from New Mexico. "The species is almost entirely bare, the sparse, short, black and light colored hairs on the dorsum of the thorax are hardly discernible. In the South American species of the genus *Lasia* there is always considerable vestiture. This fact and the termination of the second vein in the first makes its location in the genus doubtful. In these specimens I can see scarcely any golden reflections, but, on the contrary, a pronounced blue or violet reflection, almost obscuring the green of the abdomen of one. The stumps of veins on the anterior branch of the third vein and near the tip of the fourth vein are wanting."

If the two specimens above mentioned are the ones now in the Kansas University collection, and it is very probable that such is the case, they should be placed under *Lasia scribae* O. S.

***Lasia scribae***

*Lasia scribae* O. S., *Biologia*, Dipt., i, p. 166, (1887).

Male. "Thorax metallic green, with violet reflections, abdomen metallic violet, with bluish and greenish reflections towards the end; legs black; antennae broken but probably black; wings with a brownish tinge. Length, 17-18 mm.; proboscis, 18 mm.

"Hab. Guatemala (coll. O. S.).

"In one of the specimens the violet (amethystine) reflections on the thorax takes distinctly the shape of stripes—in the middle a pair of longitudinal stripes, abbreviated behind, and, on each side, another stripe, abbreviated in front; in the other specimen these stripes are not so distinctly marked. The surface of the thorax and abdomen are finely but densely punctate. A pale yellow, more or less recumbent pubescence is visible principally on the anterior half of the thorax and on the last two segments of the abdomen; on the pleurae are more dense and villose pale yellow hairs; some stiff black hairs among the yellow ones on the thorax, especially around the root of the wings and the base of the scutellum. The pubescence of the eyes is a generic character. The tarsi, especially on the under side, are beset with short rufous hairs, so much so that the hind pair appears rufous, although the ground color is black. Tegulae yellowish-brown with a black margin. Wings with a uniform pale brownish tinge, with black veins; the second vein ending in the first close before its tip; the anterior branch of the third vein reaching the costa at the tip of the first vein. Two specimens (the one is a male, the other has the end of the abdomen injured). I dedicate this species to Dr. Scriba, who kindly gave me the specimens.

"N. B.—The venation of this species differs from that of the *Lasiae* whose wings have been figured by Wiedemann,<sup>5</sup> or by Guérin;<sup>6</sup> the second vein ending in the first, and not in the costa, and the anterior branch of the third vein reaching the costa at the very end of the first vein.

"That the venation in the genus *Lasia* is not always the same is proved by *L. kletti* O. S. in which the second vein reaches the costa at the end of the first. The species is from Arizona, and not unlike *L. scribae* in its general appearance."

*Lasia auricoma* Westwood, from Brazil, to judge from the description, may resemble *L. scribae*; but it is only half an inch long; the tarsi are said to be "lutei," the tegulae "chalybae."

Two male specimens in the Kansas University collection answer the description of *Lasia scribae*. These two specimens are determined *Lasia kletti* O. S. and have a label "det. S. W. Williston." They are very probably the two mentioned above under *L. kletti*, on which Dr. Williston published in these TRANSACTIONS. The larger specimen answers the description on *L. scribae* almost per-

<sup>5</sup> Ausser. Zweifl. Ins. i. t. 1. f. 3. and ii. t. 9. f. 2.

<sup>6</sup> Iconogr. t. 91. f. 9.

fectly and has the three purple stripes on the dorsum of the thorax well defined. Length, 16.5 mm.; length of proboscis including basal shield, 23 mm.

The smaller specimen (Plate II, fig. 10) is more blue green and less purple. The infuscation of the wings is paler and there is none of the black pile on the thorax at the base of the wings, and on the pleura. The femora are blackish purple instead of black and the pile on the tibiae and tarsi pale. The tibiae are blackish with a purple luster, tarsi brown, the pile quite long and thick. The hair of the eyes is distinctly longer and yellowish white. Antennae blackish brown, second joint with a few short hairs, third joint pointed and yellowish at the extreme base. Squamae purplish brown with black rims. Genitalia clothed with yellowish pile, longer than on the rest of the abdomen, and about the same color and length as that on the venter. The venter is entirely metallic purple. Length, 14.5 mm.; length of proboscis, 16 mm.

A single specimen in the National Museum is very near *scribae*. It is labelled "Coll. C. V. Riley" and is determined *Lasia scribae* with a query. The wing is shown on Plate I, figure 1. The eyes are thickly covered with short brown pile; the occiput closed with black pile. Pleura and humeri with long fine black pile. Venter shining brown with purple and coppery green reflections, thinly covered with rather long black pile. The pile on the squamae and pleura is wool-like and long. The legs in this specimen are badly broken up but were apparently brownish in color. Coxae with a purplish color.

One specimen, from Mexico. Length, 18 mm.; proboscis, 19 mm.; wing, 15.5 mm.

### EULONCHUS

*Eulonchus* Gerstaecker, Stett. Ent. Zeitg., xvii, p. 359, (1856).

Head rather flattened in front. Antennae in center of head in profile. First two joints short and cylindrical, the third long and strap-shaped, and ending bluntly or in a point. As in the rest of the family the head is composed almost entirely of the compound eyes. Eyes contiguous, or nearly so, for some distance above and below the antennae. The ocellar triangle is usually high and wart-like, and there are three small ocelli, the front one on a

separate projection of the tubercle. The proboscis is greatly elongated, reaching beyond the end of the abdomen in *smaragdinus*. The tip of the proboscis is pronged, the labella being very large, as in the genus *Bombylius* (Bombyliidae). Near the base of the proboscis are the rather small palpi, slender, pencil-shaped and with several fine bristles at the tip.

Thorax not so strongly convex as in some of the other genera and the abdomen more slender. Scutellum small, short. Abdomen six-segmented and tapering. The male genitalia are plainly visible. Thorax and abdomen covered with fine pile which does not conceal the ground color. Legs rather slender but not weak, the tibiae spurred. Wings of good size, the venation much as in *Lasia*, but the marginal cell is widely open and the veins inclosing the second submarginal are diverging at the tip and not parallel or converging.

This genus, as Gerstaecker noted in his original description, is close to *Lasia*, differing in the insertion of the antennae and in the more elegantly formed body. *Eulonchus* also differs in the possession of palpi and eyes that are contiguous below the antennae.

#### *Synopsis of the Species*

- |   |                                |
|---|--------------------------------|
| 1. Legs altogether yellow . . . . .   | 3                              |
| Legs, or at least femora, black . . . . .   | 2                              |
| 2. Tip of femora and greater part of tibiae whitish yellow, the tegulae uniformly white . . . . .                       | <b>tristis</b> Loew            |
| Legs altogether black, only the knees paler, tegulae margined with black . . . . .                                      | <b>marginatus</b> O. S.        |
| 3. Proboscis curved and longer than the abdomen; usually quite large and metallic green in color . . . . .              | <b>smaragdinus</b> Gerstaecker |
| Proboscis straight and as long as the abdomen, often shorter; smaller species, blue, green or purple in color . . . . . | <b>sapphirinus</b> O. S.       |

***Eulonchus smaragdinus*** (Pl. IV, fig. 16.)

*Eulonchus smaragdinus* Gerstaecker, l. c.

“The body is of a beautiful, shining emerald green, that on the scutellum shows a slight tinge of bluish; the thorax is above as well as below thickly covered with long downy yellowish hair, which stretches back to the scutellum. Much finer and sparser, the hair on the abdomen is also more on the sides, where it is especially heavy on the hind margins of the segments and thickest on the third and fourth. The long hair of the eyes, which is thick and brushy, shows a paler yellow color, more of a whitish. On the antennae the first two joints and the base of the third are tinged reddish, the large part of the latter blackish, however. The legs are, with the exception of the coxae, which are the color of

the body, a weak yellow, the tarsi darker, more of a reddish color; of like color are the halteres also. The wings are hyaline, the veins blackish brown, the costal border reddish to the tip; the squamae are tinged brownish yellow.

"Two, judging from the slender body, male specimens, from California."

Osten Sacken collected this species in California and notes the following: "Not uncommon on the sands about Lone Mountain, San Francisco, according to Mr. H. Edwards. The three specimens which I have are females. Two males from Mr. Edwards are smaller (one only 10 mm.), the proboscis is shorter, although still exceeding the abdomen in length; the coloring is bluish on the thorax, purplish on the abdomen. Are they males of this species? If they are, Dr. Gerstaecker was mistaken in describing his green individuals with long proboscis as males."

A. L. Melander gave some notes on two specimens of this species,<sup>7</sup> both green females, measuring 8 and 10 mm. These were taken in Marin County, California. In the specimens I have studied the pile is more golden yellow and thicker, especially on the thorax and abdomen, than in *E. tristis*. The legs of most specimens are bright yellow, a black spot on the hind tibiae covering the spur. The halteres are yellow. The ocellar tubercle is not so high as in other species of the genus. The first two joints of the antennae are yellowish brown, and the proboscis is very long. The second submarginal cell petiolate, the anal cell closed in the margin. One specimen from Los Angeles, California, measures 11 mm., the proboscis, 16 mm.

Two smaller specimens from Santa Monica, California (one of which is shown in fig. 16), have very little bluish reflections and the antennae are dark brown. Length, 8.5 mm.; proboscis, 9.5 mm.; wing, 7 mm. The ocellar tubercle in these is very small and rounded. One small specimen from North Monterey, California, is dark and metallic blue, the tarsi dark brownish and the antennae black. The base of the second submarginal cell is angular, with a suggestion of a stump as in *E. tristis*. The ocellar tubercle is high and bifid. A specimen from Stanford University, California, has the thorax bluish green, the abdomen green, and the tarsi darkened. The antennae are black, the third joint pointed and slender. The ocellar tubercle is rather prominent.

<sup>7</sup> Ent. News, xiii, p. 181, (1902).

I have two large specimens from San Bernardino, California, which are dull metallic blue with whitish pile and light brown antennae (Coll. Van Dyke, in the U. S. N. M.). The tarsi are darkened, the ocellar tubercle low. The coxae and the pleura just above are purple. These specimens are apparently males. Another specimen of the same size and from the same locality is green in color with darker yellowish legs. The body has a slight purple tinge and golden yellow pile. The antennae are pale brown, the third joint very slender and pointed. Length, 12 mm., wing, 11 mm. One of the males was figured in Dr. L. O. Howard's Insect Book. A specimen from Los Angeles, California, has golden yellow pile and a very long proboscis, with a low ocellar tubercle. One specimen from Claremont, California, is dark bluish green with black antennae and a low ocellar tubercle.

One specimen from the Giant Forest, California, collected July 21, 1907, at 7,000 feet elevation by Prof. J. C. Bradley, is in the Cornell University collection. This specimen is large and has a very long proboscis. Some specimens from Lake County, California, have a rather low ocellar tubercle, and are blue green in color with reddish yellow pile on the thorax. The venter is blue green with narrow yellow margins to segments two, three and four. In a specimen from Los Angeles County, California, the pile on the occiput, eyes, and squamae is golden and long. The vein between the discal cell and the outer first basal does not reach the wing margin. In examining a large series of this species it will be found that (as in *tristis*) the second submarginal cell varies from long petiolate to sessile. It is the only species with a curved proboscis.

**Eulonchus tristis** (Pl. V, fig. 18.)

*Eulonchus tristis* Loew, Centuries, x, p. 236.

(Transl.) "Head green, shining, antennae and proboscis all black, palpi brownish black, ocellar tubercle as in *E. smaragdinus* Gerst., even larger, blue-black. Thorax bronze green, lower half of pleura and coxae blue, color of dorsum almost to scutellum inclined to be violet-purple, little shining. Venter steel green and more shining. Legs black, femora at apex, tibiae at base, at side and above, almost all the way to apex, whitish. Tegulae whitish; halteres pale yellow. Body furnished with close lutescent pile, thinner on the abdomen and shorter and paler. Wings hyaline, tinged with faint brownish."

A. L. Melander (104) has given some notes on *tristis*. The species is relatively common in Idaho, according to Professor Aldrich. The males sometimes have the third joint of the antennae sharp at the apex, but as a rule it is blunt in both sexes. One female from Marin County, California, has the abdomen brassy green; a pair from Idaho are blue-black. There is a great inconstancy in the juncture of the veins beyond the discal cell. In a California specimen the vein separating off the second submarginal cell is angulated near its base, and bears a short spur at the angulation; while in the Idaho specimens the vein is evenly bisinuate, although it bears a similarly placed short spur. The males have the second submarginal cell petiolate at the base; in the female it is pointed but nearly sessile, the very short petiole thickened; while outwardly the bounding veins of this cell diverge rather prominently, not being parallel as in the female.

A specimen from Stanford University (coll. Morrison) has the venter metallic blue-green, the dorsum of the abdomen bluish black with purplish reflections. The short yellow pile forms bands on the abdomen both above and below. The head and thorax are bluish green. Scutellum and thorax in front of it purplish. Femora brownish black, knees and tibiae yellowish, inner side of tibiae brownish. Tarsi and ends of tibiae light brown. Knob of halteres yellowish, the stem brown. Proboscis black, slightly longer than the body. Yellow hair on eyes and occiput; thorax and pleura yellow pilose.

This species varies as much as *smaragdinus*. One female from Muir Woods, California, has the second submarginal cell petiolate in one wing and not in the other. A male from Humboldt County, California, has the proboscis shorter than the body. In this specimen the abdomen is bright metallic purple and blue, also the humeri. The scutellum is purple, the tibiae yellowish brown, not darker on the inner side. A specimen from Kaslo, British Columbia, is larger than the average and is shining green with very little blue color. It is evidently a male but the antennae are blunt. There is a stump of a vein on the second submarginal at the base, the cell being petiolate.

In the collection at the Oregon Agricultural College there are twenty-eight specimens of *E. tristis*, taken at various places in Oregon and at various times. Most of the specimens were taken

as follows: Mt. Jefferson, July 15, 1907; Mary's Peak, June 6, 1915 (Lovett); Rock Creek; Buck Mountain, July 9 to 15. One specimen from Mt. Jefferson has an extra cross-vein in each wing, forming a supernumerary cell just beyond the outer first basal cell. Two specimens from Buck Mountain have the third antennal joint very large and broad. In another specimen the vein closing the fourth posterior cell is represented by only a stump in one wing. In two specimens from Mary's Peak the fourth posterior cell is not closed.

In the author's figure of *E. tristis* the anal cell is shown closed in the margin. In two specimens from Santa Cruz Mountains, California, the anal cell is petiolate. In these same individuals the ocellar tubercle is low and rounded. A specimen in the National Museum from Alameda County, California (Coquillett), has a short stump in the submarginal cell from the second submarginal. The third antennal joint ends very bluntly. All of these specimens and many others examined are darker in color than *smaragdinus* or *sapphirinus* and less metallic. The proboscis when at rest just about reaches the tip of the abdomen.

On June 18, 1917, I collected nine specimens of *tristis* near Parkdale, Oregon, in the upper Hood River Valley, at an elevation of about 3,000 feet. Four specimens were collected near the West Fork of the Hood River on lupines. The others were taken on some small white flowers near by. They appeared to be good fliers and were taken in the sunshine. One of the females taken in this lot has the second submarginal cell petiolate in one wing and sessile in the other. I have seen two other females with the second submarginal petiolate, so this character is not always reliable.

***Eulonchus sapphirinus*** (Pl. V, fig. 19.)

*Eulonchus sapphirinus* O. S., Western Dipt., p. 276, (1887).

"Antennae black, sometimes brownish or reddish toward the tip; epistoma black or bluish black; ocellar triangle dark blue or purple, sometimes with greenish reflections, clothed with dense, erect, grayish yellow pile on the thorax; abdomen with similar but much less dense pile, and with an appressed yellowish white pubescence, visible in certain lights only; feet straw yellow; tarsi brownish toward the tip; wings grayish subhyaline, costal cells brownish yellow; costal and first longitudinal veins black on their proximal half, brownish yellow toward the tip; tegulae whitish, their margins yellowish, knobs of halteres yellow. The proboscis of the male does not reach the end of the abdomen, that of the female does not reach beyond it. Length, 9-11 mm.



"Hab.—Webber Lake, Sierra County, California, July 23 to 26. Not rare, flying in circles around flowers. Three males and two females. A male and a female from Calaveras County, California, June, have the proboscis a little longer than the abdomen.

"This species is easily distinguished from *E. smaragdinus* female by its smaller size, blue color, shorter proboscis, less yellowish wings; the two latter characters also distinguish the males, which are somewhat alike in coloring.

"All my specimens, as far as I can remember, were more blue when I took them, and seem to have assumed the purple and even greenish tinges, which they now have, in the process of drying."

A specimen from Siskiyou County, California, has dark brown antennae, lighter at the base; the body is green. One from Mt. Angel, Oregon, is dark green, with purple reflections on the abdomen. The antennae are short, dark brown, and with the third joint pointed. Proboscis a little longer than the body. Two specimens from Humboldt County, California, have very long wings. The third antennal joint is long and very slender. The second submarginal cell is hardly petiolate; legs dark, the femora brown, knees yellow; the tibiae are yellowish brown at the apex and on the inner side. Proboscis shorter than the body, which is dark bluish green and very flat. Perhaps this form belongs with *tristis* or is a variety.

A small specimen from Siskiyou County, California (Coquillett), is seven millimeters long. Thorax green with a blue tinge, abdomen azure. One specimen from the Wasatch Mountains, Utah (C. V. Riley), has the tarsi darker than the rest of the legs. Several specimens from Placer County, California, vary from blue to green. One specimen in the National Museum from Utah differs from any I have seen. The thorax is dark metallic blue. The humeri, occiput and scutellum are purple. Two median dorsal stripes of purple on the abdomen, and two short ones on each side. Legs straw yellow. Pleura blue with purplish reflections. Abdomen and venter purple. Antennae black, the third joint pointed. Femora light yellowish brown, the knees yellow; tarsi yellowish brown. Proboscis very short and black. Whitish pile on the eyes very short. Three submarginal cells, the cross-vein not placed the same in each wing. Costal cell yellowish.

On July 12, 1918, I made a trip to the country near the old lava beds which lie at the base of Mt. Hood, in the upper Hood River Valley of Oregon. About three weeks before I had found several

specimens of *tristis* in this region, as mentioned previously, and I hoped to find a few more specimens. The best collecting ground on the previous occasion was a little willow-covered sandy strip not far from the edge of the river. Lupines were growing in these open spaces where the big trees left off, and the specimens of *tristis* had appeared to have a preference for these flowers. They did not appear to feed on the flowers, but were flying around them and resting on the leaves in the bright sunlight. Strangely enough I took no specimens of *tristis* this time, but found *saphirinus* quite common. Two pairs were taken in copulation and several others were seen. A series of twenty-four was taken on this trip, most of them not on lupines, but feeding in the little bell-shaped blossoms of the twin flower, in spots of sunlight which filtered through the forest canopy. In the sunlight they appeared a bronze color and were more noticeable than *tristis* as they flashed through the sunlit spaces. They were quite wary when not engaged in feeding and were swift fliers. Only three females were taken in this lot.

***Eulonchus marginatus*** (Pl. IV, fig. 17.)

*Eulonchus marginatus* O. S., Western Dipt., p. 277, (1887).

"Metallic green, with bluish reflections on the scutellum, the anterior margins of the segments, etc.; venter metallic blue. Antennae black. Thorax clothed with dense pale yellowish white pile; abdomen with a short appressed pubescence, which forms whitish cross-bands along the hind margins of the segments. Legs black, and only the knees yellowish white. Tegulae with very distinct black margins. Wings subhyaline; all the veins dark brown, except the distal end of the costa and of the first posterior vein, which are reddish yellow. Proboscis a little longer than the abdomen. Length, 9 mm.

"Hab. Napa County, California (H. Edwards). A single specimen, apparently a male. The petiole of the second submarginal is subobsolete; as I have only one specimen I cannot say whether this is a permanent character of the species."

There are two specimens in the National Museum collection, and a typical one in the Kansas University collection, labelled "Calif., Baron." (See fig. 17.)

CYRTINAE

Schiner, and several dipterists following him, have placed *Pterodontia* in the Panopinae; Kertész has done this in his "Catalogus Dipteriorum." I believe that the genus is more nearly related to the forms in this subfamily.

**PTERODONTIA**

*Pterodontia* Gray in Griffith, Animal Kingdom, xv, p. 770, pl. cxxvii, f. 3, (1832).

The eyes occupy most of the head, which is small in proportion to the thorax. The face is small and on the extreme lower part of the head, the antennae being placed in its upper part. The back of the head is not inflated; the eyes are holoptic and thickly pilose. There are three ocelli on the small vertical protuberance. The antennae are short, three-jointed and close together at the base; the first joint is cylindrical, the second rounded, and the third varying in shape and smaller than the other joints.

The thorax is large and swollen and with more or less thick, erect pile. The humeral calli are not very large, but the post-alar and praealar callosities are of good size. There are no bristles or very long hairs on the body. The scutellum is of medium size and rather short, with a deep rounded margin so that only a small portion has a flat surface.

The abdomen is large and inflated, appearing round from above. The squamae are quite large and with short hair on the surface. The genitalia are retracted and the structure hard to make out. The tibiae are armed with apical spurs, or sharp projections, a small inner one (in species I have examined) and a stronger outer one. The legs are rather slender for the size of the insect.

The wings have a peculiar thickening of the costa, which in the male sex bears a spur or tooth; the females apparently lack this tooth. The second longitudinal vein curves up into an enlargement of the costa. *P. analis* shows the presence of two discal cross-veins. The outer first basal cell has merged into the discal cell. The lower branch of the fourth vein bends sharply downwards and meets the short upper branch of the fifth, then goes to the wing margin. In *P. virmondii*, according to Verrall, the outer discal cross-vein and upper veinlet from the discal cell have disappeared and there is apparently no upper branch to the fifth vein. This is also true of *P. flavipes*. *P. analis* has three posterior cells and *P. flavipes*, two. *P. johnsoni* new species apparently is a connecting link between these two types of venation: the outer discal cross-vein being suggested, but the upper veinlet from the discal cell has disappeared.

*Synopsis of Species*

1. Entirely black or blackish brown . . . . . **johnsoni** new species  
With more or less red or yellow on the body . . . . . 2
2. Outer discal cross-vein present; three posterior cells. Small species.  
**analis** Westwood  
No outer cross-vein. Two posterior cells . . . . . 3
3. Second abdominal segment mostly black; black spots on dorsum of third and fourth. Scutellum black. Western species . . . . . **misella** O. S.  
Larger species, usually with more yellow on abdomen. Scutellum yellowish or whitish in female. Eastern species . . . . . **flavipes** Gray

**Pterodontia analis** (Pl. VI, fig. 20.)*Pterodontia analis* Westwood.*Pterodontia* *vir* Townsend, Proc. Cal. Acad. Sci., iv, p. 607, (1895).

"Black, apical segments of abdomen fulvous, margin of squamae blackish, wings hyaline, veins whitish, legs pale. Length 2 lines. Expanse of wings 5 lines.

"Hab. Georgia.

"Type. British Museum.

"Black, shining, black pilose, finely punctate. Head black, eyes posteriorly brown. Antennae inserted above mouth opening, terminal joint slender and short, apex furnished with setae. Thorax and scutellum black. Abdomen hemispherical, two basal segments and spot in middle to base of next following segment black. All the rest of the apical part of the abdomen fulvous. Wings hyaline, iridescent, transversely rugose. Veins whitish and distinct; discal cell 'sub apicem alarum postice aperta.' Tegulae fuscous, margin blackish. Legs whitish, base of femora darkened, ungues black."

Townsend (141) described this species as *P. vir*. One specimen was taken in Southern California. Length, 5 mm.

**Pterodontia flavipes** (Pl. VI, fig. 22.)

*Pterodontia flavipes* Gray, in Griffith, Animal Kingdom, Ins., xv, pl. cxxvii, fig. 3, (1832).

♀. Head quite small, button-like, much as in the species of *Ocuca*; seen in profile the occiput takes up about half of the head and is black, gray pollinose. Eyes and occiput long black pilose. Ocellar tubercle not very prominent. Antennae yellowish, small and inconspicuous, placed near the rim of the mouth. First joint of the antennae scarcely visible, second short and rounded, third short and flattened, with three terminal setae (see fig. 22a). The mouth-parts are aborted, but palpi are present.

Thorax large, shining black above and black pilose. Scutellum whitish yellow, thinly black pilose. Pleura and humeri brown, the upper pleura remarkably swollen. Praescutellar callosities whitish yellow. Squamae brownish hyaline with heavy blackish brown margins and blackish pile. Halteres dull brownish yellow.

Abdomen large and convex. First segment brownish, second segment yellow with a narrow anterior brown margin, and usually a median brown mark; third segment entirely yellow or with a small median brown spot on the anterior margin; the rest of the dorsum of the abdomen yellow. Venter brown, often marked with yellow. Pile of abdomen blackish, erect and fine, and not thick enough to conceal the ground color. Femora brown with dark brown pile. Tips of femora, the tibiae and tarsi whitish yellow with pale yellowish pile. Tips of claws black. Wings faintly infuscated, darker in costal region. Costa thickened at end of first vein. Wing veins brown. Length, 7.5 mm.

♂. Very much like the female. The thorax is broader and more robust. The four posterior femora blackish, except tip. Scutellum and praescutellar callosities darker. Pleura usually much darker, in some specimens almost black. Costal margin at end of first vein bulges out and has a spur or tooth-like projection on it. Wings in some specimens pure hyaline. Veins brown at base, pale at apex. Knob of halteres darkened. Venter dark brown with whitish incisures.

Mr. J. L. King, in his paper on the life history of this species, recorded that twenty-four females varied from four to eight millimeters in length. A number of male specimens varied from six to nine millimeters. *P. flavipes* is an eastern species, possibly going as far west as the Rocky Mountains. This species is said to be near *P. virmondii* Erichson, and I have a specimen of *P. mellii* from Queensland, Australia, which is almost the same. There is no difference in structure or wing venation. The median black mark on the abdomen of *P. mellii* reaches to the tip, the last segment and the genitalia being black. The middle tibiae and the hind pair are black also.

#### **Pterodontia misella**

*Pterodontia misella* O. S., Western Diptera.

"Black; clothed with black pile; scutellum black, obscurely reddish on its latter half; second abdominal segment (that is, the first visible segment) the first true segment is concealed under the scutellum) black, with an obscurely marked reddish spot on each side a little back of the scutellum; segments 3 to 6 rufous, the third and fourth with square spots in the middle, that on the fourth being narrower; they are confluent with each other and with the black of the second segment. Venter rufous; hind margins of segments 2 to 5 black. Tegulae brownish, with broad dark brown margins. Legs brownish yellow, the four posterior femora black; unguis reddish, black at the tip. Wings subhyaline; veins yellow; venation similar to that of the other species; the usual tooth on the edge of the costa, near the end of the first posterior cell, is very little projecting. Length, 5 mm.

"Hab. Oregon (H. Edwards). A single specimen. This species is very like *P. flavipes* from the Atlantic States, but is smaller and differs in the coloring of the abdomen."

I believe that *Nothra americana* is the same as the form known as *P. misella*. I have seen males of *misella*, 7.5 mm. in length, and two specimens with a yellowish scutellum. The males of this species are almost impossible to separate from *P. flavipes*, and I would have been inclined to make it a synonym of that species, had I not recently seen two females. These females have a black scutellum and the prescutellar callosities are black. The species is distinctly smaller than the average specimens of *P. flavipes*. One of the above females was collected at Forest Grove, Oregon (M. C. Lane), the other near Corvallis, Oregon (A. L. Lovett).

***Pterodontia johnsoni* new species** (Pl. VI, fig. 21.)

Body wholly blackish, semi-shining. Eyes contiguous and pilose; the pile on the eyes of the type specimen shorter than on *P. flavipes*. Head black. Antennae brown with the usual terminal setae. Humeral and praecalar callosities black. Thorax with black pile. Squamae brownish hyaline, not so pointed as in *P. flavipes* and with black borders; the surface with black pile.

The sides of the last three abdominal segments have a brownish tinge which extends almost to the middle of the segment. Venter mostly blackish, with some reddish brown color. Femora black with a slight brownish tinge; tibiae dark brown, the tarsi paler. Tips of the claws black. All the tibiae with two spurs, the inner one very short but the outer one quite conspicuous. Knees brownish yellow. The wing venation is very near that of *P. flavipes*, but, in the type specimen at least, there is a suggestion of the outer discal cross-vein, although there is no upper veinlet from the discal cell. Thus the wing is intermediate between the type of *P. analis* and *flavipes*. There is a brownish color in the costal cells, the rest of the wing being whitish hyaline. Length, 5.5 mm.

*Habitat*.—Seattle, Washington.

*Type*. In the collection of C. W. Johnson, from whom I received the specimen. The type is slightly mutilated. Two legs and a part of one wing, which had been broken off, mounted on a separate card point.

There are two paratypes in the collection of Prof. J. M. Aldrich, taken at Boise, Idaho. They are a little lighter in color than the type. The vein closing the discal cell is not so angulated. Ocellar tubercle higher than in *flavipes*. Femora dark brown. Prof. A. L. Melander loaned a specimen collected at Coupeville, Washington, July 20, 1898, which is practically the same as the Idaho specimens.

## NOTHRA

*Nothra* Westwood, Trans. Ent. Soc. London, p. 114, 1837.

*Triaxylus*. Proboscis short. Antennae small and with one terminal setae inserted in the 4th segment. Eyes continuous in front. Halteres two. Cells dorsal, prethoracic, like. Abdomen hemispherical. Wing veins arranged as in *Pterobothris*, but costa, however, not at all space above basal cell furnished with a short external appendiculate vein.

The type of the genus is *N. traxylus* from Australia.

***Nothra americana***

*Nothra americana* Bigot, Annales, 1857, p. 41.

*Triaxylus*. "Antennae filiformes, the first joint dilated, the eyes covered with long black hair; thorax scutellum shining black and black purple, scutellum which the bodies black, abdomen reddish, thinly covered with brownish hair, the base of the first and second segments ornamented with a large triangular spot black; venter with bands of the same color, some black, one hair black; legs a pale yellow, base of the middle and posterior femora blackish; the empodia well developed; wings tinged with a yellowish color, the outer border grayish, the veins brown."

"Hab. Boreal America - Wash Territory." (The specimen in the French Museum.)

As previously stated the occurrence of this genus in North America is very doubtful. I have never seen a specimen of *Nothra*, but from the description it is very close to *Pterobothris*. Bigot probably had a species of *Pterobothris*. In fact *Pterobothris* O. S. from the same locality fits the above description, and the female has no spur on the wing or the end of the first vein.

## OPSEBIUS

*Opsebius* A. Costa, Rend. I. S. R. Ent. Soc. Napoli, p. 2, 1857.

*Pterobothris* Lee, Wen. Ent. Monats. 1877, p. 187.

The head is small and far down on the thorax so that it can hardly be seen from above. The eyes are hairy and in large part holoptic; the ocellus is swollen. The proboscis is very short and the mouth-parts are small. The antennae are inserted on the vertex as in *Acanthopoda* but are much longer as a rule and the arista even more slender. There are three ocelli, the front one least conspicuous. The humeri are widely separated. The thorax is very large and bulging, almost spherical in shape, and clothed with thick fur-like hair. The pleura are swollen

as in some of the other genera. The callosities of the thorax are not very large and the scutellum is rather small and short, as in *Acrocera*. The squamae are noticeably smaller in proportion than in most of the genera, and are not bulging as in *Ogcodes* and *Acrocera*. The halteres are of medium size.

Abdomen large, appearing more square than conical in outline, with short fine pile. The legs are quite slender. Discal cell long and narrow, the proximal end pointed. Cross-veins rather far from wing margin, so that the posterior cells are long. The wing veins are strong and reach the wing margin. The third vein is branched; four posterior cells, the first is separated from the outer first basal by a remarkable cross-vein. Anal cell closed in some, widely open in others. Anal angle of wing much reduced. One species, *pterodontinus*, has a large tooth on the costa, as in the genus *Pterodontia*; this tooth is heavier, however, and nearer the proximal end of the wing than in that genus.

#### *Synopsis of Species*

1. Wing with costal spur as in genus *Pterodontia* . . . . . **pterodontinus** O. S.  
Wing with costa thickened, but without a spur . . . . . 2
2. Anal cell closed; third posterior cell about as long as fourth . . . . . 3  
Anal cell open; third posterior cell shorter than fourth . . . . . 4
3. Wings brownish . . . . . **gagatinus** Loew  
Wings tinged slightly with brownish, the base and apex subhyaline, metallic grayish brown body color . . . . . **diligens** O. S.
4. The sixth vein prolonged to wing margin . . . . . **sulphuripes** Loew  
The sixth vein interrupted long before the wing margin . . . . . **paucus** O. S.

*Opsebius formosus* Loew (Provence), *O. pcpo* Loew (Spain) and *O. inflatus* Loew (Europe) have the body black and yellow, and not uniformly blackish as in the American species.

#### **Opsebius gagatinus**

*Opsebius gagatinus* Loew, Centuries, vi, p. 24.

"Blackish, shining, legs and halteres reddish yellow, wings fuscous-black, first posterior cell divided by a cross-vein. Length,  $2\frac{3}{4}$  lines. Wing,  $3\frac{1}{12}$  lines.

"Blackish, shining, head and thorax with rather long subfuscous hair, hair of abdomen shorter and paler. Coxae black, legs all yellowish red. Tegulae medium, dirty yellow red, pale pilose, the margins fuscous. Halteres pale lutescent. Wings entirely fuscous black, veins black and disposed as in *O. inflatus*, however anterior cross-vein is oblique, and the other adjacent cross-vein, which divides the first posterior cell, is between the end of the discal and the base of the second submarginal cell."



The type was from Philadelphia, Pennsylvania (Osten Sacken). I have not seen this species.

**Opsebius sulphuripes** (Pl. VII, fig. 24.)

*Opsebius sulphuripes* Loew, Centuries, ix, p. 204.

"Blackish, shining, halteres and legs whitish or pale yellowish, wings blackish fuscous, first posterior cell divided by a cross-vein, anal cell open. Length,  $2\frac{1}{2}$  lines. Wing,  $2\frac{7}{12}$  lines.

"Black, shining. Eyes closely black pilose, however pile on lower part of eyes paler than on upper part. Antennae yellowish. Prothoracic stigmata bordered brown. Dorsum of thorax, scutellum and abdomen whitish pilose. Legs whitish or pale yellowish, finely white pilose. Tegulae moderate, hyaline. Halteres pale yellow. Wings brownish, the tips and posterior margins paler; veins brownish black; small cross-vein perpendicular; first posterior cell cut by the other cross-vein, as in *O. gagatinus*, between end of discal cell and base of second submarginal; the third posterior cell, which in *O. gagatinus* goes beyond the base of the fourth, in this species does not reach it, thus the third posterior cell is shorter than the fourth; anal cell, in *gagatinus* and *inflatus* long and closed in the margin, is open in *sulphuripes*."

Habitat—Sharon Springs, New York (Osten Sacken).

Prof. A. L. Melander in his notes on the Acroceridae (1902) mentions a specimen of this species taken at Alameda County, California, which answered the type description well. The species is rare and I have seen only two specimens.

**Opsebius pterodontinus** (Pl. VIII, fig. 26.)

*Opsebius pterodontinus* O. S., Berlin Ent. Zeit., xvii, p. 299, (1883).

*Opsebius agulena* Melander, Ent. News, xiii, p. 180, (1902).

"Male. Brownish black, shining, clothed with dense, erect, fulvous hairs; legs yellow; wings hyaline; costa with a conspicuous abrupt projection at the end of the first vein. Length, 7 mm.

"The dense hair on the eyes is brownish-fulvous; the antennae brown, arista brownish-yellow; thorax and abdomen are clothed with a uniform covering of erect fulvous hairs, through which the shining, apparently dark brown, ground color is visible. Halteres whitish yellow; tegulae transparent, with a yellowish tinge; veins yellow, anal cell open; third posterior cell much shorter than the fourth, all the veins reach the margin; first posterior cell divided by a cross-vein which is a little beyond the discal cell; posterior cross-vein nearly opposite (a trifle beyond) the origin of the second vein; tip of the second vein opposite the proximal end of the second submarginal cell, the costa, soon beyond the ending of the auxiliary vein is thickened, and the thickening forms an abrupt projection, blunt at the tip; the terminal portion of the first vein, likewise conspicuously thickened, runs parallel to the costa, with a very small space between, and coalesces with it under the projection.

"Hab. Dallas, Texas (J. Boll); a single male labelled 26, IX, which probably means September 26.

"N. B. Wings resemble *Pterodontia*, on account of the expansion of the costa. It may be this character is sexual. The profile of the body of *Opsebius* (*Pithogaster*) *inflatus* figured by Loew, is exactly like this form."

Professor Melander described this species from two males from Austin, Texas, and one male from Rochester, Wisconsin. "One of the Texas specimens was found under a stone, entangled in a web of the Southwestern variety of *Agelena naevia* Bose., apparently just after issuing from the body of the spider. The shriveled spider was lying close by, with a round perforation near the base of the under side of the abdomen."

**Opsebius diligens** (Pl. VII, fig. 23.)

*Opsebius diligens* O. S., Western Diptera, p. 278, (1876).

"Of a slightly metallescent brownish-black color, clothed with brownish-yellow pile; legs brownish-yellow; wings tinged with brownish, the tips hyaline; first posterior cell divided in two by a cross-vein; the bases of the third and fourth posterior cells nearly on the same line; anal cell closed and petiolate. Length about 5 mm.

"The venation is like that of the European *O. inflatus* Lw.,<sup>11</sup> with the following differences: 1. The first posterior cell is divided in two (nearly equal) parts by a cross-vein placed between the end of the discal and proximal end of the second submarginal cell (the same character distinguishes the two North American species described by Mr. Loew in the Centuries); 2. The third and fourth posterior cells have their proximal ends nearly on the same line; in other words the insertion of the intercalary vein is coincident with the cross-vein at the base of the fourth posterior cell; 3. The fifth vein runs straight to the margin, and the sixth is incurved toward it at a short distance from the margin. The costa is distinctly thickened beyond the ends of the first and third veins, and a little beyond the latter. The wing is distinctly tinged with brownish, except at the base and the tip, which are subhyaline.

"Body of a uniform brownish black, slightly metallescent on the thorax. Thorax densely clothed with brownish-yellow erect pile, not dense enough, however, to conceal the shining surface under it. On the abdomen, the same pile is more dense on the second segment; the pile on the two intermediate segments is more blackish, except along the posterior margins, where it is yellowish; the fifth has a shorter and more appressed whitish-yellow pubescence, interspersed with longer pile; the last segment is black, shining, rugose. Legs brownish-yellow; femora slightly tinged with brownish; coxae, except the extreme tip, brown. Halteres with a yellowish-white knob; tegulae semitransparent, colorless. Eyes pubescent; antennae (broken)."

*Habitat*.—Vancouver Island (G. R. Crotch). Two specimens.

<sup>11</sup> Wiener Entom. Monatschr., 1857, p. 33, tab. i, f. 1.

I have seen numerous specimens of this form from California, and was able to get a number of notes on it, which are included in another part of this paper. There is a good series at Pomona College, Claremont, California.

**Opsebius diligens** var. **hyalinus** new variety

♀. Very near *diligens* O. S. in appearance. Antennae brown. Eyes short black pilose. Pile of mesonotum and scutellum brownish-yellow. Gray pile on front and sides of thorax and on pleura.

Abdomen black, finely punctate. Dorsum of second and third segments with yellowish brown pile. Incisures, except first, reddish brown. Some black pile on base of segments two, three, four and five. Gray pile on segments four to six.

Legs a dull straw yellow. Wings hyaline with brown veins. Venation and shape of wings as in *diligens*. Length, 2.5 mm. Wing, 3.20 mm.

*Habitat*.—San Diego County, California. One specimen collected by E. P. Van Duzee (X, 4, 1913).

One other specimen collected at Berkeley, California, May 8, 1915, by Mr. M. C. Van Duzee, is intermediate between *paucus* and *diligens*, and might well be placed with *hyalinus*. The wings are hyaline and the venation the same. The pile of the body is almost entirely brownish yellow. Length, 5 mm.

*Opsebius gagatinus* Loew, *O. diligens* O. S. and *O. paucus* O. S. are very closely related. I have seen typical forms of the last two, and also specimens which are hard to place. Two specimens loaned for study by Cornell University would, on account of the closed anal cell, be placed under *gagatinus*, an eastern species. These specimens were collected by Professor Bradley in the Giant Forest, Marble Fork, King's River Trail, 6,500 feet elevation, California, on July 24, 1907. I have seen individuals from near this locality which would be placed in *paucus* O. S. on account of the open anal cell, but which were hardly distinguishable from the two specimens above mentioned in other ways. It is possible that the open or closed anal cell may not be a character of specific importance in this little group. In one wing of the smaller specimen from the Giant Forest there are two supernumerary cross-veins and two extra cells (see fig. 25a).

**Opsebius paucus** (Pl. VII, fig. 25.)

*Opsebius paucus* O. S., Western Diptera, p. 279.

"Very like *O. diligens*, but smaller, 4-5 mm. long; sixth vein interrupted before the nearest cross-vein, and thus the anal cell open; the branches of the

fourth vein do not quite reach the margin. Antennae yellowish-brown at the base; pubescence of the eyes long and dense. Thorax with very dense, soft, erect, grayish-yellow pile; the greenish-black, shining ground color but little visible under it. Abdomen brownish-black, moderately shining, densely clothed with brownish-yellow erect pile; the penultimate segment and the hind margin of the preceding one are clothed with recumbent yellowish-white pile. Wings slightly tinged brownish, much less than in *O. diligens*, but more uniformly, as the paler color of the tip is not apparent. The rest as *O. diligens*."

*Habitat*.—California (G. R. Crotch). One specimen.

### ACROCERA

*Acrocera* Meigen, Illiger's Mag. f. Ins., ii, p. 266, (1803).

*Paracrocera* Mik, Wien. Ent. Zeit., v, p. 276, (1886).

Antennae placed at extreme top of head, ending in a long thin arista. Venation very much reduced. Proboscis absent or aborted.

Head of male larger than that of female, almost all eyes except for a rather broad vertical triangle, the tiny mouth-part, and the inflated back of the head; head broad ovate when seen from above, but circular when seen from in front; mouth-parts very small and almost at the bottom of the head; proboscis short and withdrawn; back of head rather inflated but close to the thorax and consequently the neck is barely visible; ocelli three. Eyes bare, touching beneath the antennae quite down to the tiny mouth-part. Antennae inserted in the front part of the vertical triangle, apparently two jointed because the basal joint is concealed; next joint apparently orbicular and last joint ovate with a long thin apical arista.

Thorax strongly arched, with none of the calli very prominent (unless from color) though the post alar calli are often quite conspicuous. Pubescence abundant, but usually short and not concealing the ground color, recumbent and coarse. Outer part of male genitalia dilated and prominent. Female genitalia projecting and of characteristic form.

Legs rather short and stout and without spurs or projections. The tarsi are as in *Ogcodes* but the claws are even longer, and the pulvilli shorter and more pad-like. The abdomen is large and balloon-like, conico-globular, with five visible segments; the pubescence is very short and adpressed.

Wings shorter and smaller in male than in female; venation reduced and some of the veins hard to homologize. There is a

simple auxiliary near the costa, a long first longitudinal from which the praefurca issues before the middle of the wing. The second longitudinal, when present arises near the praefurca, but it is indicated by a rudiment in some and in others is obliterated. The open fork in the tip of the wing is composed in the upper part of the end of the third vein, and in the lower by an end piece of the fourth vein; below this are two simple long veins (lower branch of fourth and fifth), and these veins are connected by a long apparent cross-vein between the third and fourth vein and another between the fourth and fifth vein. The anal vein is simple and straight. There is no trace of the discal cell; the posterior veins hardly reach the wing margin. If the cell which includes the wing tip is included, there are three posterior cells in all. Alulae large. Squamae very large, bare, and of apparently thinner texture than in *Ogycodes*. Alar squamae small. (The above is essentially the description given by Verrall in his British Diptera.)

The wing venation is variable and very puzzling in some cases, and it requires a great deal more material to settle certain points. Westwood's short Latin descriptions are far from adequate, now that so many species have been described. So far as known the species of this genus parasitize ground spiders such as *Lycosa* and *Amaurobius*.

*Synopsis of Species*

- 1. Dorsum of thorax marked with yellow ..... 2  
 Dorsum of thorax without yellow markings ..... 3
- 2. Thorax with a median black stripe and two elongate spots on either side.  
**liturata** Williston  
The lateral stripes of dorsum much larger, reaching the black scutellum.  
**subfasciata** Westwood
- 3. Second vein present and other veins as in typical form ..... 4  
 Venation not typical ..... 7
- 4. Abdomen largely yellow or reddish ..... 5  
 Abdomen mostly black ..... 6
- 5. Base of abdomen black, the four corners of thorax whitish.  
**bakeri** Coquillett  
Base of abdomen yellow, the four corners of thorax black.  
**bakeri** var. **arizonensis** new variety
- 6. Praescutellar callosities mostly black and the rims of squamae black in females ..... **bullae** Westwood  
 Praescutellar callosities mostly white, rims of squamae whitish.  
**bullae** var. **melanderi** new variety

- 7. Second longitudinal vein obliterated. . . . . S  
 Second longitudinal vein represented by a very distinct apical rudiment. **bimaculata** Loew
- 8. Anterior cross-vein and end of third vein obsolete or entirely wanting. . . . . 9  
 Anterior cross-vein and end of third vein present. . . . . 10
- 9. Abdomen black, wings fuscous at base. . . . . **fumipennis** Westwood  
 Abdomen more or less yellow; wings hyaline. . . . . **unguiculata** Westwood
- 10. Abdomen with basal black fasciae on each segment, regular in outline. **fasciata** Wiedemann  
 Abdomen without regular basal fasciae on segments. . . . . 11
- 11. Veins, except first, with an obsolete appearance. . . . . **obsoleta** Van der Wulp  
 Veins black, or at least distinct. . . . . 12
- 12. Legs pale yellow, the abdomen with basal black spots on second, third and fourth segments. . . . . **convexus** new species  
 First and second segments black. . . . . 13
- 13. Praescutellar callosities blackish, genitalia blackish, wings infuscated. Eastern species. . . . . **nigrina** Westwood  
 Praescutellar callosities whitish, genitalia marked with yellow; wings almost hyaline. Western species. . . . . **hubbardi** new species

**Aerocera bimaculata** (Pl. XI, fig. 32.)

*Aerocera bimaculata* Loew, Centuries, vi, p. 23.

(Transl.) "Male and female. Pitch black, apex of abdomen with two yellow spots, halteres reddish yellow. Wings evenly and slightly infuscated, veins dark fuscous, second longitudinal, except on apical rudiment, entirely lacking. Length ♂ 2 $\frac{1}{6}$ —♀ 2 $\frac{7}{8}$  lines. Wings ♂ 2 $\frac{1}{2}$ —♀ 3 $\frac{1}{2}$  lines.

"Pitch black, covered with short subfuscous hair. Humeral callosities mostly testaceous or fusco-testaceous, ante-seutellars sometimes margined testaceous, frequently all one color. Abdomen swollen, near the apex and on both sides with large transverse yellowish spots. Venter blackish, the separate segments bordered whitish posteriorly. Legs pale testaceous, femora and tibiae a large part yellow. Tegulae sordid whitish, margined fuscous. Halteres pale golden yellow. Wings slightly and evenly infuscated, veins apparent, dark fuscous, auxiliary, however, black; third longitudinal vein furcate and cross-veins both complete, as in most of the other species. (D.C. Coll. O.S.)."

Easily recognized by the rudimentary second vein. The abdominal markings are variable. From several specimens Mr. C. W. Johnson gives the length as four to six millimeters. One specimen from Delaware Co., Pennsylvania (C. A. Voelker), had two additional small spots on the posterior margin of the third segment. A small male from Southbridge, Massachusetts (S. W. Bromley), had a margin of yellow on the posterior angles of the fourth segment only. The wings are light hyaline.

**Acrocera bakeri** (Pl. XII, fig. 34.)

*Acrocera bakeri* Coquillett, Invertebrata Pacifica i, p. 23, (1904). Published by C. F. Baker.

"Black, the four angles of the thorax, legs and halteres whitish, the prothoracic spiracle and abdomen orange-yellow, the latter having the first segment, a fascia on the second expanding on the sides and extending across the venter, a small basal spot in the middle of dorsum of the third and fourth segments, a large spot on each side of the third segment extending across the venter, in the middle of which it is greatly expanded, a small spot in basal angles of the fourth segment and a pair of spots on the venter of this segment, black; tarsal claws and last tarsal joint except the base, also black; wings hyaline, veins black, calypteres wholly whitish hyaline. Length, 5 mm. A female specimen."

*Habitat*.—Ormsby County, Nevada. Collected by C. F. Baker.

*Type*.—No. 6709, U. S. N. M.

**Acrocera bakeri** var. **arizonensis** new variety (Pl. IX, fig. 28.)

Very near *A. bakeri*. Scutellum and the four corners of the thorax shining black. Basal black triangular spot on second segment; another spot at base of third segment and rounded spot at the base of the fourth. Abdomen orange-yellow. Legs yellow, the coxae black. Venter yellow with black markings under the genitalia. Wings gray hyaline with blackish veins, the venation as in *A. bakeri*.

*Habitat*.—One specimen, from Chiricahua Mountains, Arizona, June 6. (H. G. Hubbard coll.)

**Acrocera fasciata** (Pl. XI, fig. 33.)

*Acrocera fasciata* Wiedemann, Auss. Zweif., ii, p. 16, (1830).

"Head black. Corners of thorax and scutellum yellow. First black abdominal band close to scutellum, goes clear across venter and unites on both sides with the second. The third somewhat smaller with a widening on each side. On either side of abdominal tip is a black spot. Costa of wing black; squamae brownish. Legs pale yellow, last tarsal joint black. Length, 1½ lines.

"Type.—Berlin Museum."

This is probably the best known American species and has been bred from *Lycosa ocreata* Hentz (*L. stonei* Montgomery) and from *Amaurobius sylvestris* at Waltham. A small male specimen from Farmingham, Massachusetts, has the scutellum black except apex, and the wings are a clear, not a brownish hyaline. The uninterrupted bands on all of the segments readily distinguish the species. A female measured five millimeters and had the scutellum entirely yellow. Mr. C. W. Johnson in his paper on

*Acrocera* (60) figures a wing of *fasciata* which has an adventitious cross-vein between the forks of the third vein.

***Acrocera obsoleta*** (Pl. XII, fig. 36.)

*Acrocera obsoleta* Van der Wulp, Tijdschr. v. Ent., 2nd Ser., x, p. 139, pl. 3, fig. 17.

The original description is fairly comprehensive. Van der Wulp in figuring the wing indicates all but the auxiliary and first longitudinal veins by dotted lines; "wing veins, except the two first longitudinals, obsolete, fork in the apex of the wing with a short petiole."

I give in the following the original description in the language in which it was written, as it may not be available to all who might wish to refer to it:

"Kop zwart; achter de oogen een zoom van lichtgrijze bestuiving; de zeer kleine sprieten zwartbruin. Thorax en schildje zwart, met flauwen glans en zijdeachtige lichtbruine beharing; van de schouders naar den vleugelwortel eene fijne beenwitte lijn, die aan haar voorste einde verbreed is; de knubbels ter wederzijde voor het schildje bruinachtig. Aehterlijf bleekgeel, aan den wortel en den anus zwart; de zwarte kleur niet scherp begrensd; die van den wortel zich in't midden enaan die beide zijden uitbreidende, zoodat de gele kleur aldaar dubbel uitbogen is; de middenste ringen hebben eene aanduiding van zwarte driehoekige rugvlekken; buik bleekgeel, met onduidelijke zwarte dwarsbanden, die aan de laaste ringen breeder worden en in't midden zijn ingekeept. Pooten eenkleurig witachtig; alleen de haken der tarsen zwart. Vleugelschubben en vleugels bijna glasachtig, met zeer flauwe geelbruine tint; de aderen lichtbruin; alleen de voorrandsader, de beide eerste langsaderen en de wortel der derde langsader er duidelijk, de overigen onschijnbaar; het gevorkte uiteinde de derde langsader, benevens de dwarsader, die de der derde en vierde langsadern verbindt, nauwelijks zichtbaar als men den vleugel in eene schuinige rigting beziet; de vorkeel is ongeveer half zoo lang als haar steel.

"Aanmerking. Deze soort is zeer verwant aan de ook bij ons voorkomende *A. orbiculus* Fabr.; bij laatstgenoemde zijn ook de onderste vleugelsaderen weinig gekleurd, maar toch, tegen het licht gezien, duidelijk; de vorkeel is bij haar grooter en komt in lengte met den steel overeen."

A specimen sent from the Museum of Comparative Zoology apparently belongs here. It was collected in Orono, Maine, August 5, 1915, by A. P. Morse. The humeri and postalar callosities are white; thorax and pleura black; abdomen bright yellow except narrow basal margin, a dorsal triangle at base of third segment and a small anal spot of black; venter yellow, segments with narrow whitish posterior margins and lateral spots of black.



A male and female of this species were in a small collection loaned by Professor Doane from the Stanford University collection. Both are from Lake Tahoe, California. The venter in the female is almost all black with narrow pale margins to the segments. In the male the ventral segments are black basally and broadly black on the lateral margins. The legs are honey yellow; claws and most of last tarsal joint black. Wings whitish hyaline with pale veins which have an obsolete appearance. There is no second longitudinal vein. Length, 5 mm.

A male from Pullman, Washington (A. L. Melander), was collected July 5, 1907. The scutellum is jet black. The abdominal markings are as in the Lake Tahoe specimen. A female specimen from Denver, Colorado, July 12, 1903 (Van Duzee), has the dorsal black triangles on the abdomen joined to the lateral spots, so that there are complete cross-bands.

**Acrocera convexa** new species (Pl. X, fig. 29.)

♂. Nearly answers the description of *A. obsoleta* v. d. W. Head and thorax black; the pleura black. Scutellum, mostly yellow, black at base and sides. Humeral callosities yellowish. Abdomen very large and orange-yellow in color. Base of second abdominal segment with black triangle, a shorter triangle on third, and an irregular black spot at base of fourth. Fifth segment and genitalia all yellow. Wings very short, the veins pale, but the anterior cross-vein and upper branch of third clearly present. No second longitudinal. Praescutellar callosities white except blackish base. Venter yellow, the sides black, the black narrowing toward apex of abdomen. Legs yellow, last half of last tarsal joint black. Body with short whitish hair. Length, 5.5 mm.

Female. Markings much as in the male. The abdomen in this specimen much retracted. Abdomen orange color; first segment and base of second black. A large black basal triangle on third segment. Venter black with few markings. Wings much longer than in male; the venation the same.

*Type*.—Holotype, a male, in U. S. N. M., no. 21206. Siskiyou County, California, (Coquillett).

Allotype in Museum of Comp. Zoology at Cambridge. Spokane, Washington, July 22, 1882, (Henshaw).

**Acrocera unguiculata** (Pl. XIII, fig. 37.)

*Acrocera unguiculata* Westwood, Trans. Ent. Soc. London, v, p. 98, (1848.)

Head and thorax black. Abdominal spots rather irregular. Postalar and humeral callosities black. The second segment black with a small yellow spot near the posterior margin. Large irregular spot on margin of third segment not reaching the lateral margins.

Posterior half of fourth segment yellow. Halteres yellow. Squamae whitish hyaline. Legs pale yellowish. Base of venter pale brown. Female genitalia very prominent. Claws large and black. Wings hyaline, the venation incomplete; second vein wanting. Anterior cross-vein (really a portion of the fourth longitudinal) obsolete and also the end of the third longitudinal vein.

I have seen two female specimens from Enola, Pennsylvania (W. R. Walton, VI, 13, 1909), and a specimen from Ft. Washington, Maryland (C. W. Johnson), in which the third segment has a large yellow transverse spot on the posterior half, not reaching the lateral margin. The fourth segment is yellow except a narrow anterior margin. The wings are whitish hyaline. A specimen five millimeters in length, from Lehigh Gap, Pennsylvania (H. L. Viereck), in which the yellow on the abdomen covers all the fourth, all but narrow anterior margin on third, and the posterior dorsal fourth of the second segment, has brownish hyaline wings. A female specimen from Austin, Texas (Col. A. L. Melander), has the yellow of the abdomen confined to a large spot on each side of the second, third and part of fourth segment. This specimen, which appears to be immature, is about 2.5 mm. in length.

**Acrocera bulla** (Pl. IX, fig. 27.)

*Acrocera bulla* Westwood, Trans. Ent. Soc. London, v., p. 98, (1848).

♂. Thorax black, with short grayish white hair as on the abdomen. Short gray hair on the occiput. Scutellum black; praescutellar callosities whitish yellow, the humeral callosities yellow. Markings of abdomen somewhat varied. Pleura black; venter blackish-brown; the segments with yellow borders. Male genitalia rounded and quite prominent. Legs whitish-yellow. Venation typical. Length, 3.5 to 4.5 mm. Type described from Georgia.

Specimens from Franconia, New Hampshire (Coll. Mrs. Slosson); Williams, Arizona, June 7 (H. Barber coll.); Medicine Hat, Alberta, Canada, October, 1911 (J. R. Malloch coll.); Stanford University, California (H. Morrison coll.). Two small specimens from Los Angeles, California (Coquillet coll.), may be a variety. They are not much over two millimeters in length, and the abdomen is almost wholly yellow.

I have taken it for granted that Westwood's species has typical venation. One from Bailey's Island, Maine, August 20, 1915 (Dr. G. M. Allen), has very light yellow markings, those on the second segment consisting of two widely separated triangular spots on the posterior margin; the third segment similarly

marked, except that spots are quadrate and very narrowly separated at posterior margin. Fourth segment largely yellow, with dorsal triangle and small triangles at anterior angles, black; venter black; with narrow white posterior margins on all segments. Legs a very light yellow, last tarsal joint and claws black, halteres yellow. Length, 4.5 mm. This specimen is a female.

Specimen collected by S. W. Bromley, at Southbridge, Massachusetts, has dark yellow markings, the two widely separated spots on second segment are quadrate, those on third triangular and narrowly connected, and those on the fourth quadrate and also narrowly connected at posterior margin. The wings and squamae are slightly darker hyaline than the Maine specimen. The abdomen is contracted. The rims of the squamae are black; venation typical. Humeral callosities yellow, the prescutellar callosities mostly blackish. Legs pale brown. Veins of wing distinct and black. This specimen is a female. Length, 5.5 mm. A very similar specimen is from Colebrook, Connecticut, August 14, 1910 (A. L. Melander coll.).

The above mentioned specimens from Franconia, New Hampshire, Williams, Arizona, and Medicine Hat are all males and are much alike. It may be that they do not belong with the females described under this species. The abdomen is yellow and the black abdominal markings small (see fig. 27a). The squamae are whitish with whitish rims. The praescutellar callosities are darkened in the specimens from Arizona. The legs are whitish yellow, the terminal half of last tarsal joint black.

***Acrocera bulla* var. *melanderi* new variety**

♀. Head black. Thorax and scutellum black, shining. Pleura black. Thorax, pleura and scutellum with rather short grayish pile. Four corners of thorax (callosities) whitish.

Abdomen black, shining, a narrow yellow rim at extreme base. Markings much resemble *bullata*. Second segment with two roughly triangular orange yellow spots. Third segment with two similar spots, but they are larger and connected by the narrow yellow posterior border of the segment. End of fourth segment yellow. Genitalia black above at base. Fifth segment with a narrow yellow posterior border. Venter black.

Legs yellowish, brownish on femora and tips of tibiae. Most of last tarsal joint black. Venation as in *bullata*. Veins brown. Last section of costa black. Auxiliary vein black. Abdomen is distorted and wings slightly mutilated. Length, 5 mm.

*Habitat*.—Gallatin County, Montana. Elevation, 6,400 feet. July 7, 1900. (E. Koch coll.)

*Type*.—In collection of A. L. Melander.

Since writing the above I have received a specimen taken at Corvallis, Oregon, August 18, 1918, (F. H. Lathrop).

***Acrocera liturata*** (Pl. X, fig. 30.)

*Acrocera liturata* Williston, Trans. Amer. Ent. Soc., xiii, p. 294, (1886).

"Male. Yellow; three broad, dorsal, thoracic stripes, pectus and tip of the tarsi black; abdomen with irregular brown fasciae. Length, 3 mm.

"Vertical triangle and occiput black, the latter pollinose. Dorsum of thorax honey-yellow, the humeral and post-alar callosities yellowish-white, in the middle with a broad black stripe, attenuated behind, and on each side a large elongate spot or stripe. Pleura dark; pectus black. Scutellum black above, the margin broadly honey-yellow. Tegulae white. Abdomen yellow, translucent, the second and third segments on sides brown, connected by a basal fascia, narrower on the third, dilated triangularly in the middle; fourth segment with a median, basal subtriangular or "T"-shaped spot. Venter brown in middle. Legs yellowish white, the tip of all the tarsi and claws black. Wings hyaline, veins yellowish."

*Habitat*.—Washington.

I have a female of this species from Stanford University, California (H. Morrisson coll., Oct., 1914). The thorax has a rather narrow median black stripe. The pleura are brown, not very dark. The venation, of which Williston does not speak, is typical. The specimen is shrivelled so that the markings on the abdomen are difficult to make out. There is only a narrow black base to the scutellum. The fourth and fifth segments of the venter each have a round black spot on each side, a larger spot on the third. Length, 3 mm.

Another female of *liturata* was recently sent in to the National Museum from Cedar Pass, South Dakota (C. H. Over coll.). In this specimen the scutellum is jet black. The yellow of the thorax is much darker and the median stripe of the thorax much broader. The antennae are broken off. The two oval spots on the thorax are large and merge with the median stripe before the scutellum. The markings of the abdomen are different from those in the California specimen. There is a basal subtriangular or "T"-shaped black spot on the first abdominal segment; the narrow base and sides of the second segment are black, and there is a median wedge-shaped mark. The third segment has a broad

triangular black mark. Pleura black. Venter black, with brown blotches. Last segment of venter very short. Length, 4 mm.

A specimen received from J. M. Aldrich was collected at Friday Harbor, Washington, July 23, 1905. The median stripe on the thorax does not reach the scutellum and the elongated oval spot on each side barely reaches the praescutellar callosities; upper pleura brown and yellowish. Basal brown triangles on second, third and fourth abdominal segments. There are no markings on lateral margins of abdomen. The halteres are yellow. Venter yellow, brownish toward tip, two round black spots on second segment of ovipositor.

This species resembles *A. trigramma* Loew in general appearance, if one can depend on Loew's figure (79). *A. trigramma* was described from Sicily.

***Acrocera nigrina*** (Pl. XII, fig. 35.)

*Acrocera nigrina* Westwood, Trans. Ent. Soc. London, v, p. 98, (1848).

Head and thorax black. Thorax with short grayish-white appressed hair. Humeral callosities bright yellow, pleura black. Post-alar callosities blackish-brown, with yellow at each end; scutellum black. First two segments of abdomen all black. Two large yellow spots on third segment, fourth segment largely light yellow with black median basal triangle. Median black spot on fifth segment; the genitalia blackish-brown. Venter blackish-brown, with narrow yellow posterior margins to segments; the last three segments more broadly yellow. Squamae hyaline; the halteres bright yellow. Legs yellow with a pale brownish tinge, the middle section of the femora and tibiae darker. Claws and most of last tarsal joint, black. Second vein usually entirely lacking; there may be a basal, rudimentary stump. Wing dark brown. Wings with a pale brown tint. Length, 5 to 5.5 mm.

*Habitat*.—The type is in the British Museum, and was described from Georgia.

Mr. C. W. Johnson noted, in his paper on the genus *Acrocera*, that a specimen from Quebec (Provancher) had a stump of the second vein, the basal end, in each wing, and also a short median section of this vein in one wing (see fig. 35) and two sections in the other wing. This specimen was included in material loaned by the Museum of Comparative Zoology. Johnson advances the theory that *bulla*, *bimaculata* and *nigrina* may be varieties of one species, which is not at all impossible.

*Localities*.—Darien, Connecticut, June 2 (C. W. Johnson); Bennington, Vermont, June 18, 1915 (C. W. Johnson); Shirley Hill, New Hampshire, June 17, 1911 (F. W. Grigg). I have a specimen from Massachusetts, June 18, 1886 (J. G. Jack); color paler, immature.

**Acrocera fumipennis**

*Acrocera fumipennis* Westwood, Trans. Ent. Soc. of London, v: 98, (1848).

"Black, shining, wings hyaline, toward base infuscated, veins obscure near base, at apex almost obliterated. Alulae fuscous, legs whitish. Length of body  $1\frac{1}{2}$  lines. Expanse of wings 4 lines. Georgia.—Type in British Museum."

C. W. Johnson in his paper on the genus *Acrocera* states that *fumipennis* may be a dark form of *unguiculata* Westwood. "The entire absence of yellow markings in the description, and the statement that the base of wing is smoky brown cannot apply to those seen with obsolete venation."

**Acrocera subfasciata** (Pl. XIII, fig. 38.)

*Acrocera subfasciata* Westwood, Trans. Ent. Soc. of London, v: 98, (1848).

"Black, thorax with two euneiform fulvous spots; abdomen fuscous, first segment with two transverse spots toward apex, two apical fascia on both sides short, luteous; the other segments yellow margined posteriorly. Length,  $1\frac{1}{2}$  lines. Expanse,  $4\frac{1}{2}$  lines.

"New York.—Type in British Museum.

"Head and thorax black, two euneiform spots fulvous, spiracles white, sides of mesothorax white posteriorly. Legs white, ungues black. Wings hyaline, veins pale fuscous, costa slightly darker."

C. W. Johnson describes a specimen collected by J. C. Bridwell at Pelham, New Hampshire, September 8, 1905, which agrees with Westwood's description, except that the yellow euneiform markings on each side of the anterior part of the thorax extend in two very narrow subdorsal lines to the base of the scutellum; likely a variety, apparently resembling *liturata*, which may prove a variety. Abdomen yellow with dorsal and lateral spots of black, those on second segment narrowly connected with those on sides. Venation typical. Williston does not mention the venation of *liturata*.

**Acrocera hubbardi** new species (Pl. X, fig. 31.)

♀. Head and thorax black, shining. Very fine, short gray hair; praescutellar callosities whitish; the humeral callosities whitish-yellow. Whitish hair on occiput. Most of scutellum black, the outer rim yellowish brown. Abdomen

black with yellow markings, which differ some in the two specimens I have. First and second segments black. Posterior margin of third abdominal segment broadly yellow in middle, the yellow reaching almost to lateral margins. Posterior half of fourth segment orange-yellow. Genitalia black, marked with yellow. Pleura shining black. Venter blackish brown, the segments with yellow posterior borders. Short whitish hair on abdomen. Squamae whitish hyaline. Legs yellowish, femora and tibiae brown except the tips. Tarsi a brownish-yellow, most of last joint black. Claws black. Wings brownish hyaline with brown veins. Second longitudinal vein missing. Very near *A. nigrina* Westwood. Length, 3 to 4.5 mm.

*Habitat*.—Two female specimens from Santa Rita Mountains, Arizona, May 24. (Hubbard and Schwarz.)

*Type*.—In U. S. N. M., no. 21205. Holotype a female.

### OGCODES

*Ogcodes* Latreille, Prec. Car. Gen. Ins., p. 154, (1796).

*Oncodes* of authors.

Antennae placed on lower part of head near the mouth-parts and ending in a long thin style or arista. Proboscis absent. Head of male larger than that of female, almost all eyes except small vertex (on which are two ocelli) and the small space at the bottom of the head, on which are the antennae and indistinct mouth-parts; frons slightly produced below, visible from side; back of head rather inflated in male, but more so in female and crammed onto the thorax; jowls slightly inflated. Proboscis absent, the place where it should be being closed by a membrane. Eyes enormous, quite bare. Antennae apparently two-jointed, dove-tailed into face; apparent basal joint cylindrical, short and thick; apparent second joint oval, with long apical thin style which is dilated at its base but ends in a minute hair-like bristle.

Thorax forming a complete sphere; humeral, praecalar and post-alar calli large, but not very conspicuous; pubescence rather dense and soft but hardly abundant enough to be furry, and without the slightest sign of bristles or long hairs even on the post-alar calli or the margin of the scutellum. Scutellum large, with a very deep rounded margin, which leaves only a small portion of the disc rather flat, pubescence similar to that of thorax; metanotum rather small.

Abdomen dorsally arched but hardly globular, short ovate with a blunt base and tip in the male, but short and round in the

female, with five obvious segments; short pubescence fairly abundant. Genitalia concealed beneath the rather small fifth segment.

Legs rather short and stout, but simple and without any trace of spurs or processes; tarsi with first and fifth joints longer than the others. Pulvilli and claws well separated from fifth tarsal joint; claws long and thin; pulvilli in male almost equally long and thin, but shorter and more pad-like in female.

Wings short in male, but larger and longer in female; venation very imperfect; in *O. costatus* the two large basal cells and the closed anal cell can be traced, but the small cross-vein is absent; the wing-tip is clear of all venation for a considerable space; second longitudinal vein absolutely absent; third vein sloping downwards, incomplete, and not forked; fourth vein indicated by three incomplete veins running toward the margin long after the wing tip. Squamae (thoracal) enormous, depressed, and clothed all over upper surface with not at all dense wooly pubescence; alar pair rather small but thick, clothed only with minute down. Halteres on comparatively short stems, hidden beneath squamae.

Verrall considers that there are six species in the Palaearctic region, although Kertész gives thirteen in his Catalog. There are thirteen species from North and Central America: one from South Africa, one from Southern Asia, and about six from Australia and New Zealand.

Erichson gave a fairly good characterization of *Ogcodes* in his Monograph of 1840. He preferred *Ogcodes* to *Henops*, claiming that the former name was older and that Meigen had not clearly defined *Henops*. Dr. Benno Wandolleck, in 1909, published a paper on the "Mouth opening of *Ogcodes*," and gave a detailed account of its structure. He found that dried material was useless in this study, as did Erichson in 1846.

The following artificial table may help to separate the species of this difficult genus. I have not included *engonatus* and *humeralis* in this table, as I have not seen either of the species, and the descriptions offer no striking characters that would establish them. Both are near *costatus* Loew, and the types would have to be examined before drawing any conclusions as to their status.



*Synopsis of Species*

1. Male orange to brownish yellow with dark brown spots on the abdominal spiracles. Female brown. **dispar** Macquart  
Not colored thus. . . . . 2
2. Brown species averaging 7-9 mm. in length; the wings infuscated.  
**incultus** O. S.  
Smaller species; wings usually hyaline. . . . . 3
3. Body shining blackish, with unusually long, erect brownish pile on thorax.  
**niger** new species  
Pile of body shorter; ground color of body usually brownish. . . . . 4
4. Abdomen mostly reddish above. **rufoabdominalis** new species  
Abdomen mostly brown or blackish. . . . . 5
5. Humeri usually yellowish. . . . . 6  
Humeri usually blackish. . . . . 7
6. Pleura brownish yellow; scutellum blackish brown.  
Small species, known only from Pacific Coast region. **aedon** Townsend  
Scutellum usually more or less yellow; the white posterior margins of abdominal segments sharply defined. . . . . **costatus** Loew
7. Legs dull yellowish, the coxae black. **borealis** new species  
Legs more or less blackish or brown. . . . . 8
8. Abdomen largely white above; venter white except a transverse band on the last segment. **albiventris** Johnson  
Abdomen not marked in this manner. . . . . 9
9. Pile of body whitish. . . . . 10  
Thorax with reclinate yellow pile; rims of squamae blackish. Rather small species. **pallidipennis** Loew
10. Rims of squamae black, hind margins of first three abdominal segments narrowly white. Legs blackish. **melampus** Loew  
Rims of squamae yellowish. Pile of thorax quite long and erect. Very wide white posterior margins on male abdominal segments. Legs marked with yellow. **marginatus** new species

**Ogcodes melampus**

*Ogcodes melampus* Loew, Centuries, x, p. 236.

"Black, humeri, margin of tegulae, all of legs and veins of wing concolorous, abdominal segments with white posterior borders, ventral segments white, each with basal black band. Length,  $2\frac{3}{4}$  lines. Wing,  $2\frac{11}{12}$  lines.

"Black, pile whitish, not sublutescent. Humeri of like color with rest of thorax. Abdomen with segments posteriorly white margined, border of first segment narrowest, borders of second and third narrow and equal, that of the following segments a little wider and less even; venter white, first segment black, toward the sides wider and suddenly dilated near the margin of the abdomen. Legs all black. Halteres fuscous black, tegulae whitish, black margined. Wings hyaline, pale ashy tinge, veins all black. ♂ and ♀."

*Habitat*.—California (H. Edwards).

Osten Sacken in Western Diptera doubtfully refers a specimen to *melampus*. "Tibiae brown, not black; borders of tegulae very pale brownish; the wing veins are very pale, except those near the costa, which are brownish."

There are four specimens labelled *melampus* in the United States National Museum, from Santa Cruz Mountains, California. They are quite varied in size and coloring. None are black and all have brown wing veins. There is a slight brownish tinge to the wings. The legs are brown. Only two specimens have typical abdominal markings. The markings on the venter may vary considerably. One specimen from Rio Piedras Verdes, Sierra Madre, Chihuahua, Mexico, 7,300 feet (coll. Townsend), apparently belongs here. There are several specimens in the National Museum from California which are near *melampus*, but which cannot be determined with certainty.

#### **Ogcodes eugonatus**

*Ogcodes eugonatus* Loew, Centuries, x, p. 236.

"Black, pile whitish, not sublutescent vestiture. Humeri of same color as rest of thorax. Abdomen with each segment widely bordered white posteriorly; venter white except black base of first segment, rest of segments with base black, black color, however, suddenly very much dilated toward the abdominal margin. Legs pitehy black; femora toward apex honey-yellow; tibiae above pitehy black, below honey-yellow, apex all yellow; however, apex of first tarsal joint black. Halteres black; tegulae whitish, black margined. Wings pure hyaline, shorter in proportion than in the preceding species, costal and first two longitudinal veins less strong, fuscous black, rest of veins pale."

*Habitat*.—Texas (Belfrage).

I am inclined to believe this to be a color variety of *costatus*. I have not seen the types of the two species.

#### **Ogcodes incultus**

*Ogcodes incultus* O. S., Western Diptera, p. 279.

"Brownish-black; humeral callosities brownish-yellow; antescutellar callosities yellowish-brown; posterior margins of abdominal segments white; legs dark brown; knees brownish-yellow; wings strongly tinged with brown. Length, 8 mm.

"The brownish-black thorax and scutellum are clothed with a dense, short, yellowish pubescence; abdomen dark brown, segments two and three with narrower, four and five with broader, white posterior margins; venter, except the base, white; each segment with a black cross-band on the anterior margin. Tegulae brownish, with narrow dark brown edges. Halteres with a brown knob. Wings comparatively long, strongly and rather uniformly tinged with brown.

This color is darker in the costal cells, especially in the interval between the auxiliary and the first veins; costa distinctly incrassate in the region of the stigma; veins brown.

"Hab.—White Mountains, New Hampshire. Two specimens.

"Easily distinguished from the other described species of the genus by its strongly infuscated wings and its large size. The abdomens of my specimens being somewhat shrunken, the measurement I give is only an approximation."

There are nine specimens of this species in the United States National Museum. The pile of the body is very pale yellow, in some forms whitish. In all the abdomen is somewhat shriveled as in the type material. A specimen from San Diego, Texas, October 26, is 8.5 millimeters in length. A specimen from Camel's Hump, Vermont, has very narrow, white, posterior margins on third, fourth and fifth segments of abdomen and no distinct markings on the venter. The legs are uniformly pale brown. A specimen from Tyngsboro, Massachusetts, has the underside of the femora and tibiae yellow. One typical specimen from Victoria, Texas, April 5, was collected by E. A. Schwarz. We have also a specimen collected at St. John, New Brunswick, July 8, 1902 (W. McIntosh), and one specimen from the type locality (Morrison). I have seen specimens from New York, Maine, Massachusetts and Illinois. The specimen collected by Morrison has yellowish legs, yellowish antennae and brown humeri. The wings are infuscated but pale. A rather small specimen from Rociada, New Mexico (Cockerell), has pale wings and legs. A specimen received from Nathan Banks was collected at Falls Church, Virginia, August 21.

### **Ogcodes pallidipennis**

*Oncodes pallidipennis* Loew, Centuries, vii, p. 23.

"Blackish brown, clothed with pale lutescent pile, abdominal segments narrowly margined posteriorly with white, wings hyaline, veins whitish. Length, 2 lines. Wings, 2 $\frac{1}{4}$  lines ♀.

"Blackish-brown, clothed with pale lutescent pile. Thoracic callosities and praescutellars testaceous. Posterior margins of the abdominal segments narrowly white. Venter fuscous, the segments with narrow whitish posterior margins. Legs fuscous-testaceous, femora except extreme apex brownish black, tarsi except apex fuscous. The tegulae dirty whitish, margined fuscous. Halteres black, the stem pale. Wings hyaline, the veins all faded, no stigmatal spot.

"Hab.—Penn[sylvania]. (O. S.)

"Note. *Oncodes dispar* Macq. with yellowish tegulae, has yellowish halteres and blackish brown stigmatal spot."

This is a hard species to place with certainty and the type would have to be studied to make sure.

I have seen specimens answering this description from several localities, mostly in the New England States; two specimens were taken in Toronto and Manitoba. A specimen in the National Museum, collected by A. A. Girault at Coulterville, Illinois, has a label, "Bred from cell of *Sceliphron cementarius*. Iss. June 18, 1911."

**Ogcodes costatus** (Pl. XIV, fig. 40.)

*Oncodes costatus* Loew, Centuries, ix, p. 202.

"Black, posterior margins of abdominal segments whitish, costa and veins of wing fuscous, apical half of costa incrassate. Length,  $2\frac{1}{2}$  lines. Wing,  $2\frac{5}{12}$  lines.

"Shining, of pitch black color, prothoracic stigmata margined black, tarsi, however, toward apex black, pulvilli and empodia concolorous. Abdominal segments with posterior white fasciae, narrow and evenly marked. First ventral segment black, with posterior white fascia, quite narrow but dilated toward sides. Tegulae dirty whitish, margined fuscous. Wings subhyaline showing toward base a vestige of subfuscous color; costa and veins deep fuscous; apical half of it incrassate, half of posterior cross-vein obsolete."

*Habitat*.—Massachusetts (Sanborn).

I have seen a number of specimens of this species from various localities and all were males. Perhaps the female is known as another species. The four species: *melampus*, *eugonatus*, *pallidipennis* and *costatus* all seem to merge. C. W. Johnson sent a specimen of *costatus*, or what seemed to be that species, which had a black scutellum. It is impossible to place immature specimens of this group. Specimens of what I would term *pallidipennis* are on the average smaller than the other three species mentioned above, but size is a very unreliable character in any parasitic form, especially if there is at most a difference of only two or three millimeters. I have seen no specimen of *costatus* from localities west of Michigan. Malloch gives several localities in Illinois (97), a large series taken on dead twigs of elm. There was considerable color variation in these.

**Ogcodes humeralis**

*Oncodes humeralis* O. S., Biologia Centr.-Amer. Dipt. i, p. 164, (1887).

"Humeral and prescutellar callosities and also pleurae brownish-yellow; legs yellowish-brown, tips of tarsi darker; wings subhyaline.

"Hab.—N. Sonora, Mexico.

"Face, vertical triangle, occiput and antennae black; thorax the usual brownish black, metallescent color, with dense, short, yellowish pubescence.

Humeral and praescutellar callosities and upper part of the pleurae brownish-yellow; above the coxae the pleurae are black, shining. Legs yellowish-brown, including the front coxae; extreme base of the latter black; tarsi brownish; unguae and pulvilli black. Tegulae honey-colored, without any perceptible darker margin. Halteres with a brown knob. Abdomen brown, the hind margins of the segments white. Venter whitish-yellow; incisures darker. Wings subhyaline; very slightly tinged with brownish before the apex, near the costa; auxiliary and first veins brownish; the costa, beyond the junction of the auxiliary vein, is dark brown and a little stouter. A single male.

"Among the described North-American species, *O. incultus* O. S., alone has the humeri of a paler color than the thorax; but it is easily distinguished by its large size, its brownish wings, etc."

At least two other species (*costatus* and *aedon*) have the humeri paler than the rest of the thorax. This is a variable character.

### **Ogcodes aedon**

*Oncodes aedon* Townsend, Proc. Cal. Acad. Sci., ser. 2, no. 4, p. 607, (1895).

"Very similar to *Oncodes humeralis* O. S.,<sup>13</sup> but differs in the tegulae being fuscous whitish with well-defined narrow dark brown margins. Wings without apical brownish tinge.

"Humeral and prescutellar callosities, and upper pleurae brownish-yellow. Thorax and scutellum, and lower pleurae, brownish-black. Legs yellowish-brown, tarsi darker. Head black, thorax with short yellowish pubescence. Tegulae obscure whitish, or with a fuscous tinge, possessing a well-defined dark brown border. Knob of halteres brown. Abdomen brownish, hind borders of segments yellowish-white. Wings subhyaline, costal margin brown distally and more yellowish basally.

"This species differs from *O. pallidipennis* Lw. in the blackish scutellum, yellowish outer humeral callosities and pleurae, and more distinctly margined tegulae. From *O. melampus* Lw., it differs in the yellowish humeral and prescutellar callosities, yellowish pleurae and much smaller size and lighter coloring.

"Baja Purisima, Lower California, April. One specimen. Length slightly more than 4 mm."

A male specimen in the National Museum may be placed in this species. Thorax black. Border of squamae not well defined.

### **Ogcodes niger** new species (Pl. XV, fig. 41.)

♀. Body shining black, thus differing from all other North American species. Occiput black and almost flat, very little swollen. Head longer than usual and of different shape in this specimen at least; not sloping back. Antennae whitish. Thorax with rather long brownish pubescence which has gray reflections; the body color is plainly visible through it. Scutellum not

<sup>13</sup> Biol. Centr. Amer., Dipt., i, p. 164 to 165.

as long as in some species, with rather long thick brown pile. Humeral and prealar calli black. White color which is around base of wings extends some distance on the post-alar callosities. Squamae grayish with black margins, the black color spreading some distance into the membrane; surface of squamae with short white pile. Alar squamae pure white. Thoracic spiracle white and with a narrow white line separating pleura from mesothoracic dorsum. Pleura and coxae brownish-black.

Abdomen shining brownish-black with sparse white pile; the posterior margins of all abdominal segments but first, narrowly white. Femora darkened, knees, tibiae and tarsi whitish; the claws black. First and second segments of venter and median spot on third blackish-brown, the rest sordid whitish. Wing veins pale brown but quite strong; the upper branch of the fifth longitudinal fork and the anal vein much clearer than usual (see fig. 41).

*Habitat*.—Stockton, Utah, July 11, 1916, (T. Spaulding).

*Type*.—A female in Museum of Comparative Zoology at Cambridge.

**Ogcodes dispar** (Pl. XIV, fig. 39.)

*Ogcodes dispar* Macquart, Dipt. Exot., Suppl., v, p. 67, pl. 11, f. 12, (1855).

♂. Body bright yellow. Head and antennae blackish. Thorax with a brown tinge in some specimens. Scutellum brownish-yellow. Thorax and scutellum with short yellow pile which does not conceal the ground color. Pleura yellowish. Squamae yellow hyaline with a yellow margin.

Abdomen usually a little paler than thorax. Incisures whitish and raised slightly. Sides of abdomen with very conspicuous blackish spots around the spiracles. Venter yellow with broad whitish posterior margins to segments and round brown spots at sides of second, third and fourth. Stem of halteres yellow, the knob brown. Genitalia brown.

Legs yellow with short yellowish pile. Hind tibia darkened in middle and above in some specimens. Tarsi brownish, the last joint darkest. Claws black. Wings hyaline with a slight brownish tinge. Costal cells pale brown. Veins of wing brown. Length, 5.5 mm.; wing, 5 mm.

♀. Body a sepia brown, often with yellowish or whitish mottlings. Head noticeably smaller and wings larger than in the male. Squamae pale brown. Abdomen dark brown with narrow white incisures. Venter blackish brown with paler posterior margins. Legs darker than in male and wings more infuscated. Length, 5.5 mm.; wing, 6 mm.

*Habitat*.—Macquart described the species from Baltimore, Maryland (coll. M. Bigot). I have seen specimens from Maryland; Arizona; Montreal, Quebec, and Pennsylvania.

Macquart noted the difference in color of two specimens on the same pin. He could not distinguish the sexes but considered them one species. There are a number of specimens in the National Museum from Plummer's Island, Maryland, taken in May,

June and August. One pair was taken in copula, April 25, 1912, by E. A. Schwarz. Mr. E. T. Cresson, Jr., loaned a pair taken in copula, June 18, 1905, at Swarthmore, Pennsylvania.

**Ogcodes marginatus** new species (Pl. XV, fig. 42.)

♂. Eyes, head and thorax black. Antennae black. Frons black and not prominent, with a few short white hairs. Few white hairs on sides of face.

Thorax, pleura and scutellum black, semi-shining and with fine white pile. The pile is unusually long and dense for an *Ogcodes*, that on the thorax in certain lights almost obscuring the ground color. Humeral and praescutellar callosities black. Squamae white with pale rims; there is a narrow hyaline space between the rim and the white color of center of squamae which is very noticeable.

Abdomen black, the posterior margin of the first segment narrowly white. Posterior margins of other segments wide (see fig 42). Abdomen clothed with erect whitish pile. Venter white, the segments with a brownish black basal stripe, rather narrow except on first two, and suddenly widening near the lateral margins. Genitalia black. Coxae and femora black, apical third of femora yellowish. Tibiae yellowish, basal two-thirds darkened on outer side. Tarsi blackish and rather short, especially first joint. Femora with fine white pile. Wings hyaline. Costa and veins at base of wing brownish, yellow the rest of their length.

*Habitat*.—Upper Geyser Basin, Yellowstone Park, Wyoming, 7,200 feet elevation, August 24, 1915.

*Type*.—One male specimen in Cornell University collection. There are two male paratypes in the Kansas University collection, from Clark County, Kansas, June, elevation, 1,962 feet (F. H. Snow).

A specimen from Fort Collins, Colorado, July 10, 1907, in the collection of C. W. Johnson, is very probably a female of this species. It is near *melampus* Loew. The white posterior margins of the abdominal segments are very narrow on the first and second segments, gradually wider on the following segments, and rather irregular.

Three small specimens in the National Museum collection may belong here. These are: one male from Mono Lake, California, June 21, 1911; a male from Los Angeles, California (Coquillett); a female from Salt Lake, Utah, June 26 (H. S. Barber).

**Ogcodes albiventris**

*Ogcodes albiventris* Johnson, Psyche, xi, p. 18, (1904).

"Head black, antennae yellow. Thorax and scutellum black, shining and covered with erect yellowish pile. Abdomen white, and marked with black as

follows: first segment with a large dorsal spot, the other segments with a short transverse basal band, which extends only over the dorsal third, and from which projects posteriorly, except on the last segment, a short dorsal triangle; third and fourth segments with a small spot on each side of the dorsal line near the posterior margin; all the segments with a small lateral triangle, most prominent on the last three segments; venter white, with a single transverse band on the last segment; the entire abdomen covered with whitish hairs. Legs yellow, coxae and basal half of the femora black, tips of the tarsi brownish. Wings hyaline, veins light yellow, tegulae whitish with a narrow hyaline margin. Length, 5 mm."

One specimen, Toronto, Ontario, Canada, July 18, 1896.

**Ogcodes borealis** new species

♀. Head black. Thorax and humeral callosities black. Pleura mostly black, yellowish brown just below base of wing. Thoracic pile yellowish white. Scutellum black. Praescutellar callosities black, brown above next to thorax. Squamae infuscated and black rimmed, whitish pile on the surface.

Abdomen blackish brown. Posterior borders of segments narrowly yellowish white, the band on first segment very narrow, wider on succeeding segments. Pile of body very short. Posterior margins of ventral segments yellowish white and the lateral margins of the second, third and fourth segments narrowly whitish. Legs pale brownish yellow, the coxae black. Wings slightly infuscated, the veins brown and distinct.

*Type*.—Montreal, Quebec. May 28, 1902. In collection of C. W. Johnson.

Another specimen from St. Johns County, Quebec, is in the collection of C. W. Johnson. I have made this a paratype. In this specimen the squamae are more whitish hyaline. The venter is yellowish brown with darker lateral margins. This species can be recognized by the pale yellowish legs.

**Ogcodes rufoabdominalis** new species (Pl. XV, fig. 43.)

♂. Head black. Antennae blackish brown. Thorax and scutellum black with bright yellow pile, which is quite thick and in some lights a pale golden color. Pleura black. Squamae whitish hyaline, yellowish near the yellow borders, and with short yellow pile. Halteres blackish brown.

Abdomen orange yellow. Segments two to six with a basal blackish band which does not reach nearly to the lateral margins (see fig. 43). The incisures whitish. Pile of abdomen short, erect, and yellow. There is a blackish brown spot on the stigmata along the sides of the abdomen as in the male of *dispar*. Venter orange yellow with narrow whitish posterior margins. Genitalia blackish brown.

Coxae mostly black, but with some yellowish brown coloring. Trochanters jet black. Femora and tibiae brownish yellow. Tarsal joints dark brown



apically, ungues and last joint black. Wings almost hyaline, faintly infuscated, especially along the costal border. Veins blackish brown and very distinct.

*Habitat.*—Great Salt Lake, Utah, June 8, 1915. Collected by M. C. VanDuzee.

*Type.*—One male specimen, in collection of M. C. VanDuzee.

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## EXPLANATION OF PLATES

All figures were drawn free hand by the author and unless otherwise stated, the drawings were made from the specimens. A binocular microscope was used in this work.

## Plate I

## Types of wing venation in the Cyrtidae

Fig. 1. Actual length, 15.5 mm. The lettering as in Verrall's figure in British Diptera. a. Costal vein. b. Auxiliary vein. c. First longitudinal vein. d. Second longitudinal vein. e. Third longitudinal vein. e<sup>1</sup> Upper branch of the fork of third vein. e<sup>2</sup> Lower branch of the fork of third vein. f. Fourth longitudinal vein. f<sup>1</sup> Upper branch of fourth vein. f<sup>2</sup> Second branch of fourth vein. f<sup>3</sup> Third branch of fourth vein. g. Fifth longitudinal vein. g<sup>1</sup> Upper branch of the fifth longitudinal fork. g<sup>2</sup> Lower branch of the fifth longitudinal fork. h. Sixth longitudinal or anal vein. i. Auxiliary vein. Praefurca—common stem of second and third veins. Ambient vein—continuation of costa around the posterior wing margin. w. Humeral cross-vein. x. Discal or middle cross-vein. y. Lower cross-vein. Anal cross-vein—g<sup>2</sup> (lower branch of fifth vein). 1. Costal cell. 2. Subcostal cell. 3. Marginal cell. 4. Submarginal cell. 4a. Second submarginal cell. 5. First posterior cell. 6. Discal cell. 6a. Second posterior cell. 6b. Third posterior cell. 7. Fifth posterior cell. 8. Auxiliary cell. 9a. Upper (or first) basal cell. 9a<sup>2</sup>. Second upper (or outer first) basal cell. 9b. Second basal cell. 9c. Anal cell. 10. Alula.

Fig. 2.—Actual length, 7 mm.

Fig. 3.—Actual length, 9 mm.

Fig. 4.—Actual length, 5.5 mm.

Fig. 5.—Actual length, 7 mm. Redrawn from Verrall.

Fig. 6.—Actual length, 8 mm.

Fig. 7.—Actual length, 5 mm.

Fig. 8.—Actual length, 6 mm.

Fig. 9.—Actual length, 4.2 mm.

## Plate II

Fig. 10.—*Lasia scribae* O. S.

Fig. 10a.—*Lasia scribae* O. S. Head from front, with proboscis and antennae cut away.

Fig. 11.—*Lasia scribae* O. S. Outline drawing of side view.



## Plate III

- Fig. 12.—*Ocnaca loewi* new species.  
 Fig. 12a.—*Ocnaca loewi* new species. Ocelli and base of antennae from above much enlarged.  
 Fig. 12c.—*Ocnaca loewi* new species. Antenna much enlarged. Third joint from inner side.  
 Fig. 13.—*Ocnaca schwarzi* new species.  
 Fig. 13a.—*Ocnaca schwarzi* new species. Outline drawing from side.  
 Fig. 13b.—*Ocnaca schwarzi* new species. Ocelli and base of antennae from above, greatly enlarged.

## Plate IV

- Fig. 14.—Abdomen of *Ocnaca coerulea* new species.  
 Fig. 14a.—*Ocnaca coerulea* new species. Outline drawing of head, from side.  
 Fig. 14b.—*Ocnaca coerulea* new species. Outline drawing of antenna. Greatly enlarged.  
 Fig. 14c.—Wing of *Ocnaca coerulea* new species.  
 Fig. 15.—*Ocnaca grossa* O. S. Redrawn from Van der Wulp's figure in the *Biologia*.  
 Fig. 16.—*Eulonchus smaragdinus* Gerst.  
 Fig. 16a.—Blunt type of antenna of *Eulonchus smaragdinus*.  
 Fig. 16b.—*Eulonchus smaragdinus* Gerst. Sharp pointed type of antenna of same species.  
 Fig. 16c.—*Eulonchus smaragdinus* Gerst. Outline drawing of head from front.  
 Fig. 16d.—*Eulonchus smaragdinus* Gerst. Outline drawing of ocellar tubercle. Greatly enlarged.  
 Fig. 17.—End of wing of *Eulonchus marginatus* O. S.  
 Fig. 17a.—Antenna of *Eulonchus marginatus*.  
 Fig. 17b.—*Eulonchus marginatus*. Outline drawing of head from front.

## Plate V

- Fig. 18.—*Eulonchus tristis* Loew.  
 Fig. 18a.—*Eulonchus tristis* Loew. Antenna greatly enlarged.  
 Fig. 18b.—*Eulonchus tristis* Loew. Outline drawing of head from front.  
 Fig. 19.—*Eulonchus sapphirinus* O. S.  
 Fig. 19a.—*Eulonchus sapphirinus* O. S. Outline drawing of head from front.  
 Figs. 19b and 19c.—*Eulonchus sapphirinus* O. S. Types of antennae. Greatly enlarged.  
 Fig. 19d.—Wing of variety of *Eulonchus sapphirinus*.

## Plate VI

- Fig. 20.—*Pterodontia analis* Westw.  
 Fig. 20a.—*Pterodontia analis* Westw. Antenna, much enlarged.  
 Fig. 21.—*Pterodontia johnsoni* new species. Wing.  
 Fig. 21a.—*Pterodontia johnsoni* new species. Two views of antenna.  
 Fig. 21b.—*Pterodontia johnsoni* new species. Last tarsal segment, with ungues. Much enlarged.  
 Fig. 22.—*Pterodontia flavipes* Gray.  
 Fig. 22a.—*Pterodontia flavipes* Gray. Antenna, much enlarged.

## Plate VII

- Fig. 23.—*Opsebius diligens* O. S.  
 Fig. 24.—*Opsebius sulphuripes* Loew.

## Plate VIII

- Fig. 25.—*Opsebius paucus* O. S.  
 Fig. 25a.—Wing of *Opsebius* species near *paucus*.  
 Fig. 26.—*Opsebius pterodontinus* O. S.

## Plate IX

- Fig. 27.—*Acrocera bulla* Westw., ♂.  
 Fig. 27a.—*Acrocera bulla* Westw., ♂. Dorsal view of abdomen.  
 Fig. 27b.—*Acrocera bulla* Westw. Female genitalia. Much enlarged.  
 Fig. 27c.—*Acrocera bulla* Westw. Male genitalia. Much enlarged.  
 Fig. 27d.—*Acrocera bulla* Westw. Head from above. Much enlarged.  
 Fig. 28.—*Acrocera bakeri* var. *arizonensis* new variety.

## Plate X

- Fig. 29.—*Acrocera convexa* new species.  
 Fig. 29a.—*Acrocera convexa* new species. Abdomen from above.  
 Fig. 30.—*Acrocera liturata* Williston.  
 Fig. 31.—*Acrocera hubbardi* new species.

## Plate XI

- Fig. 32.—*Acrocera bimaculata* Loew.  
 Fig. 32a.—*Acrocera bimaculata* Loew. Female genitalia. Much enlarged.  
 Fig. 33.—*Acrocera fasciata* Wiedemann.

## Plate XII

- Fig. 34.—*Acrocera bakeri* Coquillett. From type.  
 Fig. 35.—*Acrocera nigrina* Westw.  
 Fig. 35a.—*Acrocera nigrina* Westw. Dorsal view of abdomen.  
 Fig. 36.—*Acrocera obsoleta* V. d. W. Abdomen from above.  
 Fig. 36a.—*Acrocera obsoleta* V. d. W. Abdomen of female from side.  
 Fig. 36b.—*Acrocera obsoleta* V. d. W. Dorsal view of male abdomen.  
 Fig. 36c.—*Acrocera obsoleta* V. d. W. Lateral view of male abdomen.

## Plate XIII

Fig. 37.—*Acrocera unguiculata* Westw.

Fig. 37a.—*Acrocera unguiculata* Westw. Dorsal view of abdomen (drawn from another specimen).

Fig. 37b.—*Acrocera unguiculata* Westw. Head from above. Much enlarged.

Fig. 38.—*Acrocera subfasciata* Westw.

Fig. 38a.—*Acrocera subfasciata* Westw. Dorsum of thorax.

## Plate XIV

Fig. 39.—*Ogcodes dispar* Macquart. Female.

Fig. 39a.—*Ogcodes dispar* Macquart. Male.

Fig. 40.—*Ogcodes costatus* Loew.

## Plate XV

Fig. 41.—*Ogcodes niger* new species, ♀.

Fig. 42.—*Ogcodes marginatus* new species. Dorsum of abdomen, ♂.

Fig. 43.—*Ogcodes rufoabdominalis* new species. Dorsum of abdomen, ♂.

Fig. 45.—Male genitalia of *Ogcodes dispar* Macquart. Much enlarged.

Fig. 46.—Male genitalia of *Ogcodes costatus* Loew. Much enlarged; a. from above; b. from side.

Fig. 47.—Male genitalia of *Ogcodes incultus* O. S. Much enlarged.



A NEW SPECIES OF GRASSHOPPER OF THE GENUS  
CHLOEALTIS (ACRIDINAE) FROM THE  
PACIFIC COAST

BY JAMES A. G. REHN AND MORGAN HEBARD

In Oregon, a short distance north of the California line, the railroad between Portland and San Francisco winds its course up from the Rogue River Valley into the eastern portion of the Siskiyou Mountains, and, finding a way through, drops into the broad Klamath River region of California. At the little station of Siskiyou, at forty-one hundred feet elevation, is the highest point of this crossing of the mountains. The heavily wooded slopes rise sharply from the little valley, up which the railroad winds its way to the tunnel piercing the final barrier of the mountains. On August 13, 1909, the authors spent some hours collecting Orthoptera in this vicinity, examining particularly the slopes to the west of the track, reaching the summit of the ridge on that side, which is at an elevation of fifty-eight hundred feet.

From forty-two hundred to five thousand feet, the very steep slopes were covered with a heavy and truly magnificent forest of fir and pine, above which alpine hemlock became evident and the whole forest more open with scanty undergrowth. At fifty-six hundred feet we entered a summit bald, treeless but covered with an almost impenetrable bushy scrub, four to five feet high, through which were scattered grassy areas, especially along the lower edge of the bald. In the more open forest above five thousand feet and in the grassy areas of the summit bald we found a most active grasshopper belonging to the genus *Chloealtis*. Knowing the interest attached to the capture of this genus many hundreds of miles away from the previously known occurrence of either of its species, we made special effort to secure individuals. It was, however, not common, and we were compelled to be satisfied with a series of two males, three females and one immature female. In the timber we found the species near dead branches and its oviposition is doubtless performed in a similar fashion to that of the other species of the genus. The form is quite distinct from the others of the genus and we here describe it.

**Chloealtis aspasma**<sup>1</sup> new species

A striking species which can be readily distinguished from both of the previously known species of the genus (*conspersa* and *abdominalis*) by the more slender form, the more produced and distinctly acute-angulate fastigium when seen from the dorsum, in both sexes, the more retreating face and more produced fastigio-facial angle and the distinctly obtuse-angulate caudal margin of the pronotal disk. The female sex has, in addition, one feature which is interesting in its bearing on the value of a classic differential character used in the subfamily Acridinae (Truxalinae). The fastigium in *C. conspersa* has no appreciable lateral foveolae in either sex; in *C. abdominalis* we find hardly any more indication although the fastigial margins are broader; in *C. aspasma* the male sex has indications of foveolae, which are lateral and hardly visible from the dorsum, while in the female sex we find similar indications which are clearly visible from the dorsum. The three species are unquestionably congeneric, with *aspasma* showing affinity with each of the others in certain features. In the general pronotal form the new species more nearly resembles *abdominalis*, in the tegminal structure of both sexes it approaches *conspersa* more nearly than *abdominalis*, the form and sculpture of the ovipositor jaws is also more like the condition found in *conspersa* than in *abdominalis*, while the form of the caudal limbs is more as in *abdominalis*.

The indication of the lateral foveolae with fair distinctness, and also their visibility from the dorsal surface in the female sex, immediately suggests relationship with the Gomphoceri and Scyllini sections of the subfamily. It would seem from the evidence of the genus *Chloealtis*, as well as tendencies observed in other genera of the subfamily, that, unless deeply excavate and sharply delimited, the pitting of the lateral foveolae is not as fundamental a character as generally supposed. This also would appear to be true of the exact position of the lateral foveolae, when indicated, as we have in the present species proof of their position differing in the sexes of the same form. That the sexes in hand represent one species, and that this species is a member of the genus *Chloealtis* are incontestable conclusions, from which we are naturally led to deduct that the dorsal position of the lateral foveolae

<sup>1</sup> From *ἀσπασσα*, welcome.

is not as invariable an indication of the Gomphoceri-Scyllini division of the subfamily as had previously been supposed. Tendencies similar to those found in *C. aspasma* are indicated in the South American genus *Cocytotettix*, but to a less marked degree.

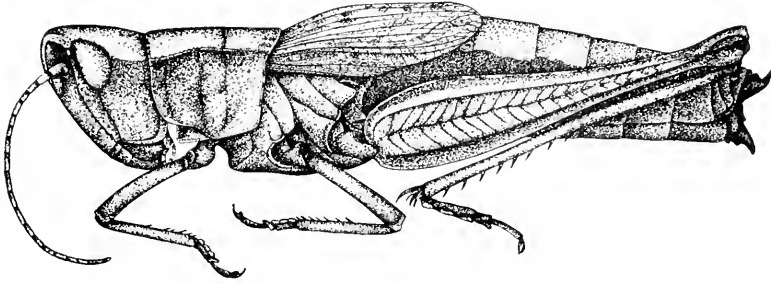


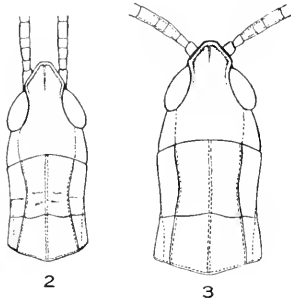
Figure 1. *Chlocaltis aspasma* new species. Lateral view of type. ( $\times 4$ )

*Type*.—♀; Siskiyou, Siskiyou Mountains, Jackson County, Oregon. Elevation, 5000 to 5800 feet. August 13, 1909. (Rehn and Hebard.) [Hebard Collection, Type no. 483.]

*Description of Type*.—Size small (for the genus): form moderately compressed. Head with its exposed dorsal length slightly less than the dorsal length of pronotal disk, not elevated dorsad of same; interspace between eyes subequal to two-thirds of greatest fastigial width; fastigium with length from eye interspace less than greatest fastigial width, in form slightly more acute than a right-angle when seen from the dorsum, the apex rounded, the dorsal surface of fastigium weakly impressed within its margins, a faint medio-longitudinal carina present on the fastigium and interocular region, becoming obsolete on the occiput; lateral foveolar surfaces visible from the dorsum, the surfaces directed distinctly dorso-cephalad, the impression of the foveolae formed of punctures and without clearly defined shape; fastigio-facial angle, when seen in profile, rather narrowly rounded, face decidedly retreating; frontal costa relatively broad, narrowed dorsad at its junction with the fastigium, subequal in width thence to the median ocellus, thence the margins of the costa regularly diverge and become subobsolete ventrad; surface of the costa rather thickly punctate, faintly and narrowly sulcate mesad for a short distance ventrad of the median ocellus; eyes in basal outline short and broad ovoid, the length of the eye less than the depth of the infra-ocular portion of the genae; when seen from the dorsum the eyes are not at all prominent; antennae almost two and one-half times as long as pronotal disk, flattened to some extent in the greater portion of their length, weakly expanded in proximal third.

Pronotum with greatest caudal width of its dorsal surface contained one and one-half times in the greatest length of the same; cephalic margin of disk moderately arcuate, caudal margin of disk broad obtuse-angulate, the im-

mediate angle entire and not markedly rounded; lateral carina of pronotal disk distinct, in general arcuate, appreciably converging caudad to slightly before



Figures 2 and 3. *Chloealtis aspasma* new species. Dorsal outlines of head and pronotum of male allotype (fig. 2) and female type (fig. 3). ( $\times 4$ )

the middle of the pronotum, thence diverging at about the same angle to the caudal pronotal margin, when seen from the side the lateral carina is appreciably bent-arcuate dorsad, the least width of the pronotal disk is equal to slightly more than three-fourths that of the cephalic margin of the same; median carina decided, straight when seen in profile; transverse sulcus intersecting the median and lateral carinae faintly caudad of the middle of the disk: lateral lobes of the pronotum slightly longer than deep, cephalic margin faintly sinuate, ventro-cephalic angle rounded obtuse-angulate, ventral margin strongly sinuate-emarginate cephalad, straight caudad, ventro-caudal angle rounded rectangular, caudal margin moderately oblique, faintly sinuate.

Tegmina equal in length to that of the head and pronotum combined, falling considerably short of the apex of the abdomen, in form elongate lanceolate, the greatest width, which is faintly proximad of the middle, contained two and three-fifths times in the greatest length, apex narrowly rounded: marginal field moderately expanded, regularly narrowing distad from point of greatest width of tegmen, the costal margin rounded obtuse-angulate at point of greatest width: venation well indicated. Wings greatly reduced.

Mesosternum with interspace subquadrate, weakly transverse, slightly widening caudad, caudo-internal angles of mesosternal lobes broadly rounded: metasternum with interspace moderately transverse, about two-thirds as wide as the mesosternal interspace. Abdomen distinctly compressed, with a prominent medio-longitudinal carina dorsad and a similar but less decided one ventrad: supra-anal plate elongate semi-elliptical in marginal outline, the apex weakly angulate, in transverse section the plate is arcuate, with a transverse depressed section, poorly defined, mesad: cerci short, styli-form: dorsal ovipositor jaws short, deep, robust, of the general type found in the other species of the genus, the apices strongly recurved, the dorsal surface deeply concavo-excavate, main external marginal cusp rather low, long, compressed, the margin of the same as a whole entire but with very minute serrulations evident under medium magnification, basal cusp decided, subpyramidal, transverse, its margin finely serrulate; ventral ovipositor jaws moderately compressed, apices little decurved, ventral marginal tooth rectangular at apex.

Cephalic and median limbs relatively slender. Caudal femora moderately slender, the length three times as long as the dorsum of the pronotum, greatest depth contained nearly four and one-half times in greatest length of same: caudal tibiae slightly shorter than the caudal femora, external margin with eleven to twelve spines, internal margin with twelve spines; internal calcaria moderately unequal, the dorsal the shorter.



*Allotype*.—♂; same data as type. [Hebard Collection.]

*Description of Allotype*. Differing from the description of the type in the following features.

Fastigium with greatest width subequal to length of same from eye interspace, in form distinctly acute-angulate when seen from the dorsum, the immediate apex blunt and rounded, the dorsal surface of fastigium broadly but shallowly impressed, the margins appreciably and the median carina slightly elevated; lateral foveolar surfaces hardly visible from the dorsum, not reflected toward the dorsal surface, impression of same as in female but more concentrated and limits more evident; fastigio-facial angle, when seen in profile, more narrowly rounded than in female, face more retreating; frontal costa narrower, faintly constricted at median ocellus, distinctly sulcate for a considerable distance dorsad and a lesser distance ventrad of the same; eyes with greatest length subequal to the greatest depth of the infra-ocular portion of genae, cephalic margin of basal outline less strongly truncate, more arcuate; antennae about two and two-thirds times as long as the pronotal disk, flattening of segments less extensive than in female.

Pronotum with cephalic margin of disk weakly obtuse-angulate, caudal margin of same with angulation obtuse but slightly more marked in degree than in the female; lateral lobes with ventral margin oblique truncate cephalad, caudal margin faintly concave. Tegmina falling short of the apex of the abdomen by about the length of the pronotal disk, the discoidal field weakly inflated; greatest width of marginal and discoidal fields combined subequal to greatest depth of caudal femur, greatest width of these fields at distal fourth; marginal field with expansion regular from the very weak basal lobe to the distal fourth, thence the marginal field is rather sharply emarginate and narrowed to the apex of tegmen. Wings greatly reduced.

Metasternal interspace slightly more narrow than in female. Abdomen compressed, carinate dorsad, non-carinate ventrad; supra-anal plate trigonal, apex acute, lateral margins sinuate and broken at proximal third, a transverse depression present here, a broad medio-longitudinal one present proximad and the distal third of plate is slightly elevated; cerci simple, heavy, styliform, reaching to apex of supra-anal plate; subgenital plate weakly compressed, faintly rostrate, apex bluntly produced.

Caudal femora with length slightly more than three times as long as the pronotal disk, caudal tibiae with twelve to thirteen spines on external, and twelve on internal margins.

*Color Notes*.—General color ranging from argus brown to mummy brown, occasionally (type and allotypic male) with dorsal surface of head, pronotum, abdomen and greater portion of tegmina ochraceous-tawny to buckthorn brown. Rarely (allotypic male) this paler area is hardly indicated on head and pronotum, and is tawny on the abdomen and dull buckthorn brown on tegmina. Face occasionally (allotypic male) paler—buckthorn brown, this due to a reduction in the number of dark specklings which deepen the general tone in the other individuals; antennae ochraceous-tawny to russet, darkened with prout's brown distad; eyes mars brown to saccardo's umber, but little contrasted with

dorsal surface. General color of genae, lateral lobes of pronotum and pleura contrasted with pale dorsum in specimens having latter, giving the impression of broad, dark, poorly defined post-ocular bars, in both males augmented by poorly defined fuscous blotches on the lateral lobes and less distinctly so on the postocular section of genae. Tegmina in all at least faintly paler than the sides of the body, generally finely quadrato-maculate on anal, and in one case (type) on discoidal, field with the general color; vicinity of marginal field of general color. Abdomen with dorsal surface always paler than lateral surfaces, contrast decided. Limbs as a whole of the general color: caudal femora with three indefinite pale cross bars on dorsal surface, these occasionally subobsolete; external surface of caudal femora with a small, median, pale spot; ventral surface of caudal femora and ventral surface of body ranging from dresden brown to weak ochraceous-orange, the apex of ventral surface of male abdomen clear ochraceous-orange, genicular region of caudal femora and proximal portion of caudal tibiae infuscate; caudal tibiae ranging from ferruginous to english red, distal extremity, and to a lesser degree caudal tarsi, infuscate; spines black tipped.

The female in instar preceding maturity has a generally uniform medal bronze coloration, the caudal femora tending toward citrine, caudal tibiae with suggestion of the coloration of the same in adult.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Greatest caudal width of pronotal disk	Length of tegmen	Greatest width of tegmen	Length of caudal femur
♂ <i>allotype</i> . . . . .	17.5	3.6	2.1	8.6	2.5	11.6
♂ <i>paratype</i> . . . . .	17	3.4	2.2	8.4	2.4	11
♀ <i>type</i> . . . . .	23	4.2	2.8	7.3	2.9	13
♀ <i>paratype</i> . . . . .	23.5	4.5	3	8	3	13
♀ <i>paratype</i> . . . . .	23.4	4.9	3.1	8.4	3	14.5

In addition to the typical pair we have before us the other specimens (1♂, 2♀, 1 immature ♀) secured at the same time. The female paratypes show more indication of sulcation of the frontal costa than the type, one appreciably more. In the female paratypes the tegmina are slightly more tapering distad than in the type.

The immature female in the instar preceding maturity is of particular interest, as it has the lateral foveolae well indicated, but no more evident from the dorsal surface than in the adult male. This would indicate that this condition in the adult female is not a primitive one.

*Tentative Key to Species of the Genus Chlocaltis*

The present key is based solely on the more evident features of the species and their use here is not to be understood as an ex-

pression of opinion by the authors as to their real importance. The key is a largely artificial means for recognizing the species of the genus—more than that is not expected of it by the authors.

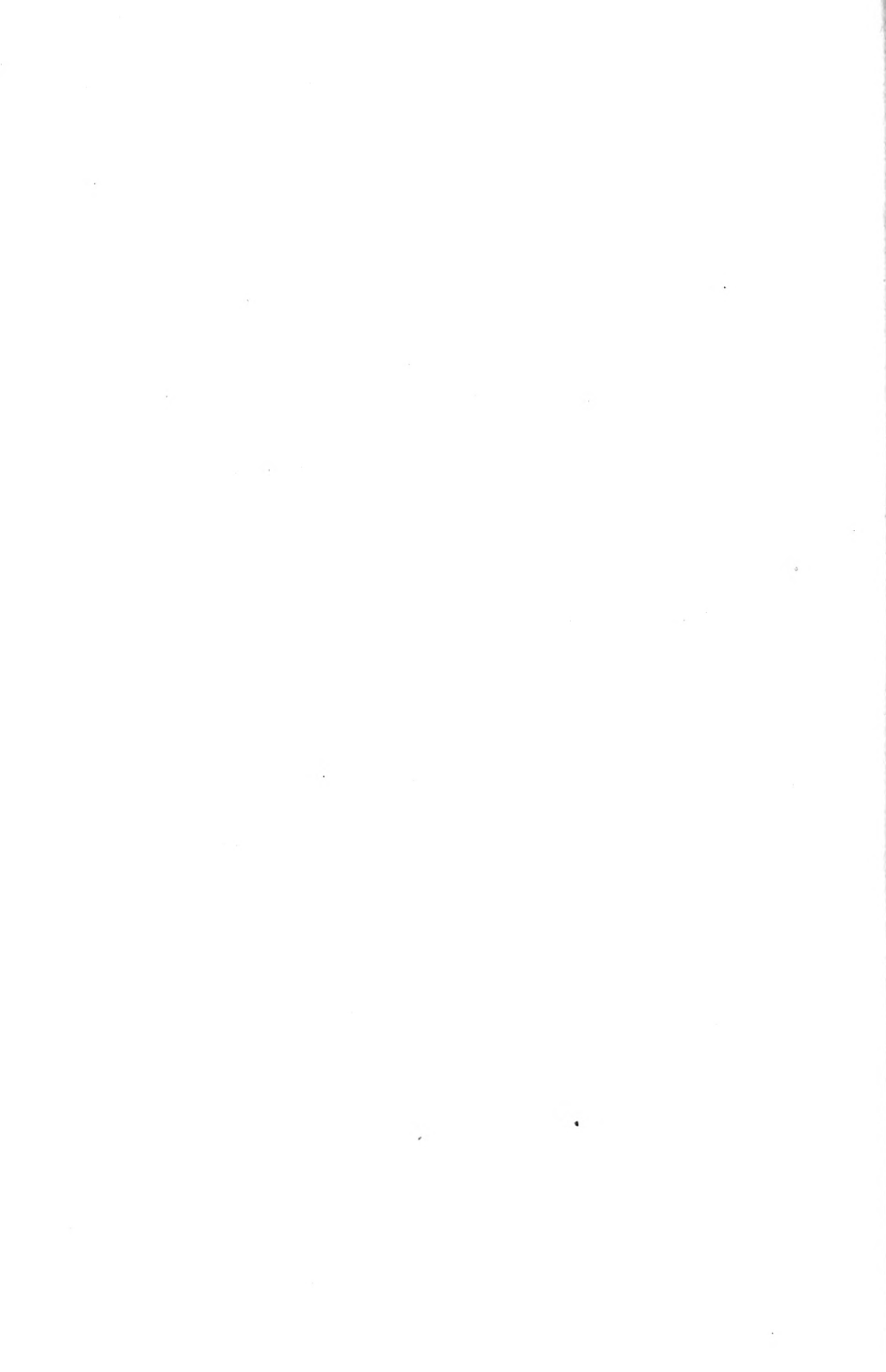
A. Caudal margin of disk of pronotum truncate. Lateral carina of pronotum weakly incurved. Caudal femora proportionately more robust. (Lateral foveolae not evident.) **conspersa** Harris

AA. Caudal margin of disk of pronotum obtuse-angulate. Lateral carina of pronotum markedly incurved or in-bent on prozona. Caudal femora proportionately more slender.

B. Form more compressed. Caudal margin of disk of pronotum weakly obtuse-angulate. Face moderately retreating. Female with lateral foveolae of fastigium not evident. Tegmina of male broad, considerably inflated; of female (normal type) shorter, broad ovate-lanceolate.

**abdominalis** (Thomas)

BB. Form less compressed. Caudal margin of disk of pronotum distinctly obtuse-angulate. Face markedly retreating. Female with lateral foveolae of fastigium indicated by strongly punctate depressions, visible from dorsum. Tegmina of male of average width, weakly inflated; of female longer, elongate lanceolate. . . . . **aspasma** new species





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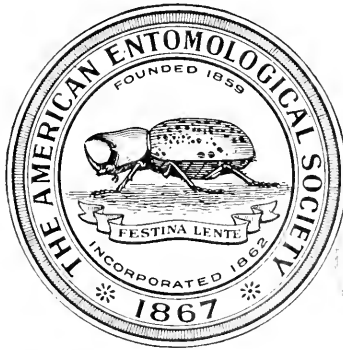
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**STUDIES IN THE DERMAPTERA AND ORTHOPTERA  
OF COLOMBIA****FIRST PAPER****DERMAPTERA AND ORTHOPTEROUS FAMILIES BLATTIDAE,  
MANTIDAE AND PHASMIDAE**

BY MORGAN HEBARD

In undertaking the study of Dermaptera<sup>1</sup> and Orthoptera from Panama, we have found that a good beginning has been made for Costa Rica, to the north of that region, but for Colombia, to the south, all that appear in the literature are scattered descriptions of new species or records of previously known forms.

In consequence, in order to have a better understanding of this portion of the Colombian fauna, we have assembled all the material available from the country and present in the present paper the results for the Dermaptera and first three families of the Orthoptera.

The series at hand are much smaller than is desirable and it is patent that only a fraction of the Colombian species are represented. The material is, however, much more representative than any previously reported and furnishes striking evidence of the multitude of species which occur in that country, so varied in topography and environmental conditions.

The lack of previous study is shown by the fact that of the seventy species here considered, thirty-five are new to science, these including nine new genera. Two hundred Colombian specimens are recorded, in addition to which a number of exotic specimens of the same or allied species are discussed. We wish to extend our hearty thanks to Mr. James A. G. Rehn, of the Academy of Natural Sciences and to Mr. A. N. Caudell, of the United States National Museum, for the privilege of studying the Colombian material under their care.

We would note that the Colombian series is comprised of a few small collections and a number of individuals from widely

<sup>1</sup>This portion of that work has been published. Trans. Am. Ent. Soc., xliii, pp. 301 to 334, (1917).

scattered localities. The best of the small collections are from the Sierra Nevada de Santa Marta, in the north, on the coast of the Caribbean; from the Cordillera Oriental, in the department of Santander, in the central northern interior; from the valleys about the Cordillera Oriental, in Cundinamarca, in central Colombia, and from the Cordillera Occidental, in the department of Cauca, western Colombia. Little affinity is shown to the Panamanian fauna by these series, all from regions separated by decided natural barriers, or of widely different character, from low-lying Panama. It is probable, however, that in the lower portions of northern Cauca and eastern coastal Bolivar, the fauna is very similar to that of Panama. Hardly any material whatever is obtainable from the eastern lowlands in the Orinoco and Amazon drainage.

## DERMAPTERA

### PSALIDAE

#### PSALINAE

***Psalis apolinari***<sup>2</sup> new species (Plate XVI, fig. 1.)

This insect is apparently closely related to *P. peruviana* (Bormans).<sup>3</sup> The present female, when compared with the description of the unique male type of that species, is found to have the pronotum much shorter and more nearly quadrate and the tegmina decidedly broader. The caudal portion of the occiput is much paler in the present insect, but this may be due to individual variation. The scent glands are obsolete, the abdomen decidedly broader and the forceps decidedly longer, these features representing possibly only sexual differences.

The darkened knees and single heavier tooth on each arm of the forceps are striking features in both *peruviana* and *apolinari*.

<sup>2</sup> We take pleasure in naming this and other interesting species in the present paper for Hermano Apolinar Maria, Doctor of the Natural Sciences in the Instituto de la Salle, Bogotá, Colombia. It is through his kind cooperation that a large portion of the material treated in the present paper has been made available for study.

<sup>3</sup> 1880. *Anisolabis peruviana* Bormans, Anal. Soc. Españ. Hist. Nat., ix, p. 505. [♂, Central Peru.] Figured by Burr (Gen. Ins., Fasc. 122, Dermaptera, pl. iii, fig. 3, (1911)) as *Euborellia peruviana*. This generic assignment is untenable; it was based solely on the fact that the species has rudimentary tegmina.

*Type*.—♀; Pamplona, Santander, Colombia. Elevation, 7700 feet. May, 1916. From A. Maria. [Hebard Collection, Type No. 441.]

Size much smaller than in *P. americana*, close to that of *peruviana*; body robust, abdomen expanding and decidedly broadest meso-distad. Head with sutures distinct but represented by mere lines, occiput smooth and convex. Eyes small, much shorter than checks. Antennae with ten joints which are supplied with very few microscopic hairs; first joint very elongate and slender, nearly as long as width between antennal sockets; second joint minute, quadrate; third elongate, slender, three times as long as width, which is subequal throughout; fourth twice as long as greatest width; succeeding joints increasing in length and more slender distad, but all showing a weak convexity of the lateral margins, not tubular as is the third. Pronotum subquadrate, surface weakly convex proximad with a very fine medio-longitudinal sulcus; lateral margins weakly cingulate and feebly diverging caudad; caudal angles rectangular, more broadly rounded than the rectangular, sharply rounded cephalic angles; caudal margin transverse. Tegmina represented by small, broad ovate, lateral pads, extending very slightly beyond the caudal margin of the mesonotum. Wings absent. Metanotum with caudal margin broadly concave. Abdomen smooth, broadening to fifth dorsal segment, stink glands obsolete. Ultimate dorsal abdominal segment broad, smooth, with a weak medio-longitudinal sulcus becoming gradually heavier toward the caudal margin, along which margin, between the bases of the forceps, is a narrow, transverse, depressed area. Forceps heavy, triquetrous proximad, flattened distad and curving weakly to the acute apex; internal margin with a heavy tooth just beyond end of proximal third, succeeded by a few, irregular, decidedly smaller, blunt teeth. Penultimate ventral abdominal segment with distal margin nearly rectangular with apex broadly rounded. Limbs elongate and slender. Caudal metatarsus with ventral surface heavily supplied with hairs and with an internal and external row of rather closely set spines,<sup>4</sup> the external row not continued to distal portion of joint.

Length of body, 15.6; head, 3.8; pronotum, 2.9; exposed portion of tegmen, 1.8; forceps, 5.1; caudal femur, 4.3 mm. Width of occiput, 3.2; pronotum, 3; tegmen, 1.4; lateral portion of tegmen, .8; dorsal portion of tegmen, 1; abdomen at fifth dorsal segment, 5.6 mm.

<sup>4</sup>Lacking an internal fringe of lamellae as found in *Anisolabis maritima*, *Euborellia annulipes* and *scudderi*, or an internal fringe of very closely set hairs as in *Psalis americana* and *compacta* and in *Spandex percheron*. The armament of the ventral surface of the metatarsus may prove a valuable generic feature in the Psalinae. At the present time the genera *Psalis*, *Anisolabis*, *Spandex*, *Metalabis* and *Euborellia* offer a number of vexing problems. Without a monographic study of this group we would hesitate to erect a new genus for the present species with its distinctive metatarsal armament. When such work has been done, however, it is probable that this and other features will oblige generic separation.

Surface smooth and shining. Head deep chestnut, shading back of eyes to sanford's brown, the caudal portion of the occiput being solidly this color. Pronotum, tegmina, and remaining dorsal surface, including forceps, black with a chestnut luster, ventral surface of abdomen paler, showing a stronger chestnut coloration. Other underparts ochraceous orange. Limbs ochraceous orange, except at knees where they are very briefly but strikingly suffused with chestnut.

The type is unique.

***Psalis compacta*** new species (Plate XVI, figs. 2 and 3.)

This insect is readily distinguished from dark examples of *P. americana* having abbreviate and truncate tegmina, by the more robust build, shorter head, pronotum, tegmina and forceps, less hairy antennal joints and forceps in both sexes; the latter, though of the same general type, agreeing more closely with the type developed in *Euborellia annulipes* and other species of that genus.

In addition to other less striking features, *compacta* differs from *P. apolinari* in having quadrate tegmina, immaculate and much shorter limbs, pronotum with caudal margin less transverse and differently armed forceps.

In general appearance this insect is strikingly like an exceptionally large species of *Euborellia*, having the antennae not annulate and quadrate tegmina. Numerous features, however, of which the metatarsal armament is the most important, show the species to be a member of the genus *Psalis*.

*Type*.—♂; Soacha, Cundinamarca, Colombia. Elevation, 8800 feet. June 17, 1904. From A. Maria. [Hebard Collection, Type No. 442.]

Size and form much as in *apolinari*, but with abdomen, though broad, expanding somewhat less. Head proportionately not as large as in *americana* or *apolinari*, sutures represented by faint lines, occiput smooth and convex.<sup>5</sup> Eyes small, much shorter than cheeks. Antennae with (fourteen to sixteen in the series) joints moderately supplied with microscopic hairs, this covering not as heavy as in *americana*, much heavier than in *apolinari*; first joint elongate and slender, three-quarters as long as width between antennal sockets; second joint minute, length less than width; third elongate, slender, slightly over twice as long as greatest (distal) width; fourth slightly longer than greatest width; succeeding joints increasing in length distad, relatively shorter than in *americana* or *apolinari*. Pronotum subquadrate, surface weakly convex proximad where the medio-longitudinal sulcus is strongest; lateral

<sup>5</sup> In the series occasional individuals show brief and weak linear impressions parallel to and lateral of the medio-longitudinal suture.

margins cingulate and almost parallel; cephalic angles rectangulate and sharply rounded, caudal angles obtuse-angulate, rounding broadly into the broadly convex caudal margin. Tegmina smooth, dorsal surface subquadrate, sutural margins weakly overlapping, caudal margins of dorsal portions straight, transverse. Wings absent. Abdomen smooth, broadening to fifth dorsal segment, the two succeeding segments showing little difference in width; stink glands obsolete. Seventh dorsal abdominal segment with surface roughened by irregular longitudinal ridges laterad and there obtuse-angulate produced, with angle rather sharply rounded; eighth similar in this portion, but with angle more sharply rounded; ninth similar, but with angle subrect-angulate and decidedly more sharply rounded; in these features much as in *americana* but with ultimate dorsal abdominal segment showing a longitudinally pinched and striate area instead of the single longitudinal and declivent caudal carina found in *americana*; ultimate dorsal abdominal segment elsewhere smooth, with a medio-longitudinal sulcus distinct only meso-distad.<sup>6</sup> Forceps heavy, briefly triquetrous proximad, flattened distad, with internal margin supplied with a few blunt, irregular teeth; sinistral arm almost straight to blunt and weakly incurved apex; dextral arm straight in proximal half, thence curving evenly and strongly sinistrad to the blunt apex,<sup>7</sup> thus crossing the sinistral arm distad. Penultimate ventral abdominal segment with distal margin forming an angle of over ninety degrees, the lateral portions straight and convergent to the apex which is broadly truncate, weakly and irregularly concave. Limbs proportionally shorter than in *americana*, much shorter than in *apolinari*. Caudal metatarsus with ventral surface thickly supplied with stiff hairs, with an internal and external row of rather widely spaced spines and an internal marginal fringe of very closely set, shorter hairs.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following features. Distal portion of abdomen slightly narrower, forceps and armament of internal margin similar except that the dextral arm shows no more curvature than the sinistral, both being weakly curved in distal portion. Apex of penultimate ventral abdominal segment not truncate, rather broadly rounded.

Surface smooth and shining. Head, pronotum and abdomen unicolorous, ranging from auburn (recessive) to black with a chestnut tinge (intensive). Antennae of same color as head, the proximal joints often slightly paler. Tegmina similarly colored, but in occasional examples of a slightly paler shade. Dorsal distal abdominal segments and forceps the same except in recessive examples where these portions are of a darker shade. Limbs immaculate, ochraceous-tawny.

<sup>6</sup> This is obsolete in specimens of the series before us.

<sup>7</sup> In *americana* this arm is somewhat offset at the base of the more strongly curved distal portion, this giving it a distinctly different general appearance.

## Measurements (in millimeters)

	Length of body	Length of pronotum	Width of pronotum	Exposed length of tegmen	Dorsal width of tegmen	Length of caudal femur	Length of forceps <sup>8</sup>
♂							
Soacha, <i>type</i> . . . . .	16	2.8	2.6	1.7	1.7	2.9	3.7
Soacha, <i>paratype</i> . . . . .	18	2.9	2.7	2.3	2	3.2	4.2
Soacha, <i>paratype</i> . . . . .	18.3	3.1	2.8	2.1	2	3.2	4.3
♀							
Soacha, <i>allotype</i> . . . . .	14.7	2.8	2.6	2.1	2.1	3.4	4.2
Soacha, <i>paratype</i> <sup>9</sup> . . . . .	13	2.5	2.2	1.6	1.7	2.8	3.7
Soacha, <i>paratype</i> . . . . .	17	2.9	2.6	2.1	2	3.3	4.5
Bogotá, <i>paratype</i> . . . . .	12.2	2.4	2.2	1.9	1.9	—	4.1
Bogotá, <i>paratype</i> . . . . .	13	2.8	2.7	1.9	1.9	3.2	4.3

In the series the head varies from 3 by 2.6 to 3.8 by 3 mm.; the greatest abdominal width ranges from 5.1 to 5.4 in the males and from 4.1 to 5.1 in the females.

*Specimens Examined*: 10; 3 males and 7 females.

Soacha, Cundinamarca, VI, 1904, (from A. Maria), 3 ♂, 5 ♀, *type*, *allotype*, *paratypes*, [Hebard Cln.].

Bogotá, Cundinamarca, 8750 feet, (from A. Maria), 2 ♀, [Hebard Cln.].

## SPONGOPHORINAE

**Spongophora forfex** Scudder

1876. *Spongophora forfex* Scudder, Proc. Bost. Soc. Nat. Hist., xviii, p. 259. [♂, doubtless subtropical or tropical America.]

Jiminez, Cauca, 1600 feet, VII, 1907, (M. G. Palmer), 1 ♂, 1 ♀, [A. N. S. P.].

The species of the present genus show astonishing variation in the development of the forceps. Whether such variation is also exhibited in the beading of the caudal margins of the dorsal abdominal segments, and on the ultimate dorsal abdominal segment, is at present not known. Until this problem is solved the number of valid species of *Spongophora* will remain in doubt.

At present we believe the pair at hand to represent a very depauperate condition of Scudder's species,<sup>10</sup> comparable with the depauperate material before us of *S. crocicpennis*, recently recorded from Panama.<sup>11</sup>

<sup>8</sup> In the males the sinistral arm of the forceps is measured.

<sup>9</sup> The measured paratypes represent the extremes of the series before us.

<sup>10</sup> It would appear very likely, from consideration of Burr's description and figures of his *S. borjansii*, that his name is based on material showing an intermediate development of the present insect and should be assigned to synonymy here.

<sup>11</sup> Hebard, Trans. Am. Ent. Soc., xliii, p. 306, (1917).

The present male differs from the Panamanian males of *croceipennis* in having the exposed portion of the wings darker, pale mahogany red, the caudal margins of the fourth to seventh dorsal abdominal segments weakly beaded, the ultimate dorsal abdominal segment with minute scattered knobs distad and a concave row of larger knobs along the caudal margin between the forceps. The forceps show very slight curvature, have no distal tooth on the beaded ventro-internal margin, but do have a single, irregular, dorso-internal tooth as shown in the figures of *S. bormansi*.

## FORFICULIDAE

## FORFICULINAE

**Doru lineare** (Eschscholtz)

1882. *Forficula linearis* Eschscholtz, Entomogr., p. 81. [♀, Santa Catharina, Brazil.]

Choachi, Cundinamarca, 5900 feet, VI, 17, 1904, IX and XII, 1916, (from A. Maria), 2♂, 3♀, [Hebard Chn.].

These are the first specimens of *lineare* in the very large series of nearly two hundred specimens before us, in which the wings are rudimentary and entirely concealed by the tegmina. It is very exceptional to find both macropterous and brachypterous individuals in the same species of *Doru*, but three macropterous examples of the normally brachypterous *D. aculeatum* are also before us.<sup>12</sup> Other distinctive features make confusion with the normally brachypterous *D. luteipenne* impossible.

## OPISTHOSMIINAE

**NEOCOSMIELLA** new genus

This genus has the tegmina keeled to near the distal portion and the dorsal abdominal segments neither recurved or acute laterad. In other respects it appears to agree best with *Cosmiella*, a Malaysian genus.

The large, subrectangulate pronotum, nearly as broad as the dorsal width of the tegmina, is very different from the proportionately much smaller type found in the other American genera of the Opisthocosmiinae, *Dinex* and *Sarcinatrix*, which have the tegmina keeled but the sides of the abdominal segments without folds. In this pronotal type it agrees with *Neolobophora*, which

<sup>12</sup> Recorded by Hebard, Ent. News, xxviii, p. 322, (1917).

genus we believe will be placed in the *Opisthocosmiinae*, Burr's *Neolobophorinae* being, in our opinion, based on insufficient characters. The head with occiput not bilobate and tegmina with heavy keel in all but the distal portion, are features which readily separate *Neolobophora* and *Neocosmiella*.

*Genotype*.—*Neocosmiella atrata* new species.

*Description of Genus*.—Head short, convex, with twin impressions between eyes and with several weak concavities mesad on the moderately convex occiput. Pronotum ample, subquadrate, nearly as broad as head, not conspicuously narrower than width across tegmina. Tegmina with a well-developed dorso-lateral keel to near the distal margin. Abdomen with stink gland of third dorsal segment weakly developed, that of fourth segment conspicuous; sides of dorsal segments simple; ultimate segment smooth, transverse, very feebly narrowing and declivent distad. Male forceps elongate, without a dorsal tooth.

***Neocosmiella atrata*** new species (Plate XVI, fig. 4.)

The present species has no near relatives. The tegmina are very similar in contour and outline to those of the Javan *Sken-dyle aptera* (Verhoeff), as figured by Burr.<sup>13</sup>

Some similarity to *Neolobophora ruficeps* is found in pronotal amplitude, tegminal outline, all abdominal features and general curvature of forceps, but that species differs very widely in coloration, bilobate occiput, smooth tegmina without keels, forceps without a proximo-internal tooth and with proximal weak curvature extending nearly to the mesal point.

*Type*.—♂; Pamplona, Santander, Colombia. Elevation 7700 feet. May, 1916. From A. Maria. [Hebard Collection, Type No. 443.]

Size decidedly larger than *Dinex americanus*, pronotum and proximal portion not as slender, but form very elongate. Head of same type as in *Dinex americanus* but more elongate, with eyes less protuberant and slightly shorter than cheeks.<sup>14</sup> Antennae with first joint heavy, elongate, as long as width between antennal sockets; second joint minute, scarcely longer than wide; succeeding joints elongate, rod-like, increasing in length distad. Pronotum subquadrate; surface irregularly moderately convex; cephalic angles rectangular, rather sharply rounded but not produced laterad in minute points as in *Neolobophora ruficeps* and *Dinex americanus*; lateral margins very feebly

<sup>13</sup> Gen. Ins., Fasc. 122, Dermaptera, pl. 9, fig. 12a, (1911).

<sup>14</sup> See generic description for additional characters of head, pronotum, tegmina, abdomen and forceps.



convex, subparallel; caudal angles rectangulate, broadly rounded; caudal margin broadly convex. Tegmina about twice as long along humeral trunk as dorsal width; dorsal surface deplanate, rugulose, separated from less heavily punctulate lateral surface by a heavy dorso-lateral keel, which disappears before the distal margin; angle at costal margin acute but broadly rounded, distal margin thence oblique to sutural margin. Abdomen widening very slightly and gradually to sixth dorsal segment, then narrowing a little more sharply to apex. Pygidium inconspicuous, declivent, surface weakly convex. The latero-ventral angles of the ultimate dorsal abdominal segment project as a minute tooth on each side beneath the base of the forceps. Forceps cylindrical, very elongate and slender, smooth but armed with a large proximo-internal tooth just beyond the pygidium, feebly bowed in proximal third, thence almost straight but weakly curved to immediate incurved apex, with internal margin very feebly serrulate. Penultimate ventral abdominal segment with lateral margins straight, convergent, rounding broadly into mesal third of free margin which is feebly concave. Limbs elongate and slender.

Length of body, 10.7; head, 2.3; pronotum, 1.9; exposed portion of tegmen along humeral trunk, 1.9; exposed portion of tegmen along sutural margin, 1.7; forceps, 8.9; caudal femur, 3.3 mm. Width of head, 1.9; pronotum, 1.9; abdomen at widest point, 2.7 mm.

Head, pronotum, tegmina and abdomen shining black. Antennae deep chestnut, excepting first joint which is shining black. Forceps in brief proximal portion shining black, remaining portions deep chestnut. Limbs shining black, except distal portion of tibiae and the tarsal joints which are auburn.

The type of this remarkable insect is unique.

## ORTHOPTERA

### BLATTIDAE

#### PSEUDOMOPINAE

#### **PLATYLESTES**<sup>15</sup> new genus

This genus, a member of the Group Blattellites, shows relationship to *Latiblattella* Hebard in the Type B armament of the ventro-cephalic margin of the cephalic femora, which bears three heavy, elongate distal spines, the very broad form and general structure of male subgenital plate. Other features are very distinct, agreeing instead with *Neoblattella* Shelford; the most important of these are the tegmina which have the discoidal sectors longitudinal and the dorsal surface of the male abdomen which is unspecialized.

*Genotype*.—*Platylestes colombiac* new species.

*Description of Genus*.—Sexes similar, except that in the female the pronotum and abdomen is more ample. Size rather large,

<sup>15</sup> From *πλατύς* = broad and *ληστὴς* = plunderer.

form very broad for the group. Head with eyes well separated; lateral margins of face distinctly converging ventrad. Maxillary palpi with distal joint slightly shorter than penultimate joint. Tegmina moderately chitinous; discoidal sectors few (5 to 6), longitudinal. Wings with costal veins not clubbed, becoming obsolete toward costal margin; intercalated triangle small but apparent. Dorsal surface of male abdomen unspecialized. Cerci ensiform. Subgenital plate of male fusing and specialized with styles. Subgenital plate of female short, showing a very short medio-longitudinal distal cleft. Cephalic femora with ventro-cephalic margin armed with (6 to 9) long stout spines (of which one or two distad are sometimes decidedly shorter than the others), succeeded distad by a row of minute, well-spaced, piliform spines, terminating in three heavy, elongate distal spines in increasing ratio. Ventro-caudal margin of cephalic femora distad, and ventral margins of median and caudal femora supplied with elongate, moderately stout spines. First three tarsal joints supplied distad with small pulvilli, brief ventral surface of fourth joint occupied by a pulvillus.<sup>16</sup> Tarsal claws unspecialized. Arolia present.

**Platylestes colombiae** new species (Plate XVII, figs. 1 and 2.)

Superficially the present insect suggests a large and very broad form of *Latiblattella*. The shorter, ensiform cerci are remarkable.

*Type*.—♂; La Palmeta, Santander, Colombia. Altitude, 7500 feet. July 15 to 20, 1916. (M. A. Carriker Jr.) [Hebard Collection, Type No. 464.]

Size rather large for group, form very broad. Head with interocular space three-fifths that between antennal sockets; ocelli obsolete; entire face flattened, weakly convex; very small circular areas, with surfaces feebly convex, occur meso-ventrad of and adjacent to antennal sockets. Maxillary palpi with distal joint large, slightly shorter than penultimate joint and rather thickly supplied with stiff hairs. Pronotum very feebly and evenly convex; greatest width near caudal margin; transparent lateral portions not strongly declivent; cephalic margin above head and caudal margin truncate, lateral margins feebly convex and distinctly divergent to the broadly rounded latero-caudal angles. Tegmina broad, showing slight reduction, not reaching apices of cerci; wings showing distinct reduction: see generic description for other features. Supra-anal plate small, lateral margins feebly convex, strongly convergent to distal

<sup>16</sup> This is the type found in both *Latiblattella* and *Ncoblattella*; the former genus has been unfortunately assigned otherwise in Hebard, Mem. Am. Ent. Soc., 2, pp. 12 and 18, though correctly characterized in the original description.

portion which is bilobate. Cerci short, ensiform, tapering to acute apex, subdeplanate dorsad, joints distinct but feebly moniliform. Internal genitalia complex. Subgenital plate small, asymmetrical; with two broad, elongate inset plates (the styles), the surfaces of which slope dorso-laterad, these styles directed dorso-mesad with apices nearly attingent, thus forming the distal surface of the subgenital plate, beneath which lies the median rotundato-trigonal produced portion of the plate; the sinistral style is decidedly the smaller and leaves a distinct gap between its ventral margin and the median produced portion of the plate. Limbs and armament as given in generic description.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Very similar to male in general appearance, but with abdomen considerably heavier and as a result slightly surpassing the tegminal apices. Interocular space nearly as wide as that between antennal sockets. Pronotum similar to that of male except that the width of the cephalic portion is greater, giving it a more rotundato-quadrate appearance. Supra-anal plate small, triangular, but decidedly angulate-emarginate at apex with apices of lateral productions rounded. Subgenital plate ample, convex, short, briefly upturned distad, with a brief medio-longitudinal cleft; free margin convex proximad, then broadly obtuse-angulate concave beneath bases of cerci, thence evenly convex.

*Measurements (in millimeters)*

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
<i>Type</i> .....	16	4.8	6.8	12.2	4.9
<i>Paratype</i> .....	15.4	4.8	6.7	12.1	4.7
♀					
<i>Allotype</i> .....	16.7	5	6.7	12	4.8

Head ochraceous-tawny, washed with cinnamon brown, or entirely cinnamon brown. Pronotum with disk marbled, sudan brown to ochraceous-tawny, transparent lateral portions tinged with ochraceous-tawny. Tegmina transparent, ochraceous-tawny, the humeral trunk briefly suffused proximad with prout's brown. Wings transparent, whitish like ground glass, veins faintly tinged with brown. Abdomen, cerci and limbs ochraceous-tawny, tinged with cinnamon brown on disto-dorsal portion in males; female darker, possibly discolored.

In addition to the type and allotype, a single paratypic male, bearing the same data, is at hand.

***Neoblattella carrikeri***<sup>17</sup> new species (Plate XVII, figs. 3, 4, 5 and 6.)

The male of this insect is the most attenuate, and has the proportionately longest tegmina, of any American form of the Group Blattellites. The highly specialized male subgenital plate

<sup>17</sup> We name this species in honor of Mr. M. A. Carriker Jr., who collected these specimens and also the valuable series from the Magdalena and Santander regions recorded in the present paper.

and styles will probably show striking differences from any other closely related species.

The female closely resembles that sex of *N. pellucida* (Burmeister) in dorsal appearance, size of pronotum, length and shape of tegmina and dorsal coloration, but differs widely in the much more elongate maxillary palpi with very short distal joint, more slender limbs and the inconspicuously marked ventral surface of the abdomen.

With other species *carrikeri* would appear to form a unit which we would term the Carrikeri Group, the species distinguished by their attenuate form and elongate tegmina and limbs; the elongate tegmina conspicuous only in the males of some of the species. In this Group, from the descriptions, we would place *azteca* and probably *alaris*, both of Saussure and Pictet, and *titania* of Rehn, from study of the type; the order being *titania*, *alaris*, *azteca* and *carrikeri*, the first two species having the organs of flight considerably shorter than in the others.

*Type*.—♂; San Lorenzo, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 7000 to 8300 feet. August 23, 1913. M. A. Carriker Jr. [Hebard Collection, Type No. 443.]

Size medium, large for the Carrikeri Group; form slender. Interoocular space wide; ocellar spots barely indicated. Lateral margins of genae straight, parallel. Maxillary palpi very elongate; third joint very elongate and slender, distinctly longer than width between antennal sockets, fourth almost as long, fifth (distal) joint slightly more than half as long as fourth, moderately enlarged, oblique truncate to near its base. Pronotum with surface almost perfectly deplicate, showing very feeble convexity meso-cephalad and along the caudal margin, and with undulations on the slightly impressed disk; cephalic and caudal margins truncate, feebly convex, the caudal margin much the broader; lateral margins convex; greatest width at mesal point. Tegmina very delicate and elongate; with (7 sinistral, 8 dextral) longitudinal discoidal sectors; cross-veinlets scarcely apparent; minute colorless nodes widely scattered distad over the surface on the veins, these the bases of minute microscopic hairs. Wings very delicate; proximal (7 and 8) costal veins heavily clubbed distad with succeeding (2) veins weakly clubbed; ulnar vein with (7) branches complete; intercalated triangle very small. Supra-anal plate triangularly produced with apex rounded, about twice as broad as long. Concealed genitalia: a very slender and elongate, dark, slightly outwardly curved aciculate process is apparent with apex resting in cleft above the sinistral style. Subgenital plate roughly quadrate, scoop-shaped; lateral raised portion with dorsal margins weakly concave, the sinistral slightly the longer, leaving a median portion with oblique distal margin forming about one-third of the free margin, weakly

produced sinistral, with disto-sinistral angle produced in a minute, delicate, subquadrate plate; these three portions are separated by very deep and narrow clefts, in depth about half the distance between their bases, at which bases are situated the elongate, cylindrical styles, the sinistral as long as the sinistral cleft, the dextral very slightly the longer, each with dorsal surface thickly supplied with minute spines directed caudad and with apex very feebly enlarged and incurved: Limbs very elongate and slender. Cephalic femora with ventro-cephalic margin supplied with a series of slender, moderately elongate spines, which decrease gradually in length and size to minute spinulae before the two large and elongate distal spines, of which the more distal is the longest. Tarsi extremely long, four proximal joints each supplied with a small distal pulvillus which is produced to an acute apex. Moderate aroha present. Tarsal claw specialized<sup>18</sup>; broad to near uncinatè apex, with internal margin of flange minutely serrulate, the three distal serrulations largest.<sup>19</sup>

*Allotype*.—♀; same data as type. [Hebard Collection.]

Agrees with male in form of head, maxillary palpi, microscopic nodes on tegmina, armament of limbs and specialization of tarsal claws. Pronotum more ample, surface showing moderate convexity. Tegmina and wings very much shorter, the veins all very much more weakly developed. Supra-anal plate triangularly produced, with apex strongly angulato-emarginate at an angle of somewhat less than ninety degrees. Subgenital plate scoop-shaped, the meso-distal portion not strongly produced; lateral margins broadly convex to near bases of cerci, there broadly concave, meso-distal portion with margin broadly convex.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
San Lorenzo, <i>type</i> . . . . .	12.7	3.1	4	17.9	4.9
♀					
San Lorenzo, <i>allotype</i> . . . . .	10.8	3.2	4.4	11.5	3.7
San Lorenzo, <i>paratype</i> . . . . .	12.1	3.2	4.4	11.7	3.8

<sup>18</sup> A differently specialized tarsal claw has recently been noted for the genus *Plectoptera*. Hebard, Mem. Am. Ent. Soc., No. 2, p. 251, (1917).

<sup>19</sup> This type of specialization is clearly a character of specific importance in the present genus, but largely of degree, the differences in the various species showing that it can not be used as a constant generic feature. In *Neoblattella* the highest specialization is noted in *nahua* and the genotype *alspersicollis*, in which the internal flange of the claw is heavily serrulate throughout; in *fasciata*, *conspersa* and *fraterna* the serrulations are heavy distad; in *pellucida* moderate distad, while in *fratercula* and *titania* they are subobsolete. In the closely allied genus *Caribblatta*, the majority of the species show this flange with serrulation of its margin subobsolete, but in *punctipennis* and *imitans* weak distal serrulation of the internal margin of the flange is found, while in *acliculata* it is decided. Species of the genera *Euthlastoblatta*, *Aglaopteryx*, *Dendroblatta*, *Latiblattella*, *Supella* and *Blattella* have been examined and are found to show no specialization of the tarsal claws.

General coloration of male pale ochraceous-tawny, the lateral portions of pronotum and tegmina transparent, tinged with ochraceous-buff. Head ochraceous-buff with interocular area suffused with prout's brown, three pairs of suffused flecks of this color (remnants of transverse bands) below on the face and a fleck of this color below each antennal socket. Underparts and limbs clear ochraceous-buff.

Females similarly colored but with interocular area paler, in one scarcely suffused, in the other weakly clouded with ochraceous-tawny; facial flecks as pronounced as in male. This sex also has the tegmina more heavily suffused with ochraceous-buff in median section, beyond this hardly at all suffused and ventral surface of the abdomen ochraceous-buff with a lateral marginal suffusion of chestnut, becoming broader and deep shining chestnut-brown along the free margin of the subgenital plate.

In addition to the type and allotype, a single paratypic female, bearing the same data, is at hand.

**Ischnoptera morio** Burmeister

1838. *Ischnoptera morio* Burmeister, Handb. Ent., ii, Abth. ii, pt. i, p. 500. [Colombia.]

Choachi, Cundinamarca, 5900 feet, VIII, 1916, (from A. Maria), 1 ♀, [Hebard Cln.].

Length of body 17.1; pronotum, 4.8; tegmen, 20.9; caudal tibia, 6.2 mm. Width of pronotum, 6.2; tegmen, 5.9; abdomen, 8 mm.

**Ischnoptera apolinari** new species (Plate XVI, figs. 6 and 7.)

The present species is widely distinct from any of the described forms of the genus. With *I. pallipes*, *pampaconas*<sup>20</sup> and *colombiae*,

<sup>20</sup>**Ischnoptera pallipes** (Scudder) (Plate XVI, fig. 5.)

1869. *Phyllodromia pallipes* Scudder, Proc. Bost. Soc. Nat. Hist., xii, p. 342. [♂, Napo or Marañon, [Upper Amazon].]

The description of this insect is insufficient. The dried alcoholic type before us shows differences from *I. apolinari* in the decidedly longer, uniform blackish chestnut pronotum and less delicate wings with veins blackish chestnut.

The genitalic features are distinctive. Supra-anal plate of same form as in *apolinari*, but with disto-dorsal surface heavily supplied with hairs and ventral surface unspecialized and not hairy. Subgenital plate with margins rather strongly concave to the median produced portion, which is not large, subquadrate, with distal angles rounded, the disto-dextral angle very broadly rounded; sinistral style situated at sinistral base of production, small, simple, cylindrical, feebly curved dextrad, tapering to the sharply rounded apex; dextral style (Plate XVI, fig. 5a) situated at disto-dextral angle of production, proximal portion developed into a large, globose, smooth swelling, from which dorso-caudad projects caudad the rather stout, distal cylindrical portion, the apex

the latter here described, this species represents a group of rather large, dark species having very elongate tegmina in both sexes, pronotum unicolorous or with narrow pale lateral margins, limbs pale and male supra-anal plate produced but showing no sub-chitinous area. We would call this the Apolinari Group and place it after the Rufa Group in linear arrangement.

Compared with *colombiae*, known only from the male sex, males of *apolinari* are found to be identical in every detail of structure and coloration except that the limbs are proportionately longer and the genitalia highly distinctive.

*Type*.—♂; Choachi, Cundinamarca, Colombia. Elevation, 5900 feet. July, 1915. From A. Maria. [Hebard Collection, Type No. 444.]

Size medium for the larger species of the genus, form slender. Interocular space narrow, hardly one-third ocular depth, about three-fifths interocellar width. Ocelli large, surface flattened, margins at interocellar area slightly raised and narrowly convex. Maxillary palpi rather short, hairy, particularly fourth and fifth joints; fourth joint shorter than third, fifth (distal) joint about as long as third, moderately enlarged, with ventral margin weakly convex. Tegmina comparatively narrow, with numerous (9 and 11) weakly radiating discoidal sectors; dextral tegmen with diagonal channel strongly impressed and conspicuous. Wings as normal for the genus<sup>21</sup>; ulnar vein with (5) proximal incomplete branches and (2) complete distal branches. Dorsal surface of abdomen with sixth and seventh segments specialized, typical for the genus.<sup>22</sup> Supra-anal plate well produced, chitinous throughout; free margins briefly straight, oblique and strongly convergent to just beyond cercal bases, thence very feebly convex and very feebly convergent to the broadly rounded latero-caudal angles, the distal margin between these feebly convex but showing a very weak mesal obtuse-angulate emargination, the produced portion thus

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of which is bluntly rounded, the entire surface of this distal portion heavily supplied with minute spines.

Length of body 14; pronotum, 3.8; tegmen, 16.2. Width of pronotum, 4.5 mm.

### ***Ichnoptera pampaconas* Caudell**

1913. *Ichnoptera pampaconas* Caudell, Proc. U. S. Nat. Mus., xlv, p. 318.  
[♀, Pampaconas River, Peru.]

This species belongs to the Apolinari Group, though not as elongate as the other species here discussed. From examination of the type we would note that the supra-anal plate in that female is distinctively rotundato-produced between the cerci. The pale borders of the costal margins of the tegmina are particularly striking in the costal half of the marginal fields.

<sup>21</sup> Described in Trans. Am. Ent. Soc., xlii, p. 339, (1916).

<sup>22</sup> See Mem. Am. Ent. Soc., No. 2, p. 62, (1917).

formed about twice as broad as long, its form weakly suggesting bilobation; the plate bears latero-distad scattered hairs on the dorsal surface and a fringe of stouter hairs directed cephalad near the distal margin on the ventral surface; proximal of these the ventral surface is raised dextrad in a heavy ridge from which projects a stout, heavy, rounded process directed meso-proximad and armed with a few short, sharp teeth. Cerei slender with (11 to 12) well-defined joints. Concealed genitalia: the very brief, recurved genital hook is situated sinistrad, from beneath the dextral projection of the supra-anal plate projects a narrow, chitinous lobe, while along its inner surface is a slender, elongate, channeled, chitinous projection, surrounded by a soft whitish mantle. Subgenital plate roughly subquadrate, scoop-shaped; sinistral portion curled dorsad with margin concealed, distal margin broadly concave, oblique and moderately produced dextrad, there rounding into the dextro-lateral margin which is broadly concave distad, thus forming a bluntly triangular production with surface moderately reflexed and concave; proximo-dextral portion curled dorsad, the margin concealed. Mesad in the sinistral concavity of the distal margin is situated a slender, straight, gently tapering, hairy style with apex rounded and dorsal surface supplied with a few minute, but rather stout, teeth directed distad; at the apex of the roundly triangular dextral production is situated a short, heavy, blunt, conical style, supplied distad with a few blunt teeth. Limbs elongate, their armament, pulvilli and arolia normal<sup>23</sup>; the ventro-cephalic margins of the cephalic femora having a series of heavy proximal spines and a series of minute, distal, closely set, piliform spines.

*Allotype*.—♀; same data as type, but taken August, 1916. [Hebard Collection.]

Very similar to male, differing in the following features. Size somewhat larger, form generally similar but with abdomen broader. Tegmina and wings fully as elongate. Dorsal surface of abdomen unspecialized. Supra-anal plate with lateral margins straight, weakly oblique to median two-fifths of the plate, where a subrectangulate production, about twice as wide as long, occurs, with distal margin broadly convex, this production suggesting a simplified miniature of the homologous production in the male. Subgenital plate broadly scoop-shaped, lateral margins straight, parallel in very brief proximal portion, thence rounding broadly into the very broadly and evenly convex distal margin.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
Choachi, <i>type</i> . . . . .	13.5	3.5	4.6	17	4.6	6.1
Choachi, <i>paratypes</i> . . . . .	15.8-16.7	3.6-3.6	4.6-4.6	17-17.2	4.5-5	6.2-6.3
♀						
Choachi, <i>allotype</i> . . . . .	16.8	3.9	4.9	18.5	5.2	6.4

Head shining blackish chestnut brown, mouthparts paler, ocelli conspicuously light buff. Pronotum shining blackish chestnut brown with lateral margins narrowly translucent warm buff, this continued without interruption

<sup>23</sup> See Mem. Am. Ent. Soc., No. 2, p. 62, (1917).



around the cephalic margin, there being still narrower and somewhat suffused. Tegmina shining deep chestnut brown, translucent when spread, with marginal field narrowly bordered with translucent warm buff; portion of dextral tegmen concealed when at rest hyaline but enbrowned. Wings hyaline faintly enbrowned except in intercalated triangle, with a very faint iridescent luster, veins and entire area of costal veins chestnut brown. Body, abdomen, except dorso-proximad where the abdomen is paler, and cerci chestnut brown. Limbs light buff, proximal portion of coxae chestnut brown, tibiae and tarsi tinged with brown.

In addition to the type and allotype, a single paratypic male from the same locality is at hand.

**Ichnoptera colombiae** new species (Plate XVI, figs. 8, 9 and 10.)

This insect is so similar to *I. apolinari* that careful comparison shows the majority of features exactly as given for that species. We therefore describe below only the characters separating these species.

*Type*.—♂: Valle de Las Pappas to San Augustin, Tolima, Colombia. April 6, 1912. [Hebard Collection, Type No. 214.]

Interocular space moderately wide, three-fifths the ocular depth, four-fifths the interocellar width. Internal margins of ocelli forming a sharply rounded angle with interocellar area, not raised. Maxillary palpi shorter than in *apolinari*, with fifth (distal) joint slightly longer than third. Supra-anal plate with production of similar type but uniformly less heavily chitinous, this portion slightly longer than its proximal breadth; ventral surface lacking a projection. Concealed genitalia: an elongate, heavy, moderately chitinous plate is situated dextrad and directed caudad, adjacent to which mesad are two very elongate and slender chitinous projections, the longest of which terminates in several long contiguous spines. Subgenital plate very short, scoop-shaped, surface entirely convex; free margin convex except meso-sinistrad where a moderate obtuse-angulate emargination occurs, the convexity strongest meso-dextrad where the production is greatest. Sinistral style situated in sinistral angulate-emargination, elongate, decidedly stouter than this style in *apolinari*, flattened cylindrical, feebly sinuous, tapering slightly to the rounded apex, unarmed. Dextral style situated on dorsal surface of distal margin sinistrad on dextral production, very small, slender, cylindrical, unarmed, hardly tapering to the apex, which is directed sinistrad. Limbs short, strikingly shorter than in *apolinari*.

Length of body, 12.6<sup>21</sup>; pronotum, 3.1; tegmen, 17; caudal femur, 3.7 mm. Width of pronotum, 1.1; tegmen, 1.1 mm.

Coloration throughout as in *apolinari* except that the pronotum is slightly less dark, shining dark chestnut brown, with narrow warm buff marginal marking more sharply defined cephalad, but very narrowly interrupted meso-cephalad. Limbs slightly darker than in *apolinari*, general coloration ochraceous-buff, but similarly marked.

The type is unique.

<sup>21</sup> The abdomen in this specimen is decidedly drawn in.

**Xestoblatta carrikeri** Hebard

1916. *Xestoblatta carrikeri* Hebard, Trans. Am. Ent. Soc., xlii, p. 374, pl. xix, figs. 5, 6 and 7. [♂, ♀: Cincinnati, [Sierra Nevada de] Santa Marta, [Magdalena,] Colombia.]

This remarkable species was described from a pair from the collections at present under consideration. No further specimens of this insect have been obtained.

## NYCTIBORINAE

**Nyctibora obscura** Saussure

1864. *N[yctibora] obscura* Saussure, Rev. et Mag. de Zool., 2e sér., xvi, p. 316. [♀, Brazil.]

Cincinnati, Sierra Nevada de Santa Marta, Magdalena, Colombia, 4000 to 5000 feet, VII, 1913, (M. A. Carriker Jr.), 1 ♀, [Hebard Cln.].

Length of body 24.5; length of pronotum, 7.15; width of pronotum, 10.7; length of tegmen, 26.3; width of tegmen, 10.5 mm.

**Eunyctibora nigrocincta** (Shelford)

1907. *Nyctibora nigrocincta* Shelford, Ann. Mag. Nat. Hist., (7), xix, p. 37. [♂, ♀, Colombia.]

Bogotá, Cundinamarca, 8750 feet, (from A. Maria), 1 ♀, [Hebard Cln.].

**Paratropes biolleyi** Saussure and Zehntner

1893. *Paratropa biolleyi* Saussure and Zehntner, Biol. Cent.-Amer., Orth., i, p. 60. [♀, Costa Rica; ♂, Bugaba, Panama.]

Cauca, Colombia, 1 ♀, [Academy of Natural Sciences of Phila.].

This specimen differs from material of *P. bilunata* Saussure and Zehntner at hand, in having the pronotal marking and the borders of the tegmina uniform translucent antimony yellow.

## EPILAMPRINAE

**Epilampra shelfordi**<sup>25</sup> new species (Plate XVIII, fig. 1.)

This insect belongs to an apparently exclusively South American group of the genus, distinguished by the tegmina being not only punctulate, but with a maculate and marbled ground coloration difficult to describe, but giving the insects an unusually richly colored appearance.

<sup>25</sup> We name this beautiful insect in honor of that distinguished student of the Blattidae, R. Shelford, whose excellent work was so abruptly terminated by his untimely death.

To this group belong *E. conspersa* and *E. agathina*, of which species single specimens are at hand. More material may show these forms to be generically distinct.

The present species has the tegmina narrower than in *conspersa*, less strikingly marmorate, with an irregular clustering of black dots mesad which are not found in that species, neither is the area of the costal veins solidly colored or as dark, showing only numerous irregular dark punctae. The coloration of *agathina*, which is a larger and heavier insect, is much darker and of a distinctly different type.

*Type*.—♂: El Credo, Cauca, Colombia. Elevation, 1000 feet. February, 1907. (M. G. Palmer.) [Academy of Natural Sciences of Philadelphia, Type No. 5345.]

Size small for the group, medium for the genus; form moderately broad. Interocular space wide, nearly as wide as interocellar space, much wider than space between antennal sockets; face flattened; ocelli large, well defined, with flattened surfaces forming an obtuse-angulation with plane of face. Pronotum convex, lateral portions moderately declivent latero-cephalad, greatest width mesad; cephalic margin rather evenly convex, broadly but feebly thickened to point of greatest pronotal width, where the angle formed is sharply rounded at slightly more than ninety degrees, latero-caudal margins moderately convex convergent, then concave convergent to the distinct, bluntly rounded, meso-caudal production. Tegmina elongate, width subequal from apex of anal field to a distance equalling the length of that field; rounded apex nearer the costal margin. Wings with numerous, irregular costal veins; ulnar vein with numerous (18) incomplete and few (4) complete branches. Dorsal abdominal segments with latero-caudal angles all blunt and not produced. Supra-anal plate with all but narrow proximal portion subchitinous, about two and one-half times as broad as long; lateral margins feebly convergent, nearly straight to the broadly rounded, nearly rectangulate latero-caudal angles, distal margin transverse, feebly convex. Cerci moderately elongate, tapering moderately to the very slender distal third, joints distinct but very weakly crenate. Subgenital plate with sinistral margin moderately convex to beyond mesal point, dextral margin decidedly concave.<sup>26</sup> Cephalic femora with ventro-cephalic margin armed proximad with a few heavy, well-spaced spines, succeeded by a row of microscopic widely spaced piliform spines, with a single heavy and very elongate distal spine; other ventral femoral margins moderately supplied with heavy spines. Caudal metatarsus very elongate and slender, equal to combined length of succeeding joints, armed along each ventral margin with a closely-set row of minute spines; four proximal tarsal joints each with a round distal pulvillus, the surface of which is produced caudad. Large arolia present.

<sup>26</sup> In this specimen the subgenital plate is apparently distorted. A single microscopic style is apparent in the concavity of the dextral margin.

Type and peculiarities of color pattern very important in present group, but differences due to individual variation must always be discounted.

Length of body, 25.5; pronotum, 6.7; tegmen, 25.9; wing, 23.9; caudal tibia, 8.7; caudal tarsus, 5.8 mm. Width of pronotum, 8.7; tegmen, 7.6; wing, 15 mm.

General coloration ochraceous cinnamon buff, marmorate with tawny olive and spotted with mummy brown. Head with occiput to interocellar band dresden brown, heavily marked with microscopic dots of mummy brown; ocellar areas and a narrow connecting band ventrad, clouded ochraceous-buff, face below this clouded with prout's brown, in other portions clay color. Pronotum clay color sprinkled evenly and heavily with microscopic dots and a few larger flecks of mummy brown. Tegminal ground color cinnamon buff, marbled with tawny olive, each minute marmorate area becoming darker distad, individually dresden brown to mummy brown, with a heavy fleck of mummy brown mesad in the anal field and a number of such irregular markings mesad on the tegmina. Wings hyaline showing a faint buffy tinge, except from area of costal veins to apex where they are translucent, suffused briefly proximad with cinnamon buff, the larger remaining distal suffusion tawny olive, all rather thickly flecked with prout's brown. Body buckthorn brown, the abdomen suffused with prout's brown to mummy brown distad. Limbs clay color, the spines and tarsi prout's brown.

The type is unique.

#### BLATTINAE

#### **LAMPROBLATTA**<sup>27</sup> new genus

This genus is of particular interest, due to the fact that it probably includes the only known American species of the Blattinae lacking tegmina of any kind. Furthermore these are the only species of the Blattinae having the dorsal surface smooth and showing this condition.

The genus includes three species: *meridionalis* (Bruner),<sup>28</sup> *albipalpus* here described, and *zamorensis* (Giglio-Tos).

<sup>27</sup> From λαμπρός = shining.

<sup>28</sup> 1906. *Blatta* (*Stylopyga*) *meridionalis* Bruner, Jour. N. Y. Ent. Soc., xiv, p. 141. [♂, ♀, Trinidad.]

The described pair, an additional female and an immature specimen bearing the same data, have been kindly submitted for examination by Professor Bruner. We here select the adult male, in the Bruner Collection, as single type. In addition there is before us an adult male taken at Montserrat, Trinidad, by A. Busck, July 27, from the National Museum.

Giglio-Tos' *Stylopyga zamorensis*, described from the valley of Zamora, Ecuador, in Boll. Mus. Zool. Anat. Comp. Univ. Torino, xiii, No. 311, p. 10, (1898), also belongs to the present genus. This is a species differing from *albipalpus* in its decidedly greater size and differently colored coxae and limbs.

The nearest relationship is clearly with the genus *Eurycotis*: the most important features of difference being the absence of tegmina; less flattened structure, with dorsal surface consequently more convex, and more elongate and slender tarsal joints, with metatarsi longer than the combined length of the succeeding joints. The greater general body convexity shows agreement with the genus *Pelmatosilpha*.

*Genotype*.—*Lamproblatta albipalpus* new species.

*Description of Genus*.—Form less deplanate than in *Eurycotis*, entire dorsal surface and ventral surface of abdomen rather decidedly convex. Head evenly rounded, eyes widely separated and not projecting; maxillary palpi rather short. Pronotum with surface evenly convex; margin evenly convex, this strongest cephalad, to the transverse caudal margin. Mesonotum and metanotum with surface transversely convex, this less decided on abdomen. Tegmina and wings absent. Supra-anal and subgenital plates in both sexes of the type characteristic in the genus *Eurycotis*. Limbs heavily spined as in that genus. Tarsal joints elongate and slender. Caudal metatarsus longer than combined length of succeeding joints, supplied with a double row of minute ventral spines to its extremity, which border distad the large elongate distal pulvillus. Succeeding three joints with ventral surfaces fully occupied by large pulvilli. Large arolia present.

***Lamproblatta albipalpus*** new species. (Plate XVII, figs. 7, 8 and 9.)

This species shows nearest general resemblance to *Eurycotis mexicana* (Saussure), differing signally, however, in its jet black coloration, white palpi and the features given in the generic discussion.

Compared with *meridionalis*, that species is found to differ in both sexes in having the limbs blackish chestnut rather than black, the pale portions more yellowish and not as contrasting, ochraceous-buff, and the supra-anal plate truncate distad, the distal margin showing no emargination and transverse or very feebly convex. The most important differential character, however, is that in *meridionalis* both sexes have similarly simple, elongate, slender metatarsi.

*Type*.—♂; Cincinnati, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 4000 to 5000 feet. July 14, 1913. M. A. Carriker Jr. [Hebard Collection, Type No. 446.]

Size no larger than the smallest species of *Eurycolis*, form nearly elliptical. Interocular space appreciably broader than the very wide space between the antennal sockets; ocellar spots distinct. Maxillary palpi short; third and fourth joints subequal in length; fifth shorter, little enlarged, ventral margin oblique to point of greatest width, two-thirds distance to base. Pronotum as given in generic description; latero-caudal angles rather sharply rounded rectangulate. Mesonotum with caudal margin almost perfectly transverse, with latero-caudal angles rather sharply rounded rectangulate. Metanotum with caudal margin transverse, very broadly and weakly concave, with latero-caudal angles very feebly produced, very sharply rounded, at less than a right angle. Caudal margins of dorsal abdominal segments very feebly and distantly beaded, latero-caudal angles very feebly acute-angulate produced, this increasing slightly distad to seventh segment. Supra-anal plate feebly tectate with sides concave, lateral margins concave convergent to distal margin, which is about two-thirds as long as the plate, feebly obtuse-angulate emarginate with plate there feebly subchitinous. Cerci stout, margins entire, rounding to acute apex, articulations subobsolete, dorsal and ventral surfaces moderately convex, the latter heavily haired. The two plates beneath the supra-anal plate, which form a heavy triangular adjacent production, are large and conspicuous. Beneath these are the complex concealed genitalia: genital hook elongate and slender, weakly curved dextrad to suddenly incurved and broadened apex. Subgenital plate of the characteristic Blattinid type; lateral margins moderately convex to styles, distal margin between these feebly convex, transverse. Styles feebly inset, small, cylindrical, similar, half as long as the distance between their bases. Limbs heavy, with armament heavy, as given in generic description. Caudal metatarsus longer than combined length of succeeding joints, decidedly thickened; all metatarsi stout, broadening in proximal third, thence narrowing feebly to apex, the ventral margin broadly convex; ventral surface with a row on each margin of minute spines which in the distal two-thirds border the very large and elongate pulvillus.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Size slightly larger than male, differing in the following features. Supra-anal plate tectate, with sides declivent to near the lateral margins which are slightly raised; lateral margins almost straight, convergent to the decidedly concave distal margin which equals about half the length of the plate. Subgenital plate of the characteristic valvular Blattinid type, the valves differing from those of *Eurycolis mexicana* in being considerably shorter than the basal portion of the plate, with proximal suture much narrower and less strongly defined. Caudal metatarsus decidedly longer than combined length of succeeding joints, slender; all metatarsi elongate and slender, the ventral margin straight; ventral surface with a row on each margin of minute spines, which at the immediate extremity border the large pulvillus.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Width of pronotum	Greatest width of abdomen	Length of caudal femur	Length of caudal metatarsus
♂						
Corozal, Panama . . .	17	5	—	7.8	6	2.7
Empire, Panama . . .	17	5.1	7.3	8	6	—
Gatum, Panama . . .	14	5	7.1	7.8	6	2.7
Gatum, Panama . . .	13.7	4.7	6.7	7.6	5.8	2.6
Cineinnati, Colombia, <i>type</i> . . . . .	17	5.5	7.2	8.6	6.7	2.8
♀						
Corozal, Panama . . .	18.5	5.8	7.8	9.2	6.7	2.8
Gatum, Panama . . .	17.5	5.7	7.9	9	6.9	2.8
Gatum, Panama . . .	18.4	5.7	7.7	9	6.9	2.8
Cineinnati, Colombia, <i>allotype</i> . . . . .	16.8	5.5	7.3	9.3	6.8	2.7
Cineinnati, Colombia, <i>paratype</i> . . . . .	17	5.6	7.4	9.3	7	2.8

General coloration of entire dorsal surface shining, polished, jet black, showing a chestnut tinge only in a strong light. Head the same but with ocellar spots buffy, clypeus suffused zinc orange and palpi strikingly whitish buff. Dorsal surface of limbs jet black, in some specimens showing a chestnut tinge. Other ventral portions deep blackish chestnut, shining, except the coxae in which the latero-external margins and distal portions are pale, ochraceous-buff, in some specimens tinged with zinc orange. In the immature examples from Panama the pronotum, mesonotum, metanotum and limbs are in large part shining chestnut, translucent laterad, giving them a very different general appearance.

The enlarging of the male metatarsi only begins in the last instar before maturity, there showing a slight enlargement with slightly increased size of the distal pulvillus. The preceding instars show in both sexes the type found in the adult female.

This insect was found widely distributed by us in Panama, being the most plentiful roach under litter in or near the jungle. Individuals were not as rapid in their movements as the Pseudomopid and Epilamprid material there found, as would be expected from their heavier structure.

*Specimens Examined:* 31; 6 males, 8 females and 17 immature individuals.

Gatum, Canal Zone, Panama, VII, 17 to VIII, 22, 1916, (D. E. Harrower), 2 ♂, 2 ♀, 1 large juv. ♀, [Hebard Cln.].

Obispo Station, Canal Zone, Panama, VII, 6 to 11, 1871, (Steindachner), 1 ♂, 1 ♀, [M. C. Z.].

Zone limit five miles west of Empire, Canal Zone, Panama, IX, 14, 1913, (M. Hebard; rubbish under vines on edge of jungle), 1 ♂, 1 ♀, [Hebard Cln.].

Corozal, Canal Zone, Panama, XI, 13 and 17, 1913, (M. Hebard; under decaying banana stem lying in jungle), 1 ♂, 1 ♀, [Hebard Cln.].

Old Panama, Panama, XI, 13, 1913, (M. Hebard; under drift on edge of coral sand beach), 1 small juv. ♀, [Hebard Cln.].

Taboga Island, Panama, II, 23, 1912, (A. Busck), 1 large juv. ♂, [U. S. N. M.].

Tabogilla Island, Panama, II, 16, 1912, (A. Busck), 1 large juv. ♂, 1 medium juv. ♂, 2 large juv. ♀, [U. S. N. M.].

Cincinnati, Sierra Nevada de Santa Marta, Magdalena, Colombia, 4000 to 5000 feet, VII, 10 and 14, 1914, (M. A. Carriker Jr.), 1 ♂, 2 ♀, *type, allotype, paratype*, 1 very large juv. ♂, [Hebard Cln.].

Venezuela, 1 ♀, [A. N. S. P.].

#### *A Note on Eurycotis and Pelmatosilpha*

The genera *Eurycotis* and *Pelmatosilpha* have been dogmatically separated by features of tegminal length; species with abruptly truncate or lateral tegmina being referred to *Eurycotis*, those with less decidedly reduced or fully developed tegmina to *Pelmatosilpha*.

From study of the considerable series at hand, representing numerous species of both genera, we would distinguish between them as follows:

A. Dorsal surface of insect less convex. Tegmina transversely truncate, or more decidedly reduced, lateral. (The dark species have dorsal surface and tegmina roughened. Many species of pale coloration represented with differently striking color patterns.) . . . . . **Eurycotis** Stål

AA. Dorsal surface of insect more convex. Tegmina truncate but obliquely so, with distal angle at sutural margin the more produced, or fully developed. (All are dark species with dorsal surface including tegmina polished and frequently showing a purplish sheen. Some of the species have pronotum and tegmina conspicuously margined with yellow.) . . . . . **Pelmatosilpha** Dohrn

It is evident from the description that *Eurycotis cothurnata* Giglio-Tos must be assigned to *Pelmatosilpha*, as is possibly true for *Eurycotis subalata* Saussure and Zehntner, the description of the tegmina of the latter species leaving considerable doubt as to their actual form. From material at hand from Trinidad we are also able to assign *Pelmatosilpha decipiens* Kirby to *Eurycotis*. That author has badly confused these genera and their established synonymy.<sup>29</sup>

**Pelmatosilpha micra** new species (Plate XVIII, fig. 2.)

The present species is evidently closely related to *P. villana* Saussure and Zehntner and *P. cothurnata* (Giglio-Tos). It differs from both in the smaller size, particularly indicated by the

<sup>29</sup>Synon. Cat. Orth., i, pp. 112 to 111, (1904). See Hebard, Mem. Am. Ent. Soc., No. 2, pp. 165 and 166, (1917).



pronotum.<sup>30</sup> Compared further with *villana*, we find that species to differ in the black palpi, tegmina distinctly longer than broad, blackish chestnut limbs and cerci which are reddish distad only.

The differences shown by *colburnata* are: the black head, yellow antennae, slightly more abbreviate tegmina, minute lobi-form wings, black limbs with tibiae ferruginous and yellow cerci.

It is possible that *Eurycotis subalata* Saussure and Zehntner may be still another closely allied species of *Pelmatosilpha*. In that insect the tegmina are considerably shorter than in *micra* and other features of differences are indicated in the brief and unsatisfactory original description.

*Type*.—♂: La Pahueta, Santander, Colombia. Elevation, 7500 feet. July 15 to 20, 1916. (M. A. Curriker, Jr.) [Hebard Collection, Type No. 465.]

Size small for the genus, form robust. Head broad; very broad interocular space very slightly greater than that between antennal sockets; ocelli represented by minute spots. Pronotum smooth and polished, broad, rather decidedly convex, particularly laterad; cephalic and lateral margins very feebly cingulate, lateral margins divergent and weakly convex to the rounded rectangulate latero-caudal angles, caudal margin transverse, very feebly convex. Tegmina overlapping, extending mesad to base of second dorsal abdominal segment, polished with subobsolete punctae; venation obsolete, anal sulcus briefly indicated only near extremity of sutural margin; costal margins feebly cingulate, subparallel, feebly convex to the broadly convex obtuse-angulate costal angle, the distal margin continuing this curvature and moderately oblique to the rounded, weakly obtuse-angulate, more produced sutural angle, sutural margin weakly convex. Wings atrophied, extending mesad to median portion of first dorsal abdominal segment, fields distinct, anterior field the wider and rather strongly elutinous toward the costal margin, veins coarse and irregular.<sup>31</sup> Disto-lateral angles of fourth to sixth dorsal abdominal segments sharply but briefly acute-angulate produced in increasing ratio caudad. Supra-anal plate rounded trapeziform<sup>32</sup> with distal portion decidedly hairy. Cerci depressed, rigid, with lateral margins entire but joints distinct, three times as long as greatest width, apex acute. Internal genitalia complex. Subgenital plate of normal type for genus, styles well inset, cylindrical, feebly incurved, about five times as long as basal width. Armament of limbs heavy, as characteristic of genus. Caudal metatarsus

<sup>30</sup> The measurements for the others are both apparently for the female sex, and, in consequence, the size difference for *micra* is probably not as considerable as comparison of the measurements given in the original descriptions of these species would indicate.

<sup>31</sup> Very similar to those of *P. villana* as given in the original description of that species.

<sup>32</sup> Somewhat deformed dextro-distad in this specimen.

broadening distad, slightly longer than combined length of succeeding three joints, ventral margin with a double row of minute spines in proximal two-thirds, distal third occupied by a large pulvillus, succeeding three joints with ventral surfaces fully occupied by large pulvilli. Arolia well developed.

Length of body, 18; pronotum, 5.8; tegmen at costal margin, 5.1; tegmen at sutural margin, 6.2; exposed portion of tegmen at sutural margin, 5.8; cercus, 1.9; style, 1; caudal femur, 6.9 and caudal metatarsus, 2.2. Width of interocular space, 3; pronotum, 7.9; dextral tegmen, 5.7; sinistral tegmen, 5.6 and abdomen, 9.9 mm.

General coloration shining blackish brown. Head with occiput chestnut, the sulci slightly darker, eyes and face blackish chestnut, minute ocellar spots ochraceous-tawny, mouthparts and palpi russet. Antennae russet shading to cinnamon brown distad. Tegmina shining blackish brown, opaque, when held up to light chestnut, a metallic purplish sheen is present on the dextral tegmen immediately before the narrow sutural marginal portion which is concealed when at rest and which is transparent, tinged with brown. Wings transparent, tinged with brown, this stronger toward the costal margin, there burnt sienna. Mesonotum and metanotum weak ochraceous-orange. Abdomen shining blackish brown, cerci carol brown. Coxae ochraceous-tawny tinged with dark brown meso-proximad. Cephalic and median limbs and caudal femora russet, caudal tibiae briefly russet proximad, shading rapidly to blackish chestnut brown, caudal tarsi blackish chestnut brown.

In addition to the type, a single immature specimen in one of the later instars, bearing the same data, is at hand.

**Periplaneta brunnea** Burmeister.

1838. [*Periplaneta*] *brunnea* Burmeister, Handb. Ent., ii, abth. ii, part i, p. 503. [♂, ♀: Chile; Demerara [=British Guiana].]

Ambalema, Tolima, 900 feet, IX, 1914, (from A. Maria), 1♂, [Hebard Ch.].

**Periplaneta australasiae** (Fabricius)

1775. [*Blatta*] *australasiae* Fabricius, Syst. Ent., p. 271. ["In nave e mare pacifico et regionibus incognitis revertente."]

Pacho, Cundinamarca, III, 19, 1917, (from A. Maria), 12♂, 4♀, 1 juv. ♀, [Hebard Ch.].

Fusugasugá, Cundinamarca, 5464 feet, XII, 1916, (from A. Maria), 1♂, 1♀, [Hebard Ch.].

PANCHLORINAE

**Leucophaea maderae** (Fabricius)

1781. [*Blatta*] *maderae* Fabricius, Spec. Ins., i, p. 341. [Madeira.]

Fusugasugá, Cundinamarca, 5464 feet, XII, 1916, (from A. Maria), 1♂, 1♀, [Hebard Ch.].

**Pyenoscelus surinamensis** (Linnaeus)

1767. [*Blatta*] *surinamensis* Linnaeus, Syst. Nat., ed. xii, p. 687. [Surinam.]

Jimenez, Cauca, 1600 feet, VII, 1907. (M. G. Palmer), 3 ♀, [A. N. S. P.].

**Panchlora cubensis** Saussure

1862. *P[anchlora] cubensis* Saussure, Rev. et Mag. de Zool., 2e sér., xiv, p. 230. [♀, Cuba.]

Caldas, Cauca, 2560 feet, V, 14, 1914. (H. S. Parish), 1 ♀, [A. N. S. P.].

This specimen agrees fully with Cuban females of the species before us.<sup>33</sup> In it the eyes are very narrowly separated by a distance about one-fifth the greatest ocular width; this feature apparently varies in the present species. In fact so much variation is seen to occur in the large series at hand of *cubensis*, that the species is clearly one of the centers of difficulty in the proper understanding of the genus.<sup>34</sup>

The measurements of the specimen recorded are: length of body, 19.4; pronotum, 5.7; tegmen, 20.7 mm. Width of pronotum, 6.4; tegmen, 6.3 mm.

**Panchlora colombiae** new species (Plate XVIII, fig. 3.)

This plain green species is closely related to *P. bidentula* Hebard, known only from the male sex, this sex of the present species differing in the larger size, normally wider interocular space and striking genitalic features.

Compared with both sexes of *P. cubensis* Saussure, the present insect is found to differ in the normally wider interocular space, proportionately larger pronotum, proportionately wider tegmina and distinctive male genitalic features.<sup>35</sup>

From the insufficient description of *P. punctum* Saussure and Zehntner, based on a single female from "Central America," a possibility of the present material representing that species might exist, were it not for the fact that Central American material of

<sup>33</sup> See diagnosis: Hebard, Mem. Am. Ent. Soc., No. 2, pp. 197 to 199, pl. viii, figs. 2 to 5, (1917).

<sup>34</sup> See Hebard, Ent. News, xxvii, pp. 217 to 222, (1916).

<sup>35</sup> We would note, however, that unless a large collection representing many species of the plain green species of *Panchlora* is available, the student is certain to have almost insurmountable difficulties in determining single females belonging to this section of the genus.

the present species before us is even smaller than the material here treated, with interocular space narrower.<sup>35</sup>

*Type*.—♂: La Cumbre, Cordillera Occidental, Cauca, Colombia. Elevation, 6600 feet. May 15, 1914. (H. S. Parish.) [Academy of Natural Sciences of Philadelphia, Type No. 5346.]

Size medium large, form moderately broad, when compared with the species of nearest affinity. Head with eyes very broad in front; eyes separated by a brief space, in width about one-sixth the greatest diameter of the eye.<sup>37</sup> Pronotum and tegmina of normal form, the clear margins of these parts somewhat tessellate with greenish and in consequence somewhat opaque. Supra-anal plate rounded subrectangular, transverse distad but produced beyond apex of produced subgenital plate, dorsal surface weakly concave; lateral margins straight and longitudinal to broadly rounded disto-lateral angles, this convexity continued on the caudal margin, thus forming a moderate obtuse-angulate emargination mesad. Cerci small, more elongate than in *bidentula* but of similar form, extending well beyond supra-anal plate, tapering gently and evenly to flattened, narrow and rather sharply rounded apex. Subgenital plate transverse, roughly triangularly bilobate produced, the sinistral produced portion broadest, reaching from base of sinistral style to mesal point, the dextral production adjacent, brief, the area of these productions bent dorsad. Very slender, straight, cylindrical styles are situated on the free margin of the subgenital plate at the inner margins of the cercal bases; the sinistral extending beyond distal margin of supra-anal plate to base of slender apical portion of cercus, two-thirds as long as cercus; the dextral very slightly shorter. Femora with normal hairs and spines extremely delicate.

*Allotype*.—♀: same data as type, but taken May 18, 1914. [Academy of Natural Sciences of Philadelphia.]

Size larger than male, form proportionately broader. Head with interocular space broader, three-fifths as wide as greatest ocellar width; the eyes, however, decidedly narrower than in male. Pronotum ample, proportionately distinctly larger than in females of *cubensis*. Tegmina elongate and broad, proportionately broader than in females of *cubensis*. Genitalia showing no differences from *cubensis*, of the characteristic type found in the plain green species of the genus.

*Measurements (in millimeters)*

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
La Cumbre, Colombia, <i>type</i> . . . . .	15.3	4.2	5.1	16.8	5.6
La Cumbre, Colombia, <i>paratype</i> . . . . .	16.7	4.5	5.6	17.4	5.9

<sup>36</sup>The female type of *punctum* is described as having ample pronotum and much wider interocular space than the females of *colombiae*.

<sup>37</sup>In the recorded series of *P. bidentula*, one male from Caparo, Trinidad, has the interocular space fully as wide.

♀	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
La Cumbre, Colombia, <i>allotype</i> . . . . .	22.7	5.7	7.7	22.6	7.8
La Cumbre, Colombia, <i>paratype</i> . . . . .	22.2	6	7.4	22.7	8.3
Cauca, Colombia, . . . .	19.8	5.4	6.8	20.9	7.3
Cauca, Colombia, . . . .	18.8	5.9	7.7	21.2	7.7

The pronotal differences, though apparent, are not as decided as the measurements would indicate, this portion being more flattened in some specimens than in others, while the caudal production is sometimes curved downward, sometimes flat.

The subgenital plate of the male paratype is deformed, this particularly affecting the area of the dextral production.

The entire series is apparently slightly faded. The general coloration is shining, light green yellow. Lateral margins of pronotum and lateral fields of tegmina opaque, greenish. Lateral cream colored lines of pronotum and tegmen conspicuous, the disk of the pronotum tinged with reddish in one female from Cauca, Colombia. Eyes very dark brown, the interocular space ferruginous to varying degrees. Antennae antimony yellow, immaculate. From one to two inconspicuous blackish brown dots are present on the tegmina in their distal half in all except two females.

*Specimens Examined:* 6; 2 males and 4 females.

La Cumbre, Cordillera Occidental, Cauca, Colombia, 6600 feet, V, 15 and 18, 1914, (H. S. Parish), 2♂, 2♀, *type, allotype, paratypes*, [A. N. S. P.].

Cauca, Colombia, 2♀, [A. N. S. P.].

### **Zetobora lata** Shelford

1907. *Zetobora lata* Shelford, Ann. Mag. Nat. Hist., (7), xix, p. 45. [♂, no locality given.]

Bogotá, Cundinamarca, 8750 feet, (H. G. Klages,) 1♀, [U. S. N. M.].

This specimen agrees fully with the type except in being appreciably smaller. The subgenital plate is distinctly bilobate-produced meso-distad, though not as strongly so as the supranal plate. The femora entirely lack genicular spines and have their ventral margins unarmed; the ventro-cephalic margin of the cephalic femora is supplied distad with a row of well separated, moderately elongate hairs, as are the ventro-caudal margins of the median and caudal femora throughout their length.

Length of body, 25; pronotum, 8; tegmen, 20.2. Width of pronotum, 12.9; tegmen, 10 mm.

## BLABERINAE

**Blaberus giganteus** (Linnaeus)

1758. [*Blatta*] *gigantea* Linnaeus, Syst. Nat., ed. x, i, p. 424. [America.]

Cincimati, Sierra Nevada de Santa Marta, Magdalena, VII, 10, 1913, (M. A. Carriker Jr.; fundacion), 5 ♀, 1 juv. ♂,<sup>38</sup> [Hebard Chn.].

This insect differs from *B. colosseus* (Illiger) only in the average proportionately broader pronotum and wider marginal field of the tegmina. It is possible that that name may be found invalid, representing a mere variation of the present species. Much larger series of both conditions must be had before this can be finally settled.

**Blaberus colosseus** (Illiger)

1802. *Blatta colossea* Illiger, Mag. Insektenkunde, i, p. 186. [Demerara [= British Guiana].]

Muzo, Boyaca, 2700 feet, VI, 1915, (from A. Maria), 1 ♂, [Hebard Chn.].

The measurements of this specimen are: length of body, 59; pronotum, 15.8; tegmen, 66.7. Width of pronotum, 21.6; tegmen, 22; marginal field of tegmen, 6.8 mm. Length contained in width of pronotum 1.37 times.

**Blaberus discoidalis** Serville

1839. *Blabera discoidalis* Serville, Hist. Nat. Ins., Orth., p. 76. [♀, Santo Domingo.]

Cincimati, Sierra Nevada de Santa Marta, Magdalena, 4000 to 5000 feet, VII, 1913, (M. A. Carriker Jr.), 2 ♂, [Hebard Chn.].

Susumuco, Cundinamarca, 2600 feet, XI, 25, 1916, (from A. Maria), 5 ♂, [Hebard Chn.].

Fusugasugá, Cundinamarca, 5464 feet, XII, 1916, (from A. Maria), 3 ♀, [Hebard Chn.].

The Cincimati specimens are exceptionally large for the species, representing the optimum condition, and are similar to material recently recorded adventive in the United States from Colombia.<sup>39</sup> The remainder of the series is typical, the pronotal spot showing considerable variation, as is usual, in extent and contour.

<sup>38</sup> This series has been fully discussed; Ent. News, xxvii, p. 290, (1916).

<sup>39</sup> Mem. Am. Ent. Soc., No. 2, p. 273, (1917).

## OXYHALOINAE

**Chorisonera translucida** (Saussure)

1864. *Bl[atta] translucida* Saussure, Rev. et Mag. de Zool., (2), xvi, p. 311.  
[[♀], Mexico.]

La Cumbre, Cordillera Occidental, Cauca, 6600 feet, V, 14, 1914, (H. S. Parish), 1 ♀, [A. N. S. P.].

A considerable series of apparently the same species from Mexico, Guatemala, Costa Rica and Panama is before us. More material is, however, needed before we can state definitely whether the somewhat marked differences observed are attributable in all cases to individual variation, or should be in some used as a basis for geographic racial or even specific separation.

We would note that subsequent records, from various portions of South America, of the species originally described from Mexico, are in the majority of cases found to represent actually distinct species. The species which have so wide a range are almost all ubiquitous and abundant forms. To this category the present species may belong.

The species is apparently closely allied to *C. mysteca* Saussure.<sup>40</sup> From the original description that insect apparently differed only in the tegmina having a fuscous humeral line, but later, when more fully described,<sup>41</sup> found to differ also in having the tegmina with veins of the "marginal" (scapular) field very numerous and intercalated.

The specimen before us agrees fully with two females in the Hebard Collection from San Rafael, Vera Cruz, Mexico.

## PERISPHAERINAE

The Perisphaerinae are divided into a number of distinct divisions. First we would place *Dasyposoma* and its allies, showing a strong Blattinid development; then *Stenopiloma* and allied genera which show a distinctive type. This type may be said to exhibit an Epilamprine or Panchlorine facies, the general structure showing the Epilamprine tendency the stronger. In this group the three new American genera described below should be placed first; *Colapteroblatta* indeed showing closest general similarity to certain aberrant genera of the Epilamprinae, differing very widely from these in features which assign it to the Perisphaerinae. The groups which come after are: that including

<sup>40</sup> Rev. et Mag. de Zool., (2), xiv, p. 167, (1862).

<sup>41</sup> Mém. l'Hist. Nat. Mex., iv, Blatt., p. 110, (1864).

*Hormetica* and allied genera, showing a Blaberine facies, and lastly that in which belongs *Paranauphoeta*, showing striking approach toward the Panesthinae.

Still other divisions are represented in the present subfamily, but at present insufficient material is before us to assign these properly.

**COLAPTEROBLATTA**<sup>42</sup> new genus

The simple type of pronotum in the present genus is remarkable in the present group, the majority of the forms of which have the lateral wings of the pronotum deflexed and variously specialized.<sup>43</sup>

Nearest relationship is found in *Poroblatta*, also an American genus, described on page 123, where these genera are compared.

*Genotype*.—*Colapteroblatta compsa* new species.

*Description of Genus*.—Form dissimilar in the sexes: male elongate, rather broad, with dorsal surface of abdomen feebly convex between the moderately raised lateral margins; female less elongate, broad, with dorsal surface of abdomen evenly convex. Head of male with interocular space broad and ocelli large and sharply defined, of female with interocular space extremely broad and ocelli small but distinct. Pronotum of male moderately punctulate, with surface very weakly convex except above the head, where the convexity is more decided, and laterad where the lateral wings are subdeplanate and feebly declivent, caudal margin feebly convex with a median angulation subobsolete; of female moderately punctulate, with surface moderately convex, the greatest convexity above the head (less than in male) and declivent, unspecialized lateral wings (more strongly declivent than in male), leaving the evenness of the general convexity little disturbed. Tegmina of male delicate, very elongate and narrow, extending much beyond apex of abdomen; of female heavily chitinous, abbreviate. Wings of male fully developed; of female minute, atrophied pads. Supra-anal plate of male bilobate, very delicate; of female with distal margin convex but showing traces of bilobation, heavily chitinous. Subgenital plate of male of characteristic Blaberine type (variously developed also in the Epilamprinae and Panchlorinae); of female simple, ample, convex and fitting closely all of ventral portion of abdomen beyond fifth

<sup>42</sup> From *κολαπτήρ* = chisel.

<sup>43</sup> See Shelford, *Ann. Mag. Nat. Hist.*, (8), i, p. 162, (1908).



dorsal abdominal segment. Limbs moderately heavy in male, heavier in female; in both sexes with cephalic femur very slightly wider proximad than distad, the ventro-cephalic margin supplied with a fringe of hairs, terminating distad in a single heavy, reduced spine, ventro-caudal margin with one or several similar distal spines; ventro-cephalic margins of median and caudal femora with very few, irregularly scattered, distant, reduced spines, ventro-caudal margins of median and caudal femora with more numerous, heavier but reduced spines. Tarsi similar in both sexes except that the joints are more slender in the male; caudal metatarsus no longer than combined length of first three succeeding joints; four proximal joints with ventral surfaces unarmed and fully occupied by large pulvilli, which are bluntly angulato-produced distad, that of metatarsus linear in proximal portion. Large arolia present between the delicate tarsal claws.

**Colapteroblatta compsa** new species (Plate XIX, figs. 1 and 2.)

The males are unknown of the species showing nearest affinity to this large and striking insect. When compared with the female of that species, *Poroblatta cylindrica*, here described, that sex of the present insect is found to differ in the much broader form, weak hooding of the pronotum cephalad even less apparent but with lateral wings likewise simple, overlapping sutural margins of the tegmina and less reduced cerci, which in normal position extend slightly beyond the curvature formed by the free margin of the adjacent segments.

*Type*.—♂; San Lorenzo, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 7000 to 8300 feet. August 23, 1913. (M. A. Carriker Jr.) [Hebard Collection, Type No. 447.]

Size large for group; form elongate, rather broad. Head with interocular area deplanate, moderately punctulate, forming a weak, rounded, obtuse-angulation with the deplanate, moderately punctulate-face; eyes large, moderately projecting; interocular space broad, as wide as eye, slightly broader than interocellar space, considerably narrower than width between antennal sockets; ocelli decided, large, flattened surfaces oblique to plane of intervening area. Maxillary palpi small and slender; third joint longest; fourth decidedly shorter; fifth (distal) joint intermediate in length between these, weakly enlarged. Pronotum, tegmina, wings, abdomen and limbs as given in generic description. Oblique sulci of pronotal disk broad, distinct. Tegmina broadest meso-distad, with discoidal sectors moderately oblique. Sinistral wing with few (3) complete and many (16) incomplete rami of the ulnar vein; inter-

calated triangle very elongate and narrow. Cerci small, elongate, extending caudad beyond distal margin of supra-anal plate, tapering evenly to the sharply rounded apex, with lateral margins distinctly crenate. Subgenital plate with surface weakly convex; minute, subchitinous, slender styles situated on distal margin just inside cerci, the dextral slightly the longer; distal produced portion of plate between these with sinistral margin moderately convex to beyond mesal point, rounding there into the straight, oblique dextral margin.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Body bulk larger than male; form elongate elliptical, broad. Head much more simple than in male, front portion entirely deplanate, moderately punctulate; eyes reduced, not projecting; interocular space very broad, as wide as space between antennal sockets; ocelli reduced, small, smoothly concave, irregularly rounded. Maxillary palpi slightly heavier than in male. Pronotum, tegmina, wings, abdomen and limbs as given in generic description. Pronotal surface more evenly convex than in male with oblique sulci of disk obsolete, latero-caudal angles rectangulate, sharply rounded, caudal margin perfectly transverse. Tegmina truncate, about as long as wide, roundly produced caudad at costal margin, thence with distal margin roundly emarginate, this cutting through the distal portion of the anal field, angle at sutural margin slightly less than ninety degrees, with apex sharply rounded. Cerci greatly reduced, very small, short; brief lateral margins entire, apex acute.

*Measurements (in millimeters)*

	♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen <sup>44</sup>	Width of abdomen
San Lorenzo, <i>type</i> . . . . .		27.7	6.2	8.9	33.9	9.8	9.4
	♀						
San Lorenzo, <i>allotype</i> . . . . .		28.5	7.2	9.7	6	7.9	12.2
San Lorenzo, <i>paratype</i> . . . . .		25.7	7	9	5.3	6.3	11
San Miguel, <i>paratype</i> . . . . .		28.8	7.3	9.4	5.8	6.8	12.3
San Miguel, <i>paratype</i> . . . . .		26.1	6.3	8.7	6.7	6.7	10.8

The degree and curvature of the tegminal truncation in females shows some variation in the series before us.

*Coloration*.—♂. *Type*.—Pronotum with mesal portion shining black tinged with chestnut and shading to chestnut meso-caudad, laterad this marking is angulate produced before the mesal point, thence the lateral margins are nearly straight, moderately divergent to caudal margin above humeral trunk of tegmina; lateral wings transparent warm buff, this extending rather broadly across the pronotum along the cephalic margin, there suffused caudad; punctae in the pale area chestnut brown. Tegmina transparent, marginal field warm buff, the numerous irregular veinlets more strongly so, humeral trunk bay, other proximal portions washed with chestnut, this fading gradually to apex of anal field and with flecks of chestnut, thence the tegmina are buffy, this weakest in distal portions. Wings almost colorless, showing a faint buffy tinge toward the margins of the anterior field, with an irregular line of opaque

<sup>44</sup> This is for the exposed portion only.

light buff distad along the mediastine vein. Dorsal surface of abdomen raw umber, with lateral margins rather broadly warm buff. Head with face shining blackish with a chestnut tinge, becoming slightly paler on occiput, eyes prout's brown, ocelli light buff, antennae uniform cinnamon brown, genae, mouthparts and limbs brussels brown. Ventral surface of abdomen shining black, shading to brussels brown meso-proximad, rather broadly margined with warm buff, this continued as a narrow marginal line on the subgenital plate.

♀. *Allotype*.—Pronotum with mesal portion shining black shading to deep carob brown meso-caudad, lateral margins of this marking not showing the angulate production before the mesal point as strongly as in the male and feebly convex divergent caudad; lateral wings antimony yellow, punctae and cingulate margin bay. Tegmina with anal field carob brown, marginal field antimony yellow, punctae and larger distal flecks bay, intervening portion between these areas blackish tinged with carob brown. Wings minute, vestigial, irregular pads. Abdomen entirely shining black, showing a very faint carob brown tinge. Head with face the same color, shading to carob brown on occiput, ocelli and mouthparts clay color. Coxae deep bay black, other portions of limbs and antennae deep bay.

In the majority of the females before us, the angulate production of the dark pronotal marking is not as decided as in the male. Several are not as dark as the allotype, one individual being much paler, with dark portions of pronotum and tegmina bay and dorsal surface of abdomen heavily tessellate with buffy.

*Specimens Examined*: 11; 1 male, 7 females and 3 immature individuals.

San Lorenzo, Sierra Nevada de Santa Marta, Magdalena, Colombia, 7000 to 8300 feet, VIII, 23, 1913, (M. A. Carriker Jr.), 1 ♂, 2 ♀, *type*, *allotype*, *paratype*, 2 juv. in different instars, [Hebard Ch.].

San Miguel, Sierra Nevada de Santa Marta, Magdalena, Colombia, 5500 feet, IV, 24, 1914, (M. A. Carriker Jr.; in bromeliads), 5 ♀, *paratypes*, 1 large juv., [Hebard Ch.].

#### **POROBLATTA**<sup>45</sup> new genus

The present genus is known only from the female, which agrees with that sex in the genus *Colapteroblatta* in the type of head, pronotum with simple lateral wings, abdomen and limbs and their armament. It differs in the more slender form, greater pronotal convexity, and more slender and more strongly convex abdomen.

Closer affinity is shown to the female sex in *Acroporoblatta*, which has, however, a proportionately much larger head, more strongly hooded pronotum with lateral, longitudinal gland-like swelling and lacks tegmina.

*Genotype*.—*Poroblatta cylindrica* new species.

<sup>45</sup> From πῶρος = boring.

*Description of Genus.*<sup>46</sup>—Form elongate, with entire dorsal surface evenly and strongly convex. Interocular space extremely broad and ocelli small but distinct. Pronotum moderately punctulate with surface strongly convex, the cephalic portion divided from the larger caudal portion by a weak and broad transverse sulcation, distinct only meso-laterad, lateral wings unspecialized. Tegmina heavily chitinous, abbreviate. Distal portion of abdomen, limbs and their armament, pulvilli and arolia as given here in the description of the genus *Colapteroblatta*.

**Poroblatta apatela** new species (Plate XIX, fig. 3.)

The present species is readily distinguished from the closely allied *P. cylindrica*, described in the present paper, by the slightly more punctate pronotum, with lateral margins of dark area more broadly and less deeply invading mesad the pale lateral portions, tegmina nearly attingent mesad and of the form found in *Colapteroblatta compsa*, here described, and dorsal surface of abdomen strongly mottled laterad. In other respects *apatela* and *cylindrica* agree closely.

*Type.*—♀; La Palmeta, Santander, Colombia. Elevation, 7500 feet. July 15 to 20, 1916. (M. A. Carriker Jr.) [Hebard Collection, Type No. 466.]

Size medium large for the group, rounded cephalad and caudad. Head as described for *cylindrica*. Maxillary palpi with fifth joint decidedly longer than fourth, slightly longer than third. Pronotum as in *cylindrica*, but caudal margin without trace of minute angulate mesal projection. Tegmina<sup>47</sup> truncate, about as long as wide, roundly produced caudad at costal margin, thence with distal margin roundly emarginate, this cutting through the distal portion of the anal field, angle at sutural margin slightly less than rectangular with apex sharply rounded. Wings vestigial, small rounded pads. Abdomen as in *cylindrica*. Distal portion of abdomen, cerci, limbs and their armament, pulvilli and arolia as given in the generic description of *Colapteroblatta*.

Length of body, 26; pronotum, 6.7; tegmen at costal margin, 5.3; exposed portion of tegmen at costal margin, 4.4; tegmen at sutural margin, 2.3; caudal tibia, 5.3. Width of head, 4.5; pronotum, 7.7; tegmen, 5.2; interval mesad between tegmina, 1.6; abdomen at widest point, 9 mm.

Dorsal surface shining blackish chestnut brown. Pronotum with dorsal portion shining blackish chestnut brown, this invading the cinnamon buff lateral wings briefly in all but a short cephalic and caudal portion, its margin there broadly and weakly convex, punctae and cingulate margin of lateral wings bay. Tegmina shining blackish chestnut brown; marginal field cinna-

<sup>46</sup> Based on female, the male sex being unknown and probably very dissimilar.

<sup>47</sup> In this specimen the distal portion of the dextral tegmen is malformed.

mon buff, the few punctae bay. Head blackish chestnut brown, antennae prout's brown except in proximal portion which is buffy, ocelli, genae, palpi and mouthparts light ochraceous-buff. Coxae and limbs light ochraceous-buff, the spines tawny. Dorsal surface of abdomen shining blackish chestnut brown, the first to sixth segments ochraceous-buff heavily speckled with blackish chestnut brown on each side, these pale portions extending over each segment slightly over one-fourth its width and each showing an oblique bar of blackish chestnut brown running from the outer margin proximad to its median portion, and continued on the succeeding segment mesad as a meso-proximal oblique dash. First and second ventral abdominal segments ochraceous-buff tinged with ochraceous-tawny, and with meso-lateral dots of chestnut on each segment; third segment similar but washed with chestnut proximo-mesad; fourth ochraceous-buff laterad, entirely chestnut mesad becoming blackish proximo-laterad; subgenital plate shining blackish tinged with chestnut, with a large, roughly triangular area of ochraceous-buff proximo-laterad on each side.

The type is unique.

**Poroblatta cylindrica** new species (Plate XIX, fig. 4.)

This species in general form agrees closely with *P. apatela* here described, under which species a comparison is made.

*Type*.—♀: Cincinmati, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 4000 to 5000 feet. July 10, 1913. (M. A. Carriker Jr.) [Hebard Collection, Type No. 448.]

Size medium large for group; form elongate, rounded cephalad and caudad. Head with front portion deplanate, thickly and irregularly punctulate; eyes reduced, not projecting; interocular space broad, as wide as space between antennal sockets; ocelli small, smoothly concave, irregular in outline. Maxillary palpi small and rather slender, with third and fifth joints subequal in length, the latter weakly enlarged, fourth slightly shorter. Pronotum as given in generic description; latero-caudal angles weakly produced, appreciably less than ninety degrees, sharply rounded; caudal margin almost transverse, lateral halves very feebly concave, showing a minute angulate production at their juncture mesad. Tegmina subtriangular lateral pads; heavily chitinous; surface shining and rather thickly punctulate as is the entire dorsal surface, humeral trunk alone indicated; costal margins almost straight to the bluntly rounded apex, sutural margins very briefly straight oblique-convergent proximad, thence straight oblique divergent to the tegminal apices. Wings minute, vestigial. Abdomen strikingly narrower and more strongly convex than in *Colapteroblatta compta*, much as in *Acropteroblatta adnophora*. Distal portion of abdomen, cerci, limbs and their armament, pulvilli and arolia as given in the generic description of *Colapteroblatta*.

Length of body, 25.3; pronotum, 6.7; exposed portion of tegmen, 4.8; caudal tibia, 5.6. Width of head, 4.4; pronotum, 7.9; tegmen, 3.9; abdomen at widest point, 9.2 mm.

Dorsal surface shining, black tinged with chestnut brown, this strongest proximad on abdomen. Pronotum with lateral wings almost entirely cinnamon-buff, the punctae and cingulate margin bay, before the mesal point is a triangular invasion of the black mesal portion, which dark portion is also extended to the caudal margin above the humeral trunk of the tegmina. Tegmina black tinged with chestnut brown; marginal field, which includes the apex, cinnamon-buff, the punctae bay. Head black with a feeble chestnut tinge, antennae prout's brown except in proximal portion which is buffy, ocelli, genae, palpi and mouthparts ochraceous-buff. Limbs and coxae pale ochraceous-tawny, the spines slightly darker, coxae suffused proximad on cephalic faces with blackish. Meso-proximal portion of abdomen ochraceous-tawny, becoming black tinged with chestnut laterad and very extensively distad.

The type is unique.

**ACROPOROBLATTA**<sup>48</sup> new genus

The three genera of Perisphaerids here described are all evidently boring types, the females for the most part probably living in and boring through decaying vegetable matter.

The peculiar longitudinal gland-like swelling of the lateral wings of the pronotum in the present genus, is a feature not found in any other American genus of the Blattidae. The pronotal contour shows a more specialized development of the type found in the female sex of *Poroblatta*.<sup>49</sup>

*Genotype*.—*Acroporoblatta adenophora* new species.

*Description of Genus*.—Form elongate with entire dorsal surface strongly convex. Interocular space extremely broad, ocelli small but apparent. Pronotum heavily punctulate, with surface strongly convex, the cephalic portion conspicuously separated from the larger caudal portion by a broad transverse sulcation, strongly defined only meso-laterad; lateral wings with a well-developed, longitudinal, gland-like swelling, lying parallel to the free margin from a point adjacent to the eye to near the caudal margin, the resultant convexity there of the pronotal surface about equally decided on its external and internal surfaces. Tegmina and wings absent. Distal portion of abdomen, limbs and their armament, pulvilli and arolia as given here in the generic description of *Colapteroblatta*.

<sup>48</sup> From *ἄκροπόρος* = boring through.

<sup>49</sup> It is probable that in these species the males will be found to show similar but less decided pronotal modification than the females.

**Acroporoblatta adenophora**<sup>50</sup> new species (Plate XIX, figs. 5 and 6.)

This species bears *Poroblatta cylindrica*, here described, a strong general superficial resemblance. The major features of difference are pointed out under the discussion of that genus.

*Type*.—♀; Cincinatti, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 4000 to 5000 feet. July 10, 1913. (M. A. Carriker Jr.) [Hebard Collection, Type No. 449.]

Size medium large for the group; form elongate, rounded cephalad and caudad. Entire dorsal surface thickly but minutely punctulate, except laterad on the pronotum, where the punctae are larger. Head proportionately larger and much broader than in *Poroblatta cylindrica*; front portion deplanate, thickly but minutely punctulate; eyes reduced, not projecting; interocular space very broad, slightly wider than the space between the antennal sockets; ocelli small, smoothly concave except for a few punctae in dorsal portion, irregular in outline. Maxillary palpi small, much as in *Poroblatta cylindrica*. Pronotum as given in generic description, length proportionately considerably greater than in *Poroblatta cylindrica*; latero-caudal angles weakly produced, appreciably less than ninety degrees, sharply rounded; caudal margin almost transverse, its lateral halves very feebly concave, showing a minute angulate production at their juncture mesad. Tegmina and wings absent. Mesonotum and metanotum with latero-caudal angles strongly produced, acute, their apices sharply rounded; the caudal margins, as a result, strongly concave, showing a minute angulate production mesad. Abdomen narrow and strongly convex, slightly wider than in *Poroblatta cylindrica*. Cerci entire, the acute apex very slightly projecting beyond the lateral curvature of the free margins of the adjacent segments. Distal portion of abdomen except cerci, limbs and their armament, pulvilli and arolia as given in the generic description of *Colapteroblatta*. Limbs shorter and heavier than in *Poroblatta cylindrica*.

Length of body, 24.6; pronotum, 8.3; caudal tibia, 5.2. Width of head, 5.2; pronotum, 8.2; abdomen at widest point, 9.8 mm.

Dorsal surface shining liver brown, becoming darker laterad on mesonotum and metanotum and darker both laterad and caudad on abdomen. Pronotum with lateral margins almost entirely ochraceous-buff, the decided punctae and cingulate margin bay, the dark mesal portion of the pronotum with margins suffused, forming an obtuse-angulate invasion laterad before the mesal point, its margins thence parallel to the caudal margin of the pronotum. Head with occiput chestnut, shading to deep liver brown above clypeus, ocelli and genae light buff, mouthparts warm buff. Limbs warm buff, the spines russet. Ventral surface of abdomen shining, buffy proximad rapidly shading through chestnut to blackish liver brown.

An additional single immature specimen, bearing the same data as the type, is before us. This individual is 14 mm. in length and is similar to the adult, except that the gland-like swelling of the lateral wings of the pronotum is not as conspicuous.

<sup>50</sup> From ἀδην and φώρα = gland carrier.

**Hormetica subcineta** (Walker)

1868. *Brachycola subcineta* Walker, Cat. Blatt. Brit. Mus., p. 188. [♂, Colombia.]

1907. *Hormetica subcineta* Shelford, Trans. Ent. Soc. London, 1906, p. 507, pl. xxx, fig. 8. (Further data.)

Ibagüé, Tolíma, 4000 feet, (from R. Shelford), 1 ♂, [A. N. S. P.]

This specimen is in every way typical. The limb armament, which has not been described, is as follows: Ventral margins of femora without heavy spines; cephalic femora with ventro-cephalic margin bearing distad a rather closely-set series of rather long chaetiform spines, ventro-caudal margins of median and caudal femora with a percurrent fringe of long hairs. Disto-dorsal genicular spine of median and caudal femora very greatly reduced.

Length of body, 25.8; pronotum, 9.8; exposed portion of tegmen, 7.2. Width of pronotum, 13.7; tegmen, 9.3 mm.

**Hormetica apolinari** new species (Plate XVIII, fig. 4; plate XIX, fig. 7.)

The present insect represents a pale type of this distinctive genus, the most striking features being the dark head with pale occipital marking, pale pronotum and tegmina with conspicuous black patches.

The species belongs to the forms having the tegmina marked with black; of these *interna*, *strumosa* and *vittata* have a longitudinal marking, *apolinari* and *verrucosa* a median roughly triangular marking and *advena* a median marking which is very much more extensive.

Compared with its nearest ally, *verrucosa* Brunner, the present insect appears to differ in the striking pale occipital marking, pale borders of the pronotum, much more elongate tegmina and wings and in the tegmina having, in addition to a mesal black marking, a proximal black band, extending from the sutural margin to the humeral trunk and there continued distad for a distance nearly equalling its width.

*Type*.—♂; Fusugasugá, Cundinamarca, Colombia. Elevation, 5464 feet. February, 1917. (From A. María.) [Hebard Collection, Type No. 450.]

Size medium for the genus, form elliptical. Head broad; front flattened, polished, with scattered punctulae; interocular space very wide, but not as wide as width between antennal sockets. Pronotum with cephalic margin decidedly reflexed, subkumellate; cephalic and lateral margins evenly convex



and cingulate, this strongest cephalad; caudal margin truncate, very feebly convex; disk with two decided, blunt-conical protuberances latero-cephalad, between which it is strongly impressed and scabrous, this area bounded near the caudal margin of the pronotum by a broad and weakly raised ridge, which connects latero-cephalad with the protuberances. Tegmina extending to apex of abdomen, surfaces shining, showing under the microscope a close network of raised veinlets, so close proximad as to give a punctulate appearance. Wings extending to apices of tegmina but showing atrophy and useless for actual flight.<sup>51</sup> Ventral margins of femora without heavy spines, excepting a single heavy but greatly reduced distal spine on all but the caudal margin of the caudal femora, the largest being on the ventro-caudal margins of the median femora. Ventro-cephalic margin of cephalic femora with a distal row of chaetiform spines, by their irregularity clearly showing reduction in extent. Median and caudal femora with genicular spine heavy but greatly reduced, ventro-caudal margins well supplied with hairs. Tarsi unarmed, ventral surface of caudal metatarsus in distal two-thirds with a linear pulvillus, which broadens out roundly distad, succeeding three short joints each with ventral surface fully occupied by a large rounded pulvillus. Tarsal claws with proximal portion decidedly enlarged, arolia moderately developed.<sup>52</sup>

*Allotype*.—♀; same data as type, but taken March 11, 1917. [Hebard Collection.]

Size slightly larger than male. Pronotum less strongly specialized in contour, the cephalic and lateral margins about equally heavily cingulate but not sublammellate; the disk with latero-cephalic protuberances represented by very blunt sub-conical ridges, the median portion less strongly impressed. Tegmina and wings similar, but reaching only to base of supra-anal plate. Supra-anal plate chitinous, sub-bilobate in outline, dorsal surface weakly concave. Cerci short, not surpassing supra-anal plate, entire, rounding sharply to blunt apex. Subgenital plate very broad, scoop-shaped.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
♂ Fusugasugá, <i>type</i> . . .	33	11.6	15.7	25.8	13.6	8.9
♀ Fusugasugá, <i>allotype</i> . . .	36.7	11.8	16.2	25.8	13	8.8

Head black, a large, transverse oval marking of light ochraceous-buff occupying the interocular area; ocelli buffy, in the male this color is continued to the margin of the eye; clypeal suture broadly buffy. Antennae unicolorous, black. Pronotum ochraceous-buff, the areas occupied by the two latero-cephalic projections black with outline of these large blotches irregular, impressed area

<sup>51</sup> The supra-anal and subgenital plates are missing.

<sup>52</sup> A large portion of the species of the genus *Homotica* are strikingly marked. For the separation of these, color characters have been almost exclusively used, these showing many excellent diagnostic features.

between these tawny. Tegmina opaque, ochraceous-buff; with a broad irregular proximal band of black from sutural margin to humeral trunk, a ray of this color extending caudad on humeral trunk a distance nearly the width of the band, and with a meso-lateral, irregular, rounded-trigonal black marking opposite the apex of the anal field, this marking more extensive in the male. Wings opaque, anterior field shining dresden brown, posterior field dull buffy brown with veins mummy brown. Dorsal surface of abdomen blackish, broadly margined laterad with buffy, supra-anal plate and cerci of female entirely blackish. Underparts of male blackish, a few flecks of buffy on the coxae and abdomen broadly margined laterad with buffy; of female solid blackish.

This beautiful insect is known from the single pair.

## MANTIDAE

### ORTHODERINAE

#### **Choeradodis rhombicollis** (Latreille)

1833. *Mantis rhombicollis* Latreille, in Humboldt and Bonpland, Obs., Zool., ii, p. 103, pl. xxxix, figs. 2 and 3. (No locality given.)

Las Mangos, (Juntas), Cauca, 1005 feet, II, 1907, (M. G. Palmer), 1 ♂, [A. N. S. P.].

La Maria, Cauca, 4700 feet, (M. G. Palmer), 1 ♀, [A. N. S. P.].

These specimens are typical of *rhombicollis* as discussed by Saussure and Zehntner. The inner face of the cephalic femora bears a large and shining black spot, through which the unguicular sulcus runs at about the distal third. A Central American series before us shows that the size of this spot varies individually, when reduced not extending beyond the unguicular sulcus. The pronotal form also shows considerable individual variation. As a result we feel satisfied that the features given by Saussure and Zehntner<sup>53</sup> to separate *C. servillei* from this species are of no specific value.

### MANTINAE

#### **Acontiothespis<sup>54</sup> iriodes** new species (Plate XVIII, fig. 5.)

This diminutive and beautiful insect shows nearest relationship to *A. cordillerac* (Saussure)<sup>55</sup> and *A. vitrea* (Saussure and Zehnt-

<sup>53</sup> Biol. Cent.-Amer., Orth., i, p. 126, pl. IX, figs. 1 to 3.

<sup>54</sup> New name for *Acontistes*, emended to *Acontista* by Saussure, as proposed by Rehn, Trans. Am. Ent. Soc., xlii, p. 258, (1916).

<sup>55</sup> It would appear probable that Saussure and Zehntner's *mexicana* and *mexicana* variety *quadrimaculata* are mere color variations of this species.

ner)<sup>56</sup>; a series of males of both of these species before us shows without exception the distal portion of the caudal femora blackish brown, while those of *vitrea* also have the cephalic limbs and caudal surface of the head very dark brown. In other respects males of *vitrea* agree closely with the type of *iriodes*, except that the tegmina and wings are distinctly more elongate in the former species. The colored tegmina and wings in males of *cordillerac* are distinctive.<sup>57</sup>

*Type*.—♂; Santa Marta, Magdalena, Colombia. December 26, 1910. [Hebard Collection, Type No. 460.]

Size rather small for genus, form moderately slender. Head with occiput distinctly raised above eyes. Ocelli prominent. Pronotum moderately elongate, margins cingulate, smooth; collar slightly longer than wide; shaft strongly constricted mesad, caudad of the decided supra-coxal enlargement, transverse sulcus distinct, with shallow weak sulci adjacent on collar, which broaden and diverge cephalad. Tegmina and wings fully developed, extending distinctly beyond apex of abdomen, but less elongate than in *fraterna* and *cordillerac*. Supra-anal plate strongly transverse, length about one-fourth basal width, free margin convex latero-distad, transverse mesad, showing very feebly a sub-bilobate condition. Cerci about twice as long as supra-anal plate, tapering to acute apex, joints feebly defined. Subgenital plate with free margin convex, showing a brief but sudden distal emargination, the portions laterad of this not bluntly acute-angulate produced as in *fraterna* and *cordillerac*. Limbs and their armament as characteristic for genus, their proportions as in *fraterna* and *cordillerac*. Features of coloration are important as specific diagnostic characters.

Length of body, 19.5; pronotum, 5.2; tegmen, 15.2; wing, 13.7; cephalic femur, 5.3; caudal femur, 4.8. Width of head, 3.7; pronotum at widest point, 2.2; tegmen, 4.2 mm.

Head oil green; eyes dresden brown, heavily suffused with oil green dorsad; antennae oil green briefly proximad, the remaining portions black; ocelli clay

<sup>56</sup> We here select the type locality for *vitrea* as Costa Rica. This insect may represent a geographic race of *cordillerac*, or merely the recessive extreme of coloration found in that species. Sufficient material to determine this definitely is not at present available.

<sup>57</sup> From Costa Rican material of *A. fraterna* (Saussure and Zehntner) at hand, we find that females of that species agree closely with those of *cordillerac* and *vitrea* except in being distinctly more slender; males of that species, however, in addition to this feature, are very strikingly and differently colored.

Through the kindness of Professor L. Bruner we have also been able to examine both sexes of *A. multicolor* (Saussure), from Trinidad. Females of that species would suggest small and remarkably brilliant individuals of *cordillerac* of intensive coloration. The males, however, show that the species is much more nearly related to certain South American forms (*A. eximia* and allies).

color. Pronotum oil green, extensively faded to brownish in this dried specimen. Tegmina glossy, colorless, hyaline, with principal veins lettuce green and veinlets paler green; marginal field lettuce green; stigma a minute dot of mummy brown. Wings glossy, colorless, hyaline, strongly iridescent, showing delicate metallic la france pink and delicate metallic pale turquoise blue reflections; costal margin and veins probably lettuce green in life, faded to yellowish with traces of green in this dried specimen. Limbs immaculate lettuce green.

The type of this delicately beautiful insect is unique.

**Tithrone roseipennis** (Saussure)

1870. *A[contista] roseipennis* Saussure, Mittheil. Schweiz. ent. Gesellsch., iii, p. 229. [♀, Guiana.]

Pueblo Nuevo de Ocaña, Santander, IX, 3, 1916, (M. A. Carriker Jr.), 1 ♂, [Hebard Cln.].

Montamela, Cauca, 4900 feet, VII, 29, 1908, 1 juv. ♀, [U. S. N. M.].

Rio Aguatal, Cauca, 5250 to 7100 feet, VIII, 17 and XI, 1908, 1 ♀, 1 juv. ♀, [U. S. N. M.].

**Stagmomantis tolteca** (Saussure)

1861. *Mantis (Stagmatoptera) tolteca* Saussure, Rev. et Mag. Zool., 2e sér., xiii, p. 127. [1 ♀, "Mexico calida."]

Saussure subsequently states that in his opinion *tolteca* is merely a large and richly colored form of *S. carolina*. Seudder later considers that *tolteca* constitutes a geographic race of *carolina*. Burmeister's *Mantis dimidiata*<sup>58</sup> has been frequently incorrectly assigned as the green condition of either *carolina* or *tolteca*. That author later diagnosed his *dimidiata* more fully from a series of Argentinian localities,<sup>59</sup> and as the genus *Stagmomantis* is not found in that region, it is evident that his name applies to a species of some other genus.

Until *carolina* has been thoroughly and carefully studied, we prefer to use the name *tolteca* for the robust and, in the brown phase, richly colored, tropical condition.

Santa Marta, Magdalena, XII, 26, 1910, 1 ♀, [Hebard Cln.].

Cincinnati, Sierra Nevada de Santa Marta, Magdalena, 4000 to 5000 feet, VII, 1913, (M. A. Carriker Jr.), 1 ♀, [Hebard Cln.].

San Antonio, Cauca, 5900 to 6500 feet, X and XII, 1908, 2 ♀, [U. S. N. M.].

<sup>58</sup> Described from South America. Handb. Ent., ii, Abth. ii, pt. i, p. 539, (1838).

<sup>59</sup> Berliner Ent. Zeitschr., viii, p. 237, (1864).

The Cincinnati and San Antonio specimens are dark brown in general coloration and richly colored, agreeing in all respects with Mexican individuals before us. The Santa Marta individual is green.

**Macromantis ovalifolia** (Stoll)

1813. [*Mantis ovalifolia* Stoll, Natur Afbeeld. Beschryv. Spooken, etc., Spooken, p. 58, pl. xix, fig. 72, register p. 78. [♀, no locality given.]

Jimenez, Cauca, 1600 feet, III and VII, 1907, (M. G. Palmer; ♀ at rest under leaves), 1 ♂, 1 ♀, 1 juv. ♀, [A. N. S. P.].

Los Mangos, (Juntas), Cauca, 1005 feet, III, 1907, (M. G. Palmer), 1 ♀, [A. N. S. P.].

These huge Mantids are the largest examples of the species yet reported. They appear in every way typical, except that the marginal field of the male tegmen is much narrower than in a male before us from Igarapé-assú, Pará, Brazil, and distinctly narrower than in the first male of the species recorded, from La Mana, Guiana, as given by Saussure. The differences are sufficient to indicate possible racial or even specific distinction, for among the Mantidae the width of this field is usually extremely constant and an important specific diagnostic feature. Without more material, however, we do not feel justified in attempting separation in the present case.

*Measurements (in millimeters)*

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmental marginal field
Jimenez, Cauca, Colombia . . . . .	101	35.9	8.2	78	1.7
La Mana, Guiana. (Éx Saussure) . . . . .	91	35	7	80	5.5
Igarapé-assú, Pará, Brazil . . . . .	97	34.7	7.8	74.3	6.2
♀					
Jimenez, Cauca, Colombia . . . . .	104	41.8	10.6	47.2	12
Los Mangos, Cauca, Colombia . . . . .	113	43.9	11.7	52.8	13.1
La Mana, Guiana. (Éx Saussure) . . . . .	92	35	9.5	41	12.5
La Mana, Guiana. (Éx Saussure) . . . . .	98	41	10	43	13.5

**Liturgousa mesopoda** Westwood

1889. *Liturgousa mesopoda* Westwood, Revis. Ins. Fam. Mant., p. 30, pl. xiii, fig. 10. [[♀], St. Laurent de Maroni, French Guiana.]

Jiminez, Cauca, 1600 feet, III, 1907, (M. G. Palmer), 1 ♀, [A. N. S. P.].

## MIOPTERYGINAE

**Pseudomiopteryx bogotensis** Saussure

1870. [*Pseudomiopteryx*] *bogotensis* Saussure, Mittheil. Schweiz. ent. Gesellsch., iii, p. 228. [♂, Bogotá, [Colombia].]

Cincinnati, Sierra Nevada de Santa Marta, Magdalena, 4000 to 5000 feet, VII, 10, 1913, (M. A. Carriker Jr.), 1 ♂, [Hebard Ch.].

San Antonio, Cauca, I, IV, 8 and 14, X and XI, 1908, 6 ♂, 1 ♀, [U. S. N. M.].

Jiminez, Cauca, 1 ♂, [A. N. S. P.].

The present series shows marked variation. Those from Cincinnati and Jiminez have the pronotum distinctly more elongate (4.7 and 4.8 mm.) and slightly more slender than in the San Antonio series (pronotal length, 3.9 to 4.2 mm.). This may be of specific or racial diagnostic importance. In three Costa Rican males before us of the very closely allied, if not synonymous, *P. infuscata* Saussure and Zehntner, variation is also found (pronotal length, 3.6 to 4.3 mm.), but in these the diameter is proportionate to the length, the proportions being as in the San Antonio series of *bogotensis*. The extremes of tegminal length (19.7 and 21.2 mm.) are found in the San Antonio series, the marginal field also varying in width (1.5 to 2 mm.).

No granulations of the facial scutellum are shown by any of the material at hand. This is a feature described by Saussure for the type of *bogotensis*. In other respects the series is perfectly typical, and we believe that a smooth and feebly tri-sulcate facial scutellum will be found to be the normal condition in *bogotensis*. It is clear that *bogotensis* and *infuscata* are very closely related, and that the latter name may prove to be synonymous, or at best of only racial value. Saussure and Zehntner, overlooking priority, suggest that *bogotensis* might represent a variety of their *infuscata*.

The spine of the lower ocellus, characteristic of the genus, is similarly developed in specimens of these species and in paratypes of *guyanensis* Chopard, now before us.

Chopard's *guyanensis* is very closely allied, the male having the facial scutellum moderately tri-sulcate, both sexes, when compared with *infuscata*, showing a greater development of the characteristic irregularities of the head, pronotum and abdomen. The male tegmina are much as in *infuscata*, but with marginal field broader, as in *bogotensis*. The striking limb coloration, as described by Chopard,<sup>60</sup> is probably the same in all these species; being similar in the males of all before us and showing the identical remarkable coloration in females of *infuscata* and *guyanensis*, the only species of which we have material of this sex.

It would appear very possible that the four known forms of the genus will be found to represent geographic races of a single species.

**Miopteryx granadensis** Saussure

1870. *M[iopteryx] granadensis* Saussure, Mittheil. Schweiz. ent. Gesellsch., iii, p. 237. [♂, Bogota [, Colombia].]

This species was selected as genotype of *Miopteryx* by Rehn in 1904,<sup>61</sup> and Giglio-Tos' *Promiopteryx*,<sup>62</sup> with *granadensis* selected as genotype, consequently falls under *Miopteryx*.

Cincinnati, Sierra Nevada de Santa Marta, Magdalena, 4000 to 5000 feet, VII, 10, 1913. (M. A. Carriker Jr.), 1 ♀. [Hebard Ch.].

This specimen closely resembles a female before us of *M. simoni* Chopard, from Cariaquito, Venezuela, from which place we also have a male of that species.<sup>63</sup> These individuals show that females of the present genus lack tegmina and wings; weak convex production of the latero-caudal angles of the mesonotum and metanotum, even less decided than in *Pseudomiopteryx*, alone being indicated.

Without males from Cincinnati the determination can not be made with certainty, as the female sex has not been described of *granadensis* or Giglio-Tos' species, *simplex* (from Venezuela) and *fallax* (from Bogotá, Colombia). The insufficiency of the color

<sup>60</sup> Ann. Soc. Ent. France, lxxx, p. 325, (1911).

<sup>61</sup> Proc. U. S. Nat. Mus., xxvii, p. 566.

<sup>62</sup> Bull. Soc. Ent. Italiana, xlvi, p. 137, (1915).

<sup>63</sup> Differing from Chopard's description only in the almost complete absence of maculation.

character alone given to separate the unique specimen described as *fallax* from *granadensis*, taken at the same locality, indicates that the validity of *fallax* is highly doubtful.

The measurements of the specimen here recorded are as follows: Length of body, 16.8; pronotum, 5.5; cephalic coxa, 4.8; cephalic femur, 5 mm. Width of head, 3.7; of pronotum at widest point, 2.3 mm.

**Pogonogaster latens** new species (Plate XVIII, figs. 6 and 7.)

This remarkable mantid is not widely separated from the genotype, *P. tristani* Rehn.<sup>64</sup> It differs in having the pronotal collar proportionately slightly shorter, with the two median elevations represented by slightly raised swellings rather than blunt conical projections; the supra-coxal expansion not as decidedly produced on each side, these portions less delicate with margins not as strongly irregularly serrate; shaft with median carina distinct but lacking nodes, the flexure dorsal of the caudal portion not as sharp, the pair of nodes there found heavier and lower, as are the nodiform projections mesad on the caudal margin of the mesonotum, metanotum and median segment; abdomen with large and striking foliaceous plates only mesad on first, second and third dorsal segments, these irregular in outline but lacking spiniform marginal projections; succeeding abdominal segments only moderately cristate mesad, this strongest on fourth segment; supra-anal plate more bluntly rounded distad, and limb armament similar except that the minute microscopic denticulations of the margins of the cephalic coxae and proximal portions of the ventral margins of the cephalic tibiae are more numerous and even smaller, while the cephalic tibiae are supplied ventro-externally each with two minute spines curved distad.

*Type*.—♀; Rio Aguatal, Cauca, Colombia. Elevation, 5900 feet. November, 1908. [United States National Museum.]

Size medium; form very slender, except the abdomen which is moderately stout. Head crushed; ocelli obsolete. Pronotum elongate, collar nearly half as long as shaft, showing a large, moderately raised swelling meso-caudad and a lesser swelling meso-cephalad; pronotal margins microscopically denticulate; supra-coxal expansion with lateral portions triangularly produced, directed slightly cephalad, with apex bluntly rounded, the angle there formed slightly less than a rectangle; shaft with a distinct medio-longitudinal carina, shaft moderately bent dorsal near the caudal extremity and there supplied with a

<sup>64</sup>Trans. Am. Ent. Soc., xlv, p. 327, (1918). The type, a female, apparently nearly adult, from La Palma, Costa Rica, is in the Academy collection.



large rounded projection on each side of the median carina. Mesonotum and metanotum with a distinct medio-longitudinal carina, this raised and forming with the caudal margin a small, acute projection on each segment; tegminal and wing pads distinct, produced. Median segment with median carina weak but caudad more strongly produced dorsad than the metanotum, forming with the caudad margin a small acute projection. First, second and third dorsal segments with caudal half of dorsal surface produced dorsad in large, delicate, foliaceous plates, each plate so formed that its irregularly scalloped and bluntly angulate margins represent a continuation of the caudal margin of its respective segment; each of these segments with latero-caudal angles produced in a small, roundly subquadrate plate; fourth segment with a dorso-caudal projection much like that of the median segment but larger, this and the fifth segment with latero-caudal angles produced in still smaller, rounded plates; fifth and succeeding segments with their entire dorsal surfaces (due to their brevity) each occupied by a medio-longitudinal projection ascendent caudad, each similar to but distinctly smaller than that of the fourth segment. Supra-anal plate elongate shield-shaped, with a distinct medio-longitudinal carina, projecting as far as apex of subgenital plate, apex rather broadly rounded. Ventral abdominal segments each produced mesad at the caudal margin, forming with that margin a very small rounded projection directed ventrad. Limbs elongate and slender; cephalic limbs as in *tristans*, except as noted above. Subgenital plate developed distad in a valvular process nearly half as long as the distance from its base to base of subgenital plate, process with a medio-longitudinal ventral sulcation to its base, which is formed by a transverse, broadly V-shaped sulcation of the surface of the plate.

Length of body, 32; pronotum, 10.6; pronotal collar, 3.7; pronotal shaft, 6.9; process of first dorsal abdominal segment, 3.6; dorsal portion of supra-anal plate, 2.3; cephalic coxa, 7.4; cephalic femora, 9.8; cephalic tibia, 3; caudal femora, 10.2; caudal tibia, 10.4; caudal metatarsus, 5.7 mm. Width of pronotum at supra-coxal swelling, 2.9; pronotum at narrowest point of shaft, 1.1; process of first dorsal abdominal segment at widest point, 2.7; cephalic femur, .8 mm.

General coloration warm buff marbled and flecked with mummy brown. Abdomen with median portion of dorsum and median portion of foliaceous projections suffused with mummy brown. Ventral surface suffused with mummy brown. Cephalic coxa warm buff, flecked with mummy brown and with two median, irregular, transverse bands of this color on the external face. Cephalic femur light buff washed with mummy brown in three broad, irregular transverse bands. Cephalic tibia light buff with two internal irregular suffusions of mummy brown. Median and caudal limbs mummy brown with irregular annuli and flecks of light buff.

The type of this remarkable mantid is unique.

#### VATINAE

***Loboconeme colombiae*** new species (Plate XIX, figs. 8 and 9.)

As in the genotype, *L. lobipes* (Redtenbacher), this species has the head more transverse and the supra-coxal dilation of the

pronotum more decided than in the species of the genus *Parastagmatoptera* at hand. The antennae are distinctly serrate, but not strongly so, as described for the male sex of *lobipes* and shown in males of *Parastagmatoptera* before us.

The generic position is easily recognized by the slight but distinct, rounded lobe distad on the ventro-caudal margin of the caudal femora,<sup>65</sup> confusion alone being possible with *Paroxyopsis*, in which genus the eyes are said to be more produced laterad. This lobe is much less strongly developed in *colombiae* than in *lobipes*.

The marginal field of the tegmina agrees more nearly with *Parastagmatoptera serricornis* Kirby<sup>66</sup> and *P. unipunctata* (Burmeister)<sup>67</sup> than it does with males of the other species of that genus at hand, but narrows more suddenly than in either of these.

*Type*.—♂; Santa Marta, Magdalena, Colombia. December 26, 1910. [Hebard Collection, Type No. 463.]

Size small for the group, distinctly smaller than *lobipes*; form slender. Head strongly transverse, width nearly two times depth, front distinctly concave, the eyes and adjacent portions of the head directed moderately laterocephalad; occipital outline weakly concave between the weakly arcuate-elevated juxta-ocular sections; ocelli well developed, arranged in a triangle; facial scutellum nearly three times as broad as deep, dorsal margins weakly concave-ascending to blunt median obtuse-angulation. Eyes showing very faintly a meso-lateral angulation. Antennae with joints serrate. Pronotum with margins supplied with numerous widely spaced, minute, microscopic teeth; collar comprising about one-fourth total pronotal length, distinctly constricted before the supra-coxal dilation; supra-coxal dilation decided, with sulci conspicuous. The tegmina reach to apices of cerci and are slightly surpassed by the wings; stigma present, small, longitudinal, linear; marginal field rather broad proximad, narrowing rather suddenly before median portion of tegmen. Supra-anal plate triangular, length half proximal width, subchitinous toward the bluntly rectangulate apex. Cerci scarcely four times as long as supra-anal plate, proximal joints fused for one-third cercal length, remaining eight joints distinct, the ultimate joint bluntly rounded distad. Concealed genitalia complex, resting in the produced subgenital plate; two large lobes, from beneath the sinistral of which project three specialized processes. Subgenital plate produced, length nearly twice proximal width; moderately convex mesad, the lateral and distal portions subdeplanate, this widest latero-distad; slightly constricted proximad, the lateral margins subparallel, weakly convex, the convexity increasing distad to the styles, between which the margin is transverse and less heavy in structure. Styles set in sockets on distal

<sup>65</sup> In the type the median limbs are missing.

<sup>66</sup> 1 ♂, Perené, Peru, [A. N. S. P.].

<sup>67</sup> 1 ♂, Embarcacion, Salta, Argentina, [A. N. S. P.].

margin of subgenital plate, minute, subcylindrical, feebly tapering to the bluntly rounded apex, each in length about two-fifths the distance between their bases. Armament of limbs as characteristic for the genera *Lobocneme* and *Parastagmatoptera*. Limbs slender, (but not as elongate as in males of the species of *Parastagmatoptera* examined). Median femora missing. Caudal femora with a slight, but distinct, rounded lobe immediately proximad of the genicular area on the ventro-caudal margin.

Length of body, 33.5; pronotum, 11.3; tegmen, 22.3; wing, 20.6; cephalic coxa, 7.2; cephalic femur, 8; caudal femur, 8.4; caudal tibia, 8 mm. Width of head, 5.4; pronotum at supra-coxal dilation, 2.4; tegmen at widest point, 5.8; tegmen in distal third, 4.9; marginal field of tegmen, 1.7 mm. Depth of head, 2.85 mm.

Head vinaceous-russet tinged with green caudad, except facial scutellum which is light buff. Eyes saccardos umber. Antennae orange cinnamon. Ocelli clear cadmium yellow. Green portions of insect evidently somewhat faded, probably all light oriental green in life. Pronotum green. Tegmina largely colorless hyaline, with veins very weakly green; marginal field opaque green, in this dried specimen showing a reddish discoloration in distal two-thirds, as do the apices of the wings; stigma buffy, glossy, linear (length, 1.8 mm.). Wings colorless hyaline, showing a weak iridescence, with veins very weakly green; costal margin opaque green. Abdomen yellowish brown, shading to green on the subgenital plate. Limbs green. Cephalic coxae with a longitudinal suffusion of blackish brown ventrad on the internal face, immediately before the genicular area. Cephalic femora with inner face mustard yellow shading to green dorsad, with minute brown dots at bases of alternate spines.<sup>68</sup>

The type is unique.

#### *Stagmatoptera septentrionalis* Saussure and Zehntner

1894. *Stagmatoptera septentrionalis* Saussure and Zehntner, Biol. Cent.-Amer., Orth., i, p. 186, pl. viii, fig. 2. [♀; Bugaba, Panama.]

Santa Marta, Magdalena, XII, 26, 1910, 1 ♀, [Hebard Cln.].

Cauca, (F. Bonis), 1 ♀, [A. N. S. P.].

The Cauca specimen is nearly as large as the type, the Santa Marta individual considerably smaller. These specimens agree in all important features with Central American material of the species at hand.

#### Measurements (in millimeters)

♀	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of marginal field of tegmen
Ex Saussure, <i>type</i> . . . . .	96	38		51	8.3
Cauca . . . . .	85	31.8	8.9	52.2	8.8
Santa Marta . . . . .	76.5	31.7	7	40.9	7.3

<sup>68</sup>This insect appears to agree closely in the coloration of the cephalic limbs with *Paroxyopsis icterica* (Saussure and Zehntner), described from a female. That genus, from the female sex, appears to differ from *Lobocneme* in the differently shaped eyes, much narrower marginal field of the tegmina and transverse stigma.

**Phyllovates chlorophaea** (Blanchard)

1835. *Mantis chlorophaea* Blanchard, Mag. Zool., v, Ins., pl. 135. [♀; Water-town, New York. (In error.)]

Honda, Tolima, V, 1913, 600 feet (from A. Maria), 1♂, [Hebard Cln.].

Fusugasugá, Cundinamarca, 5800 feet, XII, 1913, (from A. Maria), 1♀, [Hebard Cln.].

**Phyllovates stollii** (Saussure and Zehntner)

1894. *Theoclytes stollii* Saussure and Zehntner, Biol. Cent.-Amer., Orth., i, p. 192. [♀; Guiana; Brazil.]

Cincinnati, Sierra Nevada de Santa Marta, Magdalena, 4000 to 5000 feet, VII, 1913, (M. A. Carriker Jr.), 1♀, [Hebard Cln.].

## PHASMIDAE

## PYGIRHYNCHINAE

**Acanthoclonia erinaceus** Redtenbacher

1908. *Acanthoclonia erinaceus* Redtenbacher, Insektenfamilie der Phasmiden p. 62. [♀; Antioquia, Colombia.]

San Antonio, Cauca, 6600 feet, X and XI, 1908, 2♂, 1♀, [U. S. N. M.].

The female agrees fully with the original description except in being considerably larger<sup>69</sup> and in the metanotum, which besides being armed with the heavy pair of median composite spines is generally denticulate, but shows no two short, widely spaced spines cephalad worthy of special mention.

The dorso-external teeth of the first antennal joint are clearly variable; in the female at hand one of these joints has a heavy projection, showing a large and two smaller teeth, the other a similar projection showing a large and a small tooth. The males have but a single tooth distad.

Compared with the female, the males are in general similar, with homologous spines and laminate projections; differing in being decidedly more slender, with spined laminate processes as elongate but less composite, mesonotum and metanotum showing a low but decided medio-longitudinal ridge, the surface generally not as heavily rugose and denticulate. Abdomen differently armed as follows: first<sup>70</sup> and second dorsal segments each with

<sup>69</sup> The type may not be fully adult.

<sup>70</sup> We do not include the median segment as does Redtenbacher, hence our first dorsal abdominal segment is that referred to by that author as the second, and so forth.

a median pair of slender spines with few spinulae near bases; succeeding segments unarmed; auriform process of fifth less decided than in female; sixth, seventh and eighth segments carinate medio-longitudinally, with dorsal surface of carina rather broad and flattened; seventh segment expanding laterad, the remaining segments broadened so that the end of the abdomen is clubbed, its caudal margin irregularly serrate, the supra-anal plate produced to a strongly bilobate apex, the inner faces of these adjacent lobes heavily denticulate.

*Measurements (in millimeters)*

♂	Length of body	Length of pronotum	Length of mesonotum	Length of metanotum <sup>21</sup>	Length of caudalfemur
San Antonio.....	39.5	7.7	5.6	13.9	15.2
San Antonio.....	37.5	7.7	5.5	14	15.7
♀					
San Antonio.....	43	8.4	6.1	12	15.7

***Acanthoclonia strangulata*** new species (Plate XX, figs. 1, 2 and 3.)

This remarkable insect belongs to the forms of the genus showing no laminate projections on head and other segments of the body. The remarkable and very large pair of composite spines on the mesonotum show a transition from the type of the heavy pair of spined plates, as found in the species of the first section of the genus, to the much smaller and less striking pair of sub-composite spines, as found in the forms showing no laminate projections on head and other body segments.

It is noteworthy that, in apparently every species of *Acanthoclonia*, the position of plates and spines shows in some or many features a distinctive arrangement from that found in any other species. It is probable that the contrast between the sexes is a matter largely of degree, as discussed under *A. crinaceus* Redtenbacher.

The elongate mesonotum, which is decidedly narrower cephalad than caudad, and great number of spines on the body, are striking features in the present species.

*Type*.—♀; San Lorenzo, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 8300 feet. August 23, 1913. (M. A. Carriker Jr.) [Hebard Collection, Type No. 451.]

<sup>21</sup> In the present paper the length of the metanotum, as given for the Phasmidae, includes the median segment unless otherwise stated.

Size large for genus. Antennae with first joint rounded rectangular, longer than broad, showing a feeble, longitudinal, proximal dorso-internal carina and bearing a decided, distal dorso-external spine.<sup>72</sup> Head with occiput gibbous, bearing three pairs of spines, the mesal pair largest, decided (length, 1.9 mm.), with a few small spines at bases, in addition there is a small pair of spines caudad of the antennal sockets, with a depressed area between these, and mesad on each cheek a stout spine, while other irregularly placed, small spiniform nodes occur. Pronotum subquadrate, with four spines on the cephalic margin, of which the two mesad are the smaller, a single small spine on the lateral margins above a small coxal spine, and a transverse row of four decided spines near the caudal margin, of which the two mesad are the largest. Mesonotum elongate, decidedly wider caudad than cephalad, lateral margins straight, divergent caudad; mesonotum with a pair of elongate, heavily spined processes (spiniform and not lamellate as in many species of the genus) (length 6.4 mm.), springing from a raised saddle near the caudal margin, these processes curving dorso-laterad, cephalad of these are two median pairs of equidistant moderate spines, between which is a pair of more widely spaced elongate spines (length, 2.2 mm.), while laterad near the lateral margins is a series (four and five) of widely spaced, smaller and somewhat irregular spines. The metanotum bears two pair of widely spaced, similar spines and two similar spines laterad near each lateral margin. The median segment is appreciably broader than long, and bears meso-dorsad near its caudal margin a pair of moderate spines (length, 1.9 mm.) with spinulae at their bases, in addition to two well-spaced, smaller spines mesad on each side. The first dorsal abdominal segment is similarly armed except that the meso-dorsal pair of spines is smaller and there is an additional spine at each latero-caudal angle. The succeeding dorsal abdominal segments to the sixth are similarly armed, with meso-dorsal pair of spines increasingly robust, those of the fourth, fifth and sixth segments forming rather twin spinose lamellate processes, the meso-lateral spines decrease in size distad, the spines at each latero-caudal angle increasingly robust to the eighth segment, those of the fourth and fifth forming lamellate plates each projecting as two triangles, of the sixth and seventh similar but horizontal (in normal position) and of the eighth forming a much larger, irregularly rounded lamellate plate. Meso-dorsad the seventh segment is supplied with small twin spines, the eighth and ninth with minute twin nodes, the meso-lateral spines are present as nodes on the seventh and obsolete on the eighth and ninth segments.

The ninth dorsal abdominal segment has its distal margin made up of large acute-angulate projections with apices rounded, a line drawn through these being convex. Between the sixth, seventh and eighth dorsal abdominal and its corresponding ventral segment, specialization of the soft integument evidently occurs; this is too shrivelled in the present specimen to describe accurately. Mesopleurum and metapleurum with a row of spines, the former with a supra-coxal swelling bearing three longer spines. Prosternum with a spine on each side just caudad of the insertion of the limb. Coxae and other

<sup>72</sup> Other portions of antennae missing in this specimen.

ventral portions moderately well supplied with spines. Operculum produced, free margin forming a median angle of less than ninety degrees with apex rather bluntly rounded. Femora with the two dorsal and the two ventral margins armed, the dorsal armament the heavier, this armament represented by spines proximad, developing rapidly into triangular spiniform plates, then decreasing near the extremities to heavy spines. Tibiae with ventral surfaces supplied proximo-mesad with a few small spines, supplied dorsal with an alternating series of triangular, spiniform plates, which decrease greatly in size distad. Tarsi with large pulvilli, occupying distal half of ventral surface of metatarsus and all of this area in the three succeeding joints. Large arolia present.

Length of body, 51.5; pronotum, 3.2; mesonotum, 10.4; metanotum, including median segment, 6.8; cephalic femur, 11.9; caudal femur, 13 mm. Width of mesonotum, cephalad, 2.9; mesonotum, caudad, 5.8; metanotum, 5.8 mm.

General coloration bister and snuff brown, heavily marbled with microscopic black markings which give the insect a soiled appearance. Many of the plates on the limbs are almost solidly black. Many of the heavier spines are black tipped. The proximal abdominal spiracles are narrowly margined dorsad with greenish white.

The type of this remarkable spine-covered walking-stick is unique.

***Acanthoclonia carrikeri*** new species (Plate XX, figs. 4 and 5.)

The present species is so distinctive in several features that generic separation may eventually be found necessary. At present, however, the forms of this group are known from so few specimens and the differences between all the species of *Acanthoclonia* are so remarkable, that we do not feel justified in taking that step. Certain features, such as the spined occiput, general disposition of a large number of the spines and absence of spined lamellate processes on occiput and metanotum, agree best with *Mirophasma cirsiium* Redtenbacher, but the great development of spinulose lobes on the abdomen, with other features, serves readily to separate that species.

The most striking features in the present species are: the antennae with first joint unarmed and succeeding joints straight and not enlarged distad; rather smooth dorsal surface between the spines and spinulae, and caudal metatarsus nearly as long as the combined length of the succeeding tarsal joints.

*Type*.—♂; La Palmeta, Santander, Colombia. Elevation, 7500 feet. July 15 to 20, 1916. (M. A. Carriker Jr.) [Hebard Collection, Type No. 467.]

Size very small for the genus, slightly less than that of *A. dicranum* Redtenbacher, smallest of the previously known species; form moderately slender for the genus. Antennae with proximal joint flattened, rectangulate, slightly longer than wide, unarmed; succeeding joints elongate, straight and not enlarged distad.<sup>73</sup> Head with occiput armed with two transverse arcuate rows of slender elongate spines, four in each row, of which the median-cephalic pair are slightly the largest, before these is a sub-approximate pair of decidedly smaller spines, and between these and the antennal sockets a more widely separated pair of larger slender spines. Pronotum rectangulate, appreciably longer than broad, armed mesad with an approximate pair of very elongate slender spines, behind these showing a rather broad transverse concavity, with a pair of minute approximate spinulae mesad at the cephalic margin and a heavier, longer, more widely separated pair of small spines mesad toward the caudal margin, each angle of the pronotum is also armed with a small slender spine directed laterad. Mesonotum narrowing evenly cephalad in cephalic two-thirds, narrowing slightly in caudal third, armed with a widely separated pair of elongate slender spines near the cephalic margin, and with an approximate pair of spines mesad at end of cephalic third, which are enlarged and supplied with a few spinulae at their attingent bases, armed with a transverse series of four elongate, heavy, composite spines at end of caudal third, the median pair of which are fused in proximal portion, the lateral spines of this series the longest on the insect, lateral margins supplied with elongate spinulae and a transverse series of four minute spinulae near the caudal margin. Metanotum with a similar, but much smaller, transverse series of four elongate, heavy, composite spines mesad, and with a lateral projection on each side above the coxa armed with a similar spine. Median and first dorsal abdominal segments showing rudiments of four spinulae mesad at their caudal margins, and with feeble smooth carinulae running from these laterad to near the latero-cephalic angles of these segments, such are found caudad as far as the seventh segment; second dorsal abdominal segment with four spines mesad, of which the cephalic pair are well developed and composite, these are found on each segment in decreasing size to the seventh where they are subobsolete. First to seventh dorsal abdominal segments with latero-caudal angles produced in small, irregularly rounded projections. Distal portion of abdomen moderately enlarged, cristate,<sup>74</sup> produced, terminating in two narrow vertical lobes, which internally are heavily denticulate. Cerci flattened, short, incurved. Subgenital plate short, truncate distad. Femora each with an acute, dorsal genicular projection and with all margins supplied with triangular plates, which are sharp at their apices, these largest meso-distad. Tibiae supplied with smaller triangular plates with apices sharply rounded. Tarsal joints slender and rather elongate, caudal metatarsus nearly as long as combined length of succeeding joints.

<sup>73</sup> In both paratypes the succeeding ten joints are elongate and slender, the remaining eleven or twelve joints much shorter, decreasing gradually in length from first of these, the thirteenth half as long as the twelfth.

<sup>74</sup> Slightly more pronounced and showing three serrations in the paratypes.



♂	Measurements (in millimeters)				
	Length of body	Length of mesonotum	Cephalic width of mesonotum	Length of metanotum	Length of caudal femur
La Palmeta, <i>type</i> . . . .	19.5	4	1.6	2.8	9.2
San Antonio, <i>paratype</i>	18.5	3.8	1.7	2.8	7.1
San Antonio, <i>paratype</i>	18	3.8	1.7	2.8	7.4

Type discolored. Paratypes moderately discolored, buffy suffused with brown. In one the pale proximal portion of the cephalic femora is pale green, suggesting that this may be the paler coloration in life. Head buffy with spines tipped with brown, as are all the heavier spines of the body. Antennae dark brown, annulate, proximal half of alternate joints buffy. Dorsal surface buffy with traces of a median brown line. Femora dark brown, except proximal portions which are buffy. Tibiae dark brown, irregularly annulate with buffy.

The species is known from the type and two paratype males, in the United States National Museum, from San Antonio, Cauca, Colombia, at 6600 feet, taken in November, 1908.

#### ANISOMORPHINAE

**Anisomorpha atrata** new species (Plate XX, fig. 6.)

The general form and type of male genitalia is characteristic for the genus *Anisomorpha*. The metanotum is, however, not as long as the combined length of the head and pronotum, the cephalic femora are straight and all the femora are terete dorsad; these features have been supposed to be characteristic for *Autolyca*.<sup>75</sup>

The mesonotum is feebly armed, as in *A. paromalus* Westwood.

*Type*.—♂; San Lorenzo, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 8300 feet. August 23, 1913. (M. A. Carriker Jr.) [Hebard Collection, Type No. 452.]

Size rather large for the genus, form robust. Head about as broad as long; vertex with a decided transverse dorsal impression between the antennal bases; lateral ocelli minute but distinct, laterad of which are shallow convex impressions, convergent caudad; occiput showing seven longitudinal sulci, of which the three situated mesad are weak, but the median sulcus is percurrent to the impression of the vertex. Antennae with internal margin of first joint

<sup>75</sup> Redtenbacher's separation of these genera is by no means satisfactory. The character of the first antennal joint is hardly of any value whatever, while that author contradicts himself in his statements as to the character of degree of development of femoral carinae. Insektenfamilie der Phasmiden, pp. 87 and 94, (1908). Examination of specimens in the Hebard Collection of the genotype, *Autolyca pallidicornis* Stål, shows far more important differences from *Anisomorpha* than would appear, from the literature, to exist, the male genitalia being of a particularly distinctive type.

pinched proximad. Pronotum longer than wide, surface shining, very feebly roughened, transverse sulcus distinct, medio-longitudinal sulcus very weak. Mesonotum shining, feebly roughened; armed with two pairs of small conical projections cephalo-laterad, and with a few (three and four) nodes proximo-mesad on the lateral margins. Metanotum and dorsal surface of abdomen polished, very feebly roughened; median and succeeding dorsal abdominal segments to and including sixth each supplied mesad, immediately before the caudal margin, with a minute, depressed, triangular projection, directed caudad. Supra-anal plate convex, slightly broader than long, lateral margins straight and parallel to a minute obtuse-angulate emargination, thence convex to the small, but decided, meso-distal emargination; thus the distal portion of the plate is bilobate, the free margins of these lobes thickened and armed ventrad with numerous and very minute teeth. Cerci straight, cylindrical, with apex bluntly rounded. Subgenital plate convex, short. Limbs moderately elongate; femora rounded dorsad, moderately deplanate laterad and weakly sulcate latero-distad; tibiae rounded; tarsi heavily supplied with hairs ventrad, so that the pulvilli are visible only meso-distad. Arolia small.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following features. Size much larger. Occipital sulci much weaker, subobsolete. The two pairs of conical projections of the mesonotum and the nodes (four and four) of the lateral margins more pronounced. Abdominal segments unarmed meso-distad. Supra-anal plate convex. Operculum with base on line with that of seventh dorsal abdominal segment, extending to apex of abdomen, with lateral margins weakly convex to the acute apex.

*Measurements (in millimeters)*

	♂	Length of body	Length of pronotum	Length of mesonotum	Length of metanotum including median segment	Length of cephalic femur	Length of caudal femur
<i>Type</i> . . . . .		31	2.8	4.7	4.2	9.3	10.4
	♀						
<i>Allotype</i> . . . . .		49.5	4.9	8.4	7	12.4	15

General coloration solid blackish chestnut brown, limbs paler distad, shading there to ochraceous-tawny. Antennae blackish brown, strikingly buffy at the intersections of the joints.

The type and allotype are all we have seen of this interesting insect.

PSEUDOPHASMINAE

***Stratocles viridis*** new species (Plate XXI, fig. 1.)

This insect is distinctive in having almost the entire dorsal surface, excepting the head, green, and the caudal area of the wings dark, except for a large circular mesal white area. In this latter respect the insect agrees alone with *S. rufipes* Redtenbacher, but differs in the considerably larger size, much more extensive green coloration and other differences of color distribution.

With these species, *S. bennetti* (Gray) and *S. bogotensis* Kirby are clearly closely related, as shown by the very short mesonotum and general type of coloration; the former, however, has the caudal area of the wings immaculate, the latter has this area smoky hyaline, with a broad curved milk-white band across the middle, not extending to either margin, in addition to other differential features, particularly of coloration.

*Type*.—♀; Muzo, Boyaca, Colombia. Elevation, 2700 feet. August, 1915. (From A. Maria.) [Hebard Collection, Type No. 453.]

Size medium for the genus. Head with meso-caudal portion of occiput slightly depressed, bounded laterad by brief and shallow longitudinal carinae, and also with a median carina weak but percurrent to the three rather well-developed ocelli, which are rather closely placed on a raised heart-shaped area, the vertex before the median ocellus showing a minute, but decided, depression. Antennae nearly as long as body. Pronotum decidedly longer than the very short mesonotum, mesonotum not elevated caudad. Tegmina irregularly ovate, shoulders raised but bluntly rounded. Wings extending to apex of abdomen. Abdomen smooth to ninth dorsal segment, which is strongly convex, with lateral margins straight to near base of cerci, thence broadly and weakly concave to mesal sixth of margin, which is slightly less broadly and more strongly concave, leaving the convex apex of the supra-anal plate briefly exposed. Cerci slender, simple, hairy, very feebly incurved to the rather sharply rounded apex. Operculum elongate, hairy, free margins distad convex-convergent to the apex, which is directly beneath the apex of the supra-anal plate. Cephalic femora straight, all femora rounded above. Tibiae rounded, hairy. Tarsi hairy, thickly supplied with coarse hairs ventrad, concealing pulvilli. Arolia very small. Many features of coloration are of great diagnostic value, specific structural differences in the present genus have been much neglected in the descriptions of the species of the genus.

Length of body, 45; pronotum, 3.7; mesonotum, 2.3; tegmen, 6.2; wing, 37.8; cephalic femur, 9.7; caudal femur, 13.8; caudal tibia, 14.2 mm. Width of pronotum, 2.5; dorsal portion of tegmen, 3; wing, 20.2 mm.

General coloration civette green. Head pale yellowish green, with heavy postocular longitudinal bands of black, and between these irregular occipital bands of the same coloration. Mouthparts and antennae black, the two proximal antennal joints showing weak maculations of pale greenish. Pronotum and mesonotum rinnemann's green, suffused meso-laterad with black. Lateral field of tegmina shining jet black, dorsal field civette green with veins black. Wing with lateral field shining jet black, except in proximal two-thirds of area between mediastine and humeral veins which is solidly civette green proximad, becoming paler, whitish and less extensive distad; dorsal field civette green with veins black; posterior field transparent, heavily suffused with black, except for a large, roughly circular, median area suffused with white (10.2 by 10.8 mm.). Metapleura black, with a median and ventral longitudinal

band of green. Abdomen with dorsal surface black, lateral margins of segments and caudal margin of distal segment greenish. Entire ventral surface of insect green. Femora civette green, distad lined with black dorsad and laterad, these lines broadening distad. Cephalic tibiae black, median and caudal tibiae suffused green, black dorso-distad. Cerci and tarsi black, the hairs yellowish.

The type of this strikingly beautiful insect is unique.

**HOLCOIDES** new genus

The present genus is readily separable from others of the *Stratocoles* Section of the Phasmini by the femora and tibiae all being terete, both dorsad and ventrad. In Redtenbacher's key the genus would stand nearest *Parastratocoles*.

*Genotype*.—*Holcoides forceps* new species.

*Description of Genus*.—Head elongate, nearly twice as long as width between eyes; ocelli distinct. Antennae elongate, segments increasing greatly in length distad, the very elongate distal segments divided into numerous joints. Head, pronotum and mesonotum smooth. Mesonotum shorter than metanotum; with a decided medio-longitudinal sulcus in slightly less than proximal half, which is bounded laterad by rounded carinae; lateral margins strongly cingulate. Tegmina short, truncate. Wings fully developed. Male disto-dorsal abdominal segment highly specialized. Mesosternum evenly convex in transverse section. Cephalic femora with cephalic flexure distinct. All femora and tibiae terete both dorsad and ventrad.

**Holcoides forceps** new species (Plate XXI, figs. 2, 3 and 4.)

This species is of particular interest in showing not only an unusual type of limb structure, but also distinctive male genitalic features.

The general appearance of the insect agrees very closely with that of *Holca annulipes* Redtenbacher<sup>76</sup>; that species differing widely, however, in the carination of the femora, sulcation of the cephalic tibiae, the percurrent sulcus and granulation of the mesonotum and black radial vein of the tegmina.

*Type*.—♂; San Antonio, Cauca, Colombia. Elevation, 6600 feet. January, 1909. [United States National Museum.]

Size medium, form slender. Head smooth, elongate; cheek slightly over twice as long as eye; ocelli distinct, median ocellus situated in an abrupt and distinct pit. Antennae nearly as long as body, segments increasing greatly

<sup>76</sup> Insektenfamilie der Phasmiden, p. 114, pl. iv, fig. 16, (1908).

in length distad, the very elongate distal segments divided into numerous (eight to twelve) short and less strongly defined joints. Pronotum smooth, length about one and three-quarters times width, longitudinal and transverse sulci very weak. Mesonotum as given in generic description; carinae of proximal medio-longitudinal sulcus and cingulate lateral margins polished, all finely and irregularly impresso-punctulate. Tegmina short, margin of lateral field broadly convex; dorsal field truncate distad, angle at the sutural margin very slightly the more produced, distal margin nearly transverse, very feebly convex. Wings fully developed, extending to base of seventh dorsal abdominal segment. Dorsal abdominal segments elongate to seventh, which is much shorter, about as long as wide; eighth slightly longer, widening distad. Ninth (distal) dorsal abdominal segment ascendant and somewhat tectate proximad for a distance equalling the length of the preceding segment, thence, due to the great production of the disto-ventral portions, furcate, the arms tapering strongly in proximal portion, due to the declivity of the dorsal margin, thence slender, produced to their sharply rounded apices which touch on their inner faces, internal surface of these arms supplied with minute short hairs and thickly armed with minute chitinous denticulations. Cerci elongate, straight to their bluntly rounded, incurved apices. Subgenital plate short, slightly shorter than eighth dorsal abdominal segment, free margin convex, except in distal portion where it is bilobate. Limbs as given in generic description. Arolia present.

Length of body, 48; head, laterad, 3.8; pronotum, 2.8; mesonotum, 4.9; tegmen, 3.8; wing, 32.8; ninth (distal) dorsal abdominal segment, 3.2; cercus, 2.3; cephalic femur, 12.6; cephalic tibia, 11.7; caudal femur, 10.3; caudal metatarsus, 2.1 mm. Width of head, behind eyes, 2.1; dorsal field of tegmen, 1.8; lateral field of tegmen, 1.2; abdomen before apex, 1.2; abdomen at widest (distal) point, 1.7 mm.

Head light brownish olive; with two narrow, longitudinal, postocular bands on each side of cinnamon-buff margined with sepia, of which the dorsal band is the widest; face and mouthparts cinnamon-buff. Antennae walnut brown proximad, each joint beyond the first two deepening to blackish brown distad, very elongate distal joints gradually becoming paler distad, the more distal with proximal portion light buff, the distal portion suffused, shading to walnut brown at apex. Pronotum and mesonotum light brownish olive, lateral carinae of latter cream buff. Tegmina walnut brown, the veins slightly paler; intermediate field paler, cacao brown; areas between veins suffused with burnt umber toward sutural margin in dorsal field. Anterior field of wings rood's brown, except along the caudal margin where it is pinkish buff heavily and irregularly maculate with longitudinal markings of burnt umber; radial field transparent, avellaneous. Mesosternum ochraceous-buff, suffused with rood's brown mesad. Metapleura and metasternum rood's brown, the soft integument between these portions buffy. Abdomen cinnamon above, clay color below; the fourth, fifth and sixth dorsal segments with two pairs of small blackish brown flecks, of which those of the cephalic pair are the largest and less widely spaced. Limbs ochraceous-buff, the extreme tips of the femora

and bases of the tibiae black, all the femora and the median and caudal tibiae each showing two wide, but very faint, bands of ochraceous-tawny.

The antennal coloration and the unusual marking of the internal margin of the anterior field of the wings, and of the limbs, all are found in the otherwise apparently widely separated *Holca annulipes* Redtenbacher.

The type of this interesting species is unique.

**Pseudophasma**<sup>77</sup> **taeniatum** new species (Plate XXI, fig. 5.)

This insect agrees with *P. robustum*, described in the present paper, in the decidedly robust form and abbreviate wings. The latter extend but slightly beyond the apices of the caudal femora and are clearly useless for sustained flight, though they can probably be employed as parachutes. Very decided difference from *robustum* is found in the nodulose occiput, differently colored antennal joints much more strongly defined, exceptionally short mesonotum, distinctive venation of tegmina, broad medio-longitudinal pale band of the anterior field of the wings, unicolorous limbs and bluntly rounded apex of operculum.

*Type*.—♀; San Antonio, Cauca, Colombia. Elevation, 6600 feet. November, 1908. [United States National Museum.]

Size smaller than *robustum*, form robust. Head very slightly longer than wide; occiput with six irregular rows of widely spaced nodules. The three ocelli minute, but not as much reduced as in *robustum*, not closely crowded, forming the apices of an equilateral triangle, the surface about each feebly raised, the depression before the median ocellus decided. Antennae with joints weakly but distinctly enlarged distad, excepting the elongate distal joints, which are subdivided into short segments. Pronotum with surface roughened and with a few weak nodules. Mesonotum extremely short, considerably shorter than pronotum, with surface decidedly roughened, with three decided and closely placed tubercles on each lateral margin and one decided pair laterad on the dorsum, with a pair of nodes cephalad and caudad, in which region the surface is generally nodulose. Tegmina of normal length for genus; production decided at sutural angle; shoulders compressed with outline irregularly convex, due to the varicose condition of the veins, which though prominent in the dorsal field are decidedly more thickened and raised on the shoulders; distal margin of dorsal field evenly and weakly convex to the rather broadly rounded angle at the sutural margin, sutural margin very feebly convex. Wings reduced, extending only very slightly beyond apices of caudal femora; anterior field broad. Distal portion of abdomen apparently as described for *robustum* (dorsal segments distorted), except that the angle formed by the apex of the operculum is only slightly less than a right angle and is bluntly rounded. Cephalic femora with cephalic flexure moderate, slightly weaker

<sup>77</sup> The necessity of following Kirby in the use of this name for *Phasma* of authors (not of Lichtenstein as restricted) is fully explained by Rehn. Proc. Acad. Nat. Sci. Phila., 1904, p. 95, footnote 43, (1904).

than in *robustum*. All femora and tibiae with four carinae conspicuous. Tarsi heavily supplied with hairs on ventral surfaces, the small distal pulvilli almost concealed. Moderate arolia present.

Length of body, 50; dorsal surface of head, 4; pronotum, 5; mesonotum, 3.7; tegmen, 7.2; wing, 27.2; cephalic femur, 12.7; median femur, 11.8; caudal femur, 16.7 mm. Width of head, 4.2; pronotum, caudad, 3.9; mesonotum, 4.7; dorsal field of tegmen, 3.3; wing, 19 mm.

General coloration black. Head black with a suffused postocular band on each side of sayal brown, mouthparts buffy. Antennae with two proximal joints blackish, other joints sayal brown, their apices suffused with blackish, this suffusion extending on the dorsal surface of each of the proximal joints to near its base. Pronotum black, the lateral margins narrowly sayal brown cephalad. Other portions of body and limbs solidly black, the thick hairs of the ventral surfaces of the tarsi sayal brown. Tegmina velvety black, the enlarged and raised veins cinnamon-buff, except toward the sutural margin where they shade to cinnamon; in consequence of the very unusual enlargement of the veins on the shoulders, these portions are almost entirely cinnamon-buff. Wings with lateral portion of anterior field blackish, dorsal portion divided into three broad longitudinal bands, the external band blackish (concolorous with the adjacent lateral portion), the median band striking sayal brown, the internal (sutural) band velvety black; posterior field immaculate, avellaneous.

The type is unique.

***Pseudophasma robustum*** new species (Plate XXI, Fig. 6.)

This robust species is particularly distinctive in the abbreviation of its wings, these extending but slightly beyond the apices of the caudal femora. The distinctively annulate antennae, dark tegmina with velvety black area obsolete, immaculate posterior field of the wings and limbs reddish brown in proximal half, blackish brown in distal half, are other features of decided diagnostic importance. Under *P. taeniatum*, here described, these two species are fully compared.

From the brief description of *P. unicolor* (Gray), nearest relationship of that insect would appear to exist with *robustum*; in that species the size is smaller, the antennae differently annulate, the wings longer and the posterior field of the wings differently colored.

*Type*.—♀; Cincimati, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 4000 to 5000 feet. July, 1913. (M. A. Carriker Jr.) [Hebard Collection, Type No. 454.]

Size medium for the genus, form robust. Head simple, much as in *P. phthisicum* (Linnaeus),<sup>78</sup> with three, very feeble, longitudinal occipital sutures and the

<sup>78</sup>Of which species, the genotype, we have material from French Guiana, determined by Chopard as the synonymous *P. ucyptaloides* (Johannson).

three ocelli minute, not closely crowded, forming the apices of an equilateral triangle, the surface about each hardly raised, the depression before the median ocellus very weak. Pronotum with surface slightly roughened. Mesonotum with surface decidedly roughened and with a few tubercles near the lateral margins and laterad on the dorsum, of which latter the second pair are decided, the third (caudal) pair only a little less pronounced. Tegmina reduced, short; shoulders strongly compressed, moderately depressed, outline strongly convex, showing no angulation; caudal margin of dorsal field oblique, weakly concave to sutural margin, as a result only a vestige of the area remains in which the velvety marking, so conspicuous in many species of the genus, is developed; network of veins heavy. Wings reduced, extending only slightly beyond apices of caudal femora. Disto-dorsal abdominal segments with a medio-longitudinal keel, seventh and eighth with keel slightly raised and bluntly rounded distad. Ninth dorsal abdominal segment not as broad dorsad as in *phthisicum*, with distal margin moderately concave, leaving exposed the minute supra-anal plate with margin convex. Cerci short, stout. Operculum with lateral margins straight, convergent distad to the acute apex, which is situated beneath the cercal bases. Cephalic femora with cephalic flexure moderately decided; all femora and tibiae with four carinae conspicuous. Tarsi heavily supplied with hairs on ventral surfaces, the large distal pulvilli of the four proximal joints not concealed. Moderate arolia present.

Length of body, 57; dorsal surface of head, 4.3; pronotum, 4.5; mesonotum, 5.7; tegmen, 6.6; wing, 31; cephalic femur, 16.3; median femur, 12.8; caudal femur, 8.4 mm. Width of head, 4.1; pronotum, 3.4; mesonotum, 4.3; dorsal field of tegmen, 3.6; wing, 21 mm.

General coloration dirty blackish brown. Head mummy brown mottled with prout's brown, with a paler, buckthorn brown, broad postocular band. Pronotum and mesonotum mummy brown, obscurely mottled with prout's brown. Lateral field of tegmina dull black, dorsal field brownish black. Wings with lateral portion of anterior field brownish black, dorsal portion brownish black except proximad, where it lacks heavy pigmentation and is buffy<sup>79</sup>; posterior field subtransparent, immaculate, pale ochraceous-salmon. Abdomen and ventral surface blackish brown. Proximal half of femora tawny, distal half black. Tibiae and tarsi tawny. Antennae black, except proximal half of sixth, eighth and tenth joints which are ochraceous-tawny, the succeeding alternate joints similarly annulate but becoming paler distad, ochraceous-tawny and buckthorn brown.

The type alone has been examined.

***Pseudophasma eupeplum*** new species (Plate XXII, fig. 1.)

This large and handsome species shows close relationship to *P. fulvum* (Redtenbacher), differing in the shorter mesonotum, distinctive tegminal and wing coloration and sharply acute operculum.

<sup>79</sup>This is briefly visible beyond the tegmina when at rest, due to the emargination of the distal portion of the tegmina.



The similarity in general type of antennae, wing and limb coloration and small meso-caudal tubercles of the seventh and eighth dorsal abdominal segments in the female, indicate that the very different generally appearing *P. robustum*, here described, probably belongs to the same group in the present genus. Males of these species must be obtained before this can be definitely determined.

*Type*.—♀; La Palmeta, Santander, Colombia. Elevation, 7500 feet. July 15 to 20, 1916. (M. A. Carriker Jr.) [Hebard Collection, Type No. 468.]

Size large, form moderately robust. Head distinctly longer than wide; occiput smooth, except for a few, very minute microscopic nodes which occur in the greatest numbers caudad of the antennal sockets. The three ocelli small, not closely crowded, forming the apices of a triangle, the sides of which are slightly longer than its base caudad, the surface about each ocellus distinctly raised, the depression before the median ocellus deep. Antennae with each joint very feebly enlarged at apex, except the elongate distal joints which are subdivided into short segments. Pronotum smooth, except for scattered, very minute, microscopic nodes. Mesonotum slightly longer than pronotum, with surface nodulose, bearing (three to five) slender, blunt tubercles on each lateral margin and three pairs of similar projections proximo-laterad on the dorsum. Tegmina normal for genus, produced moderately at sutural angle; shoulders strongly compressed, with outline flattened convex; distal margin of tegmen weakly concave, oblique to rather broadly rounded angle at sutural margin, that margin broadly convex. Wings fully developed, extending to base of ninth dorsal abdominal segment. Seventh dorsal abdominal segment produced in a small median tooth just before the caudal margin; eighth with a similar but slightly more decided tooth mesad on the caudal margin; ninth with a medio-longitudinal carina distinct distad, distal margin obtuse-angulate emarginate; supra-anal plate minute. Styles short, straight, tapering to blunt apex. Operculum broad lanceolate, apex acute. Cephalic femora with cephalic flexure very weak; all of the limbs with the four carinae decided. Tarsi moderately heavily supplied with hairs on ventral surfaces, the rather large distal pulvilli of the four proximal joints not concealed. Moderate arolia present.

*Measurements (in millimeters)*

♀	Length of body	Length of pronotum	Length of mesonotum	Length of tegmen	Length of wing	Length of cephalic femur
<i>Type</i> . . . . .	75	5.4	5.8	8.7	55.5	18.8
<i>Paratype</i> . . . . .	72	5.2	5.5	9.1	54	18.6

*Type*.—Length of dorsal surface of head, 4.3; median femur, 14.8; caudal femur, 20.3 mm. Width of head, 4.1; pronotum, 3.8; mesonotum, 3.8; dorsal field of tegmen, 4.8 mm.

Head saecardos olive; occiput microscopically marked with four longitudinal blackish lines; two broad postocular bands of ochraceous-buff on each side,

separated by a blackish line. Antennae black with nine conspicuous and three less conspicuous annuli of pinkish buff, these covering all but the apices of alternate joints proximad, but extending over only the proximal half of the alternate long distal joints. Pronotum saecardos olive obscurely marked with buffy and brown, the microscopic nodes buffy. Mesonotum similar with nodules buffy. Other portions of body sepia, shading through saecardos umber to tawny olive distad on abdomen. Tegmina with lateral field saecardos umber tinged with sepia, particularly distad; narrow intermediate field pinkish buff, including the proximal portion of the radial vein; dorsal field saecardos olive, the shoulders black, this extending as a dark suffusion caudad to near the caudal margin. Wings with anterior field immaculate buffy citrine, the veins and veinlets old gold; posterior field transparent, seashell pink, with veins pinkish cinnamon, showing a very weak grayish suffusion along the peripheral margin, which narrows rapidly from the distal portion. All femora snuff brown in proximal three-quarters, distal quarter black except apex, which is pinkish buff. Tibiae snuff brown except at immediate base, which is pinkish buff, and distal fifth, which is blackish. Tarsi blackish brown.

In addition to the type, a paratypic female bearing the same data is before us.

**Pseudophasma bispinosum** (Redtenbacher)

1906. *Ph[asma] bispinosus* Redtenbacher, Insektenfamilie der Phasmiden, p. 122. [♂, ♀; Coca, Santa Inez, Ecuador.]

Susumuco, Cundinamarca, 2600 feet, IV and VIII, 1912, IX, 1913, (from A. Maria), 2 ♂, 1 ♀, [Hebard Cln.].

These specimens are decidedly more depauperate than the types, but appear to be in no way separable.

*Measurements (in millimeters)*

	Length of body	Length of mesonotum	Length of tegmen	Length of wing	Length of cephalic femur	Length of caudal femur
♂						
Susumuco . . . . .	49	4.4	5.1	35	17.6	16.2
Susumuco . . . . .	50	4.5	5.1	35.7	16.8	16.2
♀						
Susumuco . . . . .	65	5.5	9.2	53.5	19.4	18.4

**Euphasma salpingus** (Westwood)

1859. *Phasma salpingus* Westwood, Cat. Orth. Ins. Brit. Mus., Phasmidae, p. 119, pl. xxxiii, figs. 3 and 3a. [♀; Bogota, Colombia.]

Susumuco, Cundinamarca, 2600 feet, (from A. Maria), 2 ♀, [Hebard Cln.].

The specimens before us are typical of this beautiful insect, striking in the annulate yellow and brown antennae, brown limbs marked with yellowish and mottled olive and brown tegmina and anterior field of wings.

**Planudes cortex** new species (Plate XXII, figs. 2, 3 and 4.)

This insect shows remarkable dissimilarity in the sexes: the male slender and having fully developed organs of flight, the female moderately stout and showing only the merest vestiges of tegmina. The dissimilarity in form is slightly more pronounced than in *Creoxylus spinosus* (Fabricius),<sup>50</sup> in which species, also a member of the Prexaspes Division, similar sexual differences in the organs of flight are found, these in neither case being of any generic diagnostic value.

In a species such as the present, showing no lobation of the limbs or conspicuous projections of the body, it is very difficult to associate the sexes. In body proportions, the female, though decidedly heavier, agrees with the male in proportionate length of head, pronotum and mesonotum, and these portions, though much more heavily nodulose, show a general similarity of contour and structure. The limbs in the female are all stouter, the cephalic femora distinctly more lamellate and the tarsal joints shorter than in the male, but the relative proportions of the cephalic and caudal limbs are the same in both sexes; these features show similar differences in the sexes of *Creoxylus spinosus* but to a slightly lesser degree. The sculpture of the head in the ocellar area and facial scutellum, the black basal joints of the palpi, the hirsute antennae, the length of which differ in approximately the same ratio as found in the sexes of related species, and the similarly developed carinae of the limbs (except the greater lamellation of the cephalic femora in the female), all of which are similarly strongly hirsute, give us reason to believe this association to be correct.

The female shows the close relationship of the species to *P. molorechus* (Westwood), apparently differing in having vestigial tegmina, the fifth dorsal abdominal segment simple and the form slightly heavier, the mesonotum and metanotum distinctly shorter.

The male, in Redtenbacher's key, would run to his *Isagoras plagiatus*, from which species this specimen is readily distinguished by the dissimilarity of proportions, this most striking in the caudal femora being distinctly longer than the cephalic.

<sup>50</sup> A large series of this species from Trinidad is in the Hebard Collection.

*Type*.—♀; San Antonio, Cauca, Colombia. Elevation, 6600 feet. October, 1908. [United States National Museum.]

Size medium; form moderately stout, the body width nearly subequal throughout. Head moderately elongate; occiput supplied with nodules arranged in irregular longitudinal lines, slightly swollen caudad, there showing three brief sulcations caudad; ocelli obsolete, ocellar area weakly convex except meso-cephalad where a shallow rectangulate pit occurs, with angles median and lateral; facial scutellum impressed, dorsal and ventral margins parallel, arcuate dorsad, rounding sharply into brief and more strongly raised lateral margins, which are directed dorso-laterad. Antennae with joints simple, moderately hirsute. Pronotum with transverse and medio-longitudinal impressions distinct, about as long as head, supplied with nodules about as thickly as occiput, with a few of these larger meso-caudad. Mesonotum slightly over three times as long as pronotum, surface thickly supplied with nodules and irregularly rugulose with a few scattered nodes, with microscopic vestiges of tegmina at the latero-caudal angles. Metanotum over two-thirds as long as mesonotum, moderately nodulose as are also the proximal abdominal segments; median segment half again as long as metanotum. Tegmina represented by minute, vestigial, roughened pads; wings absent. Proximal dorsal abdominal segments decidedly longer than broad. Disto-dorsal abdominal segments apparently cristate, the ninth truncate distad. The soft integument between the dorsal and ventral sixth abdominal segments is on each side produced in a moderately lamellate projection, very weakly undulating with margin trilobate. Mesosternum and metasternum rugulose. Operculum elongate with margins parallel to distal portion, which is angulato-convex. On each side of this distal portion of the operculum is a large, longitudinal, vertical plate, over twice as long as broad, with margins feebly convex-convergent to its acute apex.<sup>81</sup> Cephalic femora strongly compressed, with cephalic flexure well developed, showing (four to five) weak undulations of the ventral margin and (two) of the dorsal margin in the portion of greatest width, length less than that of caudal femora. The carinae of the limbs are pronounced and all are decidedly hirsute. Pulvilli rather large. Arolia well developed.

*Allotype*.—♂; Villa Eloira, Cauca, Colombia. Elevation, 5900 feet. September 5, 1908. [United States National Museum.]

Very dissimilar in general appearance from female. Size nearly as large, form much more slender. Head similar but very much smoother, the nodules much fewer and smaller; as in the male of *Crocoxylus spinosus*, the eyes are more protuberant and larger in proportion to the size of the head than in the female. Pronotum similar to that of female but much smoother, with only a few scattered minute nodules. Mesonotum with a feeble medio-longitudinal sulcus, very feebly rugulose with a few scattered nodules and minute nodes.

<sup>81</sup> These plates, called "appendix styloformis" by Redtenbacher, serve to hold an egg after it has been extruded. One of the eggs was in this position in the specimen before us. It is broad oval, flattened at each end, the surface of the excorion or shell rough and thickly supplied with short sharp spines, all directed cephalad.

Tegmina ample, lateral field narrow, apex mesad in dorsal field, outline ovate, shoulders moderately inflated and considerably raised, their outline convex. Wings fully developed. Abdomen missing. Limbs differing from those of female only in features discussed above, the margins of the decidedly less lamellate cephalic femora showing no undulation, except that caused by the characteristic expansion beyond the weak cephalic flexure.

*Type*, ♀.—Length of body, 60.5; pronotum, 3.8; mesonotum, 11; metanotum, including median segment, 8.8; tegmen, 1.2; cephalic femur, 10; median femur, 8.7; caudal femur, 11.5 mm. Width of pronotum, 2.8; tegmen, .6; cephalic femur, 1.7 mm.

*Allotype*, ♂.—Length of pronotum, 2.8; mesonotum, 8.3; metanotum, including median segment, 10.3; tegmen, 6.7; wing, 37.8; cephalic femur, 11.3; median femur, 8; caudal femur, 12.7 mm. Width of pronotum, 1.8; dorsal field of tegmen, 3.2; cephalic femur, .9 mm.

*Type*, ♀.—General coloration clove brown, except face which is pale, sea-foam green, and cephalic femora suffused, but not solidly, with light brownish olive. Antennae olive brown, mottled with deep olive-buff, this strongest distad and showing traces of pale green meso-distad. Fifth dorsal abdominal segment showing traces of warm buff dorsad, sixth with dorsal surface warm buff heavily maculate with clove brown. The two plates latero-distad of the operculum each with an oval, slightly raised and conspicuous area of warm buff with surface smooth. Due to the contrasting coloration and very different texture from the surrounding surface of the insect, these two areas are very conspicuous. Median limbs mummy brown, marbled with prout's brown; caudal limbs clove brown, marbled with mars brown.

*Allotype*, ♂.—General coloration of head, pronotum and mesonotum buffy brown, suffused, but not solidly, with deep olive-buff. Antennae olive-brown, mottled with deep olive-buff and showing a very faint trace of green meso-distad, proximal several segments are so extensively buffy that in these portions the antennae appear weakly annulate. Tegmina with lateral field olive-buff, with a few irregular marks of deep olive; dorsal field, including shoulders, deep olive mottled with sage green. Wings with anterior field buffy brown, with large irregular patches of olive-buff mesad in portions toward costal margin which are exposed when at rest; posterior field transparent, unicolorous, drab-gray, showing a very feeble iridescence. Limbs buffy brown mottled with buffy, this suffusing the cephalic femora almost solidly in distal half to near the apex.

We would note that the female has the appearance of a brown and feebly lichenose twig, while the male rather resembles mottled and more strongly lichenose bark. In such forms the degree of mottling is, in all probability, decidedly variable individually.

The pair is unique.

#### **Metriotes diocles** Westwood

1859. *Metriotes diocles* Westwood, Cat. Orth. Ins. Brit. Mus., Phasmidae, p. 161, pl. xv, figs. 1, 1a and 1b. [♀, Colombia.]

Honda, Tolíma, 600 feet, III, 1913, (from A. Maria). 1 ♀, [Hebard Cln.].

Length of body, 84; tegmen, 21.8; wing, 60.8; cephalic femur, 18.2; caudal femur, 16.8 mm.

This beautiful member of the Prexaspes Division has been recorded from Chiriqui, Panama; Bogotá, Colombia, and Ecuador.

#### HETERONEMINAE

We here find a series of American genera, part assigned to the Bacunculinae, part to the Phibalosominae by Brunner and Redtenbacher, based on characters which as used are wholly or in part unsatisfactory. The proportionate length of the median segment is by far the most important of these; being decidedly shorter than one-third of the metanotum (*Dyme*, *Calynda*), distinctly shorter than the metanotum (*Bostra*) or longer than the metanotum (*Bacteria*, *Otocrania*). Separation of *Calynda* from *Dyme* is made on the greatly produced operculum in females of that genus; but in females which are assigned to *Bostra*, similar contrasts in this organ are found. Separation of *Otocrania* from *Bacteria* is made by the two very large horns on the head, but again there are species which show this feature in every way similar, but from the proportions of the median segment are referred to *Bostra*. It is probable that the majority or all of these genera are valid and that additional valid genera are represented among the already described species concerned; but we are convinced that the generic assignment of the species is and will be in many cases inaccurate, until the genera involved are carefully studied and other or additional characters determined for their separation. At present far too little material is at hand to attempt this study and we are obliged to follow Brunner and Redtenbacher.

It is indeed deplorable that, with so many species before them, those authors have made virtually no effort to study and discuss these problems in a scholarly and scientific manner. They have treated the forms recorded or described throughout the "Insektenfamilie der Phasmiden" practically without regard for any recent scientific literature, and in a brief, stereotyped and careless manner that would have brought little credit to an author publishing one hundred years earlier. In their work palpably careless inaccuracies in geographic records are frequent, and localities given for many

American species often prove the material to be misidentified or mislabelled. We would be inclined to commend the series of measurements given for each species discussed, but when we consider the lack of care, errors and ignorance of geographic essentials and the host of clearly inadequate descriptions, we naturally fear that the measurements have been compiled in the same manner. As a whole, we can definitely state that the "Insektenfamilie der Phasmiden" is the greatest retrograde step made in recent years, away from true scientific study of the order Orthoptera.

**Bostra**<sup>22</sup> **colombiae** new species (Plate XXII, fig. 5 and 6.)

This species shows nearest affinity to *B. incompta* Rehn.<sup>23</sup> The differences in the male genitalia are very decided, however; the lateral portions of the eighth dorsal abdominal segment being hardly at all produced ventrad, the operculum not as deep and more evenly and broadly convex distad. The head, pronotum, mesonotum, metanotum and limbs are all slightly but appreciably more elongate and attenuate than in *incompta*, the length of the median segment approaching slightly more closely that of the metanotum.

*Type*.—♂; San Antonio, Cauca, Colombia. Elevation, 6600 feet. December, 1908. [United States National Museum.]

Size large; form very slender and elongate; surface smooth but not glabrous as in *incompta*. Head moderately elongate; eyes circular, length contained twice in cheek; occiput smooth, unarmed. Pronotum nearly twice as long as broad. Median segment only a little shorter than metanotum. Sixth dorsal abdominal segment broadening slightly caudad, distinctly shorter than fifth; seventh with sides parallel, half as long as sixth; eighth slightly shorter than seventh, with sides produced ventrad no lower than seventh, its median portion slightly pinched and more strongly convex, lateral margins almost straight. Ninth (distal) dorsal abdominal segment small, with length equal to width, surface convex except distad where it is weakly bi-impressed, lateral margins

<sup>22</sup> Redtenbacher has described twenty-five new species of *Bostra* in the "Insektenfamilie der Phasmiden," entirely without figures. Though the association of sexes is extremely difficult, conscientious effort to do so on the part of that author would have secured much better results. The overlooking of *B. jugalis* Rehn has resulted in the erection of two synonyms: *amplectens* described from the male, *longoperculata* from the female. A Costa Rican pair of this species, still in coitu, establishes definitely this sex association.

<sup>23</sup>In the Philadelphia collections are a paratype male and an additional Costa Rican male.

evenly convex, slightly flaring, cingulate to distal margin which is feebly concave, ventral surface of distal margin thickened on each side, transversely sub-bilobate ventrad, with surface heavily armed with minute spines. Cerci slender, elongate, straight to the roundly enlarged apices which are bent inward. Mesosternum and metasternum with a heavy, glabrous, microscopically pitted, medio-longitudinal carina. Seventh ventral abdominal segment over half as long as sixth, enlarging somewhat caudad. Subgenital plate (eighth ventral abdominal segment) of equal diameter throughout and of almost equal depth throughout, ventral length twice depth; proximal portion convex in transverse section, distal portion convex, in outline sharply ascendant, from a very minute, transverse, ventro-mesal node directed caudad, to the free dorsal margin which is moderately thickened and forms part of a narrow oval.<sup>84</sup> Limbs very elongate, strongly carinate and compressed, unarmed. The caudal femora reach to near base of sixth abdominal segment. Metatarsus very elongate, the combined length of the succeeding joints only three-quarters its length.

Length of body, 101; head, 4; pronotum, 3; mesonotum, 28.7; metanotum, including median segment, 17.2; median segment, 8.2; ninth (distal) dorsal abdominal segment, 1.9; poculum, 3.7; cephalic femur, 39.2; median femur, 30.8; caudal femur, 37.7; caudal tibia, 44; caudal metatarsus, 8.7 mm. Width of mesonotum, 1.2; abdomen at poculum (greatest), 2. Depth of poculum, 2 mm.

General coloration brownish olive; limbs darker, particularly toward the genicular regions; the femora and tibiae all broadly tri-annulate with buffy, these annuli suffused; tarsi buffy.

In addition to the type, a paratypic male, bearing the same data but taken in January, 1909, is before us.

A badly preserved female, apparently two or three instars removed from maturity, from the same locality, taken July 25, 1908, is at hand.

This specimen is apparently the same species, the relative proportions all agreeing as closely as would be expected for the sexes. The head has two small conical occipital spines (length, 1.3 mm., more decided and approximate than in Costa Rican females of *B. jugalis* Rehn, at hand) and laterad of these a minute conical spine toward each eye, the occipital surface is smooth, supplied with twelve abrupt, rounded, minute nodes. The mesonotum and metanotum are almost perfectly smooth, showing a few, widely scattered, weakly defined nodules laterad. The otherwise smooth pleura and sterna are supplied with more numerous, but widely

<sup>84</sup> In *incompta* the sides of the eighth dorsal abdominal segment are more projecting, wider, though not produced, the seventh ventral segment widens more strongly and the broader subgenital plate is more decidedly deflexed, these features making the distal portion of the abdomen of that species much heavier and more strongly clubbed.



scattered, similar nodules. The limbs are unspecialized, the caudal metatarsi simple, equalling the combined length of the succeeding joints. The ninth (distal) dorsal-abdominal segment is slightly longer than broad, truncate at apex. The sixth ventral abdominal segment is produced in a small rounded mesal projection at the base of the operculum. The operculum is broken.

**Bacteria**<sup>85</sup> *apolinari* new species (Plate XIX, figs. 10 and 11.)

The species appears to be nearest *B. horni* Redtenbacher. It agrees in being apterous, with vertex smooth, eighth dorsal abdominal segment with lateral margins straight and horizontal, median segment not more than half again as long as the metanotum, femora not bearing lobes and ninth (distal) abdominal segment with apex rounded, not bilobate. In addition to having longer limbs and mesonotum, but metanotum and median segment of approximately the same length, the genitalia show the present insect to be distinct. Were the description of *horni* adequate, other differential characters could doubtless be given.

*Type*.—♂; Susumuco, Cundinamarca, Colombia. Elevation, 2600 feet. August, 1913. (From A. Maria.) [Hebard Collection, Type No. 456.]

Size medium for the genus, form slender. Head ovate, weakly narrowed caudad, cheeks about two and one-half times as long as eye. Pronotum, mesonotum and metanotum smooth, the former with the median transverse sulcus weakly indicated. Abdominal segments elongate, slightly enlarged at their junctures; seventh dorsal segment three-fifths as long as sixth, widening moderately and evenly caudad; eighth about three-quarters as long as seventh, proximad impressed dorso-laterad, not narrowing caudad, lateral margins briefly convex proximad, thence straight, horizontal, the latero-caudal portions of the segment vertical with angle sharply rectangulate; ninth (ultimate) segment intermediate in length between seventh and eighth segments, narrow in distal half, strongly cucullato-tectate, with an appreciable blunt medio-longitudinal carina and lateral surfaces regularly convex, lateral margins concave to cereal bases, there forming a blunt obtuse-angulate production, thence to bluntly rounded apex feebly concave, their ventral surfaces thickened, particularly distad, heavily supplied with stout, recurved denticulations. Seventh ventral abdominal segment strongly widened caudad. Subgenital plate (eighth ventral abdominal segment) strongly inflated, with a small blunt conical projection (rounded-triangular in lateral outline) slightly caudad of the median point, from which a minute medio-longitudinal carina extends to the evenly convex free dorsal margin. Cerci elongate, cylindrical, very feebly incurved, enlarging

<sup>85</sup> Thirty-seven new species of this genus are described by Redtenbacher in the "Insektenfamilie der Phasmiden." No figures are given for these, the treatment being fully as unsatisfactory as that of the species of *Bostra*.

very feebly to the bluntly rounded apices. Limbs simple, cephalic flexure of cephalic femora brief and very decided. Median femora with median carina of ventral surface well supplied with minute chaetiform hairs.<sup>86</sup> Metatarsi simple.

Length of body, about 100; head, 4.1; pronotum, 3.2; mesonotum, 24.4; metanotum, including median segment, 15.7; median segment, 9.9; first dorsal abdominal segment, 7.3; cephalic femur, 31.3; median femur, 25; cephalic tibia, 36.6. Width of head at pronotum (least), 2.2; mesonotum (least), 1.8; abdomen at intersection of seventh and eighth segments, 2.9 mm.

General coloration sepia. Head with dorsal surface tawny olive, paler laterad, with a postocular band of blackish brown on each side, below which the genae are buffy. Abdomen much paler distad, buffy with a few very small markings of black on seventh and eighth and proximal portion of ninth dorsal segments. Subgenital plate dark brown proximad and distad, shading to paler mesad and with a transverse black spot at the caudal base of the median projection.

The type is unique.

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We have considered Brunner's treatment of his sub-family Bacunculinae, in the "Insektenfamilie der Phasmiden," with surprise and dismay. It did not seem possible that so pretentious a work, published as recently as 1906 to 1908, by supposedly the greatest of orthopterists living at that time, could actually be so carelessly executed, superficial and unsatisfactory.<sup>87</sup> Inexcusable ignorance of important literature is shown, publications antedating that work by as much as ten years being wholly or in part ignored. The most important recent literature by Kirby, Rehn and Giglio-Tos has received such treatment. As an instance: of the fourteen Ecuadorean species of the Phasmidae described by Giglio-Tos in 1898, three are mentioned. Kirby's Catalogue, including fixation of all the genotypes, published in 1904, is completely ignored. Selection of single types or genotypes is in almost all cases apparently deemed superfluous.

The new genus *Oenophila*, placed among the first genera of the Bacunculinae, is made to include twenty-nine species, many of which when carefully studied will certainly be found to represent distinct generic units. The twenty-five new species are described

<sup>86</sup> The caudal limbs are missing.

<sup>87</sup> Brunner states that the species of *Libethra* can be separated from those of allied genera only by genitalic features. He describes *Libethra brevipes* from a single female, lacking head and distal portion of abdomen, labelled "Mexico." This kind of work speaks for itself. We would note, however, that the genus *Libethra* is apparently confined in distribution to northwestern South America.

in the usual superficial manner, but sufficient characters are given to show that the majority, to varying degrees, violate even the very brief and unsatisfactory generic description. No genotype was selected. We here select as genotype, *Ocnophila integra* Brunner, the only species of which figures were given.

**LIBETHRA** Stål

1875. *Caulonia* Stål, *Recens. Orth.*, iii, p. 74.

1875. *Libethra* Stål, *ibid.*, iii, p. 74.

Kirby's genotypic designation for *Caulonia* Stål<sup>88</sup> is invalid, being based on a species not originally included in that genus by Stål. We here select *Ceroys rabdota* Westwood as genotype of *Caulonia* Stål.

Brunner's designation of a genotype for *Libethra* is invalid,<sup>89</sup> being antedated by Kirby's designation of *Libethra nisseri* Stål.<sup>90</sup>

It is almost certain that *rabdota* and *nisseri* are congeneric, and in consequence *Libethra* would fall as a synonym of *Caulonia*, the latter description having line priority,<sup>91</sup> except for the fact that *Caulonia* is preoccupied, Lorient, in 1873, having used this name for a genus of Echinoderms.

Study of the literature and the material now at hand convinces us that a host of species of the genus occur in Colombia. The variously specialized forms are easily separated, association of the sexes alone proving difficult for some in which the males almost or altogether lack the most distinctive features exhibited by the females.

The least specialized forms are, however, difficult in the extreme, at least in the state of our present knowledge. From the series at hand it is clear that in the same species both green and brown color forms occur, and that, in the brown condition, the body granulation and carinulae of the dorsal abdominal segment may be intensified. Size variation is also apparent and the similarity of nearly adult to fully adult material makes careful examination of each individual essential. Large collections, containing extensive series of each species, will have to be assembled before the number of such species and the association of the sexes can be definitely and conclusively determined. In the material

<sup>88</sup> *Syn. Cat. Orth.*, i, p. 344, (1904).

<sup>89</sup> *Insektenfamilie der Phasmiden*, p. 304, (1908).

<sup>90</sup> *Syn. Cat. Orth.*, i, p. 345, (1904).

<sup>91</sup> Brunner uses *Libethra*, discarding *Caulonia* without explanation.

at hand but one species of the plain forms, *L. strigiventris* (Westwood), is so represented.

We would note that *Libethra aurita* Rehn, which species Brunner has ignored, describing the synonymous *Libethra confusa*, is referable to the genus *Sermyle*. Kirby has selected as genotype of *Sermyle*, *Acanthoderus mexicanus* Saussure, which species Brunner later places in his genus *Ocnophila*. Were the species there included congeneric, this would invalidate *Ocnophila*.

***Libethra spinicollis*** new species (Plate XXIII, figs. 1 and 2.)

This stout and highly specialized species is nearest *L. rabdota* (Westwood), differing strikingly in being decidedly shorter, the head with numerous smaller, irregular, blunted spines caudad of the pair of thickened composite spines (in this feature alone agreeing rather with *L. bifolia* (Stål)), the pronotum with paired clusters of heavy, blunted, composite spines caudad (not occurring in any other known species of the genus), the mesonotum with a similar pair of fused clusters of smaller, blunted, composite spines caudad, the first dorsal abdominal segment with four nodes at the caudal margin, the second with a large depressed lobe (as in *rabdota*), the third with medio-longitudinal carinae terminating in a very small lobe, the sixth with medio-longitudinal carinae developing into a small depressed lobe.

*Type*.—♀; San Antonio, Cauca, Colombia. Elevation, 6600 feet. October, 1908. [United States National Museum.]

Size medium for genus, form robust. Head with occiput armed with a pair of sublamellate, thickened, composite spines, caudad of which are numerous smaller, irregular, blunted spines, which decrease in length caudad, cephalad and laterad of which are still smaller blunted spines and nodes. Antennae simple, slender, extending to near caudal margin of metanotum. Pronotum with surface rugulose and nodulose, broadly subsulcate mesad and proximad on each side, with paired clusters of heavy, blunted, composite spines caudad; width greater caudad, nearly equal to length. Mesonotum rugulose and nodulose, moderately tectate, with an irregularly placed longitudinal row of short stout spines (three to four) on each side, and near the caudal margin armed with a pair of fused clusters of short, stout, blunted, composite spines. Mesopleura armed with an irregularly placed longitudinal row of short stout spines (five and six). Metanotum nodulose, with a few short, stout, blunt spines proximad; minute elongate rugulose pads above the trochanters of the median limbs suggest vestigial wings. Metapleura armed with a longitudinal row of short, stout spines (four and four). Median segment rugulose. Dorsal abdominal segments nodulose, irregularly multicarinate; first with four small, blunt, conical projections at caudal margin, of which the median pair are deflexed caudad; second with a large, transverse, horizontally extended lobe caudad,

which overhangs the proximal half of the third segment, this lobe with margins angulato-arcuate, its dorsal surface irregularly rugulose with projections similar to those of third segment mesad at its base; third with median carinae enlarged caudad into very small, vertical, rounded plates directed caudad; fourth, fifth, seventh and eighth segments with median carinae terminating caudad in small projecting nodes directed caudad; sixth with a pair of rounded plates meso-caudad, fully twice as large as those of the third segment, on each side of which is a small plate of half the size; ninth (distal) segment with a weak medio-longitudinal carina, lateral margins convex-convergent to the minutely angulate-emarginate apex. Ventral surface strongly nodulose. Operculum very elongate, extending to apex of abdomen,<sup>32</sup> carinate medio-longitudinally, deeply rotundato-emarginate at the narrow apex, the lateral projections narrow and bluntly rounded distad. Cephalic femora weakly laminate, carinae very decided, dorsal surface with (six and seven) weak strumosities, these making the dorso-lateral carinae weakly crenate. Cephalic tibiae with dorso-lateral carinae weakly crenate, the more proximal of these sub-lobate. Median femora with dorso-lateral carinae each supplied with three opposed lobes, these increasing in size distad, those of the dorso-caudal margin decidedly the largest. Median and caudal tibiae with dorso-lateral carinae each supplied with three small opposed lobules. Caudal femora with lobes as in median femora, but with a faintly indicated additional pair of sub-lobate expansion distad. Well-developed arolia present.

Length of body, 48; composite spines on head, 1.3; pronotum, 3.2; composite spines on pronotum, 1.3; mesonotum, 10.8; metanotum, including median segment, 6.8; lobe of second dorsal abdominal segment, 2.1; cephalic femur, 11.5; median femur, 8.8; caudal femur, 11.2; operculum, 8.8 mm. Width of pronotum, caudad, 3.8; mesonotum, caudad, 4.7; lobe of second dorsal abdominal segment, 5; cephalic femur at widest point, 1.7 mm.

General coloration mummy brown. Labrum ochraceous-tawny. Mesosternum and metasternum mars brown, maculate with mummy brown.

In addition to the type a single immature female, 41.5 mm. in length, is at hand, bearing the same data but taken in December.

***Libethra columbina*** (Westwood)

1859. *Ceroys columbina* Westwood, Cat. Orth. Ins. Brit. Mus., Phasmidae, p. 62, pl. xxiv, figs. I and Ia. [♀, Colombia.]

San Antonio, Cauca, 6600 feet, XI, 1908, 1 ♀, [U. S. N. M.].

This insect, compared with *L. spinicollis* here described, agrees in size and similar, though much less decided, specialization of

<sup>32</sup> The operculum is elongate, slender and tapering from the median portion, which is distinctly strumose, to the narrow apex, which is emarginate, in all the females of *Libethra* at hand. It completely hides both the ovipositor valves and the very brief cerci. This is in our opinion of high generic value, minor differences in type of apex alone appearing to have specific significance.

the limbs. The form is robust, but not as stout as in that insect. There are no lobes or spines, except that the sixth dorsal abdominal segment has the median carinulae terminating caudad in a very small sub-lobate projection. Westwood's figure is excellent, showing accurately the areuation and greater distinctness of the medio-lateral carinulae on the dorsal surface of the abdomen.

**Libethra insalubris**<sup>93</sup> new species (Plate XXIII, fig. 3.)

Apparently closely related to *L. rabdotula* Brunner, differing in the irregular occipital excrescence, unarmed metanotum and unspecialized fourth and fifth dorsal abdominal segments. The species is much more slender than *L. rabdota* (Westwood), with which species Brunner compares *rabdotula* but makes no comment on this feature in his inadequate description.

*Type*.—♀; Pueblo Nuevo de Ocaña, Santander, Colombia. September 3, 1916. (M. A. Carriker Jr.) [Hebard Collection, Type No. 469.]

Size medium; form slender for genus, as slender as in the unspecialized species before us, *L. strigiventris* (Westwood) and *L. molita* (Westwood). Head with surface of occiput smooth, but well supplied with nodules and a few blunt spines, and mesad with a large, trilobate, very irregularly nodose, paired excrescence.<sup>94</sup> Eye small, length contained four times in that of cheek. Antennae simple, slender, extending to base of second abdominal segment. Pronotum with length nearly twice caudal width, transverse and longitudinal sulcus weakly indicated, the latter briefly replaced by a delicate carinula caudad, surface smooth but thickly supplied with nodules and small nodes. Mesonotum elongate and slender, with a delicate medio-longitudinal carinula, surface smooth but thickly supplied with nodules and small nodes. Metanotum and median segment with a delicate medio-longitudinal carinula, the surface subrugulose but weakly supplied with nodules and very few small nodes. Dorsal abdominal segments multicarinulate and nodulose. First dorsal abdominal segment with entire dorsal surface caudad developed into a trilobate, equally produced, horizontally extended, foliaceous plate,<sup>95</sup> the lateral lobes acute-angulate, the median lobe much broader with caudal margin irregularly and broadly convex; from the bases of the lateral lobes, delicate, bluntly subserrate, parallel carinulae extend to the cephalic margin of the segment. Second dorsal abdominal segment with caudal portion developed

<sup>93</sup> In allusion to the unwholesome appearance of the irregularly trilobate excrescence on the occiput.

<sup>94</sup> This excrescence is strongly asymmetrical, the sinistral lobe has a supplementary lobe projecting latero-cephalad near its juncture with the dextral lobe. It is to be expected that additional material will show individual variation in so asymmetrical a structure.

<sup>95</sup> The dextral lobe of this plate is wider, with margins more convex, than the sinistral.

into a much larger, transverse, horizontally extended, foliaceous plate, the broad caudal margin of which is irregularly convex with a distinct bilobation indicated mesad; four carinulae, such as the two shown on the first segment, occur. Third dorsal abdominal segment with a very much smaller, horizontally extended, foliaceous plate; sixth with a similar but slightly larger plate and with two parallel dorsal carinae; other dorsal abdominal segments unarmed. Ninth (distal) dorsal abdominal segment with a medio-longitudinal carina and two lateral carinulae concave-divergent caudad, lateral margins caudad broadly convex-convergent to the minutely angulate-emarginate apex. Ventral surface rugulose, nodulose and moderately supplied with nodes. Operculum much as in *L. spinicollis* here described, but with apex only moderately rotundato-emarginate. Cephalic femora weakly laminate, carinae very decided, dorso-lateral carinae of these portions and also the dorso-internal carina of the cephalic tibiae feebly undulate, dorso-external carina of cephalic tibiae supplied with (two and three) very minute and widely spaced lobes. Median and caudal femora with a moderately large, bilobate production of dorsal carinae proximal and two similar, smaller bilobate productions distad, the lobes of the caudal carinae being the more decided. Median and caudal tibiae with dorsal carinae supplied with (two external and one internal) very minute lobes, these no more decided than those of the cephalic tibiae. Well-developed arolia present between the delicate tarsal claws.

Length of body, 49.5; exerescence of occiput, 1.6; pronotum, 2.8; mesonotum, 12.2; metanotum, including median segment, 7.6; lobe of first abdominal segment, 1.1; lobe of second segment, 2.4; lobe of seventh segment, 1.2; cephalic femur, 13.1; median femur, 10; caudal femur, 12.8; operculum, 7.7 mm. Width of pronotum, caudad, 2.1; mesonotum, caudad, 2.9; lobe of first abdominal segment, 3.1; lobe of second segment, 5; lobe of seventh segment, 1.1; cephalic femur at widest point, 1.2 mm.

General coloration light ochraceous-buff, feebly maculate and speckled with bone brown, with a suffusion of this color over the proximal and meso-distal portions of the abdomen (possibly due to discoloration). Occipital exerescence blackish, contrasting strongly with the head coloration which is ochraceous-buff, with a suffused postocular band of bone brown on each side. Lobes on abdomen and limbs bone brown. Ventral surface of body and limbs light ochraceous-buff, heavily suffused with bone brown.

The type is unique.

***Libethra strigiventris*** (Westwood) (Plate XXIII, figs. 4, 5 and 6.)

1859. *Bacteria strigiventris* Westwood, Cat. Orth. Ins. Brit. Mus., Phasmidae, p. 28, pl. xxiv, figs. 6, 6a and 6b. [♀, Colombia.]

Cauca, 1 ♀, [A. N. S. P.].

San Antonio, Cauca, 6600 feet, I, IV, VI, VII, VIII, X, XI, XII, 1908, 8 ♂, 3 ♀, 1 juv. ♂, [U. S. N. M.].

Tocota, Cauca, 6500 feet, V, 28, 1908, 1 ♀, [U. S. N. M.].

Rio Aguatal, Cauca, 4600 to 5900 feet, VI, 15 and X, 1908, 2 ♀, [U. S. N. M.].

The series enables us to associate the sexes with little difficulty. In length little difference between these occurs.

The males are readily distinguished from those of *L. molita* (Westwood) by the average decidedly smaller size, much shorter antennae, which extend only to base of abdomen, more inflated disto-dorsal abdominal segment, which is strongly transverse, absence of acute-angulate projection of latero-caudal angle of preceding segment (shown by males of that species at hand and excellently figured by Westwood for the type) and more roughly nodose ventro-caudal surface of subgenital plate.

The females differ from those of *molita* in average decidedly smaller size, with antennae shorter, extending only to base of abdomen, and in being somewhat less attenuate, the multicarinate condition of the dorsal surface of the abdomen more pronounced and the pronotum and mesonotum being heavily acute-nodulose to varying degrees in all but pale examples, in some of which these portions are fully as smooth as in *molita*.

The present series shows conclusively the development of both green (yellowish in dried material) and brown color phases in the female sex and that, in the green condition, the pronotum, mesonotum and metanotum become much smoother.

*Measurements (in millimeters)*

	♂	Length of body	Length of mesonotum	Width of mesonotum	Length of metanotum	Length of cephalic femur
San Antonio (S) <sup>96</sup> . . . . .		42-55.5	12-16.2	1.7-1.8	8.4-9.8	13-17
	♀					
San Antonio (3) . . . . .		46-48	11.2-11.8	2.9-2.6	8	12.4-13.2
Tocota . . . . .		46	11	2.8	7.9	11.8
Río Aguatal (2) . . . . .		46-46.5	12-11.8	2.7-2.6	8-8.2	13

In addition to the series recorded there is a male from San Antonio, taken in October, agreeing in every genital feature and with the majority in size. In this specimen, however, the occiput bears three minute blunt denticulations latero-dorsad on each side, while in addition to minute twin dark maculations meso-caudad on each dorsal abdominal segment, the second segment bears twin minute blunt denticulations at this point. The importance of these features can not be determined and if the specimen is referable to a different species we are at present unable to place it.

<sup>96</sup> All but two of the males at hand are very close to the minimum measurement.



**Libethra molita** (Westwood)

1859. *Bacteria molita* Westwood, Cat. Orth. Ins. Brit. Mus., Phasmidae, p. 29, pl. xxiv, figs. 3, 3a and 3b. [♂, Colombia.]

Cunday, Tolima, 1550 feet, X, 1916, (from A. Maria), 1 ♀, [Hebard Ch.].

Villa Eloira, Cauca, 5900 feet, X, 6, 1908, 1 ♀. [U. S. N. M.].

San Antonio, Cauca, 5900 and 6600 feet, X, 1908 and I, 1909, 2 ♂, [U. S. N. M.].

The males agree fully with Westwood's excellent description and figures except that one is decidedly larger, the other very much larger, than the type. In addition to the diagnostic features discussed under *L. strigiventris* (Westwood) for both sexes, we would note that in these males the antennae extend to the apex of the abdomen, the dark general coloration is more unicolorous and greenish, and the brief proximal pale portions of the femora more decided, than in any of the males of that species at hand.

The females have the antennae extending as far as the base of the fourth abdominal segment. The two at hand were green in life. Both agree closely in all features except proportionate length of cephalic femora and mesonotum<sup>97</sup> and are apparently very small examples. The female recorded and measured by Brunner, though decidedly larger than these examples, would not be of proportionately large size to the larger male at hand. From these few specimens it would appear certain that the species shows tremendous individual size variation.

*Measurements (in millimeters)*

	Length of body	Length of mesonotum	Width of mesonotum	Length of metanotum	Length of cephalic femur
♂ San Antonio (2)	73-82	22.5-24.2	1.7	13.8-15	21.5-24.6
♀ Villa Eloira	59	13.7	2.7	9.6	15.3
Cunday	61.5	16	2.9	10.1	15.8

A single male from Pueblo Nuevo de Ocaña, Santander, taken September 3, 1916, by M. A. Carriker Jr., is at hand. This specimen agrees fully with the males of *molita* in coloration and all diagnostic features, except that there are a few minute nodules on the otherwise smooth occiput, and, as in *L. strigiventris*, the latero-caudal angles of the penultimate dorsal abdominal segment

<sup>97</sup> It would appear that this character as used by Brunner is of no value. It is probable that his *L. socia* is a synonym of this species, or of *L. strigiventris*.

lack an acute-angulate projection, as found in *molita*. The significance of these features can not at present be determined, though probably indicating specific distinction.

**LIBETHROIDEA** new genus

Related to *Libethra* and *Ocnophila*, differing from the former only, but strikingly, in the distal abdominal segments of the female, in which sex the ninth (ultimate) segment is produced, elongate, extending far beyond apex of abdomen, with apex rounded.

*Genotype*.—*Libethroidea inusitata* new species.

We would place Giglio-Tos' *Bacunculus sarmentum* and *palea* in this genus; the differences in the operculum of these species are unusual for congeneric forms and when both sexes of these species are known, further generic separation may be found necessary.

*Generic Description*.—Four caudal tibiae lacking an impressed ventral triangular area distad. Median segment very much shorter than metanotum, strongly transverse. Ocelli absent. Tegmina and wings absent. Head elongate. Antennae elongate. Abdomen of female longitudinally carinulate. Ninth (distal) dorsal abdominal segment of female very elongate, lanceolate, decidedly longer than any other dorsal abdominal segment and extending much beyond apex of abdomen. Operculum of female very elongate, concealing ovipositor valves and cerci, as in *Libethra*, rounded distad with apex briefly cleft, the lateral portions of the apex broad. Cephalic femora strongly compressed.

**Libethroidea inusitata** new species (Plate XXIII, figs. 7 and 8.)

Apparently closely related to *L. palea* (Giglio-Tos), differing in having the apex of the operculum cleft and in coloration, which is not immaculate in that species. The size is also smaller. Comparison of material of these species would probably show other differences.

*Type*.—♀; Altas de las Cruces, near San Antonio, Cauca, Colombia. Elevation, 7200 feet. October, 1908. [United States National Museum.]

Size medium, form moderately slender as compared with the species of *Libethra*. Antennae simple, elongate, reaching to near median portion of abdomen. Head elongate; occiput smooth, except for (three and four) minute nodes arranged longitudinally near the caudal margin back of the eyes. Eye small, length contained four times in cheek. Pronotum decidedly shorter than

dorsal surface of head, lateral margins parallel, surface smooth, transverse and longitudinal sulcus subobsolete, a few nodules weakly defined laterad. Mesonotum with surface smooth, furnished cephalad and meso-laterad with moderately numerous small nodes. Metanotum with surface smooth, furnished laterad with a few small nodes. Median segment smooth. Dorsal abdominal segments longitudinally multicarinulate, the first two with a very few small nodes laterad. Seventh dorsal abdominal segment nearly twice as long as eighth, which is subquadrate. Ninth (ultimate)<sup>98</sup> dorsal abdominal segment very elongate, nearly as long as combined length of seventh and eighth segments, surface smooth with a medio-longitudinal carina, form lanceolate, with apex sharply rounded. Ventral surface of insect smooth, without carinae or nodules. Opereulum very elongate, rounding rather sharply distad with apex briefly fissate, not extending beyond apex of abdomen. Limbs simple, unarmed. Cephalic femora strongly laminate. Tarsal joints very elongate, metatarsus equal to combined length of succeeding three joints, ventral surfaces heavily supplied with very delicate hairs, apices of four proximal joints occupied by moderate pulvilli. Moderate arolia present between the delicate tarsal claws.

Length of body, 60; head, 4.7; dorsal surface of head, 4.3; pronotum, 3; mesonotum, 13.7; metanotum, including median segment, 9.3; sixth dorsal abdominal segment, 3; seventh, 3.8; eighth, 1.9; ninth (ultimate), 5.3; opereulum, 7.9; cephalic femur, 17.3; cephalic tibia, 18.3; median femur, 12; caudal femur, 15.2; caudal tibia, 16.8; caudal metatarsus, 2.8 mm. Width of head, behind eyes, 2.9; pronotum, 2.6; abdomen, at widest point, 3.3; cephalic femur, at widest point, 1.7 mm.

Coloration immaculate, pale green, faded to yellowish on median portion of body. In life probably light bic green, as are the cephalic limbs in this dried specimen.

The type of this species is unique.

#### **LITOSERMYLE** new genus

Relationship with *Sermyle* is evident. Compared with the female of the genotype, *Sermyle mexicana* (Saussure),<sup>99</sup> the female here described differs in the elongate, not globose, head; pronotum with transverse sulcus inconspicuous; ninth dorsal abdominal segment elongate, not quadrate; sixth ventral abdominal segment unspecialized; opereulum elongate and ventral surface of subequal width to its truncate apex; proximal portion of ovipositor valves similarly fused and not concealed, but not broad and conspicuously convex, and cephalic femora much more strongly lamellate.

<sup>98</sup> A supra-anal plate is not developed.

<sup>99</sup> A Mexican female in the Hebard Collection is before us.

The genotype of *Ocnophila* having been established as *integra* Brunner, in the present paper,<sup>100</sup> we would note that probably the best linear arrangement of this group of genera is as follows: *Libethra*, *Libethroidea*, *Ocnophila*, *Litosermyle* and *Sermyle*.

The present female would appear to differ from that sex of *Ocnophila integra* Brunner, genotype, in the more elongate head; elongate, not quadrate, ninth (ultimate) dorsal abdominal segment, and elongate operculum, with ventral surface of equal width to the truncate apex, not sublanceolate.

*Genotype*.—*Litosermyle ocaanae* new species.

*Generic Description*.—All diagnostic characters, except the following, as given on page 170 for *Libethroidea*.<sup>101</sup> Ninth (distal) dorsal abdominal segment of female<sup>102</sup> elongate, not narrowing, truncate distad. Operculum of female with width of ventral surface subequal to that of its truncate apex, very elongate but leaving the ovipositor valves exposed. Cerci of female exposed from below. Genicular lobes of median and caudal femora acute produced, more so than in any species at hand of *Libethra* or *Libethroidea*, not as much produced but more acute than in the species of *Sermyle* before us.

**Litosermyle ocaanae** new species (Plate XXIII, figs. 9 and 10.)

This somber and plain walking stick exhibits a type of female genitalia widely different from that of any previously described form. In Brunner's key for *Ocnophila* the species would run to the genotype, *integra* Brunner, the differences discussed above obliging us to separate *ocaanae* as generically distinct.

*Type*.—♀; Pueblo Nuevo de Ocaña, Santander, Colombia. September 3, 1916. (M. A. Carriker Jr.) [Hebard Collection, Type No. 470.]

Size medium; form moderately slender as compared with species of *Libethra*, medium as compared with species of *Sermyle*. Antennae simple, moderately elongate, reaching to base of third dorsal abdominal segment. Head elongate, occiput smooth but with six longitudinal rows of minute, blunt, irregularly

<sup>100</sup> See page 163.

<sup>101</sup> The species of the group of allied genera of the Heteroneminae, to which this genus belongs, show almost exclusively the characters of generic value in the distal abdominal segments and genitalia. This is in part due to the fact that differences in length of antennae, and simple or variously specialized processes or armament of body segments and limbs, constitute most striking features to distinguish the species, but are plainly valueless for generic criteria.

<sup>102</sup> The male sex is unknown.

spaced, microscopic tubercles. Eye small, oval, length contained six times in cheek. Pronotum decidedly shorter than dorsal surface of head, lateral margins parallel, transverse and longitudinal sulcus weakly defined, surface rather thickly supplied with minute nodules and subtuberculate. Mesonotum with surface thickly supplied with minute nodules, subtuberculate and feebly carinulate, showing a faint medio-longitudinal carina. Metanotum similar with a very faint lateral carinula on each side caudad, these continued on median segment, the surface of which is similar. Mesopleura and metapleura nodose. Dorsal abdominal segments longitudinally multicarinulate, the four median carinulae increasing slightly in strength toward the caudal margin of each segment, this more marked on the second and sixth segments, slightly less decided on third, on these three segments forming minute rounded crests at the caudal margin. Eighth dorsal abdominal segment quadrate. Ninth (distal) dorsal abdominal segment nearly twice as long as broad, moderately convex in transverse section with sides strongly convex; lateral margins parallel, suddenly ascendant distad to the transverse caudal margin, which is minutely emarginate mesad and as a result sub-bilobate; dorsal surface with a median carinula which divides into two small carinulae proximad, laterad on each side with a supplementary carinula, these are slightly convergent in proximal half, thence straight, divergent to point where they round into the distal margin. Mesosternum very feebly and irregularly carinulate and feebly nodulose; metasternum similar but more nearly smooth. Three proximal ventral abdominal segments smooth, succeeding three segments longitudinally multicarinulate. Operculum elongate; ventral surface sharply defined from vertical sides by a decided carina on each side, these carinae parallel but disappearing near apex of plate; ventral surface with a weak medio-longitudinal percurrent carinula, this surface feebly convex proximad, showing a weak swelling mesad, deplanate distad; free margins of sides distad declivent, feebly convex, to abruptly transverse caudal margin, which is concave on each side, thus leaving a brief triangular projection mesad hardly produced beyond the latero-caudal angles. Limbs simple, unarmed, the carinae very decided even on dorsal surfaces of tarsal joints. Cephalic femora strongly laminate, cephalic flexure decided. Tarsal joints moderately elongate, metatarsus slightly longer than combined length of three succeeding joints, ventral surface heavily supplied with delicate hairs, apices of four proximal joints occupied by moderately large pulvilli. Large arolia present between the delicate tarsal claws.

Length of body, 54; head, 4.5; dorsal surface of head, 3.7; pronotum, 2.8; mesonotum, 13; metanotum, including median segment, 9; sixth dorsal abdominal segment, 3.3; seventh, 2.3; eighth, 1.8; ninth (distal), 2.6; operculum, 5.2; cephalic femur, 15.1; cephalic tibia, 16.6; median femur, 10.2; caudal femur, 13.1; caudal metatarsus, 1.8 mm. Width of head, behind eyes, 2.6; pronotum, 2.3; abdomen, at widest point, 2.8; cephalic femur, at widest point, 1.7 mm.

Coloration generally blackish brown, except in the following portions. Face and proximal antennal joint buffy. Head in the ocellar area suffused with

cinnamon and with a postocular band and one parallel on the genae, on each side, of the same color. Limbs blackish brown, showing irregular traces of verona brown.

The type is unique.

**Dyme**<sup>103</sup> **carrikeri** new species

This insect appears to be nearest *D. chiriquensis* Brunner. It agrees in being slender, with limbs very slender, head and thorax smooth, femora unarmed, apex of abdomen more slender with segments not carinate, ventral margins of eighth<sup>104</sup> dorsal segment straight and cerci terete with apices incurved. It differs in having the operculum reaching as far as the apex of the eighth dorsal abdominal segment, in the apparently more strongly fornicate ninth (distal) dorsal abdominal segment,<sup>105</sup> in the shorter mesonotum and metanotum and decidedly shorter femora. Other features doubtless exist, but can not be determined from the inadequate description of *chiriquensis*.

*Type*.—♂; San Lorenzo, Sierra Nevada de Santa Marta, Magdalena, Colombia. Elevation, 8300 feet. August 23, 1913. (M. A. Carriker Jr.) [Hebard Collection, Type No. 455.]

Size medium for the genus; form very slender; surface smooth, moderately glabrous. Head elongate, very slender, cylindrical, moderately depressed and tapering gently caudad from eyes to pronotum. Eye one-third as long as cheek. Pronotum slender, over twice as long as greatest width, showing faintly the transverse and longitudinal sulci. Mesonotum shorter than cephalic femur. Metanotum with suture of median segment obsolete. Median segment very elongate for genus, two-fifths the total length of the metanotum. Abdominal segments elongate and slender, distinctly enlarged at their junctures; seventh decidedly shorter than sixth, widening moderately and evenly caudad; eighth as long as seventh, narrowing caudad, this almost entirely confined to mesal third, lateral outline convex, then very weakly concave, lateral margins briefly convex proximad, thence straight, horizontal, the latero-caudal portion curved briefly inward with angle sharply rectangulate. Ninth (ultimate) dorsal abdominal segment appreciably shorter than eighth, narrow, nearly twice as long as broad, cucullate, smooth, not carinate, lateral margins almost straight, feebly convex, ascendant to apical portion which is feebly notched mesad, the small bilobate portion thus formed with ventral surface of each lobe heavily armed with minute conical teeth. Seventh ventral abdominal segment widening moderately and evenly caudad. Subgenital plate (eighth segment) moder-

<sup>103</sup> Forty new species of this genus are described by Brunner in the "Insektenfamilie der Phasmiden." No figures are given and the insufficient and carelessly drawn descriptions are soon found to be even more unsatisfactory than those of Redtenbacher.

<sup>104</sup> Brunner gives ninth, treating the median as the first abdominal segment.

<sup>105</sup> Termed anal segment by Brunner.

ately inflated, convex, with a median node, lateral margins convex-convergent distad at less than ninety degrees to the rather acute apex, which is opposite the apex of the eighth dorsal abdominal segment. Cerci small, cylindrical from the moderately enlarged bases, with bluntly rounded apex incurved.

Length of body, 78.5; head, 3.2; pronotum, 2.8; mesonotum, 19.1; metanotum, including median segment, 13; median segment, 4.9; first dorsal abdominal segment, 6.2; cephalic femur, 23.1; cephalic tibia, 26.6; median femur, 17.7; caudal femur, 22.8 mm. Width of head, at pronotum (least), 1.9; mesonotum (least), 1.2; abdomen at sixth dorsal segment, 1.2; abdomen at intersection of seventh and eighth dorsal segments, 2.1 mm.

General coloration dull tawny-olive. Head with dorsal surface sepia, face and lower portions of genae buffy. Femora and tibiae marked with scattered minute flecks of black, the median and caudal femora with two obscure, broad bands of buffy weakly indicated, the tibiae tinged with grayish.

The type of this slender phasmid is unique.

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## THE GENUS PHATNOMA FIEBER

(TINGIDAE; HETEROPTERA)

BY EDMUND H. GIBSON

*United States Bureau of Entomology*

*Phatnoma* is one of the Tingid genera whose known distributions are limited to the tropical zone, and hence has some of the peculiar structural variations so characteristic of native groups of that region.

Fieber described the genus, in 1844, to include his *lacinata*, which is the genotype. The only other contributions to the knowledge of this group were made by Champion, in 1901, and Distant, in 1909, describing new species. Seven species are included in the genus, two of which are herein described as new.

The principal characters which distinguish *Phatnoma* are the long and numerous head spines, the extremely broad and flaring lateral membranous margins of the pronotum, whose angles terminate in spines, and the sharp carinae which separate the costal, subcostal, and discoidal areas of the elytra.

So far as is known the genus is of little economic importance, no food plants of any of the species having been recorded.

**PHATNOMA** Fieber

1844. Fieber, Ent. Mon., p. 57.

1901. Champion, Biol. Centr.-Am., Heteropt., ii, p. 2.

1910. Distant, Fauna British India, v, p. 102.

Head long, horizontal, with numerous spines as follows: one pair at base of head, one pair just in front of basal pair, one single spine just in front of second pair, jugae terminating in spines, and antenniferous tubercles spinous. First two segments of antennae very short, third very long, fourth about as long as first two taken together. Rostrum long. Pronotum tricarinate, without hood, and nearly truncate behind. Lateral margins of pronotum membranous, flaring, with four or more rows of areoles and directed forward, forward border being sinuate with angles spinous. Scutellum distinct. Elytra wide ovate, with claval area prominent. Other areas prominently separated by sharp carinae.

*Key to the Species*

1. Outer margin of costal area of elytra with a row of areoles much larger than other areoles of elytra..... **ovata** Champion  
Outer margin of costal area of elytra with areoles the same size as others of elytra..... 2
2. Basal pair of head spines distinctly shorter than second pair. Outer border of pronotal lateral margins deeply sinuate and with two long acute points directed forwards..... **lacinata** Fieber  
Basal pair of head spines at least as long as second pair. Sinuation of pronotal lateral margins not so deep..... 3
3. Pronotal margins with not more than four rows of areoles, **marmorata** Champion  
Pronotal margins with five or more rows of areoles..... 4
4. Pronotal margins with more than seven rows of areoles, **annulipes** Champion  
Pronotal margins with less than seven rows of areoles..... 5
5. Costal area with a longitudinal, undulating black line near inner margin, **costalis** Distant  
Costal area without such a line..... 6
6. Light brown in general color, comparatively large. Subcostal area not widened at any one point..... **filetia** new species  
Dark brown in general color, comparatively small. Subcostal area widest just before the middle..... **spinosa** new species

**Phatnoma ovata** Champion

1901. Champion, Biol. Centr.-Am., Heteropt., ii, p. 4.

"Lighter or darker brownish-ochreous, the outer carinae of the pronotum and the costal margin and carinae of the elytra spotted with black or fuscous, the inner basal margin of the clavus also blackish; the small areolae of the pronotal and elytral margins hyaline; the legs and antennae testaceous, the apical joint of the latter black at the tip. Pronotum with the margins a little raised, angularly dilated before the middle as well as in front, becoming narrow behind, the anterior terminating in a short spine; the disc closely punctured, tricarinate, the outer carinae curved inwards in front. Elytra rather short, regularly oval, somewhat narrowly rounded at the apex; discoidal and subcostal areas equal in width, separated by a sharp-raised carina which extends forwards to the base, the discoidal area limited inwards by a moderately raised carina which extends to the apex of the subcostal area, both areas with several transverse or oblique raised lines, and, like the clavus and sutural area, with very small rounded areolae; costal area moderately broad, becoming narrow at the tip, with a row of oblong areolae along the margin and three rows of much smaller areolae within. Length  $3\frac{1}{4}$ - $3\frac{1}{2}$ , breadth  $1\frac{4}{5}$ -2 millim.

Hab. Guatemala, San Asidro, Panajachel, Zapote, Capetillo, Dueñas (Champion)."

The above is a copy of the original description. No specimens of this species were at hand for study, but it is very evident that the row of large areoles along the outer margin of the costal area of elytra will distinguish this from all other species of the genus.

**Phatnoma lacinata** Fieber

1844. Fieber, Ent. Monographien, p. 57.

As this species is the genotype of the genus and the type specimen is not available for study, I do not feel warranted in setting forth a redescription of it from the original description and illustrations. However, it is very evident that this species is the only one of the genus which has the basal pair of head spines shorter than the second pair, and hence this character may be used as the diagnostic one for the species.

The type locality is "East Indies."

**Phatnoma marmorata** Champion

1901. Champion, Biol. Centr.-Am., Heteropt., ii, p. 3.

"Brownish-ochreous or sepia-brown, mottled with fuscous, the fuscous markings on the costal area of the elytra forming numerous vague transverse fasciae, which sometimes terminate in a small black spot on the costal and inner margins, the apex of clavus and some spots on the carinae also black; the pronotal and elytral margins partly hyaline; the antennae testaceous, with the apical joint partly or entirely black, the third joint sometimes infuscate; the legs testaceous, with the knees usually infuscate, the femora with a yellow annulus before the apex. Pronotum with the margins raised, and broadly, acutely dilated before the middle as well as in front, becoming narrow behind, the anterior dilatation terminating in a rather long slender spine; the disc punctured closely and tricarinate, the outer carinae subparallel. Elytra moderately broad, suboval, broadly rounded at the apex; discoidal and subcostal areas equal in width, separated by a sharply raised carina, which extends forwards to the base, the discoidal area open behind and limited inwards by a curved carina which extends to near the tip of the elytra; the clavus and the sutural, discoidal, and subcostal areas with very small rounded punctiform areolae, the discoidal and subcostal areas each with about five transverse or oblique pallid raised lines; costal area rather broad throughout, closely reticulated, there being four rows of areoles at the middle, increasing to five or six behind. Length  $3\frac{1}{2}$ -4, breadth 2 millim.

Hab. Panama, Bugaba, Caldera, and David in Chiriqui (Champion)."

The collection of the United States National Museum contains eight specimens from Paraiso, Canal Zone, Panama, collected by Mr. E. A. Schwarz.

**Phatnoma annulipes** Champion

1901. Champion, Biol. Centr.-Am., Heteropt., ii, p. 4.

"Lighter or darker ochreous-brown, the expanded margins of the pronotum and the elytra more or less mottled with fuscous, the fuscous markings on the costal area of the elytra sometimes forming fasciae, the apex of the clavus and some spots on the carinae and costa black; the pronotal and elytral margins partly hyaline; the antennae testaceous, with the apical joint more or less black, the third joint sometimes infusate; the legs testaceous, with the knees usually infusate, the femora with a more or less distinct yellow annulus before the apex. Pronotum with the margins greatly raised, and very broadly and obliquely dilated forwards, angularly produced in front and also at the sides anteriorly, the anterior dilatation terminating in a short spine, the margin rounded behind the outer angle; the disc closely punctured and tricarinate, the outer carinae parallel. Elytra moderately broad, suboval, broadly rounded at the apex; discoidal and subcostal areas separated by a sharply raised carina which extends forwards to the base, the discoidal area limited inwards by a curved carina which extends to near the tip of the elytra; the clavus and the sutural, discoidal, and subcostal areas with very small rounded punctiform areolae, the discoidal and subcostal areas each with about five transverse or oblique pallid raised lines; costal area broad to the tip, closely reticulated, there being five rows of areolae at the middle, increasing to six or seven behind. Length  $3\frac{1}{4}$ -4, breadth  $1\frac{9}{10}$ - $2\frac{1}{10}$  millim.

Hab. Mexico, Frontera in Tabasco (H. H. Smith); Guatemala, Cahabon in Vera Paz, San Isidro (Champion); Panama, Volcan de Chiriqui (Champion)."

Several specimens from Alta Vera Paz, Guatemala, are in the collection of the United States National Museum.

**Phatnoma costalis** Distant

1909. Distant, Ann. Soc. Ent. Belg., liii, p. 113.

1910. Distant, Fauna British India, v, p. 102.

A copy of the original description is here given. This species may be easily distinguished by the undulating longitudinal line in the costal area of the elytra.

"Pale brownish-ochraceous, the lateral areas of the pronotum and the costal, subcostal and sutural areas of the elytra greyish; a small linear black spot in the discoidal area and a similar spot near the apex of sutural area; body beneath and legs reddish-brown; antennae with the third joint very long, apical joint piceous at apex; pronotum tricarinate, the lateral areas greyish with the margins of the areolets brownish, the lateral margins amplified and produced in two strong stout spines; costal area of the elytra with small brown margined areolets, a piceous undulated line near its inner margin and small piceous spots on its outer margin, the subcostal and discoidal areas with distinct pale transverse raised lines. Length 4 mill.

Hab.: Tenasserim; Myitta (Doherty)."



**Phatnoma fletia** new species

Head punctate, horizontal, as long as pronotum. Spines on head long and prominent, basal pair very long, each terminating in a slender curving tip, second pair long, normally stout, single spine prominent, jugae spines prominent and acute. Antenniferous tubercles spinous. Antennae with first two segments very short, basal segment slightly longer and more stout than second, third very long, fourth longer than first two taken together. Pronotum punctate, carinae parallel, membranous margins with five or six rows of areoles, angles acute, the anterior angles bearing definite spines. A slight indication of a posterior membranous margin in front of scutellum. Apex of scutellum distinct. Elytra oblong, with claval area long. Carinae separating subcostal and discoidal areas parallel. Subcostal area not widened before the middle. All areas of elytra areolate. General color brown, resembling *marmorata* Champion. Length, 4 mm.; width, 2.3 mm.

*Type*.—♀; *allotype*, ♂; one *paratype*, ♀. All specimens were collected by Mr. E. A. Schwarz at Porto Bello, Panama, during March, 1911. Type No. 22159, United States National Museum.

In general appearance it more nearly resembles *marmorata* Champion.

**Phatnoma spinosa** new species

Head horizontal, as long as pronotum. Spines on head long and prominent, basal pair very long, each terminating in a slender curving tip, second pair long, normally stout, single spine prominent, jugae spines prominent and acute. Antenniferous tubercles spinous. Antennae with first two segments very short, basal segment slightly larger and stouter than second, third very long, fourth longer than first two taken together. Pronotum punctate, carinae parallel, membranous margins with five rows of areoles, the fifth row somewhat reduced, angles acute with definite spines on anterior angles. A slight indication of a posterior membranous margin in front of the distinct apex of scutellum. Elytra oblong, with claval area long. Carinae separating subcostal and discoidal areas slightly bowed, making the subcostal area widest just before the middle. All areas of elytra areolate. General color very dark brown, resembling *marmorata* Champion and the previous species in pattern. Length, 3.5 mm.; width, 1.8 mm.

*Type*.—♂; Bohio, Canal Zone, Panama, collected by Mr. E. A. Schwarz, April 7, 1911. Type No. 22160, United States National Museum.





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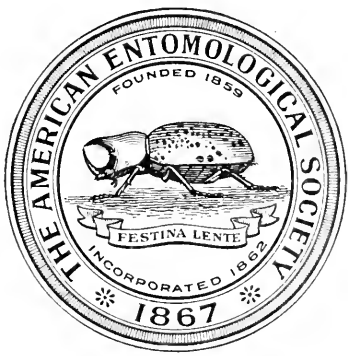
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## THE GENUS GARGAPHIA STÅL

(TINGIDAE; HETEROPTERA)

BY EDMUND H. GIBSON

*United States Bureau of Entomology*

This paper is an attempt to bring together and up to date the taxonomic knowledge of this very interesting and characteristic genus. It is drawn up along the lines of the author's recent work on the genus *Corythucha* Stål, and is the third in a series of contributions to the knowledge of the family Tingidae, which family the writer hopes to monograph at some future date.

*Gargaphia* Stål embraces at the present time twenty-five species, five of which are herein described as new. The genus is limited in its distribution to North, Central and South America, and includes several species which are of economic importance as plant feeders.

Because of the fact that material, including types, of some of the South American forms has not been available for study, it has been impossible for the writer to redescribe them and hence to treat those species separately. However the lack of this degree of completeness is not sufficient to warrant the withholding of the detailed treatment of the remaining species. It is believed that until certain types in European museums can be studied this paper is as complete as possible.

The characters used in separating the species are quite a different set than are used in the genus *Corythucha*. The pronotal hood in *Gargaphia* is so much reduced that comparative measurements would hardly be reliable. The size and shape of the lateral margins of the pronotum, and the number of rows of areoles in the costal and subcostal areas of the elytra, are the most stable characters for the determination of species. The character of the head spines should also be taken into account.

Stål described *Gargaphia* as a subgenus of *Monanthia* in 1862, and then, in 1873, he gave it generic rank. His *patricia* is the logotype of the genus.

The writer has deemed it wise to redescribe all of the species known to him so as to conform to the idea of uniformity in description.

In the listing of the species no attempt is made at a natural or evolutionary order; instead, they are presented as they occur in the key.

#### GARGAPHIA Stål

1862. Stål, Stett. Ent. Zeit., xxiii, p. 324.  
 1873. Stål, Enum. Hemip., iii, pp. 119, 124.  
 1884. Uhler, Stand. Nat. Hist., ii, p. 285.  
 1887. Provancher, Pet. Faune Ent. Can., iii, p. 159.  
 1897. Champion, Biol. Centr.-Am., Heteropt., ii, p. 9.  
 1898. Champion, Proc. Ent. Soc. Lond., p. 58.  
 1916. Osborn and Drake, Ohio St. Univ., Bull., xx, p. 233.  
 1917. Drake, Ent. News, xxviii, p. 227.

This genus may be distinguished from all others of the family by the sinuous transverse carina interrupting the rostral groove between the meso- and metasternum. In general it may be characterized as follows: Head small, black, more or less shiny, with five prominent spines, three of which are on the front between the eyes and two at the base of head, one on either side. These basal spines may be erect or decumbent and reduced to mere threads. The frontal spines may be reduced to mere stubs. Antennae long, first and second segments stout, the first at least three times the length of the second, and about equal to the fourth in length, segments more or less hairy. Pronotum with a hood, varying in size with the species but never entirely covering the head, three longitudinal membranous carinae, and a wide membranous lateral margin which is more or less flaring and angular in some species. A transverse sinuous carina interrupts the rostral groove between the meso- and metasternum. Elytra laey, with hyaline areoles at least in the costal area. Various areas of elytra well defined. Elytra narrowed at the base, never reflexed anteriorly as in *Corythucha*.

#### FOOD PLANT INDEX

The following list of food plants is given merely as an aid to identification. It is as complete as possible with the data at hand, which was taken from various publications and insect labels:



- Amphichyris* species  
*solani* Heidemann
- Basswood (*Tilia pubescens*)  
*tiliae* Walsh
- Beans  
*angulata* Heidemann
- Coffee Weed (*Cassia* species)  
*solani* Heidemann
- Cotton (*Gossypium* species)  
*solani* Heidemann
- Dahlia parryi*  
*condensa* Gibson
- Dahlia spinosa*  
*opacula* Uher
- Egg plant (*Solanum melongena*)  
*opacula* Uher  
*solani* Heidemann
- False Indigo (*Amorpha fruticosa*)  
*amorphae* Walsh
- Horse Nettle (*Solanum carolinense*)  
*solani* Heidemann
- Mallow (*Malva* species)  
*iridescens* Champion
- New Jersey Tea (*Ceanothus americanus*)  
*angulata* Heidemann
- Night Shade (*Solanum* species)  
*iridescens* Champion  
*solani* Heidemann
- Potato (*Solanum tuberosum*)  
*solani* Heidemann
- Ragweed (*Ambrosia* species)  
*iridescens* Champion
- Sage (*Salvia pitcheri*)  
*solani* Heidemann
- Sand Nettle  
*iridescens* Champion
- White Horse Nettle (*Solanum elaeagnifolium*)  
*solani* Heidemann
- Wild Cherry (*Prunus serotina*)  
*tiliae* Walsh
- Willow (*Salix* species)  
*opacula* Uher

## DISTRIBUTIONAL GROUPINGS OF SPECIES

The grouping as here listed is also an aid to the identification of species. The definite limits of distribution of only a few species are known, hence the following should be considered merely as a guide:

NORTHERN UNITED STATES—*tiliae* Walsh.

EASTERN UNITED STATES—*amorphae* Walsh, *tiliae* Walsh, *iridescens* Champion, *angulata* Heidemann.

SOUTHERN UNITED STATES—*tiliae* Walsh, *fasciata* Stål, *angulata* Heidemann, *solani* Heidemann.

SOUTHWESTERN UNITED STATES—*carinata* Gibson, *condensa* Gibson, *albescens* Drake, *iridescens* Champion, *opacula* Uhler, *angulata* Heidemann, *solani* Heidemann.

WESTERN UNITED STATES—*opacula* Uhler.

CENTRAL AMERICA (including Mexico)—*panamensis* Champion, *patricia* Stål, *nigrinervis* Stål, *vanduzeei* Gibson.

SOUTH AMERICA—*lasciva* Gibson, *magna* Gibson, *nigrinervis* Stål, *formosa* Stål, *trichoptera* Stål, *subpilosa* Stål, *flexuosa* Stål, *lunulata* Mayr, *munda* Stål, *obliqua* Stål, *tricolor* Mayr, *simulans* Stål.

## Key to the Species

1. Costal area of elytra with less than four rows of areolae at its widest part . . . . . 10  
     Costal area of elytra with four or more rows of areolae at its widest part . . . . . 2
2. Membranous margins of pronotum angularly expanded . . . . . 3  
     Membranous margins of pronotum rounding . . . . . 5
3. Frontal spines produced, at least one-half the length of the basal segment of the antennae . . . . . 4  
     Frontal spines not produced, very short, mere stubs . . . . . **angulata** Heidemann
4. Angle of the membranous margin of pronotum sharp, pointed. Hood small . . . . . **nigrinervis** Stål  
     Angle of the membranous margin of pronotum not sharp or pointed. Hood large . . . . . **solani** Heidemann
5. Length of the discoidal area noticeably less than one-half the length of elytra; narrow, in width about equal to the subcostal area . . . . . 6  
     Length of the discoidal area about one-half the length of elytra, width greater than subcostal area . . . . . 7
6. Length of discoidal area barely one-third the length of the elytra. . . . . **panamensis** Champion  
     Length of discoidal area slightly more than one-third the length of elytra. . . . . **magna** new species
7. Subcostal area with but two rows of areolae . . . . . 9  
     Subcostal area with three rows of areolae . . . . . 8
8. Apical angle of discoidal area about median . . . . . **tiliae** Walsh  
     Apical angle of discoidal area at the outer side . . . . . **amorphae** Walsh

9. All five frontal spines erect, long. Nervures of elytra concolorous.

**fasciata** Stål

The two basal spines not erect, median spine long, anterior spines not long.

Nervures of elytra not of uniform color. . . . . **patricia** Stål

10. Costal area with two rows of areolae . . . . . 12

Costal area with three rows of areolae. . . . . 11

11. Nervures of elytra concolorous. Hood nearly as broad as long.

**albescens** Drake

Nervures of elytra not of a uniform color. Hood nearly twice as long as broad. . . . . **iridescens** Champion

12. Subcostal area with two rows of areolae . . . . . 13

Subcostal area with three or more rows of areolae . . . . . 14

13. Lateral margins of pronotum angulate. Hood comparatively small.

General color dark. . . . . **condensa** new species

Lateral margins of pronotum rounding. Hood larger. General color light . . . . . **vanduzeei** new species

14. Subcostal area with less than four rows of areolae . . . . . 15

Subcostal area with four rows of areolae . . . . . **lasciva** new species

15. Pronotal carinae low, without distinct areolae . . . . . **opacula** Uhler

Pronotal carinae high, with large clear areolae . . . . . **carinata** new species

**Gargaphia angulata** Heidemann

1899. Heidemann, Can. Ent., xxxi, p. 301.  
 1900. Chittenden, U. S. Dept. Agr., Div. Ent., Bull. n. s. xxiii, p. 32, fig. 8.  
 1910. Smith, Cat. Ins. N. J., edn. 3, fig. 63, p. 149.  
 1916. Osborn and Drake, Ohio St. Univ. Bull., xx, p. 233, fig. 6.  
 1917. Parshley, Occasional Papers Boston Soc. Nat. Hist., vii, p. 56.  
 1917. McAtee, Bull. Brooklyn Ent. Soc., xii, p. 79.  
 1917. Van Duzee, Catalogue of Hemiptera of North America, p. 218, no. 657.

Head dark shiny. Three frontal spines reduced to mere light colored conical stubs. Basal head spines mere decumbent hairs, not plainly visible without removing pronotal hood. First three segments of antennae light, concolorous, hairy. Fourth segment dark except basal third. Pronotum dark, punctate. Pronotal hood twice as long as broad. Three parallel carina with one row of areoles. Lateral membranous margins wide, with four rows of areoles at its widest point, distinctly angular. Membranous portions of pronotum yellowish or dirty white and hairy. Elytra with four rows of areoles at the widest part of costal area, subcostal area with two rows of areoles. Nervures of elytra yellowish. Length, 3.4 mm; width, 1.6 mm.

Type, a male from Auburn, Alabama, number 4371, in the United States National Museum. This and a long series of specimens from New Jersey to Arizona have been examined. Mr. H. M. Parshley records its capture in Massachusetts and Connecticut. It would, therefore, appear that its present distribution reaches from the New England States south and west

to Arizona and inland to Missouri. Mr. McAtee states that *Ceanothus americanus* is the most common food plant of this species. It also feeds on beans to an economic extent.

**Gargaphia nigrinervis** Stål

1873. Stål, Enum. Hemip., iii, p. 125.

1897. Champion Biol. Centr.-Amer., Heteropt., ii, p. 10.

Head dark, eyes prominent. The frontal pair of head spines much reduced, barely more than stubs, in this respect resembling those of *angulata* Heidemann, but the median spine is long and erect. Basal spines also long and erect. First three segments of antennae reddish brown, third segment lighter towards apex. Fourth segment black. Pronotal hood small, more than twice as long as broad. Three parallel carinae normal. Lateral margins wide, flaring, and distinctly angulate, with four rows of areoles at point of greatest width. Angle sharp or pointed, margin rounded behind. Nervures of lateral margins brown. Elytra with five rows of areoles in costal area at its greatest width. Subcostal area with two rows of areoles. Discoidal area very short, about one-third the length of elytra. Five or six oblique nervures distinctly darkened, brown to black. Apex of elytra narrowed. Length, 3.7 mm.; width, 2.2 mm.

Eleven specimens from Panama are in the collection of the United States National Museum. Champion records its occurrence also in Colombia. Food plants of this species are not known.

**Gargaphia solani** Heidemann

1914. Heidemann, Proc. Ent. Soc. Wash., xvi, p. 136.

1915. Fink, U. S. Dept. Agri., Div. Ent., Bull. 239, pp. 1-7.

1916. Osborn and Drake, Ohio St. Univ. Bull., xx, p. 235, fig. 7.

1917. Van Duzee, Catalogue of Hemiptera of North America, p. 218, no. 658.

Head small, dark, eyes and rostral sulcus prominent. Three frontal head spines long, basal spines long, and more or less erect and protruding beyond hood. Basal joint of antennae dark. Second and third joints lighter, fourth dark except at base. Third and fourth antennal segments with numerous long hairs, those on first and second segments shorter and less conspicuous. Pronotal hood comparatively large for species of this genus, four times as long as wide, and as high or slightly higher than median carina. All three carinae comparatively high, with one distinct row of large areoles, and densely hairy. Lateral membranous margins of pronotum wide and distinctly angular, with at least five rows of areoles at their widest point and very hairy. Pronotum dark and punctate, membranous portions of pronotum light, yellowish, with nervures darkened in angle of lateral margins. Elytra with five rows of areoles at the widest part of costal area and three rows in subcostal area. Five transverse nervures of costal area blackened, more or less distinct. Apical angle of the discoidal area at outside. Legs pale, yellow. Length, 4 mm.; width, 2 mm.

Two specimens labelled types, in the collection of the United States National Museum, numbered 18810, have been examined. One was collected at Kirkwood, Missouri, the other in Lavaca County, Texas. Many other specimens are in the same collection from Maryland, west to Arizona. It would appear that this species occurs over the entire southern half of the United States. Its food plants include *Solanum carolinense* (Horse nettle), *Solanum elaeagnifolium*, *Cassia* species (Coffee weed), *Amphichrus* species, *Salvia pitcheri*, *Solanum* species, eggplant, potato, and cotton. Mr. David E. Fink in Bulletin number 239, U. S. Dept. Agriculture gives an economic treatise of this species and includes descriptions of the egg and nymphal stages. He terms it the eggplant lace-bug.

**Gargaphia panamensis** Champion

1901. Champion, Biol. Centr.-Amer., Heteropt., ii, p. 10.

The writer, having seen no specimens of this species, is unable to give a redescription, and therefore includes a copy of the original description, which is in such detail as to make its identity fairly certain.

"Moderately elongate; ferrugineo-testaceous, the body black beneath, the margins of the pronotum and the elytra subhyaline; the antennae testaceous, with the basal and apical joints black; the legs testaceous, with the tarsi and the greater part of the tibiae infuscate; the margins of the pronotum and the costal margin of the elytra to about the middle very minutely denticulate. Head with three short slender frontal spines, meeting at the tip; antennae long and slender, joint one three times as long as two and nearly as long as four, two very short. Pronotum with the membranous margins moderately wide, rounded in front and behind and slightly recurved, with three rows of small areolae; hood rather small, oval, compressed, angularly projecting in front; the three carinae feebly foliaceous, the interspaces closely, finely punctate. Elytra moderately long, arcuately widened from the base, broadly rounded at the tip; discoidal area narrow, barely one-third the length of the elytra, closely reticulated; subcostal area as wide as the discoidal, closely reticulated; costal area with four rows of areolae at the middle, diminishing to three at the base, the areolae, except towards the base, where they are small, moderately large and (like those of the sutural area) subequal in size. Length  $2\frac{1}{2}$ , breadth  $1\frac{1}{2}$  millim. Hab. Panama, Caldera in Chiriqui (Champion)."

No record of food plants was given.

**Gargaphia magna** new species

Head small, black, with frontal spines all short, about the length of the second antennal segment. Basal spines not protruding noticeably in front of hood, more or less decumbent. First three antennal segments dark reddish brown. Basal segment long and very dark. Third segment lighter towards apex. Fourth black except at base. Hairs on antennae very short and fine. Pronotal hood slightly more than twice as long as broad and distinctly higher than median carina. Nervure on crest of hood darkened. Pronotum black, punctate. Parallel carinae normal, rather low and wide apart. Lateral membranous margins rounding, with three rows of areoles, nervures light brown, margin dark brown. Elytra with four rows of areoles in costal area at its greatest width. Subcostal area with four rows and raised to apex of elytra. Nervures of membranous portions not hairy. Three transverse oblique nervures of costal area black, also nervures towards apex of elytra darkened. Areoles of the apical third of the elytra smoky except those of costal area. Legs dark brown. Length, about 5 mm.

Because of its size and coloring this is the most easily recognizable species of the genus known to the author.

*Type*.—♂; San Bernardino, Paraguay; K. Fiebrig, collector. Type number 22139 in the collection of the United States National Museum.

Food plant unknown.

**Gargaphia tiliae** Walsh

1864. Walsh, Proc. Ent. Soc. Phila., iii, p. 408.  
 1886. Uhler, Check List, p. 22.  
 1887. Provancher, Pet. Faune Ent. Can., iii, p. 159.  
 1892. Bergroth, Revue d' Ent., xi, p. 264.  
 1894. Van Duzee, Bull. Buffalo Soc. Nat. Sci., v, p. 181.  
 1895. Gillette and Baker, Hemip. Colo., p. 57.  
 1910. Bueno, Journ. N. Y. Ent. Soc., xviii, p. 31.  
 1910. Smith, Cat. Ins. N. J., edn. 3, p. 149.  
 1916. Osborn and Drake, Ohio St. Univ. Bull., xx, p. 234.  
 1917. Drake, Ent. News, xxviii, no. 5, p. 227.  
 1917. Van Duzee, Catalogue of Hemiptera of North America, p. 217, no. 654.

Head small with spines erect, frontal pair shorter than median spine, inconspicuous. Antennae hairy, first three segments yellowish brown, colorous, fourth segment black except at base. Pronotal hood small, twice as long as wide. Carinae normal, comparatively low. Pronotum black punctate. Membranous margins rounding, with three or four rows of areoles. Nervures yellowish. Elytra with four or five rows of areoles at the greatest width of the costal area. Subcostal area with three rows of areoles. Apical angle of discoidal area about median. Length of discoidal area about one-half the length of elytra. Nervures of costal area, opposite apical half of discoidal area, darkened. Legs yellow with tarsi and claws black. Length, 4 mm.; width, 2 mm.

The type, a male, number 1150, in the collection of the United States National Museum, has been examined, together with a long series from states including New Hampshire, Connecticut, New York, Virginia, Maryland, North Carolina, Tennessee, Illinois, Missouri, and Wisconsin. The species probably is well distributed over the entire eastern half of the United States and southern Canada.

Basswood appears to be the most common food plant of the species. It has also been recorded on wild cherry.

#### **Gargaphia amorphae** Walsh

1864. Walsh, Proc. Ent. Soc. Phila., iii, p. 409.  
1886. Uhler, Check List, p. 22.  
1892. Bergroth, Revue d'Ent., xi, p. 264.  
1904. Wirtner, Ann. Carn. Mus., iii, p. 202.  
1910. Smith, Cat. Ins. N. J., edn. 3, p. 149.  
1916. Osborn and Drake, Ohio St. Univ. Bull., xx, p. 235.  
1917. McAtee, Bull. Brooklyn Ent. Soc., xii, no. 4, p. 79.  
1917. Van Duzee, Catalogue of Hemiptera in North America, p. 217, no. 654.

Differing from *tiliae* Walsh only in the slightly smaller and narrower pronotal hood, and in the apical angle of the discoidal area of the elytra not being about median, but instead noticeably nearer the outside than center, thus making the angle larger than in *tiliae*. This is true in both sexes.

The type, a female, numbered 1141, is in the collection of the United States National Museum. Other specimens from West Virginia and North Carolina have been examined.

Walsh records False Indigo (*Amorpha fruticosa*) as its food plant.

#### **Gargaphia fasciata** Stål

1873. Stål, Enum. Hemip., iii, p. 125.

Head small, black, all five spines erect, the anterior pair about one-half as long as median spine. Median and basal spines about equal in length. First three segments of antennae yellowish brown, fourth black. Hairs short and comparatively few in numbers. Pronotal hood small, twice as long as broad. Pronotum black. Parallel carinae normal. Lateral membranous margins rounding, with four rows of areoles at point of greatest width. Nervures of membranous portions yellowish brown, no dark markings except discoidal area somewhat darkened toward apex. Costal area of elytra with five rows

of areoles at point of greatest width. Subcostal area with three rows. Apical angle of discoidal area nearly median, slightly nearer outer side. Length, 4 mm.; width, 2.2 mm.

Four specimens in the C. F. Baker collection, which is on deposit in the United States National Museum, are the only representatives of this species which I have examined. They bear a label which states that the determination was made by Champion. The specimens are from Alabama. No record of a food plant is given.

*Fasciata* Stål has been placed, by Osborn and Drake in 1916 and Van Duzee in 1917, as a synonym of *tiliae* Walsh. Osborn and Drake state that their conviction was confirmed by Heidemmann. This error of synonymy was probably due to the fact that the specimens Heidemmann determined first as *fasciata* were later properly recognized as *tiliae*, and that he never examined the specimens determined by Champion above mentioned.

*Fasciata* may readily be separated from *tiliae* by the greater length of head spines, greater width of pronotal margins and narrower subcostal area. There is also no darkening of nervures of elytra in *fasciata*, as there is in *tiliae* in the costal area opposite the discoidal area. *Fasciata* more nearly resembles *patricia* Stål.

#### **Gargaphia patricia** Stål

1862. *Monanthia (Phyllontochila) patricia* Stål, Stett. ent. Zeit., p. 324.

1873. *Gargaphia patricia* Stål, Enum. Hemip., iii, p. 125.

Head black, frontal pair of spines shorter and lighter than median spine. Basal spines long and more or less decumbent. First three segments of antennae yellowish, concolorous and hairy. Fourth segment black, except at base, and hairy. Pronotal hood small and narrow. Pronotum black, punctate. Carinae normal, comparatively low. Lateral membranous margins rounding with four rows of areoles, nervures more or less darkened. Pronotum and its parts quite hairy. Elytra with four rows of areoles in the costal area and subcostal with two. Length of discoidal area less than one half length of elytra. Apical angle of discoidal area about median. Four or five transverse oblique nervures in costal area darkened. Legs pale, tarsi and claws black. Length, 4½ mm.; width, 2½ mm.

A long series from Cordova, Mexico, collected by the late Mr. Frederick Knab, are in the collection of the United States National Museum, as are other specimens from Atoyac, Mexico,



and Volcan de Chiriqui, Panama. Champion also records its occurrence in Guatemala. Nothing is known of its food plants.

**Gargaphia albescens** Drake

1917. Drake, Ent. News, xxviii, p. 228.

Small, elongate. Head with spines short. Basal pair somewhat decumbent. First two and fourth segments black, except basal third of fourth. Antennae very finely pubescent. Pronotal hood comparatively large for the size of the insect. Carinae normal, with a distinct row of areoles, nearly parallel for entire length, slightly farther apart in front. Lateral margins rounding with two rows of areoles in costal area, subcostal with two, and discoidal with three. Length of discoidal area about one-half of length of elytra. All membranous portions more or less hairy and clear white. Legs whitish. No color markings. Length, 3 mm.; width, 1.3 mm.

Type locality: Sacramento, California. Type in collection of Mr. C. J. Drake. Eleven specimens from this locality are in the United States National Museum collection.

There are no recorded food plants.

**Gargaphia iridescens** Champion

1897. Champion, Biol. Centr.-Amer., Heteropt., ii, p. 10, pl. 2, fig. 1.

1917. Drake, Ent. News, xxviii, p. 227.

1917. Van Duzee, Catalogue of Hemiptera of North America, p. 217, no. 655.

Resembles *opacula* Uhler, from which it can be separated by a slightly wider and more flaring membranous margin of the pronotum, and by the three rows of areoles in the costal area of elytra. Otherwise the description given for *opacula* will apply equally as well for *iridescens*. At some later date it may be proved that this is a synonym of *opacula*. Intergradations between the two have been at hand for study, but the writer hardly feels warranted in making this a synonym of *opacula* with but this sort of evidence.

Specimens have been examined from California, Arizona, New Mexico, and Texas. Champion records it from North Mexico.

Food plant records include *Ambrosia* species, *Solanum* species, *Malva* species, and sand nettle.

**Gargaphia condensa** new species

Head with spines erect, basal spines long. First two and fourth segments of antennae black, third reddish brown. Pronotal hood small, about twice as long as broad. Pronotum black, membranous portions hairy. Carinae parallel and low. Lateral margins angular, with three rows of areoles at widest

part. Nervures yellowish brown to dark reddish brown. Elytra with two regular rows of areoles in costal area, two rows in subcostal and three rows in discoidal. Nervures dark reddish brown except on raised portions of elytra where they are yellowish. Black spot near apex of discoidal area. Legs dark reddish brown, tarsi and claws black. Length, 2.8 mm.; width, 1.1 mm.

*Type*, ♀; *allotype*, ♂; *paratypes*, two females and five males: Santa Rita Mountains, Arizona. Collected by Mr. E. A. Schwarz. All in the collection of the United States National Museum, Type number 22140.

Food plant is recorded as *Dahlia parryi*.

*Condensa* was a Uhler manuscript name.

#### **Gargaphia vanduzeei** new species

Basal pair of head spines long, slender and erect, median spine long and erect, frontal pair short but distinctly spinous. First segment of antennae twice as long as second, third very long, fourth as long as first and second taken together. First, second and fourth segments very dark, third light. Pronotal hood moderately large and broad, carinae moderately high and nearly parallel, lateral membranous margins with two rows of areoles, lateral angles rounding, anterior to which the margins are nearly straight. Elytra with two rows of areoles in costal and subcostal areas. General aspect of insect light yellowish brown, above and beneath. A few transverse nervures of costal area of elytra darkened. Membranous portions of thorax hairy.

Described from a single specimen, which because of its damaged condition will not permit of a more detailed description. It is, however, very evident that it represents a new species.

*Type*.—♂; Costa Rica, in collection of Mr. E. P. Van Duzee, who kindly permitted the writer to study and describe it.

#### **Gargaphia lasciva** new species

Head with spines erect, frontal pair short, basal pair long. First segment of antennae reddish brown, second and third segments concolorous, yellowish, fourth darkened on apical two-thirds. Pronotal hood comparatively large, high, much higher than median carina, narrow. Pronotum brown, carinae parallel and comparatively low, lateral margins rounding with two rows of areoles and wider anteriorly than posteriorly. Nervures of membranous portions yellow and not hairy. Elytra narrowed at base and apex, apex pointing outward. Costal area with two rows of large areoles, subcostal with four rows, and discoidal with three. Subcostal equal or slightly greater in width than discoidal area. An oblique fuscous band across elytra from inner margin opposite apex of discoidal area to apex of elytra. Areoles clouded. Three or four transverse veins in basal half of costal area darkened. Legs light. Length, 3 mm.

*Type*.—♂; Pará, Brazil, collection of the United States National Museum. Type number 22141.

No record of food plant.

**Gargaphia opacula** Uhler

1893. Uhler, North Amer. Fauna, vii, p. 263.

1894. Uhler, Proc. Calif. Acad. Sci., ser. 2, iv, p. 178.

1894. C. H. T., Townsend, Can. Ent., xxvi, p. 313.

1914. Van Duzee, Trans. San Diego Soc. Nat. Hist., ii, p. 11.

1917. Van Duzee, Catalogue of Hemiptera of America, p. 218, no. 656.

Head black, eyes prominent, spines prominent and erect, pronotal pair rather small. First two and fourth segments of antennae black, third yellowish. Pronotum very convex and hairy. Hood not as high as median carina. Three carinae straight, parallel, and comparatively low and thick. Lateral margins carinate, with but one row of areoles and fitting close to pronotum. Elytra whitish with nervures yellowish or brown. Costal area with two rows of areoles and subcostal with three rows. Legs brown, tarsi and claws black. Length, 3 mm.; width, 1.2 mm.

The type, a female, numbered 1189, from the Argus Mountains, California, and numerous other specimens from California, Utah, and Kansas, are in the collection of the United States National Museum. A specimen from California is labeled "on *Dahlia spinosa*." Van Duzee records specimens captured from willow. Mr. C. H. T. Townsend records having found it abundant on young egg-plants at Las Cruces, New Mexico.

**Gargaphia carinata** new species

Head spines long and erect, yellow. Head black, shiny. First two and fourth segments of antennae black, third yellowish brown. Pronotal hood of medium size, about twice as long as broad. Three parallel carinae higher than hood with a row of large clear areoles. Lateral membranous margins angular and distinctly short. Membranous portions with long hairs. Elytra narrow and elongate with two rows of areoles in costal area, three in subcostal, and four in discoidal. Discoidal area about one-half the length of elytra. Nervures of elytra various shades of brown, without pattern. General appearance brown. Legs light. Length, 2.5 mm.; width, 1.1 mm.

*Type*.—♀; Santa Rita Mountains, Arizona. Collected by Mr. E. A. Schwarz. In collection of the United States National Museum. Type number 22142.

This is very distinct from any other species of the genus and easily can be recognized by its small size, high pronotal carinae, and short membranous margins of pronotum.

No record of any food plant is available.

The types of the following species have not been available nor has the author seen any specimens identified as belonging to these species. He requested material for study from various American hemipterologists, but in none of the collections examined were representatives of these species found. The best that can be done under the conditions, and until such a time as the types are available, is to consider them according to Stål's<sup>1</sup> treatise of the genus, and to apply his differentiations to the author's divisions as set forth in the key to the species.

*Formosa* Stål, *trichoptera* Stål, and *subpilosa* come within the division containing species whose costal areas have four or more rows of areoles at their widest part. *Formosa*, whose type locality is Rio Janeiro, is listed by Stål with *patricia* Stål and *fasciata* Stål. *Trichoptera*, whose type locality is Bogotá, Colombia, is compared with *nigrinervis*. It is much larger than *nigrinervis*. According to Berg,<sup>2</sup> *subpilosa* Berg, with type locality Buenos Ayres, differs from *trichoptera* in the smaller number of hairs, principally on the lower part of the body, in the very high angle of the lateral membrane of the pronotum, and in its smaller size. It also differs from *nigrinervis* Stål in the hairs which are on the hemelytra, in the hairs scanty and very short on the abdomen, and in the much elevated angle of the lateral membrane of the pronotum.

*Gargaphia flexuosa* Stål, *lunulata* Mayr, *munda* Stål, *simulans* Stål, *obliqua* Stål, and *tricolor* Mayr, all belong to the division having less than four rows of areolae in the costal area. *Flexuosa* and *lunulata* have two rows of areolae in costal area while the other species have three rows. Stål states that while *flexuosa* and *lunulata* are very similar, *lunulata* is much the paler. The writer suspects that could the types be examined *lunulata* would be placed into synonymy with *flexuosa*. The type locality for both is Rio Janeiro.

*Obliqua* is separated from *munda* and *simulans* by having the lateral margins of the pronotum much wider. *Simulans* is smaller than *munda*, otherwise greatly resembling it, and may prove to be a synonym of *munda*. The type locality of *munda*, *simulans*, and *obliqua* is also Rio Janeiro.

<sup>1</sup> Enum. Hem., 1873, no. 3, p. 124.

<sup>2</sup> Hem. Argentina, 1879, p. 137.

The description of *tricolor* by Mayr, from Venezuela, is based largely upon color characters, and hence cannot easily be closely associated with any of the afore-mentioned species.

TRANS. AM. ENT. SOC., XLV.



## THE NORTH AMERICAN SPECIES OF THE GENUS SCELIPHRON (HYMENOPTERA)

BY J. C. HUTSON

### INTRODUCTION

This paper has been prepared by the writer in the Entomological laboratory of the Massachusetts Agricultural College, Amherst, as a part of a thesis for the Degree of Doctor of Philosophy. He here desires to express his debt of gratitude to Dr. H. T. Fernald for his valuable suggestions and kindly interest at all times during the progress of the work, and for his trouble in securing material from many public and private collections in the United States; to Dr. G. C. Crampton for his ready help in the anatomical portion of the paper; and to Mr. Daniel G. Tower whose preliminary notes on these insects were at the disposal of the writer, and were of no small assistance. The writer is also under great obligations for opportunities to study material from the United States National Museum, the American Entomological Society at Philadelphia, the Brooklyn Museum, and the New Hampshire State College, which had been loaned to Professor Fernald through the kindness of those in charge of these collections, and also from Professor Herbert Osborn, Dr. J. C. Bradley and many others, which were obtained in a similar way.

### GENERAL CHARACTERS

The insects of the genus *Sceliphron* of the subfamily Sceliphroninae found in North America are of medium to small size, varying from half an inch to an inch even within the same species. The wings are large in proportion to the somewhat slender body and the legs are long, especially the hinder pair. The surface of the body is almost completely covered with punctures varying in size and proximity to each other, and with hairs differing in length and density on various parts of the body. It will be noticed that the nature of the punctation bears a close relation to the size and distribution of the hairs, in that each puncture usually has its corresponding hair, though some of these are

rubbed off in older specimens. In other words the punctures mark the places of attachment of the hairs to the chitinous integument of the insect's body.

Some of these punctures are so small as to be visible only under a high powered lens and the corresponding hairs are very fine and usually decumbent. Such hairs may be seen on the dorsal segments of the abdomen and the terms "fine sericeous" or "sparsely sericeous" are applied to such areas. Similar minute but somewhat denser hairs are found on the legs and are called "sericeous" or "densely sericeous." These last are dark or whitish according to the species, while the "coarse sericeous" hairs found on portions of the fore and hind tibiae are always dark.

There are two regions in which the hairs are seen to lie flat down on the integument and are so closely set as to hide the ground color of the body, and give it a soft, satiny appearance when viewed from certain angles. The hairs in these regions are called "pubescent." One region is found along the sides of the clypeus and the frons where the hairs are silvery, and more developed in males than in females. The other region consists of two somewhat circular areas on the third and fourth ventral segments of the abdomen of *Sceliphron cyaneum* females, and the hairs in this instance vary from dark to pale brown when seen from different angles.

From the above description it may be noticed that the terms "sericeous" and "pubescent" apply to fine decumbent or semi-decumbent hairs and the chief point of distinction seems to be in their density and length, since the sericeous hairs are shorter and only partly disguise the color of the integument, while the longer pubescence may completely hide the underlying chitin.

The remaining portion of the vestiture of the body in these insects is composed of erect or nearly erect, more or less coarse hairs, which are attached to distinct punctures of varying sizes and density of arrangement. In connection with this part of the vestiture the writer has used the terms "hairs" or "erect hairs," coupling with them various words to denote gradations in density and coarseness. The coarsest hairs are found on the clypeus, the genae, the "end" and "sides" of the propodeum,



the sternum of the mesothorax, and the coxae. The hairs on the "dorsum" of the propodeum, the thoracic pleura, the prothoracic lobes, the dorsal surface of the petiole and the undersides of the trochanters and femora are perhaps not quite so dense and coarse as those in the first class, but the gradations are so slight that no marked line of distinction can be drawn. The smallest erect hairs occur on the dorsal portion of the sixth or terminal segment of the female abdomen and along the sides of the ventral portions of the abdominal segments in males and females.

Certain areas of the integument are marked by more or less parallel grooves known as "striations," other parts by fine irregular raised lines enclosing shallow punctured areas and giving a condition known as "rugose."

These insects do not show any startling color markings or bands, the body being more or less evenly colored with shades of metallic blue, black, or green, sometimes with purple or violet reflections. As mentioned above, the actual body color is sometimes obscured by the closely-set vestiture of fine pubescence.

The wings may be dark brown to pale fuliginous, even in the same species, or they may be hyaline with fuscous tips, and in most cases may show violet to bluish reflections in certain lights.

## EXTERNAL ANATOMY

### *Head*

The head is medium to large, broader than high, and seen from above is transversely elongate. The compound eyes are large, somewhat oval structures, extending from the sides of the vertex almost to the base of the mandibles. Seen from in front they occupy together an area about equal to that which lies between them, while on a side view each eye covers about twice the area of the check which lies behind it. They are narrowest at the top, where they are bluntly rounded, and gradually expand towards the bottom, where they are broadly truncate with a slight emargination to receive the lateral extensions of the clypeus. The eyes may be nearer each other at the vertex than at the clypeus, as in females, or the reverse, as is the case in males of the species dealt with in this paper.

*Clypeus*.—The clypeus is roughly a trapeziform plate lying below the antennae and occupying the lower central portion of the front of the head, with its lower angles extending laterally

under the compound eyes to form part of the articulation of the mandibles. On each side of the clypeus is a narrow downward extension of the frons bounded externally by the inner margin of the eye, internally by the lateral clypeal suture, and ending below in the lower of two foveae. A second or upper fovea is also present about half way to the top of the clypeus from this point, close to the suture between clypeus and frons, but apparently in the latter plate. The lower margin of the clypeus is normally tridentate, but the relative size and shape of the teeth varies in species and individuals, as will be noted under the descriptions of species. The upper margin of the clypeus is marked by a transverse to quite emarginate suture below the base of the antennae, and the lateral clypeal sutures may be continued upward as faint lines, meeting between the antennal pits, thus forming a small triangular area above the truncated apex of the clypeus, or these lines may end at the suture, which is then distinctly emarginate and its ends curve upwards on each side almost to the bases of the antennae. The central area of the clypeus is convex, with a more or less distinct median ridge, and is covered with rather long erect black hairs and closely set coarse punctures, and may be partially clothed with a silvery pubescence.

*Frons*.—The frons lies between the clypeus and the ocelli, but extends downwards on each side between the clypeus and the compound eyes and upwards on each side of the ocellar area as far as the ocello-ocular line. This is a line from the top of the compound eye to the lateral ocellus on each side. The sides of the frons extending along the inner margin of the compound eyes are somewhat sunken below the rest of the facial area and are closely punctate. The frons as a whole is usually covered with coarse erect black hairs, and the sides are more or less clothed with fine silvery pubescence which is seen to the best advantage from behind. A short median raised line runs from between the antennae to within a short distance of the median ocellus.

*Ocelli*.—The three ocelli lie near the top of the head, forming a triangle with the median ocellus, the largest of the three, below. The base of the triangle, or postocellar line, is always greater than the distance between the median and either lateral ocellus,

and always less than the ocello-ocular line. The exact proportions vary with the species. The surface between the ocelli, or intraocellar area, is slightly raised and each of the ocelli has a slight depression at its outer base.

*Vertex*.—Behind the ocelli is a shallow oblong depression, and posterior to this there may be a raised oval area, which might be regarded as the vertex proper, but in this paper the vertex is considered that part of the head bounded anteriorly by a line through the lateral ocelli, posteriorly by the occipital ridge and laterally by the genae and tops of eyes.

*Occiput*.—The occiput is the narrow circular strip at the back of the head surrounding the occipital foramen. It is of no systematic importance.

*Genae*.—The cheeks or genae are paired sclerites at the back of the head between the compound eyes and the occiput, and extend from the vertex to the base of the mandibles. They are narrowest at the top and gradually widen ventrally, where they curve in on each side to meet between the occiput and the gular cavity, and extend laterally outwards under the eyes to meet the clypeal extensions.

The mouth parts with the exception of the mandibles do not appear to be of systematic importance, but mention may be made of the labrum, which is a narrow oblong strip attached under the lower edge of the clypeus. In pinned specimens it is usually hidden behind the closed mandibles, but if these are opened the labrum can be seen as a flap lying over the other mouth parts.

*Mandibles*.—The mandibles of females are long, rather curved, bluntly rounded at the tip, and may or may not have a tooth on the inner side according to the species. In males they are shorter and taper to a point.

The extension of the lower angle of the clypeus meets a corresponding extension of the genae and the two together furnish articulations for the mandible in the following manner. On the under part of the clypeal extension is a condyle which fits into a socket on the upper side of the mandible, while the genal piece has a facet to receive the condyle on the lower side of the mandible. There is also a median basal projection on the outer side of the mandible, serving as an attachment for muscles. This projection

fits into an emargination on the lower margins of the clypeal and genal extensions when the mandible is closed, but swings inwards leaving the emargination empty when the mandibles are open.

*Antennae.*—The antennae are situated in the middle of the frontal area and articulate in two oval sockets facing obliquely outwards, thus giving the antennae a wide range. They are of medium length, consisting of twelve segments in the female and thirteen in the male.

The proximal segment, or scape, is divided into a small basal portion, the bulb, which articulates with the head in an oval socket, and a larger part, the scape proper. The latter is to all appearances a separate segment from the bulb, but the two parts are generally regarded as one segment. The true scape is somewhat oval and enlarges suddenly after its junction with the bulb, forming the thickest part of the antenna. The second segment, or pedicel is small, rounded proximally where it articulates with the scape and truncate distally where it joins the first segment of the filament. The remaining segments constitute the flagellum or filament and are more or less cylindrical. All the segments of the flagellum, except the last, are smaller at their proximal ends, the first being noticeably so. The first three segments are of about the same length and either the first or second may be the longest according to the species. The remaining segments gradually decrease in length to the penultimate, which is the shortest. The last segment is slightly longer again and tapers distally to a more or less truncate end.

The antennae are dark in color, the scape and pedicel being either dark blue or dark green with strong hairs on the inner side, while the flagellum is dull black, but the covering of fine recumbent hairs may give it a greyish appearance.

#### *Thorax*

*Prothorax.*—The prothorax falls naturally into two parts, a somewhat narrow anterior portion articulating with the head and known as the neck, and a broader part behind, which articulates with the mesothorax and is usually termed the collar. Seen from above the neck is flatly convex, narrow in front and widening posteriorly to the collar, and the angle of inclination of these dorsal surfaces to each other varies, being sometimes acute and

sometimes a right angle. The anterior dorsal margin of the neck is slightly reflexed, and is hidden within the occipital foramen into which the neck fits.

The ventral surface of the neck is shorter than the dorsal and is composed of two plates closely approximate along a median suture and together forming the episternum of Snodgrass. The anterior portions of these plates are narrow and concave, and fit closely under the convex extension of the prothorax to form with it a short cylinder which fits into the occipital foramen, and gives the head freer movement. These plates widen posteriorly into two lobes, whose posterior margins are convex and unite with the concave ventral surface of the collar to form articulations for the coxae. The small triangular sternum lies between the bases of the coxae and adds support to their articulations.

The dorsal surface of the collar is somewhat flat anteriorly, but slopes upwards, sometimes almost vertically, to a rounded crest at the back, which is divided by a median furrow into two lobes. The anterior dorsal surface may be slightly arched and almost horizontal so that it forms nearly a right angle with the posterior surface, the lobes being rounded and not prominent, or it may form an acute angle with the posterior surface, in which case the lobes are rather sharp, with their crests higher than the mesonotum.

The posterior region of the collar is somewhat vertical and extends over the anterior margin of the mesonotum which has a broad median projection under it.

Between the lateral edge of the episternum and the anterior lateral margin of the collar is a very narrow plate, called the epimeron, which has been partly telescoped under the collar. This narrow strip appears to be the continuation of the anterior margin of the neck. The epimeron suddenly grows wider ventrally and extends to the base of the coxa on each side. The collar extends ventrally as far as the epimeron and its lower posterior margin projects over a portion of the mesothorax in the form of a semicircular lobe, called the prothoracic lobe by Fernald. This lobe touches the side of the mesonotum above and covers a depression on the mesopleuron, at the bottom of which lies a spiracle.

*Mesothorax*.—The mesonotum is a broad, rather sellate plate, with its anterior margin articulating with the posterior margin of the collar and at the sides with the prothoracic lobe. Its lateral margins are somewhat emarginate to receive the tegulae and slightly reflexed, while its broadly truncate posterior margin is closely applied to the scutellum. Lying between the lateral margin and the median line on each side is a shallow groove starting from the posterior margin and extending forwards for about one-third the length of the mesonotum. Near the anterior end of each groove there is a curved incised line extending forwards for the middle third of the segment. These curved lines may be the parapsidal grooves. A short straight line can be seen lying along the anterior third of the median depression of the mesonotum. The scutellum is a rather narrow plate lying behind the mesonotum. It is distinctly raised in the middle and usually marked by a faint median depression. It has a lateral forward extension on each side, as far as the base of the fore wings and tegulae, broken by two deep cavities, a smaller one on each side of the raised central portion, and a larger cavity from which the fore wings have been evaginated. These two cavities are separated by a sharp ridge. The mesopleuron is a large plate occupying the side of the mesothorax and extending obliquely from behind the prothoracic lobe to the base of the mesocoxa, where it ends in an elevation evidently serving to prevent further dorsal flexure of the leg. The mesopleuron is bounded dorsally by part of the mesonotum, and by the overhanging edge of the scutellum, but its ventral limits are not defined. Its anterior margin shows a deep depression under the prothoracic lobe bearing a spiracle, which is protected by the lobe, but its posterior boundaries are rather vague.

This plate is divided by morphologists into three parts, the pre-episternum, the episternum and the epimeron. The episternal groove is a shallow lateral depression marked by scattered ridges and separating the pre-episternum from the episternum. The epimeron has no definite limits, but lies in the broad depression extending obliquely down the sides of the body and marked by distinct foveae. This depression is known as the metapleural groove.

There is no apparent suture or line separating the mesopleuron from the sternum or ventral plate. The latter is a large plate occupying the ventral surface between the fore and middle coxae, and marked by a distinct median suture with a shallow pit near each end. About halfway between this suture and the upward curve of the mesopleuron is a short line, sometimes appearing distinctly incised with a shallow depression around it.

The episternal groove is continued ventrally on each side and curves forward to meet behind the bases of the procoxae. This groove divides the mesosternum into the propectus, or small portion anterior to the episternal groove, and the mesosternum proper, which extends to the bases of the mesocoxae, whose articulations it bears.

*Metathorax*.—The postscutellum is a narrow plate lying behind the scutellum to which it is somewhat closely applied and in front of the propodeum from which it is separated by a deep fissure. Its lateral extensions are from two to three times as broad as the middle portion, and have a deep cavity from which the hind wings arise, and a much shallower cavity on each side of the central portion of the plate. The posterior margins of these lateral pieces are somewhat flanged and extend over the anterior margin of the propodeum and the dorsal edges of the metapleura. Outside the cavity of the hind wings on each side is a small oval protuberance, sometimes called the metapleural lobe.

The metapleuron is a somewhat indefinite plate, with its dorsal portion lying obliquely under the hind wings and its ventral extending horizontally under the side of the propodeum. It is broad dorsally where its limits are well defined, but gradually narrows ventrally when its boundaries become rather indefinite, being more distinct in one species than the other.

The hind legs are both at the ventral posterior end of the metathorax, with the small metasternal area lying between the coxal cavities.

#### *Abdomen*

The median segment or propodeum lies between the postscutellum and the base of the petiole, and is bounded laterally by the metapleura. It is really the first segment of the abdomen

which has become closely connected with the thorax, and it was regarded by early writers as part of the metathorax. Behind the propodeum is a very slender cylindrical petiole, which suddenly enlarges near its posterior end to the size of the abdomen. The petiole and its enlarged posterior portion form the second abdominal segment proper, but for our purpose it can be regarded as the first segment of the abdomen.

The propodeum, therefore, lies between the metathorax and the petiole and is fused with the former, except for a dorsal fissure separating it from the postscutellum.

Its dorsal surface or dorsum extends from behind the postscutellum to the point where the body begins to slope ventrally towards the base of the petiole. This point is marked by a more or less distinct fovea or pit. The shape of the dorsum varies with the species, since its posterior margin may be evenly rounded, or its sides may converge to a point. Its surface may be more or less striated, and a median groove may be present or absent. On each side of the dorsum is a spiracle belonging to the propodeum; this lies in the anterior half of the segment in the line of the depression which marks the limits of the dorsum. The portion of the propodeum behind the dorsum is termed the end by Fernald. It extends posteriorly as far as the petiole and its hinder margin is strongly reflexed to prevent too great dorsal flexure of the petiole. The end is bounded laterally by a faint depression extending forward on each side from the base of the metacoxa to the stigma or spiracle. This is known as the stigmatal groove. Between this groove and the metapleuron is the remaining portion of the median segment, known as the side.

The somewhat slender petiole is usually narrower basally than distally. It varies in length usually with the size of the specimen, and has a slight downward curve. At the base of the dorsal side of the petiole is a small elevator muscle called the funiculus. As mentioned above, the petiole is a slender cylinder for the greater part of its length, but enlarges dorsally near its hinder end to join the second segment of the abdomen. The sternal portion of the cylinder extends continuously to the sternum of the second abdominal segment, with which it is connected by a membranous strip. The dorsal portion of the cylinder is shorter, thus giving



the petiole proper the appearance of being cut off obliquely, and the intervening space between its posterior edge and the anterior dorsal edge of the second abdominal segment is covered over by a roundly convex plate. This plate may be regarded as the true notum and is hinged to the petiole proper along its anterior dorsal edge by a thinly chitinized strip, thus allowing considerable flexion along that region. The notum sends down a flap on each side, which extends below the edge of the sternum but is connected with it on the inner side by a membrane, so that the lower portion of the flap is free on each side. The posterior margin of the notum widens out to fit over the anterior margin of the second abdominal segment, and between the two plates is a thinly chitinized strip similar to those found between any two other abdominal segments.

The modification of the petiole may be interpreted as follows. The cylindrical portion is possibly the result of the gradual curling up of the sternum and pleuron on each side and the ultimate dorsal fusion of the pleura to form a solid tube. During this process the notum appears to have been gradually pushed backwards, until it finally came to occupy its present position as a convex plate fitting over the distal end of the cylinder. The above is only a brief suggestion as to the process through which the petiole may have passed in order to reach its present highly specialized condition, but this subject is of sufficient interest to be worked up from a morphological standpoint.

The portion of the abdomen behind the petiole is of normal size, widening suddenly to a somewhat ovate form. In females the tip of the abdomen is dorso-ventrally flattened to a blunt point, while in males the tip is more or less truncate and curved under. In females six segments are visible dorsally and ventrally, while males show seven on top and eight below. The spiracles are on the anterior dorso-lateral portion of the segments and occur on all the segments in females and males, but usually only those on the first two segments are visible in pinned specimens. The third and fourth ventral segments of the female may or may not have pubescent spots on their ventral surfaces, and the posterior margin of the third ventral segment may be sinuous or almost straight, according to the species. In males the fourth and fifth

segments are finely pubescent along their posterior margins and the third and sixth may be slightly pubescent also. These segments are flattened or even concave, giving the abdomen a compressed appearance ventrally. The genitalia are usually withdrawn inside the posterior segments so as to be almost completely hidden. In conjunction with other characters they may be used in separating males, but they have not been so employed in this paper. The sixth or terminal segment of females is modified to protect the genitalia, and at the same time to allow them free play. The ventral portion of the terminal segment is longer than the dorsal and its tip is somewhat squarely truncate. It has a flap on each side which folds together dorsally, while the triangular dorsal portion fits over the basal part of the segment.

#### *Wings*

The wings are of medium size and may be either hyaline and fuscous at the tips, or evenly colored in varying shades of brown showing blue violet in certain lights. In this paper the nomenclature of veins and cells given by Cresson and used by Fernald in his "North American Digger Wasps" has been followed. It is not proposed to give a general description of the wings, but the characters of systematic importance will be mentioned in the table for separation and under the descriptions of the species. A reference to the figures at the end of this paper will furnish all the necessary details.

#### *Legs*

The legs are long and slender, especially the hind pair, and in addition to the hairs and spines mentioned below, all the segments are clothed with fine to coarse sericeous hairs, dark or whitish according to the species.

All the coxae are clothed with somewhat long hairs, but have no spines; the fore and middle coxae are both smaller than the hinder pair, which articulate closer together than either of the other two pairs. The trochanters are all smaller than their corresponding coxae and have scattered hairs mostly on the inside. The femora in the three pairs of legs are all stouter than the tibiae with which they articulate, but while the fore and middle femora are distinctly longer than the corresponding tibiae,

the hind femur and hind tibia are about equal in length. The femora have no spines but are covered with rather long hairs on the inside. Round the tip of each tibia is a circle of small spines, two of which are usually longer than the others, and each tibia usually has a row of small recumbent spines on each side. The fore and hind tibiae have a densely sericeous area, the former in a small strip on the inside near its distal end, and the latter in a narrow strip along its outer side. The fore tibia has a large, somewhat modified spine with a chitinous blade and some fine hairs on its inner surface. This spine runs parallel to the first tarsal segment which has a similar modification on its outer side. This structure forms a cleaning apparatus. The middle and hind tibiae each have two strong spines of unequal length, but only the hind tibia has a cleaning apparatus, which is a little different from that on the fore tibia, as will be seen from a comparison of the figures. The tarsus in each leg consists of five segments, the first of which is much longer than any of the others and is called the metatarsus. All the tarsal segments are covered with closely set spines, those at the distal ends being longer than the others.

The last tarsal segment is provided with a pair of strong curved claws, between which is a well developed pulvillus. On the inner side of the claws near their bases there are usually two or three fine hairs, one longer and stiffer than the others, while about the middle of the inside of the claw there may be a small tooth. These teeth occur only on the claws of the fore and middle legs in these insects.

#### SENSORY AREAS ON THE ANTENNAE

In the females of both *cyaneum* and *zimmermanni* all the segments of the filament have somewhat irregularly oblong, apparently bare regions lying along their inner sides when the antennae are held curled forward. These areas appear slightly depressed and usually darker than the remaining parts of the segments, owing to the absence of the fine recumbent hairs with which the other portions are covered. When the antennae are cleared and mounted the above areas are seen to be covered with pits and hairs of various sizes, probably of a sensory nature. The structures on the male antennae appear to be more complicated, since,

in addition to depressed regions along the inner basal portion of each filamentous segment, they have somewhat oval to oblong, bare, brown to blackish areas on the distal end of these segments. These areas when cleared are seen to be covered with small pits and hairs closely packed, and are a distinct contrast to the larger and more scattered pits on the inner basal portions of the segments. These brownish areas occur, as far as could be determined, only on the seventh, and eighth segments in *cyaneum* and on the seventh, eighth and ninth, and occasionally sixth, segments in *zimmermanni*, and vary in size and shape. In both species there are also minute slightly raised areas near the basal end of all the segments of the filament, but the nature of these is undetermined. They are seen on the upper part of the inside of the segments when the antennae project forward.

## ANALYTICAL KEYS

A very good working table of the families of the Sphecoidea is given by Ashmead<sup>1</sup> and should be consulted by those interested. The following table of the subfamilies of the Sphecidae has been taken from those given by Ashmead<sup>2</sup> and by Fernald,<sup>3</sup> with slight variations, in connection with the subfamily Sceliphroninae.

## ANALYTICAL KEY TO SUBFAMILIES

1. Second cubital cell receiving only the first recurrent vein; the second recurrent vein received by the third cubital cell, or at least beyond the second transverse cubital. (Both recurrent veins are received by the first cubital cell in a few extra-limital forms) . . . . . 2
  - Second cubital cell receiving both recurrent veins, or the second recurrent vein is interstitial with the second transverse cubitus, although sometimes the first recurrent is interstitial with the first transverse cubitus, or then received by the first cubital cells . . . . . 3
2. Antennae inserted on the middle of the face; claws with one to six teeth beneath; tibiae strongly spinous, or at least never with weak or feeble spines; tarsal comb in female present (except in *Isodontia*).

**Chlorioninae** (*Sphex*inae of Authors)

Antennae inserted far anterior to the middle of the face; claws simple, without teeth, or at most with a single small tooth near the middle; tibiae smooth, not spinous; tarsal comb in female never present. . . . . **Podiinae**

<sup>1</sup> Canadian Entomologist, xxxi, 152.

<sup>2</sup> *Idem*, 348.

<sup>3</sup> Digger Wasps of North America, Proc. U. S. Nat. Mus., xxxi, 308.

3. Claws simple, without a tooth beneath; tibiae more or less spinous; tarsal comb in female present; abdomen most frequently very elongate, the petiole composed of two segments, rarely only of one segment; cubital vein of hind wings usually originating beyond the transverse median vein . . . . . **Sphecinae** (*Ammophilinae* of Authors)  
 Claws simple with a single tooth beneath, although sometimes very minute; hind pair with or without a tooth; tarsal comb in female absent; abdomen always with one-segmented petiole; cubital vein of hind wings interstitial or nearly so . . . . . 4
4. Antennae inserted on the middle of the face; metathorax with a large U-shaped area above; mesopleura not longer than the height of the thorax . . . . . **Sceliphroninae**  
 Antennae inserted far anterior to the middle of the face, on or just above an imaginary line drawn from base of eyes; metathorax without a large U-shaped area above; mesopleura much longer than the height of the thorax . . . . . **Podiinae**

KEY TO GENERA OF SUBFAMILY SCELIPHRONINAE

Second cubital cell receiving both recurrent veins.

Species black and yellow, not metallic; clypeus flat, bidentate at apex; transverse median vein in front wings not interstitial with basal vein, but uniting with the median vein a little before the origin of the basal nervure; petiole of abdomen about twice as long as the median segment.

**Pelopaeus** Latreille

Species metallic blue or violaceous; clypeus normally tridentate anteriorly; transverse median vein in front wings interstitial with the basal vein; petiole of abdomen not longer than median segment. **Sceliphron** Klug

*Table of Species of Sceliphron*

1. Females . . . . . 2  
 Males . . . . . 3
2. Abdomen with pubescent spot on third and fourth ventral segments; body hairs almost entirely dark. . . . . **cyaneum** Klug  
 Abdomen without pubescent spot on third and fourth ventral segments; whitish hairs on dorsum of median segment . . . **zimmermanni** Dahlbom
3. Body dark blue black or blue green, hairs almost entirely dark.  
**cyaneum** Klug  
 Body paler, hairs almost entirely whitish, wings fuliginous to hyaline with fuscous tips . . . . . **zimmermanni** Dahlbom

Genus **SCELIPHRON** Klug

*Sceliphron* Klug, Neuschrift Ges. Naturf. Freunde, Berlin, iii, 1801, 561.

*Chalybion* Dahl, Hym. Eur., i, 1843, 21.

*Chalybion* Patton, Proc. Bost. Soc. Nat. Hist., xx, 1880, 378.

Genotype—*Chalybion caeruleum* (= *cyaneum* Dahlbom), designation of Patton.

Body metallic blue black or blue green, sometimes with violet reflections. Clypeus normally tridentate, but teeth vary in size and shape. Metapleural sutures indistinct. Claws of posterior tarsi unarmed. Petiole of abdomen somewhat variable in length, but never as long as median segment.

The genus *Sceliphron* was established, in 1801, by Klug, who included five species under it, viz: *spirifex*, *madraspatanum*, *lanatum*, *cyaneum* and *fuseum*. In 1802, Latreille<sup>4</sup> established the genus *Pelopacus*, giving *Sphex spirifex* Linnaeus and *S. lanata* Fabricius as examples, and in volume xiii of the same work (1805), besides describing these species under *Pelopacus*, mentioned that Klug had called the genus *Sceliphron*. In 1843, Dahlbom<sup>5</sup> established the genus *Chalybion*, separating it from *Pelopaeus* on a color basis, with *violaceum* Fabricius, *zimmermanni* new species, and *cyaneum* Linnaeus as species, and at the same time included *spirifex*, *lanatum* and several other species under *Pelopacus*. Two years later, in his tabulation of species on page 432 of the same work, he mentioned *Pelopacus* as a genus, with *Chalybion* and *Pelopaeus* as sub-genera, since no additional characters could be found to justify separation. *Chalybion* remained under *Pelopacus* until 1880, when Patton<sup>6</sup> gave distinctive characters in addition to color, sufficient in his opinion to establish *Chalybion* and *Pelopacus* as separate genera, and with this the writer agrees.

It will be noticed that the species removed from *Sceliphron* by Latreille are black and yellow, while *cyaneum* remaining is blue, and *fuseum* is apparently unknown to modern workers. Accordingly the separation of *Pelopacus* from *Sceliphron* leaves *cyaneum* as its type, in accordance with recommendations *k*. and *n*. of the International Rules of Nomenclature. Patton's designation of *cyaneum* as the type of *Chalybion* would therefore make this genus a synonym of *Sceliphron*, as restricted by the removal of the species placed under *Pelopacus* by Latreille.

*Pelopacus californiensis* Saussure is regarded by the writer as conspecific with *cyaneum*, since he has examined a number of specimens from California, all of which are similar to *cyaneum*,

<sup>4</sup> Hist. Nat. Crust. et Ins., iii, 334.

<sup>5</sup> Hym. Eur., i, 1843, 21.

<sup>6</sup> Proc. Bost. Soc. Nat. Hist., xx, 1880, 378.

and he does not consider the shorter petiole of sufficient importance to justify separation. In this the writer agrees with Patton.

### *Descriptions*

#### **Sceliphron cyaneum** Klug

It has been found advisable to give only the more important references on this species.

*Sceliphron cyaneum* Klug, Neuschrift Ges. naturf. Freunde, Berlin, iii, 1801, 561.

*Pelopaeus cyaneus* Lepeletier, Encycl. Méthod., Ins., x, 1825-33.

*Chalybion cyaneum* Dahlbom, Hym. Eur., i, 1843, 21.

*Pelopaeus (Chalybion) cyaneus* Dahlbom, Hym., i, 1845, 432.

*Pelopaeus caeruleus* Lepeletier, Hist. Nat. Ins., Hym., iii, 1845, 320.

*Pelopaeus caeruleus*, Jones, Naturalist in Bermuda, 1859, 113.

*Pelopaeus (Chalybion) caeruleus* Saussure, Reise Novara, Zool., ii, 1867, 26.

*Pelopaeus (Chalybion) californicus* Saussure, Reise Novara, Zool., ii, 1867, 26.

*Pelopaeus Californicus* Patton, Proc. Bost. Soc. Nat. Hist., xx, 1880, 379.

*Chalybion caeruleum* Patton, Proc. Bost. Soc. Nat. Hist., xx, 1880, 378.

*Pelopaeus caeruleus* Provancher, Natural. Canad., xiii, 1882, 12.

*Pelopaeus caeruleus* Provancher, Faun. Entom. Canad., Hym., 1883, 613.

*Chalybion caeruleum* Cameron, Biol. Centr.-Amer., Hym., ii, 1888, 25.

*Chalybion (Pelopaeus) Californicum*, Cameron, Biol. Centr.-Amer., Hym., ii, 1888, 25.

*Chalybion caeruleum* Schwarz, Proc. Ent. Soc. Wash., i, 1890, 254.

*Pelopaeus caeruleus* Peckham, Wis. Geol. and Nat. Hist. Surv., Bull. 2, 1898, 176, pl. ii, fig. 5; pl. x, figs. 1-3.

Fernald's paper<sup>7</sup> discussing the name *caerulea* of Linnaeus and others, clearly shows that this name cannot be applied to the species here considered, leaving *cyaneum* Klug as the first name available.

*Types*.—There is a specimen (seen by Fernald in 1913) from North America in the Berlin Museum bearing a label *cyaneus*, stated by the authorities there to be in Klug's handwriting. It is a small male, undoubtedly of this species. No specimens in that collection were found which appear to have been labelled by Dahlbom. At Lund are eighteen specimens, the first marked "Chalybion caeruleum, Sphex Lin. Pelopaeus Pelet. ♂ ♀ New York." This specimen is a male and it is to be inferred that Dahlbom at the time of labelling this specimen was confusing it with *Chlorion caeruleum*. This confusion has already been discussed by Fernald.<sup>8</sup>

<sup>7</sup> Ent. News, xv, 117, 1904.

<sup>8</sup> See above.

The types of *californicus* Saussure have not been seen, but are presumably at Geneva.

The following description has been made from fifteen females and the same number of males, selected from a large number of specimens and covering as wide a distribution as possible.

Metallic blue black or blue green, sometimes with purple reflections, especially on legs and abdomen; head and body except abdomen thickly pilose, pubescence silvery on sides of frons, dark on third and fourth ventral segments of female abdomen; remainder of body covered with fine dark sericeous hairs, more or less concealed by pilosity, except on legs and abdomen. Wings varying from pale to dark fuliginous.

*Female*.—Head across the eyes broader than thorax across the tegulae; clypeus sloping abruptly at sides down to depressed areas of frons, somewhat flat in center with surface closely punctured and covered with dark erect hairs and finer dark sericeous hairs; these are best seen from the side and vary in density with individuals; anterior margin of clypeus black, extending laterally under the eyes, armed near the middle with three blunt teeth (the median tooth generally the smallest), and a small lateral process on each side varying in size, but never as large as the central teeth; a row of strong black hairs projects forwards over the teeth; posterior margin concave, bending round at the sides to join the clypeal sutures, which form the lateral boundaries of the clypeus; central portion of clypeus with a median line appearing as an irregular shiny strip; surface of frons channelled on each side of the antennal elevation and clypeus; these depressions together with the antennal region are closely punctate, the punctures being somewhat confluent and smaller than those on the clypeus with correspondingly smaller hairs; there is also a fine silvery pubescence on the sides of the frons seen best from behind; antennal region divided by a distinct median elevated line extending from between the antennae to within a short distance of the median ocellus; intra- and circum-ocellar areas finely punctured and with small erect black hairs; surface of vertex rather sparsely punctured with a few long black hairs on a slightly raised area behind the ocelli; occiput covered with fine punctures and shorter black hairs, sometimes densely sericeous; genae clothed with long erect black pilosity, interspersed with fine sericeous hairs thickest along the hinder margins of the eyes and the lower portions of the genae, and giving these parts a coppery reflection when seen from behind; inner margins of compound eyes more concave than those of males and more convergent posteriorly than anteriorly; antennae with scape and pedicel blue black or blue green, generally metallic with a few black hairs mainly on inner side and surface covered with very fine dark hairs; flagellum or filament dull sooty black or greyish black, owing to the presence of minute recumbent hairs; first segment of the filament usually slightly the longest, the remaining segments very gradually decreasing in length until the last, which is usually a little longer than either the penultimate or ante-penultimate; last segment tapers distally but is somewhat squarely truncate at its distal end; mandibles long, narrow, curved, without teeth, rather bluntly pointed, sometimes worn down



so as to be roundly truncate at tip, black or blue black for basal half, gradually shading to pale brown at distal end, with a groove along upper and lower margins, sometimes with fine hairs, and a strong groove at external basal end with a few stout black hairs; there is also a row of short hairs on the inner face, but these are usually hidden when the mandibles are closed.

*Thorax*.—Neck may be slightly rugose with sparse punctures and small hairs; collar narrower than remainder of thorax, sides almost vertical, laterally compressed with a central depression ending dorsally in a deep fovea; the anterior dorsal surface may form an acute angle with the posterior surface making the lobes somewhat sharp, or it may slope gradually upwards making these more rounded; median dorsal groove may be transversely striated; dorsal surface, sides and episterna strongly punctured and covered with erect black hairs interspersed with a fine brownish vestiture; prothoracic lobe with small scattered punctures and hairs, posterior edge fringed with short delicate pale brown hairs; mesonotum with a distinct median depression for its anterior half, surface strongly and closely punctate and covered with somewhat erect black hairs; scutellum also with median groove, but not so closely punctured as mesonotum, postero-lateral margins of lateral depressions fringed with fine pale brown to silvery hairs; postscutellum finely punctured in center, lateral extensions fringed posteriorly with small light brown to whitish hairs; mesopleura and mesosternum covered with strong punctures and coarse black hairs interspersed with minute coppery hairs; metapleura and metapleural grooves somewhat sparsely punctate, the latter sometimes almost bare and shiny; median segment with dorsal shield bounded by a linear V-shaped depression and broadly rounded at posterior margin, where there is a small but deep fovea; this depression may be transversely marked by ridges on each side both anterior and posterior to the spiracle, but these raised lines usually end where the sides begin to curve round posteriorly; dorsum with a distinct median depression, rather faint anteriorly where the shield has a gradual upward slope, surface of shield usually with no markings other than rather small, often confluent punctures, but may be rugose, hairs medium sized; sides and end usually with more distinct punctures, small at sides of shield, coarser at posterior end, pilosity to correspond; petiole stouter at distal end before suddenly enlarging to size of abdomen, punctures fine, hairs slender and rather scattered, finely sericeous mainly in upper distal surface.

*Abdomen* of medium size, somewhat ovate, shining, arched dorsally, flatter ventrally, pointed behind, almost the whole dorsal and ventral surfaces covered with minute dark decumbent hairs, giving the abdomen a dirty appearance in certain lights without obscuring the body color; first three dorsal segments without coarse punctures or stout hairs, last three with small punctures and scattered hairs, a row of fine punctures along the hinder margins of the first two of these segments, but the corresponding hairs very rarely complete; sixth or terminal dorsal segment with a group of small punctures and hairs on each side nearest the anterior margin, but central portion bare except for minute hairs; sixth or terminal ventral segment with a narrow punctate strip on each dorsal flap sparsely covered with small hairs of varying sizes, ventral surface covered with fine hairs except for a bare median

strip; fifth ventral with a few scattered punctures and hairs; fourth with a black or brown pubescent area on the middle of the posterior part of the segment and a few hairs on each side (Fig. 3); third bears a smaller similarly colored pubescent area and a deeply sinuate double row of hairs extending across the segment behind the pubescent area, but if the abdomen is at all telescoped these cannot always be seen; posterior margin of third segment sinuate; second segment with a V-shaped double row of hairs; in all of the above cases the hairs may be missing, but the punctures can still be seen.

*Wings* vary from pale to dark fuliginous, with violet to purple reflections except at tips, which are dull and sometimes darker than the basal portion of the wing; fore wings have no distinctive characters apart from those shown in the figures; tegulae blue green or blue black, sometimes with purple lights, shining, paler at margins, finely sericeous for basal half, hairs dark; hind wings, angle between median and transverse median usually greater than a right angle; discoidal leaves cubital slightly exterior to junction of median cubital and transverse median.

*Legs* colored with various shades of blue, black or green, sometimes with metallic purple reflections; coxae and trochanters blue black or greenish black, sometimes dull purple in old specimens, strongly punctured especially on ventral side, with long black hairs and fine brown sericeous vestiture; femora and tibiae colored much the same as the preceding segments, femora with rather long black hairs on ventral side and minute brown hairs over the whole surface, fore and hind tibiae finely sericeous, with a coarser brown sericeous area along inner surface; tarsi may be dark to purplish or the sericeous hairs may give them a brownish appearance; claws dark brown for basal half, paler at tips; spines on legs black to brown.

*Male*.—Differs from female as follows: Body usually more hairy; eyes more approximate below than above; clypeal teeth small and rather pointed, no side processes; frons less sunken at sides of clypeus; mandibles of medium size, pointed at tip; antennae with thirteen segments; second segment of flagellum longer than first; dorsal lobes of collar usually somewhat more acute; abdomen more compressed ventrally, especially the last few segments, tip curved under; seventh or last dorsal segment evenly rounded, covered with short black hairs chiefly at sides, hinder margin bearing a pair of genital palpi one on each side, sixth, fifth, fourth and third dorsal segments with one, sometimes two rows of small punctures near hinder margins, but corresponding hairs often absent; eighth or terminal ventral segment usually drawn in so that only the lobed distal portion projects beyond the hinder margin of the seventh ventral and covers the anal opening; this lobe is here termed the hypopygium, but has been given various names by different authors, it is covered with short erect hairs seen best in profile; seventh ventral segment bare, sixth finely sericeous; fifth and fourth finely sericeous in center, punctate at sides; third with anterior margin sericeous and a sinuous row of punctures anterior to it; second with a deeply sinuous row of punctures and hairs.

*Length*.—Females, 15 to 23 mm.; males, 12 to 18 mm.

*Distribution.*—This species is widely distributed throughout North America, and the writer has examined specimens from southern Canada, the eastern United States from Maine south along the east coast to Florida, then west through the Gulf States to southern California as far north as San José, then east again through Nevada, Utah and north to the Great Lakes. This insect also occurs in southeastern Montana but, as far as the writer knows, does not extend over the Rocky Mountains to the northern Pacific Coast region. He has also seen specimens from the central Gulf Coast of Mexico.

This species, therefore, as known to the writer, seems to be an Austral form, occurring mainly in the Upper and Lower Austral with frequent specimens in the Transition Zone.

*Habits.*—The members of the sub-family Sceliphroninae are collectively known as Mud-daubers, and this beautiful species is called the Blue Mud-dauber. The females can be noticed during the early summer months flying in and out of barns, outhouses, porches or any sheltered place, and if followed up may be seen at work on their small earthen nests, which are usually placed fairly high up near the roof.

The writer has had little opportunity of studying the habits of these insects, so that he cannot do better than to refer to the interesting observations made by Mr. and Mrs. Peckham<sup>9</sup> on the habits of this species, there called *Pelopacus caeruleus*. These observations were made over a period covering a number of years and are of great interest and importance, especially those on the methods employed by the wasps in capturing and stinging their prey.

**Sceliphron zimmermanni** (Dahlbom)

*Chalybion Zimmermanni* Dahlbom, Hym. Eur., i, 1843, 22.

*Pelopacus (Chalybion) Zimmermanni* Dahlbom, Hym. Eur., i, 1845, 433.

*Pelopacus (Chalybion) Aztecus* Saussure, Reise Novara, Zool., ii, pt. 1, 1867, Hym. 26.

*Pelopacus (Chalybion) zimmermanni* Saussure, Reise Novara, Zool., ii, pt. 1, 1867, Hym. 26.

*Pelopacus texanus* Cresson, Trans. Amer. Ent. Soc., iv, 1872, 210.

*Chalybion zimmermanni* Patton, Proc. Bost. Soc. Nat. Hist., xx, 1880, 379.

<sup>9</sup> Instincts and habits of the Solitary Wasps, by G. W. and E. G. Peckham. Wis. Geol. and Nat. Hist. Survey, Bull. No. 2, Sci. Ser. No. 1, 1898, p. 176.

*Chalybion texanum* Patton, *idem*.

*Chalybion aztecum* Patton, *idem*.

*Chalybion zimmermanni* Cameron, Biol. Centr.-Amer., pt. 71, 1888, Hym., ii, 25.

*Chalybion aztecum* Cameron, *idem*.

*Types*.—Dahlbom evidently described *zimmermanni* from at least two specimens, since he records both male and female. In the Berlin Museum there is a specimen labelled with this name, but so far as could be ascertained by Fernald, who examined it in 1913, the only difference from *cyaneum* was that the dorsum of the propodeum was slightly cross striate which, as has been shown, is not distinctive. At Lund there are several specimens, the first a male being labelled "Zimmerm N. Amerika" on the upper label and "Zimmermanni Dlbm. sp. ign." on the second. On the dorsum of the propodeum of this specimen are traces of transverse ridges, the thoracic hairs are white and wings quite fuliginous. Another specimen is labelled "E. Sud Carolina a Zimmermann." The writer is inclined to regard the first named specimen from Lund as representing at least one of the original specimens used by Dahlbom and the one at Berlin as not *zimmermanni* at all.

The types of *aztecus* Saussure have not been seen, but are probably in the Saussure collection at Geneva.

*Texanus* Cresson was described from two specimens called female and male. No females with clear wings are known and a reexamination of material at Philadelphia by Mr. Cresson shows that he designated one of them as female by error. Two specimens of this species labelled "type" in the United States Museum are in reality paratypes.

This species has been redescribed from seven females and fourteen males from the localities mentioned in the habitat.

*Female*.—Medium sized, dark blue or blue green, coarser pilosity everywhere dark except on dorsum of median segment where it is whitish, finer hairs silvery to whitish; no pubescent spots on third and fourth ventral segments of abdomen; mandibles unidentate; wings fuliginous.

*Head* similar to that of *cyaneum* in general shape; clypeus usually somewhat flat at sides, arched in center, with median ridge, surface distinctly punctured, pilosity only moderately dense, silvery pubescence on sides, anterior margin black with narrow extensions under the eyes, three rather pointed teeth, no lateral processes, posterior margin broadly truncate and slightly emarginate;

frons not so deeply sunken as in *cyaneum*, distinctly punctured, moderately covered with erect black hairs; a fine silvery pubescence clothing nearly all the sunken area of the frons; ocelli with distinct grooves at outer bases; vertex sparsely punctured, erect hairs rather few, finer hairs whitish; genae distinctly punctate, moderately dense hairs interspersed with fine sericeous vestiture; inner margin of compound eyes distinctly concave near upper end, gradually convergent towards clypeus for lower half, eyes usually more approximate below than above; antennae with scape black with metallic blue green reflections, a number of rather short hairs mostly on inner surface, finer sericeous hairs vary from silvery to pale brown, pedicel with a few small hairs on inner surface; flagellum dull black with a dense covering of fine recumbent hairs giving it a black to greyish appearance according to the light; first segment of flagellum distinctly narrower proximally and shorter than second, remaining segments only very slightly narrower proximally, last segment not cut off truncate as in *cyaneum*, but tapering to a blunt point; mandibles of medium length with one rather wide tooth on inner margin not reaching to the tip; a row of four or five stout hairs on outer side and about twice that number on inside.

*Thorax*.—Anterior surface of collar with a steep upward slope to the somewhat acute crest; and distinctly rugose at anterior end, dorsal lobes small and separated by a shallow depression; punctures small and scattered, pilosity finer and smaller than in *cyaneum*, sericeous hairs pale to whitish; median depression on sides of collar not ending abruptly in a fovea but continued above to the groove between neck and collar; prothoracic lobe with a fringe of pale brown hairs; median depression on mesonotum faint or absent; depressions at posterior sides of mesonotum not as strongly marked as in *cyaneum*; scutellum may have a slight median depression; posterior margin of lateral pits fringed with silvery white hairs; postscutellum with small punctures, posterior margin with a few white or pale hairs; median segment with anterior margin of dorsum flanged, posterior margin more pointed than in *cyaneum*, whole surface of shield transversely striated or rugose and without median depression, hairs rather delicate, whiter at sides along the outline of dorsum than in the center; posterior end of dorsum sloping more gradually to hinder margin than in *cyaneum*, surface with irregular striations, punctures confluent, numerous dark hairs; stigmal groove not well marked, sides of dorsum strongly punctate behind, smaller punctures anteriorly; mesopleura and mesosternum with deep punctures and long black hairs; metapleura distinctly punctate except along metapleural groove which is somewhat bare and shiny, lateral oblique depression shallower than in *cyaneum*; petiole slightly shorter and more slender than that of *cyaneum*, punctures and hairs scattered, chiefly on basal half, finely sericeous mostly on upper half of distal end.

*Abdomen* medium to small, rather ovate, paler blue than in *cyaneum*, shining, with minute white recumbent hairs scattered evenly over the dorsal surface, first three dorsal segments without dark hairs, fourth and fifth with a few scattered punctures and dark hairs; sixth or terminal segment with hairs near posterior margin, bare along median line, dorsal segment may almost cover ventral; tip of abdomen a little more slender than in *cyaneum*; ventral segments

with dorsal flaps of terminal segment (where visible) with dark hairs along the sides, thinner or almost absent along the median line; fifth to third segments with a double sinuate row of fine punctures, but hairs only scattered; third and fourth without the pubescent areas present in *cyaneum*; second with a V-shaped double row of punctures with apex pointing forwards, but corresponding hairs not complete.

*Wings* similar to those of *cyaneum*, but without such a range of brown shades in the few specimens available; fore wings as in figures; tegulae with white sericeous hairs; hind wings with angle between median and transverse median about a right angle; discoidal leaves cubital slightly more exterior to junction of median, cubital, and transverse median than is the case in *cyaneum*.

*Legs*.—Segments with same general features as in *cyaneum*, somewhat paler blue; coxae, trochanters, and femora covered with fine white recumbent hairs; fore and hind tibiae with a dense pale brown sericeous area especially noticeable on hind tibiae; fine hairs white on other parts of tibiae; tarsi with rather pale sericeous hairs.

*Male*.—Differs from female as follows: Body color paler blue; vestiture of body denser and hairs everywhere white except on face and genae and some of the ventral segments of abdomen; the approximation of the eyes across the clypeus is more noticeable than in female, giving the face a narrower appearance below than above; middle tooth of clypeus more prominent than laterals, which are small and rudimentary; mandibles without tooth, of medium length, stout at base, tapering to a point; wings varying from somewhat dark fuliginous to hyaline with fuscous tips; abdomen more compressed ventrally and curved under at tip, similar to that of *cyaneum* male in general features except that the fine sericeous hairs are whitish.

*Length*.—Females, 16 to 20 mm. Males, 12 to 19 mm.

*Habitat*.—Dahlbom mentioned that "Zimmermann caught this elegant species in South Carolina, North America" and it has been reported from Michoacan, Cordova, Atoyac in Vera Cruz, Ventanas, Valladolid in Yucatan, and Teapa in Tabasco, Mexico. Specimens have been examined from Elkin, North Carolina; "Loui[siana]"; Texas, Dallas County, Cypress Mills, Austin, Comal County, Brownsville; from "Mex[ico]"; Alta Mira, Tampico, and Teapa, Mexico; and San Antonio, Nicaragua. These localities seem to show that it is mainly a Lower Austral form, with occasional specimens from the Tropical Zone and a possible occurrence in the southern part of the Upper Austral. No records of the habits of this species as such have been found by the writer.

## EXPLANATION OF PLATES

The following figures were drawn by the author in most cases with the aid of a camera lucida, and are only intended to be diagrammatic.

Fig. 1.—Dorsal view of thorax of *Sceliphron cyaneum*.

Fig. 2.—Lateral view of *Sceliphron cyaneum*.

a, prothorax. a<sub>1</sub>, neck. a<sub>2</sub>, collar. ac, anterior coxa. b, mesothorax. b<sub>1</sub>, mesonotum. b<sub>2</sub>, scutellum. b<sub>3</sub>, mesothoracic episternum (including pre-episternum and episternum). b<sub>4</sub>, episternal groove. b<sub>5</sub>, mesothoracic epimeron. c, metathorax. c<sub>1</sub>, post-scutellum. c<sub>2</sub>, metapleuron (including metepisternum and metepimeron). c<sub>3</sub>, metathoracic epimeron. c<sub>4</sub>, metapleural lobe. d, median segment or propodeum. d<sub>1</sub>, dorsum of propodeum. d<sub>2</sub>, end of propodeum. d<sub>3</sub>, side of propodeum. d<sub>4</sub>, stigma or spiracle. d<sub>5</sub>, fovea. d<sub>6</sub>, stigmatal groove. f, funiculus. fw, fore wing. hw, hind wing. l, lobe. mc, mesocoxa. p, petiole. pc, posterior coxa. s, stigma or spiracle. st, sting. t, tegula. 1 to 6, abdominal plates.

Fig. 3.—Ventral aspect of abdomen of *Sceliphron cyaneum* (female) showing the pubescent spots on the third and fourth segments. Lettering as above.

Fig. 4.—Hind tibial comb spine of *Sceliphron cyaneum*.

Fig. 5.—The wings of *Sceliphron cyaneum* with the cells named according to the usual nomenclature.

Fig. 6.—The same wings with the veins named according to the usual nomenclature.

Fig. 7.—Fore tibial comb spine of *Sceliphron cyaneum*.

Fig. 8.—Frontal view of head of *Sceliphron cyaneum*, female.





DESCRIPTIONS OF NEW AND CRITICAL NOTES UPON  
PREVIOUSLY KNOWN FORMS OF NORTH  
AMERICAN OEDIPODINAE (ORTHOPO-  
TERA; ACRIDIDAE)

First Paper

BY JAMES A. G. REHN

For a number of years it has been one of the author's ambitions, to make a thorough and comprehensive systematic study of the forms of the genera of that section of the North American Oedipodinae centering about the genus *Trimerotropis*. From whatever angle we had approached this complex of genera, whether in attempting generic studies, the presumably much simpler determination of scattered material or in detailed faunistic studies, it speedily became evident that the classification left much to be desired in the way of interpreting the true valuation of characters, appreciation of variation, relationship of forms and generic affinities, as well as the generic position of certain species. The difficulties encountered tended to concentrate our attention upon these genera, and the opportunity to study the problem in the desired fashion was something for which we continually strived.

The greatest desideratum was material and for over twelve years the field work of Hebard and Rehn has had this proposition as one of its main objectives. We now have before us for study a series of specimens of the genera under consideration, running into the tens of thousands, by far the greater portion collected by Hebard and Rehn and with full field data. After extensive series, type examination was next in importance, and we feel fortunate in having been able to examine, or now have in our possession, by far the majority of the types of the forms of the genera, at least as far as they are known to be in existence.

The critical work upon our projected study has been under way for some months, and in certain genera all the comparative work has been completed. Our plan is to publish in the course of a few years an extensive detailed work upon the genera studied,

but as it is desirable for various reasons to bring out the descriptions of the new forms already located, and certain of our conclusions relative to the relationship of some of the previously known ones, we are introducing them in the present form.

The types of all the new forms here described are in the Hebard Collection, and the paratypical material is in that collection and that of the Academy of Natural Sciences of Philadelphia.

Our earnest thanks are due our colleague, Mr. Hebard, for many helpful suggestions, and also for the gift of the colored plate accompanying this paper.

*The Haydenii Group of the Genus Derotmema*

We find this group consists of three geographic races or subspecies, for which the oldest, and consequently the specific, name is *haydenii* of Thomas.<sup>1</sup> Seudder's later *cupidineum*<sup>2</sup> is a pure synonym of *haydenii*, as type examination shows. Saussure's *brunnerianum*<sup>3</sup> is another pure synonym of *haydenii*, which latter name was apparently unknown to Saussure at that time. Typical *haydenii* is the race of the Great Plains region from Montana to New Mexico.

In the Great Basin and Snake River regions we find a related form which intergrades with *haydenii haydenii* in Wyoming, and to this Saussure's name *rileyianum*<sup>4</sup> is applicable, as material from the type locality and the original lot shows. Seudder,<sup>5</sup> by an interpretation of his *cupidineum* not warranted by his original description or material, shifted his name to this Great Basin form, where it clearly does not belong. The Great Basin race must be known as *Derotmema haydenii rileyianum*.

In western Texas and northern Mexico we find a third geographic race, which occurs typical in the Great Bend country of trans-Pecos Texas, north to Marfa and Sierra Blanca, occasionally not fully typical at the latter locality, and, at Marathon, Texas,

<sup>1</sup> *Oedipoda haydenii* Thomas, Ann. Rep. U. S. Geol. Surv. Terr., v, p. 460, (1871). ["Above Fort Fetterman on the North Platte," Wyoming.]

<sup>2</sup> *Derotmema cupidineum* Seudder, Ann. Rep. Chief of Engineers, 1876, p. 513, (1876). [Northern New Mexico.]

<sup>3</sup> *Derotmema brunnerianum* Saussure, Prodr. Oedipod., p. 155, (1884). [Colorado.]

<sup>4</sup> *Derotmema rileyianum* Saussure, Prodr. Oedipod., p. 156, (1884). ["Salm County" [Salmon City], Idaho.]

<sup>5</sup> Proc. Amer. Acad. Arts and Sci., xxxv. no. 19, 391, (1900).

to the eastward showing a marked Great Plains influence in instability of features and tendency toward *D. h. haydenii*. Southward in Mexico it is known to occur as far as Camacho, Zacatecas. This subspecies is new and is here described.

***Derotmema haydenii mesembrinum***<sup>6</sup> new subspecies. Plate XXVI, figs. 1 and 2; plate XXVIII, figs. 1 and 2.)

This race is more nearly related to *D. h. haydenii* (see plate XXVI, figs. 3 and 4; plate XXVIII, figs. 3, 4, 5 and 6), from which it is chiefly separable in the male sex having the eyes larger, more prominent and protuberant, more circular in basal outline and deeper in proportion to the infra-ocular portion of the genae, and in the slightly broader pronotum; in the female sex it can be distinguished by the eyes being slightly more prominent and the pronotum distinctly broader, particularly the metazonal portion of the disk. From *D. h. rileyanum* (see plate XXVIII, figs. 7 and 8) the present race differs in the male sex having more prominent eyes, which are somewhat more elevated, although not as rounded in basal outline, more prominent fastigio-facial angle when seen in profile, and in the prozonal lobes of the median carina of the pronotum being of the type found in *D. h. haydenii*; in the female sex differing much as in the male sex, but with features less decidedly indicated, also in the pronotum having the metazona appreciably broader and in general more deplanate on the disk.

*Type*.—♂; Double Windmill,<sup>7</sup> Brewster County, Texas. Elevation, 2725 feet. September 3, 1912. (Rehn and Hebard.) [Hebard Collection, Type no. 490.]

*Description of Type*.—Agrees fully with virtual topotypes of *D. h. haydenii*<sup>8</sup> except in the following characters. Eyes more globose, when seen from dorsum with width across eyes very appreciably greater than width of metazonal disk, in profile more circular and depth and width more nearly subequal, instead of appreciably deeper than wide, as in the typical form of the species; in cephalic aspect appreciably more protuberant, making width across eyes decidedly greater, instead of but moderately greater, than greatest width across genae. Pronotum with the metazona of disk slightly more transverse.

*Allotype*.—♀; Marfa, Presidio County, Texas. Elevation, 4650 to 4750 feet. September 1, 1912. (Rehn and Hebard.) [Hebard Collection.]

<sup>6</sup> From *μεσημβρινον*, *southern*.

<sup>7</sup> Appearing on the recent government topographic map as "Twin Mills."

<sup>8</sup> From Casper, Wyoming.

*Description of Allotype.*—This sex differs from virtual topotypes of the same sex of *D. h. haydenii* in the following characters. Eyes slightly more prominent and globose when seen from the dorsum, with width across eyes faintly greater than, instead of subequal to, the width of metazonal disk, in profile as in male sex; in cephalic aspect slightly more protuberant, making width across eyes subequal to, instead of slightly less than, the greatest width across genae. Pronotum with the metazona of the disk broad, relatively short, greatest width across same nearly equal to greatest length of pronotum.

Coloration of type and allotype not distinctive, when compared with *D. h. haydenii*. Both red and yellow disks are present on the wings, as in the typical form of the species.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Greatest width of pronotal disk	Length of tegmen	Length of caudal femur
♂					
Double Windmill, Texas, <i>type</i> . . . . .	15.1	3.3	2.7	15.8	8.9
Double Windmill, Texas, <i>para-</i> <i>type</i> . . . . .	15.4	3.2	2.7	17	9
Marfa, Texas, <i>paratype</i> . . . . .	15.4	3	2.8	17.9	10.2
Puertacitas Mountains, Texas, <i>paratype</i> . . . . .	15.8	3.4	3	17.5	9.4
♀					
Marfa, Texas, <i>allotype</i> . . . . .	23.8	4.8	4.5	25	12.5
Persimmon, Gap, Texas, <i>para-</i> <i>type</i> . . . . .	23.6	5	4	24	13

*Specimens Examined:* 46; 18 ♂, 28 ♀.

TEXAS: Sierra Blanca, El Paso County; Puertacitas Mountains and Marfa, Presidio County; Double Windmill and Persimmon Gap, Santiago Mountains, Brewster County and Marathon, Brewster County.

COAHUILA: Monclova and Jimulco.

DURANGO: Lerdo.

ZACATECAS: Camacho.

A male from Double Windmill, bearing the same data as the type; a male from Marfa with the same data as the allotype; a male from Puertacitas Mountains, Presidio, Texas, elevation 5100 to 5200 feet, August 30, 1912; and a female from Persimmon Gap, Santiago Mountains, Brewster County, Texas, September 3, 1912, are designated paratypes. All of these specimens were collected by Rehn and Hebard.

The Mexican specimens are typical of this race, as are all the paratyptic individuals. The Sierra Blanca specimens (four males, eleven females) are practically typical, occasional individuals showing *D. h. haydenii* influences. The Marathon series (eight

males, ten females) is virtually intermediate between the typical form of the species and the race here described. These specimens are variable individually from a truly intermediate condition to practically typical *D. h. mesembrinum*. From this information the area of typical *mesembrinum*, and the points at which intergradation becomes evident, can be determined.

The present subspecies was always found on adobe soil, generally bare, but occasionally with scattered bushes and grass. Double Windmill is in the middle of the broad Maravillas Valley between the Santiago Mountains and the high broken country to the east, an extremely arid and very hot locality, an uninhabited watering station on the Marathon-Boquillas road, about forty miles south of Marathon.

***Derotmema piute*** new species<sup>9</sup> (Plate XXVI, figs. 5, 6, 7 and 8; plate XXVIII, figs. 9, 10 and 15).

This striking species is related to *D. delicatulum* and *laticinctum* Scudder, but is more removed from the latter than from the former. There is no close relationship with *D. haydenii* or *sauseareanum*.

From *delicatulum* the new species can be separated by the more robust form, more distinctly vertical face with very weak interantennal angle profile, proportionately broader head when seen in cephalic aspect, more strongly transverse pronotum, the tegmina more appreciably narrowed distad when compared with the width of their proximal half, very ample anal field of tegmina, slightly broader wing, shorter and more robust caudal limbs, the abbreviation being shared by the tarsal joints, and the generally distinct and more complete transverse banding of the tegmina and caudal limbs. From *laticinctum*, *piute* can be separated by the slightly more vertical face, slightly more prominent eyes, which are more circular in basal outline, smoother pronotal surface, more regularly angulate caudal margin of pronotal disk, narrower lateral lobes of the pronotum, the shorter, broader and more distally narrowed tegmina, the broader wing, which has the band always narrower and much weaker, the shorter and more robust limbs, and, in the female sex, in the more slender and straighter ovipositor jaws.

<sup>9</sup> Named for the Indians native to the Walker River region and adjacent country of Nevada.

*Type*.—♀; Mason, Lyon County, Nevada. Elevation, 4500 feet. September 5, 1910. (Rehn and Hebard.) [Hebard Collection, Type no. 493.]

*Description of Type*.—Size relatively small: form robust, tegmina and wings shorter and broader than usual in genus: surface dull; tegmina almost entirely coriaceous, briefly subhyaline distad.

Head relatively large, broad: occiput moderately elevated in profile, interspace between eyes dorsad subequal to transverse width of eye: fastigium strongly and regularly arcuate declivent, broad, very shallowly arcuate-excavate, lateral margins weakly but appreciably elevated, in outline subovoid, greatest width ventro-cephalad, median carina distinct but very low: frontal costa moderately broad (for genus), in general moderately expanding ventrad, obsolete ventrad on face, margins bisinuate and constricted dorsad of the insertion of the antennae and ventrad of the median ocellus, continuous with fastigial margins; costa of moderate width at junction with fastigium, weakly and incompletely sulcate, V-shaped impression at fastigial junction distinct, acute: in profile fastigium regularly passes into facial outline, latter nearly vertical, very weakly arcuate: interantennal projection slightly arcuate: width of head across genae faintly less than that across eyes: eyes very prominent, in basal outline nearly circular, slightly flattened dorsad, the depth very faintly greater than that of the infra-ocular portion of the genae; from cephalic and dorsal aspects the eyes are seen to be quite prominent: antennae slightly more than three-fourths as long as caudal femora, slender.

Pronotum broad and short, the greatest width across metazona of disk subequal to greatest length, subsellate in form, surface largely rugulose, pale areas on lateral lobes relatively smooth; transverse sulcus almost straight, intersecting median carina at about middle: cephalic margin of disk arcuate produced mesad; caudal margin of disk obtuse-angulate, the margin regularly and evenly converging to the apex, which is very weakly rounded: median carina low and carinulate cephalad on prozona, subarcuate in profile, obsolete caudad on prozona, with the group of three tubercles found in some species of the genus represented by low bosses on a transverse fold; median carina of metazona delicately carinulate, low: surface of metazona with rugulosities to some extent connected and erratic: lateral carinae not evident on prozona, very weak but evident on the rounded metazonal humeral shoulders: lateral lobes slightly deeper than broad; caudal margin gently arcuate from humeral angle to the broadly arcuate ventro-caudal angle; surface of metazona of lobes cribroso-reticulose.

Tegmina three times as long as head and dorsum of pronotum combined, broad proximad, their width there but slightly less than length of pronotum, narrowed distad, the width at distal sixth subequal to length of metazona of disk: costal margin of tegmina straight from costal lobe to briefly proximad of apex, i.e. point measured above, thence to rounded apex arcuate; sutural margin straight in the greater portion of its length, the sutural and costal margins moderately converging distad: anal field of tegmina relatively broad, proximad

nearly equal in width to length of prozona, regularly narrowing distad, reaching practically to the tegminal apex. Wings relatively broad, greatest width contained slightly less than twice in length.

Mesosternal interspace strongly transverse, cephalic margin of interspace very weakly obtuse-angulate, internal angle of lobes rounded rectangulate, caudal margin of lobes obliquely truncate; metasternal interspace not narrower than mesosternal interspace, strongly transverse, shallow, cephalic margin arcuate, lobes angulately converging caudad. Ovipositor jaws moderately compressed; dorsal valves moderately upcurved in distal third, ventral valves gently arcuate decurved in distal half.

Cephalic and median limbs of medium length, slender, the femora appreciably enlarged distad. Caudal femora faintly more than two and one-half times as long as dorsum of pronotum, moderately robust for the genus, the greatest depth contained slightly more than four times in greatest length; dorsal carinae faintly sublamellate in proximal half; external paginal pattern regular: caudal tibiae slightly shorter than femora, slightly sinuate proximad, armed on external margin with eight, internal with ten to twelve spines: caudal tarsi short, second and third joints together subequal in length to the proximal joint.

*Allotype*.—♂; same data as type. [Hebard Collection.]

*Description of Allotype*.—Differing from female sex in the following noteworthy features.

Size small; tegmina more extensively subhyaline, a considerable portion of distal half of such structure.

Head with least width of interspace between eyes equal to three-fourths of transverse width of eye; frontal costa with supra-antennal constriction much more decided than in female, there narrowly but distinctly and below broadly but appreciably sulcate; width of head across genae three-fourths of width across eyes; eyes very prominent, slightly exserted, the depth slightly but appreciably greater than that of infra-ocular portion of genae; antennae in length subequal to caudal femora.

Pronotum with surface smoother, less rugulose and more shagreenous than in female; median carina slightly higher and more angulate in profile than in female; tubercles caudad on prozonal disk more distinct and acute; lateral carinae obsolete on metazonal shoulders; lateral lobes with metazona cribroso-shagreenous.

Tegmina slightly less than three times as long as head and pronotum combined.

Mesosternal interspace with cephalic margin of interspace subtruncate; metasternal interspace slightly narrower than mesosternal interspace.

Caudal femora with greatest depth contained slightly less than four times in length of same; caudal tibiae with eight spines on external margin and ten spines on internal margin.

General pale tone of dorsal coloration varying from pale tilleul-buff, through pinkish buff to vinaceous-pink, the face, genae, much of the lateral lobes, portions of pleura and pale areas on cephalic and median limbs and on external face of caudal femora hoary white. Darkened markings of occiput, pronotum, tegmina and limbs ranging from bistre to mummy brown: on the pronotum this is usually restricted to a darker edging at the irregularly angulate junction of the hoary ventral portions and colored dorsal section, this brown edging occasionally being isolated from the dorsum of the pronotum by additional hoary white, which in a single specimen (one female; Mason, Nevada) includes most of the dorsum; occasionally the dorsum and much of the pronotal lateral lobes is somberly uniform brownish (both Mina females); tegmina with dark maculations relatively small and quadrate, frequently weakly grouped into two principal transverse bands, one proximal and the other mesal, the proximal the more solid, the intervening pale areas and distal section with scattered maculations, which show tendencies, when grouped at all, to assemble along the sutural margin and the humeral trunk. In the dully colored individuals from Mina and several weakly contrasted specimens from Mason, the tegmina, and for that matter the pronotal markings, are little evidenced. Wings with disk varying from very pale naphthaline yellow to pale citrine yellow, the color never decided and dilute peripherad; distal portion clear hyaline except for vein infuscation; wing band ranging from the faintest trace in a relatively few cells, with no spur, to a fairly well-marked and moderately broad band, with a connected, well-marked spur, extending half way to wing base, the band becoming obsolescent periphero-proximad; in color the band ranges from raw umber to mummy brown. Rarely a distinct band and a well indicated spur are present but not connected. Eyes ranging from ochraceous-orange through buckthorn brown and tawny to dresden brown and mummy brown. Antennae whitish pink, broadly annulate with blackish brown, this condition subobsolete distad. Cephalic and median limbs annulate with blue-black (intensive) to fuscous (recessive); caudal femora with the dark bars of similar color, oblique on external face and there occasionally incomplete, distinct dorsad. Caudal tibiae pale, external face with a distal, a pre-median and a proximal darkening of variable intensity and definition, internal face faintly washed with pale veronese green to glaucous blue, increasing in intensity distad. Venter and abdomen light buff to light ochraceous-buff, the surface often with numerous scattered small blotches of buckthorn brown. Dorsum of abdomen proximad french green to empire green.

The Mason series is, as a whole, sharply, brightly and contrastingly colored; the Mina representation is duller, the females quite dull, with little contrast, while the male is more contrasted, but duller than the Mason specimens. The extremes of wing band condition are found in the Mina males.



*Measurements (in millimeters)*

	Length of body	Length of pronotum	Greatest caudal width of pronotal disk	Length of tegmen	Length of caudal femur
♂					
Mason, Nevada, <i>allotype</i> . . . . .	15	3.3	2.7	14.5	8.9
Mason, Nevada, <i>paratype</i> . . . . .	13.2	2.9	2.7	14.5	8.4
Mina, Nevada, average of seven <i>paratypes</i> . . . . .	14.3 (13.7-15.5)	3.1 (3-3.4)	2.5 (2.4-2.8)	14.9 (14.2-16)	8.5 (8.2-9)
♀					
Mason, Nevada, <i>type</i>	20.4	4.1	3.5	19	10.4
Mason, Nevada, average of six <i>paratypes</i> . . . . .	20 (18.5-21.2)	4.1 (4-4.3)	3.4 (3.2-3.7)	18.8 (18.2-19.8)	10.4 (10-11.2)
Mina, Nevada, <i>paratype</i> . . . . .	20.5	4.2	3.4	19	9.9
Mina, Nevada, <i>paratype</i> . . . . .	20.8	4	3.4	19	10.5

In addition to the type and allotype we have before us one male and six females bearing the same data as the type, and seven males and two females taken at Mina, Mineral County, Nevada; elevation, 4350 feet; September 3 and 4, 1910; (Rehn and Hebard.). All the specimens here recorded, in addition to the type and allotype, are considered paratypes.

In structure the series shows certain features of variation. The pronotum, as usual in any series of the species of the genus, shows some variation in breadth to length, in one extreme being slightly longer than greatest breadth across the metazona of disk. The frontal costa shows a slight degree of variation in the strength of the constrictions and in the continuity of the sulcation, while the lateral carinae vary in their indication, being occasionally obsolete in the male and never stronger than in the type. The median carina of the pronotum is weakly variable in the arcuation of the cephalic portion of the prozonal section, and in the degree of indication on the caudal portion of the same section. The tegmina vary from three to over three times in length of head and pronotum combined, while the wings are occasionally broader than in type, being one and six-tenths times width in length. The mesosternal interspace has the cephalic margin varying from

as described to nearly straight, while the lobe angles vary in the extent to which they are rounded. The caudal femora have the depth varying from three and one-half to slightly more than four times in the length. The caudal tibiae have from seven to nine external, and from eight to twelve<sup>10</sup> internal marginal spines.

At Mason the species occurred on a gravelly alluvial slope with fairly heavy but scattered bush vegetation, and also in a depression of the slopes with similar cover. The species was scarce in the former situation, and more numerous, but not common, in the latter location. At Mina the insect occurred in but one environment, this was on ground strewn with rock fragments, the general location being to the east of the broad playa in the middle of the valley in which Mina is located, and where there is a similar but sparser vegetation than found at Mason. The species was not common, and individuals were secured only after long and careful search.

#### *The Plattei Group of the Genus Mestobregma*

This group is composed of two sections, one comprising *plattei* and its races and the second composed of *impeyum* and *terricolor*, both of the latter very distinct new species, here described.

The races of *Mestobregma plattei* number three. These are: *plattei plattei*,<sup>11</sup> which is the form of the Great Plains region, south to southern Colorado; *plattei corrugata* (Scudder),<sup>12</sup> ranging from northern New Mexico southward, and *plattei rubripenne* (Bruner)<sup>13</sup> of central and southern Arizona. In our detailed projected study of the genus we will discuss the relationship, synonymy and variation, as well as detailed distribution, of these forms.

The *impeyum-terricolor* section of the group is moderately cohesive, made up of the two species, which agree in eye outline, and to a certain degree in pronotal form, but differ in the form of the frontal costa, fastigio-facial angle, mesozonal carina, length of lateral lobes and general form. *Impeyum* is nearer *plattei* than *terricolor*, and the latter is an evident tendency toward *Trepidulus*, yet in all general features it is a true *Mestobregma*.

<sup>10</sup> The latter on one margin in type only.

<sup>11</sup> 1873. *Oedipoda plattei* Thomas, Rep. U. S. Geol. Surv. Terr., v. p. 123. ["Near Platte River in Colorado and Wyoming."]

<sup>12</sup> 1902. *Conozoa corrugata* Scudder, in Scudder and Cockerell, Proc. Davenport Acad. Sci., ix, p. 33. [Fillmore Canyon, Organ Mountains, New Mexico.]

<sup>13</sup> 1905. *Trachyrhachis rubripennis* Bruner, Biol. Cent.-Amer., Orth., ii, pp. 175, 177. [Oracle, Arizona.]

**Mestobregma impexum**<sup>14</sup> new species (Plate XXVI, figs. 9 and 10; plate 13 and 14.)

1910. *Mestobregma rubripennae* Rehn and Hebard (not of Bruner, 1905), Proc. Acad. Nat. Sci., Phila., 1909, p. 442. [Cima and Bird Spring Mountains, California.]

The present species can be separated from the component races of *Mestobregma plattei* (see plate XXVI, figs. 11 and 12; plate XXVIII, figs. 11 and 12) by its more robust form, more circular basal eye outline, the much less angulate fastigio-facial angle when seen in profile, and by the sharp and decided constriction of the frontal costa briefly dorsad of the antennal bases. From *M. terricolor*, here described, the present species differs in the more inflated genae, the less decided fastigio-facial angle when seen in profile, in the frontal costa constriction, in the more distinct mesozonal section of the pronotal median carina, in the shorter lateral lobes of the pronotum, the shorter and more robust form and more contrasted coloration.

*Type*.—♂; Milford, Beaver County, Utah. Elevation, 4900 to 5000 feet. September 5, 1909. (Rehn and Hebard.) [Hebard Collection, Type no. 494.]

*Description of Type*.—Size medium: form slender, subcompressed: pronotum rugose on dorsal surface.

Head moderately inflated, the genae moderately bullate and with the width across same slightly more than greatest width across eyes: occiput and vertex, when seen from side, distinctly arcuate, ventro-cephalad markedly and sinuately arcuate declivent to the rounded and weakly indicated fastigio-facial angle, which is situated between the antennal bases; face subvertical: fastigium with length and breadth subequal, very shallowly excavate; lateral carinae of fastigium low but clearly marked, subparallel caudad, converging cephalad to about one-half their median separation, the cephalic margin of the fastigium indicated by a more weakly defined, narrowly V-shaped carina, the apex directed caudad: frontal costa appreciably V-foveolate dorsad at its junction with the fastigium, the foveolation in contact with the V-shaped carina of the fastigium, immediately ventrad of this the costa is first strongly, although regularly, constricted, then arcuately expanded between the antennae, at the constriction and dorsad to the foveolation with an appreciable median carina, ventrad of inter-antennal region very faintly constricted, then with margins weakly diverging and becoming obsolete before reaching the elypeal suture; marginal carinae of frontal costa distinct but low, surface of costa ventrad of foveolation very weakly excavate; lateral facial carinae strongly arcuate divergent. Eyes moderately prominent, not elevated dorsad of vertex when seen in cephalic aspect; basal outline very broad ovate, in depth subequal to the infra-ocular sulcus. Antennae slender, nearly twice the

<sup>14</sup> Rude, uncouth—from the rough appearance of the pronotal disk.

combined dorsal length of the head and pronotum, subequal in width, subdepressed proximad.

Pronotum weakly sellate, sub-strangulate, with dorsum rugose, the dorsal length faintly less than the dorsal length of the head, the greatest (caudal) width of the disk but slightly less than the greatest dorsal length: cephalic margin of disk very weakly, though finely, obtuse-angulate; caudal margin of disk sub-rectangulate, the immediate angle narrowly rounded, the margin appreciably cingulate: median carina distinct but not high on the metazona, elevated and moderately bilobate on the prozona, the cephalic section of this about half again as long as the caudal (or mesozonal) one, the former but little higher than the latter and subdeclivent cephalad, the caudal (or mesozonal) section more regularly arcuate; lateral carinae indicated by converging, low, irregular elevations cephalad on the prozona, on caudal (or mesozonal) section of prozona is a distinct, transverse raised area with a pair of impressed pits, lateral shoulders on metazona distinct, rather prominent, noncarinate: metazona slightly longer than the prozona. Lateral lobes of pronotum deeper than long, ventral margin sinuate, the greatest depth caudad, caudal margin sinuate, the greatest width of lobe ventrad, the ventro-caudal angle full and rounded.

Tegmina surpassing the apex of the abdomen by about four-fifths the length of the caudal femur, greatest width contained slightly more than five times in greatest length of same; costal margin with a distinct, but low and relatively short, proximal lobation, distad distinctly arcuate to the rounded acute apex; sutural margin in general subparallel to costal; distal margin obliquely arcuato-truncate: texture coriaceous proximad, becoming more membranous and less closely areolate in distal fourth: intercalary vein present, proximad nearer the ulnar, distad nearer the median vein. Wings moderately long, greatest width contained one and three-quarter times in length of same; apex rounded rectangulate.

Interspace between mesosternal lobes strongly transverse, shallow, the lobes obliquely arcuato-truncate caudad; interspace between metasternal lobes strongly transverse, but little narrower than mesosternal interspace, regular.

Cephalic and median limbs moderately slender. Caudal femora about half as long as the tegmen, of the form usual in the subfamily, greatest width contained three and one-half times in the length, with the lamellation of dorsal carina little indicated and not sharply terminated distad, as in most of the individuals of the genus; pattern of the external paginae regular: caudal tibiae slightly shorter than the caudal femora, armed on the external margin with ten spines and on the internal margin with eleven spines: caudal tarsi relatively short, the metatarsus subequal in length to the other two joints combined.

*Allotype*.—♀; same data as type. [Hebard Collection.]

*Description of Allotype*.—Differs from the description of the type in the following noteworthy features.

Size rather large: form slightly more robust: surface more rugulose, and of dorsum of pronotum more extensively rugose. Head with whole facial profile, including fastigio-facial angle, less bulging, more regularly low arcuate, with barely appreciable sinuosities: width across genae about one and a third that

across eyes, the genae being moderately bulging; structure of fastigium and frontal costa as in male, but the whole structure broader in proportion. Eyes distinctly smaller in proportion, in depth appreciably shorter than the infra-ocular sulcus. Pronotum slightly longer in proportion to the head; caudal margin of the disk with apex more rounded and lateral portions faintly areuate-emarginate. Ovipositor jaws moderately slender. Caudal femora with dorsal lamellation more evident and more appreciably excised distad than in male.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Greatest (caudal) width of pronotal disk	Length of tegmen	Length of caudal femur
♂					
Milford, Utah, <i>type</i> . . . . .	17.7	3.6	3.4	20.4	10.5
Milford, Utah, <i>paratype</i> . . . . .	18.2	4.2	3.5	20.2	10.7
Milford, Utah, <i>paratype</i> . . . . .	19.5	4.2	3.7	22	11.1
Cima, California . . . . .	19.4	3.9	3.6	20.6	11.2
♀					
Milford, Utah, <i>allotype</i> . . . . .	32	5.5	4.9	24.5	13.7
Milford, Utah, <i>paratype</i> . . . . .	29	5.1	4.5	24.5	13.4
Milford, Utah, <i>paratype</i> . . . . .	31	5.3	5	26.8	13.5
Cima, California . . . . .	25.3	4.7	4	23.2	13
Cima, California . . . . .	26	5	4.3	25.5	13.6
Bird Spring Mountains, California . . . . .	24 <sup>15</sup>	5	4.5	24.5	12.7

Color pattern of the type found in *Mestobregma plattei*, with sharply contrasted bicolored lateral lobes of the pronotum and *Conozoa*-like contrasted barring on the costal half of the proximal three-fifths of the tegmina. Pale base color ranging from pale clay color to light buff, occasionally in large part, particularly on the head, hoary white; dark pattern color ranging from mummy brown to dark bone brown. Frequent specimens from Milford show a castor gray suffusion, to variable degrees, of the greater portion of the head and dorsum of the pronotum, or of the dark areas alone, and rarely, to an extent, on the lateral lobes of the pronotum. The type shows a tendency in this direction on the dark areas of the dorsum of the head. The transverse dark infra-antennal facial line is smoke black in the male sex, and variable in depth of color, while mesad its costal portion is either lacking or more ventral in position than laterad of the costa. In the female sex this bar is obsolete or subobsolete. Eyes ranging from ochraceous tawny to deep mars brown. Antennae with joints distad of the second fuscous, obscurely alternated (by segments) with dull russet. Pronotum with dark angulate marking on lateral lobes in male sharply contrasted, shining dark bone brown, much weaker in female; dorsum dull, with little contrast. Tegmina with dark bars always sharply contrasted with pale interspaces; sutural section and distal two-fifths with numerous arcuate patches of the darker color. Wings with disk in yellow-winged phase ranging from very weak marguerite yellow (*typic*) to primrose yellow, in the red-winged phase it is coral red; wing-band dark bone brown, crossing the

<sup>15</sup> Abdomen abnormally contracted.

wing slightly distad of the middle and following the peripheral margin to as much as half-way to the body, spur broad, heavy, extending more than half-way to the base, costal margin free from spur and of the disk color; distal portion hyaline with few scattered brown areas near margin and along certain of the veins. Limbs with the usual barring of the group, the caudal femora frequently with much hoary white, rarely suffused, on dark areas, with castor gray; caudal tibiae olive buff to bluish glaucous, mottled with brownish proximad, dorsal surface in glaucous type darkened to russian blue, spines black-tipped on bone brown, bases of same of tibial color. In the infrequent castor gray suffused individuals the caudal tibiae are much mottled with this color.

In addition to the type and allotype we have before us eight males and three females taken at Milford, Utah, September 5, 1909, by Rehn and Hebard. We also have for study one male and three females from Cima, San Bernardino County, California, taken August 12, 1907, by Hebard, and one female from the foothills of the Bird Spring Mountains, San Bernardino County, California, taken August 11, 1907, also by Hebard. The Cima and Bird Spring Mountains material was previously recorded by us as *Mestobregma rubripenne*,<sup>16</sup> to which the present species is closely related, but quite distinct. The Milford series we here designate as paratype.

In the series examined, we find some little variation in the Cima male, which has the fastigio-facial angle, in profile, more evident and angulate than in the others; the eyes and costa, however, are typical. Of the Milford series two of the males are red-winged, the remainder, of both sexes, are yellow-winged. One Cima female is red-winged, the remainder and the Bird Spring Mountains individual are yellow-winged. The species was scarce at Milford, occurring on sage covered ridges at 5000 feet and on relatively bare slopes, with scattered sage and yellow-flowered bushes, at 4900 to 5000 feet elevation.

***Mestobregma terricolor***<sup>17</sup> new species (Plate XXVI, figs. 13, 14 and 15; plate XXVIII, figs. 16 and 17.)

This interesting species is more nearly related to *D. impexum*, here described, than to any other of the genus. It forms with *impexum* a section of the *plattei* group of the genus, and can be distinguished from the component races of *M. plattei* by the less

<sup>16</sup> *Vide supra.*

<sup>17</sup> Meaning *earth-colored*, in relation to the general tone of the coloration of the insect in repose.

inflated ventral portion of the genae, when seen in cephalic aspect, in the more circular basal outline of the eye, in the mesozonal portion of the median carina of the pronotum being weak or subobsolete, but the lateral portions of the mesozonal bifoveolate elevation not reduced, the pronotum thus more sellate than in *plattai*, in the median carina on the metazonal portion of the pronotum being weak, and in the lateral lobes of the pronotum being proportionately longer.

From *impeyum* the present species can be distinguished by the less inflated ventral portion of the genae, seen in cephalic aspect, in the more subequal frontal costa, which is not sharply constricted immediately dorsad of the insertion of the antennae, the more produced fastigio-facial angle when seen in profile, the less cristate median carina of the pronotum, the smoother pronotal surface, the more slender and elongate form and duller normally exposed coloration.

The beautiful rose-red disk of the wings appears to be a specific character, as we have seen none with yellow disks.

*Type*.—♂; Pecos, Reeves County, Texas. Elevation, 2596 feet. September 18, 1912. (Rehn and Hebard.) [Hebard Collection, Type no. 496.]

*Description of Type*.—Size rather small; form slender, elongate, subcompressed dorsad; surface finely rugulose and dull, particularly in depressed areas, smoother in elevated sections, the dull areas with sparse, very short hairs.

Head less inflated than in the related species: occiput, vertex and fastigium in profile regularly arcuate; fastigio-facial angle well marked, narrowly rounded, obtuse, situated between the antennal bases; facial line moderately retreating; fastigium slightly broader than long, broadly open caudad; lateral margins distinct, parallel caudad, concavely convergent cephalad, the cephalic width of the fastigium less than one-half its greatest width, there closed by a V-shaped carina, as described in *D. impeyum* but less evident; surface of fastigium shallowly excavate; frontal costa of medium width, very faintly and broadly narrowed dorsad, gently and broadly expanding between the antennal bases to slightly more than the width of proximal antennal joint, very faintly and broadly narrowed ventrad of this, then regularly, though moderately and in a sub-obsolete fashion, expanding to the clypeal suture; surface of frontal costa as a whole considerably sulcate, weakly foveolate dorsad in contact with fastigial V-carina, sulcation becoming obsolete ventrad; carinal margins as a whole sharp; lateral facial carinae arcuate about antennal bases, thence rather strongly divergent to the clypeal angles. Eyes large, prominent, in cephalic aspect they are seen to be very faintly elevated dorsad of the vertex, the width across the eyes slightly greater than that across genae; in lateral outline the eyes are broad subreniform-ovate, their basal outline less in area than their

lateral outline, due to the eye prominence and globosity; greatest depth of the eye subequal to that of the infra-ocular sulcus. Antennae slightly longer than caudal femora, slender, apex acute, proximal joints (beyond two basal ones) appreciably depressed but not expanded.

Pronotum short, subsellate, weakly stragulate. Disk of pronotum with greatest (caudal) width but slightly less than greatest length of same; cephalic margin of disk very faintly angulate; caudal margin of same subrectangulate, the margin cingulate and very faintly sinuate on lateral portions: metazona one-third again as long as the prozonal (prozona s. s. and mesozona) section: median carina on restricted prozona distinct and arcuate but not high; on mesozonal section, which is faintly shorter, distinctly lower, partly obliterated and marked by a median point or knob; on metazona the carina is distinct, continuous, though weak, becoming more elevated caudad; transverse mesozonal elevation more evident than that portion of median carina, crudely resembling a figure eight, the caudal section of the margining carina the higher: lateral carinae represented on prozona solely by several detached points, on metazona by prominent but rounded shoulders: surface of metazonal disk with rugulosity scattered and irregularly transverse in disposition; principal transverse sulcus deeply impressed. Lateral lobes of pronotum deeper than long, greatest depth caudad; ventral margin distinctly arcuate-sinuate cephalad, straight caudad; caudal margin broadly but shallowly concave from the disk to near the ventral margin, where the ventro-caudal section is obliquely truncate; surface of metazona of lobes obscurely cribroso-punctulate.

Tegmina surpassing the apex of the abdomen by slightly more than the combined length of the head and pronotum, narrow, the greatest width contained six times in the length: costal margin with a broad and very low proximal lobation, in distal fifth broadly arcuate to the distal margin, which is completely rounded; sutural margin with a weak concavity distad, corresponding in a lesser degree to the arcuation of the costal margin: texture of the proximal half of the tegmina opaque, gradually becoming more translucent and with sparser areolation distad, but nowhere hyaline: intercalary vein indicated, proximad nearer the ulnar vein, distad intermediate between the ulnar and median veins; axillary vein free. Wings relatively narrow, the greatest width contained twice in the length; apex of anterior field narrowly rounded, axillary field with margin broadly and obliquely arcuate-lobate.

Interspace between the mesosternal lobes strongly transverse, the lobes with their caudal and medio-caudal margin obliquely arcuate; interspace between the metasternal lobes appreciably less than that between the mesosternal lobes, transverse.

Cephalic and median limbs moderately slender. Caudal femora slightly more than half as long as the tegmina, of medium robustness, the greatest depth contained about three and one-third times in the greatest length of the same; dorsal carina but little lamellate; external pagina with pattern relatively regular: caudal tibiae appreciably shorter than the femora, armed on the external margin with nine to ten spines, on internal margin with eleven to twelve spines: caudal tarsi quite short, the metatarsus faintly shorter than the remaining joints combined.



*Allotype*.—♀; same data as type. [Hebard Collection.]

*Description of Allotype*.—Differing from the description of the type in the following noteworthy features. Size larger. Head with fastigio-facial angle much less prominent in profile, rounded; facial line less retreating; eyes less prominent, in cephalic aspect not elevated dorsad of level of vertex, greatest depth slightly less than that of infra-ocular sulcus. Pronotum with rugulosities of metazonal disk more detached, individual and irregular than in male; ventro-caudal portion of lateral lobes of pronotum more rounded and less oblique truncate than in male. Tegmina surpassing the abdominal apex by less than the length of the pronotal disk. Wing very faintly less than twice as long as broad. Mesosternal lobes less obliquely arcuate than in male, the medio-caudal angle more distinct, though arcuate. Ovipositor jaws relatively short, well recurved, moderately compressed.

Color pattern of the basic *M. plattei* type, but greatly modified by the suppression of virtually all solid exposed dark markings, except the undulate dark line on the lateral lobes of the pronotum and reduced dark blotches on the costal section of the proximal half of the tegmina. General color ranging from warm buff to tawny, often light buff or even hoary white on the head, ventral section of the lateral lobes of the pronotum and cephalic limbs. Dark markings bone brown to clove brown, the pronotal line somewhat shining. Head with a sub-obsolete, fine postocular line and a transverse, weak vertex line of darker, occasionally many cloudings and mottlings present on the genae, occiput and face; eyes antimony yellow to yellow ochre, with several irregularly marked oblique lines of brown; antennae with distal half solid blackish brown; proximal half of the general color, irregularly multi-annulate with blackish brown except on the two proximal segments. Pronotum with median section of disk occasionally weakly clouded with brownish, the caudal margin beaded with, and the carinal and mesozonal elevations touched with, brown; lateral lobes with dark undulate line indicated as distinctly in females as in males. Tegmina with *Conozoa*-like patches of dark brown always evident, occasionally<sup>18</sup> nearly confluent, usually separated by a pale interspace somewhat less than their width, the dark patches not crossing the humeral trunk; distal half of tegmina and discoidal and anal fields with scattered punctulations of dark brown, which distad are areolate and rarely there disposed in an obscure transverse fashion, in the anal field there rarely is a weak transverse barring tendency in the disposition of the punctulations. Wings with disk jasper red; wing-band bone brown, crossing the wing at or very slightly distad of the middle, narrowed and emarginate at the base of the spur, which is broad and extends about two-thirds the way to the base of the wing; peripheral margin with band becoming obsolete half-way to the body; distal section of wing hyaline, with certain veins infuscate by pencilling or series of dots; costal margin infuscate distad, from band to near the apex; proximal of same narrowly lined with disk color. Abdomen of general color, as a rule with a more yellowish tendency; dorsum of abdomen frequently with proximal segments clouded to a variable degree with dark payne's gray. Cephalic and median limbs

<sup>18</sup> In Grand Canyon female.

usually with narrow incomplete annular patches of blue-black to blackish. Caudal femora with one distinct and several indistinct dark patches on the dorsal surface, external face often quite hoary white, ventral carinae irregularly beaded with brown: caudal tibiae on normally exposed surfaces of general color, on normally hidden surfaces tyrian blue to deep orient blue; spines black tipped on brown.

The Pecos series is quite uniform in general coloration, the wing-band varying somewhat in extent and strength, the disk color constant. The Sierra Blanca specimens and the Las Cruces female are darker in color, less grayish buff in general tone, more brown buff, the pale areas duller and dark areas more extensive. The Grand Canyon female is more like the Sierra Blanca specimens, and, in addition, has the wing-band broader than in any of the other specimens.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Greatest (caudal) width of pronotum	Length of tegmen	Length of caudal femur
♂					
Pecos, Texas, <i>type</i> . . . . .	19.3	3.6	3.4	20.5	11
Pecos, Texas, <i>paratype</i> . . . . .	20.2	3.9	3.5	22	11
Pecos, Texas, <i>paratype</i> . . . . .	18.8	4	3.5	21.4	11.4
Sierra Blanca, Texas . . . . .	18.2	3.8	3.3	20	10.2
♀					
Pecos, Texas, <i>allotype</i> . . . . .	30.2	5.3	4.8	26.8	14.5
Pecos, Texas, <i>paratype</i> . . . . .	26.2	4.6	4.2	25.5	13.5
Pecos, Texas, <i>paratype</i> . . . . .	31.3	5.8	4.9	28.5	15
Sierra Blanca, Texas . . . . .	24.4	4.9	4.2	23.8	12
Sierra Blanca, Texas . . . . .	26	5.1	4.5	24.8	13.5
Las Cruces, New Mexico . . . . .	26.2	5	4.2	26.4	12.8
Grand Canyon, Arizona . . . . .	25.4	4.6	4	24	12.2

This most interesting species, which is so inconspicuous when at rest in its native environment, and which displays such beautifully colored wings when in flight, is apparently extremely local, and as our material shows has a relatively extensive distribution, of which, at this writing, our knowledge is very incomplete. We have before us a paratypic series of fourteen males and twenty females bearing the same data as the type and allotype; a series of four males and three females taken at Sierra Blanca, El Paso County, Texas, elevation, 4524 to 4950 feet, September 13 to 14, 1912, (Rehn and Hebard); one female, taken at Las Cruces, Donna Ana County, New Mexico on August 5; and a female taken on the plateau below Bright Angel in the Grand Canyon of the Colorado, Coconino County, Arizona, elevation 3500 to 3800 feet, September 12, 1907, (Hebard).

At Pecos the species occurred on the bare spots of an adobe flat, where it was fairly numerous, but very shy and in scattered

colonies. At Sierra Blanca the species was also taken on bare adobe, while on the rocky hills at the same place its relative *Mestobregma plattei corrugata* occurred.

The species shows a distinct tendency toward *Trepidulus*, but it is clearly a *Mestobregma*. It shows, however, the probable line of relationship of the two genera. A species of *Trepidulus* shows an approximately similar tendency toward *Mestobregma*, but the gap between the two remains sufficient to indicate the generic affinities of the respective species.

#### *The Genus Psinidia Stål*

This genus is composed of two quite distinct species, *P. amplicornus* Caudell and *P. fenestralis* (Serville). The former was described as a variety, but is very distinct and its distribution within the United States can now be indicated with considerable exactness. The second species, *fenestralis*, is divisible into two geographic races; one, the typical form, distributed over a very extensive area, and the other, which was undescribed, restricted as far as known, to the coastal region of Texas, occurring at the same localities as the very different *amplicornus*.

Typical *fenestralis* ranges from the most northern points of the species distribution south, in suitable environments, to southern Florida and southwest to at least southern Alabama (Flomaton) and the coastal islands of Mississippi (Cat and Ship Islands). Material from Hearne, Robertson County, Texas, is essentially intermediate between the two races.

***Psinidia fenestralis frater*** new subspecies (Plate XXVII, figs. 16, 17 and 18; plate XXVIII, figs. 18 and 19.)

This geographic race can be distinguished from typical *fenestralis* (see plate XXVII, figs. 19, 20 and 21) by its greater size, by having the antennae broader and more ensiform in the proximal two-thirds, by the more declivent fastigium and more evident elevation of the vertex, by the head being more compressed when seen in cephalic aspect, by the median carina of the pronotum being slightly lower and not as straight in profile, the ventro-caudal angle of the lateral lobes of the pronotum more distinct and peg-like, the distal extremity of the tegmina more truncate and less rounded and the jaws of the ovipositor of the female more elongate, more slender and straighter in profile.

*Type*.—♀; Katherine, Willacy County, Texas. August 8, 1912. (Rehn and Hebard; in nearly bare white sand gully.) [Hebard Collection, Type no. 499.]

*Allotype*.—♂; same data as type. [Hebard Collection.]

*Description*.—Size larger than in *P. f. fenestralis*: form elongate. Head with occiput more appreciably ascending than in *P. f. fenestralis*, with head in normal position; vertex in profile more narrowly rounded, the juxta-ocular portions of the fastigial marginal carinae more evident in same view; in profile the fastigium is seen to be slightly more declivent: in cephalic aspect the head is seen to be more compressed and proportionately deeper: antennae heavier, very elongate, at least two and one-half times as long as pronotum, distinctly though not decidedly ensiform, the greatest expansion distinctly greater than width of the proximal joint. Pronotum in profile with the median carina subconcave in the region of the principal transverse sulcus, not straight, as a whole lower throughout than in *P. f. fenestralis*: lateral lobes with ventro-caudal angle having a distinct, slightly swollen, peg-like projection instead of an angulation of the margin. Tegmina with the distal extremity oblique, moderately truncate, not essentially rounded as in *P. f. fenestralis*. Dorsal ovipositor jaws in dorsal view no more slender than in *P. f. fenestralis*, in lateral view more elongate and regularly falciform distad of the shoulder, slender: ventral ovipositor jaws in ventral view slightly more elongate than in the typical form of the species, in profile as elongate, correspondingly, as the dorsal pair, much straighter than in *P. f. fenestralis* and more acute.

Coloration not distinctively different from *P. f. fenestralis*.

Measurements (in millimeters)

♂	Length of body	Length of antenna	Length of pronotum	Length of tegmen	Length of caudal femur
<i>P. fen. fenestralis</i>					
Wood's Hole, Mass. . . . .	16.8	13.7	3.5	18	11
Isle of Palms, So. Car. . . . .	20.8	14.2	3.9	21.2	12.5
Ship Island, Miss. . . . .	18.2	13	3.6	19.5	11
<i>P. fen. fenestralis</i> ×					
<i>P. fen. frater</i>					
Hearne, Texas. . . . .	20.7	12.5	4	21.5	12.5
<i>P. fen. frater</i>					
Galveston, Texas, <i>paratype</i>	23	17.4	4.7	23.6	14.8
Katherine, Texas, <i>allotype</i>	24	—	5.4	26.5	16.2
♀					
<i>P. fen. fenestralis</i>					
Wood's Hole, Mass. . . . .	23.5	12	4.8	20.8	12.5
Isle of Palms, So. Car. . . . .	27.2 <sup>19</sup>	13.5	4.7	24.2	14
Ship Island, Miss. . . . .	23.8	11.5	4.5	22.7	13.2

♀	Length of body	Length of antenna	Length of pronotum	Length of tegmen	Length of caudal femur
<i>P. fen. fenestralis</i> ×					
<i>P. fen. frater</i>					
Hearne, Texas . . . . .	27.5 <sup>19</sup>	10.5	5	24.8	14.8
<i>P. fen. frater</i>					
Galveston, Texas, <i>paratype</i>	29	16.5	6.3	27.8	17.5
Katherine, Texas, <i>type</i> . . . .	30.5	16.3	6.1	29	16.7
Katherine, Texas, <i>paratype</i>	37 <sup>19</sup>	18	6.6	31.2	19
Between Alice and Brownsville, Texas, <i>paratype</i> . . . .	30.8	15.8	5.7	28.4	16.2

The individuals of *P. fenestralis fenestralis* measured above are average specimens from fair-sized series.

In addition to the type and allotype we have before us the specimens measured above, which are: an additional female from Katherine, Texas, bearing the same data as the type and allotype; a pair from Galveston, Galveston County, Texas, taken July 19 to 21, 1912, (Hebard; sandy spots back from beach), and a single female from between Alice and Brownsville, Texas, taken in July. With the exception of the latter specimen, which is from the collection of the Brooklyn Institute of Arts and Sciences, the series is contained in the Philadelphia collections. These additional specimens are considered paratypes. A series of two males and three females taken in Hearne, Robertson County, Texas, August 14 to 15, 1915, (Hebard; in moderate numbers on sandy area near woods), contained in the Philadelphia collections, is virtually intermediate between *P. fen. fenestralis* and *P. fen. frater* in the structural differential characters.

*The Caeruleipennis Group of the Genus Anconia*

The genus *Anconia* is made up of two groups, one centering about *A. integra*, the genotype, and the other composed of *A. caeruleipennis* Bruner and the new species here described. Bruner's *caeruleipennis*<sup>20</sup> is known only from the unique female type, which is now before us. In 1909, Rehn and Hebard referred material taken in the vicinity of El Paso, Texas, to *caeruleipennis*, having at that time only the brief description of the latter with which to work. With the type in hand we can now definitely

<sup>19</sup> Abdomen unnaturally extended, the measurement probably ten per cent in excess of repose length.

<sup>20</sup> 1906. Biol. Cent.-Amer., Orth., ii, pp. 185, 186. [Hawthorne, Nevada.]

state that the Texas material represents a quite distinct new species, which we here describe.

**Anconia hebardi** new species (Plate XXVII, figs. 22, 23 and 24; plate XXVIII, figs. 21 and 22.)

1909. *Anconia caeruleipennis* Rehn and Hebard (not of Bruner), Proc. Acad. Nat. Sci., Phila., 1909, p. 155. [Franklin Mountains, Texas; El Paso, Texas.]

A near relative of *caeruleipennis* (see plate XXVII, figs. 25 and 26, plate XXVIII, fig. 20), differing in the more rugulose pronotum, which has more evident individual bullation of the prozona and metazona when seen in profile, in the interantennal portion of the frontal costa being narrower, the tegmina narrower and with a more coriaceous structure and much more closely woven venational pattern, in the more closely woven venational pattern of the wings, in the rich blue, instead of weakly bluish, color of the wing disk and in the more robust caudal femora.

*Type*.—♀; El Paso, El Paso County, Texas. Elevation, 3650 feet. July 10, 1907. (Rehn and Hebard; irrigated land along Rio Grande.) [Hebard Collection, Type no. 507.]

*Description of Type*.—Size moderately large; form moderately elongate, but meso and metathorax relatively robust, pronotum less than average size for general bulk, head small: surface of head and dorsal and lateral portions of thoracic segments rugulose.

Head with its exposed dorsal length hardly more than half that of pronotal disk, the depth of head to clypeal suture no greater than that of pronotum to ventral margin of the lateral lobes: occiput, vertex and fastigium evenly arcuate in profile; fastigio-facial angle moderately prominent, rounded, the inter-antennal production moderately flattened in profile, immediately ventrad of the insertion of the antennae the facial profile is appreciably concave, thence gently retreating ventrad to the clypeus: fastigium with its length and breadth subequal, indicated chiefly by a pair of shallow pit-like depressions caudad and a pair of triangular impressions cephalad; lateral margins weakly indicated, moderately converging caudad, more decidedly converging cephalad; median carina weak but apparent, connecting by a weakly indicated V-shaped fork with the lateral margins of the fastigium, which latter it delimits ventrocephalad: frontal costa but faintly sulcate dorsad of the median ocellus, more distinctly so for a short distance ventrad of the same; costa faintly and broadly constricted dorsad at its junction with the fastigium, thence gently expanding to between the antennal bases, when it is slightly broader than the proximal antennal joint, thence moderately narrowing around the median ocellus, subequal for a distance to near the clypeal suture, where the subobsolete margins diverge sharply and irregularly. Eyes but moderately prominent, when seen from cephalic aspect with the width across them subequal to that across genae; basal outline of eye broad subreniform ovate, the depth faintly greater

than that of the infra-ocular sulcus. Antennae relatively short, less than the dorsal length of the head and pronotum combined, simple, slender, subdepressed proximad (except for the two proximal segments), apex appreciably cochleate ventrad.

Pronotum narrowing cephalad, broad caudad, in dorsal silhouette regularly enlarging caudad, greatest (caudal) width of metazonal disk slightly less than greatest length of disk; in profile the prozonal (*sensu latiore*) portion of disk is moderately but very appreciably sub-bullate, higher cephalad than caudad, in section subtectate, metazonal section gently arcuate in profile, but not at all bullate: surface of pronotum irregularly, but generally transverse, rugulose on prozona; cribroso-punctulate on metazona, lateral lobes as well as disk: cephalic margin of disk weakly obtuse-angulate, the immediate angle narrowly truncate, small but appreciable and well-spaced strumositities beading the cephalic margin of disk and to an extent on dorsal section of lateral lobes; caudal margin of disk broad sub-arcuate obtuse-angulate, the margins appreciably sinuate, cingulate: metazona almost one and a half times the prozonal length: median carina of disk delicate but evident, although subobsolete shortly cephalad of the transverse sulcus, weakly subcristate near cephalic margin; lateral carinae obsolete, on prozona represented solely by several small nodes; metazonal shoulders decided but broadly rounded, non-carinate: usual median mesozonal elevation weakly indicated by a sublongitudinal horse-shoe shaped area outlined by carinulations, little distinct, however, in the general subtumidity of that section: principal transverse sulcus deeply impressed, the prozonal sulci evident, but less deeply, on the lateral portions of disk and lateral lobes, obsolete near median line. Lateral lobes of pronotum with greatest depth subequal to greatest dorsal length, the greatest depth caudad; cephalic margin moderately sinuate; ventro-cephalic angle narrowly rounded rectangular; ventral margin arcuate-emarginate cephalad, with the ventro-caudal angle moderately arcuate; caudal margin nearly straight, faintly oblique: surface of prozona of lobes in general smoother than metazona, but with several obliquely disposed subacute, though relatively low, nodes.

Tegmina but slightly surpassing the apex of the abdomen, their greatest breadth contained slightly more than five times in their length: texture markedly coriaceous proximad and mesad, becoming more transparent in distal portion: areolation as a whole close, very close in the coriaceous section, distad the individual areolae average nearly quadrate: costal margin with a distinct and rather elongate, though but moderately deep, proximal lobation, in distal third the margin is regularly arcuate to the rounded rectangular apex, where the tegmen is but two-fifths as wide as at widest point; sutural margin in general nearly straight, distal concavity appreciable but very slight; distal margin strongly oblique, moderately arcuate: intercalary vein distinct, proximad equidistant from the median and ulnar veins, distad quite close to the median vein: anal field broad, at widest point equal to two-fifths of the entire tegminal width. Wings moderately elongate, their greatest width contained one and four-fifths times in the greatest length of the same; apex rounded rectangular; axillary field arcuate lobulate: areolation of anterior

and axillary fields regular, close, relatively small, the areolae in general quadrate, proximal the cross-veins are very close and much more numerous than in *A. caeruleipennis*.

Interspace between the mesosternal lobes quadrate, slightly transverse, the margin of the lobes rounded meso-caudad: interspace between the metasternal lobes moderately transverse, faintly narrower than the mesosternal interspace. Ovipositor jaws relatively heavy, subcompressed, little recurved, jaws blunted.

Cephalic and median limbs of medium length. Caudal femora of average form, in length slightly more than half the length of the tegmen, greatest depth contained three and three-quarters times in the greatest length; lamellation of dorsal carina weakly indicated in proximal half; external pagina regularly and sharply plicated: caudal tibiae slightly shorter than the caudal femora, armed on the external margin with eight to nine spines, on internal margin with ten to eleven spines, the internal spines slightly longer than external spines, the internal spines appreciably curved: caudal tarsi short, metatarsus subequal in length to the remaining tarsal joints.

*Allotype*.—♂; El Paso, El Paso County, Texas. Elevation, 4200 feet. July 11, 1907. (Rehn and Hebard; edge of mesa.) [Hebard Collection.]

*Description of Allotype*.—Differing from the description of the female in the following noteworthy features. Size relatively and proportionately small: form more slender than in female sex. Fastigium slightly more longitudinal than in female, excavation of fastigium and prominence of median carina more evident than in female sex; frontal costa of the general type of the female but narrower, with the constriction subobsolete, sulcation distinct, quite deep and continuous from fastigium to a short distance dorsad of the clypeal suture: width across eyes very distinctly greater than that across genae, the latter nearly vertical. Eyes large, very prominent, the depth equal to one and one-half times that of the infra-ocular sulcus. Antennae slightly longer than the length of the head and pronotum, very faintly enlarged distad. Tegmina surpassing the apex of the abdomen by slightly more than the combined length of the head and pronotum, greatest width of tegmen contained nearly six times in greatest length of same, width of tegmen at distal margin about half that at point of greatest width. Wings with the greatest width contained twice in the greatest length of the same. Interspace between the mesosternal lobes quadrate, faintly transverse: interspace between the metasternal lobes quadrato-cuneate. Caudal tibiae with nine external and ten internal spines.

General color tulleul-buff to vinaceous-buff, occasionally with head and thorax, as well as proximal portion of the tegmina, but all to variable degrees, washed with very weak chamois to cinnamon-buff, the face frequently nearly hoary white. Venter and abdomen largely hoary white in individuals not discolored, dorsal surface of abdomen washed proximad with orient blue and deep orient blue to porcelain blue, this variable in depth and always extending distad as a thread for a considerable distance along the dorsal carina of the abdomen. Eyes ochraceous-buff to buckthorn brown. Antennae



obscurely annulate ochraceous and dull brown, occasionally washed with rufescent. Rarely the fastigium, face and genae obscurely and rather minutely mottled with greenish blue and rufescent. Pronotum with caudal margin of disk obscurely and sparsely beaded with dark; rarely the vicinity of the humeral shoulders is washed with rufescent; occasionally the disk is obscurely and finely mottled with pale greenish. Tegmina with rather obscure markings of bone brown, which are as a rule areolate, forming, however, three principal groupings or broken transverse bands, one at proximal fourth, one mesad and the third near the distal third; these bands are not at all complete, are irregular in outline and more evident in the male sex than in the female; the distal one is obsolete in several specimens and the distal section and the anal field are supplied with a variable number of areolae of the darker color, these not strongly contrasted. Wings with disk a beautiful chapman's blue, regularly paling distad, the blue much less extended on anterior field than elsewhere; no wing-band present; veins along costal margin, in the usual position of the spur, and in the areas which are distad of the wing band in species so supplied, fuscous. Limbs largely hoary white, clouded, subannulate and mottled to variable degrees with weak dull blue-gray; carinae of caudal femora sparsely and irregularly beaded with blackish brown; genicular arches of caudal femora yellow ocher, bordered ventrad by a broad patch of dull fuscous; caudal tibiae hoary white with a faint wash of pale veronese green, proximad with bluish gray cloudings; spines brownish distad, black tipped. Ovipositor jaws tipped and margined with bone brown.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Greatest (caudal) width of pronotum	Length of tegmen	Length of caudal femur
♂					
El Paso, Texas, <i>paratype</i> . . . . .	23	4.9	4.3	24.5	12.3
El Paso, Texas, <i>allotype</i> . . . . .	23.4	5	4.2	25.2	13.3
♀					
El Paso, Texas, <i>type</i> . . . . .	40.6	7.2	6.2	34	18.5
El Paso, Texas, <i>paratype</i> . . . . .	39.3	7	6	34	18
Franklin Mountains, Texas, <i>paratype</i> . . . . .	33.5	7	5.8	31.5	17

All of the material of this species which we have seen has already been reported by Rehn and Hebard. We have at this writing nothing further to add to the habitat information already published. All of the nine specimens (two males, seven females) previously reported are now before us and are, other than the type and allotype, considered paratypes.

We take great pleasure in dedicating this beautiful, interesting and rare species to our colleague, Mr. Morgan Hebard, as a slight token of appreciation of his excellent and indefatigable work in the field and in the laboratory, and of a friendship of many years.

## EXPLANATION OF PLATES

## Plate XXVI

- Fig. 1.—*Derotmema haydenii mesembrinum* new subspecies. Lateral outline of head and pronotum of male (*type*). Double Windmill, Texas. ( $\times 6$ )
- Fig. 2.—*Derotmema haydenii mesembrinum* new subspecies. Dorsal outline of head and pronotum of female (*allotype*). Marfa, Texas. ( $\times 4$ )
- Fig. 3.—*Derotmema haydenii haydenii* (Thomas). Lateral outline of head and pronotum of male. Cheyenne, Wyoming. ( $\times 6$ )
- Fig. 4.—*Derotmema haydenii haydenii* (Thomas). Dorsal outline of head and pronotum of female. Cheyenne, Wyoming. ( $\times 4\frac{1}{2}$ )
- Fig. 5.—*Derotmema piute* new species. Cephalic outline of head of female (*type*). Mason, Nevada. ( $\times 4\frac{1}{2}$ )
- Fig. 6.—*Derotmema piute* new species. Dorsal outline of head and pronotum of female (*type*). Mason, Nevada. ( $\times 4\frac{1}{2}$ )
- Fig. 7.—*Derotmema piute* new species. Lateral outline of head and pronotum of female (*type*). Mason, Nevada. ( $\times 4\frac{1}{2}$ )
- Fig. 8.—*Derotmema piute* new species. Lateral outline of ovipositor jaws of female (*type*). Mason, Nevada. ( $\times 10$ )
- Fig. 9.—*Mestobregma impexum* new species. Lateral outline of head and pronotum of male (*type*). Milford, Utah. ( $\times 5$ )
- Fig. 10.—*Mestobregma impexum* new species. Cephalic outline of head of male (*type*). Milford, Utah. ( $\times 5$ )
- Fig. 11.—*Mestobregma plattei plattei* (Thomas). Lateral outline of head and pronotum of male. Newcastle, Wyoming. ( $\times 5$ )
- Fig. 12.—*Mestobregma plattei plattei* (Thomas). Cephalic outline of head of male. Newcastle, Wyoming. ( $\times 5$ )
- Fig. 13.—*Mestobregma terricolor* new species. Cephalic outline of head of male (*type*). Pecos, Texas. ( $\times 5$ )
- Fig. 14.—*Mestobregma terricolor* new species. Lateral outline of head and pronotum of male (*type*). Pecos, Texas. ( $\times 5$ )
- Fig. 15.—*Mestobregma terricolor* new species. Dorsal outline of head and pronotum of male (*type*). Pecos, Texas. ( $\times 5$ )

## Plate XXVII

- Fig. 16.—*Psinidia fenestralis frater* new subspecies. Lateral outline of head and pronotum of female (*type*). Katherine, Texas. ( $\times 4$ )
- Fig. 17.—*Psinidia fenestralis frater* new subspecies. Lateral outline of ovipositor jaws of female (*type*). Katherine, Texas. ( $\times 12$ )
- Fig. 18.—*Psinidia fenestralis frater* new subspecies. Dorsal view of antenna of female (*type*). Katherine, Texas. ( $\times 4\frac{1}{2}$ )
- Fig. 19.—*Psinidia fenestralis fenestralis* (Serville). Lateral outline of head and pronotum of female. De Leon Springs, Florida. ( $\times 5\frac{1}{2}$ )
- Fig. 20.—*Psinidia fenestralis fenestralis* (Serville). Lateral outline of ovipositor jaws of female. De Leon Springs, Florida. ( $\times 10$ )
- Fig. 21.—*Psinidia fenestralis fenestralis* (Serville). Dorsal view of antenna of female. De Leon Springs, Florida. ( $\times 6$ )

- Fig. 22.—*Anconia hebardii* new species. Lateral outline of head and pronotum of female (*type*). El Paso, Texas. ( $\times 4\frac{1}{2}$ )
- Fig. 23.—*Anconia hebardii* new species. Cephalic outline of head of female (*type*). El Paso, Texas. ( $\times 4$ )
- Fig. 24.—*Anconia hebardii* new species. Lateral outline of head and pronotum of male (*allotype*). El Paso, Texas. ( $\times 4$ )
- Fig. 25.—*Anconia caeruleipennis* Bruner. Lateral outline of head and pronotum of female (*type*). Hawthorne, Nevada. ( $\times 2\frac{1}{2}$ )
- Fig. 26.—*Anconia caeruleipennis* Bruner. Cephalic outline of head of female (*type*). Hawthorne, Nevada. ( $\times 4$ )

### Plate XXVIII

The figures on this plate are reproduced natural size.

- Fig. 1.—*Derotmema haydenii mesembrinum* new subspecies. Male (*type*). Double Windmill, Texas.
- Fig. 2.—*Derotmema haydenii mesembrinum* new subspecies. Female (*allotype*). Marfa, Texas.
- Fig. 3.—*Derotmema haydenii haydenii* (Thomas). Male. Colorado Springs, Colorado.
- Fig. 4.—*Derotmema haydenii haydenii* (Thomas). Male. Near La Junta, Colorado.
- Fig. 5.—*Derotmema haydenii haydenii* (Thomas). Female. Cheyenne, Wyoming.
- Fig. 6.—*Derotmema haydenii haydenii* (Thomas). Female. Knob Hill, Colorado Springs, Colorado.
- Fig. 7.—*Derotmema haydenii rileyianum* (Saussure). Male (*topotype*). Salmon City, Idaho.
- Fig. 8.—*Derotmema haydenii rileyianum* (Saussure). Female. Baker City, Oregon.
- Fig. 9.—*Derotmema piute* new species. Male (*paratype*). Mina, Nevada.
- Fig. 10.—*Derotmema piute* new species. Female (*paratype*). Mina, Nevada.
- Fig. 11.—*Mestobregma plattei plattei* (Thomas). Male. Newcastle, Wyoming.
- Fig. 12.—*Mestobregma plattei plattei* (Thomas). Female. Newcastle, Wyoming.
- Fig. 13.—*Mestobregma impexum* new species. Male (*paratype*). Milford, Utah.
- Fig. 14.—*Mestobregma impexum* new species. Female (*allotype*). Milford, Utah.
- Fig. 15.—*Derotmema piute* new species. Female (*paratype*). Mason, Nevada.
- Fig. 16.—*Mestobregma terricolor* new species. Male (*paratype*). Pecos, Texas.
- Fig. 17.—*Mestobregma terricolor* new species. Female (*paratype*). Pecos, Texas.
- Fig. 18.—*Psinidia fenestralis frater* new subspecies. Male (*paratype*). Galveston, Texas.
- Fig. 19.—*Psinidia fenestralis frater* new subspecies. Female (*paratype*). Katherine, Texas.
- Fig. 20.—*Anconia caeruleipennis* Bruner. Female (*type*). Hawthorne, Nevada.
- Fig. 21.—*Anconia hebardii* new species. Male (*allotype*). El Paso, Texas.
- Fig. 22.—*Anconia hebardii* new species. Female (*type*). El Paso, Texas.



NEW GENERA AND SPECIES OF MELANOPLI FOUND  
WITHIN THE UNITED STATES (ORTHOPTERA;  
ACRIDIDAE)

BY MORGAN HEBARD

Part II

This is the second of a series of papers on undescribed Melanopli found in the United States. It was originally intended to include in the first paper, published in June, 1918,<sup>1</sup> all of the new forms found in the Philadelphia Collections, except those of the genus *Melanoplus*, but active duty in the Army prevented completion of the work to that point. Two new genera, ten new species and one new geographic race were there described. In the present paper twelve new species and one new geographic race are described, carrying this work through the first group of the genus *Melanoplus* with two eastern species in addition.

As in the first paper, the sequence of species described is in accordance with the revised arrangement of the species, from the preliminary studies already completed for the North American Melanopli.<sup>2</sup> Scudder's grouping of many of the forms has been found incorrect, and, particularly in the genus *Melanoplus*, his "Series" are in so many cases composed of widely separated species, that we have been obliged to institute a very different arrangement and have decided to rearrange the species into units which we have given "Group" designation. It should, therefore, be borne in mind that our Groups do not in any way correspond to Scudder's "Series."

<sup>1</sup>Trans. Am. Ent. Soc., xlv, pp. 141 to 169.

<sup>2</sup>We would note that our monotypic genus *Argiacris*, described in our first paper, comes between *Asemoplus* and *Bradynotus*. This genus was there described, in order to be able to make known one of the most distinctive units found among the undescribed forms at hand. One of our statements concerning this genus is, in part, incorrect. It is not distinguished from *Podisma* by the produced caudal margin of the pronotum, for in *Podisma*, as in *Melanoplus*, some of the groups are comprised of species which have the caudal margin of the pronotum angulate produced, while others have it weakly emarginate to different degrees.

A detailed discussion of the problems found in the genus *Melanoplus* will be given at a later date. For the present we would remark only one vital error in Scudder's treatment. That author's efforts were concentrated in an attempt to find some valid character to separate *Melanoplus* from *Podisma*. He determined the fact that the typical species of *Melanoplus* had a narrow mesosternal and metasternal interspace, while in typical species of *Podisma* these intervals were wider. Further study showed that this was not universal, but he considered it the most satisfactory feature for the generic assignment of species, and separated *Melanoplus* from *Podisma* thereby in his key.

After careful study of the situation, we have found that the width of the mesosternal and metasternal interspaces is subject to such individual variation that it is frequently of no diagnostic value, even for specific separation. In addition, we note that the forms of the Melanopli developed in a temperate environment have in the great majority of cases the mesosternal and metasternal interspaces narrow, while those developed in an arctic or arctic alpine environment have these interspaces usually broad. As a result, we find that arctic or arctic alpine species of *Melanoplus* have the mesosternal and metasternal interspaces fully as broad as in the species of *Podisma*, the majority of the species of which genus are found in arctic or arctic alpine regions. We are unable to find a single diagnostic feature to separate these genera. That *Melanoplus* and *Podisma* represent two distinct units is clear. In each case the genus divides into numerous sections, many of which are readily separable from the others by distinctive features. In fact we again find a situation much resembling that which occurs in the Tettigoniid genera *Conocephalus* and *Orchelimum*, and of which Rehn and Hebard have said, "Material of the two genera is easily separated by a decidedly different general appearance, but when the characters of the two are compared, the variation in each genus leaves us unable to state a single absolute difference."

As a result of Scudder's misconception of the significance of the widening of the mesosternal and metasternal interspaces, that author assigned to *Podisma* the following species, all of which are clearly members of the genus *Melanoplus*: *nubicola* Scudder, *stupefacta* Scudder, *dodgei* (Thomas), *ascensor* Scudder,

*marshallii* (Thomas), *oregonensis* (Thomas) and *frigida* (Boheman). Puschnig has more recently described still another European species of *Melanoplus* as a *Podisma*, this being *prossenii* from the Eisenhut in Carinthia.

We would remark that, as a result of the above assignments, all of the North American species remaining in the genus *Podisma* have the caudal margin of the pronotum concave and entirely lack organs of flight. To the genotype of *Podisma*, which is *pedestris* (Linnaeus), three North American species of *Asemoplus*, *hispidus* (Bruner), *somesi* here described and *rainierensis* Caudell, show a strong general similarity, but, in our opinion, represent a section of another valid unit. This unit, however, is almost as difficult to define as those discussed above.

In the preparation of the present paper we have met with most kind and hearty cooperation from many of our fellow workers. We are particularly indebted to Dr. E. M. Walker of the University of Toronto, Mr. Wm. T. Davis of New York and Mr. M. P. Somes, now of Kalispell, Montana. These gentlemen have furnished material which has increased the number of undescribed forms studied and has assisted in important comparative studies.

It must also be remembered that very large series are now assembled for a study of the North American Melanopli, and that these have proved invaluable in preparing the present series of preliminary papers. Without the opportunity to study these series, we would not be able to handle the problems involved with anything like the assurance we now consider ourselves justified in feeling. For the opportunity to study very important sections of these series we are deeply indebted to Mr. James A. G. Rehn of the Academy of Natural Sciences of Philadelphia, Dr. Samuel Henshaw of the Museum of Comparative Zoology and Mr. A. N. Caudell of the United States National Museum. In the present paper one thousand and forty-three specimens are recorded, one thousand and eleven of these belonging to the Philadelphia Collections.

**Hesperotettix pacificus capillatus**<sup>3</sup> new geographic race (Plate XXIX, fig. 1.)

1897. *Hesperotettix pacificus* Scudder, Proc. U. S. Nat. Mus., xx, p. 61. (In part.) [♀; San Buenaventura, California.]<sup>4</sup>

The present geographic race and *pacificus pacificus* Scudder, both show considerable size, tegminal and color variation. Considering the fact that, as is usual in the present genus, the male genitalia show no differential characters, the characterization of these races is difficult. The series at hand, however, offer such convincing proof that separation must be made, that we feel no hesitancy in describing the present race.

This race is clearly a depauperate condition of the species and will probably be found locally distributed along the Californian coast, from Monterey Bay southward to the Santa Barbara Channel. The size averages smaller, the surface is not as smooth and the hairy covering is generally more pronounced, the antennae average distinctly shorter and the caudal femora are slightly less enlarged proximad, than in *pacificus pacificus*.

Both races develop a green, pale brown and dark brown color form. In the green condition of the present race no broad reddish annuli of the cephalic and median femora and broad pregenicular reddish annulus of the caudal femora are found, which markings are usually met with in this phase of typical *pacificus*, and *pacificus capillatus*, further, is normally much less brilliantly colored. In both green and brown phases this race usually has the characteristic buffy markings less conspicuous and reduced to a greater extent than is usual in *pacificus pacificus*.

*Type*.—♂; Del Monte, Monterey County, California. September 9 and 10, 1910. (Rehn and Hebard.) [Hebard Collection, Type no. 484.]

Size small for the genus, form slender, surface well supplied with minute pilose hairs, more thickly than is normal in *pacificus pacificus*. Eyes appreciably deeper than infra-ocular portion of the genae. Sulleation of the fastigium and frontal costa moderately decided, slightly more pronounced than in *pacificus pacificus*. Antennae short and stout for the genus, little longer than combined length of head and pronotum, shorter and stouter than in *pacificus*

<sup>3</sup> In allusion to the normally more hairy condition found in this race, when compared with the typical race of the species.

<sup>4</sup> An additional female from Scudder's series, in the Hebard Collection, labelled in pencil "Los Angeles, Cal. 1888," is referable to the present race. In this case, we believe the labelling to be incorrect, or inaccurate.



*pacificus*. Caudal margin of disk of pronotum obtuse-angulate produced, with immediate angle rather sharply rounded. Tegmina small elongate-oval pads, costal margin curving distad more sharply than sutural margin, forming an acute point directed dorso-caudad.<sup>5</sup> Genitalia showing no features of difference from *pacificus pacificus*. Caudal femora moderately enlarging proximad, appreciably less robust there than in *pacificus pacificus*.

*Allotype*.— ♀; same data as type. [Hebard Collection.]

Differs from the type in the following features. Size larger, form moderately stout for the genus. Suleation of the fastigium and frontal costa weaker and broader. Antennae even shorter, distinctly shorter than the combined length of the head and pronotum, distinctly shorter and stouter than in this sex of *pacificus pacificus*. Caudal margin of pronotum forming a more obtuse angulation. Genitalia as in this sex of *pacificus pacificus*.

*Measurements (in millimeters) of extremes only*

	Length of body	Length of antenna	Length of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
Type . . . . .	15.3	6.4	4.1	2.9	1.8	9.4
Paratypes (53)	13.5-16.5	5.8-6.8	3.5-4	2.5-3.2	1.2-1.7	8.2-9.5
♀						
<i>Allotype</i> . . . . .	19.8	5.7	5	3.7	2	10.7
<i>Paratypes</i> (16)	18-20.3	5.2-5.7	4.4-5	2.7-3.9	1.7-2	10-10.8

The female from San Buenaventura shows divergence toward *pacificus pacificus* only in having the caudal femora slightly heavier than is normal in the present race.

A single male of *pacificus pacificus* from Marcel, Kern County, California, shows some divergence toward the present race in the somewhat narrower tegmina and caudal femora, but in all other respects is typical.

*Coloration*.—Dark brown, lighter brown and yellowish green phases of coloration are found in *pacificus capillatus*. All of the males are brown and only a few show some recession in coloration; eleven of the nineteen females are brown, of the same shade as the paler males. In this phase the narrow buffy medio-longitudinal dorsal line and narrow bar or bars<sup>6</sup> of the postocular portion of the genae and prozonal portion of the lateral lobes of the pronotum are distinct but not conspicuous. The external faces of the caudal femora are suffused proximad, mesad and in the pre-genicular area with dark brown, this sometimes greatly reduced, but in the majority distinct, the median and distal suffusions running across the dorsal surface as broad and distinct transverse bands.

<sup>5</sup> This feature varies individually in degree, but the entire series shows smaller and narrower tegmina, with apices less evenly rounded, than is shown in the considerable series of *pacificus pacificus* at hand.

<sup>6</sup> This is an individually variable feature. In the majority of specimens a narrow bar of buff is found below the broad dark bar of the prozonal portion of the lateral lobes of the pronotum. In others a trace of buff is shown also above the dark bar, and in some this is developed into a second bar of buff, as wide as or even wider than the ventral buff bar.

In the females the medio-longitudinal buffy line is broader, and in yellowish-green individuals is often conspicuously margined with brown, which is most decided on the abdomen. In this phase the buffy lateral markings are sometimes greatly reduced or wholly obsolete, as is also the dark band of the prozonal portion of the lateral lobes. In the paler brown examples the caudal femora have the darker suffusions reduced, the dorsal surface unicolorous; in the yellowish green individuals these suffusions usually disappear, rarely being weakly indicated, the dorsal surface washed with pale brown. No trace of pink pre-genicular annuli is found in the present series.

The slightly rougher surface and more numerous hairs of the majority of examples of the present race, gives the series less of the smooth and shining facies of the series of *pacificus pacificus* at hand.

*Specimens Examined:* 74; 54 males and 20 females.

CALIFORNIA: Del Monte and San Buenaventura.

With one exception, these specimens were taken at Del Monte by Hebard on August 20, 1909, and by Rehn and Hebard on September 9 and 10, 1910, and, excluding the type and allotype, are designated as paratypes. The female, recorded by Scudder from San Buenaventura, belongs to the United States National Museum.

At Del Monte this insect was found scarce on the shore side of the sand dunes, in low scattered grasses and bushes, where a low yellow-flowered "tar-weed" was conspicuous. In this situation more individuals were met with than elsewhere, particularly in the sand-loving Composite bush, *Chrysoma cricoides* (Less.). This race was also present, but scarce, in extensive open areas of short dry grass, where also much of the low yellow-flowered "tar-weed" was found. Orthoptera was present in great numbers in these areas, much the most abundant species being *Melanoplus microtatus*, here described, while *Melanoplus devastator* Scudder was very numerous and the species here described as *Oedalconotus phrynicus* and *fratercula* were frequently encountered.

#### AEOLOPLUS Scudder

1897. *Acoloptus* Scudder, Proc. Am. Acad. Arts and Sciences, xxxii, p. 199.

1897. *Acoloptus* Scudder, Proc. U. S. Nat. Mus., xx, p. 68.

1916. *Acoloplides* Caudell, Proc. U. S. Nat. Mus., xlix, p. 28.

The above synonymy is the result of Caudell's misinterpretation of the original type designation. The type of the genus is not "*Caloptenus regalis* by original designation," as stated by that author. Scudder gives *Acoloptus regalis* as type, without

further citation of author. This species is *Aeoloplus regalis* of Scudder and not *Caloptenus regalis* of Dodge. Scudder had a species of *Aeoloplus*, which he described and referred to *regalis* of Dodge, but with uncertainty, as his comments on page 73 show. Had Scudder given *Aeoloplus regalis* Dodge as genotype, Caudell's action would have been correct; but it is the species described by Scudder, not Dodge's species, which Scudder designated as genotype. It has been ascertained that *Caloptenus regalis* Dodge is a member of the genus *Melanoplus*; *Aeoloplus regalis* Scudder has been correctly renamed by Caudell,<sup>7</sup> and now stands as *Aeoloplus bruneri* Caudell, type of the genus *Aeoloplus*.

***Aeoloplus eremiaphila***<sup>8</sup> new species (Plate XXIX, figs. 2 and 3.)

The present species is the smallest known representative of the genus. The tegmina vary from ovate, but attinent, to a half fully-developed condition. The caudal femora do not have the margin of the ventral surface produced proximad in a shielding plate. In position we would place this insect after *A. chenopodii* (Bruner) and before *A. turnbulli* (Thomas), to the latter of which species it shows nearest relationship.

Comparing series including the types of *chenopodii* and *eremiaphila*, the former species is found to be larger and slightly heavier in structure, with vertex slightly broader, eye not as large in relative proportion, in length only slightly exceeding the genae, caudal margin of pronotum much more truncate, tegmina ovate and lateral, never attinent, subapical tubercle of male subgenital plate less acute, and coloration and color pattern distinctive.

Compared with a series of the more closely related *turnbulli*, that species is found to differ in its larger size, slightly more produced vertex, distinctly smaller eye in relative proportion, which in length is about equal to or slightly less than that of the genae, less definitely atrophied tegmina and wings even in the condition of maximum reduction, presence of a green as well as a brown color phase and coloration and color pattern distinctive.

*Type*.—♂; Foothills of Singatse Range at Mason, Lyon County, Nevada. Elevation, 4600 feet. September 6, 1910. (Rehn and Hebard.) [Hebard Collection, Type no. 485.]

Size very small for the genus; form moderately robust, medium for the genus. Fastigium of vertex very blunt, very slightly produced; eyes prominent, in

<sup>7</sup> Proc. Ent. Soc. Wash., viii, p. 134, (1907).

<sup>8</sup> From *ἐρημία* and *φίλη*, a lover of the desert.

length considerably greater than the genae. Pronotum with transverse sulci apparent but not pronounced, those cephalad feeble; medio-longitudinal carina of metazona distinct; caudal margin obtuse-angulate produced with apex rounded. Tegmina small, sub-ovate, attinent pads, about as long as pronotum,<sup>9</sup> with apices rather sharply rounded. Cerci simple, moderately broad and compressed at base, tapering slightly and evenly in proximal half, the distal half very slender, nearly subequal in width to the rounded apex. Sub-apical tubercle of subgenital plate decided, its apex as slender and sharply rounded as the cercal apices. Cephalic and median femora almost straight and moderately heavy, not as much bowed or as heavy as in this sex of the majority of the species of *Acoloplus*.<sup>10</sup> Median tibiae scarcely at all curved. Caudal femora without margin of ventral surface produced proximad in a shielding plate.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Agrees with the type in ambisexual features, differing in the following respects. Size slightly larger,<sup>11</sup> form appreciably heavier. Fastigium of vertex broader. Ovipositor valves with apices moderately elongate and gently curved. Cephalic and median femora longer and more slender. Median tibiae straight.

*Measurements (in millimeters)*

	♂	Length of body	Length of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
Singatse Range, Mason, Nevada, <i>type</i> . . . . .		12	3	2.9	1.9	6.9
Singatse Range, Mason, Nevada, <i>paratype</i> . . . . .		12.1	3	3.6	2	6.8
Singatse Range, Mason, Nevada, <i>paratype</i> . . . . .		12.4	3.3	4.7	2.1	7
	♀					
Singatse Range, Mason, Nevada, <i>allotype</i> . . . . .		14.3	3.3	3.2	2	7.7
Singatse Range, Mason, Nevada, <i>paratype</i> . . . . .		15.1	3.6	3.3	2	7.8
Mina, Nevada . . . . .		16.5	3.7	5.8	2.1	8
Mina, Nevada . . . . .		15.5	3.4	6	2.2	8
Mina, Nevada . . . . .		16.3	3.9	6.2	2.3	8.6
Pilot Mountains, Nevada . . .		15	3.6	5.9	2.2	8
Pilot Mountains, Nevada . . .		16.2	3.5	5.6	2	8
Pilot Mountains, Nevada . . .		16.5	3.8	5.9	2.2	8.1

<sup>9</sup> The tegmina vary in the present species from this type to a half fully-developed condition. Though clearly largely individual, geographic distribution may prove to have some effect on this feature. See table of measurements.

<sup>10</sup> Examination of the material at hand shows these to be secondary sexual features, as is the curvature of the median tibiae, differing in degree of development in the male sex of different species of the genus.

<sup>11</sup> The majority of females at hand are distinctly larger than the type.

In the examples having the longest tegmina, these organs are decidedly attenuate in their distal two-fifths, due to the fact that the costal and sutural margins show a very strong convergence in the third fifth of the tegmen.

In the condition of maximum tegminal reduction, the wings are minute and greatly atrophied. From this condition, they develop to fully as long as the tegmina in the condition of maximum tegminal development.

*Coloration.*—*Type.* Head cinnamon-buff, microscopically flecked with blackish brown; this increasing on the vertex and occiput, there forming an inconspicuous longitudinal band. Eyes clay color, microscopically marked with a network of blackish brown. Antennae pinkish cinnamon. Pronotum and tegmina sayal brown, with microscopic flecks and longitudinal streaks of bistre; prozona showing an indistinct medio-longitudinal band of blackish brown, but with median carina sayal brown; lateral lobes with a longitudinal blackish suffusion dorsad before the principal sulcus. Cephalic limbs and underparts cinnamon-buff; median limbs of the same coloration but flecked with blackish brown. Caudal femora cinnamon-buff, with the three dark areas, characteristic of the species of the genus, heavy and blackish brown. Abdomen cinnamon-buff with proximal segments blackish brown proximad.

Little color variation is shown by the present series. A few individuals are somewhat recessive in coloration and in these the general coloration is clay color, with all darker markings reduced, the pronotal markings and those of the caudal femora weak and poorly defined. One such example from the Pilot Mountains has the caudal femoral markings obsolete.

*Specimens Examined:* 11; 3 males and 8 females.

NEVADA: Foothills of Singatse Range at Mason, Mina and Pilot Mountains, three miles east of Mina.

The series examined, in addition to the type and allotype, are considered paratypes. All were taken by Rehn and Hebard.

The desert valley at Mina, 4800 to 5300 feet in elevation, with long and very gradual alluvial slopes running down into a large central playa, proved an area of scarce insect life. But, from the several species of dense and heavily thorned, leafless bushes on the slopes, three specimens of this species were secured after long and careful search. On the same day, three miles distant in the sterile and desert Pilot Mountains, three more specimens were taken. These were found in similar thorn bushes, scattered over the almost bare slopes at the foot of precipices and at the heads of cañons, at 5500 to 5700 feet. Great numbers of these bushes were examined, the only Orthoptera there found being the few specimens of the present species, *Ligurotettix coquilletti* McNeill in moderate numbers, and a single specimen of a Decticid which has as yet not been studied.

Two days later at Mason, in a generally similar area and from similar but heavier thorn bushes, five more individuals were

secured, at elevations from 4500 to 5200 feet in the foothills of the Singatse Range. The most successful method of capturing these specimens was to tramp down the brittle thorn bushes, in which case individuals of *Liguotettix coquillettei* McNeill would fly swiftly to other adjacent bushes, but those of the present species would appear confused and could be taken by exercising reasonable caution. When this method was not followed, these little insects were found to slip about in the dense twigs and thorns with great agility and would occasionally disappear, leaving the pursuer baffled, with hands usually well scratched.

#### OEDALEONOTUS Scudder

1897. *Oedaleonotus* Scudder, Proc. Am. Acad. Arts and Sciences, xxxii, p. 203.

1897. *Oedaleonotus* Scudder, Proc. U. S. Nat. Mus., xx, p. 390.

After careful consideration we find that the present genus, in addition to the species referred to it by Scudder, properly includes all the species which that author assigned to the Borekii Series of the genus *Melanoplus*, with the exception of *Melanoplus scitulus* Scudder.

The genus *Oedaleonotus* will be fully discussed at a later date. This rearrangement is noted here only in order to explain the generic assignment of the following new species.

***Oedaleonotus phryneicus***<sup>12</sup> new species (Plate XXIX, figs. 5 and 6.)

1908. *Melanoplus tenuipennis* Caudell (not of Scudder, 1897), Proc. U. S. Nat. Mus., xxxiv, p. 78. [Guadalupe, California.]

Closely related to *O. tenuipennis* (Scudder), (see plate XXIX, fig. 7), which species differs from *phryneicus* in the average lighter build, particularly in the females, decidedly weaker and less irregular median and lateral carinae of the pronotum, less decidedly inflated prozona, less decided pronotal sulci and in particular the less decided channel of the first sulcus dorsad on the lateral lobes, where its termination occurs, less decided expansion of the pronotal disk caudad, this more decided in females, and less heavily pitted metazona and corresponding portion of the lateral lobes.

*Type*.—♂; Del Monte, Monterey County, California. August 20, 1909. (M. Hebard.) [Hebard Collection, Type no. 486.]

Size medium for the genus, form moderately robust. Head much as in *tenuipennis*. Pronotum with median and lateral carinae and sulci decided; lateral carinae feebly concave and feebly expanding on the prozona, more

<sup>12</sup> From *φρόνος* = a toad, and *εἰκός* = like. In allusion to the squat, rough appearance, particularly of females of the present species.

strongly expanding caudad on the metazona; channel of the first sulcus dorsad on the lateral lobes, where its termination occurs, brief but deep, margined caudad with a conspicuous fleck of pale coloration; prozona distinctly inflated; caudal margin of disk transverse, showing a feeble obtuse-angulate emargination mesad, the two halves thus formed feebly convex. Tegmina lateral oval pads,<sup>13</sup> distinctly shorter than the pronotum, well separated. Genitalia as in *tenuipeennis*. Longitudinal marginal carinae of the caudal femora pronounced.

*Allotype*.— ♀; same data as type. [Hebard Collection.]

Similar to the male type except in the following features. Size decidedly larger, form very robust. All pronotal features intensified. The lateral carinae of the disk of the pronotum show microscopic pits, which give them an irregular roughened appearance; these carinae expand throughout their length, so that the caudal width of the pronotal disk is decidedly greater than the cephalic width, and very much more closely approximates the pronotal length than in this sex of *tenuipeennis*. Tegmina<sup>14</sup> separated by a greater interspace. Ovipositor valves as in *tenuipeennis*.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Cephalic width of pronotum	Caudal width of pronotum	Length of tegmen	Width of tegmen
Del Monte, California, type . . . . .	16.5	4.1	2	3.1	2.8	1.8
Del Monte, California, paratype . . . . .	15.5	3.9	1.9	3	3.2	1.8
Del Monte, California, paratype . . . . .	18.5	4.7	2.1	3.3	3.8	2
Del Monte, California, paratype . . . . .	19.2	4.9	2	3.2	3.2	2.1
Del Monte, California, paratype . . . . .	18	4.3	2	3.2	2.8	1.8
♀						
Del Monte, California, allotype . . . . .	22.8	5.8	2.7	5	3.4	2.5
Del Monte, California, paratype <sup>15</sup> . . . . .	19.5	4.9	2.5	3.8	2.6	2.2
Del Monte, California, paratype . . . . .	17.2	4.4	2.6	4.1	3.2	2
Del Monte, California, paratype . . . . .	16.2	4.3	2.2	4	2.7	1.8
Del Monte, California, paratype . . . . .	20	5.5	2.7	4.8	3.1	2.6
Del Monte, California, paratype . . . . .	22.9	6.2	2.8	5.1	4	2.6
Monterey, California . . . . .	23	5.5	3.1	5.2	4	2.7

<sup>13</sup> Varying in the males from elongate oval to (rarely) broad oval.

<sup>14</sup> More variable in relative size and form than in males.

<sup>15</sup> In this specimen the pronotal proportions are as found in *tenuipeennis*, but the individual is typical of *phryneivus* in all other respects.

The measurements give the extremes of the series. The specimen doubtfully recorded as *tenuipennis* by Seudder, from Monterey County, California, is an aberrant example of that species, showing no approach toward the present insect.

We would note that in this species, as well as in *tenuipennis*, the degree of expansion of the pronotum caudad is individually variable. The amount of expansion, however, in the present species averages very distinctly greater. The swelling of the cephalic portion of the pronotum also shows some individual variation, but the present species always shows this feature to some extent, and with its rugged structure and more strongly defined carinae is decidedly distinctive in appearance.

*Coloration.—Type.* Head ochraceous-tawny becoming darker, cinnamon brown, on the occiput, with a still darker, broad post-ocular bar of mummy brown on each side. Pronotum with disk appreciably darker than lateral lobes, cinnamon brown, with lateral carinae ochraceous-buff washed with tawny; lateral lobes ochraceous-buff washed with tawny, this heavier caudad, except on dorsal half of prozona which, not including the cephalic margin, is mummy brown with a conspicuous dorso-mesal fleck of ochraceous-buff where the channel of the first sulcus terminates.<sup>16</sup> Tegmina and dorsal surface of abdomen cinnamon brown. Cephalic and median limbs internally pinkish buff, externally clay color with irregular flecks of blackish brown, these markings heaviest distad on cephalic femora and mesad on median femora. Caudal femora sayal brown; external face with a heavy proximal area of blackish brown, another mesad which is larger and very broadly V-shaped with apex mesocephalad, and another distad, the raised carinae bounding this face pale, clay color; dorsal surface sayal brown, its external half immaculate, the heavy median carina and internal half with three broad dark bands, which continue on the internal face, disappearing there mesad; ventral surface brilliant dragon's blood red, this color suffusing also the proximal portion of the internal face. Caudal tibiae deep bluish gray green, with a broad proximal annulus of cinnamon-buff; spines whitish, tipped with black. Ventral surface cinnamon-buff.

Only a moderate degree of intensification and recession is shown by the large series at hand, the general coloration ranging from bister, with paler portions sayal brown (intensive), to sayal brown, with paler portions clay color (recessive).

*Specimens Examined:* 187; 89 males, 97 females, 1 gynandromorph.<sup>17</sup>

CALIFORNIA: Del Monte, Monterey and Guadalupe.

<sup>16</sup> This fleck is a distinctive feature in the present species; with hardly any exceptions, being conspicuous in the large series before us. Hardly ever does this marking appear in *tenuipennis*, and when present is inconspicuous.

<sup>17</sup> This specimen is remarkable in having the entire sinistral portion from head to apex of abdomen male, the dextral portion female. As a result, due to the disparity of size in the sexes of this species, this specimen is asymmetrical throughout. This is the second gynandromorph examined by us, the first being a specimen of the Tettigoniid, *Insara elegans consuetipes* (Seudder) recorded by Rehn and Hebard, Trans. Am. Ent. Soc., xl, p. 81, (1914).



A single male at hand, from the National Museum, was taken on sugar beets at Guadalupe, Santa Barbara County, on June 24, 1906, by A. N. Caudell. Excepting two males and four females from Monterey, captured by G. P. Englehardt on August 4, 1916, the remaining series was taken at Del Monte by Hebard on August 20, 1909, and by Rehn and Hebard on September 9 and 10, 1910; excepting the type and allotype, these are considered paratypes. On both occasions the species was found common, particularly in the extensive open areas of short dry grass, where a low yellow-flowered "tar-weed" was abundant.<sup>17</sup>

**Oedaleonotus fratercula** new species (Plate XXIX, fig. 4)

This, the smallest species of the genus, is seen to be in some ways annectant between the other forms of the genus and the distinctive *O. fuscipes* (Scudder).

This insect agrees with *fuscipes* in general contour and appearance, and in the male sex in the absence of furcula and presence of an apical tubercle on the subgenital plate. It differs from that species in the smaller size, slightly less robust form, appreciable, though weak, lateral carinae of the pronotum and, in the male, in the supra-anal plate, which is unspecialized toward the cereal bases and the cerci, which are more slender distad.

*Type*.—♂; Del Monte, Monterey County, California. September 9 and 10, 1910. (Rehn and Hebard.) [Hebard Collection, Type no. 487.]

Size small, smallest of the genus; form medium, slender for the genus. Head very similar to that of *fuscipes*, eyes slightly longer than genae as in that species. Pronotum with lateral carinae weak; median carina well developed on metazona, moderately developed on proximal portion of prozona, subsolate in intervening area; sulci moderately decided, the first the weakest; caudal margin of disk transverse, very feebly convex. Tegmina lateral, broadly oval pads, much shorter than pronotum, separated by a brief interspace.<sup>19</sup> Furcula absent. Supra-anal plate simple, elongate, triangular with margins gently convex and apex rounded, surface with a heavy and deep medio-longitudinal sulcation in proximal two-fifths, between the raised margins of this sulcation and the lateral margins it is broadly concave. Cerci proximad broad and moderately tumid, narrowing evenly in proximal three-fifths, distal two-fifths very narrow with apex rounded,<sup>20</sup> this portion curving moderately inward. Subgenital plate with a large and moderately blunt apical tubercle.

<sup>17</sup> See notes under *Hesperotettix pacificus capillatus* on page 262.

<sup>19</sup> The tegmina are occasionally attingent in this sex.

<sup>20</sup> The width of the distal portion of the cerci is seen to be variable to a certain degree in the males of *fratercula* at hand.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Similar to the male type except in the following features. Size decidedly larger; form robust, slenderest, however, for females of the species of *Oedaleonotus*. Pronotum similar, but with carinae and sulci all weaker. Tegmina very broad, sub-circular,<sup>21</sup> separated by a very slightly greater interspace. Ovipositor valves normal for the genus.

*Measurements (in millimeters) of extremes only*

	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
<i>Type</i> . . . . .	11.5	2.8	1.8	1.9	1.7	7.8
<i>Paratypes</i> (64)	10.8-13.7	2.7-2.9	1.8-1.9	1.9-2.6	1.7-1.8	7.3-8
♀						
<i>Allotype</i> . . . . .	14.3	3.8	2.8	2.2	2	9
<i>Paratypes</i> (70)	13-14.8	3.1-4	2.3-3	1.8-2.3	1.6-2.1	8.2-9.8

Though the series shows little variation in contour and pronotal expansion, the females exhibit decided variation in relative size of the tegmina.

*Coloration*.—Uniform pale avellaneous on face, genae (except for a broad post-ocular bar of clove brown and a subocular patch of the same color), ventral half of the lateral lobes of the pronotum (except a hair line of clove brown running down the second sulcus and curving cephalad in the mesal portion of this area), cephalic and median limbs (which, however, are flecked and washed with dark brown, particularly on their external faces) and underparts. Antennae avellaneous with a decided cinnamon tinge. Eyes tawny olive. Vertex and occiput, disk of pronotum (which, however, is paler toward the lateral carinae) and tegmina, saecardos umber. Dorsal half of lateral lobes of pronotum to principal sulcus occupied by a large, longitudinally rectangulate area of shining clove brown, separated from the cephalic margin by a narrow band of pale avellaneous; lateral lobes caudad of principal sulcus heavily washed with saecardos umber. Dorsal surface of abdomen avellaneous washed with saecardos umber, all but the distal segments heavily suffused laterad with blackish brown, each of which markings is invaded by an area of avellaneous meso-caudad; latero-proximal angles of subgenital plate heavily washed and flecked with blackish brown. Caudal femora clay color, external and dorsal faces crossed by three heavy, zig-zag bands of blackish brown, the two more distal of which also cross the internal face. Caudal tibiae pinkish buff washed and speckled with clay color, proximal spines blackish brown, distal (majority) spines blackish brown, buffy proximad on their convex dorsal faces.<sup>22</sup>

A usual amount of color variation is shown in the series, the intensive extremes having the dark patch of the lateral lobes of the pronotum and bands of the caudal femora very heavy and conspicuous. A few females are very pale, one in particular being clay color fading to cinnamon-buff on the abdomen, caudal femora and tibiae, the femoral bands very weak, sayal brown, showing only on the dorsal surface.

<sup>21</sup> In this sex rarely broad-ovate.

<sup>22</sup> This varies in the series to a condition in which the entire proximal portion of the majority of these spines is buffy.

Another exceptional and striking variation, but one which is found to crop out in other species of the genus as well, is a condition in which the pronotum has a broad band of cinnamon-buff on each side dorsad on the lateral lobes along the lateral carinae of the disk, while the dorsal surfaces of the caudal femora are also cinnamon-buff except the genicular areas which are suffused with dark brown, only a trace of the dark bars remaining. Two males and eight females of the present series show this condition to varying degrees; it is very striking and as fully developed as described above in but three of these.

*Specimens Examined:* 136; 65 males and 71 females.

CALIFORNIA: Del Monte.

The entire series of this interesting little insect was taken by Hebard on August 20, 1909, and by Rehn and Hebard on September 9 and 10, 1910. The species was found plentiful in the flat, open, sandy country, where much low grass and a low yellow-flowered "tar-weed" was to be found. This species was also found moderately abundant on a yellow-flowered Composite bush, *Chrysona ericoides* (Less.), growing about sand dunes near the shore.<sup>23</sup>

**Asemoplus somesi**<sup>24</sup> new species (Plate XXIX, figs. 8 and 9.)

1904. *Podisma polita* Caudell (not of Seudder, 1899), Ent. News, xv, p. 63. [♀; Kitchener Glacier on Mt. Kokanee, British Columbia.]

1907. *Asemoplus nudus* Caudell (not of E. M. Walker, 1898<sup>25</sup>), Proc. Ent. Soc. Washington, viii, p. 134. [♂, ♀; Paradise Valley, Mt. Rainier, Washington.]

1910. *Podisma nula* E. M. Walker (in part not *Asemoplus nudus* of E. M. Walker, 1898), Can. Ent. xlii, p. 333. [♂, ♀; Banff, Alberta, Canada, and referring Caudell's record of *Podisma polita* to this species.]

<sup>23</sup> See notes under *Hesperotettix pacificus capillatus* on page 262.

<sup>24</sup> We take pleasure in naming this species for Mr. M. P. Somes, who has done excellent work in Orthoptera in Minnesota, Iowa and Missouri, and who has frequently furnished us with material of great importance in our studies.

<sup>25</sup> Examination of the entire series of paratypes and the description and figures of *Asemoplus nudus* E. M. Walker and comparison with the type and allotype of *Pezotettix hispidus* Bruner, shows that *nudus* is an absolute synonym of the latter species. We have further learned from Dr. Walker that his original determination was *hispidus*, but that he wrote Seudder, sending material and asking if the specimens were not *hispidus*, to which a reply was received congratulating him on the discovery of a new species and making no allusion to *hispidus* whatever. Thus we find another synonym attributable largely to the carelessness of Seudder. Dr. Walker, a most careful and excellent student, was in this case the victim.

We would note that Seudder removed *hispidus* from *Pezotettix* to his new genus *Bradynotes*. This is unwarranted, the species being in no way a derivative from the *Bradynotes* stock and is best assigned to the genus *Asemoplus* as at present understood.

In general appearance the present insect shows very close similarity to *A. hispidus* (Bruner); to these species *A. rainierensis* Caudell shows also close resemblance, though having small, elongate-ovate tegmina.

From both of the above species *somesi* differs in the male genitalia having relatively large furecula, which are longer than their basal width, the lateral portions of the supra-anal plate not thickened and raised in a separate small but distinct flange opposite the cerci<sup>26</sup> and the cerci elongate and heavy proximad, very slender and scarcely tapering in the distal two-fifths. In *hispidus* the cerci are approximately as long, but taper gradually to the slightly heavier apex; in *rainierensis* the cerci are much as in *hispidus*, but proportionately shorter and frequently slightly heavier.

Females of *rainierensis* are readily distinguished by the presence of tegmina; those of *somesi* and *hispidus* show but little of differential value, this sex of *somesi* being, however, slightly heavier, with pronotal proportions slightly broader.

The three species compared above are much closer to each other than to the genotype, *montanus*, that species being readily distinguished by the more evenly convex pronotum, different coloration and color pattern and form of the male cerci, which show distinct deflection distad. Tegmina are present in *montanus*, of much the same type as found in *rainierensis*.

In linear order we would place the species as follows; *montanus*, *somesi*, *hispidus* and *rainierensis*.

*Type*.—♂; Upper Little St. Mary Valley, above Lake Ellen Wilson, Glacier National Park, Montana. Elevation, 6700 feet. August 9, 1918. (M. P. Somes.) [Hebard Collection, Type no. 500.]

Size medium for genus, form rather stout and heavily built, surface well supplied with minute but moderately elongate pilose hairs. Head much as in *hispidus*, full; vertex moderately tumid, interspace between eyes one and one-quarter times as broad as first antennal joint, fastigium moderately depressed, frontal costa with margins feebly and broadly cingulate to below ocellus, nearly subequal in width throughout. Antennae shorter than caudal femora.<sup>27</sup>

<sup>26</sup> This feature is found to exhibit a certain amount of individual variation in some examples of *A. montanus* (Bruner), *hispidus* and *rainierensis*.

<sup>27</sup> We would note that in the series at hand of both *hispidus* and *rainierensis*, individuals from lower elevations have the antennae decidedly longer than those from higher levels.

Eyes rather small, about as long as infra-ocular sulcus. Pronotum rather short, scarcely broader caudad than cephalad, with a medio-longitudinal carina weakly defined on prozona, well defined on metazona and dorsal abdominal segments; transverse sulci decided; dorsum rounding into the lateral lobes but with angulation indicated, not rounding evenly as in *montanus*, prozona quadrate, caudal margin of pronotum truncate, very feebly obtuse-angulate emarginate. Latero-caudal angle of lateral lobes sharply rounded, slightly greater than a right-angle. Tegmina and wings absent. Prosternal spine acute conical and moderately slender from its broad base.<sup>28</sup> Interspace between metasternal lobes subquadrate.<sup>29</sup> Furcula represented by a pair of parallel<sup>30</sup> rounded projections, nearly one-fifth as long as supra-anal plate, decidedly larger than the maximum developed in either *hispidus* or *rainierensis*. Supra-anal plate elongate shield-shaped, with latero-caudal angles weakly indicated; median channel broad, percurrent, moderately deep in proximal portion; lateral portions rather strongly concave, the lateral margins raised and showing a slight thickening opposite the cerci, but no lamellae as in *hispidus* and *rainierensis*. Cerci distinctly over twice as long as proximal width, heavy proximad, tapering to distal two-thirds, which portion is slender, straight,<sup>31</sup> to the sharply rounded apex. Subgenital plate conical with margin toward apex scarcely elevated above lateral portions, apex notched and consequently binodose.<sup>32</sup> Cephalic and median femora moderately inflated and slightly bowed.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Very similar to this sex of *hispidus*, slightly heavier, with pronotum proportionately slightly broader. Larger and decidedly heavier than male, agreeing with that sex except in the following features. Eye about three-quarters as long as infra-ocular sulcus. Antennae distinctly shorter. Pronotum distinctly broader caudad than cephalad, with weak percurrent median carina cut by all the weak transverse sulci, caudal margin with obtuse-angulate emargination slightly stronger. Prosternal spine moderately blunt, conical from broad base.<sup>33</sup> Ovipositor valves as in *hispidus*. Cephalic and median femora not inflated, straight.

<sup>28</sup> See footnote 33.

<sup>29</sup> So great is the individual variation in the width of the interspace between the mesosternal and metasternal lobes in many species of the Melanopli that we have found these features of little or no value for diagnostic purposes.

<sup>30</sup> Divergent in one specimen from Banff, Alberta.

<sup>31</sup> In one specimen of the series showing a very feeble flexure ventrad.

<sup>32</sup> This varies in the present species, as in *hispidus*, to a condition in which this feature is obsolete. In *rainierensis* it is obsolete, though occasionally faintly indicated.

<sup>33</sup> In the paratypic series slightly less blunt than in the Canadian series of *hispidus* at hand, distinctly blunter than in the allotype of *hispidus* from Washington. The form of the prosternal spine, as of the mesosternal and metasternal lobes, has been found by us to be extremely variable in certain species of the Melanopli, and consequently unreliable for specific diagnostic use.

## Measurements (in millimeters) of extremes only

♂	Length of body	Length of pronotum	Width of pronotum <sup>34</sup>	Length of caudal femur
Banff, Alberta (2).....	16.3-16.8	3.3-3.6	3.4-3.8	9.1-9.2
Upper St. Mary Valley, Glacier Nat. Park, <i>type</i> .....	17	3.3	4	10.1
Upper St. Mary Valley, Glacier Nat. Park, <i>paratypes</i> (11).....	15 <sup>35</sup> -18.5	3.3-3.3	3.9-4	9.4-10.2
Mt. Rainier, Washington (7)....	14.8-17	3.1-3.4	3.6-3.9	9-9.7
♀				
Lake Louise, British Columbia...	22	4	5	11
Mt. Kokanee, British Columbia	18.5	3.7	4.8	10.9
Upper St. Mary Valley, Glacier Nat. Park, <i>allotype</i> .....	20.5	4.1	5.2	12.1
Upper St. Mary Valley, Glacier Nat. Park, <i>paratypes</i> (18).....	19-23	3.9-4.1	5-5.2	11.2-12.3
Mt. Rainier, Washington (11)...	18.9-26 <sup>36</sup>	3.8-4	4.8-5	10.5-12.1

*Coloration*.—Male much as in *hispidus*; blackish olivaceous above, with a yellowish stripe on each side, interrupted at the first pronotal sulcus and sometimes at the intersections of the abdominal segments, running from the dorso-caudal portion of the eyes, along the dorsum of the pronotum just above the lateral lobes and along the abdomen to the last segments. The width and intensity of these bands shows some individual variation. Face and lower half of lateral lobes of pronotum yellowish. A blackish olivaceous band on each side starts from mesad on the caudal margin of the eye, occupies the dorsal half of the lateral lobes, expanding caudal on the metazonal portion, and is continued thence on the lateral portions of the abdomen, narrowing gradually distad. Underparts yellowish. Limbs reddish brown, the caudal femora showing three weakly defined, transverse suffusions of darker brown and a pregenicular pale area, which is weakly indicated on the caudal tibiae in the portion adjacent.

Female similar in general coloration, but much less brilliant. Reddish brown above, with paler bands represented only by a somewhat paler suffusion margining the dark lateral bands dorsad. Caudal limbs with markings even weaker.

*Specimens Examined*: 54; 20 males, 32 females and 2 immature females.

ALBERTA: Banff.

BRITISH COLUMBIA: Lake Louise and Kitchener Glacier on Mount Kokanee.

† MONTANA: Upper Little St. Mary Valley above Lake Ellen Wilson, Glacier National Park.

IDAHO: Wallace.

WASHINGTON: Paradise Valley on Mt. Rainer.

<sup>34</sup> Including lateral lobes, which expand ventrad, particularly caudad.

<sup>35</sup> Specimen shrunken.

<sup>36</sup> Specimen abnormally distended.

In addition to the type and allotype, a series of eleven males, eighteen females and two immature females bearing the same data, are designated paratypes. The specimens from Banff were taken by Sanson [Walker Cln.], that from Lake Louise by Mrs. Schaeffer on July 5 [A. N. S. P.], that from Mount Kokanee by Caudell, at 9000 feet, on August 10, 1903 [U. S. N. M.], and the male from Wallace on August 5, 1917 [Davis Cln.].

The species was found at the type locality to be very numerous on coarse herbage among the rocks. It was not, however, generally distributed but occurred in isolated spots of similar ecologic conditions.

Caudell found the species with *rainierensis*, in about equal numbers, in the alpine herbage of Paradise Valley on Mt. Rainier, in July, 1906. The series taken is before us, from the National Museum and Walker Collections. It is of interest to note that though *rainierensis* was found there in great numbers by Rehn and Hebard on August 23 and 24, 1910, the present species was not met with at all.

**Bradynotes kaibab**<sup>37</sup> new species (Plate XXIX, fig. 12.)

The present species is closely related to *B. compacta* Morse (see plate XXIX, fig. 14), described from Ormsby County, Nevada, and to *B. pinguis* Scudder (see plate XXIX, fig. 11), the type of which is from "Reno,"<sup>38</sup> Nevada. Nearest relationship is with *pinguis*, the present insect differing in the smaller size, slightly broader form and in the male sex in the much more slender cerci. The more elongate pronotum with much more conspicuous and continuous lateral carina in *compacta*, readily distinguishes that species, in males of which the supra-anal plate is more nearly elongate triangular, the cerci much as in the present species.

The female sex closely resembles a diminutive condition of that sex of *pinguis*. The carinae of the fastigium are, however, distinct between the eyes, obsolete or subobsolete above the foveolae, a condition not found in any other species of the genus.

In the present series two males and four females have the caudal tibiae nopal red, in the other five females the proximal portions of the caudal tibiae are, to different degrees, deep bluish

<sup>37</sup> Named for the tribe of Paiute Indians who inhabited this region. The tribal name derived from kaiba = mountain.

<sup>38</sup> Probably from a high elevation in the mountains near Reno.

gray-green. This shows that the color of the caudal tibiae is of no diagnostic significance, at least in one sex of the present species.

*Type*.—♂; Duck Lake, Cedar Mountains, Iron County, Utah. Elevation, 9000 feet. July 14, 1917. (G. P. Englehardt.) [Hebard Collection, Type no. 501.]

Size small for the genus, not as small as in *B. exelsa* Rehn; form heavy, as in *pinguis*; surface very feebly pilose. Head broad and full, vertex gently tumid; fastigium shallowly concave, the lateral margins moderately prominent, rounded; frontal costa much as in *pinguis*, but very slightly narrower and moderately punctate, least width slightly greater than width of proximal antennal joint, shallowly sulcate, the lateral margins like those of the fastigium but slightly broader. Eye as long as infra-ocular sulcus. Pronotum as in *pinguis*, expanding moderately caudad, this stronger between first and second transverse sulci, with distinct lateral carinae on prozona not as decided as in *compacta*, median carina slightly less well developed than in *pinguis*, weak but percurrent and cut only by the principal sulcus, continued on the three succeeding dorsal segments. Tegmina and wings absent, as in all species of *Bradynotes*. Interspace between mesosternal and metasternal lobes variable.<sup>39</sup> Furcula absent. Supra-anal plate trigonal-produced<sup>40</sup> with medio-longitudinal and lateral concavities decided proximad, the latter the more so. Cerci as long as supra-anal plate, tapering rather strongly in proximal half; distal half slender, more slender than in *pinguis*, tapering very slightly to the rounded apex, which is more sharply rounded ventrad than dorsad. Subgenital plate as in *pinguis*; conical, lateral margins very feebly convex, then as feebly concave to apex, which is small, slightly produced and feebly notched. Cephalic and median femora slightly inflated, very feebly bowed.

*Allotype*.—♀; same data as type, but taken July 17, 1917. [Hebard Collection.]

Larger and more robust than male. Lateral carinae of fastigium distinct proximal between eyes, obsolete<sup>41</sup> above the foveolae; frontal costa broader

<sup>39</sup> In the two males at hand, the mesosternal interspace is as wide as the lobes themselves in one, distinctly wider in the other; the metasternal interspace is quadrate in one, distinctly transverse in the other. These features are subject to individual variation in many species of the Melanopli and, in consequence, are of far less diagnostic value than has been supposed by Scudder and other authors.

<sup>40</sup> In the type this plate is narrow, with apex broadly rounded; in the paratype broader proximad, narrowing more strongly to the apex which is rather sharply rounded, forming an angle of slightly less than 90°. This much individual variability in the form of the male supra-anal plate is unusual. In the type of *pinguis*, the supra-anal plate is as long as its basal width, about intermediate in form between the present extremes, with concavities less decided.

<sup>41</sup> Varying to subobsolete in a few specimens of the series.



and more shallowly sulcate than in male. Eye slightly shorter than infraocular sulcus.<sup>42</sup> Pronotum much as in this sex of *pinguis*, but with very weak medio-longitudinal carina indicated throughout; pronotum considerably broadened caudad, with lateral carinae of prozona weakly defined. Succeeding segments to near apex of abdomen carinate medio-longitudinally. Ovipositor jaws much as in *pinguis*. Cephalic and median femora neither inflated or bowed.

*Measurements (in millimeters) of extremes*

	Length of body	Length of pronotum	Width of pronotal disk cephalad	Width of pronotal disk at principal sulcus	Length of caudal femur
♂					
Type . . . . .	18	3.8	2.2	3	10.1
Paratype . . . . .	16.2	3.3	2.1	3	9.7
♀					
Allotype . . . . .	23	4.6	3.2	4.7	11.8
Paratypes (8) . . . . .	18.7 <sup>43</sup> -25.8	4.8-4.7	3.1-3	4.6-4.4	11.6-12

*Coloration.*—General coloration of dorsal surface chestnut brown to mummy brown, becoming darker laterad on abdomen in males. Ventral surface antimony yellow in males, buffy in females, discolored in the majority of the present series. Head with occiput buffy, with a medio-longitudinal and two broader suffused bars of dark greenish brown, the lateral bars diverging caudad. Lateral carinae of fastigium individually jasper red to apricot orange proximad. Other portions of head ochraceous-buff with dark punctae, except for a suffused postocular bar of blackish brown. Pronotum with cephalic and caudal margins very narrowly jasper red, varying individually to apricot orange; smooth areas on lateral lobes beneath lateral carinae of disk buffy, as are the ventral portions of the lateral lobes in recessive examples. Cephalic and median limbs buffy. Caudal femora with pagina dark brown, irregularly buffy proximad; dorso-external and ventro-external surfaces ochraceous-buff; ventral portion of genicular lobes and narrow margin of dorsal surface scarlet to scarlet red; dorso-internal surface ochraceous-buff with two weak transverse bands of dark brown, these individually variable in intensity but more prominent in males than females; ventro-internal surface brazil red, deepening medio-longitudinally to claret brown or in some examples blackish. Caudal tibiae nopal red, the spines paler and black tipped; in three females the tibiae are deep bluish gray-green proximad, while in two the tibiae are deep delft blue, paler externally and shading to vandyke red in disto-internal half.

*Specimens Examined:* 12; 2 males, 9 females and 1 immature male.

UTAH: Cedar Mountains and Duck Lake, Cedar Mountains, Iron County.

The present series, besides the type and allotype, are designated paratypes. All were taken by G. P. Englehardt, from July 11 to 17, 1917, in the same general region, at elevations from 8500

<sup>42</sup> Varying to as long as infraocular portion of genae in some specimens.

<sup>43</sup> A shrivelled specimen.

to 9000 feet. The species was found not uncommon and rather sluggish, most frequently along open parts of a trail, among sparse growth of grasses on dry, sandy soil.

**Bradynotes deplanata** new species (Plate XXIX, fig. 13; plate XXX, fig. 2.)

This species is closely allied to *B. pinguis* Scudder (see plate XXX, fig. 1), differing in the smaller size, broader form, deplanate disk of pronotum with lateral carinae decided and, in the male sex, in the slightly more slender cerci.

The insect agrees with *B. compacta* Morse in the well-developed lateral carinae of the pronotum. The pronotum differs in having the disk deplanate and broader caudad, due to the fact that the lateral carinae are strongly divergent caudad between the first and second transverse sulci, thence rather strongly divergent caudad, not almost evenly and weakly divergent caudad as in *compacta*. In the male sex the cerci are not as slender as in *B. obesa* (Thomas) (see plate XXIX, fig. 10), *compacta* or *B. kaibab* here described, of the same type but more slender than in *pinguis*.

*Type*.—♂; Big Meadows of the Deschutes River, eighteen miles southwest of Bend, Crook County, Oregon. July, 1913. (C. H. Kennedy.) [Hebard Collection, Type no. 502.]

Size medium small for genus, slightly larger than in *kaibab*; form very heavy, heavier than in that species or in *pinguis*; surface moderately pilose. Head and eyes much as described for *kaibab*, except that the frontal costa is slightly less pinched at its juncture with the fastigium and is scantily punctate. Pronotum with disk strikingly deplanate, expanding rather strongly caudad, this greatest between the first and second transverse sulci, with lateral carinae well developed as in *compacta* and continued to near the caudal margin; medio-longitudinal carina as in *kaibab*, weak but percurrent and cut only by the principal sulcus, continued on the three succeeding dorsal segments. Tegmina and wings absent. Furcula absent. Supra-anal plate rather narrowly trigonal-produced, with apex broadly rounded, medio-longitudinal depression decided proximad, lateral concavities decided proximad. Cerci as long as supra-anal plate, of the same type as in *pinguis*, tapering to the slender apex, which is oblique truncate, the dorsal angle being obtuse-angulate but sharply rounded, the ventral angle acute-angulate but more broadly rounded, distal portion more slender than in *pinguis*, very slightly heavier than in *kaibab*. Subgenital plate conical, lateral margins almost straight to the very feebly elevated apex, which is small, slightly produced, entire. Cephalic and median femora slightly inflated, very feebly bowed.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Larger and more robust than male. Lateral carinae of fastigium percurrent, frontal costa as deeply sulcate as in male. Eye slightly shorter than infra-ocular sulcus. Pronotum considerably broadened caudad, with disk strikingly deplanate between the lateral carinae which are weaker than in male, but heavier than in females of *pinguis*, with a very weak medio-longitudinal carina indicated throughout. Succeeding segments to near apex of abdomen medio-longitudinally carinate. Ovipositor jaws apparently much as in *pinguis*.<sup>44</sup> Cephalic and median femora neither inflated or bowed.

*Measurements (in millimeters) of extremes only*

	Length of body	Length of pronotum	Width of pronotal disk cephalad	Width of pronotal disk at principal sulcus	Length of caudal femur
♂					
<i>Type</i> . . . . .	19	3.9	2.6	3.6	10.4
<i>Paratypes</i> (12) . . . . .	18-19.8	3.5-4	2.2-2.6	3-3.7	10-11.1
♀					
<i>Allotype</i> . . . . .	23	4.7	3.1	4.6	12
<i>Paratypes</i> (5) . . . . .	20.3-23	4.5-4.9	3.1-3	4.4-4.8	11.8-12

*Coloration*.—Male. Head light ochraceous-buff, occiput suffused triangularly with blackish, leaving the portions toward the eyes buff, lateral carinae of fastigium brazil red proximad, thence blackish with a claret tinge, as are the lateral carinae of the frontal costa; a vertical suffusion of this color from between antennal socket and eye to clypeal suture on each side and another oblique irregular suffusion across the genae, from an olivaceous postocular bar. Disk of pronotum snuff brown, the lateral carinae claret brown; lateral lobes of pronotum buffy ventrad, meso-proximad and in two smooth areas below lateral carinae of disk, remaining portions suffused with black. Mesonotum and metanotum suffused with black except for a medio-longitudinal line of buffy, and buffy in small areas dorso-laterad, from which tegmina and wings would spring if present. Abdomen suffused with black proximad, except for a medio-longitudinal line of buffy, the black areas continued half the distance to apex of abdomen on sides, and as a narrow weak suffusion dorso-laterad, to and including the supra-anal plate, remaining portions of abdomen buffy. Cephalic and median femora buffy, in type with dorsal surface washed with brick red and cephalic face heavily marked distad with black and brick red; in other individuals almost immaculate. Cephalic and median tibiae in type buffy, with cephalic face heavily lined longitudinally with black, this indicated only by a weak proximal suffusion in other examples. Caudal femora with pagina suffused with blackish, the reticulations buffy proximad and mesad; dorso-external and ventro-external surfaces ochraceous-buff, carinae tinged with reddish, ventral margin of genicular lobes and narrow dorso-distal margin garnet brown; dorso-internal surface ochraceous-buff with three heavy transverse blackish bands, the more proximal being basal in position; ventral surface

<sup>44</sup> In this specimen retracted, so that only the tips project beyond the supra-anal plate.

with margins brazil red, the remaining portion black with a claret tinge. Caudal tibiae with dorso-proximal lobe strikingly salmon-orange; external face buffy except proximad, where it is deep bluish gray-green and narrowly dorsad bluish gray-green; ventral face buffy; dorsal face nopal red, except briefly suffused proximad with vandyke red;<sup>45</sup> internal face similar but with intensity of coloration not as great. The allotypic female is similar but not as brilliant, while the dark areas are more extensive. The pronotal disk is mars brown, the dorsal surface of the abdomen mars brown, except for a narrow medio-longitudinal line and disto-laterad, where it is cinnamon brown.

*Specimens Examined:* 19; 13 males and 6 females.

OREGON: Big Meadows of the Deschutes River, eighteen miles southwest of Bend.

This series was collected, in July, 1913, by C. H. Kennedy, probably in the eastern edge of the dry pine woods, covering the eastern edge of the Cascade Mountains, and given to W. T. Davis. Due to Mr. Davis' generosity, the series is now divided between the Davis and Hebard Collections and those of the Academy of Natural Sciences of Philadelphia and United States National Museum. The specimens, other than the type and allotype, are designated paratypes.

**Melanoplus huporeus**<sup>46</sup> new species (Plate XXX, fig. 3; plate XXXI, fig. 2.)

The present species belongs to the Marginatus Group, and shows distinctly closer affinity to *M. marginatus* Scudder, than to *M. gracilipes* Scudder.

From the long-winged *marginatus* it differs in the slightly heavier form, blunter vertex and broad oval tegmina, which frequently have the immediate apex acute and sharply rounded, but are never produced distad, with apex acute, to the degree normal in the short-winged *marginatus* variety *pauper* Scudder. In addition, males are readily separated by the form of the cerci, which in *marginatus* (see plate XXXI, fig. 1) are shorter, with apex truncate and strikingly inflated. In coloration the two species are very similar.

<sup>45</sup> The extent of this purplish portion varies slightly in the series. In the type of *pinguis* the caudal tibiae are nopal red, slightly paler proximad on the external face; in the allotype similar, but with a blackish green annulus below the dorso-proximal lobe. In a very large series of that species from timber line on Mt. Shasta, California, however, the tibiae are all bicolored, dark purplish proximad and red distad. This indicates that the color of the caudal tibiae in *pinguis*, and probably in related species, can not be considered of specific diagnostic value, as supposed by Scudder and used in his key, Proc. U. S. Nat. Mus. xx, p. 81, (1897).

<sup>46</sup> From *ἐπιώρειος* = living at the foot of the mountains.

*Type*.—♂; Colfax, Placer County, California. Elevation, 2450 feet. August 28, 1910. (Rehn and Hebard.) [Hebard Collection, Type no. 503.]

Size small, form slender. Head much as in *marginatus*, but with area of fastigio-facial angle distinctly less produced, the angle itself more broadly rounded. Frontal costa shallowly concave. Eye large, about two and one-half times as long as infra-ocular sulcus. Pronotum elongate, disk of equal width, with a slender but well defined and percurrent medio-longitudinal carina. lateral carinae very weakly defined, caudal margin nearly transverse, very broadly obtuse-angulate produced. Prosternal spine as in *marginatus*; small. bluntly elongate subconical. Tegmina slightly shorter than pronotum, broadly oval with immediate apex acute and sharply rounded.<sup>47</sup> Furcula represented by a pair of minute, slender teeth, each about twice as long as wide, with apex bluntly rounded. Supra-anal plate simple, moderately elongate trigonal, the lateral margins showing very feeble convexity, surface with a moderately broad, proximal, medio-longitudinal sulcation. Cerei elongate, weakly curving inward, about three and one-half times as long as proximal width, tapering evenly in proximal two-fifths, median fifth slender with margins almost parallel, distal two-fifths enlarged, but not swollen or truncate as in *marginatus*, enlargement due to broad convexity of dorsal margin, with blunt apex at ventral margin; the ventral margin is almost straight, very feebly concave throughout, the dorsal margin more strongly concave to distal portion, where it is convex. Subgenital plate as in *marginatus*; median section of slightly greater depth laterad than mesad, with a small but distinct tubercle mesad, at the free margin. Limbs as in *marginatus*.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Size larger, form heavier than in male. The heavier form and less produced fastigio-facial angle as strikingly in contrast with this sex of *marginatus* as between males of these species. Fastigium of vertex and frontal costa decidedly broader and less sulcate than in male. Eye about two and one-quarter times as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina not as sharp as in male. Ovipositor and limbs as in *marginatus*.

*Measurements (in millimeters) of extremes only*

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
<i>Type</i> . . . . .	14.5	3.1	2	3	2	8.2
<i>Paratypes</i> (28)	14.8-16.8	3-3.9	2-2.1	3-3.9	1.9-2.2	7.9-9.8
♀						
<i>Allotype</i> . . . . .	21	4	3	4.2	2.8	11
<i>Paratypes</i> (19)	18-22	3.6-4.8	2.6-2.9	3.3-4.9	2.1-3	9-11.3

<sup>47</sup> In the majority of the series attinent, varying from subattinent to feebly overlapping.

*Coloration.*—The males range in general coloration from ochraceous-buff, with postocular band of buckthorn brown weakly indicated on prozonal portion of pronotal lateral lobes, and flecks of the same color on the sides of the abdomen proximad, to cinnamon brown with blackish postocular bar occupying the dorsal two-fifths of the prozonal portion of pronotal lateral lobes, and sides of abdomen heavily marked with blackish latero-proximad. In the darker examples the caudal femora have the dorso-internal surface showing weakly two dark flecks, while the face, ventral three-fifths of pronotal lateral lobes and ventral surface are ochraceous-buff, in striking contrast with the dorsal surface. In intensive examples the ventral face of the caudal femora is russet, shading to mars brown mesad; in recessive individuals ochraceous-buff tinged with ochraceous-orange. The caudal tibiae are buffy, tinged with glaucous.

Females are similarly colored, the intensive condition being less often encountered. In this sex also, buffy examples are often washed with greenish, this sometimes including the pronotal disk, but usually confined to the head, lateral portions of pronotum and body and exposed surface of the caudal femora.

*Specimens Examined:* 49; 29 males, 20 females.

CALIFORNIA: Colfax.

The series, in addition to the type and allotype, may be considered paratypes. These specimens were taken by Rehn and Hebard on August 27 and 28, 1910, at Colfax, California, at elevations from 2450 to 2800 feet. The series was found on hillsides, in open places overgrown with low plants and particularly where much poison oak occurred, intermingled with a low sweet-smelling bush. The hillsides were clothed generally with high manzanita and other bushes, with a scattering growth of pines and other trees. In the same environment *M. lepidus* Scudder was found, both species generally scarce, but *lepidus* common and the present species scarcer in one limited area only.

**Melanoplus hesperus** new species (Plate XXX, figs. 5 and 6; plate XXXI, fig. 3.)

The present species belongs to the Marginatus Group and to that section including the forms closely related to *M. gracilipes* Scudder.

Nearest relationship is with *gracilipes* (see plate XXX, fig. 4); males of the present insect differ in the slightly more elongate form, much more elongate furcula, more elongate supra-anal plate, more elongate cerci, with inbent distal portion twice as long

as wide, instead of subquadrate, and even weaker blunt tuberculation of subgenital plate. Much the most important differences are found in the furcula and cerci. In size, form and general appearance this species agrees fully with *M. ligneolus* Scudder, another very closely related species. The present insect is particularly distinguished from all the forms closely related to *gracilipes* by the much more elongate furcula.

Females of these species are most difficult to separate. This sex of *hesperus* is a little more slender and elongate than females of *gracilipes*, in every way similar to females of *ligneolus* except in the very slightly more pronounced lateral carinae of the pronotum.<sup>45</sup>

*Type*.—♂; San Luis Obispo, San Luis Obispo County, California. August 21, 1909. (M. Hebard.) [Hebard Collection, Type no. 504.]

Size small, but, with *ligneolus*, largest of the species closely related to *gracilipes*. Form slender, much as in *gracilipes* and in *M. hyporeus* here described. Head much as in *gracilipes*, but with area of fastigio-facial angle slightly more produced, much as in *hyporeus*, but with frontal costa appreciably wider, as in *gracilipes*, showing only very slight concavity toward median ocellus. Eye large, over two and one-half times as long as infra-ocular sulcus. Pronotum elongate, disk of almost equal width throughout, median carina well defined and percurrent, lateral carinae distinct though very weakly defined, not subobsolete as in *gracilipes* or fully as weak as in *ligneolus*, caudal margin of disk broadly obtuse-angulate produced, more produced than in *gracilipes*. Prosternal spine as in *gracilipes*; elongate, bluntly subconical. Tegmina shorter than pronotum, rather broadly oval, feebly overlapping, with apex bluntly rounded. Furcula represented by a pair of slender elongate processes, which diverge at an angle of sixty (to ninety in series) degrees, three and one-half times as long as greatest width, length contained in that of supra-anal plate slightly less than two and one-half times, width about the same in proximal two-thirds and there separated by an interval of nearly equal width, thence tapering to the acute apex. Supra-anal plate shield-shaped; surface with a deep medio-longitudinal sulcus, running through proximal two-thirds, the lateral carinae of this sulcus each with mere traces of a transverse carina externally, mesad on the plate; surface with lateral portions rather strongly concave in proximal two-thirds, beyond which two broad, longitudinal, parallel, short ridges run to the free margin just before the apex. Between the supra-anal plate and the cerci, a portion of a basal plate is extruded, this causing the lateral margins of the plate to be somewhat elevated. Cerci moderately elongate, weakly curving inward, about two and one-fourth times as long as

<sup>45</sup> This feature is probably of little diagnostic value, as the degree of difference noted is easily within the limits of individual variation.

basal width, tapering slightly to distal third, which is twice as long as wide, with apex rounded and external face concave, this portion similar but rounded quadrate in *gracilipes*. Subgenital plate with median section of equal depth laterad and mesad, feebly blunt conical at free margin, this weaker than in *gracilipes*, not sufficiently developed to be termed a tuberculation.<sup>49</sup> Limbs as in *gracilipes*.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Size larger, form heavier than in male. Fastigium of vertex distinctly broader and less deeply sulcate than in male. Eye slightly more than twice as long as infra-ocular sulcus. Pronotum with lateral carinae even weaker than in male, but slightly more pronounced than in this sex of *liqueolus*. Ovipositor and limbs as in *gracilipes*.

*Measurements (in millimeters)*

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
<i>Type</i> . . . . .	17.2	3.8	2	3.7	2.2	9.7
<i>Paratypes</i> (3)	16.3-16.8	3.7-3.8	2-2.2	3.3-3.9	2.1-2.1	9.3-10
♀						
<i>Allotype</i> . . . . .	19.2	4.1	2.9	4	2.8	11.9

*Coloration*.—Head cinnamon, except occiput which is sayal brown and a broad and sharply defined postocular band of prout's brown. Eyes cinnamon brown. Dorsum of pronotum sayal brown, paling slightly toward lateral carinae, lateral lobes with a band of prout's brown occupying dorsal third of prozonal portion, corresponding portion of metazona suffused, sayal brown, lower portions of lateral lobes cinnamon. Tegmina sayal brown, darkening gradually to cinnamon brown latero-ventrad. Abdomen cinnamon-buff with large flecks of blackish laterad on the four proximal segments. Underparts ochraceous-buff. Cephalic and median femora sayal brown. Caudal femora with pagina sayal brown, dorsal surfaces cinnamon with two proximal slightly darker areas on inner portion, remaining portions suffused cinnamon-buff. Caudal tibiae clay color.

The small series shows little color variation. The males of greater recessive coloration have the head, lower portions of the pronotal lateral lobes and dorsal surface of the caudal femora cinnamon-buff, the other portions paler to a like degree.

*Specimens Examined*: 5; 4 males and 1 female.

CALIFORNIA: San Luis Obispo.

<sup>49</sup> A large series of this species will, however, be needed to determine the value of this character. In some species, the degree of tuberculation of the subgenital plate appears to be subject to but little variation. In the closely related *M. nanus* Seudder, however, great variation in this feature occurs.



Other than the type, the three males are designated paratypes. The series was collected in a field of the sun-dried yellow grass which is characteristic of the Coast Ranges of California. The species was apparently numerous, the few specimens being secured during a brief train stop.

**Melanoplus microtatus** new species (Plate XXX, figs. 7 and 8.)

1909. *Melanoplus sonomaensis* Rehn and Hebard (not of Caudell, 1906).  
Proc. Acad. Nat. Sci. Phila., 1909, p. 468. [♂, ♀; Santa Cruz, California.]

This species belongs to the Marginatus Group and to that section including the forms very closely related to *M. gracilipes* Scudder.

Nearest relationship is with *M. nanus* Scudder, to which species close affinity is shown, though not to the degree found in *M. sonomaensis* Caudell. The insect differs from *nanus* in the average smaller size,<sup>50</sup> the slightly but distinctly more slender form and, in the male sex, in the distinctive form of the cerci and the contour of the supra-anal plate.

Females of these species are almost inseparable. In the present very large series of *microtatus*, it is noted, however, that all are slightly but appreciably more slender, and that the large majority are of smaller size. The tegmina also average more approximate, but show so wide a range of variation in this feature, as well as in size and in length in proportion to width, that this can not be used safely as a character for individual determinations.

*Type*.—♂; Del Monte, Monterey County, California. August 20, 1909. (M. Hebard.) [Hebard Collection, Type no. 505.]

Size very small, smallest of the genus; form slender, slightly but appreciably more slender than in *nanus*. Head much as in *nanus*; fastigio-facial angle slightly more produced than in *gracilipes*, as in *hesperus* here described, *nanus* and *sonomaensis*; frontal costa as in *nanus*, no wider than in *hupercus* here described, but showing only slight concavity toward median ocellus, as in all the species here referred to except *hupercus*. Eye slightly over twice as long as infra-ocular sulcus. Pronotum elongate, disk of almost equal width throughout, median carina well defined and percurrent, lateral carinae distinct though weakly defined, much as in *hesperus*, caudal margin of disk broadly obtuse-angulate produced, as in *hesperus*. Prosternal spine as in *hesperus*. Tegmina considerably shorter than pronotum, almost attinent,<sup>51</sup> with apex rather

<sup>50</sup> This is the smallest species of the genus *Melanoplus* known. The smallest known examples of *M. puer* (Scudder) show a lesser length, but have a considerably greater body bulk.

<sup>51</sup> Varying to slightly overlapping in the series of males.

broadly rounded. Furcula as in *nanus*; represented by a pair of minute, slender, tapering processes,<sup>52</sup> length contained in that of supra-anal plate over three and one-half times. Supra-anal plate moderately elongate, shield-shaped, median sulcus decided to slightly beyond median point, the lateral carinae of this sulcus at median point on plate connected with lateral margins by transverse carinae, lateral margins to intersection with these carinae raised and somewhat thickened, lateral concavities deep before and beyond the transverse carinae, laterad toward apex two low, short, parallel ridges are developed, which terminate in the lateral margins of the plate.<sup>53</sup> As in *nanus*, between the supra-anal plate and the cerci, portion of a basal plate is extruded, this causing the elevation of the lateral margins of the supra-anal plate. Cerci decidedly shorter than in *hesperus*, somewhat shorter than in *nanus*, curving weakly inward with a trace of angulation at end of proximal two-thirds, slightly over twice as long as basal width, tapering strongly in proximal third, thence tapering weakly to the rounded apex, the shaft with a weak curvature dorsad, external surface of distal third deplanate, this portion about one and one-half times as long as its basal width. Subgenital plate with median section of equal depth laterad and mesad, tapering meso-distad to a well developed apical tubercle at the free margin.<sup>54</sup> Limbs as in *nanus*, caudal femora very slightly more slender than in *gracilipes* or *hesperus*.

*Allotype*: ♀; same data as type. [Hebard Collection.]

Size larger, form heavier than in male. Fastigium of vertex distinctly broader and less deeply sulcate than in male. Eye very slightly more than twice as long as infra-ocular sulcus. Pronotum with lateral carinae even weaker than in male. Tegmina separated by a very brief interval.<sup>55</sup> Size smaller than in *gracilipes*, form more slender, and caudal femora proportionately smaller.

<sup>52</sup> Varying individually from parallel to rather strongly divergent.

<sup>53</sup> This is an intensification of the type found in *nanus*. Frequent slight individual variation is shown and in a few specimens, showing least decided contour of the supra-anal plate, little difference from *nanus* in this feature is found.

<sup>54</sup> Among the paratypes of *nanus*, as well as in a larger series of that species before us, the subgenital plate, though normally with a well developed apical tubercle, varies through a condition in which this tubercle is weak, to one in which the margin of the subgenital plate is rounded with no trace of a tubercle. As these species are very closely related, we might expect to find males of *microtatus* occasionally lacking an apical tubercle, but such is not the case in the very large series at hand, though some slight difference in degree is occasionally shown.

<sup>55</sup> In females of the present series averaging about .4 mm.; in the series of females of *nanus* averaging about .9 mm.

*Measurements (in millimeters) of extremes only*

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Del Monte, California, <i>type</i> ..	11.8	2.9	1.6	2	1.7	7.3
Del Monte, California, <i>paratypes</i> (170)	11.7-14.7	2.7-3.2	1.5-1.8	1.8-2.7	1.3-1.8	7-8.8
♀						
Del Monte, California, <i>allotype</i> . . . . .	17	3.1	2	2.3	1.8	8.8
Del Monte, California, <i>paratypes</i> (152) ..	13-18.2	2.9-3.9	1.8-2.5	2.2-3.7	1.8-2.3	8.1-10.7
Monterey, California . . . . .	17	3.9	2.5	3.2	2.2	10

*Coloration*.—As described for *hesperus* on page 284, except that the type and a large proportion of the series are more intensive in coloration. In these the occiput, disk of pronotum and tegmina are blackish chestnut brown, the postocular bar and dorsal third of the prozonal portion of the pronotal lateral lobes shining black. The lateral dark markings of the abdomen are expanded and deepened into a suffused blackish band, which narrows distad, but is continued on the subgenital plate as a dark suffusion. The femora have the pagina very dark prout's brown, with an oblique line of light buff dorso-mesad and are bordered ventrad with warm buff, this widest proximad; the dark areas on the internal portion of the dorsal surface are prout's brown, while the internal face is suffused with prout's brown meso-distad and dorso-mesad. This intensive type of coloration is found in females, but not as frequently as in males.

Every gradation is shown by the series of females to a maximum recessive condition, in which the general coloration is clay color, the postocular band subsobsolete on head and lateral lobes of pronotum, the dark lateral abdominal band indicated by three small suffusions of prout's brown on the proximal abdominal segments.

*Specimens Examined*: 327; 172 males and 155 females.

CALIFORNIA: Santa Cruz, Monterey and Del Monte.

The entire series, with the exception of three specimens, was taken at Del Monte on August 20, 1909, by Hebard and on September 9 and 10, 1910, by Rehn and Hebard. Excluding the type and allotype, these are designated as paratypes. The species was found in great numbers in extensive open areas of short, dry grass, where a low yellow-flowered "tar-weed" was

plentiful. It was, however, almost ubiquitous and in the heavy chaparral, where Orthoptera was not abundant, some of the darkest examples were secured.

One female was taken at Monterey on July 4, 1916, by G. P. Englehardt, while a pair was secured by Hebard at Santa Cruz, Santa Cruz County, on August 28, 1907. The male of this pair is somewhat atypical in having the cerci straighter and more slender distad than in any of the typical series.

**Melanoplus aspasmus**<sup>56</sup> new species (Plate XXX, figs. 9 and 10; plate XXXI, fig. 4.)

This is a striking species of the Marginatus Group. It shows no close relationship to any of the other species. The fastigio-facial angle is as blunt as in *M. gracilipes* Scudder, the furcula resemble more closely those found in *M. hesperus* here described and the cerci to some degree suggest those of *M. microtatus* here described.

The insect is the most robust of the group and is distinctive in the form of the male genitalia, particularly that of the subgenital plate, which is rounded with free margin flaring outward evenly throughout.

*Type*.—♂; Paso Robles, San Luis Obispo County, California. August 21, 1909. (M. Hebard.) [Hebard Collection, Type no. 506.]

Size small, slightly smaller than in *gracilipes*. Form moderately stout, distinctly the heaviest species of the Marginatus Group, many of the species of which are very slender. Surface moderately well supplied with long pile, this most noticeable on caudal limbs and subgenital plate. Head of the same type as in *gracilipes*, but not as deep, the fastigio-facial angle even blunter, the face distinctly less strongly retreating; the frontal costa wide, as wide as in *gracilipes*, showing only slight concavity toward the median ocellus.<sup>57</sup> Eye large, distinctly broader than in *gracilipes* or the species closely related, about two and one-quarter times as long as infra-ocular sulcus. Pronotum moderately elongate, proportionately distinctly shorter than in *gracilipes* or the related species; lateral carinae subobsolete, as in *gracilipes*; caudal margin of disk obtuse-angulate produced, with angulation rather sharp, production greater than in *gracilipes* or any other species of the Marginatus Group, but of the same type found in *M. marginatus* Scudder. Prosternal spine bluntly conical, distinctly shorter than in *gracilipes*. Tegmina attingent, broad oval with

<sup>56</sup> From ἀσπασμός = striking.

<sup>57</sup> In one paratypic male the lateral margins of the frontal costa are moderately carinate, the surface of the frontal costa resultantly shallowly concave, much as is normal in *M. huporeus* here described.

apex rather broadly rounded,<sup>58</sup> distinctly shorter than pronotum, attingent. Furcula represented by a pair of elongate processes, which diverge at an angle of about ninety degrees, tapering from their heavy and attingent bases to their slender and sharply rounded apices, nearly three times as long as basal width, length contained in that of supra-anal plate less than two and one-half times. Supra-anal plate trigonal shield-shaped, medio-longitudinal sulcus percurrent, but strongly defined only in proximal three-fifths, lateral portion deeply concave, the lateral margins strongly raised and thickened proximad, with a flexure at end of proximal third, thence gradually diminishing in height and weakly concave opposite apices of cerci at beginning of apical third; the apical portion beyond deplanate with a small node latero-proximad on each side. Between the supra-anal plate and the cerci a portion of a basal plate is conspicuously extruded, this causing the elevation of the lateral margins of the plate. Cerci suggesting those of *M. microtatus* here described, but distinctly more complex; about twice as long as proximal width, broad proximad, tapering strongly in proximal half, this due to the strong concavity of the dorsal margin, distal half relatively slender, of nearly subequal width, dorsal and ventral margins feebly convex to rounded apex, length about twice median (greatest) width, external surface longitudinally concave below median line. Subgenital plate with dorso-lateral angles at free margin rectangulate and rather sharply rounded, more sharply rounded and prominent than in any other species of the Marginatus Group; free margin of almost equal thickness and convexity throughout, somewhat more thickened mesad but showing no trace of tuberculation; median section of plate of almost equal depth laterad and mesad; surface flaring outward to free margin evenly throughout, this type distinctive and wholly unlike that developed in any other species of the Marginatus Group. Limbs much as in *gracilipes*, except that the caudal femora are distinctly shorter and heavier.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Size larger, form heavier than in male,<sup>59</sup> resultant heavier than in any females of the Marginatus Group. Fastigium of vertex distinctly broader and less deeply sulcate than in male. Eye proportionately much as in male. Pronotum with lateral carinae subobsolete, obtuse angulation of caudal margin somewhat broader but similarly rather sharp. Tegmina attingent (to separated by a brief interval in the series), (normally) rather broadly rounded distad. Limbs with caudal femora as distinctly shorter than in the related species as in male.

*Coloration*.—Male (intensive). General coloration clay color tinged with cinnamon. Eyes russet. A postocular bar, continued on the prozonal portion of the lateral lobes and broadening caudad, is shining blackish mummy brown. Tegmina tinged with cinnamon brown, particularly laterad. Proximal segments of abdomen marked dorso-laterad with moderately large maculae

<sup>58</sup> Normally thus in males, apex occasionally rather sharply rounded; apex averaging more broadly rounded in females.

<sup>59</sup> It is to be remembered that males of *aspasmus* are as heavy as females of *microtatus*.

of shining blackish mummy brown. Caudal femora with internal portion of dorsal surface showing two patches of dark brown, these continued on the internal face, and pagina tinged with dark brown dorsad in corresponding position. Caudal tibiae buffy, faintly tinged with glaucous.

The series shows variation to a recessive type (one male) in which the entire insect is ochraceous-buff, the postocular bar on head and pronotum obsolete, the markings of the caudal femora subobsolete, the caudal tibiae buffy. This recessive condition is in preponderance among females of the present series, fourteen being quite as immaculate, while but two of the remainder are strongly intensive.

This color pattern and similar intensification and recession is likewise found in other species of the *Marginatus* Group, but in none have we found as large a proportion of strongly recessive examples.

*Measurements (in millimeters) of extremes only*

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
<i>Type</i> . . . . .	15.3	3.8	2	2.9	2.1	8.7
<i>Paratypes</i> (7) . . . . .	14-15.8	3.2-3.7	2-2.1	2.6-3.7	2-2.3	8-8.8
♀						
<i>Allotype</i> . . . . .	16.2	3.8	2.5	3.2	2.4	8.9
<i>Paratypes</i> (19) . . . . .	15.2-18	3.7-4	2.7-2.9	2.9-3.7	2.2-2.6	8.5-9.9

*Specimens Examined:* 28; 8 males and 20 females.

CALIFORNIA: Paso Robles.

The entire series, which in addition to the type and allotype may be considered paratyptic, was taken at Paso Robles, California, on August 21, 1909, by the author. The species was found at elevations of from 750 to 900 feet in the low, dry, sun-cured, yellow grass, on hillsides dotted with oaks. Though not common, this was the most abundant species of Orthoptera encountered at this locality.

**Melanoplus acidocercus** <sup>60</sup>new species (Plate XXXI, fig. 6.)

The present insect is a member of the *Seudderi* Group, showing nearest affinity to *M. carnegiei* Morse (see plate XXXI, fig. 5). Compared with that species it is found to be of average larger size, showing certain differences of color pattern, while the tegmina average broader. Males are, in addition, readily distinguished by the form of the cercus: in *acidocercus* the cercus is decidedly more elongate, averaging one and one-half times as long as basal width, tapering to the acute and slender apex; in *carnegiei* the cercus is short, averaging about as long as its basal

<sup>60</sup> From *akts* = pointed (acute), and cercus.

width, triangular, with apex acute, but not at all slenderly produced.<sup>61</sup>

In general appearance the present insect is about intermediate between *M. scudderi* (Uhler) and *Eotettix quercicola* Hebard. It is evident that this species represents the type in the genus *Melanoplus* showing nearest approach to that section of the genus *Eotettix* which includes *quercicola* and *davisi* Hebard. The two latter species have a distinctive facies; in being more polished with coloration more brilliant, particularly in life, in showing distinctive features in color pattern and in having larger heads with antennae much more elongate.

The resemblance of the present species lies largely in the general, though not detailed, similarity of coloration, coupled with a very slightly greater smoothness than found in the allied species of *Melanoplus*.

*Type*.—♂; Bainbridge, Decatur County, Georgia. September 5 and 6, 1915. (Rehn and Hebard.) [Hebard Collection, Type no. 508.]

Size slightly larger, form slightly more elongate than in *scudderi*, much as in lowland series (Yemassee, South Carolina) of *carnegiei*. Fastigium of vertex and frontal costa similar, but slightly more sulcate; sulcus weak but distinct throughout, well defined between the lateral ocelli. Antennae normal, about one and three-quarters times as long as pronotum, as in *carnegiei*. Eye slightly longer than cheek, about one and three-quarters times as long as infra-ocular sulcus. Pronotum much as in *scudderi*; the percurrent median carina, cut only by principal sulcus, very slightly heavier, about as well developed as in *Eotettix davisi* and *quercicola*; caudal margin of pronotum obtuse-angulate produced (at about 120°) with angulation broadly rounded, more produced than in *Eotettix davisi* or *quercicola*. Tegmina broad oval, overlapping.<sup>62</sup> Distal portion of abdomen scarcely enlarged. Furcula as in *carnegiei*, represented by two minute projections, the areas from which they spring enlarged and separated by a subrectangulate emargination. Supra-anal plate as in *carnegiei*; shield-shaped, with a decided medio-longitudinal sulcus in proximal half, lateral portions broadly concave, distal portion nearly deplanate. Cercus slightly over one and one-half times as long as basal width, margins rather

<sup>61</sup> Some slight individual variation is shown by the series of that species at hand. One male, of two from Atlanta, Georgia, has the cercus approaching the condition found in *acidocercus* much more closely than in any other specimens. In this individual the cercus is nearly one and one-half times as long as its basal width, but much broader distad than in any specimen of *acidocercus* at hand. The other Atlanta male of *carnegiei* has perfectly typical cerci.

<sup>62</sup> Varying to attinent in a very few males of the series.

decidedly convergent in proximal half, thence less strongly convergent to the acute apex, dorsal margin broadly concave, ventral margin nearly straight. Subgenital plate as in *earnegiei*; short, tapering to the bluntly rounded apex. Limbs as in *carnegiei*.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Size decidedly larger, form decidedly more robust than in male. Resembling females of *Eotettix quercicola* except that it is smaller, with head proportionately distinctly smaller, antennae shorter, disk of pronotum showing no gloss, caudal margin of pronotum less produced and caudal tibiae less heavy. Fastigium of vertex and frontal costa wider than in male, briefly deplanate in area between lateral ocelli and antennal sockets. Eye slightly longer than cheek, about one and one-half times as long as infra-ocular sulcus. Tegmina well overlapping.<sup>63</sup> Ovipositor valves moderately elongate, moderately curved distad to their acute apices, much as in *Eotettix quercicola*, appreciably more curved than in *carnegiei*. Interspace between mesosternal lobes scarcely longer than broad. Limbs as in male but heavier, much as in females of *Eotettix quercicola*, but with caudal tibiae distinctly less strongly pilose.

*Measurements (in millimeters) of extremes only*

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
<i>Type</i> . . . . .	18.7	5	3	3.7	2.9	11.1
<i>Paratypes</i> (40)	18.5-20	4.8-5.2	2.9-3.1	3.2-4.6	2.8-3.2	10.4-11.6
♀						
<i>Allotype</i> . . . . .	25	6.4	4.2	5.5	4	14.1
<i>Paratypes</i> (36)	22.2-25.7	5.8-6.7	3.8-4.4	4-6	3.9-4.1	12.8-14.4

*Coloration*.—Male. Almost identical with material of *carnegiei* from the lowland pine woods (Yemassee, South Carolina); more tawny and less grayish than highland material of that species. Face, underparts, cephalic and median limbs and lower portion of pronotal lateral lobes clay color. Antennae russet, becoming darker distad. Eyes deep chestnut. Occiput, pronotal disk and tegmina mars brown. A moderately broad, shining, black postocular band expands caudad on the prozonal portion of the pronotal lateral lobes, filling more than half that surface and continued on the metazonal portion, but there not shining. Metapleura without a pale bar. Abdomen sayal brown weakly suffused with mars brown proximad. Caudal femora sayal brown, the genicular areas and two weak transverse suffusions of the dorsal surfaces blackish. Caudal tibiae coral red, well supplied with whitish pile, spines entirely black.

In recessive males the occiput and disk of pronotum are often as pale as the caudal femora, while the transverse bands of the dorsal surfaces of the caudal femora become obsolete.

Female. Generally cinnamon; lateral lobes of pronotum and caudal femora slightly darker, mikado brown. Postocular bar subobsolete. Tegmina with veins cinnamon and interspaces verona brown. Caudal femora slightly paler

<sup>63</sup> To (rarely) subattinent in females before us.



than general coloration, pinkish cinnamon, with genicular areas warm sepia and dorsal surfaces showing two broad transverse bands of mikado brown. Caudal tibiae as in male.

In females of maximum recessive coloration the entire insect is pinkish cinnamon, the postocular bar obsolete, the tegmina and dorsal surfaces of the caudal femora practically immaculate.

*Specimens Examined:* 84; 41 males, 37 females and 6 immature females.

GEORGIA: Bainbridge.

The entire series of adults, in addition to the type and allotype, may be considered paratypes. The series was taken by Rehn and Hebard on September 5 and 6, 1915. The species was found common in oak shoots in areas of sandy soil overgrown with oaks, and occasional among the scant grasses and plants growing on sandy soil, in the higher areas of the long-leaf pine woods near Bainbridge. Its habits much resembled those of *scudderi*.

Although this species was the sole member of the group found generally distributed in the oak and long-leaf pine woods at Bainbridge, it was absent from the undergrowth of the long-leaf pine woods growing in the narrow strip of flood-plain bordering the Flint River. In this latter locality, among scant plants, grasses and vines, *scudderi*, instead, was found.

**Melanoplus pegasus** new species (Plate XXXI, fig. 8.)

1916. *Melanoplus furcatus* Rehn and Hebard (not *Melanoplus furcatus* Scudder, 1897), Proc. Acad. Nat. Sci. Phila., 1916, p. 244. [Billy's Island, Jordan's on Billy's Island and Honey Island, all in Okefenokee Swamp, Georgia.]

The present insect is closely related to *M. furcatus* Scudder (see plate XXXI, fig. 7), and belongs to the Clypeatus Group. From *furcatus* it differs in the more solid coloration, in this respect closely resembling *M. clypeatus* (Scudder), and in the form of the male cerci, which show a further specialization of the type found in *furcatus*, the branches of the forked distal portion being more elongate and slender, and the ventral branch exceeding the dorsal branch in length.

With the unique male, type of *furcatus*, and a single male of the present species before them, Rehn and Hebard were, in 1916, unable to ascertain whether the differences found were specific

or due merely to individual variation. The series now at hand is constant in these differences, sufficient in our opinion for full specific separation.

*Type*.—♂; Billy's Island, Okefenokee Swamp, Charlton County, Georgia. July 16 to 19, 1917. (M. Hebard.) [Hebard Collection, Type no. 515.]

Size large, form robust but graceful. Fastigium of vertex feebly sulcate, frontal costa subsulcate except at median ocellus; as in *furcatus*. Antennae elongate, nearly twice as long as pronotum. Eye large, longer than cheek, twice as long as infra-ocular sulcus. Pronotum as in *furcatus*; medio-longitudinal carina distinct but not well developed on prozona, well developed on metazona, cut by sulci; lateral margins of disk distinct, rounding into the almost vertical lateral lobes; caudal margin of disk obtuse-angulate produced with angle rounded but rather sharp. Tegmina and wings almost reaching apex of abdomen.<sup>64</sup> Distal portion of abdomen enlarged. Furcula indicated as weak convexities on the segment from which these appendages spring when present,<sup>65</sup> the segment between these broadly angulate emarginate. Supra-anal plate as in *clypeatus*; very broadly shield-shaped and minutely triangularly produced meso-distad; medio-longitudinal carina deep and narrow in proximal two-thirds, thence weak, laterad of which sulcus the plate is broadly concave. Cercus moderately heavy, narrowing rather strongly to mesal portion, thence widening as strongly, strongly furcate; dorsal portion of furcation nearly twice as long as broad, with surface weakly concave, lateral margins feebly convex, subparallel and apex truncate with angles rounded; ventral portion of furcation distinctly longer than dorsal portion, broader at base, tapering evenly to the bluntly rounded apex, the dorsal portion of this margin, particularly distad, (frequently) sublamellate. Subgenital plate as in *furcatus*; moderately shallow, free margin briefly ascendant beyond cercal apices to the apex, which is slightly elevated in consequence, truncate, over twice as broad as high. Limbs as in *furcatus*.

*Allotype*.—♀; same data as type. [Hebard Collection.]

Size larger, form more robust than male, averaging not quite as heavy as in females of *furcatus*. Fastigium of vertex broader and scarcely concave. Tegmina and wings reaching base of supra-anal plate.<sup>66</sup> Ovipositor valves much as in *furcatus*; dorsal valves moderately recurved, ventral valves very weakly decurved. Limbs proportionately as in males.

<sup>64</sup> In paratypic males from reaching to slightly beyond base of supra-anal plate, to reaching slightly beyond apex of abdomen.

<sup>65</sup> In paratypic males varying from practically obsolete (frequent) to having minute angulations caudad of the margin of the segment (one specimen).

<sup>66</sup> In paratypic females showing very little variation. Two with abdomen pressed out have the abdomen extending considerably beyond the tegminal apices for this reason solely.

*Measurements (in millimeters) of extremes only*

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of wing	Length of caudal femur
♂					
Type . . . . .	31.8	7.6	4.6	19.7	17.8
Paratypes (23) . . . . .	29.9-34.9	7.2-8	4.1-4.7	19.4-22.7	17.9-18.9
♀					
Allotype . . . . .	37	8.7	5.3	21.3	21
Paratypes (12) . . . . .	33.4-37.7	8.2-9.2	5-5.4	19.3-22.2	20-21.3

*Coloration.*—Head and pronotum chestnut brown, a narrow post-ocular bar of dark chestnut brown continued feebly along the dorsal margin of the pronotal portion of the pronotal lateral lobes. Antennae hazel, darker distad. Eyes blackish brown. Dorsal field of tegmina buffy, heavily suffused with chestnut brown, particularly proximad; lateral fields dark chestnut brown. Underparts and abdomen cinnamon brown, the latter slightly paler. Metapleura cinnamon brown, with an oblique bar of buffy. Cephalic and median femora hessian brown, a purplish-red tinge distinct. Caudal femora with pagina cinnamon brown, suffused with blackish brown at apex, ventral margin strikingly straw yellow, this bar slightly broader proximad than distad, there slightly invading the pagina itself. Ventral surface of caudal femora brick red, becoming dragon's-blood red in sulcate portion, margined externally at margin of straw yellow bar with a few black dots, which fuse into a black line proximad and distad, distad occurs a broad pregenicular annulus of light buff. Caudal femora with dorso-external surface immaculate cinnamon brown with a russet tinge; dorso-internal surface tawny, with three moderately well defined suffusions of blackish chestnut brown, one of which is proximad, the most distal the broadest. Internal surface of caudal femora proximad suffused with dragon's-blood red, shading into carnelian red dorsad, the second dorsal suffusion broader and darker in dorsal half only, the third blackish and much broader and crossing the entire internal surface, pregenicular annulus warm buff and nearly as broad, genicular area externally and internally blackish except for the lobes which are buffy. Caudal femora dragon's-blood red, except for a very narrow blackish suffusion proximad and the spines, which are wholly black.

The series of males varies in general coloration from prout's brown dorsad and tawny olive laterad, to a maximum intensive condition in which the head and pronotum are blackish chestnut brown, with a comparatively broad blackish postocular bar, while the lateral fields of the tegmina are darker than the pronotum.

The females are very similar in coloration. They are a trifle less brilliant and the markings are more suffused, while the dorsal field of the tegmina averages paler, weak ochraceous-tawny, usually with a few scattered and inconspicuous flecks of darker brown.

In the series of adults, the pale ventro-external bar of the caudal femora is a conspicuous feature, much more sharply defined than in *furcatus*, while in that

species the femoral dark areas are less solid and the median dark area extends on the pagina. The coloring of the lateral fields of the tegmina is also less solid in *furcatus*, in some specimens heavily flecked with darker brown.

*Specimens Examined:* 55; 24 males, 13 females, 3 immature males and 15 immature females.

GEORGIA: Billy's Island, Jordan's on Billy's Island and Honey Island, all in Okefenokee Swamp.

In addition to the type and allotype, the adults are designated paratypes. The entire series, excepting those previously recorded, was taken by the author, on Billy's Island, from July 16 to 19, 1917.

This species was found in moderate numbers, the series being taken only after long and careful search through the proper areas. It was found in thick, rich, bushy undergrowth surrounding wet depressions filled with swamp-loving trees, these areas scattered through the long-leaf pine woods. Only in these thick margining zones of rich vegetation, growing about waist high, were specimens found. The males frequently flew short distances in a direct, plunging manner, the females were less likely to fly and were more difficult to locate.

In such environment we have found that all the species related to *clypeatus* occur. Thus all are extremely local in distribution and are easily overlooked. This probably accounts for the difficulty we had long experienced in securing series of any of these species. The present species probably reaches the maximum in number of adults about the beginning of August. The latest date we have for adults is September 1 to 5.

## EXPLANATION OF PLATES

## Plate XXIX

- Fig. 1.—*Hesperotettix pacificus capillatus* new race. Lateral outline of male (*type*). ( $\times 2\frac{1}{2}$ )
- Fig. 2.—*Acoloplus eremiaphila* new species. Lateral outline of male (*type*). ( $\times 2\frac{1}{2}$ )
- Fig. 3.—*Acoloplus eremiaphila* new species. Lateral outline of tegmen of female, showing maximum tegminal development in series. Pilot Mountains, Nevada. ( $\times 2\frac{1}{2}$ )
- Fig. 4.—*Oedaleonotus fraternacula* new species. Lateral outline of male (*type*). ( $\times 2\frac{1}{2}$ )
- Fig. 5.—*Oedaleonotus phrynicus* new species. Dorsal outline of pronotum of female (*allotype*). ( $\times 2\frac{1}{2}$ )
- Fig. 6.—*Oedaleonotus phrynicus* new species. Lateral view of female (*allotype*). ( $\times 2\frac{1}{2}$ )
- Fig. 7.—*Oedaleonotus tenuipennis* (Scudder). Dorsal outline of pronotum of female. San Gabriel Mountains, California. ( $\times 2\frac{1}{2}$ )
- Fig. 8.—*Ascomplus somesi* new species. Furcula and supra-anal plate of male (*type*). (Greatly enlarged.)
- Fig. 9.—*Ascomplus somesi* new species. Outline of cercus of male (*type*). (Greatly enlarged.)
- Fig. 10.—*Bradynotes obesa* (Thomas). Outline of cercus of male. Helena, Montana. (Greatly enlarged.)
- Fig. 11.—*Bradynotes pinguis* Scudder. Outline of cercus of male (*type*). (Same scale as fig. 10.)
- Fig. 12.—*Bradynotes kaibab* new species. Outline of cercus of male (*type*). (Same scale as fig. 10.)
- Fig. 13.—*Bradynotes deplanata* new species. Outline of cercus of male (*type*). (Same scale as fig. 10.)
- Fig. 14.—*Bradynotes compacta* Morse. Outline of cercus of male (*paratype*). (Same scale as fig. 10.)

## Plate XXX

- Fig. 1.—*Bradynotes pinguis* Scudder. Dorsal view of pronotum of male (*type*). ( $\times 4\frac{1}{2}$ )
- Fig. 2.—*Bradynotes deplanata* new species. Dorsal view of pronotum of male (*type*). ( $\times 4\frac{1}{2}$ )
- Fig. 3.—*Melanoplus huporeus* new species. Furcula and supra-anal plate of male (*type*). (Greatly enlarged.)
- Fig. 4.—*Melanoplus gracilipes* Scudder. Cercus of male (*type*). (Greatly enlarged.)
- Fig. 5.—*Melanoplus hesperus* new species. Furcula and supra-anal plate of male (*type*). (Greatly enlarged.)

- Fig. 6.—*Melanoplus hesperus* new species. Cercus of male (*type*). (Same scale as fig. 4.)
- Fig. 7.—*Melanoplus microtatus* new species. Furcula and supra-anal plate of male (*type*). (Same scale as fig. 5.)
- Fig. 8.—*Melanoplus microtatus* new species. Cercus of male (*type*). (Same scale as fig. 4.)
- Fig. 9.—*Melanoplus aspasmus* new species. Furcula and supra-anal plate of male (*type*). (Same scale as fig. 5.)
- Fig. 10.—*Melanoplus aspasmus* new species. Cercus of male (*type*). (Same scale as fig. 4.)

## Plate XXXI

- Fig. 1.—*Melanoplus marginatus* Scudder. Cercus of male. Ahwahnee, California. (Greatly enlarged.)
- Fig. 2.—*Melanoplus hupereus* new species. Cercus of male (*type*). (Same scale as fig. 1.)
- Fig. 3.—*Melanoplus hesperus* new species. Caudal view of subgenital plate of male (*type*). (Greatly enlarged.)
- Fig. 4.—*Melanoplus aspasmus* new species. Caudal view of subgenital plate of male (*type*). (Same scale as fig. 3.)
- Fig. 5.—*Melanoplus carnegiei* Morse. Outline of cercus of male. Asheville, North Carolina. (Greatly enlarged.)
- Fig. 6.—*Melanoplus acidocercus* new species. Outline of cercus of male (*type*). (Same scale as fig. 5.)
- Fig. 7.—*Melanoplus furcatus* Scudder. Cercus of male (*type*). (Greatly enlarged.)
- Fig. 8.—*Melanoplus pegasus* new species. Cercus of male (*type*). (Same scale as fig. 7.)

A NEW GENUS AND SPECIES OF ROACH FROM THE  
UNITED STATES AND TROPICAL NORTH AMERICA

(ORTHOPTERA; BLATTIDAE; PANCHLORINAE)

BY MORGAN HEBARD

For some time in our studies, small series of an apparently immature Panchlorid have puzzled us, due to the fact that nowhere in the literature have we been able to place the species. Recently additional series from Panama have, on comparison, proved to represent the same species, and further study convinces us that the insect is undescribed.

At first it appeared that all of the material was immature, but after much examination and comparison we have finally reached the conclusion that we here have a species which, at least in the female sex,<sup>1</sup> retains in full the immature form, lacking the organs of flight, but with mesonotum and metanotum laterad produced caudad as is usual for winged Blattids in the instar preceding maturity.

The insect is clearly nearest *Pycnoscelus surinamensis* (Linnaeus). Examination of the extensive series of that species at hand leads us to believe that it is probable that many females retain to the end the immature form, only a certain number attaining a normal adult form with differently shaped pronotum and fully developed organs of flight.

When compared with large females of that species lacking organs of flight, similar females of the present insect are found to differ in being slightly more slender, with roughened surface of caudal portion of abdomen less contrastingly and sharply differentiated from the remaining polished dorsal surface, in the disto-dorsal segments of abdomen having the caudal margins more decidedly beaded and latero-caudal angles brief but sharply acute-angulate produced, and in having more slender limbs, with armament of the same signally different and tarsal claws more elongate and slender. In general appearance the similarity is so close that confusion in determination might easily occur, were such based merely on a hurried examination.

<sup>1</sup> No adult males are at hand.

**PYCNOSCELOIDES** new genus

*Genotype*.—*Pycnosceloides aporus* new species.

Adult female lacking organs of flight and retaining the immature form. Head as in *Pycnoscelus*, with wide interocular space and flattened, weakly convex face. Dorsal surface smooth and polished, except distal portion of abdomen which is roughened, apparently by the adhesion of foreign particles. Pronotum evenly convex, margin convex to latero-caudal angles which are rather broadly rounded, caudal margin weakly convex, nearly transverse, showing a slight angulation mesad. Mesonotum and metanotum with caudal margins transverse mesad, laterad acute-angulate produced caudad with apex sharply rounded. Cerci reduced, short, stout, rounded distad, sublamellate, with joints indicated only ventro-proximad. Supra-anal plate transverse. Subgenital plate ample. Limbs moderately heavy. Cephalic femora with ventro-cephalic margin supplied with a fringe of hairs, lacking a distal spine. Other ventral femoral margins entirely unarmed except ventro-caudal margin of caudal femora, which bears a small, moderately stout median spine (and very rarely a similar but smaller spine proximad). Dorsal genicular spine of median and caudal femora reduced, small and moderately stout. Pulvilli occupying entire ventral surfaces of four proximal tarsal joints, as in *Pycnoscelus*. Tarsal claws elongate and delicate, much surpassing the moderately well developed arolium.

**Pycnosceloides aporus**<sup>2</sup> new species

<sup>2</sup> From ἀπορος = difficult to deal with.

*Type*.—♀; Motzorongo, Vera Cruz, Mexico. February, 1892. (L. Bruner.) [Hebard Collection, Type No. 495.]

Size small for the subfamily, similar to that of *Pycnoscelus surinamensis*; form not fully as broad as in females of that species lacking organs of flight. Ocellar spots small and irregular. Dorsal surface and character and armament of limbs given in generic description. Distal abdominal segments with caudal margins beaded, this minute but distinctly more decided than in *Pycnoscelus surinamensis*, latero-caudal angles of these segments briefly but sharply acute-angulate produced. Supra-anal plate subquadrate; caudal margin transverse, weakly convex in each half, forming a minute median acute-angulate emargination, latero-caudal angles broadly rounded. Subgenital plate broadly scoop-shaped, broadly concave at bases of cerci, produced and convex mesad, extending as far caudad as the supra-anal plate. Ventro-cephalic margin of cephalic femora fringed with hairs, which are not decidedly longer proximad as in *Pycnoscelus surinamensis*.



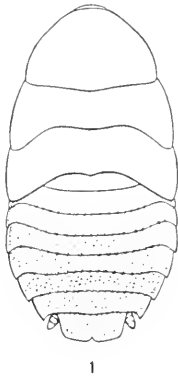


Figure 1. *Pycnosceloides aporus* new species. Dorsal view of type (female). ( $\times 2\frac{1}{2}$ )

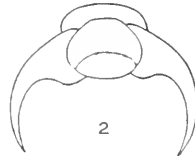


Figure 2. *Pycnosceloides aporus* new species. Distal outline of tarsal claw and arolium. (Greatly enlarged.)

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Width of pronotum	Greatest width of abdomen	Length of caudal tibia
Motzorongo, Mexico, <i>type</i> . . . . .	17	4.9	7.1	9.1	4.8
Motzorongo, Mexico, <i>paratype</i> . . . . .	18	4.9	7.3	9	4.7
Pózo Azul, Costa Rica . . . . .	18	1.9	7.3	8.8	1.7
Porto Bello, Panama . . . . .	18.8	5.1	7.8	10	1.9

*Coloration*.—Head cinnamon brown deepening to chestnut brown on face, paling to ochraceous-tawny in ocellar areas and on clypeus. In the maximum intensive condition the head is blackish chestnut brown, paling to mars brown on occiput and clypeus, with ocellar spots dark ochraceous-tawny. Dorsal surface shining chestnut brown to blackish chestnut brown, except distal portion of abdomen which is of the same color but roughened. Limbs ochraceous tawny. Ventral surface ochraceous tawny, deepening to chestnut brown on abdomen, this represented by a broad marginal suffusion or covering the entire ventral surface.

*Specimens Examined*: 54; 4 females, 12 immature males and 38 immature females.

Brownsville, Texas, XI, 22, 1907, (J. D. Mitchell), 1 small juv. ♀, [U. S. N. M.].

Pine Cañon, Monte Diablo, California, X, 5, 1893, (G. Eisen), 2 juv. ♀, 1 small juv. ♂, 1 small juv. ♀, [Hebard Cln.].

Orizaba, Vera Cruz, Mexico, I, 1892, (L. Bruner), 5 juv. ♀, 1 small juv. ♂, 5 small juv. ♀, [Hebard Cln.].

Motzorongo, Vera Cruz, Mexico, II, 1892, (L. Bruner), 2 ♀, 1 juv. ♂, 2 juv. ♀, 2 small juv. ♂, 1 small juv. ♀, *type* and *paratypes*, [Hebard Cln.].

Minatitlan, Vera Cruz, Mexico, II, 2, 1892, (L. Bruner), 1 juv. ♀, [Hebard Cln.].

Pózo Azúl de Pirris, Costa Rica, V, 10 to 20, 1902, (M. A. Carriker Jr.), 1 ♀, 1 juv. ♂, 3 juv. ♀, [Hebard Cln.].

Porto Bello, Panama, II, 18 and 24, 1911, (A. Buseck), 1 ♀, 2 juv. ♀, [U. S. N. M.].

Alhajuela, Panama, IV, 4 to 17, 1911, (A. Buseck), 1 juv. ♀, 2 small juv. ♂, 4 small juv. ♀, [U. S. N. M.].

Rio Chilibre, Panama, IV, 14, 1911, (A. Buseck), 1 small juv. ♀, [U. S. N. M.].

Rio Trinidad, Panama, V, 4, 1911, (A. Buseck), 2 very small juv. ♂, 1 very small juv. ♀, [U. S. N. M.].

Cabima, Panama, V, 22 and 24, 1911, (A. Buseck), 4 juv. ♀, 1 small juv. ♂, 1 small juv. ♀, 1 very small juv. ♂, 1 very small juv. ♀, [U. S. N. M.].

Corozal, Canal Zone, Panama, XI, 17, 1913, (Hebard; under decaying banana stem in jungle), 1 juv. ♀, 1 small juv. ♀, [Hebard Cln.].

A NEW CENTRAL AMERICAN GENUS AND SPECIES  
OF THE GROUP BLATTELLITES (ORTHOPTERA;  
BLATTIDAE; PSEUDOMOPINAE).

BY MORGAN HEBARD

In studying large Panamanian collections of Blattidae, we have recently examined much of the undetermined material of this family available. In material, as yet unreported, from Mexico and Nicaragua, a pair of a Blattelite, particularly remarkable in the character of the tarsal claws, has been found. This material we desire to treat at the present time, in order that the name may be quoted in the Panamanian study now being prepared.

**ANTITHETON**<sup>1</sup> new genus

The present genus is remarkable in having asymmetrical tarsal claws, a feature characteristic of the typical genera of the Nyctiborinae and the genus *Chorisoncura*<sup>2</sup>, though in all other respects clearly a Pseudomopid of the Group Blattellites. This species, and the species of the genus *Latiblattella*, represent the only forms of the Pseudomopinae known to us which show this type of tarsal claw specialization.

In linear arrangement we place this genus after *Latiblattella* Hebard and before *Macrophyllodromia* Saussure and Zehntner. The genus is, however, distinctive and shows little affinity to any of the other genera, though superficially and in general appearance alone agreeing more closely with *Platylestes* Hebard.

*Genotype*.—*Antitheton iniquiungues* new species.

Sexes similar. Size rather large, form very broad for the Group Blattellites. Head with eyes well separated; lateral margins of face distinctly convergent ventrad. Tegmina rather decidedly chitinous for the Group; discoidal sectors numerous, oblique but moderately radiating, so that they are strongly oblique beyond apex of anal field, but toward the discoidal vein parallel to it. Wings with costal veins weakly thickened distad;

<sup>1</sup> From ἀντίθερον = antithesis.

<sup>2</sup> Though a striking feature, we find no mention of it heretofore in the literature.

ulnar vein with numerous complete branches; intercalated triangle small but distinct. Dorsal surface of male abdomen specialized. Subgenital plate of male fusing and specialized with styles. Subgenital plate of female short, showing a very brief medio-longitudinal distal cleft. Cephalic femora with ventro-cephalic margin armed with (four to six) long, stout spines, succeeded distad by a row of minute, well-spaced, piliform spines, terminating in three spines, heavy and elongate in increasing ratio distad. Ventro-caudal margin of cephalic femora armed with (four and one distal) long, stout spines. Other ventral femoral margins well supplied with spines, which, for the Group, are long and stout, though not as heavy as those usually found in the species of the Group *Ichnopterites*. First three tarsal joints supplied distad with small pulvilli, brief ventral surface of fourth joint occupied by a pulvillus. Tarsal claws asymmetrical, simple; cephalic claw of each pair about half as large as the corresponding caudal claw, its apex extending only slightly beyond the large arolium.

***Antitheton iniquiungues*** new species

Compared with *Platylestes colombiae* Hebard, with which species alone any similarity, of even a superficial nature, is shown, the present insect is found to differ in the smaller head, shorter, much more transverse and elliptical pronotum, fully developed tegmina and wings, showing only very slight reduction in the female sex, richer coloration, more slender cerci, important features in venation and male primary and secondary sexual features, and in the remarkably asymmetrical tarsal claws.

*Type*.—♂; Cacao, Trece Aguas, Alta Vera Paz, Guatemala. Altitude, about 900 feet. April 19, 1906. (Barber and Schwarz.) [United States National Museum.]

Size rather large for the Group, form very broad. Head with interocular space half that between antennal sockets; inter-ocular-ocellar area flattened, feebly concave; large ocellar spots present; slightly smaller circular areas, with surfaces feebly convex, occur meso-ventrad of and adjacent to the antennal sockets. Maxillary palpi with distal joint large, very slightly shorter than preceding joint, which joint is distinctly shorter than third joint. Face and two distal joints of maxillary palpi well supplied with moderately elongate, coppery hairs. Pronotum strongly transverse; surface very weakly and evenly convex except toward caudal margin, where it is narrowly more strongly convex declivent; transparent lateral portions very weakly declivent, distinctly less so than in *Platylestes colombiae*; cephalic margin broadly convex, caudal margin

very broadly convex except mesad where a slightly stronger convexity is shown; lateral angles only slightly caudad of mesal point, broadly rounded. Tegmina broad; fully developed, extending beyond cercal apices a distance equal to the cercal length. Dorsal surface of abdomen with sixth segment showing a strong and sudden median depression, its cephalic margin strongly convex, from the caudal margin spring two rounded ridges, approximate, slightly concave, converging cephalad, with their apex supplied with a tuft of agglutinated hairs, these occupying the mesal portion of the depression; latero-caudal angles of segment slightly produced, subrectangulate, with apex sharply rounded; seventh and eighth segments briefly exposed, transversely decidedly narrower than sixth. Supra-anal plate briefly triangularly produced, with apex rounded; length about one-fourth basal width. Cerci elongate, slender; dorsal surface flattened, weakly convex proximad; joints (thirteen) with lateral margins almost straight to near caudal margin, but decreasing rapidly in individual size meso-distad to the acute apex; ventral surface of each joint decidedly convex, lateral margins rather broadly lamellate, particularly the external margins. Concealed genitalia very complex.<sup>3</sup> Subgenital plate very small, convex, the meso-distal third occupied by large, elongate, irregularly rounded, attinent styles, directed dorso-caudad, with broad apices rounded; beneath and covering the internal portion of the bases of the styles, the median portion of the free margin of the plate is triangularly produced. Limbs elongate and slender. Venation, limb armament, tarsi and arolia discussed in generic description.

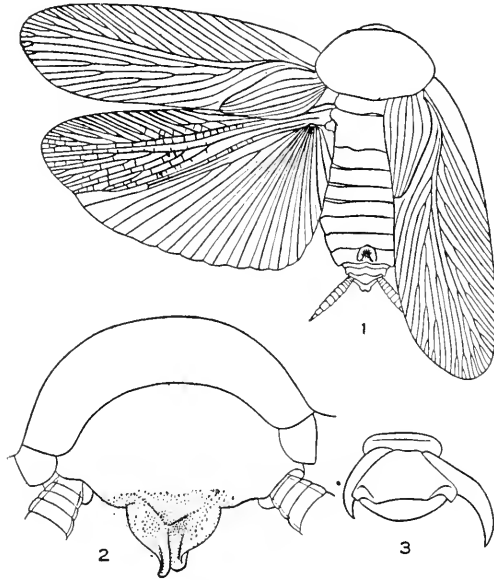
*Allotype*.—♀; Santa Lucrecia, Vera Cruz, Mexico. (F. Knab.)  
[United States National Museum.]

This sex agrees closely with the male, but has the pronotum slightly longer, while the tegmina and wings show slight reduction, reaching only slightly beyond the cercal apices. Interocular space of same width. Dorsal surface of abdomen unspecialized. Supra-anal plate triangularly produced, with apex rounded but deeply cleft; length about one-third basal width. Subgenital plate ample, convex, short, briefly upturned distad, with a brief medio-longitudinal cleft in this portion; free margin broadly convex proximad, then as broadly concave beneath bases of cerci, thence with margin of briefly upturned portion very broadly convex.

*Measurements (in millimeters)*

♂	Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
Cacao, Guatemala, <i>type</i> .	14.8	4	6.5	17	5.2
♀					
Santa Lucrecia, Mexico, <i>allotype</i> .....	14.5	4.2	6.4	15.5	5.1

<sup>3</sup> This portion can not be examined without risking damage to the unique male.



*Antitheton iniquiungues* new species. *Type*. Male. Cacao, Trece Aguas, Alta Vera Paz, Guatemala. Fig. 1. Dorsal outline ( $\times 2\frac{1}{2}$ ). Fig. 2. Ventro-caudal view of distal portion of abdomen (much enlarged). Fig. 3. Distal outline of tarsal claws and arolium (greatly enlarged).

*Coloration*.—Disk of pronotum and tegmina shining, brilliant mahogany red; the latter when spread translucent, appearing umber brown, this weaker distad and in area of dextral tegmen concealed when at rest. Lateral portions of pronotum transparent, weakly tinged with buffy. Wings transparent, weakly tinged with buffy, except veins and all but proximal portion of anterior field, which are weak amber brown. Dorsal surface of abdomen and cerci ochraceous-tawny. Head vinaceous-rufous<sup>4</sup>; eyes black; ocellar spots buffy. Antennae liver brown, except first two joints which are apricot buff. Maxillary palpi with proximal joints buffy washed with dark brown proximad, last two joints black. Limbs cinnamon rufous, the following portions suffused with blackish brown; cephalic tibiae and tarsi, distal half of median tibiae, distal half of caudal tibiae, distal portion of median and caudal metatarsi and all of remaining median and caudal tarsal joints.

This remarkable species is known only from the described pair.

<sup>4</sup> In the type dark, discolored.



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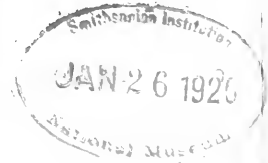
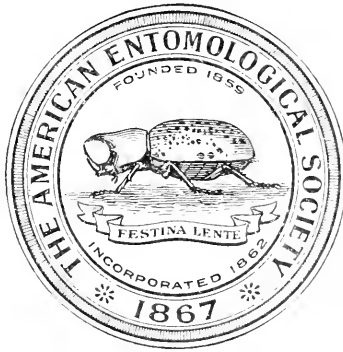


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STUDIES IN ALAUDES  
(COLEOPTERA; TENEBRIONIDAE)

BY FRANK E. BLAISDELL, SR.

In 1890, the writer took a specimen of a species of *Alaudes* at San Diego, California. It was found with ants under a cobblestone, near the mouth of what was then known as Switzer's Canyon. This canyon is to the southeast of the city. The specimen has remained an unique ever since.

In 1907, Mr. F. W. Nunemacher collected a series of a species near Goldfield, Nevada. Dr. E. C. VanDyke has also taken a small series in Alameda County, California. Very recently Mr. J. O. Martin most kindly permitted me to study a series of sixteen specimens which he collected at Pasadena, southern California. The Goldfield and Pasadena series are accompanied by specimens of the ants with which they were found. These ants are of two distinct species. Careful examination of the specimens shows conclusively that four species of *Alaudes* are involved, and that three new species make a remarkable addition to our list of blind Tenebrionids.

Dr. Geo. Horn in the "Revision of the Tenebrionidae"<sup>1</sup> defined the genus *Alaudes* and described a single species, namely, *A. singularis*. The striking generic characters are the absence of eyes, and the abrupt and very deep depression at middle of the pronotal base, with a corresponding scutellar depression of the elytral base. Horn states that in *singularis* the scutellum is "transverse, bisinuate and tridentate at apex." The elytra have nine series of punctures each, and the vestiture consists of widely spaced and interstitial series of scales or setae.

The species may be defined as follows:

***Alaudes singularis* Horn**

*Form* oblong=oval and subdepressed. *Color* brownish=castaneous.

*Head* and pronotum clothed with yellowish appressed scales, interspersed with others that are larger and scarcely suberect. Elytral vestiture consists of very sparsely arranged, more or less gradually clavate, erect scales.

<sup>1</sup> Annals Amer. Philos. Soc., xiv, p. 361.

*Head* rather large, about a third of its width wider than long; sides sinuate at the usual position of the eyes, the sinuation limited by an anterior and a posterior angulation, the latter or basal angle slightly more prominent laterally than the former; apex very moderately sinuate at middle, lateral lobes arcuate and continuous with the moderately oblique sides of the front, margin more or less subdiaphanous and slightly reflexed; base broadly arcuate and scarcely sinuate laterally.

*Pronotum* slightly more than twice as wide as long; sides moderately prominent and rounded in anterior half, thence sinuately converging to become parallel before the basal angles; base transverse in middle two-fourths, sinuate in lateral fourths and adapted to the humeral region of the elytra; basal angles blunt, somewhat prominent laterally, including the investing scales; apex broadly, rather strongly and arcuately sinuate; disk rather more than moderately convex; basal depression occupies rather more than basal two-fourths, its floor flat, quite semicircularly rounded anteriorly, sides moderately precipitous, forming an angle with the floor.

*Elytra* about three times as long as the pronotum, about a third longer than wide; sides rather less than moderately arcuate, more rapidly so in apical third to the subogival apex; base broadly and feebly emarginate, humeri feebly dentiform; disk moderately and quite evenly convex, punctures large and round, arranged in rows, obsolescent on the scutellar declivity, but attaining the base laterally, interspaces bearing a single series of widely spaced erect scales, marginal series clavate, i.e. increasing gradually in width from base to apex, inner series becoming more or less subclavate or linear on the disk, but more hair-like at base. Scutellum transverse with a few long slender hairs.

Head and prothorax beneath, and legs clothed with scales. Prosternum rather densely punctate, with a few scattered scales.

*Measurements*.—Length, 1.7 mm.; width, 0.7 mm.

*Habitat*.—Pasadena, Los Angeles County, southern California. Horn gives only "California".

Sixteen specimens studied. *Type* in the Horn Collection.

Mr. Martin's specimens were identified as *singularis* by Prof. Fall. Horn's figure in the "Revision" is quite misleading as to the general form of the insect. It is drawn too robust and too oval, sides of the pronotum too straight, basal angles too obtuse and blunt, basal projections too strong, and the sides of the head are more sinuate than represented.

As a matter of fact the basal angles of the pronotum are clothed with a dense tuft of scales which render the angles more prominent than they really are. The true angles can often be seen as a blackish line dorsally at base of the squamous tuft. Horn's specimen may have had the angles denuded.

The basal prominences of the pronotum are relatively large, and when the prothorax is fully extended slightly overlap the sides of the scutellar depression.

The sutural striæ may be slightly impressed and the first interval feebly convex as it descends on the basal declivity.

It may again be stated that the marginal row of scales on the elytra are distinctly narrowed from apex to base, the former rounded, while the next and inner series are less so, becoming fusiform or linear on the central part of the disk, and hair-like around the scutellar declivity. The scutellum has a few long, flying hairs. The elytral punctures are strong and moderately deep. The elytral base is equal in width to that of the pronotum. In the humeral fourths the base is notched and apparently interlock with the angles of the pronotum.

Sexual differences are not evident. Four out of the sixteen specimens of Mr. Martin's series have all of the elytral scales quite linear, but not hair-like nor setiform. In some of the specimens the antennæ are gradually and slightly incrassate, in others a three-jointed club is slightly evident. There are probably sexual differences, they are positively not specific.

#### ***Alaudes squamosa* new species**

*Form* oblong-oval, subdepressed and quite parallel. *Color* testaceo-castaneous. Head and pronotum densely clothed with appressed scales. Elytral vestiture consisting of sparsely placed capitate scales in interstitial series, those of the central area becoming more slender and in the basal region rather linear.

*Head* about a third of its width wider than long, not strongly sinuate at the sides, and the basal angles somewhat more prominent laterally than the anterior angulation; apical margin rather deeply sinuate in middle third, sinuation evenly rounded, lobes evenly rounded into the oblique sides, margin rather narrow and subdiaphanous; surface broadly and feebly impressed in the latero-basal area.

*Pronotum* slightly more than twice as wide as long; sides somewhat prominent and moderately arcuate in anterior third, thence convergent and broadly sinuate to become parallel in about basal fourth; apex broadly and moderately deeply sinuate and adapted to the arcuate base of the head; apical angles sub-obtuse and not broadly rounded; base truncate at middle, sinuate laterally and adapted to the humeral region of the elytra; basal angles not prominent laterally, obtuse with the investing scales; disk moderately convex anteriorly, sides of the basal depression rather obliquely precipitous, passing rather arcuately into the horizontal floor; depression equal to about a third of the width or length.

*Elytra* slightly more than three times as long as the pronotum, base equal to the pronotal base; sides moderately arcuate and parallel, arcuately convergent in apical third, apex obtusely ogival; disk evenly and moderately convex, punctures coarse and round, distinctly serial in arrangement and separated by a distance equal to their diameter or a little less, sutural series slightly impressed, sutural interval feebly convex and passing more or less on to the scutellar declivity, surface punctate to base, punctures somewhat obsolescent behind the scutellum, the latter narrow and transverse; marginal scales almost widest at apex, triangulo-clavate in form, those of the central area clavate and more rounded at apex, becoming more linear about the scutellar region, scutellar hairs few, long and slender.

*Measurements*.—Length, 1.6 mm.; width, 0.6 mm.

*Habitat*.—Goldfield, Esmeralda County, Nevada. Collected October 18, 1907. Found in ant's nests by Mr. F. W. Nunenmacher.

*Type* in the author's collection. Paratypes in Mr. Nunenmacher's collection.

*Squamosa* is more parallel than *singularis*. The elytral base is equal to the pronotal base in both species. In *squamosa* the basal angles of the pronotum are not prominent laterally, and are obtuse, including the investing scales; sides moderately rounded anteriorly and frequently subangulate at point where convergence begins. Pronotal margin with short, stout truncate scales which are semi-erect.

The elytral scales are stouter apically, somewhat rounded or nearly truncate at apex, narrowing more rapidly at base; the marginal series may be described as triangulo-clavate, while those of the central area are more or less clavate to fusiform. The punctures are less perforate than in *singularis*.

#### **Alaudes setigera** new species

*Form* slightly robust, oblong-oval and less depressed. *Color* brownish castaneous. Vestiture consisting of densely placed and appressed scales on the head and pronotum, and of slender, erect hair-like setae on the elytra.

*Head* transverse, about a half wider than long; front moderately and evenly convex, broadly and feebly impressed laterally near the basal angles, the latter subacute and distinctly more prominent laterally than the anterior angulation, sinuation rather sharply subtriangular; apical margin broadly sinuate at middle, lobes evenly rounded, edge moderately narrowly subdiaphanous; base broadly arcuate and feebly sinuate laterally, adapted to the pronotal apex.

*Pronotum* about twice as wide as long; sides prominent and rather strongly rounded in apical half, thence converging and broadly sinuate, becoming parallel in about basal fifth; apical angles quite broadly rounded and continuing

into the broadly sinuate apex; base, as a whole, moderately arcuate, squarely truncate in middle two-fourths, sinuate laterally and adapted to the elytral base at the humeri; basal depression large and broadly arcuate anteriorly, projections rather strong, distinctly touching the side of the scutellar depression; basal angles almost rectangular, narrowly rounded including the investing scales; disk strongly arcuate anteriorly and laterally.

*Elytra* about three times as long as the pronotum and about a third of their width longer than wide; disk moderately convex, punctures coarse, round and rather shallow, quite obsolete at base and on the scutellar declivity; sides moderately arcuate, converging from about the middle in an arcuate manner to the parabolically rounded apex; vestiture long, slender and hair-like, widely spaced in interstitial series. Scutellum apparently oblong-triangular and transverse, the sparsely placed hairs somewhat coarse.

*Measurements*.—Length, 1.5 mm.; width, 0.6 mm.

*Habitat*.—San Diego, California. Taken in company with ants. One specimen in the author's collection.

*Setigera* is quite distinct from either *singularis* or *squamosa*, the head is transverse, the pronotum longer and less transverse, elytral vestiture hair-like, form more robust, the basal angles of the head are more prominent and sharper and the lateral situation is more sharply reëntrant.

#### ***Alaudes testacea* new species**

*Form* oblong-oval, somewhat depressed. *Color* testaceous. Head and pronotum clothed with yellow appressed scales, some of which are apparently larger than the majority. Elytral vestiture consists of sparsely arranged erect scales in interstitial series; the marginal scales are strongly capitate, becoming less capitate centrally.

*Head* moderate in size, about a third wider than long, anterior angulation less prominent than the subobtuse basal angle, situation rather shallow, sides oblique anteriorly; apex moderately deeply sinuate in middle third, situation evenly rounded, lobes evenly arcuate, margin narrowly subdiaphanous; base rather strongly and broadly arcuate in middle three-fifths, somewhat oblique and apparently very feebly sinuate laterally; surface feebly convex centrally, broadly and vaguely impressed laterally and apically.

*Pronotum* distinctly transverse and about a third of its length shorter than the head, more than twice as wide as long, base about equal to apex; sides moderately arcuate anteriorly, thence oblique and somewhat feebly sinuate and subparallel before the basal angles, the latter obtuse (♂) to somewhat prominent (♀) posteriorly; apex broadly sinuate, angles subobtuse; base somewhat arcuate as a whole, sinuate laterally and adapted to the humeri; depression about equal to a third of the width, sides rather precipitous, passing quite arcuately into the floor, the latter flat with posterior border transverse or feebly arcuate; disk moderately convex, basal prominences rather strong.

*Elytra* about three and a half times longer than the pronotum and about a third of their length longer than wide; sides feebly arcuate and parallel in basal two-thirds, thence gradually arcuate to the less than broadly rounded apex; disk moderately convex from side to side, arcuately declivous apically; punctures large, round, quite strong, moderately deep and distinctly serial; marginal scales short, broad and rounded at apex, quite suddenly narrowed toward base, those on the central part of the disk more gradually clavate, the few flying hairs about the scutellum rather coarse. Scutellum distinctly triangular.

Body beneath clothed with scales.

*Measurements*.—Length, 1.5–1.08 mm.; width, 0.6–0.8 mm.

*Habitat*.—Alameda County, California.

*Type* (♂) in the author's collection. Collected by Dr. E. C. Van Dyke, who possesses paratypes.

The salient and differential characters are the shorter pronotum, shorter, stouter and more strongly capitate marginal scales of the elytra, and, besides the punctures attaining the base laterally, becoming obsolete on the scutellar declivity, the sutural striae are impressed toward base and extend on to the declivity as well. The triangular scutellum is distinctive and unique. In the female the sides of the scutellar depression is rather prominent, and the sculpturing is coarser. The basal prominences are noticeably tufted with horizontal elongate scales.

The posterior margin of the floor of the basal pronotal depression is distinctly arcuate.

The following table will aid in the separation of species:

Elytral vestiture distinctly scale-like. Scutellum distinctly triangular; marginal scales of elytra strongly capitate and rather short.....	<b>testacea</b>
Scutellum apparently transverse and more or less bisinuate at apex.	
Marginal scales rather narrow, increasing gradually in width from the base.....	<b>singularis</b>
Marginal scales broad at apex, increasing rapidly in width from the base; rounded or subtruncate at apex.....	<b>squamosa</b>
Elytral vestiture distinctly hair-like. Scutellum apparently transverse and more or less bisinuate at apex.....	<b>setigera</b>

It is extremely doubtful that the scutellum is transversely oblong, tridentate and bisinuate at apex. The doubt arises from a careful examination of the small series at hand. These insects are delicate and troublesome to handle, there are so few in collections that it is not desirable to dissect any. These remarks apply only to *singularis*, *squamosa* and *setigera*.



In *testacea* there can be no doubt regarding the scutellum, for it is larger than in the other species and almost an equilateral triangle.

In the other three species the bottom of the scutellar depression is transversely flattened. The scutellum when cleaned and viewed with moderately high power appears to consist of three parts, a middle or triangular part (true scutellum) and a lateral portion or callus on each side, which is a modification of the elytral margin bounding the scutellum, and fitted to the oblique sides of the central triangular part so as to give the appearance of a continuous transversely oblong scutellum, which appears distinctly bisinuate and tridentate at apex from lateral angles of the side pieces, and the middle angle or apex of the true scutellum. This appears to be the true explanation, and does not affect the status of the species. In *testacea* the parascutellar pieces are not present.

In all the species the elytral base is impressed or notched between the humeri and the more or less prominent sides of the scutellar depression, corresponding to similar notches at base of the pronotum, between the basal prominences and basal angles.



## SYNOPSIS AND REVIEW OF THE SPECIES OF COELUS (COLEOPTERA; TENEBRIONIDAE)

BY FRANK E. BLAISDELL, SR.

For many years but two species of *Coelus* were recognized, *ciliatus* Eschscholtz and *globosus* Leconte, both inhabitants of the sandy maritime districts along the Pacific Coast. In 1890, Col. Thos. L. Casey reviewed the genus and described two new species, *grossus* and *arcuarius*. In 1895, the same author again reviewed this genus defining two additional species, *latus* and *curtulus*, while in his more recent revision of the Coniontini the number of species has been increased to fifteen with one subspecies.

The present reviewer began the accumulation of material in this genus in 1890, while living at Coronado, San Diego County, California. Immediately after the appearance of Col. Casey's first and short revision, *Coelus grossus* was obtained from Mr. G. W. Dunn, who collected it at Santa Barbara, California. The present paper is the outcome of repeated examination of hundreds of specimens from different parts of the Pacific Coast from San Diego to the shores of Humboldt Bay. Notes made some twenty-nine years ago will be used here for the first time.

Before proceeding further the author takes pleasure in acknowledging his indebtedness to the following friends, who have loaned him their material in this genus or have collected series for him on request: Prof. H. C. Fall, Dr. Fenyes, J. O. Martin, Ralph Hopping, Dr. E. C. Van Dyke, L. S. Slevin, L. R. Reynolds, H. W. Numenmacher, G. R. Pilate, and the California Academy of Sciences through its Curator of Entomology, E. P. Van Duzee.

Long series have been collected in the vicinity of San Diego and San Francisco; smaller lots at Dipsea and Tomales Bay, Marin County, and at Samoa, Humboldt Bay, all from California. In all many hundreds of specimens have been systematically examined to test the intra-specific characters and to determine how they vary and whether they correspond to published values. Much time has been devoted to the comparison and arrangement

of the material according to the variation of morphological peculiarities, in order to find definite characters by which to define the different forms to be recognized as taxonomic grades, and to avoid the use of unnecessary and impractical qualifying terms.

As a result of this study the following characters have been found of definite value: Punctuation of labrum, degree of epistomal situation, degree of transverse impression of the front and degree of abruptness with which the base of the epistoma arises from the frontal suture, punctuation of the pronotum, shape and sculpturing of the mentum and degree and character of the sculpturing of the prosternum, especially that on the process. The following facts also were determined:

Color is without taxonomic value. Paleness means immaturity or retarded or inhibited pigmentation and is purely physiological and environmental. Large series of *Coelus globosus* taken in February from sand dunes at Ocean Beach, San Diego County, were entirely testaceous to castaneous; later in the season specimens from the same dunes were rufo-piceous or nigro-piceous, at other times black without exception. Occasional pale specimens taken among others entirely dark simply implies sporadic development after the main broods have appeared.

Form is equally without taxonomic value. In large series of nearly all grades, when not founded on form alone, variations in body form are abundant. The shape varies from oblong-oval, more or less broad, to somewhat elongate oblong-oval, or elliptical. This fact can readily be appreciated if the individuals of a species or race are arranged in a block system. Such an arrangement will show that males of *Coelus ciliatus*, for instance, may be elongate-oval or broader and oblong with all degrees of transition between the extremes, other characters being identical in the series.

Unusual development in size is of some value, as in *Coelus grossus* and its form *saginitus*, and smallness, in part at least, as in *Coelus debilis*.

Elytral inflation is a characteristic of *Coelus globosus* and its races. As a rule the males in each species are considerably less convex than are the females.

Shape and degree of constriction of the prosternal process is of no value. This process is rather more constricted between the coxae in *Coelus ciliatus* than in *Coelus globosus* but variable in form in the same species or race.

Pronotal punctuation is of value, but the large impunctate areas are not fixed and vary beyond all usefulness and simply indicate degree of variation. For instance in certain specimens of *Coelus grossus* they are large and unmistakable, but in a series these areas become evanescent and pass into the regularity of punctuation observed in *saginatus*. Frequently large impunctate areas will disappear entirely after immersion in chloroform; a part of the technique in the preparation of specimens for study has been a routine bath in chloroform.

Casey has given the general characteristics of the genus as follows: "Body oval to oblong-oval, always strongly convex in form, with a dense fringe of erect fulvous setae along the sides and with bristling hairs of the same nature on the legs, along the anterior margin of the pronotum and on the head behind the suture, but otherwise subglabrous."

The head is sinuate anteriorly with a deeply impressed transverse suture, which becomes a valuable aid in the division of the forms into groups, when taken in relation to the epistoma and frons. The sides of the epistoma project laterally far beyond the eyes, which are basal and more or less concealed by the pronotum.

The pronotum is transverse, narrowed to apex which is deeply sinuate, its base truncate with a fine coriaceous margin and the hind angles are not at all produced posteriorly. The scutellum is sinuate and triangular, or occasionally obsolete, much depending upon whether the pronotum is flexed or extended.

"The elytra are rounded, feebly embracing the sides of the body beneath. Epipleurae narrow, gradually wider and more or less concave basally."

Casey also states that the legs are short and stout, all the tibiae subequally dilated externally at tip, the terminal spurs long and hollowed or flattened on their under surface. The tarsi are very slender, moderately long, with the joints swollen distally and bearing each a terminal corona of stiff fulvous setae; the hind coxae narrowly separated as in *Coniontis*.

The original species of Eschscholtz and LeConte are not only very distinct but they are centers about which a number of geographical races and forms may be assembled. These two groups may be defined as follows:

- Epistoma arising gradually from the frontal suture; sides of the mentum more or less arcuate. . . . . **Globosus** Group  
 Epistoma arising abruptly from the frontal suture; sides of the mentum straight, sometimes subangulate at middle and strongly divergent. . . . . **Ciliatus** Group

The above characters vary within certain limits and if one of them is not as evident as might be the other will be, and acts as a control in determining the group. They do not intergrade. In the *Ciliatus* Group the front of the head has a punctate triangularly flattened area, with its apex at the vertex and its base at the frontal suture, the sides extending from vertex to front of the eyes. In the *Globosus* Group the front is more or less feebly convex and the transverse impression is much more shallow.

#### GLOBALOSUS GROUP

##### *Synopsis of the Globosus Group*

Epistoma very deeply sinuate. Mainland species.

Size medium; pronotal surface deeply and closely punctate throughout. . . . . **globosus** Leconte

Size large.

Form more or less oblong-oval to oblong-elliptical; pronotal surface with large impunctate areas, otherwise sparsely and more or less finely and deeply punctate. . . . . **globosus** var. **grossus** Casey

Form broader and oblong-oval in both sexes; pronotal punctures coarse, rather closely and quite evenly placed.

**globosus** var. **grossus** form **saginitus** Casey

Epistoma broadly and very feebly sinuate, the sinus generally subevenly rounded. Insular species.

Elytra as densely but more finely punctate than the pronotum, feebly asperate on the declivity; pronotum moderately densely, evenly punctate throughout. Islands of San Nicolas to San Miguel. . . . . **pacificus** Fall

Elytra finely, densely punctate without trace of asperity; pronotum subopaque, densely and coarsely punctate. Island of San Clemente.

**remotus** Fall

##### **Coelus globosus** Leconte

A series of eighty-one specimens taken from a single sand dune at Ocean Beach in February, 1891, shows this species to be absolutely distinct from *ciliatus* Esch. In these and others taken at

Coronado, San Diego County, California, in April of the same year, the color varies from testaceous of immaturity to dark nigropiceous of maturity. They occur abundantly.

*Form* subquadrate oval and strongly convex.

*Labrum* very sparsely punctate; punctures small.

*Epistoma* coarsely and rather evenly punctate, the punctures not crowded, scarcely coalescent, although laterally on the lobes they become more closely placed and the surface is distinctly impressed; lobes prominent anteriorly, quite evenly and semicircularly rounded from the sinus to the oblique suture, the latter attaining the margin which is sinuate at that point.

*Front* oblique and on almost the same plane as the epistoma; frontal suture rather deeply and narrowly impressed, the epistoma arising more or less gradually from it.

*Mentum* large, sides arcuate, often somewhat sinuate behind the apices; margin usually heavily beaded, apex more or less deeply and broadly sinuate, sinus arcuate; surface more or less impunctate centrally toward the apex and rather strongly convex; medially toward the base coarsely punctate and usually quite strongly impressed along the lateral margin.

*Pronotum* moderately transversely convex; sides broadly arcuate, more strongly so toward the base; apical angles not deflexed; surface coarsely, deeply and closely punctate throughout, the punctures scarcely differing toward the explanate sides where they are subequal to those on the disk.

*Prosternum* coarsely and quite densely rugoso-punctate before the coxae and process; the latter shining, coarsely punctate throughout and more or less distinctly margined between the coxae.

*Male:* In this sex the elytra are not strongly inflated and the form is rather more broadly oval with the pronotum more explanate and variable as regards width.

*Female:* Rather more oblong with the elytra more or less strongly inflated posteriorly.

*Measurements.*—Length, 7–7.5 mm.; width, 4–5.5 mm.

The only characters to be relied upon for recognition of typical *globosus* are size and character of pronotal punctuation. The extremes graduate into those of the variety *grossus* and the latter into its form *saginatus*.

#### **Coelus globosus** var. **grossus** Casey

Specimens of this variety are at hand that were collected at Santa Barbara, Santa Monica, Redondo, San Diego and Santa Cruz, the latter in June. It is the largest form in the genus.

*Size* large. *Form* oblong-oval to oblong-elliptical.

*Labrum* sparsely and distinctly punctate, its surface otherwise glabrous.

*Epistoma* arising very gradually and arcuately from the rather deeply impressed suture; surface coarsely punctate; punctures usually well separated,

those on the middle anteriorly somewhat smaller; sinus deep, lobes very prominent, semicircularly rounded, the surface rather deeply impressed next to the sinus; sides arcuato-sinuate, oblique suture more or less distinct; punctures of the front immediately behind the suture coarse, close, coalescing to a varying degree and almost without hairs at the middle. Frontal plane commencing at the suture and very feebly convex.

*Pronotum* rather sparsely and more or less finely and deeply punctate, these punctures uneven in distribution with large impunctate areas, becoming closer and mingled with larger punctures on the expanded lateral margin; sides broadly arcuate, converging anteriorly; apical angles more or less broadly rounded.

*Mentum* large; apex deeply and broadly sinuated; sides more or less arcuate, lobes rather broadly rounded; surface with a few coarse punctures in the central area but otherwise smooth, deeply impressed and rough along the sides and base.

*Prosternum* coarsely punctato-rugose before the coxae; process coarsely punctate throughout and rather broadly margined between the coxae.

*Elytral* sculpturing rather strongly muricate.

Male.—Somewhat broader and rather less inflated.

Female.—More oblong and more or less strongly inflated.

*Measurements*.—Length, 8.5–12 mm.; width, 5–7 mm.

The chief characteristics of *grossus* are the large size, coarse punctuation and the large impunctate areas of the pronotum.

This variety is plainly related to *globosus* by the deep epistomal situation, shape and sculpturing of the mentum, form, and punctuation of the prosternal process. In extreme cases not distinguishable from *globosus*.

**Coelus globosus** var. **grossus** form **saginat** Casey

Size large. Form broad, oblong-oval. Pronotal punctures coarse, rather closely and quite evenly placed.

Apparently there is less difference in shape between the sexes in this form than in *grossus*; the body is rather shorter in *saginat*, although in a large series from the same area this difference becomes evanescent.

Casey gives the following measurements: Length, 7.6–9.6 mm.

A large series collected at San Pedro, March 13th, 1910; Arch Beach, April 4th, 1916, and Redondo, March 5th, 1898, quite convincingly demonstrates that *saginat* is a form of *grossus*. They inhabit the same areas and behave like individuals of a single species.



**Coelus pacificus** Fall

*Form* broadly oblong, elliptical and moderately convex; color piecous-black, surface polished.

*Labrum* with a few small scattered punctures near the apex, surface otherwise smooth.

*Epistoma* arising very gradually from the frontal suture and rather finely sculptured, broadly sinuate at apex.

*Mentum* broadly and not deeply sinuate at apex; sides more or less arcuate, coarsely margined; surface rather convex medially at apex, elsewhere more or less impressed and asperato-punctate but rather glabrous along the apical margin.

*Pronotum* moderately, densely, evenly punctate throughout, widest immediately before the base; sides rather feebly arcuate and strongly convergent.

*Prosternum* coarsely and somewhat asperately punctate; punctures not crowded. Process very coarsely margined between the coxae; submarginal groove strong, central area convex; dilated apical portion more or less glabrous and, in the examples examined, broadly impressed.

*Measurements*.—Length, 7 mm.; width, 5 mm.

Seventy-five examples studied. Fall states that the prothorax is equal in width to the elytra; a little more than twice as wide as their length at the middle. These characters have been found to be very variable in the series examined.

"Elytra twice as long as the thorax along the median line, not longer than wide; equally densely but more finely punctate than the pronotum. The marginal fringe of hairs on the prothorax is noticeably shorter and finer than in any of our mainland species."

Type region, San Nicholas Island. Type collected on May 24th. Fall mentions a series taken by Dr. Eisen on Santa Rosa Island and states that, with the exception of some variation in size, these differ in no noticeable respect from the type. The author has examined material from both of these islands and possesses a specimen collected on Santa Rosa Island, kindly given to him by Prof. Fall. Mr. Van Duzee recently (May 17-20, 1919) visited Santa Cruz and San Miguel Islands where he collected a series of sixty-nine specimens of *pacificus*. These have afforded an opportunity to study the sexual differences and show the males to be usually broader and more oblong than the females.

**Coelus remotus** Fall

*Form* very convex; color piecous-black; legs and elytra brown; *epistoma* broadly sinuate; *pronotum* similar in outline to *pacificus* but shorter, its surface subopaque, densely, coarsely punctate; *elytra* polished, densely, finely punctate, without trace of asperities.

*Measurements*.—Length, 6.5-7 mm.; width, 4-4.5 mm.

*Remotus* is the only described form not at hand for study and Fall's description has been repeated. Type region, San Clemente Island, collected on June 3rd. The marginal fringe here is longer than in *pacificus* but thinner than usual. Fall's remarks are interesting: "Both the above species (*pacificus* and *remotus*) were found under rubbish at a distance from the shore and have notably the habits of *Coniontis* and *Coelotaxis* rather than of the other members of the genus. This might indeed be safely inferred from the less developed marginal hairs and lack of elytral asperities which have an undoubted connection with the habits possessed by the mainland species of burrowing, or rather, as seems to me more likely, the burrowing habit is of recent development and the island species are the remaining representatives of an earlier type." It might be added here that Mr. Van Duzee took his specimens of *pacificus* from Santa Cruz Island on the flat sand areas immediately above high water mark, while those from San Miguel Island were taken on the ancient sand dunes from high water line up to 300 feet elevation. They were all dug from sand about the roots of plants, as are *ciliatus* and other mainland forms.

It has been observed in the mainland forms which occur inland somewhat beyond the sand dunes, where the land is overgrown with plants of the perennial lupines and *Baccharis pilularis* D. C.,<sup>1</sup> that the elytral sculpturing is much less developed, as in *debilis* Casey. In many specimens of the latter the elytra are scarcely asperate. This was especially noticed and studied in the series taken at Tomales Bay.

Typical *ciliatus* is found right up to the sea beach and offers much variation in elytral sculpture. It looks doubtful whether simple elytral punctures and less developed lateral fimbriae should be considered as characters of subgeneric value. As a matter of fact most of the specimens of *pacificus* studied have the elytra as sparsely sculptured as do many examples of *ciliatus* and particularly of *debilis* Casey, as mentioned above. There is no good reason for the grade of *Pseudocoelus* unless it be because of its insular habitat. In *ciliatus* the fringe of erect fulvous hairs and those on the legs are particularly well developed, but less so in *globosus* and *arenarius*, including *debilis*. The antennal club is

<sup>1</sup> A dioecious composite shrub on the coast hills that is low and spreading, forming a more or less dense mat under which many species of insects find a hiding place.

not clearly defined in any single form, much less can it be said to be comprised of a definite number of joints, the width of the seventh and eighth varying in a series, leaving this character of no value.

## CILIATUS GROUP

### *Synopsis of the Ciliatus Group*

Epistoma more broadly and not deeply though conspicuously sinuate, sinus at bottom more or less transverse; prosternal process more or less glabrous and usually much less or scarcely punctate longitudinally along the middle third and central area of the dilated apex.

Average size moderate.

Pronotal surface rather finely, very sparsely punctate, the punctures larger at base than at apex and unequally distributed, leaving occasional impunctate areas, with scattered coarse punctures at the sides.

**ciliatus** Eschscholtz

Pronotal surface finely punctate throughout, punctures very sparsely placed.....**ciliatus** var. **sparsus** new variety  
Average size small.

Pronotal punctures irregular, fine but dense toward the sides; impunctate areas not evident.....**ciliatus** var. **debilis** Casey

Epistoma broadly and very feebly sinuate, the sinus generally subevenly rounded. Process as in *ciliatus*.

Form variable, oblong-oval, or elliptical, sometimes narrowly elongate-elliptical.

Pronotal punctures strong and not very coarse, more or less irregularly distributed, sometimes leaving impunctate areas.

Prosternum in front of coxae and process not strongly punctate and more or less asperate..... **arenarius** Casey

Prosternum strongly, coarsely punctate, punctures impressed and rounded, scarcely at all confluent. **arenarius** var. **sternalis** Casey

Form stout, oblong to subquadrate. Pronotal punctures quite evenly distributed, coarse and closely placed.

Prosternum coarsely and more or less confluent punctate, subrugose.  
**arenarius** var. **latus** Casey

### **Coelus ciliatus** Eschscholtz

Large series of specimens have been collected yearly and carefully examined in a relaxed condition, with all parts protruded or drawn out. The characters here recorded have been verified over and over again.

*Form* oblong-oval, strongly convex. *Labrum* glabrous, usually with two to six punctules along the apical margin. *Epistoma* broadly and not deeply sinuate, punctuation strong, somewhat swollen at about the middle third, there sparsely punctate; base arising abruptly from the frontal suture and

transversely punctato-rugose; surface rather broadly flattened and impressed laterally on the lobes; impression varying in degree, elongate and parallel to the side margin, densely and coarsely punctate; lobes not prominent, subequally rounded; sides more or less oblique, sometimes broadly sinuate opposite the oblique suture. *Front* broadly, rather deeply and transversely impressed, impression rather arcuately excavated, strongly and densely punctate, quite sharply defined from the vertex; each puncture with a conspicuous long yellow hair which may be disorderly directed.

*Mentum* densely punctato-scabrous and more or less carinate along the median line; apex very broadly and feebly sinuate; sides strongly divergent and nearly straight; lobes quite narrowly rounded.

*Pronotum* strongly convex transversely, rapidly declivous laterally; sides more or less arcuate; moderately and subevenly converging, frequently more strongly so, from base to apex; disk glabrous, polished, punctures very fine and sparse, unequally distributed with occasional impunctate areas, laterally with many coarse punctures intermixed, bearing yellow hairs; sides narrowly explanate; apical angles rather narrowly rounded.

*Prosternum* rather coarsely, moderately densely and more or less asperately punctate. Process glabrous, more or less impunctate on the dilated apex and along the median area between the coxae, punctures rather coarse and peripheral in position, bearing long yellow hairs; submarginal groove more or less strong between the coxae.

*Measurements*.—Length, 5.5–8 mm.; width, 3.2–4.5 mm.

Male: Oblong-oval and less inflated; pronotal sides more strongly arcuate or nearly as in the female; elytra less convex.

Female: Oblong-oval, somewhat elongate; elytra more strongly convex and inflated; pronotal sides less arcuate or somewhat as in the male.

In a series the form of the sexes varies from quite different to nearly similar, all gradations occur, however. The pronotal punctuation is *usually coarser toward the base* and finer toward the apex, and in the typical form there are large impunctate areas. A large series taken at Samoa, on Humboldt Bay, preserve the specific characteristics, but the punctures on the anterior part of the pronotum are coarser and stronger and subequal in size throughout the central area, as in a certain percentage of those taken about San Francisco. All gradations have been observed.

Casey has defined *curtulus*. The salient characters are: Very much more dilated than either *ciliatus* or *debilis*; epistoma much less tumid medially; pronotum shorter and more transverse, sides more strongly converging and arcuate from base to apex; anterior angles rather more deflexed and more rounded; surface less unequally punctate. Out of hundreds of specimens examined but four have been referred to this form. *Curtulus* is not distinct and has gradations in all directions.

*Longulus* is only an individual variation, or a group of individuals selected for certain characters which become evanescent in the aggregate.

*Distribution*.—Specimens have been examined from different places along the coast from Monterey County to Humboldt Bay.

A series of twenty-one specimens collected at Carmel, Monterey County, California, April 10th, 1919, and kindly contributed by Mr. L. S. Slevin, present several characters wherein they differ from typical *ciliatus* and from the forms described by Col. Casey. They represent a new variety which may be defined as follows:

**Coelus ciliatus** var. **sparsus** new variety

Peculiar on account of the polished surface and shining luster, feeble elytral sculpturing and very sparsely punctate pronotum. Throughout the pronotal surface the punctures are about uniform in size, fine, as sparse at base as toward the apex and but slightly denser close to the lateral margin, otherwise as in typical *ciliatus*. The form is elliptical and rather elongate. Some males are a little broader and more distinctly oblong. The elliptical form is similar to a smaller number of specimens in the *debilis* series taken at Tomales Bay. In these latter the males are not only elliptical but may be oblong to oblong-oval, and the females may be either elliptical or oblong-oval as in typical *ciliatus*.

In *debilis* the surface luster is dull, the pronotal punctuation stronger but equally as sparse as in *sparsus*. In a series the sculpture becomes as feeble as in *pacificus*.

It must be remembered that no two individuals of a species are exactly alike. Therefore the specific units taken in the same locality and existing under the same environmental conditions present variations in body form, degree of sculpturing and color. Species inhabit certain geographical areas in which the environment differs in the localities within those areas; as a result some phase of body form, sculpturing or color predominates in each region. At the same time will be found other variational forms which are connected with the predominating form by all intermediate gradations. In another region of the area one of the latter variations will predominate.

When the individuals of any recognized specific aggregate from a geographical area are arranged according to some particular

character of body form, sculpturing or color, they constitute a grade to which the term form (forma) is applicable. The relationship of the individuals as regards each other and sex is what by common consent constitutes the grade of species.

So it is with the species of *Coelus* (*globosus*, *ciliatus* and *arenarius*). The recognition of forms is an aid in estimating individual variation and should be a check to considering them varieties or subspecies, which are grades of a higher order. These grades signify that a particular form is capable of reproducing more or less true to type of variation; in the first instance intermixed with the type form and in the second instance occupying a region separated from that inhabited by the type form. In both instances there are reversions to type form. These variations are physiological rather than morphological.

To consider intra-specific forms as defined above as varieties or subspecies is not logical or scientific, but on the contrary arbitrary and theoretical, depending on the view point and personal equation of the author.

Variations in body form, sculpturing and color occur among individuals that have developed from a batch of eggs laid by a single female. So then if brothers and sisters are separated and placed as different species, as is actually being done in the present day it is time to stop talking about scientific taxonomy. A great deal of this comes from ignorance of the true relationships in nature. Hence describing new species from uniques or very small series is more pardonable than when a large series of individuals is subdivided on trivial differences of body form, sculpturing or color. How would it do to treat the human species in the same way?

Personally the author has found it difficult to keep within the bounds of his own convictions, for often what is considered a form will be found to predominate in some region and to reproduce quite true to type, with a varying number of reversions to the type form. It is best to be conservative and to wait until facts are observed or verified in the field, rather than assumed in the laboratory, where theoretical assumption runs wild.

**Coelus ciliatus** variety **debilis** Casey

A long series has been taken from the sand dunes about San Francisco and to the southward, as well as at Dipsea and Tomales

Bay, Marin County, California. Specimens can be obtained throughout the year, although they are most abundant from March to July. The color varies from immaturity to nigropiceous.

*Size* small to medium. *Form* oblong-oval to somewhat elongate-oval. *Labrum* with two to five punctures in apical third, otherwise impunctate.

*Epistoma* arising abruptly from the frontal suture, its vertical base more or less transversely rugoso-punctate; surface of the median third very sparsely punctate, usually glabrous at middle anteriorly; lobes slightly prominent, feebly areuate, sometimes subangulate; surface more or less impressed, rather densely and coarsely punctate, a few punctures coalescing; side margins oblique, feebly and broadly sinuate, oblique suture feeble; apical sinus broad and rather less than moderately deep.

*Front* not deeply impressed behind the suture, impression not distinctly defined from the general surface, not very densely punctate, most of the punctures furnished with a yellow hair.

*Mentum* comparatively small, sides straight and diverging as usual; apex feebly sinuate, angles narrowly rounded; surface not strongly punctato-scabrous, sometimes subearinate in the median line.

*Pronotum* not strongly convex transversely; sides broadly rounded, or less so and more convergent; scarcely or narrowly explanate; disk rather finely, sparsely and more or less evenly punctate.

*Prosternum* not strongly asperato-punctate. Process glabrous and nearly impunctate on the median line and on central area of the dilated apex; peripheral punctures with long hairs; not distinctly margined between the coxae.

Male: Rather broad to elongate oblong-oval; pronotum broader, or similar to that of the female.

Female: Form variable as in the male; pronotum usually narrower; elytra slightly more inflated than in the male.

*Measurements*.—Length, 5-7 mm.; width, 2.8-4 mm.

A series taken from a single sand dune some distance from the shore of Tomales Bay, determines the general characteristics of this variety of *ciliatus*, as will be seen from the description the form is variable in the sexes with all intermediate gradations. About San Francisco (type region) the habitat is inland and often away from the dunes. The dryer environment may explain the smaller size. As compared with *ciliatus* it is usually much smaller in size and narrower, although some of the specimens are relatively as broad. In *debilis* the front is less strongly punctured behind the suture and the sculpturing generally is less developed. The elytra are frequently scarcely asperate, as in *pacificus*. The color is more brownish and in many specimens the suture is narrowly rufous and the surface luster dull and more or less subopaque. Some of the specimens are scarcely larger than *Coelomorpha maritima* Casey.

**Coelus arenarius** Casey

This species was described from specimens collected at San Pedro, Los Angeles County, California, and was founded on two examples. Specimens have been identified by the author from "Southern California" and Arch Rock, Los Angeles County.

*Size* varying, usually, between that of *debilis* and *saginitus*. *Form* more or less broadly oblong-oval and moderately convex.

*Labrum* with two to four punctules scattered on the apical third, otherwise smooth.

*Epistoma* arising abruptly at base from the frontal suture. Base on the vertical edge coarsely punctured and more or less transversely rugose; median area less coarsely and sparsely punctate; laterally the punctures are large, coalesce to a varying degree and are more or less dense; apex broadly and very feebly sinuate, the sinus more or less evenly rounded; lobes not at all prominent, broadly rounded to the arcuato-subsinuate sides of the *front*, the latter quite broadly and transversely impressed behind the suture, there more or less densely punctate, the punctures varying greatly in size and more or less coalescent, each with a yellow hair, these irregularly directed.

*Mentum* strongly sculptured, sides straight and divergent, apex feebly and broadly sinuate; angles moderately rounded; surface coarsely punctato-scabrous, more or less flatly impressed each side of a more or less distinct median carina.

*Pronotum* widest slightly before the base in the type form; sides quite strongly arcuate and convergent; disk broadly and not strongly convex transversely, sparsely and more or less regularly punctate; punctures rather dense at the sides where also they are more or less intermingled with coarser punctures; sides more or less declivo-explanate.

*Prosternum* not very coarsely punctate, these punctures not strongly impressed, subsperate. Process distinctly impunctate along the middle and on the central area of the dilated apex; punctures rather strong at the periphery, each with a long yellow hair; marginal bead rather strong and usually extending beyond the coxae.

*Elytra* about as wide as the pronotum; moderately inflated, more or less coarsely and asperately punctate, punctures more strongly granulose toward the apex.

*Abdomen* rather more than sparsely punctate, punctures rather strong and moderate in size.

Sexes less differentiated than in *globosus* and *ciliatus*. In the female the pronotum may be as wide as in the male, or less so and the form more elongate.

*Measurements*.—Length, 8.4 mm.; width, 5.1 mm. The two specimens that served as a basis for the original description measured 6.5 and 8.5 mm. in length.

*Type locality*.—San Pedro, California.

**Coelus arenarius** variety **sternalis** Casey

A small series recently collected at Santa Barbara by Mr. Van Duzee is referable to this variety. The distinguishing character



is the very coarsely punctured prosternum in front of the coxae. The punctures are more or less rounded, rather distinctly separated and impressed and there is a tendency to rugoseness. The surface is rather glossy in the series examined. The degree of constriction of the prosternal process is not staple and cannot be used in defining species in a genus like *Coelus*. Here is a parallel with *Coniontis* where the individuals of a specific aggregate vary greatly in form. *Arenarius* and *sternalis* are members of the *ciliatus* group, as evidenced by the epistomal base and mentum.

The sexes are of the usual form as in *arenarius*, the females are usually more or less narrower than the males.

*Measurements*.—Length, 6.5–8.6 mm.; width, 4.2–4.85 mm.

*Type locality*.—Santa Barbara, California.

***Coelus arenarius* variety *latus* Casey**

A definition of this variety must also include *amplicollis*. In a series they are inseparable.

*Form* stout, oblong to subquadrate. *Pronotum* closely, more or less coarsely punctate, punctures evenly distributed; sides distinctly declivo-explanate, but this character varies greatly in degree.

*Prosternum* coarsely and more or less confluent punctate, subrugose.

Male.—Broader and the sides of the pronotum are usually more strongly declivo-explanate.

Female.—Rather narrower, sides of the pronotum are less strongly declivo-explanate.

*Measurements*.—Length, 4.9–7.6 mm.; width, 3–5 mm.

It is often difficult to tell the sex by form alone. The name *amplicollis* has been given to the more common form, but on account of priority it must give way to *latus* Casey. The type locality for both is San Diego, California. *Amplicollis* is found abundantly with *globosus*, and *latus* Casey occurs as an extreme form of the former. A large series has been studied. These specimens were collected by the author in February and April, in 1890 and 1891, and by Mr. Van Duzee in August, 1916, at the type locality.

Casey in his third group of species founded on the degree of epistomal sinuation, divides those forms with a very feeble sinuation into two sections, based on the distribution of pronotal punctures, which, in a large series, is a very unstable and evanescent

difference. His next dichotomous division is on the form and relative width of the pronotum and elytral base. Both of these characters appear to be very arbitrary indeed. By an examination of a considerable series collected at Redondo it was observed that the individual specimens differed among themselves, as regards the relative width of the pronotum and elytral base, just as do the specimens taken at San Diego and referred to *amplicollis*, and all gradations exist between the two series. The same is true as regards *obscurus* and *scolopax*.

It is the writer's conviction founded on long and careful comparison of series collected along the southern California sea-coast that other characters must be found to differentiate *obscurus* and *scolopax*, or they must be considered as mere forms of *arenarius*. Theoretical grading of organisms based on geographical position is unacceptable when intrinsic structural or stable characters are wanting. Geographical position and environment act more physiologically than morphologically. Why not consider the muscular, sun-burnt and non-adipose farmer or country dweller as a different species from the fairer, non-muscular and adipose city dweller?

An analysis of the *arenarius* complex may be attempted by the following tabulation of published characters:

Epistoma broadly and very feebly sinuate, the sinus generally sub-evenly rounded.

Punctures of the pronotum unequally distributed, leaving large areas devoid of punctuation.

Body rather broadly oblong-oval. . . . . **arenarius**, San Pedro  
 Body more narrowly elongate-elliptical.

**arenarius** variety **sternalis**, Santa Barbara

Punctures of the pronotum almost evenly distributed.

Body evenly elliptical in form; prothorax not at all wider than the elytral base.

Form rather elongate. **arenarius** form **obscurus**, Los Angeles County

Form relatively a little wider. **arenarius** form **scolopax**, Redondo

Body broadly oblong-oval, prothorax more swollen basally, and at a short distance before the base, distinctly wider than the elytral base.

Body very stout and subquadrate.

**arenarius** variety **latus**, San Diego

Body similarly stout oblong, but little longer than wide.

**arenarius** form **amplicollis**, San Diego

The more detailed differences are:

Head coarsely and densely punctate behind with a mixture of large and small punctures, sparse medially before the suture (*arenarius*); nearly as in *arenarius* but very coarsely, densely punctate behind the suture (*sternalis*). Entire basal region of head impunctate (*arenarius*);? (*sternalis*).

Epistoma moderately convex medially, flat laterally (*arenarius*); medially tumescent, rugosely but less densely punctate, flattened apical lobes more finely, closely and densely punctate (*sternalis*).

Pronotum two and a half times as wide as long, sides strongly converging from base to apex and broadly arcuate, gradually more rounded basally, apical angles very evidently rounded (*arenarius*); less abbreviated, sides less strongly converging, broadly and subevenly arcuate from base to apex, apical angles more distinct and less rounded (*sternalis*).

Pronotal surface sparsely and very strongly but not very coarsely punctured, punctures closer and laterally mingled with some that are much coarser (*arenarius*); surface similarly but sparsely punctate, the larger lateral punctures less coarse (*sternalis*).

Pronotal sides not very widely declivo-explanate, bead strong (*arenarius*); sides more broadly declivo-explanate, bead similar (*sternalis*).

Abdomen finely but strongly, sparsely punctate, more coarsely, densely so on last segment (*arenarius*); almost similarly punctate, last segment relatively less densely so (*sternalis*).

Prosternal process only moderately constricted between the coxae (*arenarius*); process very strongly constricted, neck scarcely more than half as wide as the dilated and rounded posterior part (*sternalis*).

Casey has said nothing about sexual differences.

The above tabulated and comparative notes give the salient synoptic and descriptive characters between the six forms of the *arenarius* section, and the relative differences between *arenarius* and *sternalis*, which are paralleled closely by *obscurus* and *scolopax*, *latus* and *amplicolis*.

Note that the differences are relatively slight, that the sexual differences are not considered, and that these insects are very variable, as has been and can be shown in any large series taken from a single sand dune anywhere between San Diego and Humboldt Bay.

The following characters are common to *arenarius* (*obscurus* and *scolopax*), *sternalis*, and *latus* (*amplicolis*):

*Epistoma* broadly and very feebly sinuate, the sinus generally subevenly rounded, base arising more or less abruptly from the frontal suture.

*Front* of the head more or less strongly, broadly and transversely impressed behind the suture.

*Mentum* punctato-scabrous, more or less carinate on the median line; sides straight and divergent; apex broadly and very feebly sinuate, apices of the subtriangular lobes rather narrowly rounded.

*Prosternum* before the coxae and process strongly, coarsely punctate, punctures more or less separated, rarely subrugose. Process more or less glabrous and impunctate along the median line and on the central area of the dilated apex.

*Characters common to globosus (solidus) and grossus (saginitus):*

*Epistoma* very deeply sinuate, base arising gradually and usually arcuately from the frontal suture; frontal plane beginning at suture, or, in other words, suture narrowly and deeply impressed, front feebly convex throughout.

*Mentum* relatively larger; surface more or less convex, glabrous centrally toward apex, there impunctate as a rule; deeply impressed laterally along the margin which is strongly beaded; sides less noticeably divergent and evidently arcuate; apex broadly and quite strongly sinuate; apices of the lobes rather broadly rounded, lobes sub-oblong.

*Prosternum* before the coxae and process coarsely punctato-rugose. Process strongly, coarsely, asperately punctate.

*Characters common to ciliatus (longulus and curtulus), debilis and sparsus:*

*Epistoma* more broadly and less deeply though conspicuously sinuate; sinus trapezoidal in form, the bottom narrowly transverse; base arising abruptly from the frontal suture.

*Front* of head flattened between suture, anterior margin of eyes and vertex, more channelled behind the suture.

*Mentum* relatively small; sides straight and divergent; apex broadly and feebly sinuate; apices of the lobes rather narrowly rounded; lobes subtriangular; surface asperato-punctate, rarely carinate on median line.

*Prosternum* in front of coxae and process asperato-punctate; process smooth and distinctly impunctate on median line and on the central area of the dilated apex.

Casey has given an interesting description of the larvae of *Coelus*.<sup>2</sup> It is very desirable to have the larvae studied from the view point of species.

#### *Genitalia of Coelus*

After prolonged and careful study of the genitalia in the series above considered no distinctive specific characters have been observed which would aid in the classification or diagnosis of the species.

*Male genital characters:* Edeagophore elongately flax-seed shaped, moderately depressed and reflexed at apex; color testaceous to dark castaneous according to maturity and degree of chitinization.

<sup>2</sup> Annals N. Y. Acad. Sci., v, p. 180.

*Basale* oblong in form, about two and a half times longer than wide; base rather strongly rounded; continuous with the *apicale* dorsally but showing an articular membrane laterally and ventrally, in the latter position the articular lines are oblique; sides inflexed, median area membranous beneath.

*Apicale* elongate; sides converging moderately; apex quite deeply cleft; bottom of cleft narrowly rounded, lobes punctate laterally, punctures setigerous, setae bristling, sides inflexed and not strongly chitinous, contiguous in basal half, separated apically by the edeagus, which is sublinguiform as in the *Eleodiini*.

*Female genitalia*: Genital segment quadrate. Valves divisable into dorsal, ventral and lateral plates. *Lateral plates* quite strongly chitinized, terminating posteriorly in a more strongly chitinized apex which is narrowly rounded at tip; dorso-laterally is a small fossa from which arises a pencil of rather long and slender setae; dorsal surface flattened and concave; body of plate with a number of moderately coarse setigerous punctures.

*Dorsal plates* much less chitinized; medial margin arcuate, not contiguous on median line; surface densely and quite coarsely punctate, punctures bearing rather soft and more or less reclining setae.

*Ventral plates* contiguous at base, medial margin arcuate; plates narrowed from base to apex, surface densely and quite coarsely punctate on about basal three-fifths; punctures all setigerous, setae soft and more or less reclining. Dorsal plates reaching to about opposite the cercopodous fossae.

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## PLATE XXXII

### EXPLANATION OF FIGURES

Fig. 1.—Head of *Coelus globosus* Lec. See definition of group I.

Fig. 2.—Head of *Coelus ciliatus* Esch. See definition of group II.

Fig. 3.—Head of *Coelus arcuarius* Casey. See definition of group II.

Fig. 4.—Edeagophore of *Coelus ciliatus* Esch.

A, ventral surface when *in situ*.

B, dorsal surface when *in situ*; the reverse of what it is in the *Eleodini*.

Fig. 5.—Genital segments of female. *Coelus ciliatus* Esch.

C, dorsal view.

D, ventral view.

Fig. 6.—Mentum of *Coelus ciliatus* Esch. See definition of group II.

Fig. 7.—Mentum of *Coelus globosus* Lec. See definition of group I.

GUNDLACH'S WORK ON THE ODONATA OF CUBA:  
A CRITICAL STUDY

BY PHILIP P. CALVERT

*University of Pennsylvania, Philadelphia, Pa.*

(With Plates XXXIII, XXXIV and XXXV)

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INTRODUCTION: THE PUBLICATION, DISTRIBUTION AND GENERAL CHARACTERISTICS OF GUNDLACH'S WORK ON THE ODONATA OF CUBA

On April 26, 1913, the library of the American Entomological Society acquired a copy of Tomo II of the *Contribución a la Entomología Cubana* by Juan Gundlach. On examining this volume shortly after, I became aware for the first time of the existence of a fairly extensive work on the Odonata of Cuba which, to the best of my knowledge, has never been quoted by any writer on this group of insects except by Gundlach himself. In his *Apuntes para la Fauna Puerto-Riqueña, Octava Parte* (Anales Soc. Españ. Hist. Nat., Serie II, Tomo 2, pp. 259-344, 31 Enero, 1894), he states: "En el mismo año 1888 empezó la publicación mía sobre los Neurópteros de la Isla de Cuba en el tomo II de mi *Contribución a la Fauna cubana, Entomología* (1)." The

corresponding footnote (1) reads "Se publicó y se publica aún, en pliegos mensuales especiales, como parte de los *Anales de la Academia de Ciencias médicas, físicas y naturales de la Habana*. . . . De la Entomología contiene el tomo II los Himenópteros, Neurópteros y Ortópteros. El tomo III principió con los Coleópteros." In these *Apuntes* the Odonata of Puerto Rico are listed without descriptions or citations of localities, but with references to literature under each species, including page references to his *Contribución*.

Neither the Catalogue of Odonata by Kirby nor that of North American species by Muttikowsky quotes Gundlach's *Contribución*, nor is any reference to it to be found in the extensive bibliographical citations under each species in the great work of Ris on the Libellulinae.<sup>1</sup> Since it has thus remained unknown for so long a period, it seems desirable that it be brought to the attention of entomologists. I have, from time to time, as opportunity permitted, studied its text critically with the aid of chiefly Cuban specimens and the present paper contains my results.

The full title of the copy in the possession of the American Entomological Society is | Contribucion | a la | Entomologia Cubana, | Tomo II. | Habana. | Imp. "La Antilla," de Cacho-Negrete, | Calle de Zulueta numero 73. | 1886. | It consists of 281+viii+v pages, of which pp. 5-187+viii are concerned with Hymenoptera, pp. 189-281+i-v with Neuroptera. The type-form of the pages measures 18×10.5 cm. There are no illustrations.

This copy is incomplete, as is evidenced from the statement of the contents of Tomo II by Gundlach in 1894, quoted above, and by the citation by Scudder in his *Alphabetical Index to North American Orthoptera described in the Eighteenth and Nineteenth Centuries*.<sup>2</sup> "Gundlach, Juan. Contribución a la Entomología Cubana. Tomo II. Habana, 1886, 1891. So. (Parte cuarta, Ortópteros, pp. 287-396 was issued in 1890 and 1891.)"

It will be noted that the title-page of Tomo II of the *Contribución* is dated 1886. Gundlach's statement of 1894 mentions its publication in the *Anales* of the Havana Academy. On referring to the *Anales*, I find the following: "Indice de las Materias contenidas en el Tomo XXIV. . . . Nota.—Con la presenta

<sup>1</sup> Cat. Colls. Zool. Selys.

<sup>2</sup> Boston Soc. Nat. Hist., 1901, p. 364.



entrega concluye el tomo XXIV de los Anales y comienza en pliego separado la publicación de la parte tercera de la Entomología que trata de los *Neurópteros* de la Isla de Cuba por el *Dr. Gundlach*." The title-page of this Tomo XXIV is dated Habana . . . 1887, but this volume contains (pp. 589 et seq.) communications of the "Sesión del 13 de Mayo de 1888." Similarly: "Índice de las Materias contenidas en el Tomo XXV. . . . Nota.—Con la presente entrega concluye el tomo XXV de los Anales y sigue en pliego separado la publicación de la parte tercera de la Entomología que trata de los *Neurópteros* de la Isla de Cuba por El *Dr. Gundlach*." The title-page of Tomo XXV is dated Habana . . . 1888, but the volume contains (pp. 881 et seq.) the proceedings of the "Sesión pública ordinaria del 24 de Marzo de 1889" which, moreover, are entered in the "Índice" for this volume, p. vi.

The method of publication of the "entregas" and "pliegos" has been cleared up by a letter which I owe to the kindness of Dr. Charles T. Ramsden,<sup>3</sup> of Guantanamo, Cuba, dated October 14, 1916, from which the following is taken:

In the first place I must make certain things clear: The Academic year begins on the 19th of May, and lasts till the same day of the following year, for this reason you will note that the Vols. cover two calendar years. The reason for this is that the Academy was founded on the 19th of May. The result is that all communications up to the 13th of May, 1888 (this being the date of the last meeting of that Academic year), appear in the Proceedings, Vol. XXIV, 1887; for the same reason Vol. XXV, 1888, contains communications sent in during the first months of 1889.

I should also inform you that Gundlach's publications were written very slowly, and at times with long interruptions, as he did not live at Havana, but at the sugar estate "La Fermina"; and when opportunity offered went on his collecting trips about the Island, as also to Porto Rico. With each number of the Anales appeared a "pliego" of eight pages of Gundlach's "Contribuciones"; there were twelve numbers each year, these numbers were called "Entregas."

The Parte II, Vol. II of Gundlach's "Contribución á la Entomología Cubana" contains the Hymenoptera; this Vol. II was begun in 1886 and ended in 1891; the Parte II is composed of 24½ "Pliegos," the last of which

<sup>3</sup> To Dr. Ramsden the scientific world is indebted for a highly interesting biographical account of Gundlach in Ent. News, xxvi, pp. 241-260, June, 1915, and subsequently in a Spanish version *Vida y Exploraciones Zoológicas del Dr. Juan Gundlach en Cuba* (1839-1896) in *Memorias de la Sociedad Cubana de Hist. Nat. "Felipe Poey,"* iii, numis. 4-6, pp. 146-168, 1918. Both versions are accompanied by the same two portraits.

is marked at the bottom No. 25 and contains the last pages of the index of the Hymenoptera and the first two pages (191 and 192) of Parte III—Neuroptera; this was published in May, 1888. So we have:—

## Parte III.

Pliego 25—pages 191, 192—published in May 1888, Vol. XXV				
do. 26	do. 193-200	do.	June 1888	do.
do. 27	do. 201-208	do.	July 1888	do.
do. 28	do. 209-216	do.	Aug. 1888	do.
do. 29	do. 217-224	do.	Sept. 1888	do.
do. 30	do. 225-232	do.	Oct. 1888	do.
do. 31	do. 233-240	do.	Nov. 1888	do.
do. 32	do. 241-248	do.	Dec. 1888	do.
do. 33	do. 249-256	do.	Feb. 1889	do.
do. 34	do. 257-264	do.	Mar. 1889	do.
do. 35	do. 265-272	do.	June 1889, Vol. XXVI	
do. 36	do. 273-280	do.	Nov. 1889	do.
do. 37	do. 281, i-v	ended	Mar. 1890	do.

Parte IV, Orthoptera, takes in "pliegos" 38-49 and an Appendix also marked No. 49 by error; this Parte IV was begun in April, 1890, and continued without interruption from June, 1890, to May, 1891, upon which date ended Vol. II of Gundlach's "Contribución á la Entomología Cubana," at the same time commencing Vol. III with Parte V, Coleoptera.

Mr. Herbert Campion, who has given me some information concerning a copy of the *Anales* of the Havana Academy and of Gundlach's *Contribución* in the library of the British Museum of Natural History, has also sent me a list of dates of publication of the "pliegos" which agrees with that quoted above from Dr. Ramsden's letter except that he gives the date in each case as the 15th of each month (Aug. 15, 1888, Sept. 15, 1888, etc.).<sup>4</sup>

When and to what extent copies of the *Anales* and of Gundlach's *Contribución* in separate form were distributed is difficult to determine. Mr. Rolla P. Currie wrote me from the United States Department of Agriculture on May 9, 1919: "With regard to Volume II of Juan Gundlach's *Contribución á la Entomología Cubana*, the date of receipt on the title page of this volume, and also on page 217, is February 29, 1892. Miss Barnett and Miss Hawks of the Department Library, however, state that this date is not necessarily significant, as at that time the copies were not always dated when first received, or the copy may have been purchased some time after it was published."

<sup>4</sup> I am indebted to Mr. Nathan Banks for calling my attention to Mr. E. A. Schwarz's note, on the catalogue of Gundlach's collection, and on the dating of Gundlach's works, in Proc. Ent. Soc. Washington, vii, 1-2, 1905.

Mr. Herbert Campion, writing on May 4, 1919, says: "As regards Gundlach, the library at the British Museum (Natural History) includes a copy of the *Anales*, as well as a copy of the *Contribución*. The parts were not received periodically, as they were issued, but a set was purchased on 24th October, 1899. The *Contribución* is bound separately, and the title-page of Vol. II bears the date 1886 as part of its contents. Vols. XXV and XXVI of the *Anales* are bound up in their original green paper covers. The first page of each cover gives the date of publication and the fourth page an indice, which refers, not only to the entrega itself, but also to the pliego aparte issued with it, whenever one was included. It is quite easy, therefore, to associate every pliego or sheet of the *Contribución* with the particular entrega of the *Anales* with which it appeared, . . ."

I have found no reference to Gundlach's *Contribución* on the Neuroptera, either as "pliegos" of the Havana *Anales* or as a separate work, in the Zoological Record<sup>5</sup> or in the Jahresberichte of the Archiv für Naturgeschichte from 1888 on. Gundlach was elected a member of the Sociedad Española de Historia Natural de Madrid in 1872 or 1874 (the printed lists differ as to date), and the "Actas" in the *Anales* of this Society mention additions to the library, but, although the receipt of Tomo XXVIII, 1892, entregas 329-332, Tomo XXIX, 1892, entregas 333-337, of the *Anales* of the Havana Academy is acknowledged,<sup>6</sup> I find no record of the reception of the volumes containing Gundlach's work now under discussion.

As will appear later, Gundlach's chief correspondent on the Odonata was Dr. H. A. Hagen and, up to October, 1889, it would seem that Hagen knew nothing of Gundlach's publication, as Hagen wrote to me from the Museum of Comparative Zoology, October 16, 1889, of some specimens which I had submitted to him: "No. 1 is *Lepthemis gravida* Hagen n. sp. in my coll. and from Florida. It is very near to *L. herbida* Hag. also new but printed in my Synopsis 1875, p. 74" (no description). Gundlach published the description of *herbida* on page 261 of his *Con-*

<sup>5</sup> Volume One of the *Contribución*, dealing with the Lepidoptera, is quoted in the Zoological Record for 1891, Insects, pp. 25, 215.

<sup>6</sup> *Anales Soc. Esp. Hist. Nat. Madrid*, xxi, Actas, p. 186, 1892.

*tribución*, and this page, according to the data from Dr. Ramsden and Mr. Campion, appeared on March 15, 1889.

It is quite possible that data showing earlier distribution of Gundlach's work than February 29, 1892, may be unearthed by bibliographers and the foregoing indicates the desirability of this. If we assume the listed dates of publication of the pliegos in the Havana Academy's *Anales* to be actual, a number of species described by Gundlach have priority in name over some proposed by other authors. Such, among the Odonata, are:

*Lestes scalaris* Gundlach, p. 216, Aug. 15, 1888, vs. *Lestes scalaris* Calvert, October 7, 1909.

*Lestes (Hypolestes) trinitatis* Gundlach, p. 216, Aug. 15, 1888, vs. *Ortholestes abbotti* Calvert, Jan. 30, 1894.

*Hypolestes* Gundlach, *l. c.*, vs. *Ortholestes* Calvert, Dec. 2, 1891.

*Libellula herbida* Gundlach, p. 261, March 15, 1888, vs. *Cannacria batesii* Kirby, Aug. 14, 1889.

The value of Gundlach's work on the Odonata is three-fold. It gives:

1. Precise geographical data on the distribution of species in Cuba.

2. Descriptions of body-colors made from living or freshly-killed Cuban examples.

3. Descriptions of some previously undescribed forms; these are, in addition to those just mentioned,

*Agrion (Enallagma) truncatum* Gundlach, p. 226, Oct. 15, 1888.

*Gynacantha ereagris* Gundlach, p. 243, Dec. 15, 1888.

Neither of these appears to have been described by any other author.

1. A considerable body of geographical data due to Gundlach has been available for many years in papers by Dr. Hagen.<sup>7</sup> It will be noticed that those reproduced in the following pages from the *Contribución* differ in a number of species. Dr. Ramsden's biographical notices indicate the situation of and the time of collecting at some of the localities cited by Gundlach.

2. Some of Gundlach's descriptions of living colors of Cuban Odonata have also been accessible and well known in German versions published by Hagen in the *Stettiner Zeitung*, as just

<sup>7</sup> Proc. Boston Soc. Nat. Hist., xi, 289-293, 1867; Stett. Ent. Zeitg., xxviii, 215-232, 1867, and xxix, 274-287, 1868.

quoted. From my studies of the *Contribución*, I think that the following notes may be usefully included here.

Gundlach appears to have had no precise idea as to the total number of abdominal segments in the Odonata. Thus, nine is the number implied in his descriptions of *Dythemis didyma*, p. 269, *D. aequalis*, p. 270, *D. debilis*, p. 272, and possibly *Mesothemis mithra*, p. 276, and *Diplax oehraeea*, p. 277. Ten segments are recognized in his translations from Hagen and for *Pantala flavescens*, p. 245, and *Mesothemis simplicicollis*, p. 275. Eleven segments are mentioned for *Lestes scalaris*, p. 216, and twelve for *Lestes tenuatus*, p. 214, *Agrion (Enallagma) truncatum*, p. 226, and the female of *Dythemis frontalis*, p. 267. In many cases he refers to the last three segments, or as antepenultimate, penultimate, and last segments, from which some clue is often to be obtained as to the number which he recognized in a particular species. Comments on these numbers will be found under various species, *postea*. Where his numeration differs from that commonly recognized (10+1 anal segment), the increase is sometimes to be accounted for by his reckoning segment 2 to be two segments separated by the transverse median carina of that segment, *e. g.* *Dythemis didyma*, p. 269, although in the following species (*D. dierota*) he does not seem to count segment 2 as if it were two segments.

Gundlach used "frente" to mean "clypeus," in some cases at least, as is well shown in his description of *Dythemis frontalis*, p. 267.

In most species, the data given by Gundlach on the dimensions and on the wings are translated from Hagen's descriptions in the *Synopsis of the Neuroptera of North America* of 1861, even where the description otherwise is original with Gundlach, although the wings of *Dythemis frontalis* are exceptions. The descriptions of new species lack measurements and data on the wings.

In many passages, Gundlach applies "pardo" (which two Spanish-English dictionaries render "grey") to parts which are luteous or pale brown in dried specimens. In the German versions in the *Stettiner Zeitung*, "pardo" is replaced by "braun."

Since the Spanish descriptions of *Pantala flavescens* and *hymenaea* in the *Contribución* correspond exactly to the German versions for these same species, one is tempted to conclude that

Gundlach did not revise his descriptions between sometime previous to 1867 and 1888; on the other hand, the Spanish and German descriptions of *Tramca marcella* differ more than by mere differences of translation.

Dr. Ramsden has kindly sent me the following information, obtained through Dr. Carlos de la Torre, respecting the existence of the types of Gundlach's new species of Odonata in the Instituto de Segunda Enseñanza at Havana. I quote from a letter of July 4, 1919:

"The specimens in the Gundlach collection are kept in small boxes, something like cigar boxes, with a glass front; this glass is held on by pasting paper all around the sides of the box and edges of the glass, thus it is impossible to repair or even to study closely any specimen; these small boxes are again placed in larger glass covered cases, several boxes to each case, the glass covers of which are screwed on." [Cf. Ent. News, xxvi, page 256.]

"The general state of the collection is satisfactory, as notwithstanding that most of the types are over 50 years old and some as much as 70 years, about 75 per cent of them are in good condition and those that have been mutilated have the pieces in the same box where they have fallen due to knocks. (I refer to the heads and abdomens.)

"The labels are like this:

104 Lestes  
129 scalaris ♂

all of them written in Gundlach's own handwriting. He used to send the specimens for identification and receive the types back, so there is no doubt that the above mentioned specimens are TYPES. I must explain that in the above numeration, the top number refers to the Gundlach number, while the lower one is the number used by Poey in his own collection; this double numbering appears in all of Gundlach's catalogues and notes, whether insects or shells are being treated.

"I have given you the data on each label [of the five new species of Odonata], as also the number of specimens of each species in the cases, but in ( ) I have stated the condition these are in, and I have also given whatever information exists in Gundlach's own MS. catalogue, so you have all the information obtainable on each species. Wherever ( ) appear it means that what is between is not on label, nor in catalogue, but notes taken by the observer."

Dr. Ramsden's notes on the types of each of the five species are quoted in appropriate places after each species respectively in the following pages.

#### EXTRACTS FROM GUNDLACH'S TEXT, WITH COMMENTS

In the following pages are given the text of the Prologue to Tomo II of the *Contribución*, extracts from the Introduction to the Neuroptera, with some comments, and then the species of

Odonata enumerated and described by Gundlach. In the majority of cases, the name of the species is, as in the *Contribución*, followed by Gundlach's collecting number in parentheses (as he explains on p. 14 of his volume). To this I have added the page number of the *Contribución*, the date of publication of the respective pliego of the *Anales* of the Havana Academy and the usual name of the species at the present time. With few exceptions, I have omitted the references given by Gundlach to previous authors. His statements of the localities for each species in Cuba and in Porto Rico, but not elsewhere, have been reproduced, as well as such items of his descriptions as seem to require comment. These last are based on comparisons with specimens which, as far as possible, are those which have been quoted in the Neuroptera volume of the *Biología Central-Americana*, as by this means a uniformity of specific identity with that work has been sought. These specimens, unless otherwise stated, are in the collections of the Academy of Natural Sciences of Philadelphia. Others are in the collections of the Museum of Comparative Zoology, at Cambridge, Massachusetts. To the authorities of these institutions, I am indebted for the privilege of studying their material.

#### ENTOMOLOGÍA CUBANA. Pages 3-4

#### NOTAS PARA LA ENTOMOLOGÍA CUBANA, SEGUN OBSERVACIONES PROPIAS DURANTE CUARENTA Y SEIS AÑOS.

##### Prologo al Tomo II.

En los seis Ordenes de Insectos que faltan que tratar, me veo obligado á cambiar el modo con el cual he redactado el Orden de los Lepidópteros, pues se conoce en muy pocos casos la transformación y las costumbres de las especies. Tampoco he querido dar, como en los Lepidópteros, una descripción corta hecha por mí en vista de los ejemplares de mi colección; sino he preferido dar la diagnosis hecha por los autores de las mismas especies, traducida al español, y solamente cuando no he podido tener la obra correspondiente, he trazado yo mismo una descripción, usando el ejemplar de mi colección. Lo mismo que en el Orden Lepidópteros, he indicado algunas particularidades observadas en las costumbres, sea de las familias, géneros ó especies. He indicado

también en la mayor parte de las especies dónde las he encontrado, sea la localidad en particular, ó las partes occidental y oriental de la Isla en general. Asimismo he anotado la sinonimia esencial, principalmente la de los autores que han escrito algo sobre las especies cubanas, incluyendo también los que trataron de la fauna portorriqueña. (He publicado y se publican aún mis Apuntes sobre la fauna de esa isla hermana en los Anales de la Sociedad Española de Historia Natural de Madrid.) Casi nunca he podido indicar si una especie es común ó rara, pues esto depende del tiempo, de la localidad etc., en la cual se observa, y también de las circunstancias más ó menos favorables para los primeros estados de la transformación del insecto. Así puede una especie ser rara en una localidad de la isla y en otra común. Unas especies se encuentran en todos tiempos del año, mientras otras vuelan solamente en ciertas épocas.

Introducción al Orden Tercero. [Neurópteros]. Pages 191 et seq.

He cogido pocas especies de los verdaderos Neurópteros y estas mismas han quedado casi todas sin clasificación por falta de la literatura necesaria ó sea tratado especial ó por falta de un naturalista que quisiera estudiar y clasificar las especies cubanas como el Sr. Poey y yo juntos tuvimos la fortuna de hacerlo para la familia Odonata de los Pseudoneuroptera, que fué clasificada y en parte descrita por el Doctor Hermann Hagen en Königsberg (Alemania), hoy empleado en el Museo de Zoología comparada en Cambridge (Massachusetts).

\* \* \* \* \*

La primera obra que trata en particular sobre especies cubanas es la obra de Ramón de la Sagra, para la cual ha redactado Mr. de Selys-Longchamps los Neurópteros, recogidos y comunicados casi todos por el Sr. Poey á la Sagra. La segunda es la que publicó el Instituto Smithsoniano de Washington, preparada por el Dr. Hermann Hagen en 1861, cuyo título es "Synopsis of the Neuroptera of North America," y en el cual incluye las especies de las Antillas. He usado esta obra para muchas descripciones y para la sinonimia.—Después publicó Mr. Samuel Hublard [sic] Seudder en Proceedings of the Boston Society of Natural History Vol. X, 1866, p. 187, un artículo sobre Odonata de la Isla de Pinos y describe diez y seis especies, de ellas cinco como nuevas,



pero el Doctor Hagen reconoció en estas especies las descritas anteriormente; pero Mr. Scudder en su Proceedings XI, 1867, p. 298 establece sobre la materia algunas dudas.

Habiendo yo redactado descripciones del colorido de especies aun vivas (pues después de ser matadas pierden mucho de su hermosura), las comuniqué al Dr. Hagen, quien las creyó útiles para la publicación que se efectuó en gran parte en las páginas 215-232 y 274-287 del tomo XXVIII [y XXIX] de Berliner [error for Stettiner] Entomologische Zeitung 1867 [y 1868].

Para no poner en cada especie el titulo de las obras citadas, he usado las abreviaturas siguientes: . . . .

The list which follows contains thirty-eight titles. The latest is "Selys Longchamps Revue de Syn. Agriôn"; although Gundlach does not give the date here, he correctly quotes it as 1886 on p. 220. The only item in this list which is unfamiliar in Odonate literature is "Selys Cub.—De Selys Longchamps. Neurópteros de la Isla de Cuba en la edición española de la obra de la Sagra 'Historia física, política, y natural de la Isla de Cuba, tomo VII, 1865.'" This is presumably the Spanish edition cited by Hagen in his Synopsis of 1861, p. xv, and in his Bibliotheca Entomologica, II, p. 101: in the first citation he gives the date as 1857, in the second as 1856, but adds: "Erschien nach Gerstaecker wohl erst 1857." It will be observed that Gundlach dates it 1865 and in listing Guérin's work in the same Tomo VII of Sagra, in his bibliography for Hymenoptera, p. 9 of this present volume, he likewise quotes it as of 1865. In his *Apuntes para la fauna Puerto-Riquiña*,<sup>8</sup> however, Gundlach gives the date of this "Edición española" as 1856. Since the Spanish edition has not been quoted by de Selys himself, as far as I am aware, nor by Hagen, Kirby, Muttkowsky, Ris, nor by any other author except Gundlach, I have retained Gundlach's citations of it wherever they occur. All other writers, including de Selys, quote from the French edition.

<sup>8</sup> Anales Soc. Españ. Hist. Nat., (2), ii, p. 261.

## FAMILIA ODONATA. Page 212

## TRIBU AGRIONINÁ.

## SUBFAMILIA CALOPTERYGINA.

Género **HETAERINA** Hagen

**Hetaerina cruentata**, (...) P. 212. Aug. 15, 1888. **Hetaerina cruentata** (Ramb.).

*Calopteryx cruentata*; Selys Cub. p. 196.

Esta especie que no hemos observado, fué indicada como de Cuba por Selys.

Gundlach's description is a translation of Hagen (1861), p. 59; "antecubitales" is erroneously rendered "denticubitales."

## SUBFAMILIA AGRIONINA.

Género **LESTES** Leach

**Lestes forficula**. (34.) P. 213. Aug. 15, 1888. **Lestes forficula** Ramb.

Cogí esta especie en los alrededores de Cárdenas.

Está la descripción del ♂ en la Synopsis [Hagen 1861], y yo tengo la de la ♀ en mis apuntes. Donde difieren ambas, pondré la de la ♀ entre paréntesis. Gundlach then translates Hagen (1861), p. 68, and adds the following at appropriate places for the female: (boca y frente pardos, mejillas azul-celestes, vértice olivado; ojos azul-celestes;) (protórax ceniciento-verdoso con la línea media angosta y estrías morenas; mesotórax en su parte superior ceniciento-verdoso, con 4 líneas verde-metálicas y la intermedia blanca, orillada de moreno; metatórax ceniciento con 3 manchitas amarillentas, de las cuales está una entre las alas anteriores y un par entre las posteriores;) (abdomen por encima verde-metálico-intenso, en las articulaciones ceniciento; los 3 últimos segmentos son cenicientos;) (pies por encima verdoso-oscuros, por debajo blanquecinos).

I have compared one male and one female from Havana, Cuba, taken by Baker, and two females from Alta Mira, Mexico, taken by Hoag; the description is correct except that "antecubitales" should be "postecubitales."

**Lestes tenuata**. (103.) P. 214. Aug. 15, 1888. **Lestes tenuatus** (Ramb.).

*Lestes tenuata* Ramb.; Selys Cub. p. 196.

Existe en toda esta Isla . . . .

I have compared one male and one female from Atoyac, Mexico, and one female from Cuba (ex coll. Needham) with Gundlach's description, which is of the male only and is apparently original; in it he speaks of the eleventh and twelfth segments of the abdomen; they apparently are the ninth and tenth respectively.

**Lestes spumaria**. (62.) P. 215. Aug. 15, 1888. **Lestes spumaria** Hagen.

He cogido esta especie en Cárdenas.

Gundlach describes first the colors of the female, then gives briefly the differences shown by those of the male, but gives no description of the appendages. I have no specimens for comparison at the present time, but have quoted and figured two Cuban males.<sup>9</sup>

**Lestes scalaris.** (104.) P. 216. Aug. 15, 1888. **Lestes scalaris** Calvert.

*Lestes scalaris*, Hagen especie nueva, pero que será pronto publicada.

Colectada en la Ciénaga de Zapata.

♂. Toda la cabeza es parda menos una faja transversa por los estemata, que se extiende luego sobre la orilla de los ojos, los que son por encima pardos, por debajo cenicientos; el protórax es pardo, apenas con dibujos oscuros; el mesotórax es por encima pardo-claro, en cada lado del medio hay una faja verde-olivada-metálica, que hacia atrás se dilata en forma de diente. Mas al lado hay otra que empieza con una mancha, se adelgaza luego y forma después el diente. Los lados del meso- y metatórax son amarillo-pálidos; éste tiene en su parte inferior dos puntos negros en fondo blanquecino y es por encima pardo. El abdomen es por encima pardo con viso olivado-metálico principalmente las divisiones; el segmento undécimo tiene una mancha gemela pardo-claro en su base; los pies son por encima verdoso-blancos, por debajo negros; las alas son cristalinas.

I have compared one male from Mayaguez, Porto Rico, with this description which, it will be noticed, omits the appendages. My description<sup>10</sup> of this as a new species,—not knowing at that time of Gundlach's work—was based on a male by Gundlach and one probably by Poey, both from Cuba, and the male from Mayaguez just quoted. Gundlach's description refers probably to the "older stage" of my description.

Dr. Ramsden's note on the type of this species in the Instituto at Havana is:

"In collection N. 1 $\frac{0}{2}$  $\frac{4}{9}$  *Lestes scalaris* ♂ (there is but one example in very good condition). In Gundlach's MS. catalogue: 1 $\frac{0}{2}$  $\frac{4}{9}$  *Lestes scalaris* Hagen n. sp. Localidad: Zarabanda."

**Lestes (Hypolestes) Trinitatis.** (118.) P. 216. Aug. 15, 1888. **Ortholestes abbotti** Calvert.

*Lestes Trinitatis* Hagen, especie nueva que no está todavía publicada, pero lo estará pronto.

He cogido esta especie en el Valle de Trinidad, y en Yateras. Ambos sexos difieren entre sí.

<sup>9</sup> Ann. Carn. Mus., vi, p. 97, pl. i, figs. 7, 19, 29, 1909.

<sup>10</sup> Ann. Carn. Mus., vi, p. 93, pl. i, figs. 6, 17, 18, 1909.

♂. Muy adulto. Labio superior y frente muy lustrosos negros con un viso azul. Mejillas y una línea en el borde del ojo pajizas; vértice y cogote negro-mates con una mancha y detrás de ésta una faja en el medio interrumpida transversal azul-aplomada, mate; ojos en su mitad superior morenos, en la inferior olivado-cenicientos; todo el cuerpo es negro-mate, pero con un sobre-color azul-aplomado en los bordes anterior y posterior del protórax y en el centro de cada lado del mismo, en la parte superior del mesotórax y en sus lados, con unas manchitas entre las cuatro alas y en la parte lateral é inferior del metatórax, en la base lateral é inferior del abdomen y encima de los segmentos abdominales; los apéndices caudales y los piés son negros; las alas cristalinas.

♂. Más jóven. En el mesotórax se ve una faja amarilla en un lado, que desaparece poco á poco hacia atrás, y otra inferior y dos fajas desde los dos últimos pares de piés hacia la base de las alas; el metatórax tiene por encima manchitas amarillas; el abdomen es negro, con una manchita larga lateral amarilla en el primer segmento; en el segundo hay en la base dos manchitas, y en el lado otra mancha larga como línea; en los cuatro siguientes la base solamente es amarilla.

♀. El protórax es negro, con una mancha anterior transversal amarilla y otras parduseas reunidas; el mesotórax es negro, con una línea pardo-cenicenta cerea de la línea intermedia, otra línea lateral entera y otra inferior por delante abreviada y pasando al color pardo-cenicento, otra tercera por el estigma, que desaparece hacia atrás, y en fin, una cuarta más abajo hacia las alas posteriores, la que tiene en su borde inferior una línea negra; el metatórax tiene en la base de cada ala una manchita aplomada. El abdomen es negro, con los segmentos en el lado de la base provistos de una manchita redonda, y en los lados de una línea longitudinal amarilla; el segmento antepenúltimo tiene una manchita larga lateral, el penúltimo una mancha transversal, y el último dos manchitas aproximadas amarillas. Piés negros, con los muslos posteriores por debajo pálido-pajizo-verdosos.

It will be noticed that the appendages and dimensions are omitted from the description. I have compared the male type of *Ortholestes abbotti* Calvert,<sup>11</sup> a male from Hayti, taken by W. L. Abbott, with the above-described "♂ muy adulto," a young male of *O. clara* Calvert from Kingston, Jamaica, taken by W. J. Fox, 1891, with that of the "♂ más jóven" and a female of *O. clara* from Kingston, taken by E. M. Aaron, May, 1890, with that of the female. The female described by Gundlach was older than this Kingston female.

Although Gundlach has given no venational or generic characters, in view of the data which I have given,<sup>12</sup> the name *Ortholestes* becomes a synonym of *Hypolestes* Gundlach, *O. abbotti* a

<sup>11</sup> Proc. Acad. Nat. Sci. Phila. 1893, p. 382.

<sup>12</sup> Ann. Carn. Mus., vi, p. 91.

synonym of *H. trinitatis* Gundlach, the type of the genus, and *O. clara* becomes *H. clara* (Calvert).

Dr. Ramsden's note on the types of this species in the Instituto at Havana is:

"In collection: N.  $1\frac{1}{3}\frac{8}{3}$  Hypolestes Trinitatis ♂ adulto (1 complete example). Id. id. ♀ juv. (1 example with abdomen broken off but in the box). In MS. catalogue: 118-132 Lestes (S. gen. Hypolestes) Trinitatis Hagen; under the above numbers are these 119-133, in red ink. (Probably these numbers correspond to the ♀ juv. when sent to Hagen, as Gundlach thought [it] to be a different species and probably also this second example is from Buenavista near Bayamo, and not from Trinidad.) The catalogue says: Localidad-Trinidad. Bv."

Género **PROTONEURA** Selys

**Protoneura (Protoneura) capillaris.** (95.) P. 218. Sept. 15, 1888.

**Protoneura capillaris** (Ramb.).

*Protoneura capillaris* Ramb.; Selys Cub. p. 200.

Se encuentra en toda la Isla.

I have compared one male from Cuba, taken by Ch. Wright, with Gundlach's description which is of both sexes and correct, except that the "Longitud 20 mil." is too little; it should be 35 mm.

A wing of this species and its base (on a larger scale) are figured in the Atlas to Sagra.<sup>13</sup> Gundlach does not quote these figures, nor does any other author, as far as I know.

This species, recognized by Kirby, Muttkowsky and Williamson<sup>14</sup> as the type of its genus, has been redescribed briefly and figured<sup>15</sup> by the last-named author.

**Protoneura (Microneura) caligata.** (83.) P. 219. Sept. 15, 1888.

**Microneura caligata** Selys.

La cogí en el Valle de Trinidad en la orilla de un arroyo.

In the absence of specimens, I have compared Gundlach's description with that of de Selys<sup>16</sup> and it seems to be correct.

<sup>13</sup> *Articulata*, tab. 18, figs. 2, 2a.

<sup>14</sup> *Proc. U. S. Nat. Mus.*, xlviii, p. 625, 1915.

<sup>15</sup> *T. c.* pl. 42, fig. 6, venation.

<sup>16</sup> *Rev. Syn. Agrion.*, p. 206, in *Mem. Couron. Acad. Roy. Belg.*, tome xxxviii.

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**Protoneura (Neoneura) carnatica.** (29.) P. 220. Sept. 15, 1888.  
**Neoneura carnatica** Selys.

La he cogido en la sabana de Guamacaro (al Sudoeste de Cárdenas) en la orilla del río.

I have compared one male from Cuba, taken by Poey, 1866 III, with Gundlach's description and find it to agree therewith and also with the *carnatica* of Mr. Williamson's key.<sup>17</sup>

**Protoneura (Neoneura) María.** (144.) P. 221. Sept. 15, 1888. **Neoneura maria** (Seud.).

De Güines y la Isla de Pinos. Doy la descripción hecha por Seudder en extracto, á falta de una hecha por mí.

I have compared one male from Cuba, taken by Poey, 1866, with Gundlach's description and it agrees therewith and with the *maria* of Mr. Williamson's key.<sup>18</sup> In Gundlach's description, however, the sign ♀ is an error for ♂.

#### Género **AGRIÓN** Fab.

Conservo los nombres de los subgéneros como están en la Synopsis de Hagen, aunque Selys ha establecido más tarde otros.

**Agrión (Nehalennia) macrogaster.** (...) P. 222. Sept. 15, 1888.  
**Telebasis macrogaster** (Selys).

*Agrión macrogaster* Selys Cub. p. 197.

No he observado esta especie mencionada por Selys en la Sagra.

Gundlach's description is a translation of Hagen (1861).

**Agrión (Ischnura) Ramburii.** (33.) P. 223. Sept. 15, 1888. **Ischnura ramburii** (Selys).

*Agrión Ramburii* Selys Cub. p. 199.

var. *tuberculatum* Selys Cub. p. 198.

Es una especie, que varía en el colorido, y que habita sobre toda la Isla, . . .

The description is a translation of Hagen (1861).

**Agrión (Enallagma) coecum.** (31.) P. 224. Sept. 15, 1888. **Enallagma coecum** (Hagen).

Esta especie vive sobre toda la Isla y también en San Thomas.

Hagen había nombrado al principio los ejemplares cubanos *A. cardenium* Hagen, pero luego reconoció la igualdad con los *A. coecum* de San Thomas y suprimió el nombre *cardenium*.

I have compared a number of Cuban specimens of both sexes with Gundlach's description and find it correct, although in the female the labrum is chiefly pale, with only a small median basal, black elongated spot or line, whereas Gundlach says: "Labio

<sup>17</sup> Trans. Amer. Ent. Soc., xliii, pp. 213-214, 1917.

<sup>18</sup> *L. c.*, 1917.

superior por delante azul, en el resto negro;" however, his description of *A. truncatum* seems to indicate that he considered the nasus (post-clypeus) to be a part of the labrum.

I have also studied the question of the distinctness of *coccum* Hagen and *cardenium* Hagen with these results:

Twenty-one males from Cuba show a variation in the abdominal appendages ranging from that seen in plate XXXV, figure 38 through 41 and 42 to 39. Five males from Jamaica have the appendages as, or very nearly as, in figures 44 and 45. One male from Hayti has the appendages as shown in figure 40. The Jamaican specimens appear to correspond to the typical *coccum*, which was from the Island of St. Thomas. Mr. Nathan Banks, on comparing the drawings from which these figures were made with Hagen's types in the Museum of Comparative Zoology, at Cambridge, writes me that "*coccum* is your figure 40, the upper interior view is very like your figure 40a with apical barely longer; from the side the lower part is not hooked so much at tip; the lower appendages are more slender than your figure. *Cardenium* is close to your no. 42p or no. 38; seen from side the apical part is convex above and concave below and almost pointed as in your no. 38p, but this apical part is rather longer than your no. 38 and below is scarcely swollen in middle, so if turned only a bit one sees the tooth, and the lower basal part is shaped more like your no. 42p, the outer edge almost at right angles with the upper apical part, not grading into it as your no. 38p; seen from above within it is very close to your 38a, with apical part, as I said, a trifle longer; the intermediate basal pieces scarcely show from above."

The only constant differences which I have found between seventeen females from Cuba and three females from Jamaica are in the color pattern of the prothorax and of the mesostigmal lamina.

Summing up for both sexes, the case stands as follows:

*Coccum* (three males, three females from Jamaica only): ♂. A small single tooth on the inner (mesal) surface of the superior appendages at about two-thirds their length; the inferior branch of the same appendages, seen in profile view, as long as wide and forming between itself and the superior branch a sinus which extends distinctly cephalad.

Stigma of the front wings tending to be broader and with a more obtuse antero-external angle.

Pale postocular spots wider, *i. e.*, .45-.49 mm., measured from cephalic to caudal edge.

Color pattern on sides of prothorax, on mesostigmal lamina and on mesinfraepisternum as in the female.

♀. Stigma and pale postocular spots as in the male.

Black on each side of middle prothoracic lobe sinuately, and less deeply, emarginated by the pale color inferiorly (fig. 4St).

Mesostigmal lamina with its external half pale, internal (mesal) end black (fig. 4St).

Mesinfraepisternum predominantly black, only its lowest fourth to third pale (fig. 4St).

Abdomen, ♂ 26-27.5, ♀ 24-27; hind wing, ♂ 17-18.5, ♀ 17-20; costal edge of stigma, front wing (including the widths of both bounding cross-veins), ♂ .52-.56, ♀ .52-.63 mm.

*Cardenium* (twenty-one males, eighteen females from Cuba only): ♂. Tooth on the inner surface of the superior appendages at six-tenths to seven-tenths their length, developed as a carina slanting caudad and mesad, the two ends of which are more elevated so as to form two pointed tubercles; inferior branch of the same appendages, seen in profile view, distinctly wider than long (even to twice as wide as long) and forming between itself and the superior branch only a very shallow sinus which extends much less cephalad (if at all) as compared with *coccum*.

Stigma of the front wings tending to be narrower and with a more acute antero-external angle (cf. pl. xxxv, figs. 38s, 39s with 45s).

Pale postocular spots narrower, *i. e.*, .28-.38 mm.

Color pattern on sides of prothorax like that of the female (in seventeen males, like *coccum* (two males), or obscured by pruinose (two males)); of mesostigmal lamina resembling that of *coccum*; of mesinfraepisternum like that of the female, *i. e.*, with the inferior half or more pale (eleven males), or with only the lowest third pale (eight males).

♀. Stigma of the front wings (cf. pl. xxxv, figs. 43s, 46s, 47s with 48s) and postocular spots as in the male.

Black on each side of middle prothoracic lobe angularly, and more deeply, emarginated by the pale color inferiorly (cf. figs. 43t and 48t).

Mesostigmal lamina black with an oblique pale streak running from near the antero-lateral to the postero-mesal angle (fig. 43t); in some the anterior margin of the lamina is also narrowly pale so that the two pale streaks, uniting laterad, form a V.

Mesinfraepisternum black with the inferior half (or more than half) pale (fig. 43t) or, less frequently (three females), with only the lowest third pale.

Abdomen, ♂ 21-24.5, ♀ 22-26; hind wing, ♂ 15-16.5, ♀ 16-17.5; costal edge of stigma (measured as for *coccum*), ♂ .56-.65, ♀ .52-.63 mm.

Although the difference between the pterostigmata of *coccum* and of *cardenium* is a relative, not an absolute, one, it will be seen, on comparing the measurements of hind wings and of stigmata of the two forms, that *cardenium*, with absolutely shorter wings, has the stigma equal to or longer than the stigma of *coccum*.

The preceding comparisons are between Jamaican and Cuban specimens only. A single male from Hayti, received from the late Prof. P. R. Uhler (Acad. Nat. Sci. Phila.), furnishes some connecting features. Thus, the tooth on



the inner surface of the superior appendages, the pale postocular spots (.35 mm.), and the color pattern on the sides of the middle prothoracic lobe resemble those of the Cuban form, while the inferior branch of the superior appendages, the stigma of the front wings and the coloring of the mesostigmal lamina are like those of the Jamaican examples. (Cf. figs. 40a-s). The mesinfracpisternum has more than the lowest third pale; the dimensions, corresponding to those given above, are: 26, 16.5 and .56 mm.

A male and a female from Biscayne Bay, Florida, taken by Mrs. A. T. Slosson (Acad. Nat. Sci. Phila.), agree essentially with the Cuban examples, except in their larger size: abdomen, ♂ 27, ♀ 28; hind wings ♂ 19, ♀ 19.5; costal edge of stigma, front wing, ♂ .7, ♀ .84 mm.

This study of the present material, therefore, seems to justify the conclusion of Dr. Hagen<sup>19</sup> that the Cuban, and we may add Floridan, examples represent a geographical race which may be designated as *Enallagma coecum cardenium* (Hagen).

**Agrión (Enallagma) cultellatum.** (101.) P. 225. Oct. 15, 1888. **Enallagma cultellatum** Hagen.

Lo cogí en la ciénaga de Zapata. El ejemplar era un ♂.

I have compared a male from Amatitlan, Guatemala, with Gundlach's description, and find the latter correct except that "los segmentos 7o. y 8o." should read "8o. y 9o."

**Agrión (Enallagma) truncatum.** (109.) P. 226. Oct. 15, 1888. *Agrión truncatum* Hagen nov. sp.

He cogido esta especie en la ciénaga de Zapata.

♂. Labio superior y frente bermejizo-amaranjados, el labio con tres puntos negruzcos en cada una de las dos piezas de que se compone; mejillas y la parte inferior de los ojos amarillas, la superior es castaño-amaranjada; el vértice es negro-bronceado con una línea transversal de los estemas virua. Tórax negro-cobrizo-metálico; protórax con los bordes marcados con dos puntos; el mesotórax tiene en sus lados dos fajas pardusco-amaranjados; de este color es también el lado del tórax, y el metatórax tiene además muchas manchitas en su parte superior. El abdomen es negro-olivado-metálico con los bordes laterales del 1o. y 2o. segmentos pardusco-amaranjados; los bordes anteriores de los segmentos siguientes y su parte inferior son pajizos. El 10o. en sus lados, el 11o. por encima y el 12o., tienen una mancha lateral posterior pardusco-amaranjada; los apéndices son en la punta negros. Piés pardusco-amaranjados con los muslos apenas teñidos de negro en su parte superior.

♀. El color de la cabeza es ceniciento-verdoso-claro en todas las partes que en el ♂ son amarillas ó amaranjadas. Los ojos son por encima olivados.

I have compared one male belonging to the Museum of Comparative Zoology, labeled "34" (a Poey label), "Cuba Poey 1864"

<sup>19</sup> Bull. Acad. Roy. Belg., (2) xli, p. 530, 1876; on the same page is a French version of a description of the colors of the Cuban *cardenium* by Gundlach.

(in Hagen's hand) and "truncatum" (in a third hand), with this description with which it agrees in most respects. By "las dos piezas" of the labrum are apparently meant the labrum proper and the supra-clypeus (nasus). The tenth, eleventh and twelfth abdominal segments seem to correspond to the eighth, ninth and tenth respectively; how Gundlach counted twelve abdominal segments, I do not see. This species is treated at greater length later in this paper.

Dr. Ramsden's note on the types of this species in the Instituto at Havana is:

"In collection: N  $1\frac{09}{34}$  *Agrion truncatum* ♂ (1 example, one wing broken). Id. id. id. ♀ (1 example without head or abdomen). In MS. catalogue: 109-134 *Agrion truncatum* Hagen, localidad: Zarabanda (no mention is made of *Enallagma*)."

**Agrión (*Enallagma*) civile.** (149.) P. 226. Oct. 15, 1888. ***Enallagma civile*** (Hagen).

Esta especie fué cogida en Güines.

Gundlach's description is a translation of Hagen (1861).

**Agrión (*Enallagma*) aduncum.** (105.) P. 227. Oct. 15, 1888. ***Argialagma minutum*** (Selys).

Lo cogí en varias localidades de la parte occidental de la Isla.

Gundlach's description is a translation of Hagen (1861).

**Agrión (*Pyrrosoma*) vulneratum.** (63.) P. 228. Oct. 15, 1888. ***Telebasis vulnerata*** (Hagen).

Vive sobre toda la isla de Cuba y también en la isla de Puerto-Rico, . . .

Gundlach's description is a translation of Hagen (1861).

**Agrión (*Erythagrión*) dominicanum.** (...) P. 229. Oct. 15, 1888. ***Telebasis dominicana*** (Selys).

*Agrion dominicanum* Selys Cub. p. 198.

No he observado esta especie, que Selys menciona en la obra de la Sagra.

Copio la descripción dada en la *Synopsis* por Hagen, quien la transcribe de Selys.

**Agrión (*Erythagrión*?) discolor.** (...) P. 229. Oct. 15, 1888. ***Amphiagrión saucium*** (Burm.).

*Agrion discolor* Burm.; Selys Cub. p. 198.

No he observado esta especie, mencionada también por Selys en la obra de la Sagra . . . La descripción dada por Burmeister es: (a translation into Spanish follows).

En esta especie dice Hagen *Syn.* p. 80, que el *Agrión dorsale* de Selys será acaso diferente. No encuentro su descripción.

Selys menciona aún otra especie que el Sr. Poey y yo no hemos observado, á lo menos no las tenemos en la colección. Ella es:

**Agrión (?) Doubledayi.** (...) P. 230. Oct. 15, 1888. **Enallagma doubledayi** (Selys).

*Agrión Doubledayi* Selys Cub. p. 199.

Copio la descripción de la Synopsis [Hagen 1861].

**Agrión (Leptobasis) vacillans.** (43.) P. 231. Oct. 15, 1888. **Leptobasis vacillans** Hagen.

He cogido esta especie en localidades de toda la Isla.

I think it desirable to reproduce Gundlach's description in full.

Ambos sexos no difieren en su colorido. Labio superior anaranjado, mejillas verdoso-amarillas, frente y vértice negros, occipucio verdemar. Los ojos son por encima negros, por debajo amarillo-verdes; protórax negro, con una mancha verdoso-amarilla en la parte delantera; mesotórax por encima negro, con una faja lateral verdoso-amarilla; del mismo color es también la parte inferior lateral; metatórax negro, con manchitas verdoso-amarillas. Abdomen en sus dos divisiones del primer segmento verde-anaranjado, por encima con una mancha larga negra; los segmentos 2o. y 3o. rojos de coral, el 4o. idem, pero hacia el fin negro con viso olivado metálico, los 5o. y 6o. de este color, pero con una manchita en cada lado de la base ó sea en la unión de los dos segmentos. El 6o. tiene ya el fin anaranjado-rojo, y este color tiene también el resto del abdomen. Por debajo son la cabeza y el tórax blanquecinos, el abdomen en su base y su fin es pálido-rojo de coral, y en la mitad amarillo-pálido ó pajizo; los pies son pálido-amarillento-pardos; las alas son cristalinas.

On comparing one male of *L. vacillans* var. *atrodorsum* Calvert, from Tlacotalpan, Mexico, and one male and one female from Teapa, Mexico, with the above, I find that the first male agrees better with Gundlach's description of the thorax, while de Selys' (original) description of *vacillans*,<sup>20</sup> based on Cuban material from Gundlach, in the Paris Museum, reads: "Thorax étroit, roux jaunâtre jusqu' à la suture humérale avec une bande anté-humérale brune de chaque côté de l'arête dorsale." Gundlach's description of the "dos divisiones del primer segmento" [= seg. 1 and 2?] should be contrasted with de Selys' "Abdomen filiforme, brun jaunâtre orangé en dessus, jaune pâle en dessous" with no mention of dark color on the anterior segments, and Gundlach's account of the "4th, 5th and 6th" segments with de Selys' "articulations terminales des 3-7e segments cerclées de noir, la base des mêmes segments jaune pâle." After all, as I have already stated,<sup>21</sup> one is still tempted to regard *atrodorsum* as aged *vacillans*.

<sup>20</sup> Bull. Acad. roy. Belg., xliii, p. 101, 1877.

<sup>21</sup> Biol. Centr.-Amer., Neur., p. 121.

**Agrión (*Anomalagrión*) *hastatum*.** (108.) P. 232. Oct. 15, 1888.

***Anomalagrión hastatum*** (Say).

♂. *Anomalagrión hastata* Say; Selys Cub. p. 200.

♀. *Trichocnemis minuta* Selys Cub. p. 197.

Esta especie vive sobre toda la isla de Cuba, . . .

I have compared one male from Havana, taken by Baker, with Gundlach's description of the male, with which it agrees. His description of the female, however, is different from any female that I know, so that it seems advisable to reproduce it here.

♀. Boca, labio superior y frente anaranjados; en la parte posterior del labio se ve una línea transversal negra; vértice negro-olivado-metálico; este color pasa angostamente detrás de los ojos; el cogote tiene un color anaranjado vivo, el cuello es negro-olivado lustroso, con el borde posterior anaranjado. Protórax negro-olivado-metálico, con los bordes laterales anaranjados; mesotórax anaranjado con una faja ancha negro-olivado-metálica encima, y una línea muy fina en los lados. Metotórax amarillo claro con las suturas negras. Abdomen anaranjado con los bordes de los segmentos en su unión negros; el primer segmento tiene por encima un color negro-olivado-metálico que ocupa las tres cuartas partes posteriores, y en los tres siguientes ocupa toda, pero dejando en el segundo segmento el borde lateral anaranjado. El último segmento tiene en su primera parte dos manchitas negro-olivadas y en los demás es barnejo. Piés amarillo pálidos con espinas negras. La espina del segmento octavo falta. Alas cristalinas con el pterostigma amarillento y regular.

It will be noticed that Gundlach considers *Trichocnemis minuta* Selys to be the female of this species, although de Selys himself, in his Synopsis of the legion Agrión,<sup>22</sup> referred *T. minuta* to *Enallagma? aduncum* Hagen. Gundlach knew this work of de Selys, at least he quotes it frequently. Gundlach's description of the female, here reproduced, is not that of the true female of *Argialagma minutum*, as the species is now known.

The male and female of *Agrión hastatum*, entire, the wings of both sexes on a larger scale, and the base of a wing are shown in the Atlas of Ramon de la Sagra's Cuba.<sup>23</sup> These figures are not quoted by Gundlach or by any other author, as far as I know

**Agrión (*Ceratura*) *capreolus*.** (106.) P. 233. Nov. 15, 1888. ***Ceratura capreola*** (Hagen).

Lo he colectado en toda la Isla y además vive en Puerto-Rico. . . .

Gundlach describes the male and the black female only. I have compared one male from Havana, taken by Baker, one male from Vera Cruz, Mexico, one black female from Los

<sup>22</sup> Bull. Acad. roy. Belg. (2), xli, p. 499, no. 94, 1876.

<sup>23</sup> Articulata, tab. 18, figs. 1-11.

Amates, Guatemala and one black female from São Paulo, Brazil, with Gundlach's descriptions, and they agree.

TRIBU AESCHININA.

SUBFAMILIA GOMPHINA.

Género **GOMPHOIDES** Selys

**Gomphoides producta.** (40.) P. 234. Nov. 15, 1888. **Gomphoides (Aphylla) producta** (Selys).

*Aphylla caraiba* Selys Cub. p. 193.

La cogí en la vecindad de Cárdenas.

I have compared one male from Havana, taken by Baker, and one female labelled "Cuba," taken by Poey, 1864, and find Gundlach's description correct.

It seems not impossible that the *Cyclophylla cubana* of P. Navas<sup>24</sup> may be this species.

SUBFAMILIA AESCHININA.

Género **ANAX** Leach

**Anax Junius.** (121.) P. 235. Nov. 15, 1888. **Anax junius** (Drury).

*Anax Junius* Selys Cub. p. 194.

Lo he colectado en la parte occidental de la Isla.

I have compared one male from Guantanamo, Cuba, Feb. 13, 1914, taken by Dr. Henry Skinner, and one male from Montego Bay, Jamaica, with Gundlach's description, which is of this sex only.

**Anax amazili.** (23.) P. 236. Nov. 15, 1888. **Anax amazili** (Burm.).

Un ejemplar fué cogido en Octubre 1871 en la Habana.

Copio la descripción dada por Hagen en su Synopsis p. 119.

Género **AESCHNA** Fab.

**Aeschna adnexa.** (45.) P. 237. Nov. 15, 1888. **Aeschna (Coryphaeschna) adnexa** (Hagen).

Vive en la parte occidental de la Isla, y no es conocida en otros países.

I have compared males from Guantanamo, Cuba, Feb. 13, 1914, taken by Dr. Henry Skinner; San Domingo; Casiguana, Ecuador, taken by Prof. F. Campos R.; and Alta Mira, Mexico, taken by Dr. Hoag, with Gundlach's description, which is of the male only, and find it correct; here his "penúltimo" and "último" segments of the abdomen are the ninth and tenth respectively.

<sup>24</sup> Mem. Pontif. Accad. Rom. Nuovi Lineei, (2), iii, p. 2, fig. 1 (details), 1917.

**Aeshna virens.** (51.) P. 238. Nov. 15, 1888. **Aeshna (Coryphaeschna) virens** (Ramb.).

Cogí esta especie en la proximidad de Cárdenas y Mr. Scudder en la Isla de Pinos.

I have compared one male from Trinidad [sic] (ex coll. Selys), one male and one female from Alta Mira, Mexico, and one female from the Amazon (Bates, ex coll. Selys) with Gundlach's description, with which they agree, except that Gundlach says: "Labio negro," while in our specimens the labrum is pale green with its distal third to half black or red. In Bates' female the labium is yellowish or yellowish brown with the apex of the median lobe reddish or brownish.

**Aeshna ingens.** (46.) P. 239. Nov. 15, 1888. **Aeshna (Coryphaeschna) ingens** (Ramb.).

Colectado en la vecindad de Cárdenas; el tipo era de la Florida.

I have compared both sexes from Florida with Gundlach's description. He says "el triángulo detrás de los ojos [= occiput] y el cogote [= rear of the head] son negros," but in all the specimens examined (three males, three females) the occiput is yellow narrowly margined with blackish, and there is a large crescentic pale greenish spot behind each eye. Otherwise the description agrees. As to the remark on the type's being from Florida, Rambur expressly says of his original specimen: "sans indication de patrie."

Género **GYNACANTHA** Ramb.

**Gynacantha trifida.** (67.) P. 240. Nov. 15, 1888. **Gynacantha trifida** Ramb.

*Gynacantha trifida* Ramb.; Selys Cub. p. 194.

La he cogido en la vecindad de Cárdenas. Suele volar al anochecer. Una vez la he visto en la Habana en innumerable cantidad y por largo tiempo, volando hácia el Sud en migración. No comprendo de donde pudieron venir.

I have compared one male from Cuba, taken by Poey, one male from Habana, Cuba, taken by Baker, and one female from Bath, Jamaica, with Gundlach's description and find it correct.

**Gynacantha septima.** ( . . . ) P. 241. Dec. 15, 1888. **Gynacantha septima** Selys.

*Gynacantha septima* Selys Cub. p. 195.

No posco esta especie, la cual indica Selys como recibida por Poey. . . . Hagen da la siguiente descripción sacada de Selys Cub.

I have compared one male and one female from Cuba, from Poey, 1864, in the collection of the Museum of Comparative Zoology, with the description.

**Gynacantha gracilis.** (24.) P. 242. Dec. 15, 1888. **Gynacantha nervosa** Ramb.

He cogido esta especie en la vecindad de Cárdenas y en la ciénaga de Zapata.

I have compared one female from Cuba, taken by Poey, 1864, in the Museum of Comparative Zoology, with Gundlach's description, which is of the female only; they agree. This specimen is one of those cited in the *Biologia Centrali-Americana*<sup>25</sup> as *G. nervosa* Rambur.

**Gynacantha ereagris.** (74.) P. 243. Dec. 15, 1888.

*Gynacantha ereagris* Hagen mss. nueva especie.

*Gynacantha ereagris* Hagen, Proceedings Bost. Soc. Nat. Hist., XI.] p. 291. Parece que en esta página está por errata *oreagris*.

La cogí en Agosto en la vecindad de Cárdenas.

Labio superior, frente y bultos frontales pálido-olivado pajizos, estos en la punta, la línea intermedia é hinchazón entre los estemas negros; ojos por encima azules-oscuros, por debajo pardo-claros con un viso á olivado. Triángulo detrás de los ojos amarillos, la parte detrás de los ojos por encima negra, por abajo pajiza. Protórax pardo con su borde posterior olivado; mesotórax en su borde delantero amarilloso verde, seguido por una faja transversal negrusca, los demás verdes; sulco intermedio y una mancha transversal morenos, metatórax negro con varias manchitas verdes dispuestas así: 1, 3, 2, 3, 1 y otras dos en la raíz de las alas. Abdomen en el primer segmento pardo con una faja transversal posterior verde, el segundo también pardo con la línea intermedia y delante el borde posterior de cada pieza verde; el tercero también pardo, en la base del segmento y en los bordes anterior y posterior de la segunda pieza del segmento en cada lado verde, los siguientes negros con el color verde menos fuerte y menos ancho, el último segmento es negro, solamente en el borde posterior de la primera pieza algo olivado-verde, la segunda pieza con los apéndices superiores morenos, los apéndices inferiores y una manchita sobre la base de cada apéndice lateral ferruginosos. Piés bermejizos.

No he apuntado las medidas y el número de células.

I have compared Gundlach's description with three specimens in the M. C. Z., labeled "eriagris" (I know not by whom): one male "70" (probably Cuba by Poey as the handwriting of this label is the same as in Poey numbers); one female, Cuba, Gundlach 1864 "74" (the number Gundlach gives to this species); and one female, Cuba, Poey 1866; also with three specimens in the Acad. Nat. Sci. Phila.: one male, Havana, Cuba, taken by Baker, no. 3517; one female, Santiago, Cuba, September 24, 1903, taken by Capt. W. Robinson; one male, Crooked Island, Bahamas, November 24, 1890, taken by J. P. Moore and D. J. Bullock, University of Pennsylvania Expedition. They all agree.

<sup>25</sup> Neur., p. 193.

This species is discussed in detail later in this paper (*postea*, page 386).

Dr. Ramsden's note on the types of this species in the Instituto at Havana is:

"In collection N 74 Gynacantha ereagris (1 example in good condition). Id. id. id. ♀ (1 example in good condition). In MS. catalogue: Gynacantha ereagris Hagen, Localidad: Cárdenas. (Catalogue nor label say *ereagris* as in your letter.)"

Dr. Ramsden's last remark calls attention to a question of the spelling of the specific name which may require a decision by the International Commission on Zoological Nomenclature. As indicated by the verbatim reprint given above from Gundlach's text, Gundlach twice spells the name *ereagris*. In the "Indice de los nombres científicos," p. ii, he spells it *ereagris*, as he does in his own label quoted by Dr. Ramsden. Gundlach's "Fe de erratas," pp. iv-v, although correcting a number of errors in the text relating to the Odonata, makes no mention of *ereagris*. A Greek word "ereagris," a small flesh hook, exists, but I have found no "ereagris." The question, of course, is a technical one of interpretation of the code of nomenclature.

#### TRIBU LIBELLULINA.

##### SUBFAMILIA CORDULINA.

Género **TETRAGONEURIA** Selys

**Tetragoneuria balteata.** (...) P. 244. Dec. 15, 1888. **Macrodiplax balteata** (Hagen).

No he observado esta especie. Hagen dice en los Proceedings [Bost. Soc. Nat. Hist., XI, p. 291, 1867] que ha visto solamente un macho (cubano.) Es, pues, una especie dudosa como habitante de Cuba.

Hagen en su Synopsis [1861] da la descripción. [A translation into Spanish then follows.]

Dr. F. Ris, the latest writer on this species, refers it to the genus *Macrodiplax*, subfamily Libellulinae.<sup>26</sup>

##### SUBFAMILIA LIBELLULINA.

Género **PANTALA** Hagen

**Pantala flavescens.** (79.) P. 215. Dec. 15, 1888. **Pantala flavescens** (Fab.).

*Libellula flavescens* Fab.; Selys Cub. p. 186.

Encontré esta especie en los contornos de Cárdenas durante la época de Agosto á Octubre.

I have compared one male from Santa Ana, III, 4, taken by

<sup>26</sup> Cat. Coll. Zool. Selys, fasc. xvi, Ire partie, p. 1038, 1913.



S. H. Hamilton, and one female from Havana, taken by Baker, both from Cuba, with Gundlach's description, which agrees, except that the "mancha morena" of the first abdominal segment is hardly E-shaped.

A German version of Gundlach's description is given by Hagen.<sup>27</sup>

**Pantala hymenaea.** (80.) P. 246. Dec. 15, 1888. **Pantala hymenaea** (Say).

Encontrada en la playa de Cárdenas: . . .

I have compared one female from Saltillo, Mexico, with Gundlach's description which is of that sex only and they agree. A German version of Gundlach's description is given by Hagen.<sup>28</sup>

Género **THOLYMIS** Hagen

**Tholymis citrina.** (11.) P. 247. Dec. 15, 1888. **Tholymis citrina** Hagen.

Cogí esta especie cerca de Cárdenas.

I have compared one male from Georgetown, British Guiana, and two males and one female, Babahoyo, Ecuador, with Gundlach's description, which is of both sexes. His males seem to have had more yellow on the fore wings than the three which I compared possess: perhaps the word "dos" was omitted from between "los" and "últimos segmentos" in his description of the superior appendages. Of the female Gundlach says: "Las manchas amarillas de las alas son menores, y en las alas anteriores casi imperceptibles."

A German version of Gundlach's description is given by Hagen.<sup>29</sup>

Género **TRAMEA** Hagen

**Tramea carolina.** (11.) P. 249. Feb. 15, 1889. **Tramea carolina** (Linn.).

*Libellula carolina* Linn.; Selys Cub., p. 185.

Esta especie está designada en la obra de la Sagra como habitante de la Isla de Cuba, pero ni el Sr. Poey, ni yo, hemos observado esta especie, sino la muy parecida *Tramea onusta* Hagen y es de suponer, como cree el Dr. Hagen, que Selys tuvo á su vista la *onusta*, que en aquel tiempo aún no era nombrada.

Gundlach's description is a translation of Hagen (1861).

<sup>27</sup> Stett. Ent. Zeit., xxviii, p. 215, 1867.

<sup>28</sup> *T. c.*, p. 217.

<sup>29</sup> Stett. Ent. Zeit., xxviii, p. 219, 1867.

**Tramea onusta.** ( . . . ) P. 250. Feb. 15, 1889. **Tramea onusta** Hagen. No he observads [sic] aún esta especie, pero el Sr. Poey la tenía en su colección en un ejemplar masculino.

Gundlach's description is a translation of Hagen (1861).

**Tramea abdominalis.** (12.) P. 251. Feb. 15, 1889. **Tramea abdominalis** (Ramb.).

*Libellula basalis* Burm.; Selys Cub. p. 185.

La he cogido cerca de Cárdenas, y existe también en la Isla de Pinos, . . .

I have compared one male from Havana, taken by Baker, and one female from Hamilton Island, Bermudas, Oct., 1905, taken by H. A. Snyder, with Gundlach's description which agrees, except that the Havana male has the superior appendages reddish, not "negros"; the female from Hamilton Island, however, has them black and males from other localities have them blackish with reddish at bases.

The German version of Gundlach's description<sup>30</sup> differs in a number of respects from that given in the present work.

**Tramea insularis.** (128.) P. 251. Feb. 15, 1889. **Tramea insularis** Hagen.

De la vecindad de Cárdenas.

I have compared one male from Cuba, taken by Poey, no. 37, with Gundlach's description which latter shows the following differences: labrum "negro," instead of brownish at the base (as it is also in other males examined); the superior appendages "con ápice negro," instead of reddish throughout (a San Domingo female has them largely blackish); legs "negros con la base de los muslos rojiza" (as a San Domingo male has them) instead of largely reddish; veins of the wings in the apical half "negras," instead of reddish or pale brownish.

A German version of Gundlach's description is given by Hagen.<sup>31</sup>

Dr. Ris<sup>32</sup> refers *insularis* Hagen to *binotata* Rambur, after examining Rambur's type. He also considers the "*binotata* Ramb." of Calvert,<sup>33</sup> to be true *binotata*. There is, however, a difference between the descriptions of the hamules given by Ris and Calvert respectively, as to their length relative to the genital

<sup>30</sup> Stett. Ent. Zeit., xxviii, p. 223.

<sup>31</sup> Stett. Ent. Zeit., xxviii, p. 221, 1867.

<sup>32</sup> Cat. Zool. Selys, fasc. xvi, p. 991, 993, 1913.

<sup>33</sup> Am. Carn. Mus., vi, p. 259, 1909.

lobe, which may or may not have some significance. Lines 5 and 6 on page 259 of the latter author's description,<sup>34</sup> should be corrected to read "Frons of ♂ superiorly metallic violet, of ♀ yellow with superior metallic blue stripe .7 mm. wide."

**Tramea marcella.** (35.) P. 252. Feb. 15, 1889. **Miathyria marcella** (Selys).

La he cogido cerca de Cárdenas en Noviembre.

I have compared one male and one female from Teapa, Tabasco, Mexico, with Gundlach's description and they agree in all essentials. The female which Gundlach describes had the brown basal band on the hind wings, as compared with the male, "más ancha, llega al triángulo, pero finaliza más lejos del borde posterior."

The German version of Gundlach's description<sup>35</sup> differs in some details.

**Tramea simplex.** (146.) P. 253. Feb. 15, 1889. **Miathyria simplex** (Ramb.).

*Libellula simplex* Ramb.; Selys Cub. p. 191.

No recuerdo donde la he cogido, pero se que en la parte occidental de la isla de Cuba.

I have compared one male from Teapa, Tabasco, Mexico, and one female from Havana, taken by Baker, with Gundlach's description which agrees and which corresponds to the German version,<sup>36</sup> although Hagen there says, "Von Gundlach ist keine Beschreibung gegeben."

**Tramea australis.** (60.) P. 255. Feb. 15, 1889. **Tauriphila australis** (Hagen).

La he cogido en los bosques cercanos á Cárdenas en Julio.

I have compared one male and one female from Havana, taken by Baker, with Gundlach's description and they agree. A German version of Gundlach's description has been published by Hagen.<sup>37</sup>

Género **CELITHEMIS** Hagen

**Celithemis eponina.** (37.) P. 256. Feb. 15, 1889. **Celithemis eponina** (Drury).

*Libellula eponina* Drury; Selys Cub. p. 186.

<sup>34</sup> Ann. Carn. Mus., vi.

<sup>35</sup> Stett. Ent. Zeit., xxviii, p. 227, 1867.

<sup>36</sup> Stett. Ent. Zeit., xxviii, p. 228, 1867.

<sup>37</sup> Stett. Ent. Zeit., xxviii, p. 229, 1867.

He cogido esta especie en la Habana (paradero del Tulipan), y en Cárdenas. Es especie rara.

No habiendo tomado descripción del insecto vivo, me veo precisado á copiar, traduciendo la descripción dada por Hagen.

Género **LIBELLULA** Linn.

**Libellula umbrata.** (18.) P. 257. Mar. 15, 1889. **Erythrodiplax umbrata** (Linn.).

*Libellula umbrata* Linn.; Selys Cub. p. 189. (de Cuba).

Es una especie sumamente común y según su edad y sexo muy variable.

I have compared two males and two heterochrome females from Havana, taken by Baker, with Gundlach's description. Although he describes what he calls "El ♂ adulto," the description is not of the *oldest* stage as the "bultos frontales y vértice [son] negro-ferruginosos." "Tórax pálido, olivado-pardo," etc. He is in error when he speaks of the wings of the male: "la base y el ápice no tienen color." However, the paragraph on page 259, beginning "A veces es el ápice de las alas anteriores algo parduzco," although following the description of the female, applies, as well as the paragraph immediately preceding and that immediately following, to the male, probably.

Gundlach's description of the female is that of the heterochrome form. He adds: "Poey y yo hemos cogido dos ó tres hembras muy adultas con una faja como la tiene el macho adulto."

German versions of these descriptions, as well as others of this species, of different ages, by Gundlach are given by Hagen.<sup>38</sup>

**Libellula angustipennis.** (16.) P. 259. Mar. 15, 1889. **Cannaphila angustipennis** (Ramb.) = **C. insularis funerea** (Carp.).

*Libellula angustipennis* Ramb.; Selys Cub. p. 188.

Cogí esta especie en los contornos de Cárdenas y Scudder en la Isla de Pinos.

I have compared one male from Cuba (without other data) and one female from Frontera, Mexico, taken by O. S. Westcott, with Gundlach's description and they agree.

Dr. Ris,<sup>39</sup> has shown the prior use of *angustipennis* for another species, so that the Cuban form must be known as *Cannaphila insularis funerea* (Carp.).

**Libellula auripennis.** (54.) P. 260. Mar. 15, 1889. **Libellula auripennis** Burm.

<sup>38</sup> Stett. Ent. Zeit., xxix, pp. 278 et seq., 1868.

<sup>39</sup> Cat. Coll. Zool. Selys, fasc. xi, p. 295, 1910.

Se encontró en bastante número en los contornos de Cárdenas, y de Cienfuegos, en la Isla de Pinos y en los Estados Unidos.

I have compared one male and one female from Altamira, Tamaulipas, Mexico, taken by Hoag, with Gundlach's description. He does not mention the sex of his specimens, but they were evidently females or young males, as indicated by such expressions as "frente y bultos frontales olivado-pardos, claros"; "Tórax ferruginoso con una faja pajiza intermedia," "abdomen . . . anaranjado-pálido con un viso olivado, y con la línea intermedia negra," etc. The statement "los apéndices caudales son casi nulos, negros," is puzzling.

Gundlach gives the dimensions (taken from Hagen 1861) as: "Longitud 48-56, entre las alas 76-85, pterostigma 6 milímetros," which corresponds well to those given in the *Biologia Centrali-Americana*<sup>40</sup> for this species. Dr. Ris<sup>41</sup> has commented on Cuban examples which are smaller: ♂ abd. 31, hind wing 34, pter. 5; ♀ 29, 33, 5 mm., respectively.

**Libellula herbida.** (27.) P. 261, Mar. 15, 1889. **Cannacria** (= **Brachymesia**) **batesii** (Kirby).

*Libellula herbida* Hagen in Proceed. [Bost. Soc. Nat. Hist., XI] p. 292. Aún no está publicada su descripción.

Encontré esta especie en Octubre y Noviembre por Cárdenas.

♀ El borde de los labios es pardo; la frente, boca y los bultos frontales son blanco-pajizos; el vértice y occipucio pardos; ojos pardo-morados en su parte superior y ceniciento-olivados en su inferior; detrás del ojo hay en la parte inferior una mancha pajiza en el fondo negro; torax pardo olivado. Abdomen en los cuatro primeros segmentos olivado-pardo, claro; los cinco siguientes son del mismo color, pero con una mancha triangular negra que con su base ocupa toda el borde apical de los segmentos, y con su punta llega á la base; el color negro se aumenta en los segmentos posteriores y ocupa así todo el segmento penúltimo; el último es negro con su borde apical bermejizo-blanco; los apéndices caudales son rojizo-pardos. La parte inferior del tórax y el vientre son de un color pardusco muy claro, pero enteramente cubierto de una especie de polvo blanco-ceniciento. Los piés son morenos.

It will be noticed that Gundlach's description omits the wings and the dimensions altogether; it appears to correspond to the species known as *Cannacria batesii* Kirby,<sup>42</sup> and one male and one female from Cuba, taken by Poey, belonging to the Museum of

<sup>40</sup> Neur. p. 206.

<sup>41</sup> Cat. Coll. Zool. Selys, Libell., fasc. xi, p. 274, 1910.

<sup>42</sup> Trans. Zool. Soc. Lond., xii, p. 341, pls. liii, fig. 1, lvii, fig. 9.

Comparative Zoology, listed in the *Biologia Centrali-Americana*,<sup>43</sup> under *Cannacria batesii*, were labeled "*herbida*" when they were lent to me in 1899. Kirby's paper was published on Aug. 14th, 1889,<sup>44</sup> while the installment of Gundlach's work containing the present species was, according to Dr. Ramsden's data (*antea*, p. 338), issued in March, 1889. The name *herbida*, therefore, has priority over *batesii*. *Cannacria* Kirby, however, has been shown by Dr. Ris,<sup>45</sup> from an examination of the type of *Brachymesia australis* Kirby, to be generically the same as *Brachymesia* Kirby. The correct name of the present species is, therefore, *Brachymesia herbida* (Gundlach).

Dr. Ramsden's note on the types of this species in the Instituto at Havana is:

"In collection N  $\frac{3}{4}$ ; *Libellula herbida* ♂ (1 complete example in good condition). Id. id. id. (1 example with head broken which is loose in the box). In MS. catalogue: *Libellula herbida* Hagen. Localidad Cárdenas."

Género **ORTHEMIS** Hagen

**Orthemis discolor.** (38.) P. 262. Mar. 15, 1889. **Orthemis ferruginea** (Fab.).

*Libellula discolor* Burm.; Selys Cub. p. 188.

He observado esta especie en toda la Isla y también en Puerto Rico.

I have compared one male from Cuba, taken by Poey, and one male and one female from Havana (C. F. Baker) with Gundlach's description which agrees. A German version of Gundlach's description is given by Hagen.<sup>46</sup>

Género **LEPTHEMIS** Hagen

**Lepthemis vesiculosa.** (50.) P. 264. Mar. 15, 1889. **Lepthemis vesiculosa** (Fab.).

*Libellula vesiculosa* Fab.; Selys Cub. p. 187.

La cogí en la vecindad de Cárdenas, también en la isla de Puerto-Rico; . . .

I have compared one male from Havana, taken by Baker, and one female from Guantanamo, Cuba, Feb. 10, 1914, taken by Dr. Henry Skimmer, with Gundlach's description, which is based on fully colored individuals, and they agree.

<sup>43</sup> Neur., p. 326.

<sup>44</sup> cf. Biol. Centr.-Amer., Neur., p. 230, footnote.

<sup>45</sup> Cat. Coll. Zool. Selys, Libel., fasc. xiv, pp. 734, 737, 1912.

<sup>46</sup> Stett. Ent. Zeit., xxix, p. 279, 1868.

**Lepthemis attala.** (49.) P. 265. June 15, 1889. **Erythemis verbenata**

(Hagen) = **E. plebeja** (Burmeister).

*Libellula attala* Selys Cub. p. 187.

La he encontrado en los contornos de Cárdenas.

I have compared an adult male and an adult female of *verbenata* Hagen from Havana, taken by Baker; and one male from Rio, Brazil, one female from Cuba, taken by Gundlach, 1866, of *attala* Selys (as I have understood these two species)<sup>47</sup> with Gundlach's description. His account of the male applies almost equally well to *verbenata* ♂ and to *attala* ♂, that of the female better to the ♀ of *verbenata*. Gundlach, however, does not give any dimensions of his own specimens, does not describe the shape of the abdomen, nor does he say anything of the wings, so that it is not certain on which species he actually based his description. His description of the female appears to be inaccurate, even allowing for his usual view that the abdomen consists of twelve segments, when he says: "los 8o. y 10o. [segmentos abdominales] tienen una mancha ceniciento-olivada, interrumpida por la línea intermedia, negra; siendo el principio de cada segmento pardo-olivado; los dos últimos segmentos son negros"; . . . It is the last three (eight, nine and ten of the usual nomenclature) that are blackish.

In his synonymy he follows Hagen (1875) in uniting *attala* Selys and *verbenata* Hagen, and, after giving his own description, discussed above, says: "Estas son las descripciones tomadas de ejemplares vistos y clasificados por el Sr. Hagen como *L. verbenata*, pero la descripción dada por Hagen en su Synopsis difiere, pues traducida es" [and then follows a translation into Spanish from p. 162].

"El Sr. Selys Longchamp da la descripción como sigue en la obra de la Sagra: . . ." [What follows is a translation of Hagen's paraphrase (1861, p. 172) of Selys' description in the French edition of de la Sagra, p. 445; whether it is a verbatim copy of the description in the Spanish edition I can not say.]

On the basis of my description<sup>48</sup> of Burmeister's type of *Libellula plebeja*, Dr. Ris<sup>49</sup> refers *verbenata* Hagen to *plebeja* Burmeister. He is probably correct.

<sup>47</sup> *Biología Centr.-Amer.*, Neur., p. 330.

<sup>48</sup> *Trans. Amer. Ent. Soc.*, xxv, p. 78.

<sup>49</sup> *Cat. Coll. Zool. Selys, Libell.*, fasc. xiii, pp. 603-604, 1911.

Género **DYTHEMIS** Hagen

**Dythemis rufinervis.** (57.) P. 266. June 15, 1889. **Dythemis rufinervis** (Burm.).

*Libellula rufinervis* Burm.; Selys Cub. p. 187.

Se encuentra en las islas de Cuba, Santo Domingo y Puerto Rico y es especie común.

I have compared one male from Cuba, from Poey, one female from Cuba, from Dohrn, with Gundlach's description and they agree sufficiently well, but in the phrase "una raya lateral en los dos últimos segmentos [abdominales] negruzcas," "dos" should be "tres."

**Dythemis frontalis.** (84.) P. 267. June 15, 1889. **Scapanea frontalis** (Burm.).

*Libellula frontalis* Burm.; Selys Cub. p. 191.

La he cogido en la sabana de Camarioeca y en Rangel (jurisdicción de San Cristóbal) y el Dr. Scudder en la Isla de Pinos.

I have compared one male from Havana, taken by Baker, one female from El Cobre, Cuba, and one male from Kingston, Jamaica, with Gundlach's description and they agree. Nothing is said in the latter, however, of the marked widening of the abdomen in segments six to nine. In the description of the female is the following: "El segmento 11 deja ver solamente dos manchitas mayores superiores y 2 pequeñas laterales [=segment 8]. El último segmento [=segment 10] y los apéndices caudales son negros sin mancha."

**Dythemis didyma.** (17.) P. 268. June 15, 1889. **Micrathyria hagenii** Kirby.

*Libellula didyma* Selys Cub. p. 191.

La he cogido en la cercanía de Cárdenas y en Rangel (San Cristóbal).

I have compared one (younger) male from Atoyac, Vera Cruz, Mexico, one (older) male from Samana Bay, San Domingo, and one female from Havana, taken by Baker, with Gundlach's description which is good. By "el tercer segmento [abdominal] en el macho con dos manchitas chicas, en la hembra una grande . . . verde," he evidently means as much of segment two as lies posterior to the transverse carina. Rather puzzling it is that he should write of the seventh segment as the antepenult: "El segmento antepenúltimo tiene dos manchas mayores casi cuadradas de un color verde-mar."

See the remark under the following species.



**Dythemis dicrota.** (139.) P. 269. June 15, 1889. **Micrathyria didyma** (Selys).

Se encontró cerca de Cárdenas. También en la Isla de Pinos y en la Isla de Puerto-Rico.

I have compared one male from Tokanto, Yucatan, and one female from Havana, taken by Baker, with Gundlach's description and they agree. The male which Gundlach describes was not yet pruinose, its markings, therefore, being very similar to those of the female. The numeration of the abdominal segments is that usually adopted by authors, as he says: "el 7o. con una [mancha] grande casi cuadrada dividida por la línea intermedia amarillento-verdes."

Gundlach's descriptions do not permit one to decide whether his *didyma* is the same as the true *didyma* Selys or whether his *dicrota* is really *didyma*. As he refers his *didyma* and *dicrota* to the *didyma* and *dicrota* of Hagen 1861, respectively, and as Hagen stated<sup>50</sup> that his *dicrota* of 1861 is the true *didyma* Selys, it is, perhaps, more likely that *didyma* Gundlach = *hagenii* Kirby and *dicrota* Gundlach = *didyma* Selys.

**Dythemis aequalis.** (42.) P. 270. June 15, 1889. **Micrathyria aequalis** (Hagen).

Encontrada en los contornos de Cárdenas.

I have compared one male from Teapa, Tabasco, Mexico, and one female from Cuba, sent by Poey, with Gundlach's description and they agree: here also his numeration of abdominal segments is the usual, although he says: "el segmento 7o. 6 antepenúltimo con 2 manchas mayores triangular amarillas (la base del triángulo está en la base del segmento)": . . . .

**Dythemis naeva.** (75.) P. 271. June 15, 1889. **Erythrodiplax berenice naeva** (Hagen).

Cogida en la vecindad de Cárdenas.

I have compared two males from Colon, Panama, and one female from Cuba, sent by Poey, 1863, with Gundlach's description which agrees, after making allowances for differences in age, except that in the males it is the last three abdominal segments instead of "los dos últimos" which lack the orange or yellow spots.

**Dythemis debilis.** (41.) P. 272. June 15, 1889. **Micrathyria debilis** (Hagen).

Observada en la vecindad de Cárdenas.

<sup>50</sup> Proc. Bosl. Soc. Nat. Hist., xviii, p. 75, 1875.

I have compared one male from Puerto Barrios, Guatemala, one male from Frontera, Mexico, taken by Westcott, and one female from Alta Mira, Tamaulipas, Mexico, taken by Hoag, with Gundlach's description and they agree; here also he describes the seventh abdominal segment as "el segmento antepenúltimo."

Género **MACROTHEMIS** Hagen

**Macrothemis celeno.** (28.) P. 273. Nov. 15, 1889. **Macrothemis celeno** (Selys).

*Libellula celeno* Selys. Cub. p. 192.

De Cárdenas. Parece que vive también en Santo Domingo y en la isla Santómas.

I have compared one male and one female from Cuba, sent by Poey, and one male and one female from Havana, taken by Baker, with Gundlach's description. The sign "♀" on p. 273 should be changed to ♂, "Boca negra" is to be modified; in "Abdomen negro. 1.er segmento con cuatro manchas redondas blanco-verdosas," "1.er" should be "2o." and in the brief description of the female on p. 274, "no" before "tener" should be struck out; these corrections have been made in the German version of Gundlach's description.<sup>51</sup>

Género **ERYTHEMIS** Hagen

**Erythemis furcata.** (...) P. 274. Nov. 15, 1889. **Cannacria** (= **Brachymesia**) **furcata** (Hagen).

No he observado la especie, qué fue colectada por el Barón von Osten Salken [sic].

Traduzco la descripción dada por Hagen en Syn. p. 169.

There is at least one male from Cuba, sent by Poey, in the Museum of Comparative Zoology, cited in the *Biologia Centrali-Americana*.<sup>52</sup>

**Erythemis longipes.** (13.) P. 275. Nov. 15, 1889. **Ephidatia longipes cubensis** (Scud.).

En los contornos de Cárdenas. También en la Isla de Pinos.

I have compared one male from Havana, taken by Baker, and one female from Cuba, sent by Poey, with Gundlach's description and they agree. This form appears as *Ephidatia longipes cubensis* (Scudder) in Ris.<sup>53</sup>

<sup>51</sup> Stett. Ent. Zeit., xxix, p. 281, 1868.

<sup>52</sup> Neur., p. 326.

<sup>53</sup> Cat. Coll. Zool. Selys, Lib., fasc. xvi, p. 1013, 1913.

Género **MESOTHEMIS** Hagen

**Mesothemis simplicicollis.** (123.) P. 275. Nov. 15, 1889. **Erythemis simplicicollis** (Say).

*Libellula caeruleans* Ramb.; Selys Cub. p. 189.

La he cogido en Cárdenas, Bomba, y Seudder en la Isla de Pinos.

I have compared one male from Cuba (Poey), one male from Jamaica (Johnson) and one female from Eleuthera, Bahamas (Univ. of Pa. Exped.) with Gundlach's description and they agree.

**Mesothemis mithra.** (66.) P. 276. Nov. 15, 1889. **Erythemis attala** (Selys).

*Libellula mithra* Selys Cub. p. 188.

Cogida en los contornos de Cárdenas.

I have compared one male from Presidio, Vera Cruz, Mexico (Barrett), one female from Cuba (Gundlach, 1866) and one female from Havana (Baker) with Gundlach's description and they agree, although the latter does not even mention the wings.

This is the *Erythemis attala* of the Biologia Centrali-Americana and of Dr. Ris.<sup>54</sup>

Género **DIPLAX** Charp.

**Diplax ochracea.** (19.) P. 277. Nov. 15, 1889. **Erythrodiplax ochracea** (Burm.).

Cogida en la vecindad de Cárdenas, en la Isla de Pinos y en la Isla de Puerto Rico.

I have compared one male and one female from Havana (Baker) with Gundlach's description, which does not mention the sex of his specimens, but was evidently based on non-adults (if males, at least, were used), as evidenced by such expressions as "Tórax verdoso-pajizo," of which color also the "Abdomen en los tres primeros segmentos . . . [y] los dos últimos segmentos y sus apéndices" are said to be. This applies fairly well to the 10th segment and to the appendages, but not to the 9th which is darker, brown, in dried specimens. Otherwise the description agrees.

This is the form called *Erythrodiplax ochracea ochracea* by Dr. Ris.<sup>55</sup>

**Diplax abjecta.** (21.) P. 278. Nov. 15, 1889. **Erythrodiplax connata** (Burm.).

Cogida en los alrededores de Cárdenas y en la Isla de Pinos.

<sup>54</sup> Cat. Coll. Zool. Selys.

<sup>55</sup> Cat. Coll. Zool. Selys, Lib., fasc. xii, p. 188, 1911.

I have compared one male from Cuba, Gundlach, 1864, 21, with Gundlach's description [of the male as fixed by "frente y vértice con un brillo de azul de acero," sex not mentioned]. This male is a little smaller than the dimensions copied by Gundlach from Hagen (1861), viz.: total length 34 *vs.* 38 mm., alar expanse 55 *vs.* 58, pterostigma 3 *vs.* 3.5, and the colors of the abdomen are less vivid, but very likely this latter difference is due to the description having been made from freshly-caught examples.

This male and one from Bath, Jamaica, are the only material from the West Indies now at hand which I referred to *Erythrodiplax connata a'* in the *Biologia Centrali-Americana*.<sup>56</sup> They agree in most respects with the *E. connata fraterna* of Dr. Ris,<sup>57</sup> but they have no *brown at the apices of the wings*, a feature on which Dr. Ris lays emphasis (p. 498) in distinguishing this Antillean form.

**Diplax Justiniana.** (C.) P. 279. Nov. 15, 1889. **Erythrodiplax connata justiniana** (Selys).

*Libellula Justiniana* Selys Cub. p. 190.

Gundlach's remarks on this species consist only of a Spanish version of de Selys' description and a note on Hagen's usage of the name *justiniana*.

**Diplax ambusta.** (130.) P. 279. Nov. 15, 1889. **Erythrodiplax connata justiniana** (Selys).

Observada en varios puntos de las islas de Pinos y en Puerto Rico.

I have compared one male and one female from Cuba (Poey), one young male from Bath, Jamaica, and one female from Havana (Baker) with Gundlach's description and they agree.

This is the *Erythrodiplax connata f'* of the *Biologia Centrali-Americana*<sup>58</sup> and the *E. connata justiniana* of Dr. Ris.<sup>59</sup>

Género **PERITHEMIS** Hagen

**Perithemis domitia.** (14.) P. 280. Nov. 15, 1889. **Perithemis domitia domitia** (Drury).

*Libellula micella* Selys Cub. p. 190.

El Dr. Hagen no está aún seguro si la especie cubana es ó no es igual á la nombrada por Drury *Libellula domitia* en *Illust. II* 83; pl. XIV, f. 4, y mencionada con el mismo nombre por Burm. II, 855, 40 y Ramb. 121, 132, y así aceptó

<sup>56</sup> *Neur.*, p. 261.

<sup>57</sup> *Cat. Coll. Zool. Selys, Libel.*, fasc. xii, p. 508, 1911.

<sup>58</sup> *Neur.*, p. 266.

<sup>59</sup> *Cat. Coll. Zool. Selys, Libel.*, fasc. xii, p. 509.

el nombre usado por Selys en la obra de la Sagra. [This probably refers to *P. metella*.]<sup>60</sup> Si fuese igual debía tener el nombre dado por Drury.

Gundlach quotes no localities for this species but gives a description of both sexes; I have compared one male from Cuba (Poey) and one female from Cuba (ex coll. Needham) with it and the males agree. The description of the wings, as usual, is a translation of Hagen (1861). The female before me was not included in the material cited in the *Biologia Centrali-Americana*,<sup>61</sup> as the male was; it has no "estrias morenas" at the base of the wings, although the yellow in the subcostal space of the front and hind wings and the submedian (cubital) space of the hind pair is a little deeper. The general yellow of the wings extends to the second postnodal for the whole width on both front and hind pairs and in the costal space only as far as the stigma. The extreme apex of the hind wings is brownish yellow for a width of one cell. Internal triangle, front wings, two-celled, the two posttriangular rows increase to three rows at the level of the separation of the bridge vein (subnodal sector) from M1 (principal sector) and so continue almost to the wing-margin. This female is of the form *domitia* (type) of the *Biologia Centrali-Americana*,<sup>62</sup> its wing coloration resembles more that of fig. 183 of "*P. domitia* var. ♀ *octoxantha* Buenos Aires" of Ris than his fig. 180 of "*P. domitia* var. *domitia*, Cuba."<sup>63</sup>

At the conclusion of his description of this species, Gundlach says: "Hay una variedad con las alas cristalinas, casi amarillentas y en su borde anterior amarillas; las posteriores en la hembra con una nube morena en el ápice. Esta variedad había nombrado Hagen *Libellula iris*." Hagen in his original and only description of *iris*<sup>64</sup> did not cite it from Cuba.

#### ON *ENALLAGMA TRUNCATUM* GUNDLACH AND ITS ALLIES IN THE UNITED STATES

The species described as *Agrion* (*Enallagma*) *truncatum* by Gundlach on page 226 of Tomo II of his *Contribución* is known to me from a single male only. In most respects, this male seems related to *E. pollutum*, *siquatum* and *pictum* of the eastern United

<sup>60</sup> Proc. Bost. Soc. Nat. Hist., xi, p. 293, 1867.

<sup>61</sup> Neur., p. 313.

<sup>62</sup> Neur., pp. 310, 312.

<sup>63</sup> Cat. Coll. Zool. Selys, Libel. fasc. xi, pp. 337, 335, 1910.

<sup>64</sup> 1861, pp. 185, 186.

States. Under *E. pollutum*, following, perhaps, my identification of this species in these Transactions,<sup>65</sup> American authors have included at least three species. One of these, the best known, is that found from Maine, Ontario, and Wisconsin to Florida and Oklahoma; it is not the true *pollutum* but distinct and may be termed *Enallagma vesperum*. The true *pollutum* I know from Florida only. For a third form, likewise seen from Florida alone, I suggest the name *Enallagma laurenti*.

Of the six species thus resulting, I know both sexes of four, the males only of *truncatum* and *laurenti*. These six species agree in having (in the sexes thus far known):

♂ ♀. Dorsum of abdominal segment two black from end to end.

Right and left pale postocular spots connected with each other across the occiput.

Mesostigmal lamina (caudal mesostigmal plate of Garman, 1917) erect and more or less (*truncatum*) produced at its mesal end into a tubercle. In the males the lamina does not reach to the mesinfraepisternum, owing to the ventral mesostigmal plate (of Garman) meeting the mesepisternum (supraepisternum of Garman); in the females the lamina reaches to the mesinfraepisternum and the ventral mesostigmal plate does not meet the supraepisternum.

First antennal joint anteriorly for its entire length and all of the second joint, except the distal end, pale colored.

Legs pale colored, dark markings, when present, narrow lines often interrupted.

♂. Dorsum of abdominal segment nine (but not of eight) pale blue or orange (black in *pictum*). Superior abdominal appendages not deeply bifid.

♀. Middle prothoracic lobe with a pair of dorsal pits. Dorsum of abdominal segment ten pale-colored (black in *pictum*).

The pair of dorsal pits on the middle prothoracic lobe of these females does not appear to have been noticed by previous writers. Each pit is oval or elliptical in outline, its greatest diameter being subtransverse to the long axis of the body (plate XXXIII, figs. 5 and 7). The shortest diameter, as far as measured, varies from .07 mm. in *pollutum* to .2 mm. in *signatum*, and varies also in the same species. Thus, in *signatum* it ranges from .1 to .2 mm. in three

<sup>65</sup> xx, 239, 1893.

specimens measured. Each pit is smooth within, shining black and its external or lateral end usually produces an emargination on the inner or mesal edge of the pale spot present on each side of the dorsum of this lobe.

The usual statement is that in the pairing of the Zygoptera the inferior appendages of the male are applied cephalad of the hind prothoracic lobe of the female, his superior appendages caudad of that lobe. If this be true for the species here discussed, these dorsal pits of the female may receive the inferior appendages of the male. Since the former are much larger than the apices of the latter (*cf.* figs. 5 and 7 with 16, 17 and 20, 21, plate XXXIII), the adaptation does not appear to be very exact.

*Enallagma cultellatum*, although suggesting the *pollutum-truncatum* group by the superior appendages of the male, has the black on the dorsum of abdominal segment two not reaching to the base, the pale postocular spots not connected, the mesostigmal lamina not so ridge-like and without any mesal tubercle, abdominal segments eight and nine both pale blue dorsally in the male.

The female of *E. cultellatum* has a pair of pits on the middle prothoracic lobe, but they are much smaller and shallower than in the other species here discussed and are situated nearer to the hind lobe, which latter is quite different from the hind lobe of our species in question being trilobulate instead of entire, the middle lobule a little posterior to the lateral two and with a horizontal ridge projecting from its hind surface.

The following pages give the chief differentials of these six species. The dimensions of the width of the various stripes on the thorax refer in each case to the width at *mid-height*. Only in the cases of *pollutum*, *laurenti* and *resperum* does it seem desirable to quote the existing literature.

The males may be distinguished by the form of the terminal abdominal appendages, shown on Plate XXXIII, figs. 12-23, and by the following color differences:

Dorsum of abdominal segment nine pale blue or orange.

Pale postocular spots directly confluent with the pale color of the rear of the head, middle prothoracic lobe predominantly pale on dorsum. . . **laurenti**

Pale postocular spots not directly confluent with the pale color of the rear of the head, although they may be indirectly confluent therewith *via* the pale transverse stripe which connects the postocular spots with each other; middle prothoracic lobe predominantly black on dorsum.

Pale antehumeral stripe narrower than the black humeral (mesopleural) stripe.

Postocular spots linear..... **truncatum**

Postocular spots cuneiform..... **pollutum**

Pale antehumeral stripe as wide as, or wider than, the black humeral stripe..... **vesperum, signatum**

(I have not found a constant color difference between the males of these two species, that given by Garman in 1917 notwithstanding, although the bright lemon yellow of the sides of the thorax in the adult males of *vesperum* is apparently never met in any age of *signatum*, but younger males of *vesperum* do not show this bright yellow; the difference in the appendages of the two species is well marked.)

Dorsum of abdominal segment nine black, pale postocular spots linear, not confluent with the pale color of the rear of the head, pale antehumeral stripe narrower than the black humeral stripe..... **pictum**

*Females.*

(Those of *laurenti* and of *truncatum*, being unknown to me, are omitted.)

Black humeral stripe at its lower end touching the external or lateral end of the mesostigmal lamina.

Pale postocular spots linear, pale antehumeral stripe narrower than the black humeral stripe, second lateral thoracic (metapleural) suture with a black stripe on its upper two-thirds or three-fourths, mesepisternal tubercles present..... **pictum**

Pale postocular spots cuneiform, wider and rounded at their lateral ends. Mesepisternal tubercles present, pale antehumeral stripe as wide as, or wider than, the black humeral, second lateral thoracic suture with a dark stripe of variable length..... **signatum**

Mesepisternal tubercles absent, pale antehumeral stripe narrower to wider than the black humeral, second lateral thoracic suture with a black stripe on its upper five-sixths or more..... **pollutum**

Black humeral stripe at its lower end not touching the lateral end of the mesostigmal lamina, pale postocular spots cuneiform, pale antehumeral stripe wider than the black humeral, second lateral thoracic suture with a black stripe on its uppermost fourth or fifth only, mesepisternal tubercles present but variable in size..... **vesperum**

**Enallagma truncatum** Gundlach (Plate XXXIII, figs. 1, 12, 13; plate XXXIV, figs. 24, 25.)

*Agrion (Enallagma) truncatum* Gundlach, Contrib. Ent. Cub., ii, 226, 1888. (Reprinted *antea*, page 353).

♂. Superior appendages in profile view, with the apical margin twice as long as the inferior margin and convex in the middle of its length with a slight concavity above and a slighter one below the convexity; in dorsal view, the intero-inferior lamella not reaching to the level of the supero-internal sub-apical hook.

Nasus (post-clypeus) shining black, two transverse linear streaks on the disk and anterior and lateral margins narrowly orange.

Frons: pale color of its anterior surface not attaining the median ocellus;



no small yellow spot enclosed in black immediately anterior to the median ocellus.

Pale postocular spots linear, not confluent with the pale color of the rear of the head.

Middle prothoracic lobe in dorsal view black, an oval orange spot each side.

Width of black mid-dorsal thoracic stripe .52, of pale antehumeral stripe .14, of black humeral stripe (stripe on mesopleural suture of Garman 1917) .42 mm.

Second lateral thoracic suture (metapleural suture of Garman) with a black stripe for almost its whole length.

Abdomen 22.5, hind wing 12.5, costal edge of stigma, front wing, .56 mm.

Anal vein (anal bridge of Tillyard 1917) separating from the hind margin of the wings at least as far proximad to Cu-A (anal crossing of Tillyard) as the latter is long. M2 arising on the front wings proximad to the fourth postnodal, on the hind wings at the third, M1a nearest the seventh on the left front wing, nearest the sixth on the other three wings.

*Material examined*.—Cuba, Poey, 1864, 1 ♂ (M. C. Z.).

**Enallagma signatum** (Hagen) (Plate XXXIII, figs. 14, 15)

*Agrion signatum* Hagen, Syn. Neur. N. Am., 81, 1861.

♂. Superior appendages in profile view, with the apical margin subequal to, to six-fifths as long as, the inferior margin, a small tooth where these two margins meet, apical margin nearly straight, in dorsal view, the intero-inferior lamella not reaching to the level of the supero-internal subapical hook.

Nasus shining black, two transverse linear streaks (absent in some) on the disk and anterior and lateral margins narrowly yellow or blue.

Frons: pale color of its anterior surface not attaining the median ocellus; a small yellow spot enclosed in the black anterior to the median ocellus.

Pale postocular spots cuneiform, orange or blue, not confluent with the pale color of the rear of the head.

Middle prothoracic lobe in dorsal view black, a subsemicircular spot each side and a median twin spot (absent in some) yellow or blue.

Width of black mid-dorsal thoracic stripe .63-.7, of pale antehumeral .35-.42, of black humeral .21-.35 mm.

Second lateral thoracic suture with a blackish brown stripe or line for the uppermost fourth to three-fourths of its length.

♀. Lateral (external) end of mesostigmal lamina black.

A mesepisternal tubercle at the antero-mesal angle of the pale antehumeral stripe.

Width of the black mid-dorsal thoracic stripe .63-.7, of pale antehumeral .35-.42, of black humeral .28-.42 mm.

Second lateral thoracic suture with a narrow dark brown stripe on its uppermost third to upper three-fourths, continued ventral in some by a very fine dark line.

Black on dorsum of abdominal segment nine usually narrowed caudad.

Abdomen ♂ 26-27, ♀ 21.5-27; hind wing ♂ ♀ 15.5-17; costal edge of stigma, front wing, ♂ .63-.7, ♀ .67-.77 mm.

*Material examined:* 8 ♂, 7 ♀, Maine, New Jersey, Pennsylvania and Indiana.

This species has been recorded from as far south as Georgia and Louisiana. No attempt has been made to study this well known species exhaustively.

**Enallagma pollutum** (Hagen) (Plate XXXIII, figs. 2, 5, 6, 16, 17; plate XXXIV, fig. 26.)

*Agrion pollutum* Hagen, Syn. Neur. N. Am., 83, 1861.

*Enallagma pollutum* Selys, Bull. Acad. Belg., (2), xli, 527, 1876.

Calvert, Trans. Amer. Ent. Soc., xx, 239, 1893 (in part only).

♂. Superior appendages in profile view, with the apical margin subequal to the inferior margin, concave; in dorsal view, the intero-inferior lamella not reaching as far caudad as the level of the supero-internal subapical hook.

Nasus black, without pale markings except the narrow yellow or orange margins.

Frons: pale color of the anterior surface not attaining the small yellow or orange spot immediately anterior to the median ocellus.

Pale postocular spots cuneiform, not confluent with the pale color of the rear of the head.

Middle prothoracic lobe in dorsal view predominantly black, a yellow or orange spot each side, no median twin spots or stripes.

Width of black mid-dorsal thoracic stripe .53-.63, of pale antehumeral .25-.28, of black humeral .37-.42 mm.

Second lateral thoracic suture with a black stripe on the upper five-sixths or more of its length.

♀. Lateral end of mesostigmal lamina pale, margined with black of the humeral stripe which extends slightly on to the lamina.

No mesepisternal tubercles.

Width of the black mid-dorsal thoracic stripe .56-.63, of the pale antehumeral .28-.42, of the black humeral .28-.35 mm.

Second lateral thoracic suture with a black stripe on the upper five-sixths or more of its length.

Black on dorsum of abdominal segment nine of almost uniform width from anterior to posterior edge of segment.

Abdomen ♂ 23-26, ♀ 23.5-26; hind wing ♂ 13-16.5, ♀ 15.5-19; costal edge of stigma, front wing, ♂ .42-.7, ♀ .52-.7 mm.

*Material examined:* Florida (no precise locality), 2 ♂, 2 ♀, (Acad. Nat. Sci. Phila.). Enterprise, April 16, P. Laurent, 1 ♀, (Acad. Nat. Sci. Phila.). Charlotte Harbor, Mrs. A. T. Slosson, 1 ♂, in her coll. Miami, March 27, April 3 and 4, 1901, P. Laurent, 2 ♂, 1 ♀, (Acad. Nat. Sci. Phila.). Biscayne Bay, Mrs. A. T. Slosson, 1 ♂, 1 ♀, in her collection. All these localities are in Florida.

The female from Enterprise has longer hind wings (19 mm.) than any other seen; these, its locality and date of collection render it *a priori* likely that it is conspecific with the male from the same

place described below as *E. laurenti*, but in all other (color) respects it agrees with true *pollutum* females.

Mrs. Annie Trumbull Slosson has recalled the delightful correspondence of earlier days by lending to me again the specimens from Florida in her collection which I had identified years ago.

Mr. C. H. Kennedy, at my request, has studied and made drawings of the penes of the males of *pollutum*, *laurenti* and *respecrum* from which drawings of the abdominal appendages had been made by myself. His drawings are reproduced as figures 24 to 30 of plate XXXIV. Neither Mr. Kennedy nor I have investigated the amount of variation in this organ which may exist within the species. These figures are not offered, therefore, as specific criteria, although they may be such; they will, at least, aid in fixing the identity of the type specimens for future researches.

Mr. Nathan Banks has kindly compared drawings of the appendages and notes on the color-differences of *pollutum*, *laurenti* and *respecrum* with Hagen's type of *pollutum* in the Museum of Comparative Zoology, and confirmed the identity with the species here given that name. He adds that the apical margin of the superior appendages of the male type of *pollutum* is "more evenly curved than your figure and the two processes are further apart. Above it looks like your figure."

**Enallagma laurenti** new species. (Plate XXXIII, figs. 4, 18, 19; plate XXXIV, figs. 27, 28.)

*Enallagma pollutum* Castle & Laurent, Ent. News, vii, 302, 1896—male = type.

♂. Superior appendages in profile view, with the apical margin subequal to the inferior margin, convex; in dorsal view, the intero-inferior lamella reaching beyond the level of the supero-internal subapical hook.

Nasus orange, traces of a faint black transverse line on each side.

Frons: pale color of the anterior surface attaining the median ocellus.

Pale (yellow) postocular spots largely confluent with the yellow of the rear of the head.

Middle prothoracic lobe orange or yellow, a transverse black stripe along its hind margin, where it joins the hind lobe, from which extends forward on each side an indistinct longitudinal blackish or dark brown line.

Width of black mid-dorsal stripe .35-.42, of pale antehumeral .19-.56, of black humeral from a mere line (type) to .10 mm. (The larger dimension given for the first two stripes is that of the type.)

Second lateral thoracic suture with a black stripe or line on its uppermost fourth only.

Labrum orange with three basal black points, one median, one right lateral.

one left lateral. Mandibles, labium and first two antennal joints yellow. There is a black spot at the latero-ventral angle of the pale postocular spots; elsewhere they are confluent with the yellow of the rear of the head.

Fore and hind prothoracic lobes, thorax (except for the black stripes and lines mentioned above, and a black line on the upper end of the obsolete first lateral suture in the type but not in the paratype) sides of abdominal segments one to eight (becoming blue on the posterior of these) and transverse basal rings on three to six yellow; nine and sides of ten blue, dorsum of one to eight and of ten black.

Anal bridge (Tillyard) separating from the hind margin proximal to Cu-A for a distance equal to (type) or shorter than (paratype) the length of the latter; M2 arising near the fifth (front wings) or fourth (hind) postnodal; M1a arising at eighth (front wings, seventh in left wing of paratype) or seventh (hind) postnodal.

Abdomen 30 (type) -26, hind wing 19 (type) -16, costal edge of stigma, front wing, .63 (type) -56 mm.

*Material examined:* *Type*, 1 ♂, Enterprise, Florida, April 15, taken by P. Laurent, in the collection of the Amer. Ent. Soc. (Acad. Nat. Sci. Phila.). *Paratype*, 1 ♂, Cres[cent] City, Florida, collection C. V. Riley (United States National Museum (head lacking)).

The type has a pair of small pits on the middle prothoracic lobe, similar to those possessed by the females of this group, but smaller; each pit is just lateral to the dark longitudinal line, measures .08 x .04 mm., its greatest dimension obliquely transverse to the main axis of the body, and is very shallow. Since the paratype does not have these pits and since I have found a single male each of *signatum* and of *vesperum* with pits, I regard their presence in males as indicating a partial gynandromorphism, as in all other respects these three individuals appear to be completely male.

This species is dedicated to the collector of the type, Mr. Philip Laurent, of Philadelphia, to whom, during many years, I have been indebted for specimens of Odonata.

Mr. Rolla P. Currie, of the U. S. Bureau of Entomology, has kindly placed the paratype at my disposal for study.

***Enallagma vesperum*** new species (Plate XXXIII, figs. 3, 7-11, 20, 21; plate XXXIV, figs. 29, 30.)

The following literature refers to this species under the name of *Enallagma pollutum*:

- 1892. Harvey, Ent. News, iii, 91 (Chemo Stream, Bradley, Maine).
- 1893. Calvert, Trans. Amer. Ent. Soc., xx, 239, pl. iii, fig. 27 (7 apps.) (in part, Maine).
- 1894. Wadsworth, Ent. News, v, 132 (Lake Cobbosseecontee, Maine).
- 1895. Kellicott, Journ. Cincinnati Soc. Nat. Hist., xvii, 206 (Sandy Beach near Lakeside and Licking Reservoir, Ohio).

1899. Id., *Odonata Ohio*, 46, fig. 13 (♂ apps.) (Ohio).
1900. Williamson, 24th Rep. State Geol. Indiana, 276, pl. v, figs. 23, 24 (♂ apps.) (Simonton, Round and Shriner lakes, Indiana).
1900. Calvert, 27th Ann. Rep. N. Jersey State Board Agric. 1899, 69 (Clemington, New Jersey).
1903. Calvert, Ent. News, xiv, 35 (Lake Hopateong, New Jersey).
1903. Needham, Bull. 68 N. York State Mus., 258, pl. 19, fig. *a* (♂ apps.) (Illinois). Calvert, *l. c.*, 277 (Black lake, Sullivan County, N. York).
1908. Muttkowski, Bull. Wisconsin Nat. Hist. Soc., vi, 78 (Little Cedar Lake, Wisconsin).
1908. Needham, Rep. Geol. Surv. Michigan 1907, 265 (Wabou Lake, Michigan).
1911. Muttkowski, Bull. Wisconsin Nat. Hist. Soc., ix, 35 (North Hudson, St. Croix County, Wisconsin).
1913. Davis, Journ. N. York Ent. Soc., xxi, 17 (Yaphank, New York).
1914. Williamson, Ent. News, xxv, 416 (Wister, Oklahoma).
1916. Howe, Psyche, xxiii, 14 (Concord, Massachusetts).
1917. Howe, Psyche, xxiv, 50 (Moultonboro, New Hampshire).
1917. Garman, Bull. Illinois State Lab. Nat. Hist., xii, 550, pl. lxxi, figs. 186, 193 (♂ apps.) (Lake Villa, Illinois).
1917. Howe, Mem. Thoreau Mus. Nat. Hist., ii, 18, fig. (♂ apps.).
1918. Howe, *l. c.*, 39 (West Peabody, Brookline and Bedford, Massachusetts).
1919. Howe, *l. c.*, 65 (Wakefield, Mass.).

♂. Superior appendages in profile view, with the apical margin one and one-half times as long as the inferior margin, convex; in dorsal view, the intero-inferior lamella reaching beyond the level of the supero-internal sub-apical hook.

Nasus black, its margins and transverse spots or stripe on the disk yellow or orange.

Frons: pale color of the anterior surface sometimes reaching the small yellow or orange spot immediately anterior to the median ocellus and indenting the black of the superior surface more deeply than in *pollutum*.

Pale postocular spots not confluent with the pale color of the rear of the head.

Middle prothoracic lobe in dorsal view with black usually predominating, a spot each side and often also a pair of short submedian lines or stripes, yellow or orange.

Width of black mid-dorsal thoracic stripe .28-.67, of pale antehumeral .35-.7, of black humeral, from a mere line to .28 mm.

Second lateral thoracic suture with a black stripe on its uppermost fourth or fifth only.

♀. Lateral end of mesostigmal lamina not margined with the black of the humeral stripe but having a black spot on itself.

Mesepisternal tubercles of varying size present, at the antero-mesal angle of the pale antehumeral stripe, in some almost as well marked as in *signatum*.

Width of the black mid-dorsal thoracic stripe .33-.63, of pale antehumeral .42-.63, of black humeral, from a mere line to .14 mm.

Second lateral thoracic suture with a black stripe on its uppermost fourth or fifth only.

Black on dorsum of abdominal segment nine narrowing caudad, reaching or not reaching the hind margin of the segment.

Abdomen ♂ 24-28.5, ♀ 24-28; hind wing ♂ 15.5-18, ♀ 18-19; costal edge of stigma, front wing, ♂ .46-.7, ♀ .7-.84 mm.

*Variations.* The extent of black and of yellow (or orange) on the *nasus* varies greatly, even in specimens taken at the same locality on the same day. Thus, all the patterns shown in figures 3, 8 to 11, plate XXXIII, are represented in the males from Black Lake, New York, August 2, 1898, while still another male from the same place and date has the basal black line broken into a median and two lateral pieces, the median piece connected by a very fine black line with the submarginal black stripe. The single males from Toronto, Ontario, and from Palm Beach, Florida, have the nasal and frontal patterns very nearly as in figure 9. The male from Simonton Lake, Indiana, has the *nasus* similar to figure 9, except that the submarginal black stripe is asymmetrically divided into two short stripes. One Bluffton male has the basal black line represented by three dots, the two lateral dots each connected narrowly with the submarginal black stripe, which latter consists of a median dot and a lateral streak each side; the other Bluffton males have the nasal pattern as in figures 3, 8 and 9. The submarginal black is broken into three sections in the male from Rome City, Indiana, and one from Clementon, New Jersey; in them the basal black stripe is continuous and is connected with the respective lateral sections of the submarginal black stripe. In the four Bluffton females, the nasal pattern is as in figures 3, 9 or 10, in the three females from Pemigewasset Pond, New Hampshire, as in figure 3.

The most frequent *frontal pattern* in the males is that of figure 3. It also varies in the same locality, *e. g.*, Black Lake (*cf.* plate XXXIII, figures 8 to 11). The pale color of the anterior frontal surface may reach the yellow spot in front of the median ocellus on one side only (right—Oklahoma, left—one Bluffton) and not on the other; in one instance in which it reaches the spot on both sides, the transverse line which remains is broken into two short isolated black lines (one Bluffton male). The most frequent frontal pattern in the females is that of figure 10.

The pale spot lying immediately anterior to each lateral ocellus (*cf.* figure 3) varies from complete absence (one male, Hurdstown River) to a size greater in diameter than that of an ocellus.

The dorso-lateral pale spot on the disk of the middle prothoracic lobe is sometimes confluent with the pale color of the lateral surface (Simonton Lake ♂, 4♂, 3♀ Bluffton, Rome City ♀, Sawkill Pond ♂, 1♂ Clementon, 1♂ Black Lake), or confluent with the pale submedian stripes (Rome City ♂, Oklahoma ♂, Angola ♀). The pale submedian stripes may be absent (3♂ Pemigewasset, 1♂ Clementon, River Styx ♂, 2♂ Hurdstown River, 1♂ Black Lake).

The black eighth abdominal segment of the male frequently has its hind margin, caudad of the anteapical spinules, narrowly blue. The blue ninth

segment may have a small black spot on each side in dorsal view (Bradley ♂, 1 ♂ Kent, Ohio, 1 ♂ Bluffton, 4 ♂ Pemigewasset, 1 ♂ Black Lake); a mid-dorsal black mark may be present on the hind margin in addition to, or in the absence of, these paired black spots.

The variations in certain features of the venation are shown in the following table:

	Front Wings	38 ♂ ♂	9 ♀ ♀
M2 arising nearest the 5th postnodal	.....	83.0%	83.3%
" " " 4th "	.....	7.8	5.6
" " " 6th "	.....	5.2	
" between " 5th & 6th postnodals	.....	2.6	11.0
	(Lost ...	1.3	
	Hind Wings		
M2 arising nearest the 4th postnodal	.....	79.0%	77.7%
" midway between the 4th & 5th postnodals	.....	7.8	16.6
" nearest the 5th postnodal	.....	7.8	5.6
" " " 3rd "	.....	5.2	
	Front Wings		
M1a arising nearest the 7th postnodal	.....	42.0%	27.7%
" " " 8th "	.....	38.0	66.6
" " " 9th "	.....	13.0	5.6
" " " 6th "	.....	2.6	
" between " 6th & 7th postnodals	.....	1.3	
	(Lost ...	2.6	
	Hind Wings		
M1a arising nearest the 7th postnodal	.....	52.6%	27.7%
" " " 8th "	.....	36.7	72.2
" " " 6th "	.....	9.1	
" between " 6th & 7th postnodals	.....	1.3	

*Material examined: Type*, 1 male, Chemo Stream, Bradley, Maine, July 21, 1891, taken by F. L. Harvey, in the writer's collection (Academy of Natural Sciences of Philadelphia). *Paratypes*: New Hampshire, Pemigewasset Pond, Meredith Township, Belknap County, July 9-23, 1917, P. P. Calvert, 1 ♂, 3 ♀. Connecticut, New Haven, June 23, 1904, H. L. Viereck, 1 ♀. (Acad. Nat. Sci. Phila.). New York, Black Lake, Sullivan County, August 2, 1898, P. P. Calvert, 11 ♂. New Jersey, Hurdstown River, September 6, 1 ♂, and River Styx, September 14, 1 ♂, both at Lake Hopatcong, 1902, P. P. Calvert; Clementon, July 22 and September 22, 1899, P. P. C., 2 ♂. Pennsylvania, Sawkill Pond, Pike County, July 19, 1898, P. P. C. 1 ♂; Conneaut Lake, August 8, 1899, D. A. Atkinson 1 ♂ (coll. E. B. Williamson). Ohio, Kent, June 22, 1900, J. S. Hine, 2 ♂. Ontario, Toronto, Grenadier Pond, August 16, 1907, E. M. Walker, 1 ♂. Indiana, Angola, July 16, 1910, E. B. Williamson, 1 ♂, 1 ♀; Simonton Lake, July 30, 1899, R. J. Weith, 1 ♂; Bluffton, June 23, 1907, 2 ♂, 2 ♀, July 24, 1904, 2 ♂, 2 ♀, E. B. Williamson; Rome City, July 28, 1907, 1 ♂, 1 ♀, E. B. Williamson. (The specimens from Ohio, Ontario, Indiana and Oklahoma in Mr. Williamson's coll.) Wisconsin, Washington County, July 29, 1907, 1

(gynandromorphic) ♂. Florida, Palm Beach, November 12, 1911, G. P. Englehart, 1 ♂ (these last 2 ♂ in the Museum of the Brooklyn Institute of Arts & Science). Oklahoma, Wister, June 3, 1907, 1 ♂. Total 38 ♂ ♂, 10 ♀ ♀.

It is a pleasure to acknowledge the aid given by Mr. E. B. Williamson and by Mr. Charles Schaeffer, of the Brooklyn Institute, in lending me specimens from the respective collections under their care, as cited above.

The name *vesperum* is suggested for this species by its habit of flying after sunset to a degree greater than in most of its allies. I observed this at Sawkill Pond and Black Lake in 1898, and at Pemigewasset Pond, July 20, 1917, at 7.50 p. m. Prof. Needham (1908) noted it at Walnut Lake, Michigan, as the "latest flying of all Odonata," and Dr. Howe (1917) writes of it as "semicrepuscular." It does not confine its flight to the evening hours, however, as the River Styx male was taken in the morning. It is found on ponds, flying from leaf to leaf of the floating vegetation.

*Larva.* Dr. E. M. Walker has described and figured details of supposed nymphs of this species, from Georgian Bay, Ontario.<sup>66</sup> Garman (1917, p. 553) had nymphs from which adults of this species were reared and says: "It (the nymph) is quite different from the species figured by Walker as *pollutum* ('13; pl. i, fig. 10), and his description also differs from the specimens obtained at Lake Villa," Illinois. Garman gives a description of his nymphs (p. 550).

I have an exuvia from which a male *vesperum* emerged at Pemigewasset Pond, July 15, 1917. This exuvia differs from both descriptions by Walker and Garman, as indicated by the following:

Eyes *not very* prominent laterally, their postero-lateral margins *not forming* a marked excavation with the sides of the head. About thirteen spinules, or short setae, of varying length can be seen on the dorsal surface of each hind angle of the head, these angles not nearly as prominent as in Walker's figure 9, but more like those of his figures 4 or 6. Second antennal joint *longer* (.21 mm.) than the first (.14 mm.); no definite difference in color.

*Two* mental setae on each side, a third much smaller and more proximal, in addition on the right side only; five setae on each lateral lobe, whose apical margin bears, next to the movable hook, a low convex lobule with about five

<sup>66</sup> Can. Ent., xlv, 162, pl. i, figs. 9, 10, 1913. Reprinted in Supplement to 47th Ann. Rep. Dept. Marine & Fisheries, Fisheries Branch, Sessional Paper 39b, p. 68, pl. iii, figs. 9, 10, Ottawa, 1915.



denticulations, then three longer distinct teeth and lastly the still longer end hook (thus, apparently, as in Walker's description). Mentum with about four or five setae on its lateral margin just proximal to the articulation with the lateral lobe.

Femora with a very indistinct transverse, anteapical, brown ring, coloring of tibiae very indistinct. Metathoracic wing-covers reaching to the middle of the *fourth* abdominal segment.

Setae on each side of dorsum of abdominal segments increasing in length and in number from segment one (.06 mm., *ca.* 15) to segment three (.14 mm., 50+), thence decreasing on four and five (.1 mm., *ca.* 25); on six to nine a group of shorter, stouter setae (.08 mm. long) at the hind end of the lateral carina. Many other still shorter setae or spinules present on seven to ten, but irregularly distributed, *not* forming rows, transverse or otherwise. No distinct markings on the ventral surface.

Median gill  $3.5 \times 1.0$  mm., a transversely extended narrow spot of brown pigment at slightly less than mid-length, pigment elsewhere much paler and indefinitely distributed; dorsal and ventral margins each with marginal setae .04 mm. long, not overlapping each other, but separated by intervals as long as the setae themselves, and which extend from the base caudad almost as far on the dorsal margin as the level of the brown spot, on the ventral edge for one-third of the gill's length.

Lateral gills  $3.7 \times 1.0$  mm., colored similarly to the median gill, but the narrow spot of brown pigment is at a little more than one-half of the gill's length; the marginal spines (.06±mm. long) are confined to the ventral edge, reaching as far as the brown spot and overlapping each other, hence more closely set than on the median gill. (Examined under a Zeiss comp. microsc., oc. 3, obj. A).

On color differences here indicated no great emphasis must be laid, considering that much pigment disappears from the exuvia after moulting.

**Enallagma pictum** (Plate XXXIII, figs. 22, 23.)

*Enallagma pictum* Morse, Psyche, vii, 274, 307, 1895 (Sherborn, Massachusetts).

♂. Superior appendages in profile view, with the apical margin two-thirds as long as the inferior margin, slightly bilobed, lower lobe a little larger than the upper; in dorsal view, the intero-inferior lamella reaching to the level of the supero-internal subapical hook.

Nasus orange, a transverse basal black stripe, trilobed distally, the three lobes of varying prominence; or, black predominating, rather broadly margined with orange.

Frons: pale color of its anterior surface not attaining the median ocellus, a mere yellow line bordering the ocellus anteriorly.

Pale postocular spots linear-cuneiform or linear, orange, not confluent with the pale color of the rear of the head.

Middle prothoracic lobe in dorsal view black with metallic green reflections, a small yellow or orange spot (in some absent) each side in the anterior half, sides inferiorly yellow.

Width of black mid-dorsal thoracic stripe .7-.77, of pale antehumeral .28-.35, of black humeral .42-.49 mm.

Second lateral thoracic suture with a black stripe on the upper three-fourths or two-thirds of its length, the stripe continued as a line for the rest of the suture.

♀. Mesostigmal lamina chiefly black, near its hind edge with a yellow line, hence both margined with the black of the mid-dorsal and humeral stripes and with a black spot on itself at its lateral end.

Mesepisternal tubercles present.

Width of the black mid-dorsal thoracic stripe .84-.91, of pale antehumeral .18-.21, of black humeral .48-.56 mm.

Second lateral thoracic suture with a black line for its whole length, widening into a narrow stripe in the upper two-thirds or three-fourths.

Black on dorsum of abdominal segment nine of uniform width.

Abdomen ♂ 24-26, ♀ 25.5-26.5; hind wing ♂ 15.5-17, ♀ 17-18; costal edge of stigma, front wing, ♂ .49-.56, ♀ .56-.63 mm.

*Material examined:* Massachusetts, Sherborn, 1897, taken by A. L. Babcock, 3 ♂. New Jersey, Hammonton, August 23, 1 ♀; Clementon, July 22, 3 ♂, 1 ♀; May's Landing, August 25, 4 ♂, 3 ♀ (2 of the ♀ *in cop.*); all in 1899, taken by P. P. Calvert: Manahawkin, Aug. 5, 1912, 1 ♂ taken by H. S. Harbeck.

#### ON GYNACANTHA EREAGRIS GUNDLACH AND ITS ALLIES

Of the four Cuban species of *Gynacantha* mentioned by Gundlach, *trifida*, *septima*, *gracilis* and *ereagris*, he did not possess *septima*, so that his description thereof is a translation of Hagen's of 1861. His "*gracilis* Burm." = *nervosa* Rambur. A comparison of his own descriptions of the three species which he had, in as far as they include the same parts of the body, gives these differences:

*trifida*—Head anteriorly greenish, with a [black] T-spot above.

Eyes above obscure blue, below yellowish brown.

Thorax blackish brown, mesothorax with a lateral, longitudinal, wedge-shaped (point toward the head) ray and the sides green, the latter with three blackish brown bands from the base of the wings to that of the legs. [Sides of the mesothorax means here the mesepimeron, metapleuron and part of the mesepisternum.] Metathorax with small green spots arranged thus, 1, 3, 2, 3, 1.

Abdomen: segment one black with two green spots on each side, segment two with the intermedian [mid-dorsal, longitudinal] line and three transverse bands green, following segments black with two small transverse spots at the middle of each segment and two more rounded at the posterior border, the former (not the latter as Gundlach says) almost disappearing on eight and lacking on nine and ten.

*nervosa* (♀ only) —Mouth and face very clear olive brown, frons with a blackish brown intermediate [mid-dorsal] line above. [A black T-spot on the

upper surface of the frons is as well developed in both sexes of *neriosa* as in those of *trifida*.)

Eyes above olive green, below clear brown, posterior margin yellow. [The rear of the head immediately posterior to the eyes is blackish superiorly, however.]

Thorax clear ashy reddish (bermejizo-ceniciento-claro), mesothorax above olive with the mid-dorsal sulcus rusty brown. Metathorax with small green spots arranged thus, 1, 3, 1, 3, 1, sides with four or five small blackish brown spots.

Abdomen clear ashy reddish, segment one with posterior border green, segment two with mid-dorsal line, base on each side and two pairs of small spots above green, following segments similar to two but the mid-dorsal line lacking, nine and ten brown (pardos).

*ercagris* (cf. *antea*, p. 359)—Labrum and face pale olive straw-color, frons with a black intermediate line above. [A black T-spot on the superior surface of the frons is as well developed in both sexes of *ercagris* as in those of *trifida*.]

Eyes above obscure blue, below clear brown with an olive reflection, part behind the eyes black above, straw-color below.

Mesothorax yellowish green on its anterior border, followed by a transverse blackish band, remainder green, mid-dorsal sulcus and a transverse spot blackish brown. Metathorax black with various small green spots arranged thus, 1, 3, 2, 3, 1 and two others at the base of the wings. [This evidently refers to the metanotum only.]

Abdomen: segment one brown with a transverse posterior green band, segment two also brown with mid-dorsal line and anterior to the posterior border of each piece [*i. e.*, those separated by the supplementary, median, transverse carina] green, three also brown, base and anterior and posterior borders of the second piece of the segment on each side green, following segments black with the green weaker and narrower, last black, posterior border of the first piece somewhat olive green, second piece rust-color.

*Trifida*, *septima* and *neriosa* are included in the key to the species of *Gynacantha* in the *Biologia Centrali-Americana*,<sup>67</sup> wherein a number of other characters are employed in distinguishing them. *Ercagris* Gundlach falls under rubric EE of that key, along with *neriosa*, in having the costal margin not more yellowish than the rest of the wing, the metepimeron not bordered posteriorly with blackish. It differs from *neriosa* in having:

The abdomen distinctly constricted at segment three. Segment two of the ♂ is 3.5–3.7 mm. wide at its base (excluding the auricles); segment three is 1.05–1.2 mm. wide at its narrowest part and 2.1–2.24 mm. wide at its hind edge; corresponding figures for the ♀ are 1.13–1.31, 1.17–1.68 and 2.17–2.24 mm.

<sup>67</sup> Neuroptera, pp. 189–190.

The smaller size: abdomen (excl. apps.) ♂ 43-44.5, ♀ 45-46; sup. apps. ♂ 6, (those of ♀ broken); hind wing ♂ 42-43, ♀ 43-46; costal edge of stigma, front wing, ♂ ♀ 3.5-4 mm.

Fewer cells in the wings: *e. g.*, between the lower branch of Rs and Rspl. at the widest part, three or four (five in one ♀) rows of cells *vs.* five or even six rows in *nervosa*; hind wings between M4 and Mspl. at the widest part three rows, occasionally four (♂) or five (♀), *vs.* four to five rows (or even six in ♀) in *nervosa*.

Differences in the genital armature of the second abdominal segment of the male and of the hind end of the abdomen of the female, which require further explanation.

The genitalia of the second abdominal segment of the males of these four species of *Gynacantha* are in most respects quite similar. In all of them the ventral margins of the tergite of two, seen ventrally, converge from the anterior end of the segment to, or near to, the level of the hind edge of the auricles, thence they diverge more slightly to the hind end of the segment. The extent to which these ventral margins are approximated or divaricated determines, of course, the degree to which the genitalia are visible, especially the posterior hamules. In all four species, the anterior lamina is deeply divided for its whole, or almost its whole length by a deep sulcus. Each half of the lamina bears a well developed spine directed caudad. The anterior hamule has a hamular process and a hamular fold, using Dr. Walker's terms. The hamular process is usually of a darker color than the surrounding parts, is lamellate in form and bent into two parts or branches; the plane of the anterior part is roughly longitudinal and subvertical, that of the posterior part is roughly subvertical and subtransverse (*cf.* plate XXXIV, fig. 34). The hamular fold is visible in ventral view in all four species, lying posterior to the hamular process.

The ligula of Rathke and of Erich Schmidt (sheath of the penis of Rambur and of other writers) bears a long, acute, median keel directed cephalad and appearing, in ventral view, as a spine. Viewed ventrally, the penis being retracted into the genital fossa, the ligula, posterior to the keel, is subequal in width throughout its length in *trifida* and *septima*, while in *creagris* and *nervosa* it widens markedly caudad (*cf.* plate XXXIV, figs. 31, 32, 34).

Such other differences in the genitalia of these four species which I have detected are as follows:

*trifida* (Plate XXXIV, fig. 34.)

♂. Ventral margins of tergite of two with no submarginal denticles.

Spines of the anterior lamina reaching caudad beyond the level of the hind edge of the hamular process, in profile view curved so as to be subparallel to the ventral margin of two.

Basal part of anterior hamule extending along the ventral margin of the tergite caudad of the level of the hind edge of the hamular process for a distance equal to about one-half of the distance from that edge to the hind edge of the sternite of one.

Planes of the posterior part of the hamular process caudo-ventral (rather than subvertical) and transverse (rather than subtransverse); mesal angle of the hind edge of the process continued directly on nearly the same horizontal level into the anterior part of the process.

♀. Styles of the genital valves .84-.9 mm. long, nearly as long as the sternite of ten (1.0 mm. on mid-dorsal line). Three spines on the sternite of segment ten, each about .55 mm. long.

*Material examined:* 8 ♂, 4 ♀, all cited in *Biologia Centrali-Americana*,<sup>65</sup> *septima* (Plate XXXIV, fig. 33.)

♂. Ventral margins of tergite of two with a submarginal row or cluster of six to eight black denticles which occupy from .7-.76 to .9-.93 of the length of the segment, measuring from the hind edge of the sternite of one, *i. e.*, in the *posterior, diverging* portion of these margins.

Spines of the anterior lamina reaching caudad beyond the level of the hind edge of the hamular process, in profile view nearly as described for *trifida*.

Basal part of anterior hamule nearly as stated for *trifida*.

Planes of posterior part of hamular process caudo-ventral and latero-ventral; mesal angle of hind edge of process not continued directly into the anterior part of the process but lying somewhat ventral to the place of union.

♀. Styles of genital valves .63-.7 mm. long, distinctly shorter than the tergite of ten (.84-1.0 mm. on mid-dorsal line). Three spines on sternite of ten, .21-.35 mm. long.

*Material examined:* 3 ♂, 6 ♀, all cited in *Biologia Centrali-Americana*, *Neuroptera*, 192.

*neriosa* (Plate XXXIV., fig. 32.)

♂. Ventral margins of tergite of two with a submarginal row of nine to thirteen black denticles which extend from .36 or .4 to .67 of the segment's length, *i. e.*, in the *anterior, converging* portion of these margins.

Spines of anterior lamina variable, reaching caudad not as far as, or beyond, the level of the hind edge of the hamular process, in profile view straight, forming a decided angle with the ventral margin of two.

Basal part of anterior hamule extending etc. for a distance varying from subequal to to about one-half of that from the hind edge of the process to the hind edge of the sternite of one.

Planes of posterior part of hamular process subvertical and transverse; mesal angle of hind edge of process not continued directly into the anterior part but lying much ventrad to the place of union.

♀. Styles of genital valves 1.26-1.5 mm. long, distinctly longer than the

<sup>65</sup> *Neur.*, 191.

tergite of ten (.9-1.0 mm. on mid-dorsal line). Two spines on sternite of ten, each .7-1.0 mm. long.

*Material examined:* 5♂, 3♀, two of the males from Liberia and Surubres in Costa Rica, the other specimens cited in *Biologia Centrali-Americana*.<sup>69</sup>

*arcagris* (Plate XXXIV, figs. 31, 35-37.)

♂. Ventral margins of tergite of two with a submarginal row of ten to fourteen black denticles which extend from .32-.4 to .66-.7 of the segment's length, *i. e.*, in the *anterior, converging* portion of these margins.

Spines of anterior lamina reaching caudad not as far as the level of the hind edge of the hamular process, in profile view straight, forming an acute angle with the ventral margin of two.

Basal part of anterior hamule extending etc. for a distance subequal to or shorter than that from that edge to the hind margin of the sternite of one.

Planes of posterior part of hamular process subvertical and subtransverse; mesal angle of hind edge of process a little ventral to the place of union with the anterior part.

♀. Styles of genital valves 1.4-1.6 mm. long, distinctly longer than tergite of ten (1.0 mm. on mid-dorsal line). Two spines on sternite of ten, each 1.0 mm. long.

*Material examined:* 3♂, 3♀, the same as those listed *antea*, page 359.

## EXPLANATION OF PLATES

### Plate XXXIII

Figs. 1-4.—Dorsal views of head of males of *Enallagma* spp., to show color patterns, labrum omitted. × 11.8. Zeiss oc. 2, obj. A, lower lens off.

Fig. 1.—*E. truncatum* Gundlach. Cuba, Poey, 1864.

Fig. 2.—*E. pollutum* Hagen. Miami, Florida, March 27, 1901.

Fig. 3.—*E. vesperum* new species. Hurdstown River, Lake Hopateong, New Jersey, September 6, 1902.

Fig. 4.—*E. laurenti* new species. Enterprise, Florida, April 15. Type.

Figs. 5-7.—Dorsal views of left half of middle and hind prothoracic lobes of *Enallagma* spp., to show color patterns. × 24. Zeiss oc. 4, obj. A, lower lens off.

Fig. 5.—*E. pollutum* Hagen. ♀, Biscayne Bay, Florida, pairing.

Fig. 6.—*E. pollutum* Hagen. ♂, Biscayne Bay, Florida.

Fig. 7.—*E. vesperum* new species. ♀, Pennigewassett Pond, New Hampshire, July 9, 1917; *pit*, pit or fossa.

Figs. 8-11.—Nasus and frons of *Enallagma vesperum* new species. 4♂, Black Lake, New York, August 2, 1898, to show color patterns. Same scale and lenses as in figs. 1 to 4.

Figs. 12-23.—Left profile (even numbers) and dorsal (odd numbers) views of terminal abdominal segment and appendages of males of *Enallagma* spp. The broken lines indicate the boundary between the black of the dorsal surface and the pale color of the side. × 28. Zeiss oc. 4, obj. A, lower lens off.

Figs. 12, 13.—*E. truncatum* Gundlach. Cuba, Poey, 1864.

<sup>69</sup> *Neur.*, 193.

Figs. 14, 15.—*E. signatum* Hagen. Fort Mifflin, Philadelphia, Pennsylvania, July 11, 1891.

Figs. 16–17.—*E. pollutum* Hagen. Florida (Acad. Nat. Sci. Phila.). This specimen was injured after drawings were made from it, but is still preserved.

Figs. 18, 19.—*E. laurenti* new species. Enterprise, Florida, April 15. Type.

Figs. 20, 21.—*E. vesperum* new species. Chemo Stream, Bradley, Maine, July 22, 1891. Type. These are new drawings from the same specimen as that from which figure 27, plate III, volume XX of these Transactions was made.

Figs. 22, 23.—*E. pictum* Morse. Sherborn, Massachusetts, 1897.

Plate XXXIV

Figs. 24–30.—Four left profile (24, 26, 27, 29) and three dorsal (25, 28, 30) views of penis of *Euallagma* spp.

Figs. 24, 25.—*E. truncatum* Gundlach. Cuba, Poey, 1864.

Fig. 26.—*E. pollutum* Hagen. Florida (A. N. S. P.), the same specimen as that from which figs. 16 and 17 were made.

Figs. 27, 28.—*E. laurenti* new species. Enterprise, Florida, April 15. Type.

Figs. 29, 30.—*E. vesperum* new species. Chemo Stream, Bradley, Maine, July 22, 1891. Type.

Figs. 31–34.—Ventral views of the genital fossa of males of *Gynacantha* spp. The broken lines on both sides of each figure indicate the level of the auricles.  $\times 14$ . Zeiss oc. 2, obj. A, lower lens off.

Fig. 31.—*G. creagris* Gundlach. (Cuba), "70 5" (Mus. Comp. Zool.).

Fig. 32.—*G. necrosa* Rambur. Surubres, Costa Rica, October 16, 1909. The dotted lines show the outlines of the posterior hamules, ligula or sheath of the penis and the glans of the penis in a more widely expanded male from Samana, Hayti (M. C. Z.), which otherwise agrees with the Surubres male.

Fig. 33.—*G. septima* Selys. Cuba, Poey, 1864.

Fig. 34.—*G. trifida* Rambur. Surinam, Thorey. A male from Cuba, Poey, 1858, was compared with this drawing and agrees therewith, but, the margins of the fossa not being as widely open, was not used for figuring.

<i>al</i> , anterior lamina;	<i>hpp</i> , posterior part of the hamular process;
<i>b</i> , basal part of anterior hamule;	
<i>glp</i> , glans of the penis;	<i>lig</i> , ligula (sheath of the penis);
<i>hf</i> , hamular fold;	<i>ph</i> , posterior hamule;
<i>hpa</i> , anterior part of the hamular process;	<i>sp</i> , spine of anterior lamina;
	<i>vp</i> , vesicle of the penis.

Figs. 35, 36.—Left profile and dorsal views of terminal abdominal segments and appendages of *Gynacantha creagris* Gundlach, ♂, Crooked Island, Bahamas, November 24, 1890.  $\times 6$ . Zeiss compens. oc. 2, obj. A, lower lens off.

Fig. 37.—Left profile view of terminal abdominal segments of *Gynacantha creagris* Gundlach, ♀, Santiago, Cuba, September 24, 1903. Same scale and lenses as for figs. 35, 36.

<i>bp</i> , basal plate of ovipositor;	<i>ov</i> , ovipositor;
<i>gv</i> , genital valve;	<i>sty</i> , style of genital valve;
<i>lp</i> , lateral plate of ovipositor;	<i>st. 10</i> , sternite of 10.

## Plate XXXV

Figs. 38, 42, 44, 45, *a*, *d*, *p*, terminal abdominal appendages of males of *Enallagma* spp., x 21; 43t, 48t, left side views of prothorax and anterior part of mesothorax of females of *Enallagma* spp. to show color pattern, x 21. All figures with the same Arabic numerals have been drawn from the same individual. In all the figures: *a*, supero-internal view of left superior appendage; *d*, dorsal view of appendages; *p*, left profile view of appendages; *s*, stigma, upper surface of right front wing or lower surface of left front wing, with bounding veins, x 15; *ml*, mesostigmal lamina; *msi*, mesinfraepisternum; *pl*, lateral surface of middle prothoracic lobe. Drawings of stigmata made with Zeiss oc. 3, obj. A, lower lens off, all others with Zeiss oc. 4, obj. A, lower lens off; all with camera lucida.

Fig. 38.—*E. coecum cardenium*, Cuba, [Coll. Needham].

Fig. 39.—*E. coecum cardenium*, Hacienda San Carlos, near Guantanamo, Cuba, May 31, 1914, taken by Dr. C. T. Ramsden [A. N. S. P.].

Fig. 40.—*E. coecum coecum*, Hayti, ex coll. P. R. Uhler, [A. N. S. P.].

Fig. 41.—*E. coecum cardenium*, Biscayne Bay, Florida, taken by Mrs. A. T. Slosson, [A. N. S. P.].

Fig. 42.—*E. coecum cardenium*, Havana, Cuba, no. 4019, taken by C. F. Baker, [A. N. S. P.].

Fig. 43.—*E. coecum cardenium*, Cuba, [Coll. Needham].

Fig. 44.—*E. coecum coecum*, Kingston, Jamaica, [A. N. S. P.].

Fig. 45.—*E. coecum coecum*, Kingston, Jamaica, May, 1890, taken by E. M. Aaron, [A. N. S. P.].

Fig. 46.—*E. coecum cardenium*, Cuba, [Coll. Needham].

Fig. 47.—*E. coecum cardenium*, Havana, Cuba, no. 4018, taken by C. F. Baker, [A. N. S. P.].

Fig. 48.—*E. coecum coecum*, Kingston, Jamaica, May, 1890, taken by E. M. Aaron, [A. N. S. P.].

Figs. 24–30 are freehand drawings by Mr. C. H. Kennedy; all the others, on all three plates, are camera lucida drawings by P. P. Calvert.



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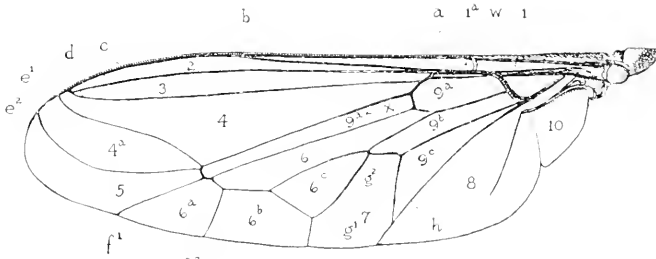


Fig. 1. *Lasia* sp.

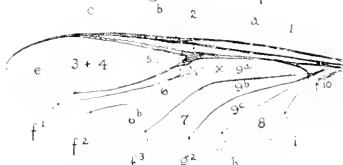


Fig. 2. *Oncodes incultus* OS. ♀.

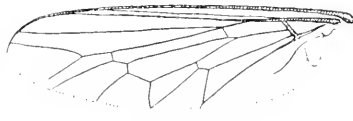


Fig. 3. *Ocnocera lewisi* n.sp.

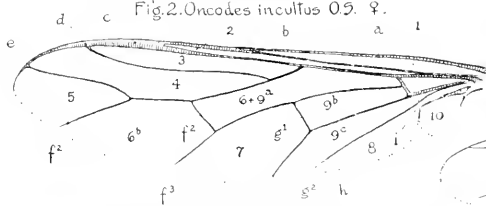


Fig. 4. *Acrocera liturata* Will. ♀.



Fig. 5. *Philopota conica* Wed.



Fig. 6. *Pterodontia flavipes* Gray. ♀.

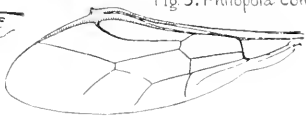


Fig. 7. *Pterodontia analis* Westw. ♂.



Fig. 8. *Opsebius diligens* OS.



Fig. 9. *Pterocera unguiculata* Westw.



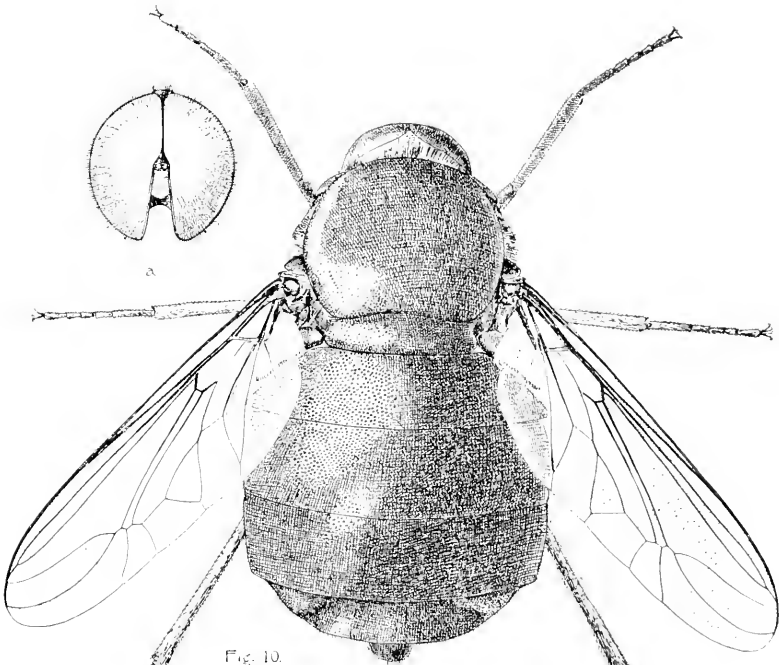


Fig. 10.

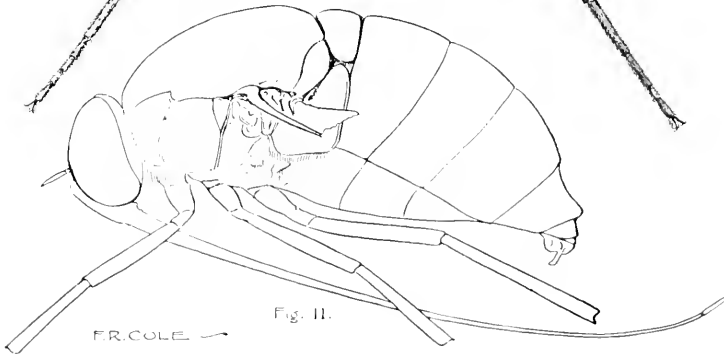


Fig. 11.

FR. COLE





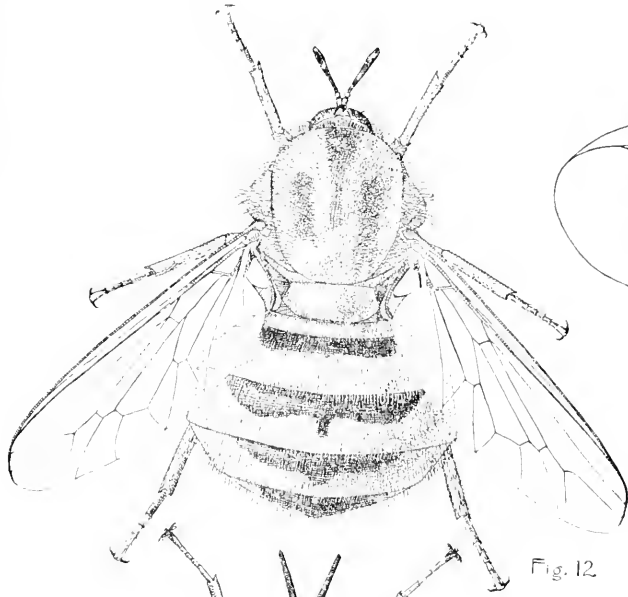
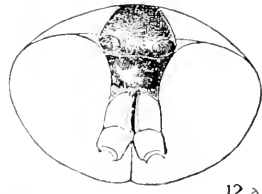


Fig. 12



12 a

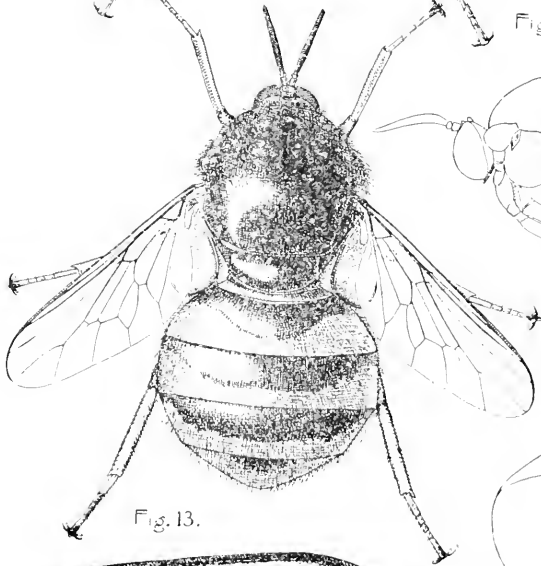
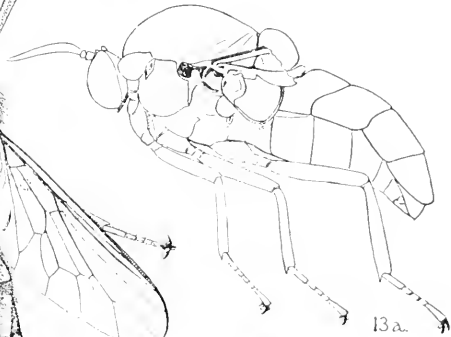
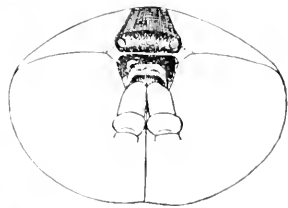


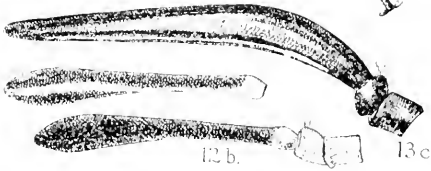
Fig. 13.



13 a.



13 b.



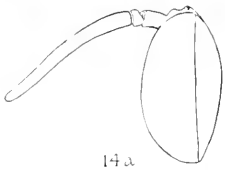
12 b.

13 c





Fig. 14



14a



14d



14b

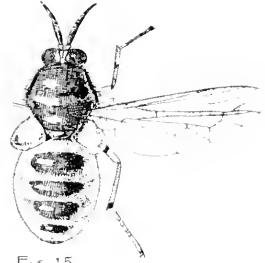


Fig. 15.



14c



16b



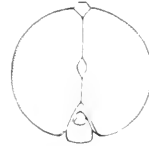
17a



16a



17b



16c

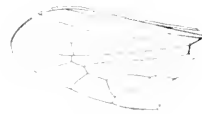
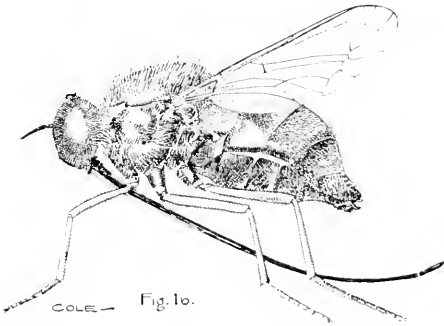
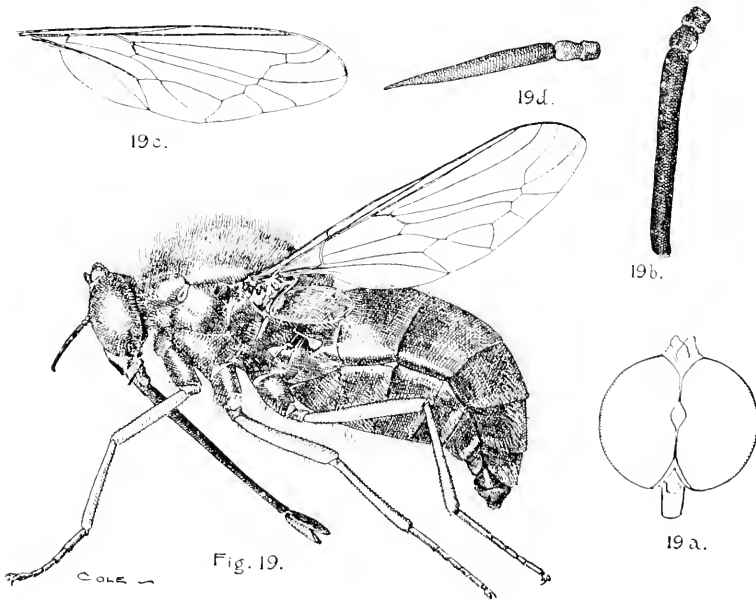
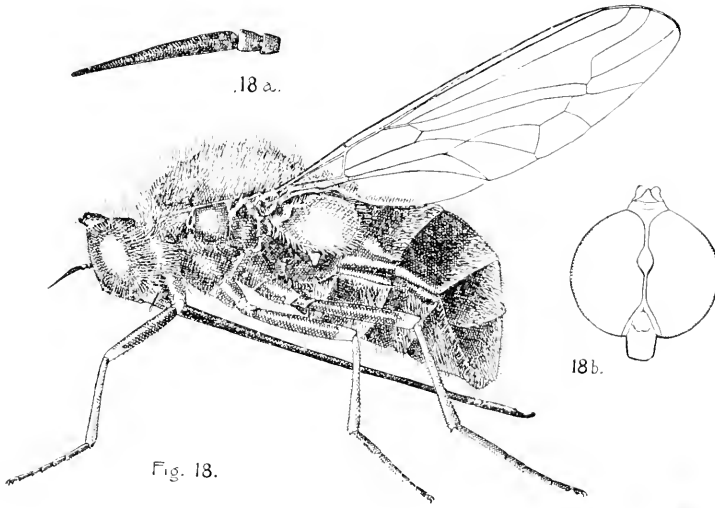


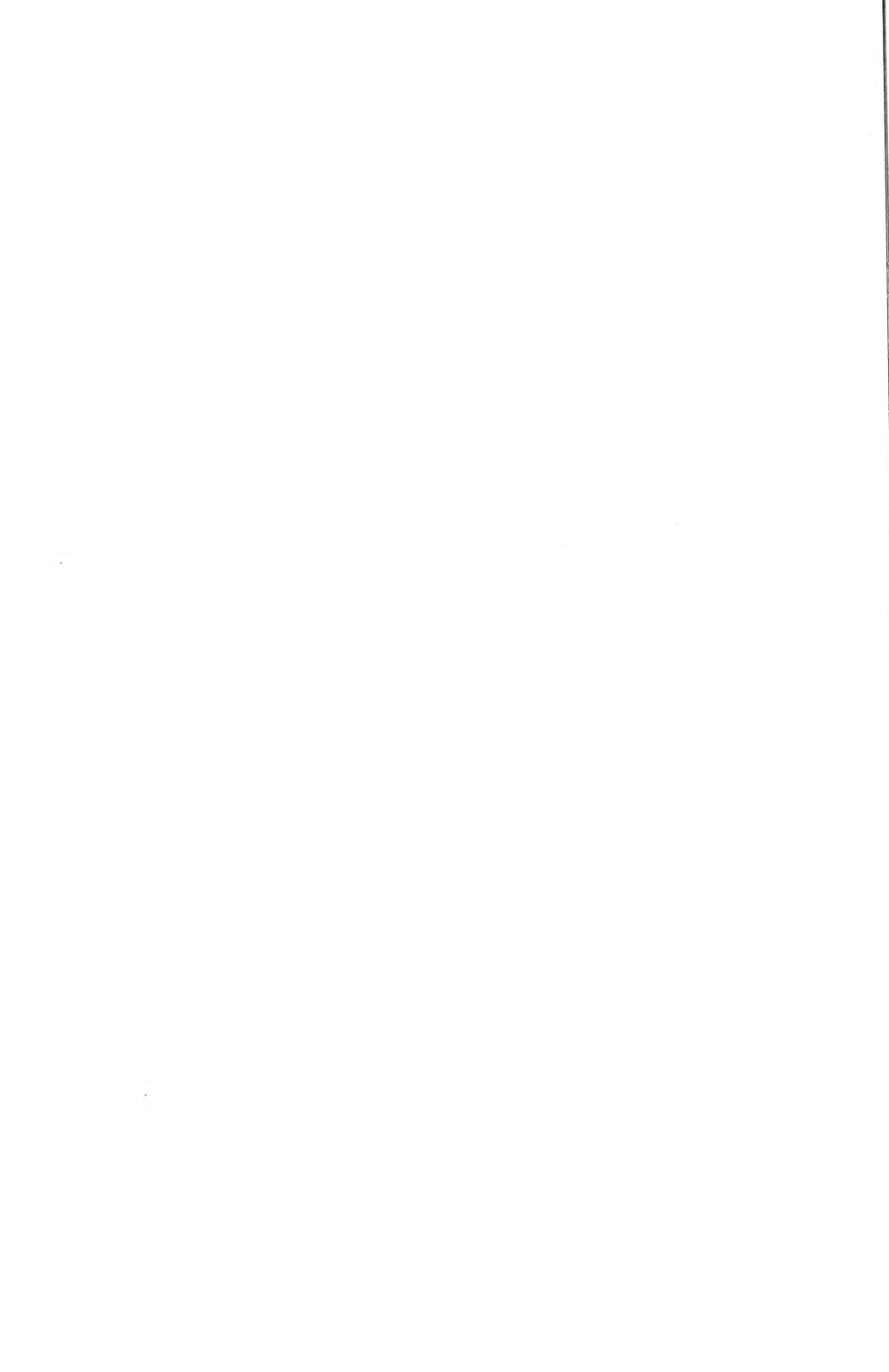
Fig. 17.

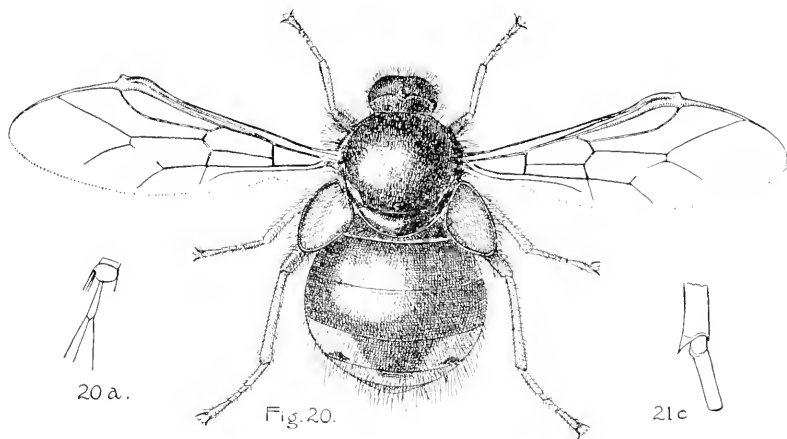


COLE— Fig. 16.









20 a.



21 c.

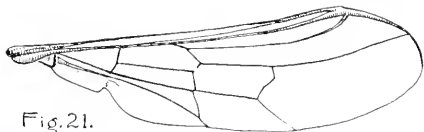
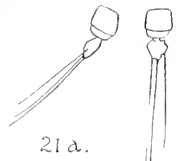
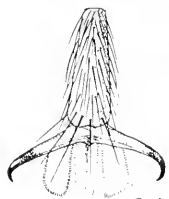
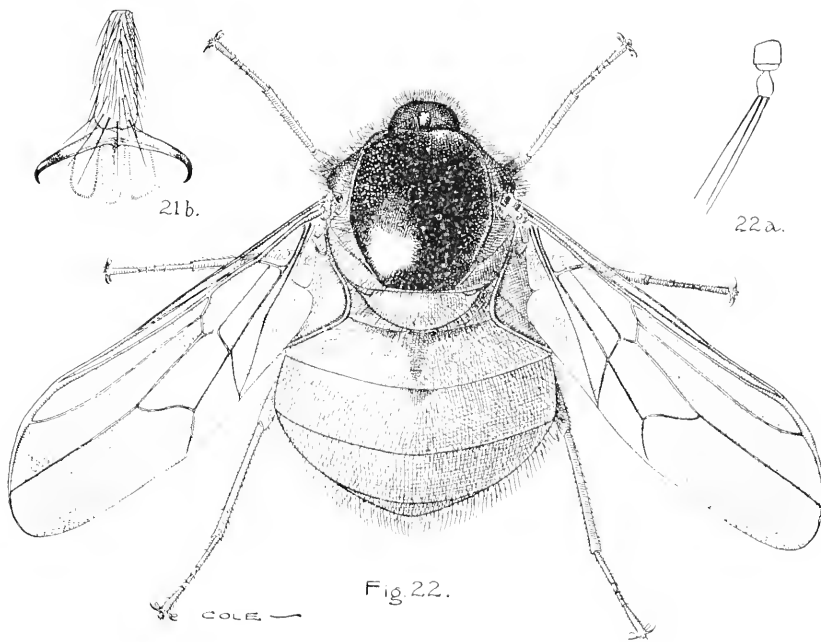


Fig. 21.



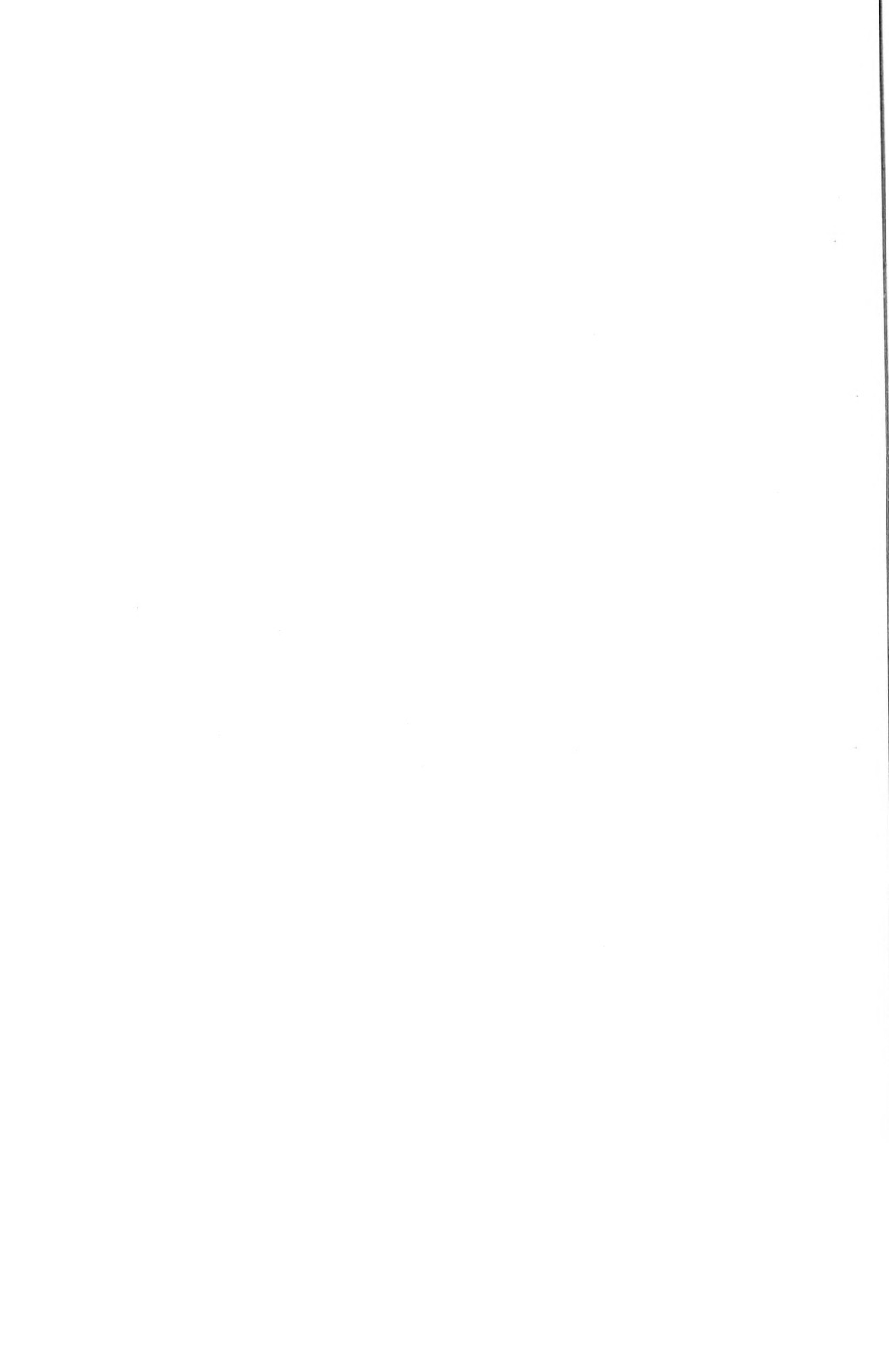
21 a.



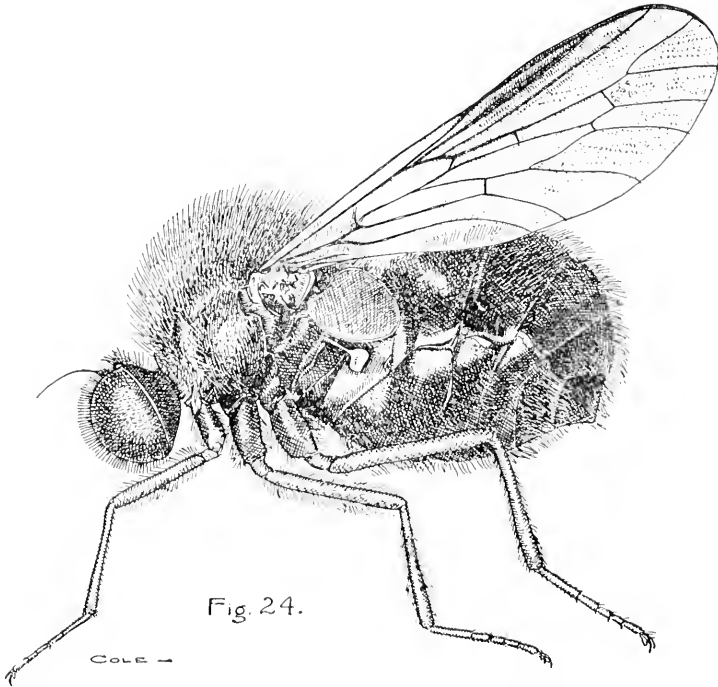
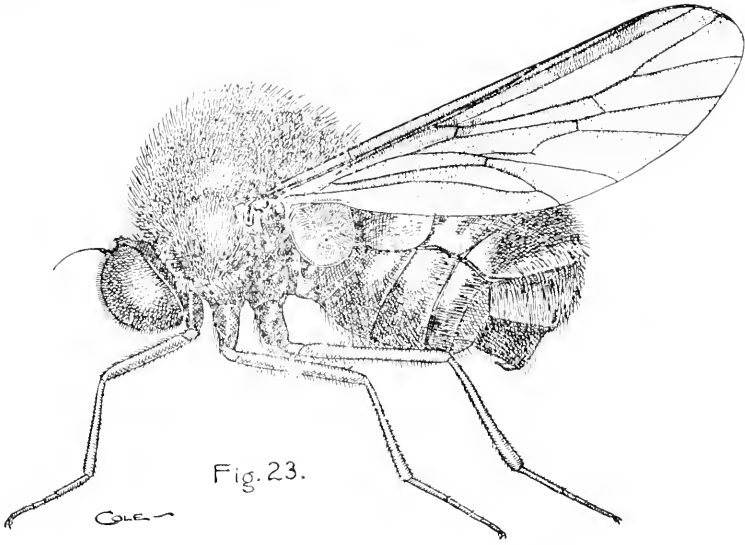
21 b.

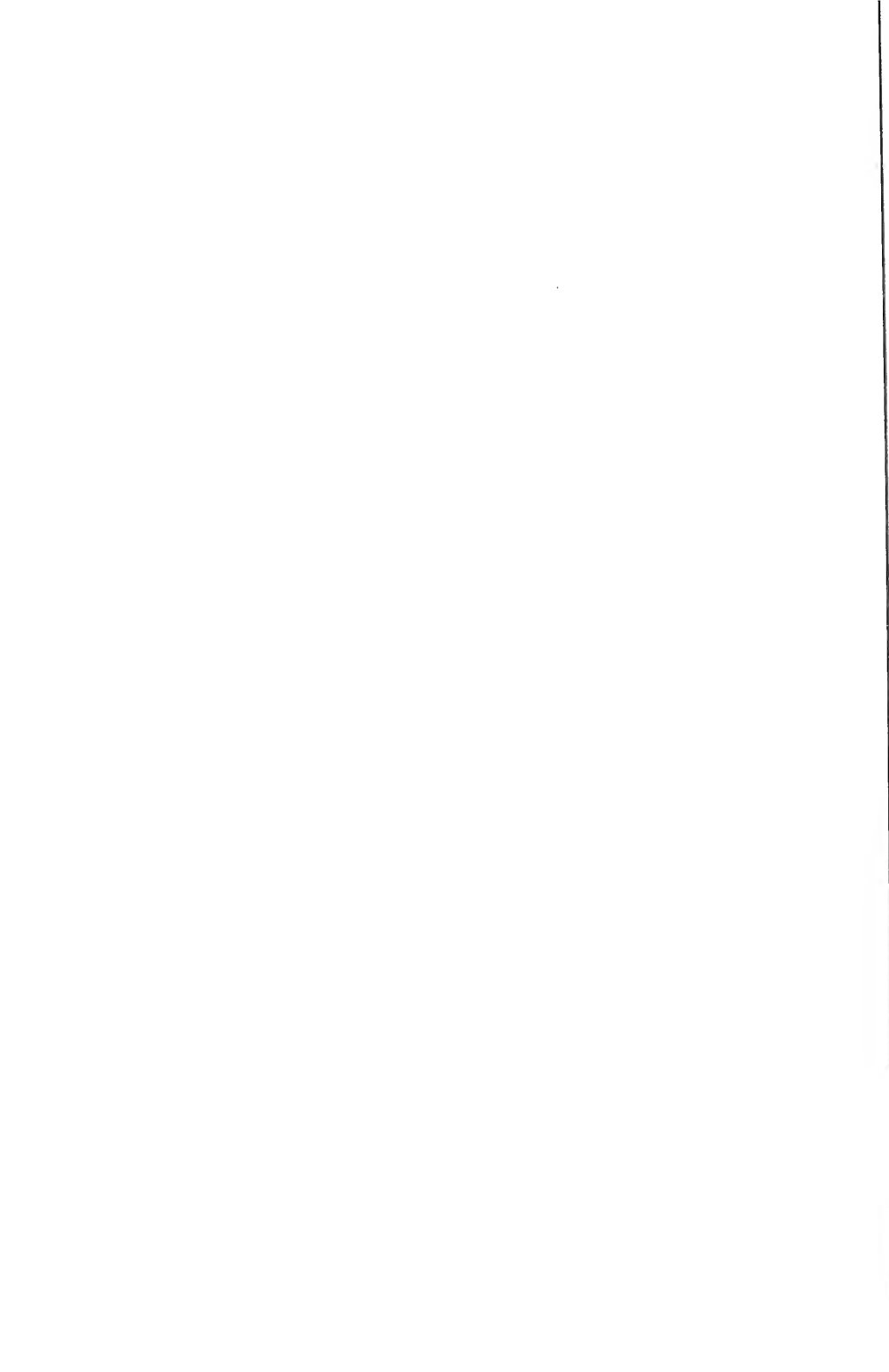


22 a.









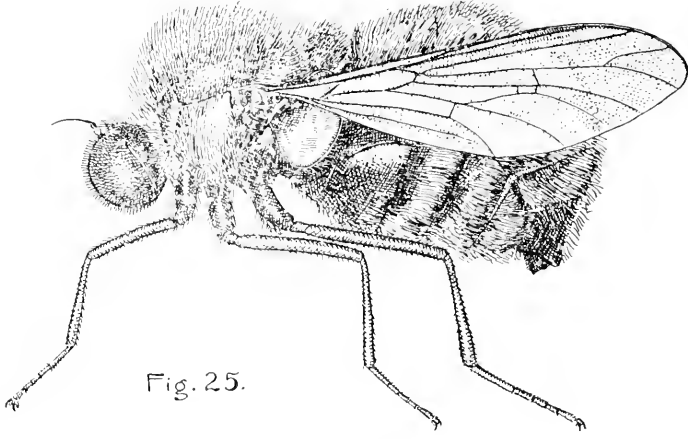
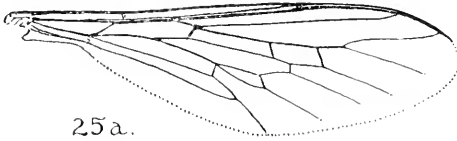


Fig. 25.



25a.

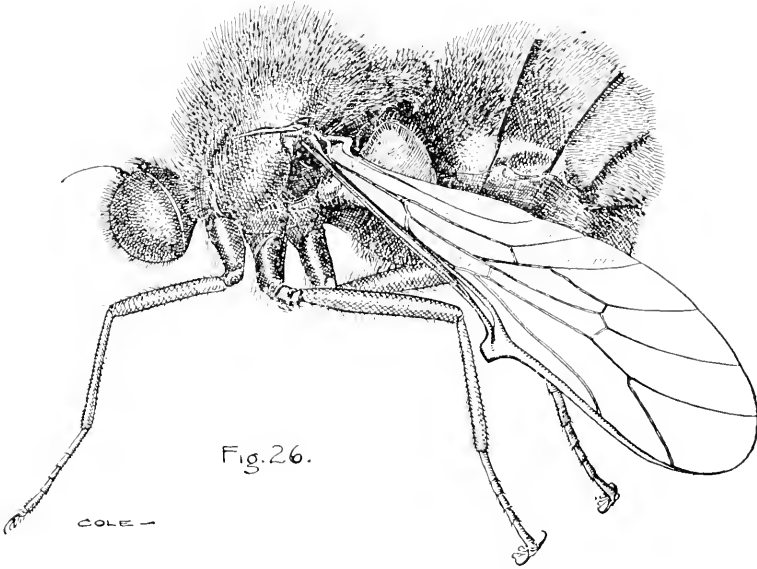
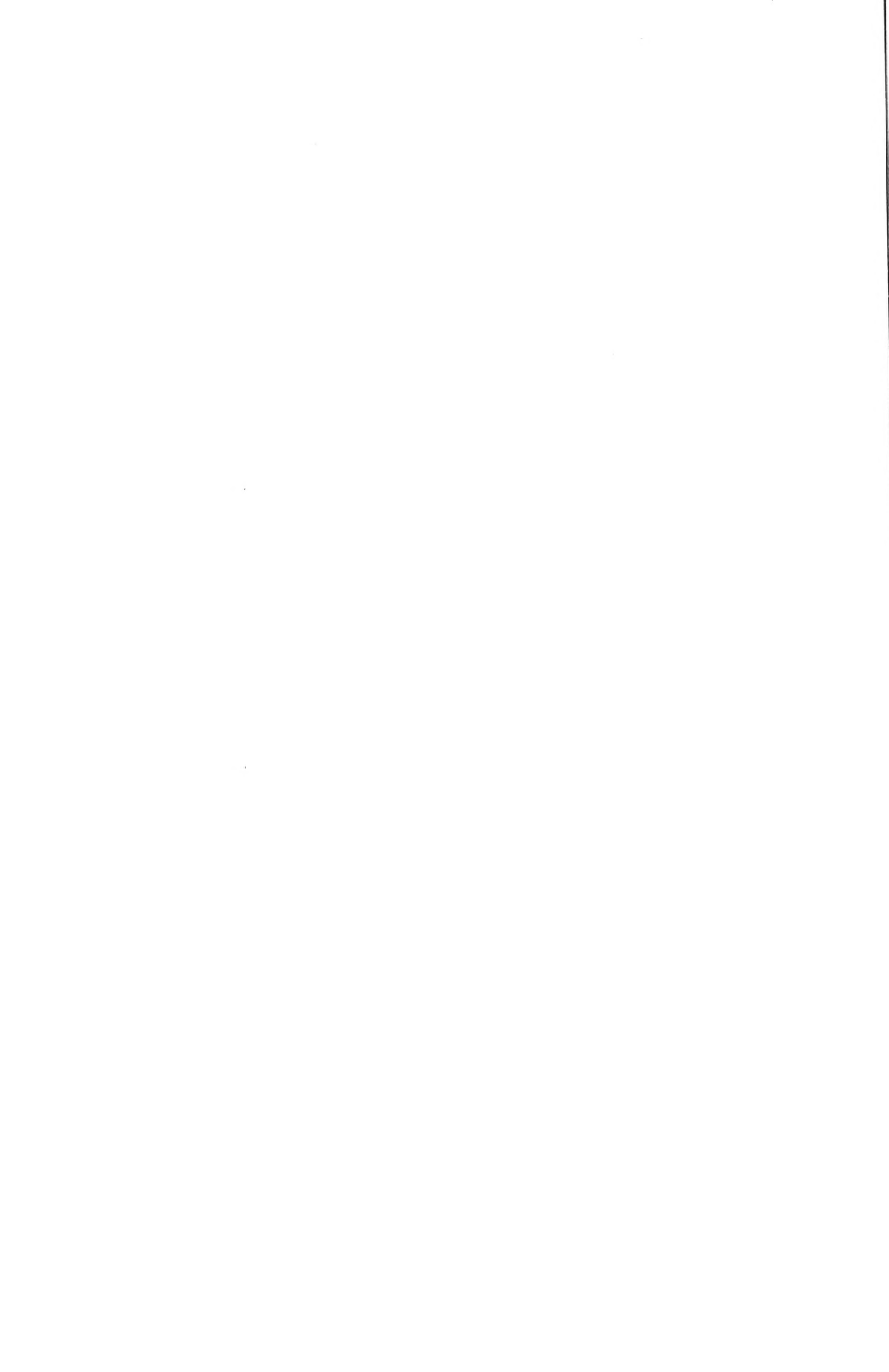


Fig. 26.

COLE



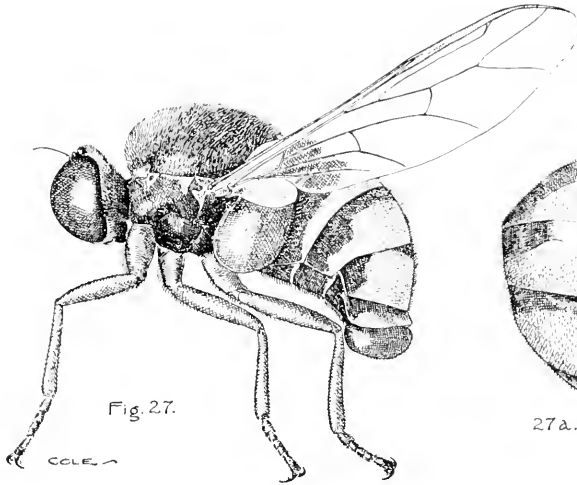
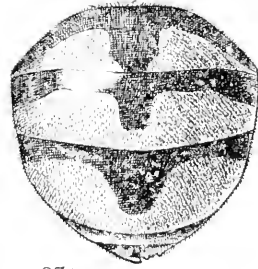


Fig. 27.



27a.

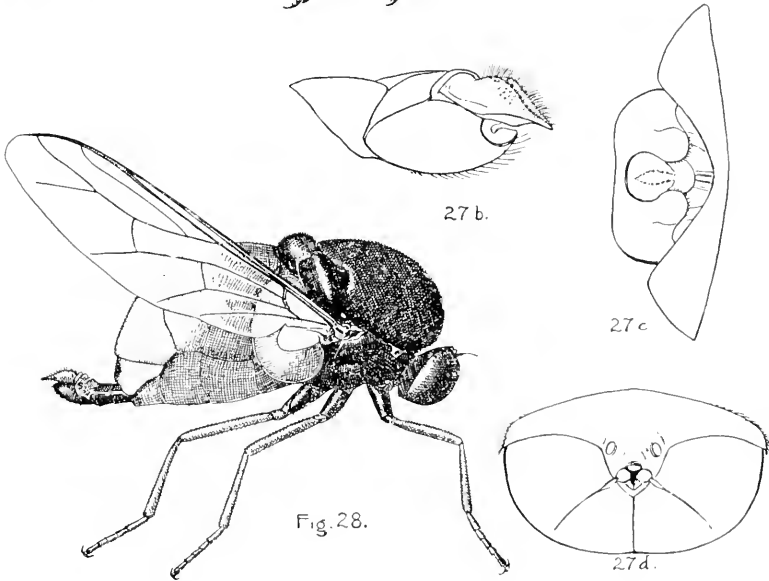


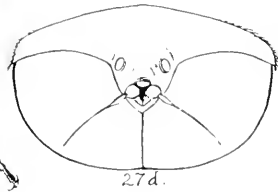
Fig. 28.



27b.

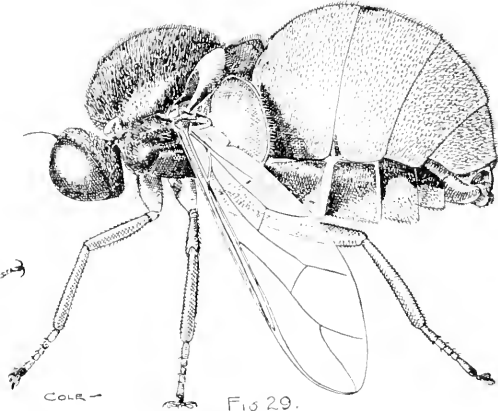


27c



27d.





COLR - Fig 29.

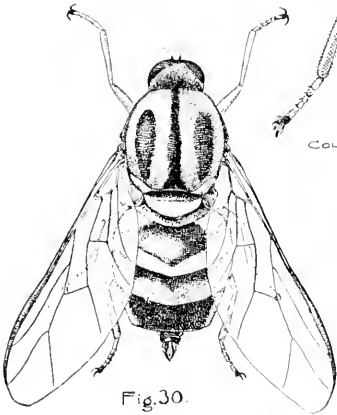
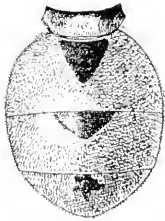


Fig. 30.



29 a.

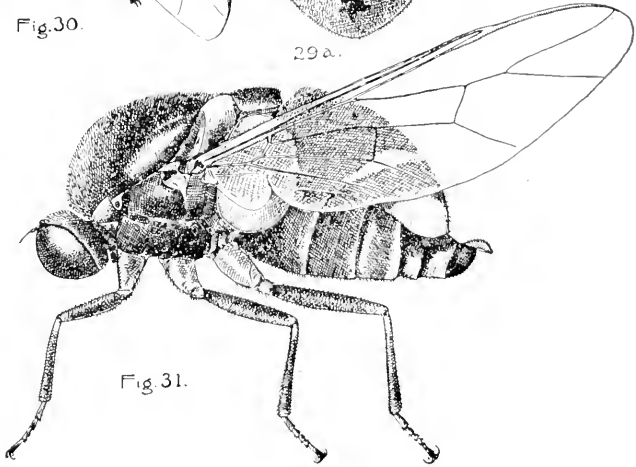
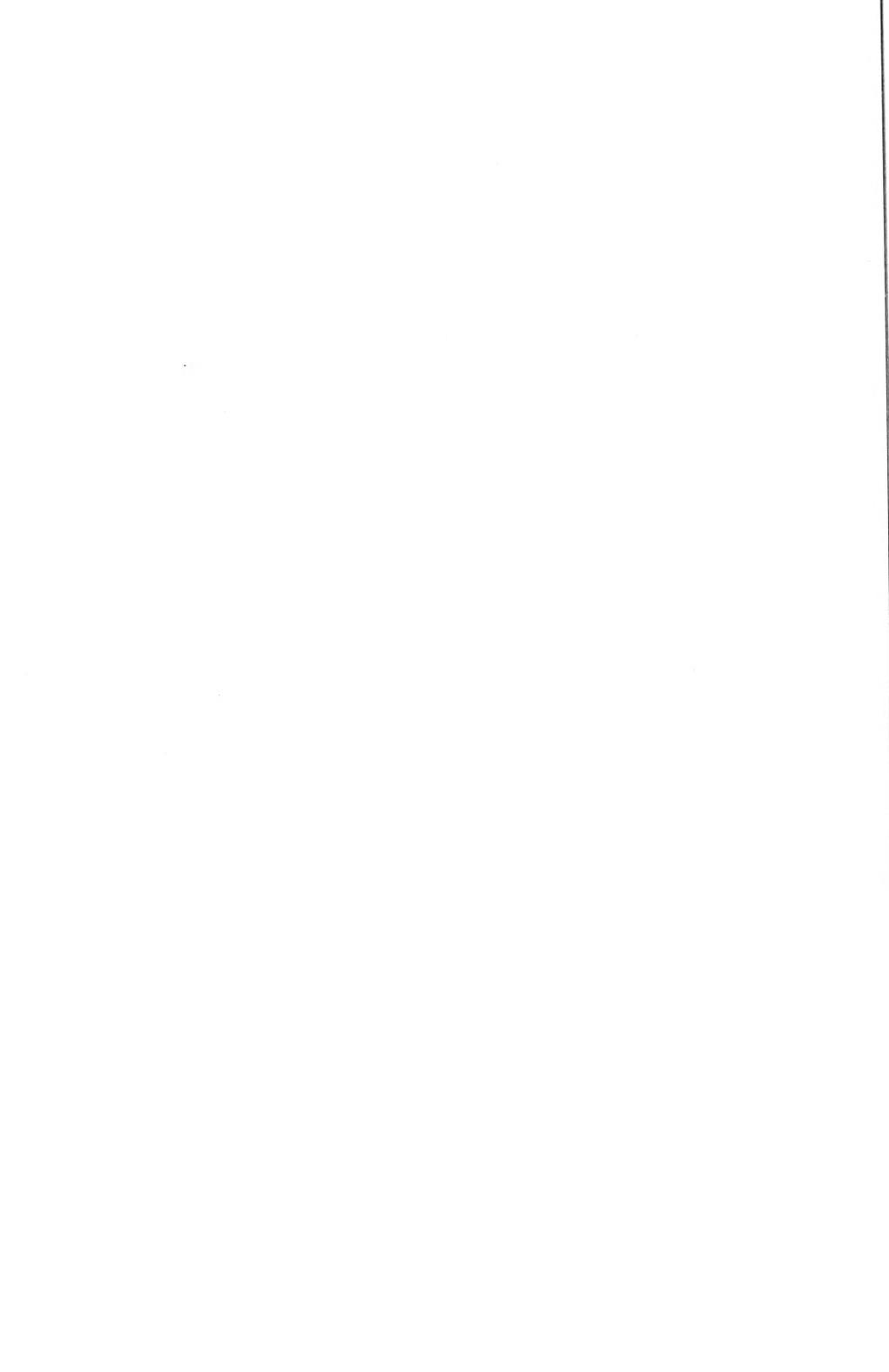


Fig 31.





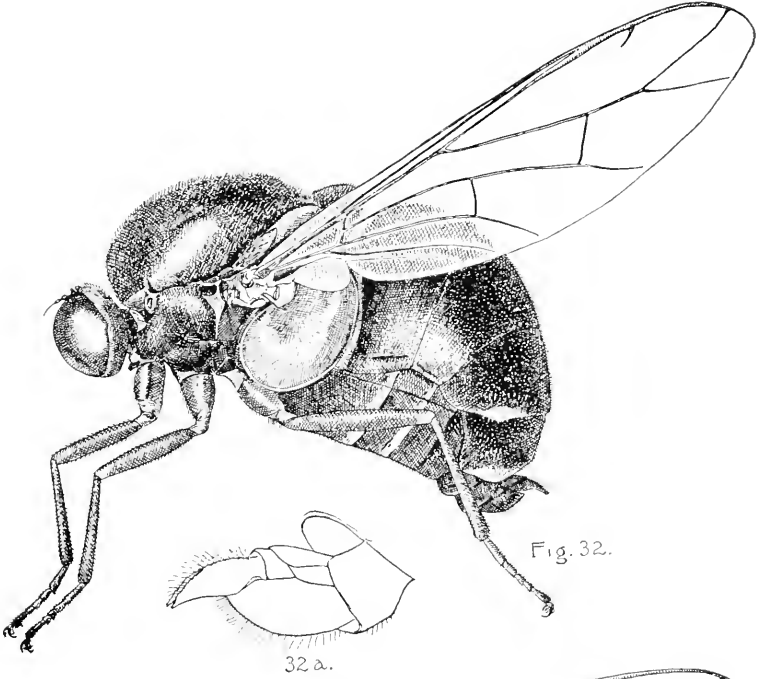


Fig. 32.

32 a.

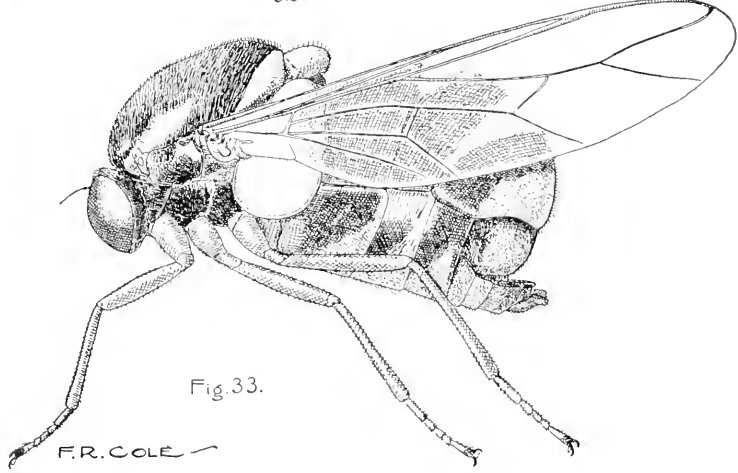
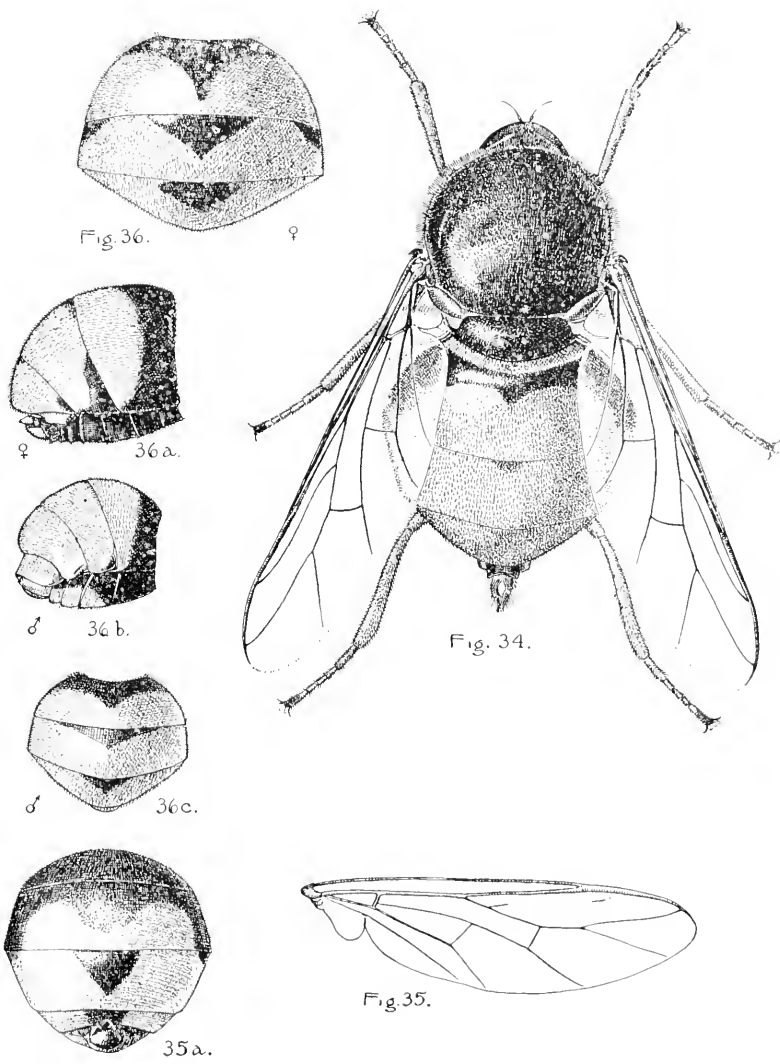


Fig. 33.

F.R. COLE





COLE-CYRTIDAE OF NORTH AMERICA



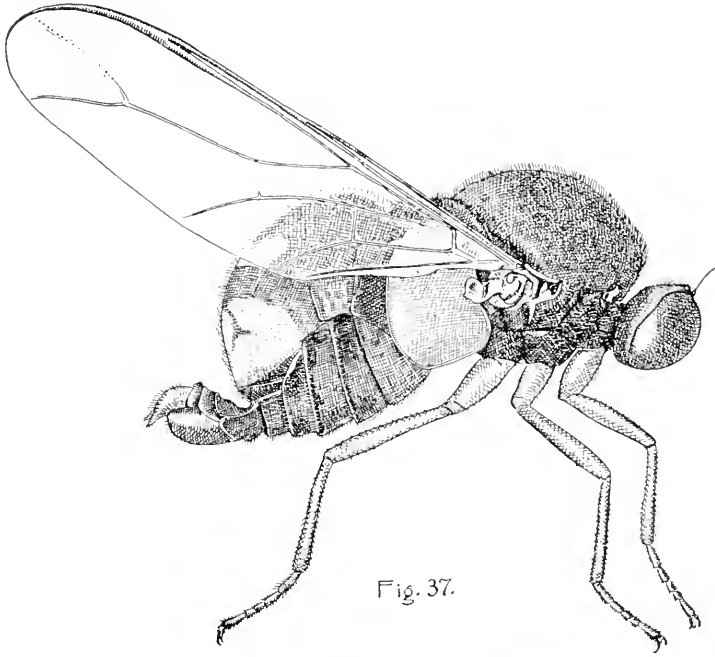


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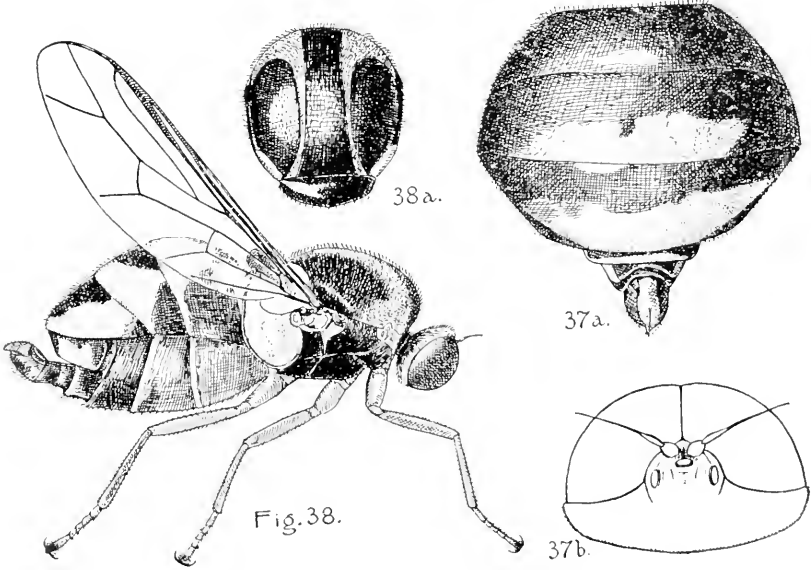


Fig. 38.

38a.

37a.

37b.



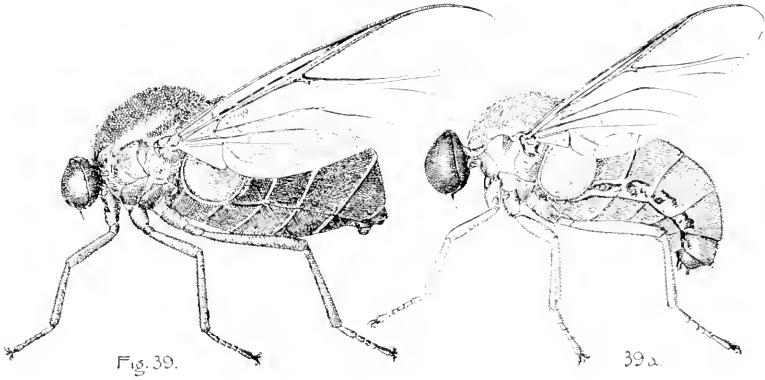
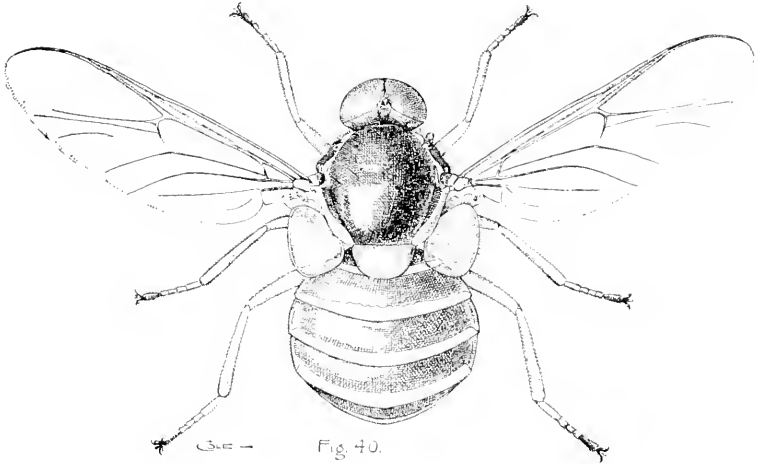


Fig. 39.

39a.



39b

Fig. 40.





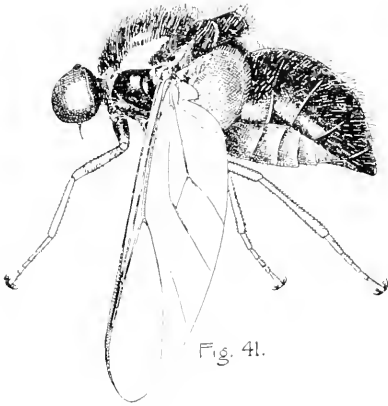


Fig. 41.



Fig. 42.

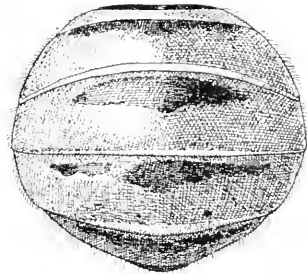


Fig. 43.



Fig. 45.

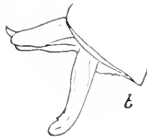
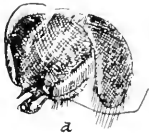
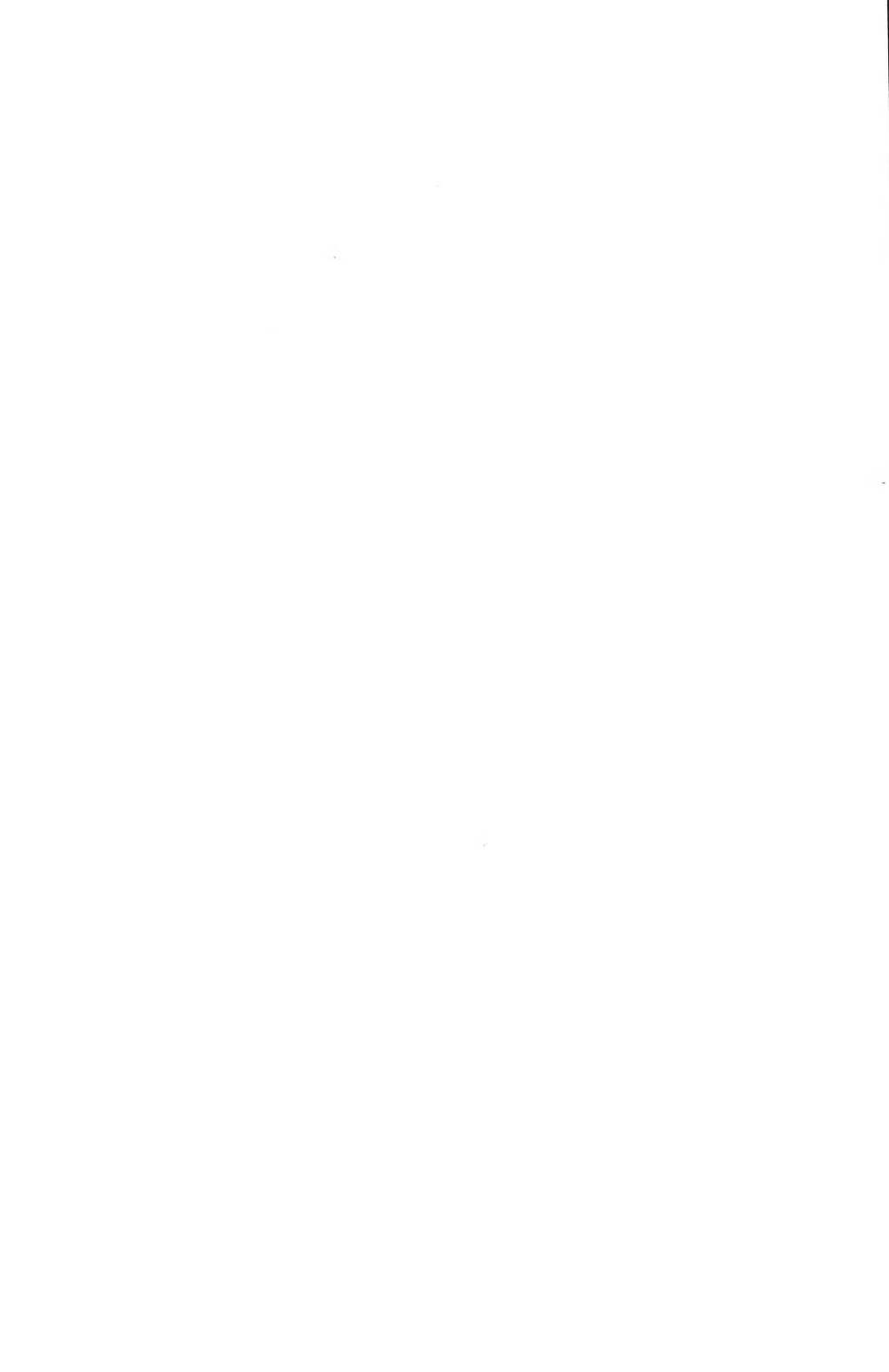
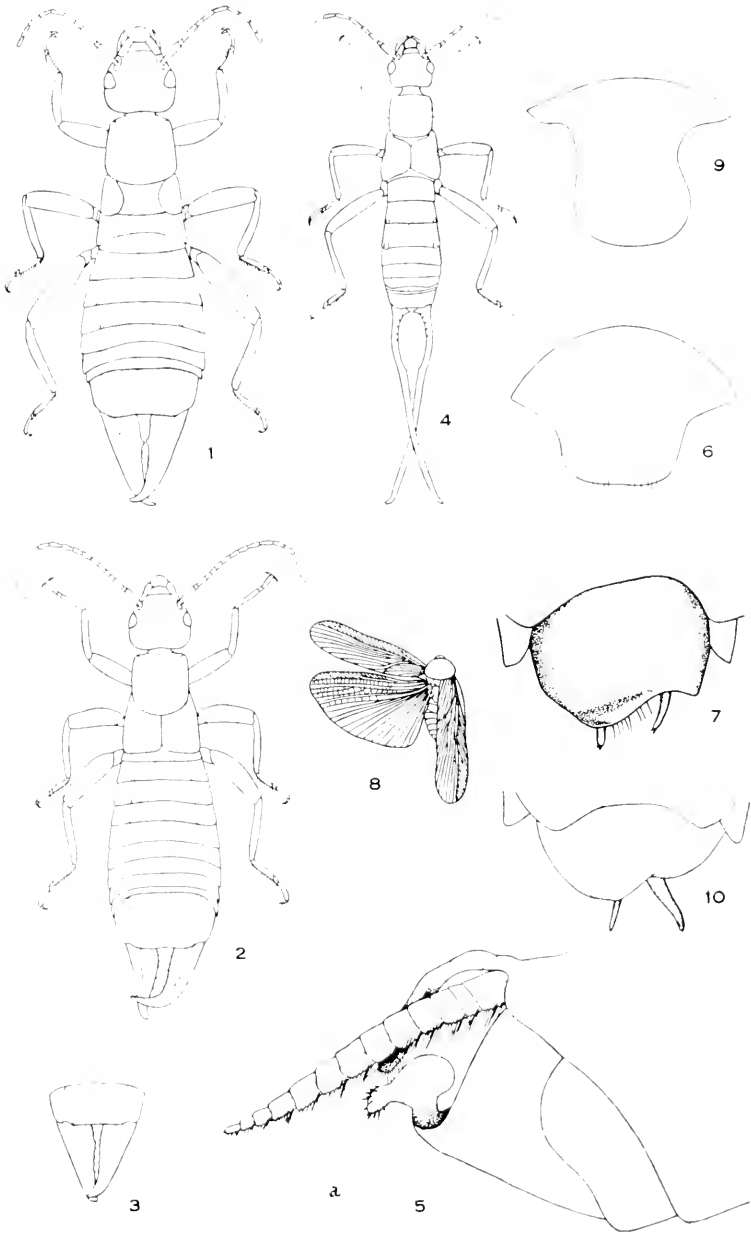


Fig. 46.



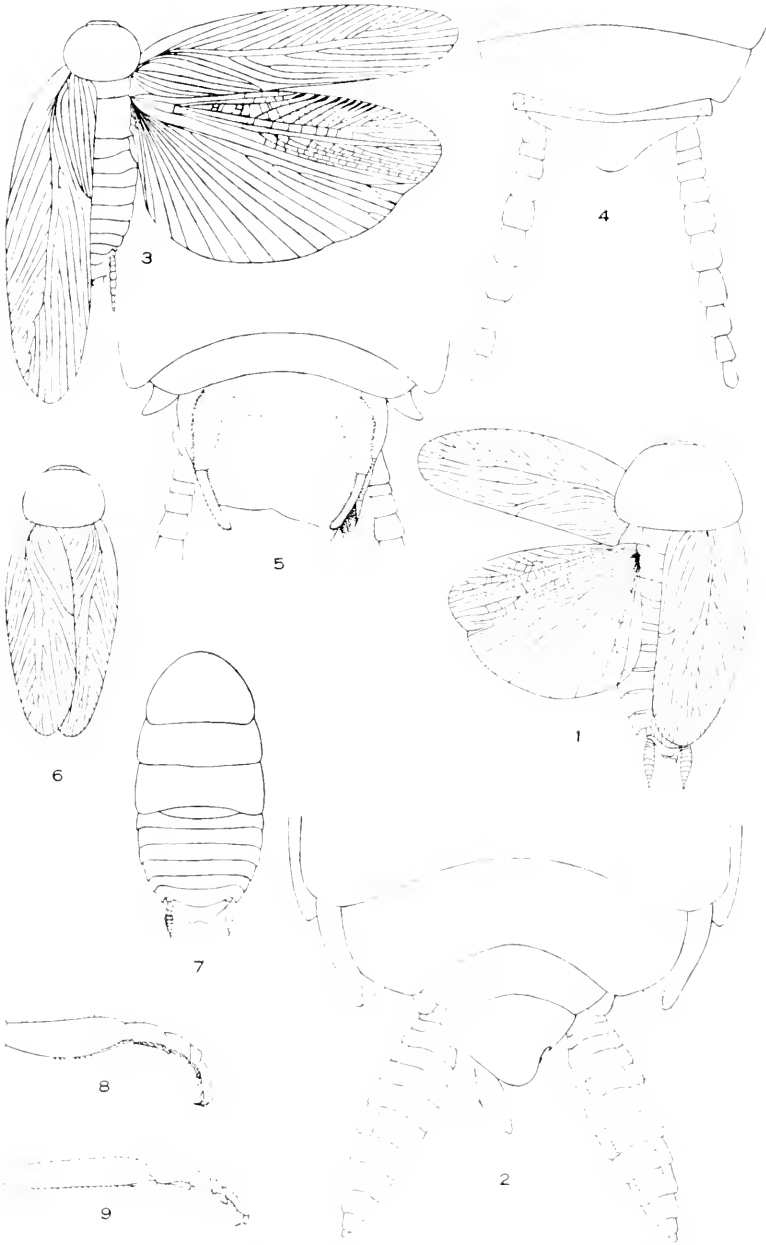
Fig. 47.





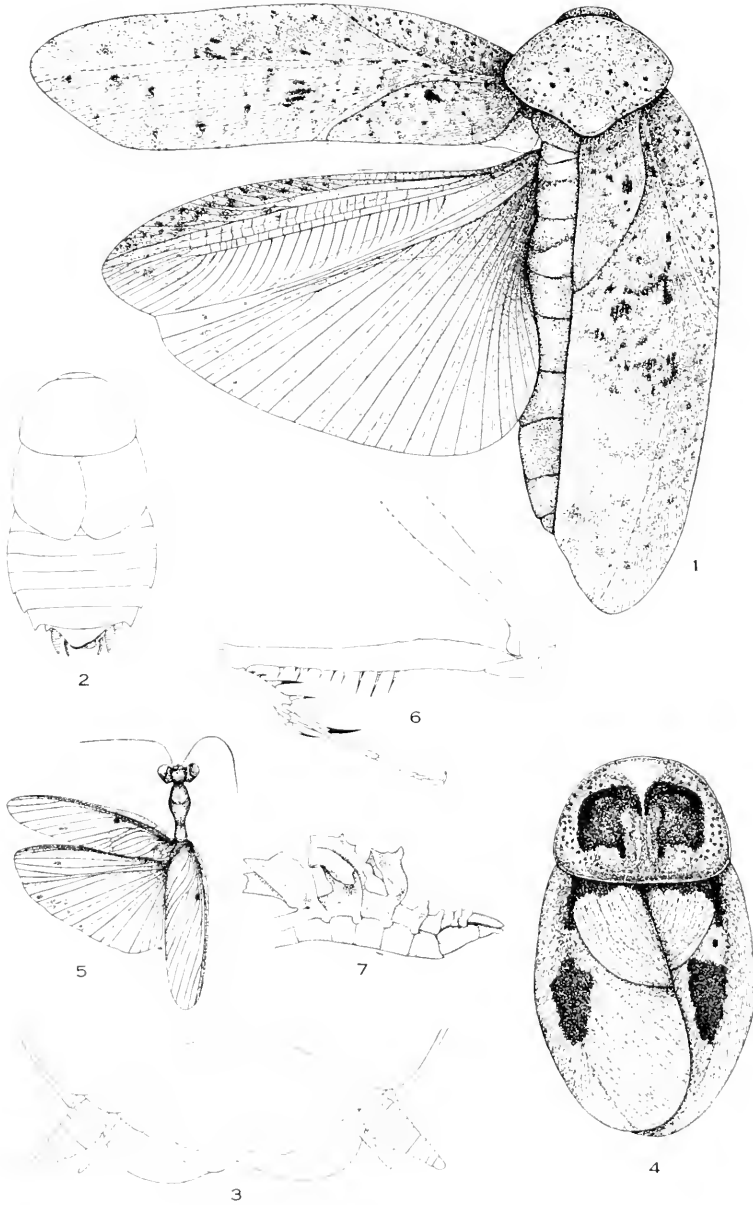
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HEBARD—COLOMBIAN DERMAPTERA AND ORTHOPTERA

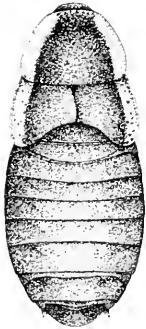




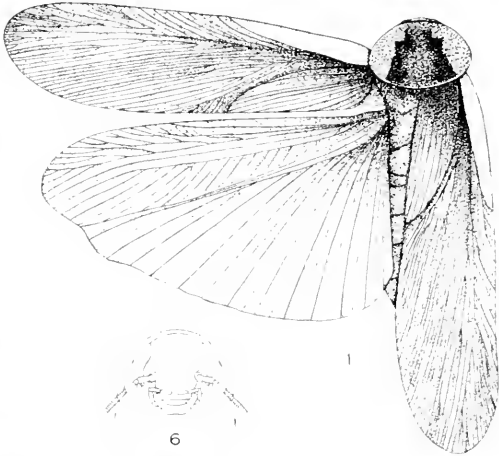
HEBARD—COLOMBIAN DERMAPTERA AND ORTHOPTERA







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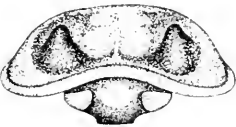
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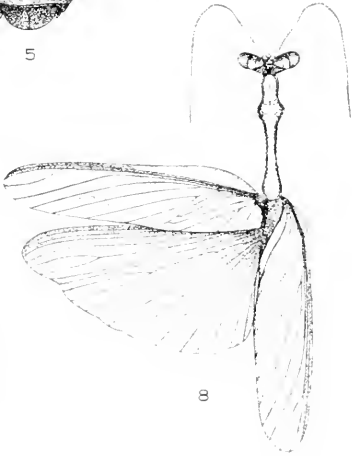
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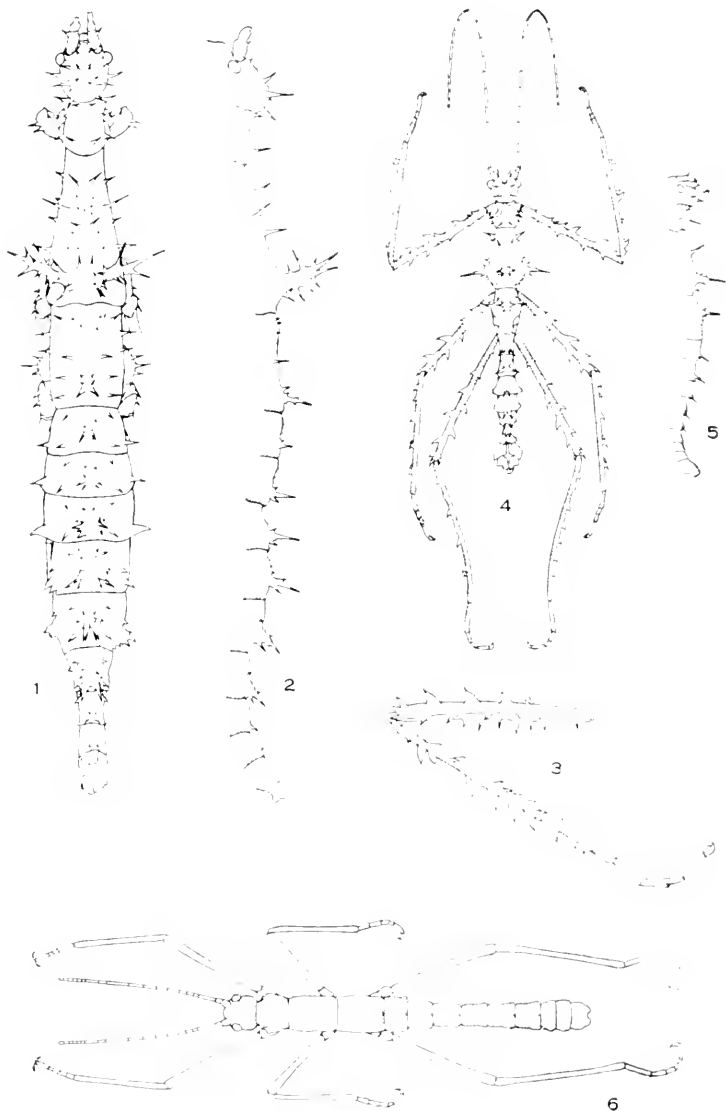


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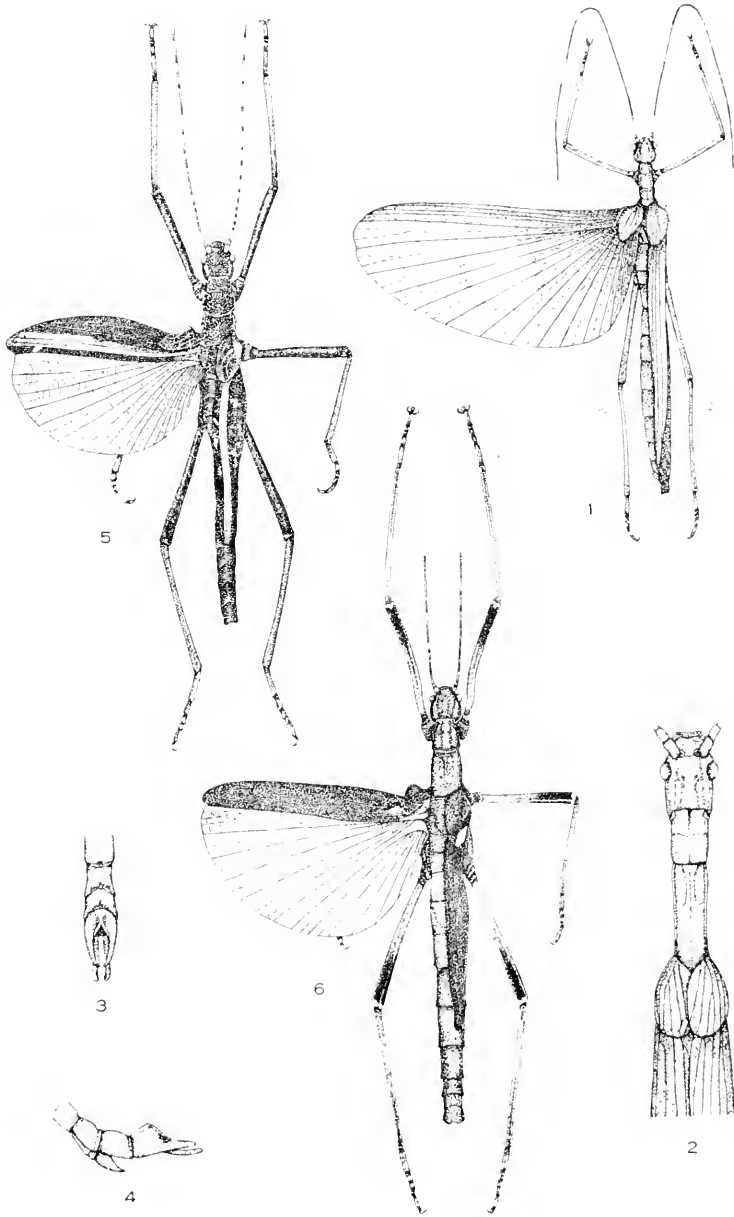
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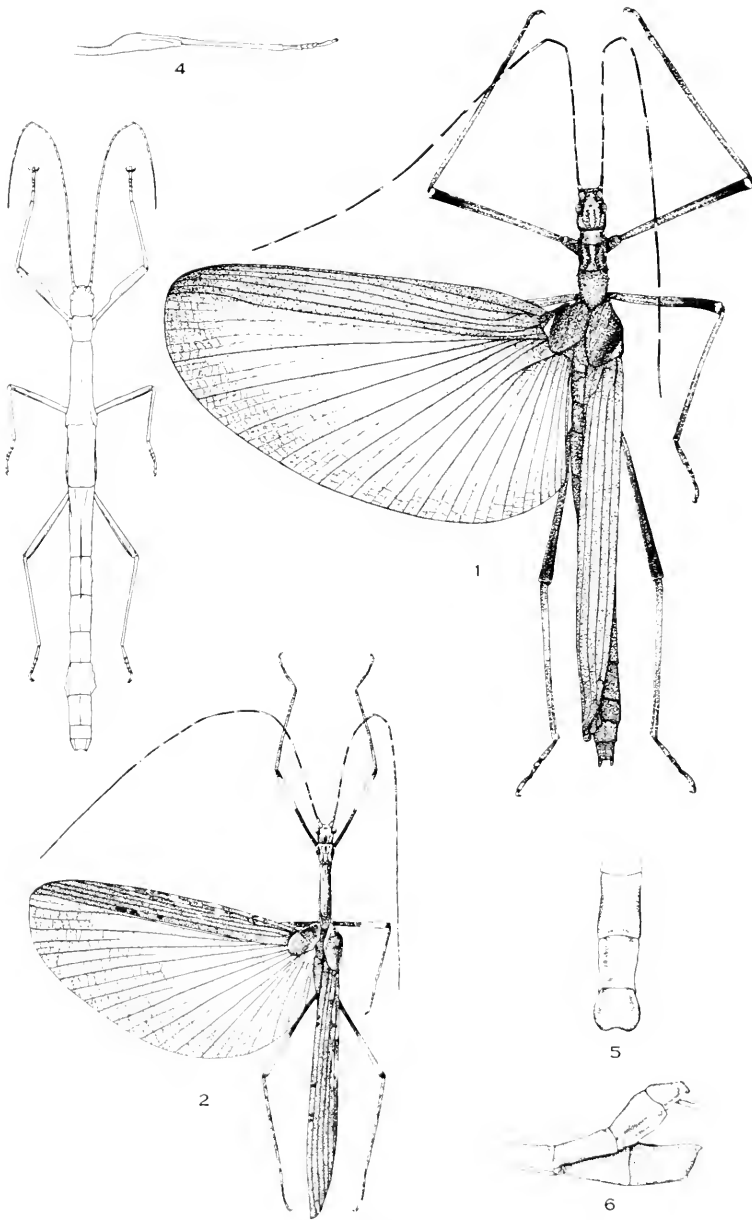
HEBARD—COLOMBIAN DERMAPTERA AND ORTHOPTERA





HEBARD—COLOMBIAN DERMAPTERA AND ORTHOPTERA

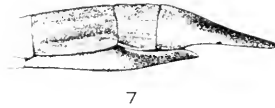
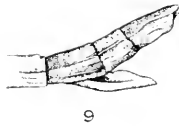
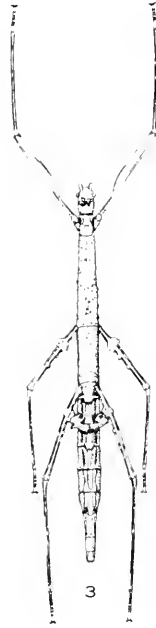
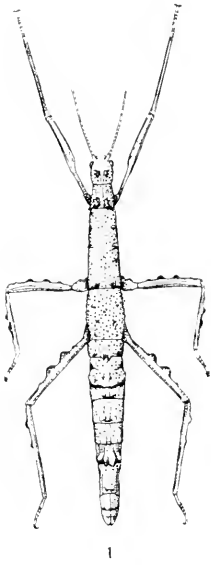




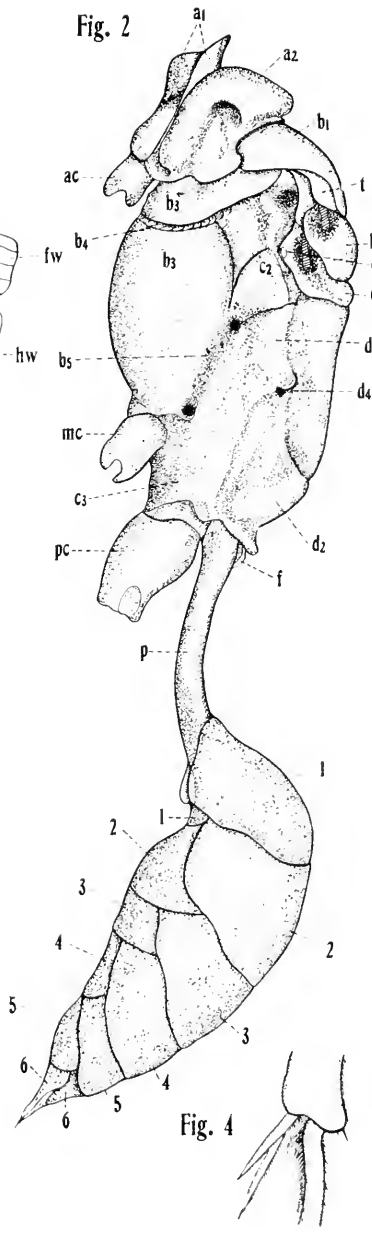
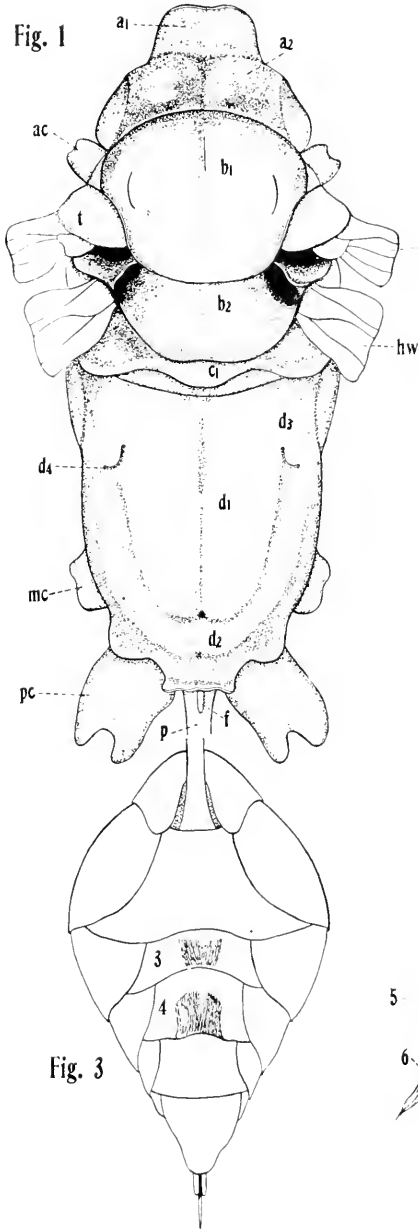
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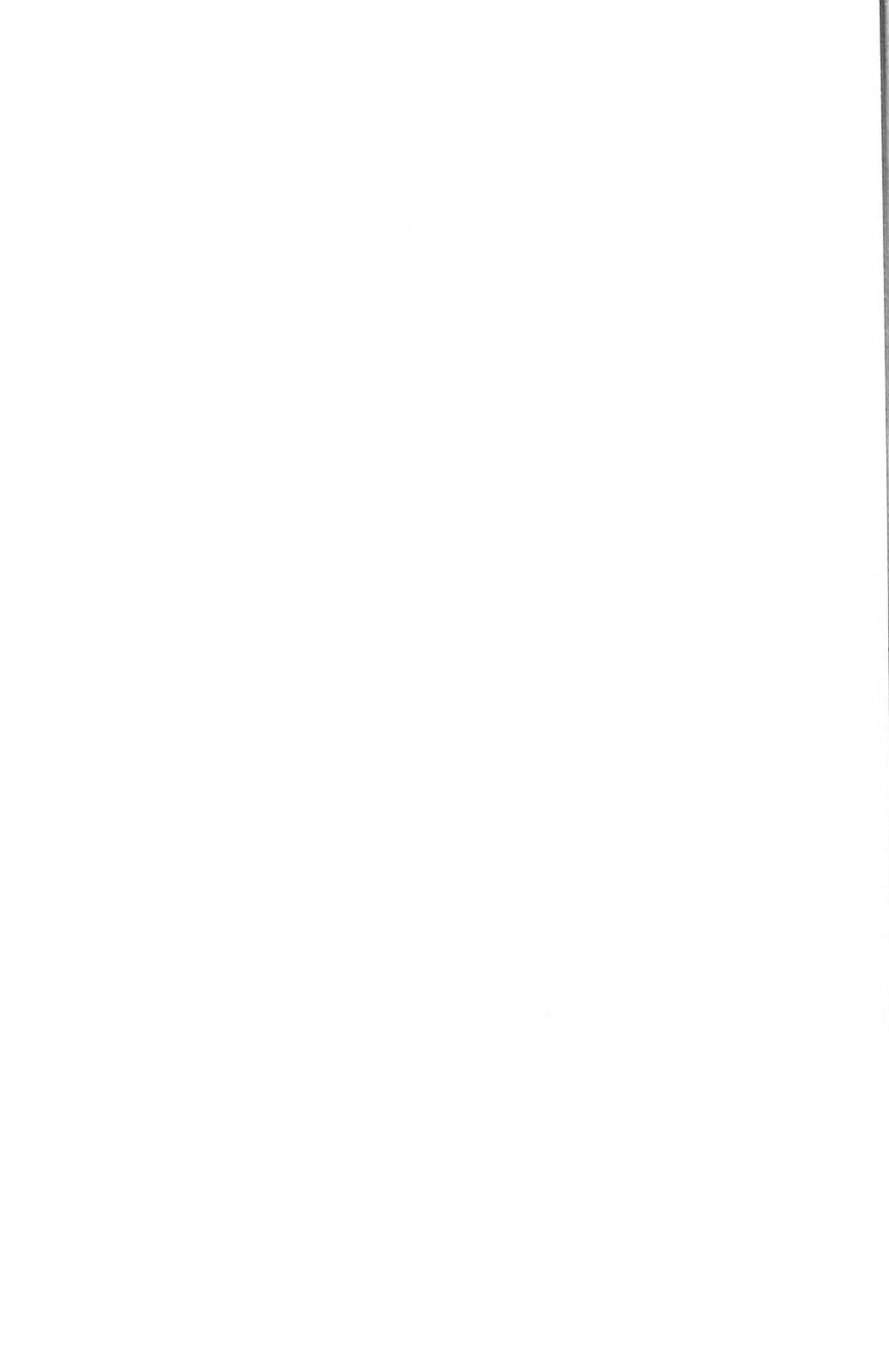


Fig. 5

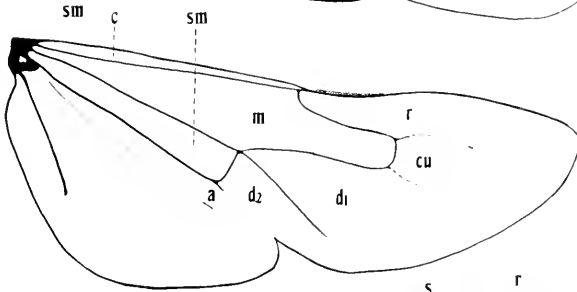
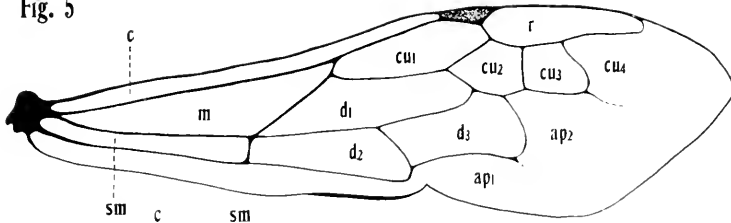


Fig. 7



Fig. 6

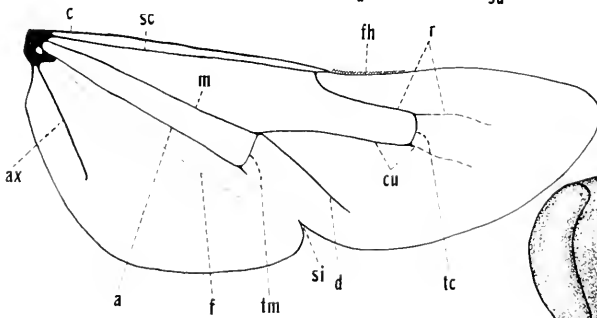
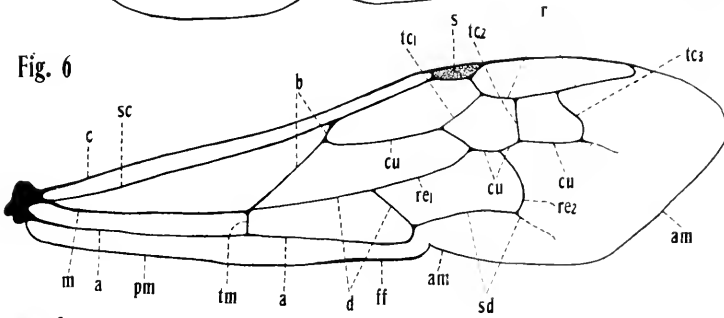
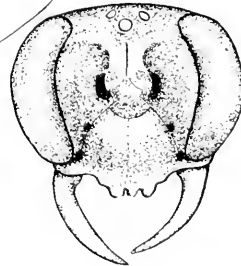
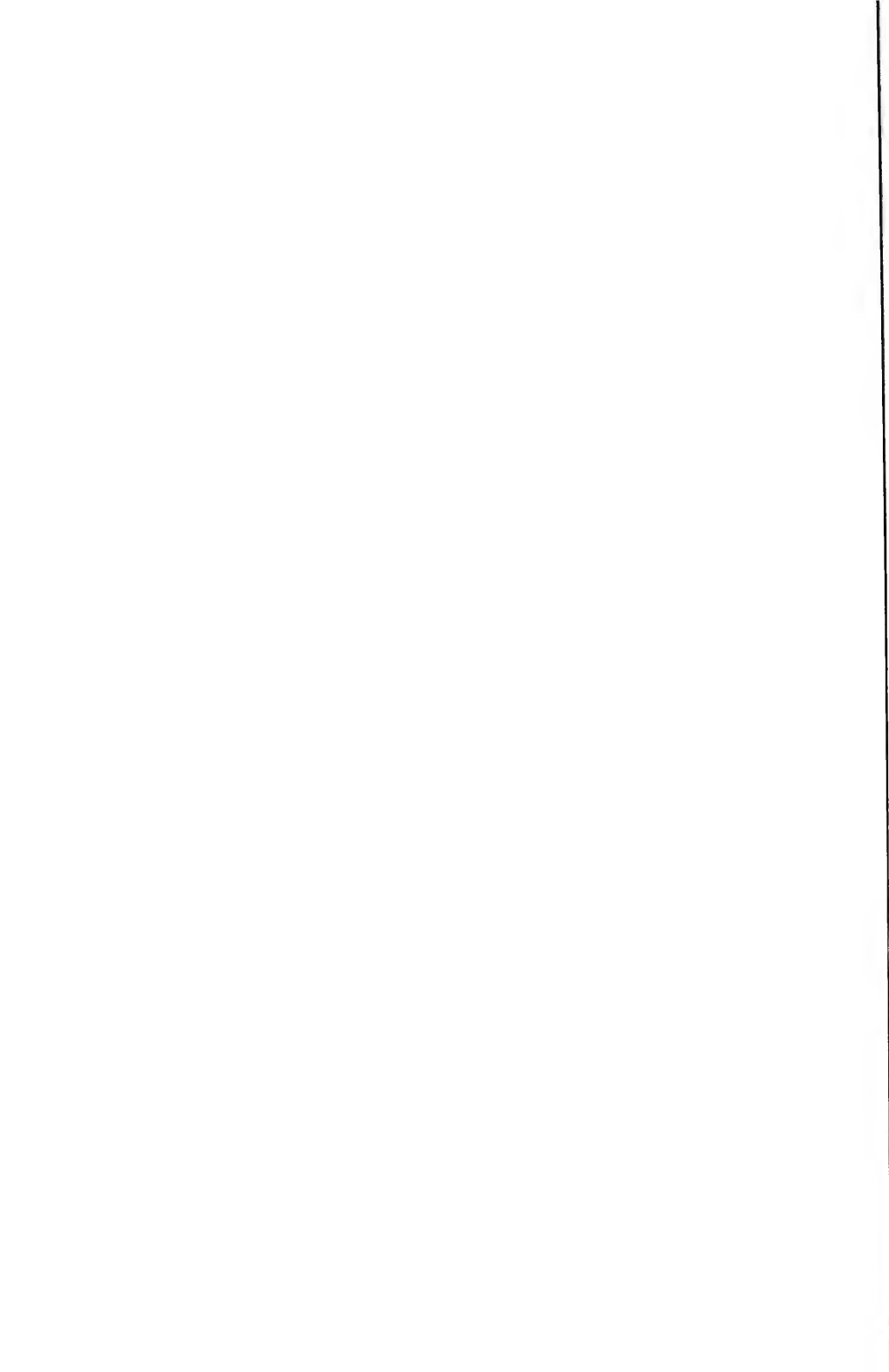
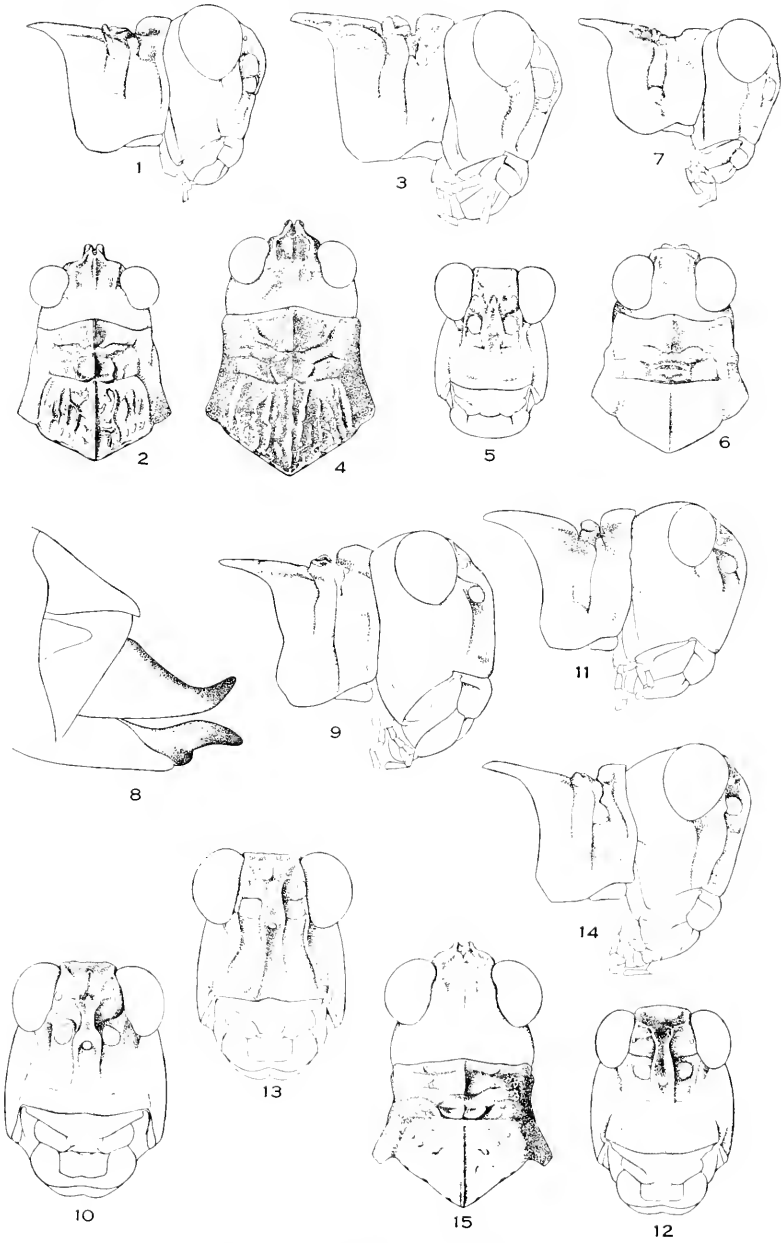
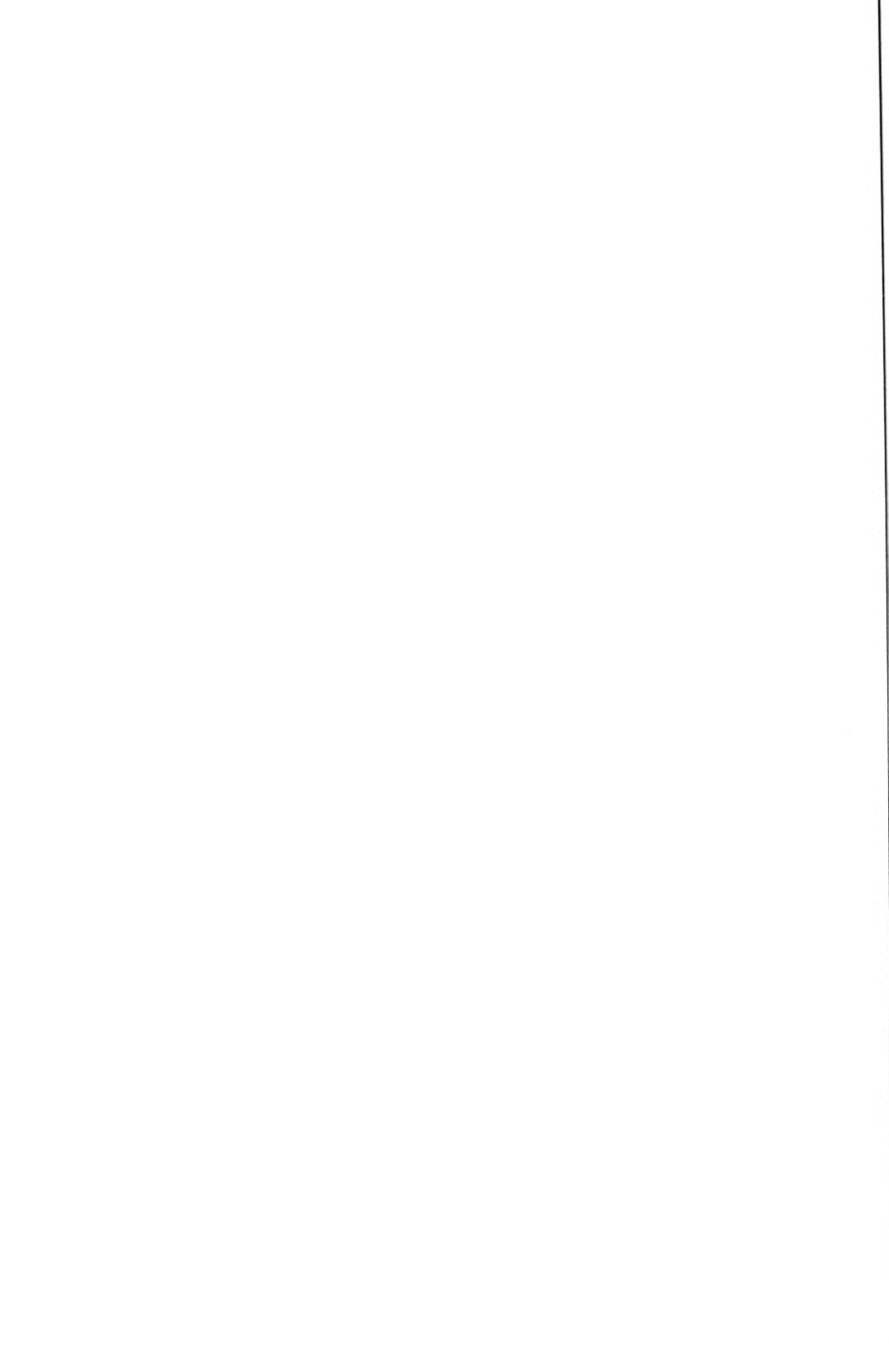


Fig. 8

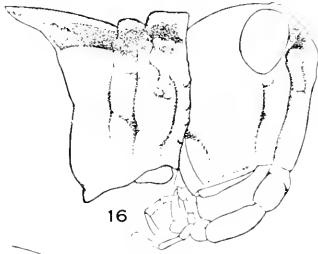




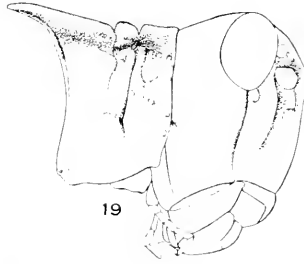




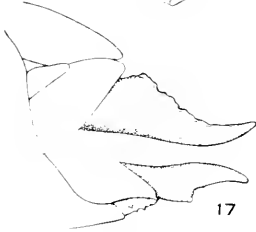




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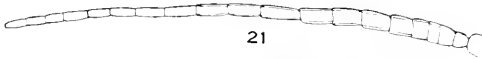
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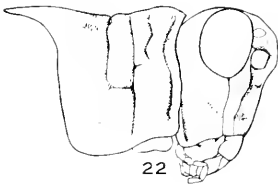
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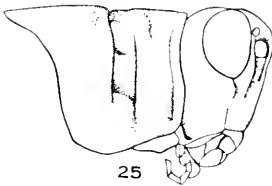
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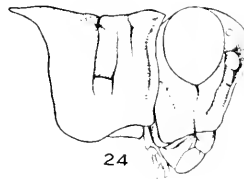
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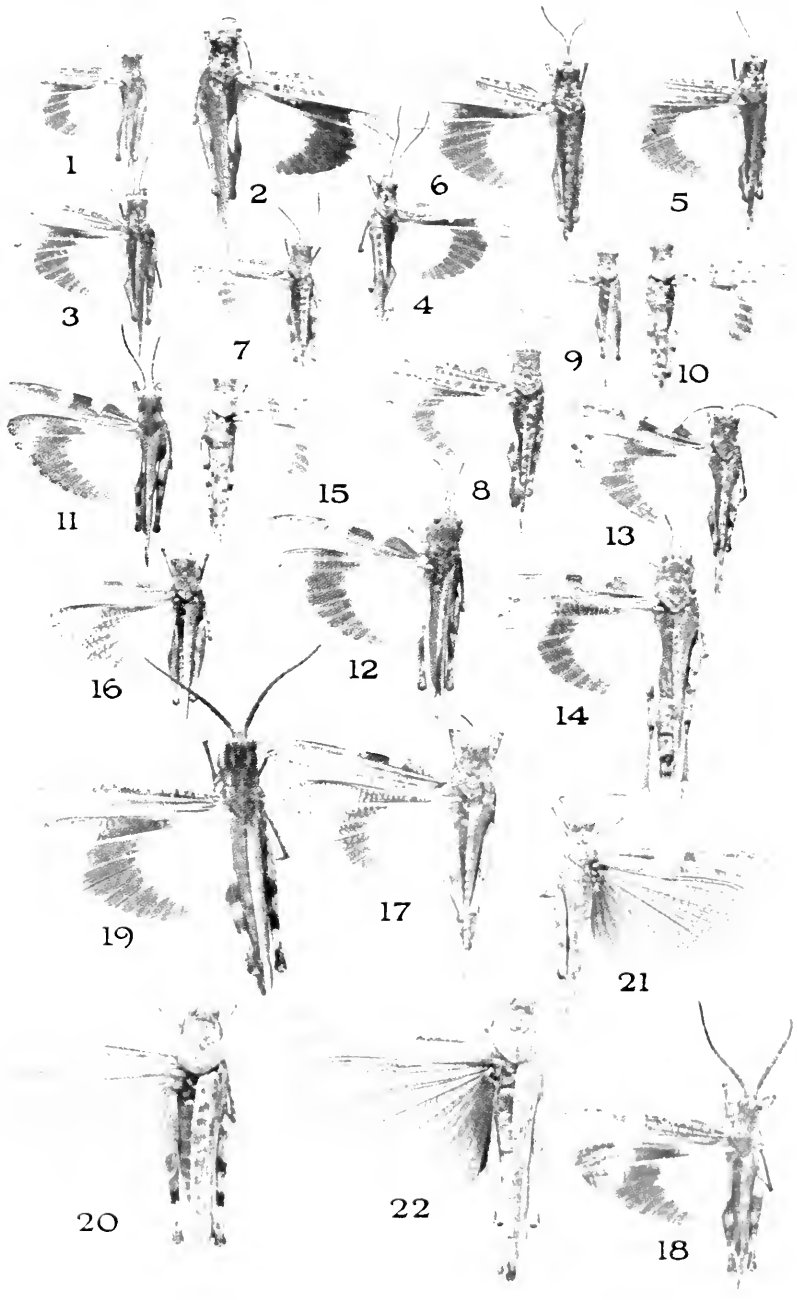


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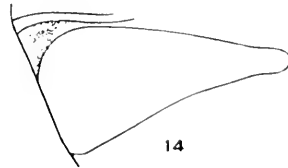
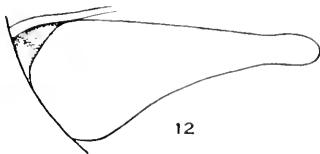
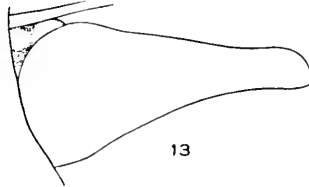
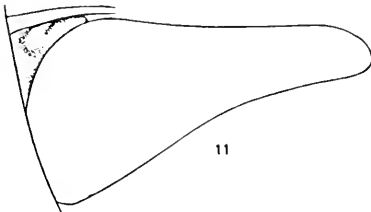
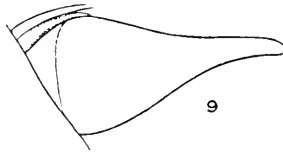
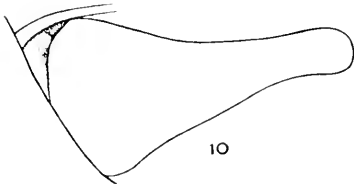
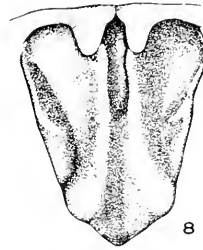
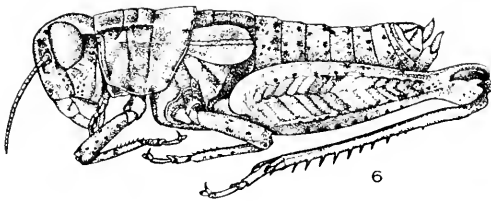
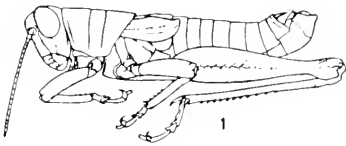


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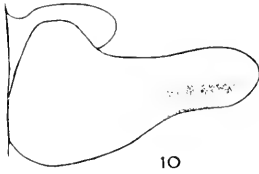
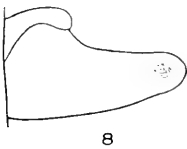
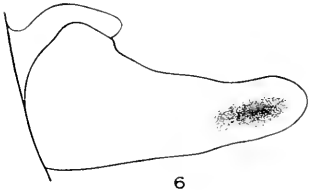
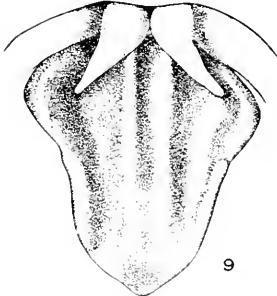
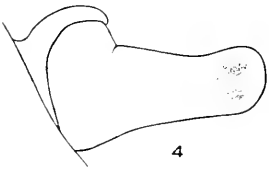
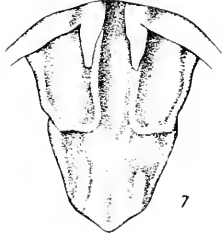
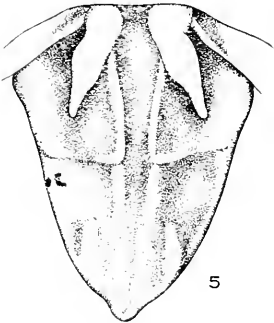
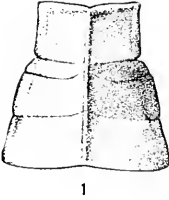
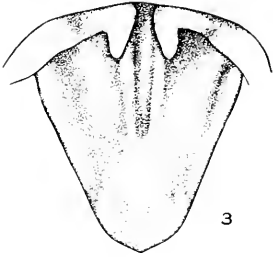






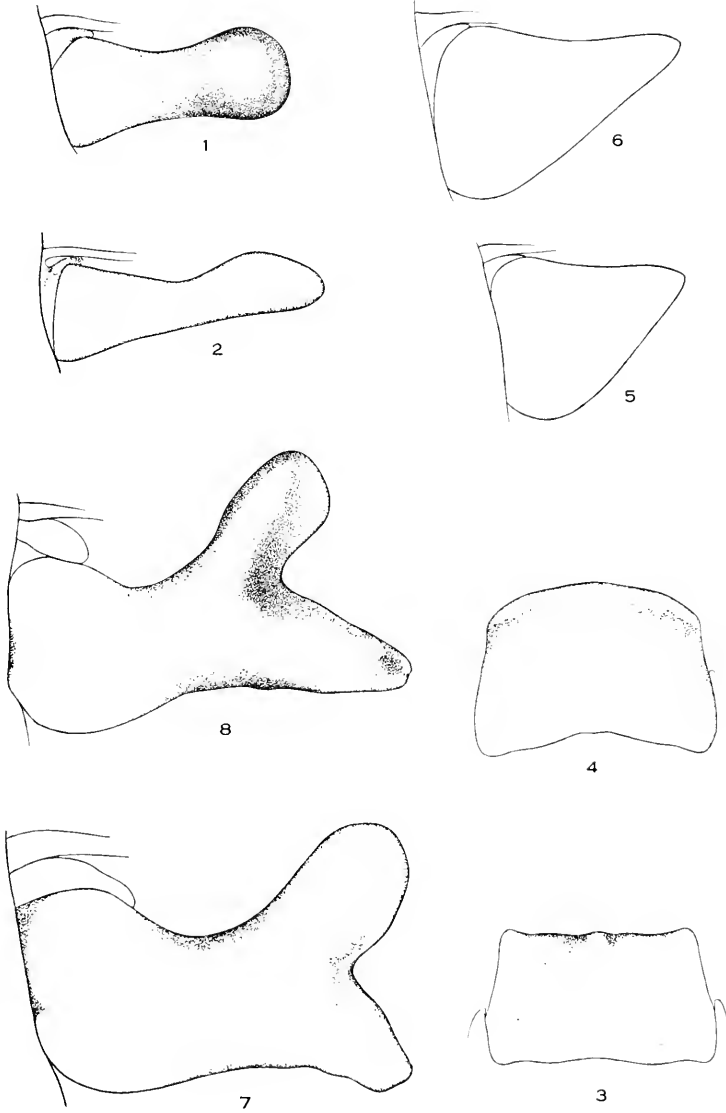




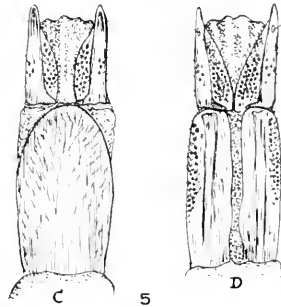
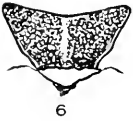
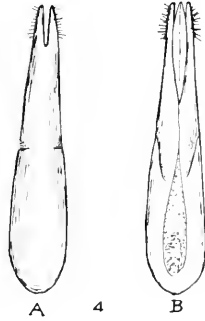
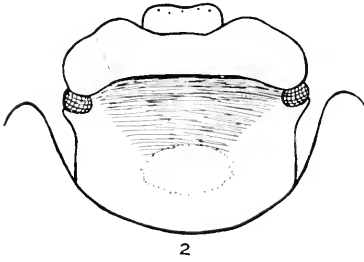
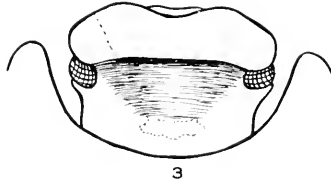
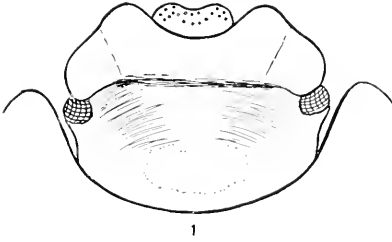




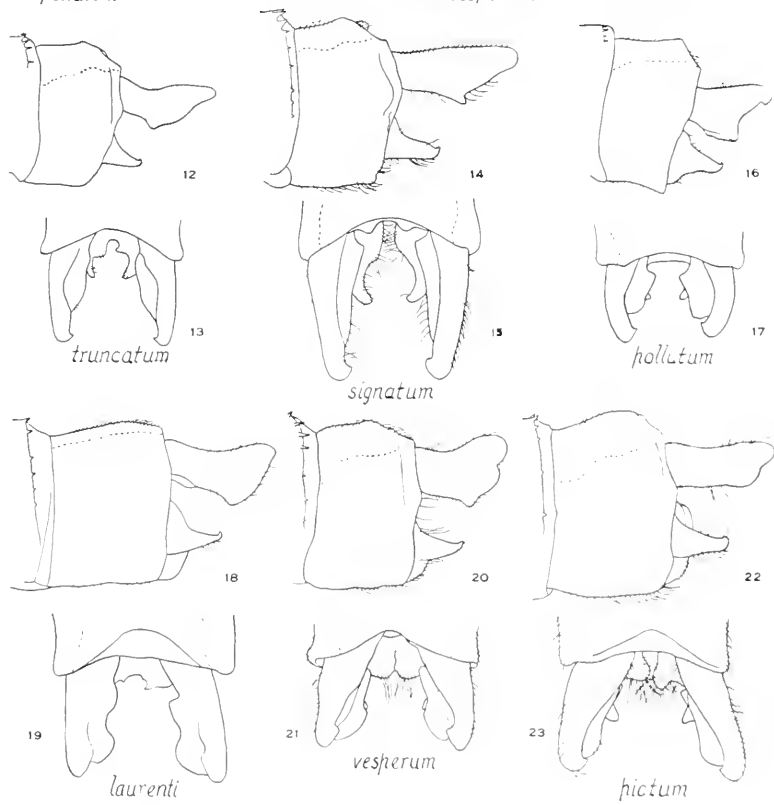
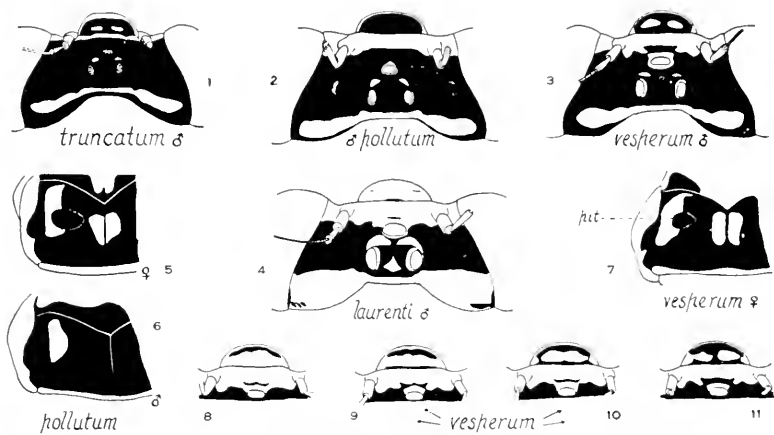




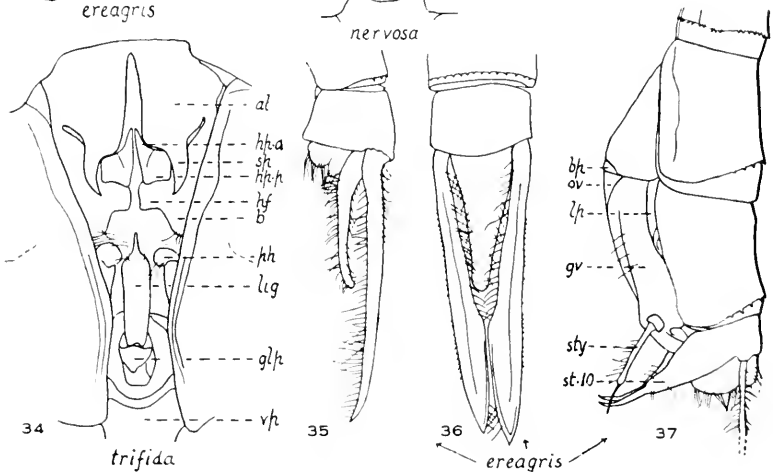
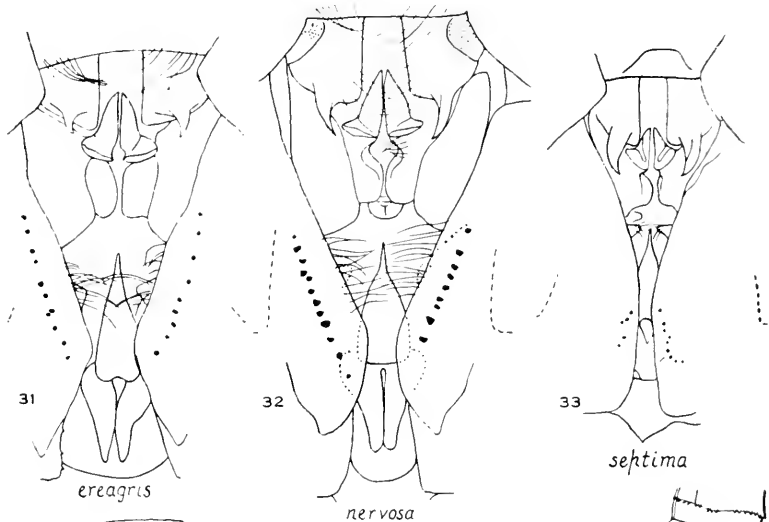
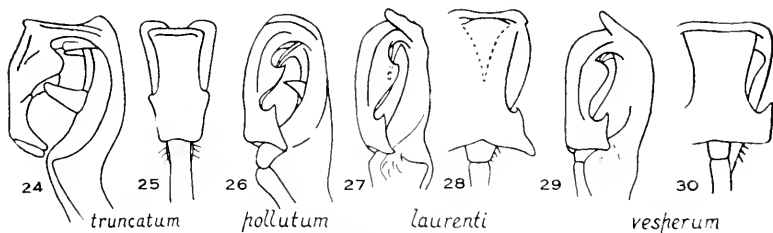






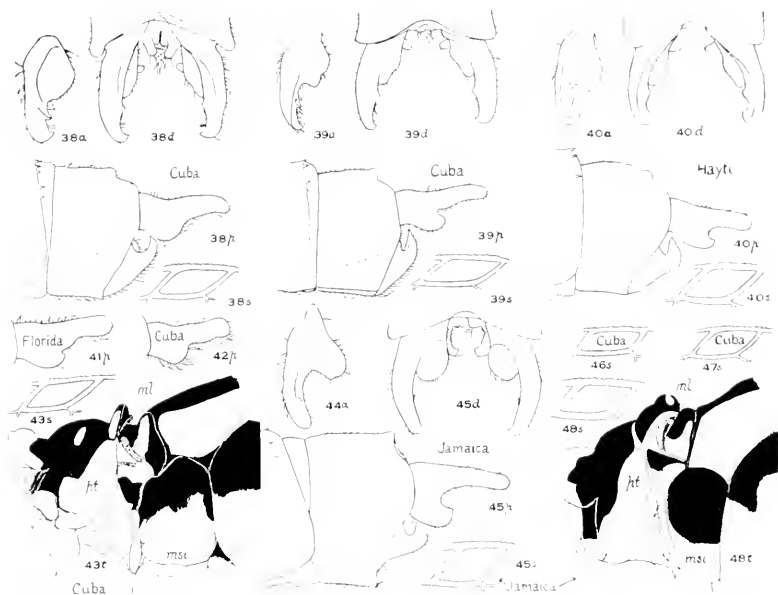












CALVERT—GUNDLACH'S ODONATA OF CUBA





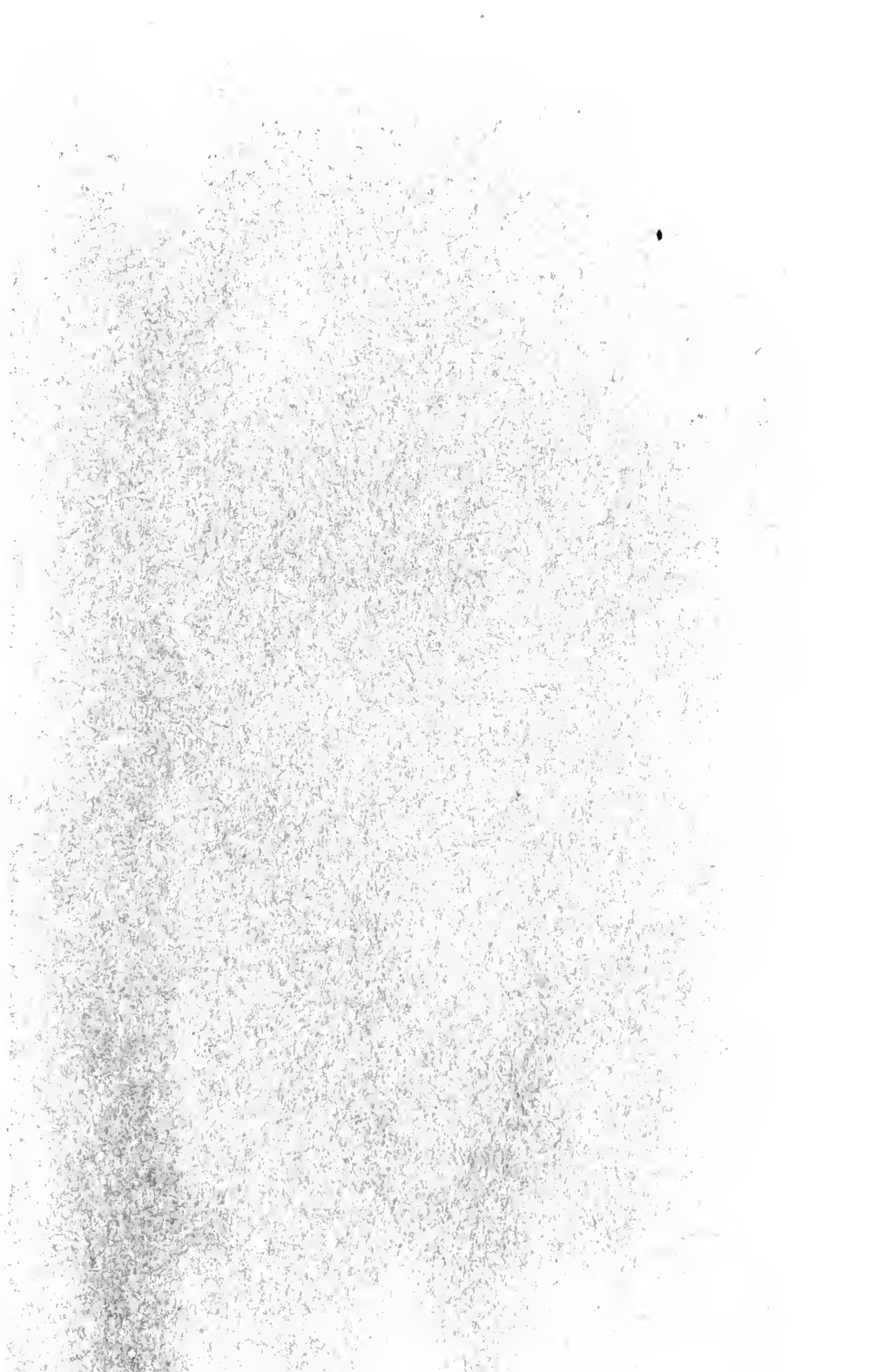
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