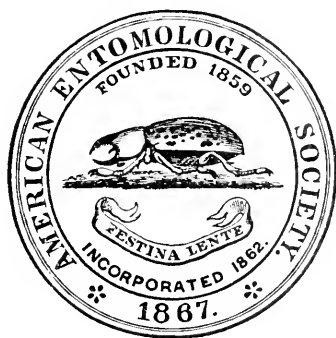


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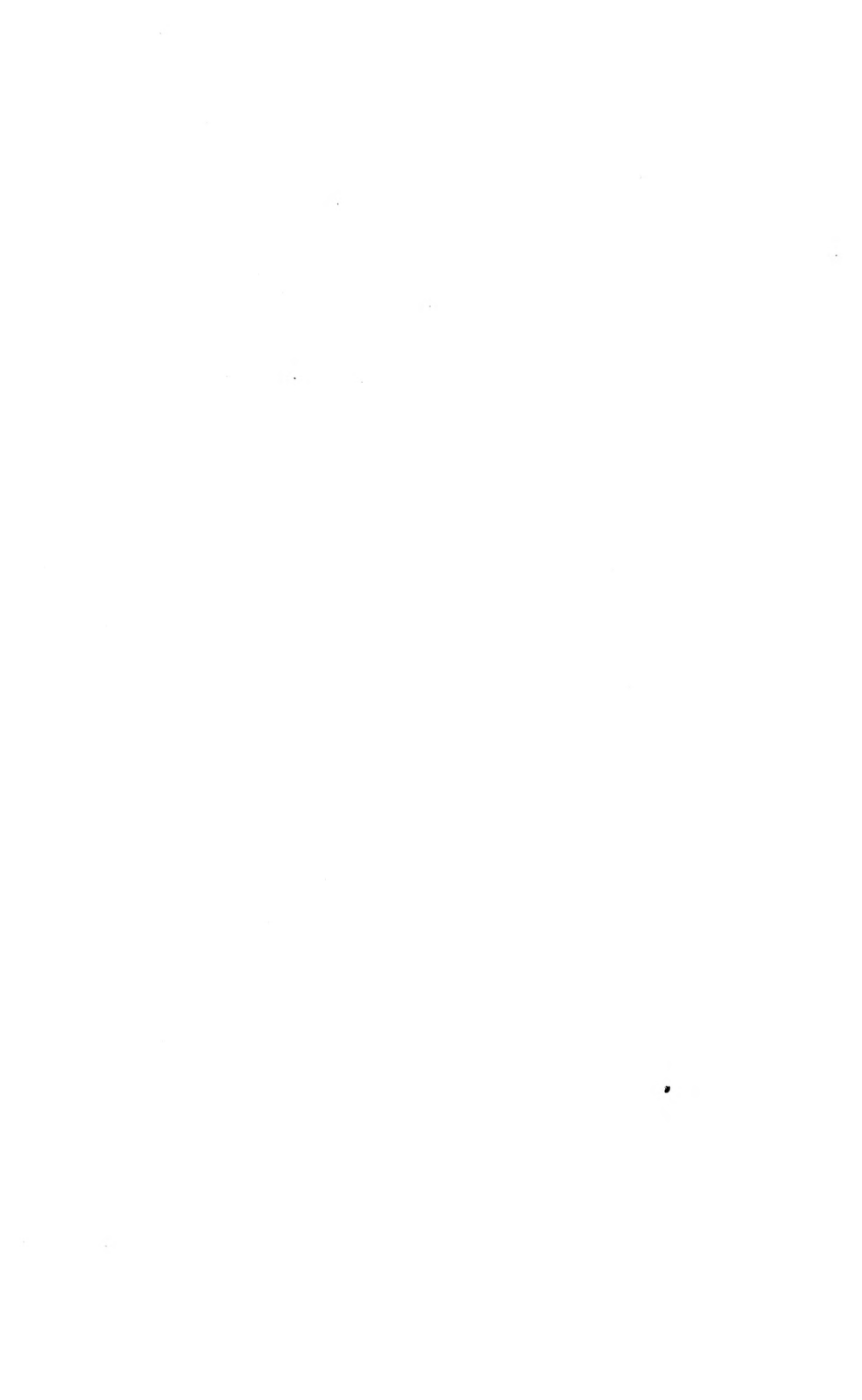
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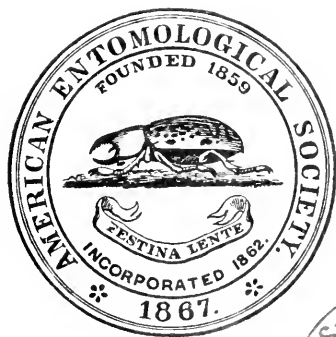
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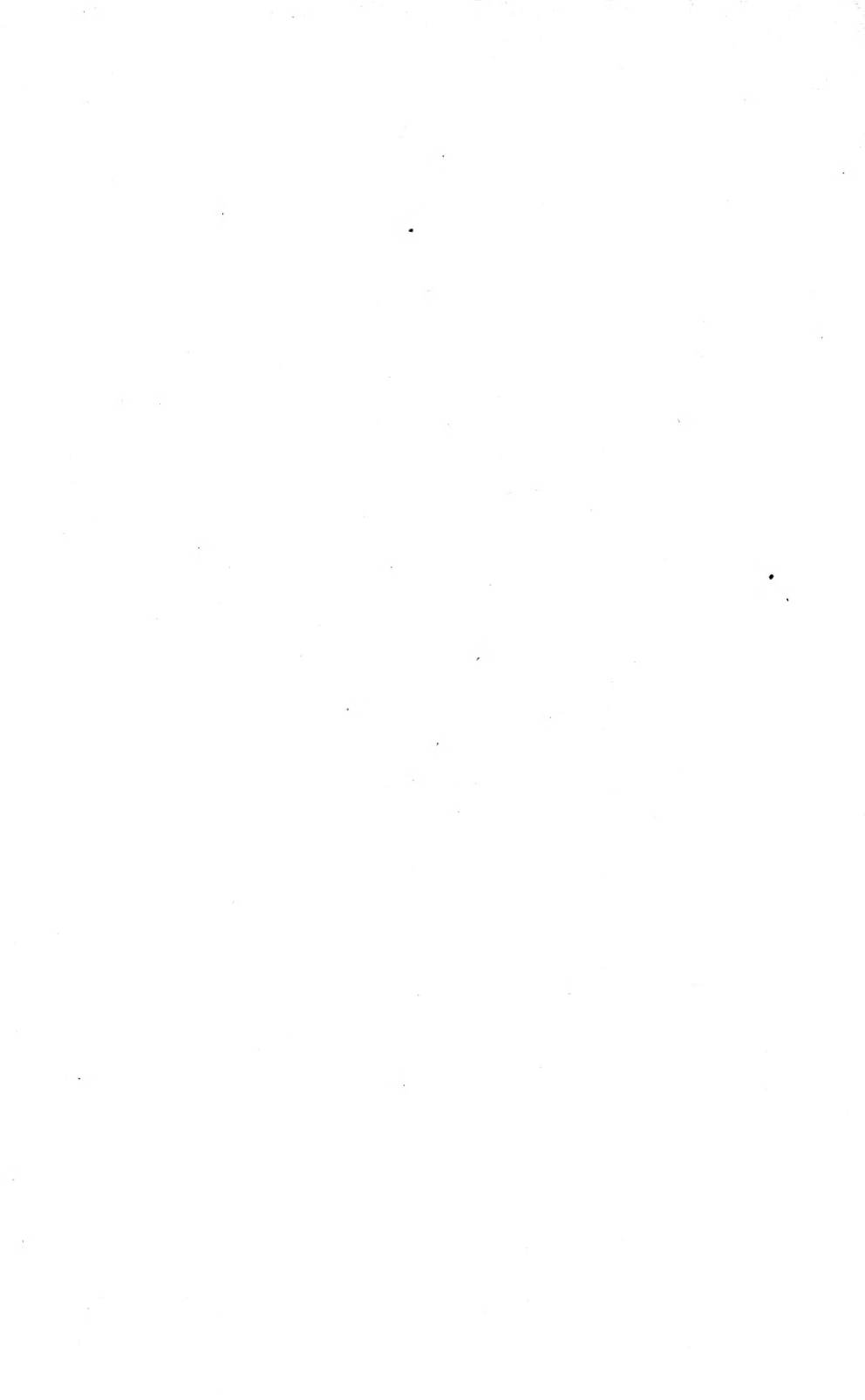
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VOLUME XL

COSTA RICAN DIPTERA

COLLECTED BY PHILIP P. CALVERT, PH.D., 1909-1910

INTRODUCTORY REMARKS

BY E. T. CRESSON, JR.

Under this general title it is intended, primarily, to publish the results of studies of the species of this order in the material collected by Dr. and Mrs. Philip P. Calvert in Costa Rica during 1909 and 1910. The papers will be prepared and published as each family or group is worked up. As the Diptera of Costa Rica have been but little studied, and in some families not at all, this work will prove to be a fairly good preliminary treatise upon the dipterous fauna of that region.

The main purpose of Dr. Calvert's visit was the study of the Odonata, and he has already published several interesting papers upon that subject. However, he gave some attention to the collecting of the Micro-Insecta, and it will be observed, by the number of species described in this series, that even a casual collecting along such lines will prove exceedingly interesting. All the types, unless otherwise mentioned, are in the collection at the Academy of Natural Sciences of Philadelphia.

Dr. Calvert has kindly prepared the following list of the localities where this material was collected, with brief descriptions of their topography and general surrounding conditions, which forms a valuable adjunct for the purpose of this work.

Localities where Diptera were collected

Alajuela.—Town on the Costa Rica Railroad on the Pacific slope west of San José. Our collecting was mostly done near the

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MAR 26 1911

Hacienda El Brazil, at least one mile north of the town. Altitude about 3100 feet. Country rolling, well watered, mostly pasture land or coffee plantations, trees scattered singly except where they form fringes along the numerous small rivers and streams (Rio Ciruelas, Rio Brazil, etc.). Rio Segundo is a river (and a station on the railroad) east of Alajuela.

Banana River.—The collections of November 9, 1909, were made near the upper reservoir for Limon, situated on the left bank of the river above Bearesen West farmhouse of the United Fruit Company, altitude 100 feet or less. Forest (with many small palms in the undergrowth) comes down to this reservoir. The whole region is mostly flat with occasional hillocks and in large part occupied by bananas, but patches of forest remain here and there.

Cachi.—A small town on the right bank of the Rio Reventazon east of Cartago, southwest of Juan Viñas. Considerable coffee raised around the town, higher up are pastures, still higher on the hills south and southeast is forest. Altitudes at which collections were made from 3450 feet (at bank of Rio Reventazon) up to 4000 feet. There are three well-marked river terraces, the lowest forming a strip of beautiful meadow with some old forest trees. A few miles west of Cachi, the Reventazon winds through a stretch of cobble-like stones and sand in several channels; collections made here on March 7, 1910.

The Rio Oro is a tributary (on the right bank) of the Reventazon, a little west of Cachi. The vegetation of its valley was quite dense, many forest trees still standing, tree-ferns 15 feet high, phyllocladon on tree trunks, Aroids, etc. (March 8, 1910). The Rio Naranjo, also a tributary (on the right bank) of the Reventazon, is east of Cachi. Where we collected it flows chiefly through open pastures.

La Carpintera.—Mountain having several peaks, highest 5700 feet elevation, bounding valley of Guarco (in which Cartago lies) on the west and forming the divide between the Atlantic and Pacific slopes. There is still some undisturbed forest on it, but not on the area collected over on December 4, 1909.

Cartago.—Town (of 8000 population previous to earthquake of May, 1910), on Costa Rica Railroad. Altitude 4750 feet. Near the top of the Atlantic slope as traversed by the railroad.

Three miles west (at El Alto) the railroad begins to descend the Pacific slope. Cartago lies in an east and west valley (valley of Guarco), bounded on the north by the volcano of Irazú (11,300 feet) and on the south by lower ranges (Serro de Las Cruces). The country around the town is pasture land, coffee plantations and some other cultivated fields, no forest, country well watered.

El Alto.—Altitude 4950 feet. Point on the railroad where the change from the Atlantic to the Pacific slope is made. El Alto is a pass between the southwest side of the volcano Irazú and the northwest side of La Carpintera (a mountain 5700 feet high which bounds on the west the valley in which Cartago lies). Near El Alto station is a flat place among the hills which is swampy, with some standing water, called the Laguna de Ochomogo. There are few trees and no forest near. At this laguna I collected on July 7, 1909.

Filadelfia.—(See Rio Tempisque).

Guacimo.—June 5, 1909. I collected in the banana fields, in a small clearing in the edge of high forest and also in low wet woods. Do not know from which place the Diptera were collected. Altitude about 350 feet in all three, as the country is fairly level.

Guapiles.—June 4, 1909; in the forest south of the town. Altitude 1150 feet. June 5, 1909; along Rio Guapiles flowing through open pastures with here and there fringes of trees and undergrowth along banks; north of town, altitude about 980 feet.

Florida Road.—A trail of a few miles west of Guapiles, leading westward into rich tropical forest of mingled deciduous exogenous trees and palms and dense undergrowth. Trees with many parasitic and epiphytic plants. The nearest point to the entrance to this trail is the hacienda of San Jacinto (June 3, 1909).

Irazú Volcano.—I have used "Irazú" to cover a large area of land, to the north of Cartago, gradually rising from say 4800 feet altitude to the rim of the highest crater, 11,300 feet altitude. This highest point is 12 miles from Cartago railroad station. All the southern slopes of Irazú, up to about 9000 feet, have been cleared of most of the original evergreen oak forest. From 9000 feet to 10,300 feet on the road from Cartago to the crater was still occupied by the oak forest. Above 10,300 feet the trees are about 10 to 15 feet high and more scattered. (In the oak forest the trees are 50 feet or more in height.) Below 9000 feet, on the

southern slopes the land is mostly in pasture, maize or potatoes. There are many small streams. (I never collected on the north slope of Irazú which is much more wooded.)

The floor of the highest crater of the volcano is about 10,600 feet above sea level; where the trail from Cartago crosses the ridge to descend into the crater, the altitude is about 10,800 feet. The highest point of the whole mountain is on the rim of the highest crater and is 11,300 feet. The various craters—there are ten in all—have much black volcanic sand with blocks of stone of all sizes, and many kinds of plants and even low trees up to 15 feet in height.

Juan Viñas.—The railroad station is at 3400 feet altitude and lies in the floor of an old crater, apparently. The most of this crater floor has been marshy and hence called “laguna.” Some ditches have been cut to drain it and others were planned. A large part of the sides of this crater was planted in coffee. The village of Juan Viñas is about two miles from the station at 4000 feet altitude. It lies in the midst of open fields. The “nearer” and “farther” waterfalls were on the railroad track a short distance west of the station. Our headquarters were opposite the station and practically at the same level. A road ran up from the station to the village, another down to the Rio Reventazon and crossed it (2500 feet altitude) by a bridge. (See also under Rio Reventazon.)

The brook in woods near mile post $74\frac{3}{4}$ of the Costa Rica Railroad, at which collections were made on May 2, 1910, was west of Juan Viñas station, lies in woods with small palms, a few low tree-ferns and arums on its banks and has a less rapid current than many streams of the neighborhood and descends by steps rather than by a continuous slope. Other plants in its immediate neighborhood were wild ginger (*Costus*), heliconias and caladiums. Altitude about 3500 feet.

Laguna del Dirumbo.—Also called Laguna del Reventado. A pond of shallow water, formed by natural or artificial barriers, on the upper course of the Rio Reventado on the south side of the volcano Irazu at 9100 feet altitude. It lies in a little flat-bottomed valley, and at the time I collected there (July 13, 1909), was about 100 feet long by 75 or 80 feet wide. There were many evergreen oaks (both dead and living), some bamboos and much

grass. Cattle were grazing not far from the laguna in another part of the same little valley. There were several smaller boggy streams and a second smaller swampy spot. The water of the laguna was clear and cold.

Liberia.—Capital of the Province of Guanacaste, on the right bank of the Rio Liberia. Altitude 500 feet. East of the town the river has sandy and clayey banks, 15 to 20 feet high in low water in January, 1910, and sandy beaches, few rocks. On January 10, 1910, collected along the river and along a road running from the left bank of the river between pastures and waste land ("charrals").

Peralta.—The railroad station is at an altitude of 1088 feet. All of my collecting was done at nearly this altitude. Tropical forest with very tall exogenous trees and many palms (both kinds hung with lianas, ferns and mosses) comes close to the tracks. The railroad is near the Rio Reventazon and only a few feet higher, so that in floods the tracks are covered with water. Monkeys, armadillos, toucans, parrakeets and basilisks observed in the vicinity.

Puntarenas.—The principal seaport of the Pacific coast and terminus of the Pacific Railroad, at the tip of a sandy peninsula between the Gulf of Nicoya and the "Estero." Two kilometers inland from the two is a mangrove swamp, the trees about 15 feet high, the soil between them firm enough to walk on in February 2, 1910, when we collected there and also on the sandy beach of the Gulf of Nicoya.

Quebrada de Panteon de Liberia.—A small brook flowing along the south side of the cemetery of Liberia (hence the name), hardly five minutes walk north of the town. The little ravine has rocky banks of volcanic material, said to be pumitic in character, whose surface is black when simply exposed to the weather, but which by wear is white and breaks down into a white sand. Here and there are sandy beaches. The rock of the bottom is grooved or worn into holes, some of them apparently pot-holes. Some of the grooves, a foot or more in depth, have been made or deepened by man. At the time I visited it (January 12, 1910), the water was more or less separated into pools, although still flowing slightly. Banks shaded with low trees and shrubs. Altitude about 500 feet.

Quebrada de Salas.—A brook a few rods east of Atenas Station on the Pacific Railroad, but west of the bridge over the Rio Grande de Tarcoles. Altitude 1600 to 1700 feet. It empties into the Rio Grande de Tarcoles south of the railroad. Collections were made north of the railroad. Very clear water, banks of brook rocky, shady, with tall trees and undergrowth. Farther up it flows through pastures. Salas is the name of the owner of a farm through which it flows.

Rio de las Cañas.—A tributary of the Rio Tempisque, coming from the western part of the northern end of the peninsula of Nicoya, flowing northeastwardly and eastwardly and emptying into the Tempisque east of Bolson. I collected on January 30, 1910, at a place on this river approximately north of the town of Santa Cruz. The river banks here were low and muddy with low twisted trees and low plants standing in the shallow water.

Rio Reventado.—On the southern slopes of Irazu volcano, a small rocky stream with fairly swift current, a short distance west of Cartago. Altitude 4650 to 5000 feet where collections were made.

Rio Reventazon (near Juan Viñas).—Altitude of the river here 2500 feet. Flows in the bottom of wooded valley 1500 feet deep. Valley sides steep. Various small brooks empty into river at short intervals. These and the rains make many moist spots. Here and there the bottom of the valley is wide enough to allow planting maize and other food-plants. On the valley sides many large forest trees, chiefly exogens, and much undergrowth. (See also Juan Viñas.)

Rio Segundo.—(See Alajuela.)

Rio Surubres.—A small tributary of the Rio Machuca on the Pacific slope. Our collecting was done near the Bonnefil Farm, where we were guests of Señor Pedro and Señorita Josefina Bonnefil. Altitude about 800 feet. The ravine occupied by the river is well wooded with a great variety of trees and there are also numerous species of plants in the undergrowth. The river was to the east and south of the farm. To the west and north was "charral," pasture that had subsequently grown up with bushes, patches of grass, thorny vines, and some palms (cojol palm, *Acromia vini-fera*, royal palm, *Orcodoxa regia*, and peji-baye, *Guilicma utilis*), guanacaste (*Enterolobium*) etc.

Rio Tempisque.—The chief river of the Province of Guanacaste arising near the Nicaraguan frontier, flowing south and southeastwardly and emptying into the upper end of the Golfo de Nicoya. At Filadelfia (formerly known as Siete Cueros), where I collected on January 18, 1910, the banks of the river were 30 feet above the water level, but at times (e. g., in October, 1908), we were told, the river overflows them. Even at this month of January, some miles further up stream, the river is too deep to be forded. The banks of this part of the river are sandy and with scanty vegetation. The collections made on January 18, 1910, were from a beach of mingled sand and small stones by the river side. Altitude between 50 and 70 feet.

Rio Tiribi.—May 16, 1909, on road from San José to La Verbená, at altitude 3500 feet.

San Isidro.—A small village four to five miles southwest of Cartago, near the foothills of the mountains which bound the valley of Guarco (in which Cartago lies) on the south. Character of the country much like that of Cartago.

Santa Cruz.—A town in the upper part of the peninsula of Nicoya, Province of Guanacaste. Altitude about 200 feet. North of the town, a few kilometers distant, on the road to Timpate, is a forest in which collections were made on January 27 and 28, 1910. This forest was quite dry at this time and there were very few orchids, bromeliads, or other epiphytes. There was a great variety in trees, both as to species and size, and much undergrowth both shrubs and herbs. Going north through this forest, which is interrupted by a pasture where cattle were grazing, we came to an open swamp, the Laguna Garzal, said to extend to the Río de la Cañas. In the swamp is a spring of hot water (113° F.), visited, said to be hot throughout the year.

Tierra Blanca.—(See Toyogres.)

Toyogres.—A small brook on the southern slope of Irazú. Where the collection of April 6, 1910, was made, i. e., where the brook is crossed by the eastern road from Cartago to Tierra Blanca; the altitude is 5000 feet; the brook flows through pastures and is bordered by bushes here and there.

Turrucares.—Station on the Pacific Railroad, at altitude of about 2200 feet, 32 kilometers west of San José. Río Siquiáres was north of station, flowed through pastures, but was bordered

by a fringe of trees and rather low woods here and there. In the wood were many bull's-horn-thorns (*Acacia* spp.). River shallow, narrow (10-15-20 feet wide).

La Verbena.—A coffee farm near San José. Altitude about 3738 feet.

PAPER I.—A Partial Report on the Borboridae, Phoridae and Agromyzidae

By J. R. MALLOCH¹

Plate I

This paper presents descriptions of several new species and records of others previously described in the families Phoridae, Borboridae, and Agromyzidae, which occur amongst the material collected by Dr. P. P. Calvert in Costa Rica, in the latter half of 1909 and early in 1910. All the types are in the Academy of Natural Sciences of Philadelphia.

It is possible that some of the species described herein as new may really be identical with European species, but unless in cases where I have very sound reasons for associating the forms, I have taken the course of giving to the Costa Rican insects names which will serve to distinguish them, in addition to the fullest possible description, which is in my opinion the safer plan than to link up two forms which, while very close in general appearance, may ultimately prove to belong to entirely different species.

One thing that strikes me in looking over the Borboridae is the absence of such species as *ferruginata* Stenh., and *crassimana* Hal. The former is cosmopolitan in its distribution and the latter is, while not recorded from so many different continents, very probably one of the species which occur almost everywhere in

¹ On account of the limited time Mr. Malloch was enabled to give to the study of the species of these families, the final preparation of this paper for publication, especially the preparation of the figures, was left to me. The descriptions and their accompanying notes are as Mr. Malloch prepared them. The figures were made with the aid of the camera lucida and are accurate except towards the base of the wings, where it was difficult to get the proper illumination, and no attempt has been made to correct such inaccuracies. In one or two cases the wings were more or less folded and the venation had to be worked out towards the hind margin. The only noteworthy case for correction is in figure 7 in which the third vein should be shown same as in figure 11.—E. J. CRESSON, Jr.

the same sort of situations as *fontinalis* Fall., which I find amongst the material before me. It is possibly due to the fact that *ferruginata* is a carrion frequenting species, or at times found on manure piles, that it does not occur in this collection, as very probably no collecting was done, or possible in such conditions. The number of species with maculated wings is evidently an indication of the presence of a large number of this form in tropical parts which are not represented in the temperate zones. I have seen two other species with wings maculated, viz.: *pictoratus* Mall., from Philippine Islands, and *myrmecophila* K. and M. from ants' nests in Australia.

The Phoridae present no peculiarities, nor do the Agromyzidae that I have seen, both being similar to the North American forms in general appearance.

I have given tables of the species where the number present justifies this course.

BORBORIDAE

TABLE OF SPECIES IN LEPTOCERA

1. Disk of scutellum with short setulae.....	mitchelli Malloch
Disk of scutellum, bare.....	2
2. Wings with brown spots, either on the veins or on the disk.....	3
Wings clear, or with faint indications of fuscous suffusion along veins, but never distinctly spotted.....	7
3. Large species, 2 mm. or more, frons and mesonotum with whitish pollinose spots at bases of bristles; wings clear on disk, the spots confined to veins and distributed as follows: one at beyond middle of first vein, one at apex of second vein, one on base of second and third veins, and another, generally less distinct, at apex of third vein.....	venalicia Osten Sacken
Smaller species, 1 to 1.75 mm.; mesonotum sometimes vittate but never punctate; wings with distinct spots on disk.....	4
4. Mesonotum yellow, browned posteriorly; legs yellow, bases of femora browned (fig. 11).....	meridionalis new species
Mesonotum black, with grayish white vittae; legs yellow, tibiae with brown rings.....	5
5. Mesonotum with 1 pair of dorso-central bristles, apex of wings clear (fig. 7).....	vittata new species
Mesonotum with two pairs of dorso-centrals.....	6
6. Anterior pair of dorso-centrals very long and strong; apex of wing infuscated (fig. 8).....	poeciloptera new species
Anterior pair of dorso-centrals weak; apex of wing clear (fig. 10).....	monticola new species

7. Wings whitish, second section of costal vein glossy black, contrasting with the other sections which are brownish in color (fig. 9)
varicosta new species
 Second section of costa not darker in color than other sections..... 8
8. Face, antennae, and legs yellow; mesonotum shining brown black, disk of scutellum velvety, opaque black or brown black... *fulva* Malloch
 Species otherwise colored, scutellum never opaque on disk..... 9
9. Last section of second vein equal to basal section of third or very slightly longer, the second costal division less than half as long as third or barely one-half as long..... 10
 Last section of second vein distinctly longer than basal section of third, second costal division generally more than half as long as third... 11
10. Third vein almost straight on its last section, reaching wing margin at very near to apex of wing..... *inconspicua* new species
 Third vein bent almost rectangularly and reaching margin of wing at very much in front of apex of wing.... *bromeliarum* K. & M.
11. Small, glossy black species, antennae, legs and wing veins yellow (fig. 6)
pallicornis new species
 Larger, more or less shining species, legs brown, with yellow joints and tarsi and wing veins brown. The face is generally yellowish in the paler species when the antennae are of that color and thus there is not the striking contrast in color as represented in *pallicornis*... 12
12. Post-humeral bristle present, incurved..... 21
 Post-humeral bristle absent..... 13
13. Scutellum with four marginal bristles..... 14
 Scutellum with six or eight marginal bristles..... 20
14. Very small species, .5 mm. in length; second costal division very distinctly shorter than third..... *minima* new species
 Larger species, 1 mm. or over in length, second costal division as long as, or slightly shorter than third..... 15
15. Third vein bent forward on its last section before reaching margin of wing; 2 or 3 pairs of dorso-centrals present..... 16
 Third vein straight or very slightly inclined forward; 1 or 2 pairs of dorso-centrals present..... 17
16. Costa stopping at end of third vein, third vein slightly bent forward
cartagensis new species
 Costa carried distinctly beyond end of third vein; third vein distinctly bent forward..... *quadrisetosa* new species
17. Second vein almost rectangularly bent at its apex, the cell enclosed by this vein of almost equal width in its entire length..... 18
 Second vein joining costa at an acute angle, the cell enclosed by it distinctly narrowed apically..... 19
18. Larger species, 2 mm. in length; last abdominal segment in male with a long hair-like bristle on either side; legs mostly brown-black (fig. 3)..... *rectangularis* new species
 Smaller species, 1.5 to 1.75 mm. in length; last abdominal segment with the apical hairs of a more uniform length; legs mostly yellow
regularis new species

19. Second costal division subequal in length with third
 bisecta new species
 Second costal division very distinctly longer than third (3:2)
 inaequalis new species
20. Scutellum with 8 bristles, the basal pair very weak; 3 pairs of dorso-centrals present; third vein bent forward; last two tarsal joints of fore pair slightly dilated in male..... **fontinalis** Fallon
21. Scutellum with several setulae on margins of disk in addition to the 8 marginal bristles which are unequal in length
 marginalis new species
 Scutellum with only marginal bristles, the disk bare..... 22
22. Wings distinctly infuscated along the veins; outer cross vein at least half as long as the section of fourth vein between the cross vein
 fuscinervis Malloch
 Wings without distinct infuscation along veins; outer cross vein less than half as long as the penultimate section of fourth vein. 23
23. Larger species, 3 mm.; third vein distinctly bent forward (fig. 2) arista in male about equal in length to width of frons, in female slightly longer..... **brevisetia** new species
 Smaller species, 1.5 to 2 mm.; third being slightly bent forward; arista in both sexes very much longer than width of frons
 m-nigrum Malloch

Leptocera (Limosina) mitchelli Malloch

1913. *Leptocera mitchelli* Malloch, Proc. Ent. Soc. Washington, xv, 135.

There are 4 specimens of this species amongst the material from Cartago, January 1, 1910; same locality, November 21, 1909; near Tierra Blanca, April 6, 1910; and Juan Viñas, May 3, 1910.

Leptocera (Limosina) venalicia Osten Sacken

1858. *Borborus venalicia* Osten Sacken, Cat., 263.

There are 3 specimens amongst the material belonging to this species from the following localities: Juan Viñas, March 20, 1910, 2 specimens at 3000 feet altitude; 1, Verbena May 16, 1909.

Leptocera (Limosina) poeciloptera new species (Fig. 8.)

Male.—Black, slightly shining. Frons brown with a gray pollinose stripe on either side and a central stripe of same color which margins the frontal triangle; face and cheeks yellowish brown with distinct white pollinosity; antennae yellowish. Mesonotum brownish black, with a central grayish pollinose stripe and one on either lateral margin; pleural sutures yellowish. Abdomen shining black. Legs yellow, blackened on mid and hind coxae, all femora except at bases and apices, a broad band on the basal half of and apical fourth of all tibiae, apical tarsal joint darkened. Wings brownish gray, with hyaline spots arranged as in figure 8. Halteres brown, stalks yellow.

Frons occupying one-half the width of head, slightly narrowed anteriorly;

2 orbital bristles present; one on about middle which is directed slightly outward over the eye and the other almost in line with the posterior ocelli and directed slightly inward and backward; the normal central setulae represented in type by only 1 or 2 pairs near to anterior margin; antennae of moderate size, divergent but not lying very close to the eye; third joint barely larger than second, pilose, arista hair-like, slightly pubescent, geniculated at junction of second and third sections; cheek about one-half as high as eye; eye distinctly longer than high; vibrissae distinct, cheek bristles weak. Mesonotum with the normal pair of dorso-central bristles on posterior fourth, and a much stronger pair situated on the lateral pale stripes at about middle of mesonotum; discal setulae distinct, acrostichals arranged along margins of the central stripe; scutellum large, its length about equal to one-half that of the mesonotum, rounded in outline, four marginal bristles present, the basal pair much weaker than the apical pair, disk bare. Hypopygium large, knob-like; surface of abdomen with sparse hairs. Legs with short surface hairs; mid tibiae with 4 to 5 dorsal bristles, the two at apical third most distinct. Wing venation as in figure 8. There is a distinct fold which extends from before middle of discal cell to well beyond outer cross vein; costa with hairs but not spinose. Length, .75 mm.

Holotype.—Juan Viñas, May 3, 1910, near brook, forest edge, 2500 feet altitude. Type No. 6020.

Leptocera (Limosina) vittata new species (Fig. 7.)

Male.—Black, slightly shining. Frons yellow, ocellar spot blackened, orbits, a central stripe and margins of frontal triangle whitish pollinose; face yellow, cheeks blackened; antennae yellow; third joint darkened above. Mesonotum black-brown, with grayish pollinosity and 3 brown vittae, the outer one of which is broadest; scutellum concolorous with the mesonotum, with a subdistinct central pollinose stripe. Abdomen glossy black. Legs yellow, coxae blackened, all femora browned at bases; fore tibia with a narrow preapical blackish ring, mid and hind tibiae with two black bands, one near base and the other near to apex; apices of tarsi darkened. Wings spotted much as in *poeciloptera* but differing as shown in figure 7. Halteres black, stalk yellow.

Frons slightly over one-half the head width, becoming broader at just above the level of antennae, where there is a slight emargination of the eye; lower orbital bristle above middle of orbit, below it there are some weak orbital hairs; central setulae absent; cheek short; vibrissa and some marginal hairs distinct; eye about four times as high as cheek and very distinctly higher than long; antennae of moderate size; third joint pilose; arista geniculated, slightly pubescent. Mesonotum with one pair of dorso-central bristles, the anterior large pair in *poeciloptera* not distinguishable in this specimen (though it is not in very good condition); scutellum with 4 subequal marginal bristles, disk bare. Hypopygium large and knob-like, the ventral organ projecting claw-like; dorsum of abdomen with scattered hairs, hypopygium with 1.2 long hairs on left side at apex and scattered surface

hairs. Wings (fig. 7) with venation very similar to *pocilloptera* but the costa extends to distinctly beyond end of third vein while in that species it does not, the cross veins are not so closely approximated and the penultimate section of fourth vein is not so much deflected as to appear like a portion of the outer cross vein. Fore femora with rather long bristles on apical half of ventral surface; the other bristling of legs as in previous species. Basal joint of hind tarsus swollen. second joint elongated, but not so distinctly swollen as basal. Length, 1 mm.

Holotype.—♂, Juan Viñas, May 3, 1910, near brook, forest edge, 2500 feet altitude. Type No. 6021.

Paratype.—Juan Viñas, 2500 feet, near Rio Reventazon, June 28, 1909.

Leptocera (*Limosina*) meridionalis new species (Fig. 11.)

Male.—Yellow, ocellar region brownish. Mesonotum browned posteriorly and on lateral margins; scutellum browned; pleura with a black-brown mark longitudinally on middle from anterior to margin and the lower half blackened. Abdomen shining black-brown, last segment with inconspicuous pale posterior margin. Legs yellow, bases of all femora darkened. Wings with large brownish spots arranged as shown in figure 11. In cases where these markings are distinct they will present the appearance of three fasciae. Veins brown. Halteres clear yellow.

Frons half the width of head, outline less distinctly emarginate than in *vittata*; 2 orbital bristles present, as in *vittata*, the central setulae (2-3) present but very weak; antennae divergent, but not lying close to the eyes, of good size, the third joint slightly larger than second, pilose; arista geniculated, distinctly pubescent, its length about equal to 2 times the width of the frons; face concave in profile, the mouth margin produced; lower margin of eye with a rounded emargination; cheek as high as third joint of antennae. vibrissae distinct, the other hairs weak. Mesonotum with the prescutellar pair of dorso-centrals large and distinct, the pair just before level of wing base short and difficult to detect from the short discal setulae; no distinct pleural bristles on type; scutellum large, equal in length to rather more than half the length of mesonotum, disk bare, margin with 4 bristles, the apical pair longest. Abdomen with short surface hairs; hypopygium very large and knob-like, curved under abdomen. Legs slender; surfaces covered with short hairs; fore femora with distinct ventral bristles; mid tibial dorsal bristles weak; hind tarsus with basal joint swollen, less than one-half as long as the slightly swollen second joint and with it equalling the length of the other 3 joints. Wings with venation as in figure 11. Costa not extending beyond end of third vein; inner cross vein situated before end of second vein and about equal in length with outer; veins 4, 5 not traceable beyond the outer cross vein. Length, 1 mm.

Holotype.—Alajuela, 3100 feet altitude, swept, September 15, 1909. Type No. 6022.

Leptocera (Limosina) monticola new species (Fig. 10.)

Male.—Black-brown, shining. Head yellow; frons brown, sides of frontal triangle and orbits whitish pollinose; face glossy; cheeks opaque. Mesonotum shining black-brown with traces of three grayish vittae; pleura opaque, black-brown, yellowish along sutures; scutellum shining black-brown. Abdomen black, subshining; hypopygium glossy brown. Legs yellow, femora blackened, tibiae with brown rings on mid and hind pairs as in *vittata*, the ring on fore pair almost indistinguishable; tarsi with apical joint browned. Wings faintly marked as in figure 10; veins brown. Halteres brown.

Two orbital bristles present, the lower one projecting over eye; central setulae indistinguishable on frons; antennae divergent, but standing well clear of the eyes; arista bare, hair-like, in length about $1\frac{1}{2}$ times the breadth of frons; cheek at highest part about equal to height of eye, the marginal bristles weak; vibrissa large, incurved. Mesonotum with 2 pairs of dorso-central macrochaetae, the anterior pair weak; discal setulae weak, arranged in 4 rows of rather irregular formation between dorso-centrals; scutellum bare on disk, 4 marginal bristles present, the anterior pair the weaker. Hypopygium large and incurved the central processes claw-like and covered with numerous stubby bristles, apex of hypopygium with short stiff hairs. Legs normal; hind tarsus with basal joint about one-half as long as the less thickened second joint; both together slightly less than equal to the length of other joints together. Wing venation as in figure 10; fourth vein traceable to half way to wing margin. Length, .75 mm.

Holotype.—Juan Viñas, May 2, 1910, forest brook, 2300 feet altitude. Type No. 6023.

Leptocera (Limosina) varicosta new species (Fig. 9.)

Male.—Glossy black. Frontal orbits sometimes with a whitish sheen; antennae clear yellow. Mesonotum unstriped. Abdomen opaque brown, yellowish on venter; hypopygium glossy brown. Legs black, apices of fore coxae, trochanters, bases of tibiae and tarsi yellowish. Wings whitish, veins yellowish brown, the second costal division glossy black. Halteres yellow, knob brown.

Head short, viewed from above at least twice as broad as long; frons raised in center, the orbits differentiated from central stripe; bristles very weak; 2 orbital bristles present, the lower one not projecting over eye; central stripe bare, antennae small, divergent but not lying close to eyes, third joint rounded; arista pubescent, in length about equal to twice the width of frons; cheek about as high as eye; marginal bristles weak, becoming stronger towards front, vibrissa weak but distinguishable. Mesonotum arched; 2 pairs of very weak dorso-centrals present, which are not easily distinguished from the numerous discal hairs; scutellum convex, rounded in outline, four marginal bristles present, the anterior pair weakest. Hypopygium covered with short hairs. Legs normal; mid tibial bristles weak.

Wings with venation as in figure 9; fourth vein very indistinctly traceable beyond outer cross vein. Length, .5 to .75 mm.

Females identical in color, etc., with male, except hypopygium.

Holotype.—♂, Alajuela, September 15, 1909, 3100 feet altitude, by sweeping. Type No. 6024.

Paratypes.—7 specimens same date; 2, Bonnefil farm, Rio Surubres, October 20, 1909, 800 feet altitude; 2, Peralta Station, August 10, 1909; 2, La Carpintera, December 4, 1909; 1, Cartago, October 27, 1909.

Leptocera (Limosina) fulva Malloch

1912. *Limosina fulva* Malloch, Smiths. Miss. Coll. lxx, No. 17, 4.

Specimens of this species are amongst the material from the following localities: Peralta Station, August 10, 1909, one specimen; Alajuela, September 15, 1909, 3100 feet altitude, 11 specimens taken by sweeping; Turrucares, December 22, 1909, 1 specimen by sweeping over mud; Filadelfia, January 1, 1910, 2 specimens on muddy beach, Rio Tempisque.

Originally described from Panama.

Leptocera (Limosina) pallicornis new species (Fig. 6.)

Male.—Glossy black. Antennae and legs entirely yellow. Wings clear, veins yellow. Halteres brownish yellow.

Frons convex, orbits indistinguishable from central stripe which is highly glossy; orbital bristles weak, both jointing over eye, the central bristles weak but distinguishable; antennae divergent, but standing well clear of the eyes, third joint pilose; arista with slight pubescence, length of arista equal to $1\frac{1}{2}$ times the width of frons; face slightly concave, produced at mouth margin; cheek at middle half as high as eye, marginal bristles distinct, vibrissae well differentiated, incurved; eye almost round, bare, facets rather large. Mesonotum with 1 distinct pair of dorso-centrals, the lateral bristles weak, setulae rather sparse and weak; scutellum convex, rounded in outline, 4 marginal bristles present, the basal pair weaker than apical. Abdomen short and broad, not as long as thorax; hypopygium knob-like, of moderate size. Legs slender, mid tibial bristles weak, in the male only the preapical dorsal bristle is distinct; hind tarsus with basal joint swollen and half as long as the less distinctly swollen second joint. Wing venation as in figure 6. Length, .5 mm.

Female. Same as male, except that the abdomen is broader, and the second costal division is rather longer.

Holotype.—♂, Juan Viñas, April 28, 1910, at brook near woods, 2600 feet altitude. Type No. 6025.

Allotype.—♀, Juan Viñas, May 1, 1910, forest brook, 4 p.m., 2500 feet altitude.

Leptocera (Limosina) inconspicua new species

Female.—Glossy black. Face and antennae brownish. Abdomen yellowish centrally. Legs dirty yellow, femora blackened except at bases and apices. Wings clear, costal vein brown, the others yellowish. Halteres yellow, knob black-brown.

Frons slightly broader than long; 2 orbital bristles present, the lower one slightly the weaker; central setulae very weak; antennae of average size, standing well clear of eyes; arista about twice as long as width of frons, hair-like, pubescence very slight; cheek at anterior margin about one-third as high as eye, becoming rapidly higher towards posterior margin; vibrissa distinct, behind vibrissa there is one much weaker setula and a very few weak hairs; eyes bare, higher than long; face distinctly concave in profile, produced between the eyes and at lower margin. Mesonotum without post-humeral bristles, and having one pair of dorso-centrals with a weak pair of setula about middle which represent the second dorso-centrals; disk with numerous, indiscriminately arranged, short hairs; scutellum bare on disk, four marginal bristles present. Abdomen as long as thorax, ovate, with sparse discal and apical hairs on segments. Legs normal, the mid tibial dorsal bristles weak, basal joint of hind tarsus about half as long as second joint. Wings with costa extending barely beyond end of third vein; third costal division twice as long as second; last section of second vein subequal in length with basal portion of third; outer cross vein at barely more than its own length from inner; vein 4 very indistinctly traceable to the wing margin; vein 5 abruptly discontinued at slightly beyond outer cross vein; last section of vein 3 straight, ending at very close to wing tip. Length, .75 mm.

Holotype.—♀, Cartago, December 12, 1909, from sweepings over muddy road. Type No. 6026.

Paratype.—Filadelfia, January 18, 1910, on muddy beach of Rio Tempisque.

Leptocera (Limosina) bromeliarum K. & M.

1912. *Limosina bromeliarum* K. & M. Ent. News, xxiii, 414.

There are 10 specimens in the material before me reared from unfolded leaves of *Heliconia mariae* from Rio Surubres, October 19, 1909.

Leptocera (Limosina) minima new species

Male.—Black. Head entirely black, frons shining. Mesonotum shining black. Abdomen subopaque black. Legs brownish the tibiae and tarsi brownish yellow. Wings clear, costa black, the other veins brown and very fine, veins 4 and 5 indistinguishable beyond outer cross vein. Halteres brown.

Frons convex; lower orbital bristle distinctly smaller than the upper; central divergent setulae distinct, 3-4 in number and as strong as the orbital bristles; antennae lying very close to the eyes, the face distinctly carinate, the anterior margin of it slightly behind the transverse line of the antennae; antennae of moderate size, third joint rounded, not larger than second, pilose; arista geniculated at junction of second and third joints, tapering, pubescent, in length equal to over $1\frac{1}{2}$ times the width of frons; cheek about $\frac{1}{3}$ the height of eye, marginal hairs weak, becoming very slightly stronger anteriorly, vibrissa strong, incurved; eyes bare, distinctly higher than long. Mesonotum with two pairs of dorso-centrals; discal setulae arranged in rows (8-10); post-humeral bristle absent; scutellum with 4 bristles, disk bare; outline of scutellum subtriangular. Abdomen cylindrical, almost bare, only a few weak hairs on apical segment and hypopygium; second segment slightly elongated; hypopygium of moderate size, not projecting much and not recurved. Legs without any conspicuous bristles, those on the mid tibia weak. Wings with costa to distinctly beyond the end of vein 3, first costal division slightly shorter than second, second about three-fourths as long as third, inner cross vein at below middle of last section of vein 2, outer cross vein at before end of vein 2, and almost as long as section of vein 4 between the cross veins, last section of vein 3 gently areolate ending slightly in front of wing tip. Length, .5 mm.

Holotype:—♂, Rio Tempisque, Filadelfia, swept over muddy part of beach, January 18, 1910. Type No. 6027.

Leptocera (*Limosina*) cartagensis new species

Female.—Brown black, opaque. Frons viewed from behind with an opaque black M-shaped mark, the spaces between the legs of the latter and beyond, gray pollinose; face shining black; antennae brown-black, third joint yellowish; cheeks brownish yellow. Mesonotum unstriped, opaque brown-black; scutellum and pleura concolorous with disk, sutures and their margins of the latter yellow. Abdomen darker than mesonotum, the posterior margins of segments narrowly yellowish, apical segment shining. Legs brownish yellow, fore coxae, all trochanters and mid femora paler. Wings clear, costal vein thick and black-brown, the other veins brown and not so distinct as costa, veins 4 and 5 very indistinct beyond outer cross vein, the latter only traceable for a short distance beyond that point. Halteres yellow, knob brown.

Frons slightly convex; both orbital bristles directed outward over the eye, the lower one slightly the weaker; orbits without additional hairs; central divergent rows of setulae distinct (3-4), distinctly convergent, the anterior pair weakest; antennae of moderate size, standing well clear of the eyes, third joint rounded and larger than second; bristles on second joint rather weak; arista hair-like, geniculated, pubescent, its length over $1\frac{1}{2}$ times the width of the frons; cheeks at center one-third as high as eye, marginal hairs weak, at slightly anterior to middle there is a strong upcurved bristle which is about as strong as the vibrissa; face slightly concave, the

mouth margin slightly produced; eyes bare, almost round, Mesonotum without the post-humeral bristle and with 3 pairs of dorso-centrals, disk with rather strong setulae, arranged in about 10 rows, the central pair becoming stronger as they recede; scutellum with 4 marginal bristles, the basal pair slightly the weaker, disk bare, outline rounded, sterno-pleural bristle of moderate strength. Legs normal, no ventral bristles on mid tibia, and only the usual dorsal bristles present; basal joint of hind tarsus slightly over half as long as second. Wing with costa ceasing at end of vein 3 and distinctly before apex of wing, second costal division about $1\frac{1}{3}$ times as long as third; second vein joining costa at an acute angle; basal section of vein 3 about one-third as long as last section of second and slightly longer than section of fourth between the cross veins; outer cross vein almost directly below middle of last section of second, and shorter than section of fourth vein anterior to its junction with that vein; last section of third vein gradually inclining forward but not distinctly bent as in *quadrissetosa*; costa with short setulose hairs to end of vein 1. Length, 1.5 mm.

Holotype.—♀, Cartago, May 25, 1909, in a ditch. Type No. 6028.

Leptocera (Limosina) quadrissetosa new species

Male.—In color rather darker than *cartagensis*. The face and cheeks are yellow and contrast more with the other parts of the insect than in the foregoing. The frons is not so noticeably pollinose and there is but little contrast between the stripes which carry the setulae and the other parts of frons. The wings are slightly grayish and the veins are more distinct, especially the costal vein which is very thick and black. Halteres yellow.

Frons with 2 orbital bristles, the lower slightly the smaller, both directed outward; several weak hairs on orbits besides the bristles; central setulae (3-4) distinct, decreasing in length anteriorly; face concave, mouth margin produced; antennae of moderate size, third joint rounded, larger than second; arista as in *cartagensis*; cheek slightly less than equal in height to breadth of third joint of antennae, one-third as high at middle as height of eye; marginal hairs rather numerous, in a double row, no central strong bristles on cheek, vibrissa strong, incurved. Mesonotum with 2 pairs of dorso-centrals; disk with numerous short setulae arranged in about 12 rows; scutellum subtriangular in outline, disk bare, 4 marginal bristles present, the basal pair slightly the weaker; disk slightly flattened. Abdomen cylindrical, shorter than thorax; hypopygium knob-like; the surfaces of all segments with numerous hairs. Legs rather stout; fore tarsi with the last 3 joints slightly flattened; mid tibiae with the usual dorsal bristles rather weak, and one weak ventral bristle; hind tarsus with basal joint much dilated and over half as long as the less dilated second joint. Wings with costa carried well beyond end of vein 3 but ceasing abruptly well before wing tip, very thick from end of first vein and tapering from end of second to its apex; second costal division slightly longer than third; angle at junction of vein 2 with costa obtuse; last section of vein 2 equal to $2\frac{1}{2}$ times the

length of basal section of 3, basal section of 3 slightly longer than section of four between the cross veins; outer cross vein at before end of vein 2 and over half as long as section of 4 between cross veins; last section of vein 3 gradually but distinctly bent forward and ending well in front of wing tip; vein 4 very indistinct beyond outer cross vein, vein 5 only traceable for a short distance beyond that point; costa slightly hairy on its whole length but more distinctly so to end of first vein. Length, 1.5 to 2 mm.

Holotype.—♂, Cartago, January 3, 1910, sweeping over mud. Type No. 6029.

Paratypes.—One male and one female with same data.

Leptocera (*Limosina*) *rectangularis* new species (Fig. 5.)

Female.—Black shining. Anterior margin of frons, third antennal joint; cheeks, and tibiae brownish, fore coxae, trochanters, and bases of all femora yellowish. Wings slightly fuscous. Halteres black-brown.

Frons convex; lower orbital bristle distinctly weaker than the upper, both directed outward; orbits otherwise bare; central setulae strong (3-4), hardly reduced in size anteriorly; antennae of moderate size; third joint larger than second, rounded; second joint with the apical bristles distinct; arista hair-like, pubescent, almost twice as long as width of frons, antennae divergent but standing well clear of the eyes; face produced between the antennae, concave in profile, the mouth margin slightly produced; cheek about one-fourth as high as eye, marginal numerous but weak, arranged irregularly; no strong bristle on middle; vibrissa strong, incurved; eye bare, distinctly higher than long. Mesonotum with only 1 distinct pair of dorso-central bristles; post-humeral bristle absent; disk with about 14 rather irregular rows of short setulae; scutellum as in *quadrisetosa*. Abdomen ovate, shorter than thorax. Legs moderately strong; fore tarsi slightly thickened; mid tibia with a weak ventral bristle and the usual dorsal bristles. Wings venation as in figure 3. Length, 2 mm.

Holotype.—♀, Juan Viñas, May 2, 1910, forest brook, 3300 feet altitude. Type No. 6030.

Paratypes.—Cartago, January 3, 1910, sweeping over mud (♂ allotype); 2, Juan Viñas, May 2, 1910; 1, Akajuela, September 15, 1909.

The allotype differs from the male of the next species in having the hypopygium larger and the last abdominal segment with a very long hair on either side, as well as in being colored as the female.

Leptocera (*Limosina*) *regularis* new species

This species is similar to *rectangularis* in most respects, but differs in being distinctly smaller (1.5 to 1.75) and in the much paler color of the face, antennae, legs and halteres, which are yel-

lowish, slightly obscured by brown. The cheeks are also rather higher than in the foregoing and the wing veins are yellowish. The very conspicuous hair on the lateral margins of the last abdominal segment in *rectangularis* is not noticeable in this species. In all other respects the species are practically identical.

Holotype.—Juan Viñas, May 3, 1910, near brook, forest edge, 2500 feet altitude. Type No. 6031.

Paratypes.—3 specimens Juan Viñas, May 1-2, 1910, forest brook, 2500 feet altitude; 1 specimen, Alajuela, September 9, 1909, swept at 3100 feet altitude, and one specimen same locality on September 15, 1909; 1 specimen, Filadelfia, January 18, 1910; 1 specimen, Cartago, February 19, 1910.

Leptocera (Limosina) bisecta new species .

Male.—Similar to the foregoing in color except that the halteres are yellow.

Frons opaque, grayish pollinose between the stripes on which the bristles are situated; lower orbital bristle slightly the weaker; central bristles 3 or 4 in number, decreasing slightly in size anteriorly; antennae divergent, but standing well clear of the eyes, of moderate size, third joint larger than second, pilose, yellowish on interior surface; arista tapering, pubescent, slightly more than $1\frac{1}{2}$ times as long as width of frons; face concave, covered with grayish pollen; cheek less than one-third the height of eye, vibrissa strong, marginal hairs weak, buccal bristle present, pointing upward. Mesonotum with 2 pairs of dorso-centrals, the anterior pair weak, situated very widely apart at about midway on disk; post-humeral bristle absent; sternopleural bristle of moderate length; scutellum with 4 bristles. Abdomen cylindrical, shorter than thorax; hypopygium glossy black, very large, with 2 projecting ventral appendages, which are thorn-like in appearance, surface covered with short hairs. Fore tarsi slightly broadened; mid tibial bristles of moderate strength, no ventral bristles present; basal joint of hind tarsus about half as long as second. Wing with second costal division about equal to third in female, slightly shorter in male; costa carried very little beyond end of third vein; penultimate sections of veins 3 and 4 subequal; last section of third vein straight, ending slightly before wing tip; outer cross vein at about twice its own length from inner and slightly before end of second vein; veins 4 and 5 indistinct from very little beyond outer cross vein; costa with weak hairs. Length, 1.75 to 2 mm.

The female agrees except in the sexual organs and as pointed out in description. Three of the specimens in the series have the buccal bristle absent, but I believe from their condition that it has been rubbed off.

Holotype.—♂, Cartago, December 12, 1909, sweeping over muddy road. Type No. 6032.

Paratypes.—1 ♂ 1 ♀, same data as holotype; 1 ♂, Cartago, December 4, 1909; 1 ♀, Cartago, January 3, 1910, and 1 ♂, same locality, October 10, 1909; 1 specimen, Cartago, November 21, 1909; 2, Cartago, February 19, 1910.

Leptocera (Limosina) inaequalis, new species

Male.—Brown, opaque, only the hypopygium shining. Face, cheeks, antennae, pleural sutures, and legs reddish yellow, more or less obscured with brown. Wings clear, costal vein black, the others pale brown. Halteres yellow.

Frons almost identical to that of *bisecta*; antennae as in that species; arista pubescent, about $1\frac{1}{4}$ as long as width of frons; face concave; cheek increasing much in height posteriorly; buccal bristle distinct, marginal hairs very weak, vibrissa strong. Mesonotum with 3 pairs of dorso-centrals, the anterior 2 pairs weak; post-humeral bristle absent; discal setulae as in *bisecta*, numerous and of moderate strength; sternopleural bristle as in that species; scutellum with 4 bristles. Hypopygium smaller than in *bisecta* and without any projecting ventral appendages. Fore tarsus with the 3 apical joints about as broad as long, the whole tarsus slightly flattened; hind tarsus stout, the basal joint much dilated; bristles as in *bisecta*. Wing with second costal division about $1\frac{1}{2}$ times as long as third; second vein joining costa at a very acute angle; costa ending abruptly at third vein; basal section of third vein slightly longer than penultimate section of fourth, outer cross vein about two-thirds as long as the latter, and at slightly beyond middle of last section of second vein; veins 4 and 5 distinct for a short distance beyond outer cross vein, the former traceable to wing margin; vein 3 almost straight on its last section, but with a distinct upward inflection and ending distinctly before wing tip; costa with short hairs to end of first vein. Length, 1.25 mm.

Holotype.—♂, Cartago, October 10, 1909, swept over mud. Type No. 6033.

Paratype.—Cartago, January 3, 1910, swept over mud.

Leptocera (Limosina) fontinalis Fallen

1826. *Copromyza fontinalis* Fallen, Dipt. Succ., Suppl. II, 16.

This species is represented in the material by specimens from the following localities: Cartago, October 27, 1909 to February 19, 1910, 23 specimens; Cañi, March 9-10, 3 specimens; near Isidro, August 21, 1909, 1 specimen; La Carpintera, December 4, 1910, 1 specimen.

The species is very widely distributed both in the old and in the new world and is generally met with near to marshy places or amongst decaying vegetation or manure.

Leptocera (*Limosina*) *marginalis* new species

Male.—Black, slightly shining. Face and cheeks brownish, obscured by grayish pollen; frons black, opaque except on the stripes on which the bristles are; antennae with third joint yellowish brown. Mesonotum and scutellum with slight traces of yellowish gray pollen; pleura subopaque, brown-black, sutures yellowish. Legs fulvous, fore tarsi, hind femora and tibiae brownish. Wings slightly browned, veins thick and brown. Halteres yellow.

Frons convex, distinctly over half the width of head; the pair of orbital bristles strong and of equal size; several weak hairs on orbits; central bristles strong and distinctly increasing in length anteriorly; face keeled, almost perpendicular in profile; labrum distinct; antennae of moderate size, standing well clear of apex; arista about $1\frac{1}{2}$ times as wide as frons, pubescent; cheek broad, slightly less than half as high as eye; buccal bristle strong, a weaker upturned bristle posterior to it, the marginal hairs not very numerous, but setulose. Post-humeral bristle strong, incurved; 3 distinct pairs of dorso-centrals present; scutellum with 4 strong and 4 weak marginal bristles and several setulose hairs on lateral margins of disk. Abdomen much shorter than thorax, cylindrical; hypopygium not projecting, its surface with short hairs, last abdominal segment with several strong bristles. Legs normal in shape; mid tibia with one bristle at middle on ventral surface and another much stronger at apex, the dorsal bristles strong; mid trochanter with a strong bristle. Wing with bristles on costa to end of first vein; second costal division $1\frac{1}{2}$ times as long as third; costa reaching to end of third vein; basal section of third vein subequal with penultimate section of fourth; outer cross vein at distinctly before end of second vein, and about one-third the length of the section of fourth vein before it; last section of third vein distinctly but not greatly bent forward, ending well in front of wing tip; last section of fourth vein distinct to margin of wing though not so thick as the outer veins; fifth vein carried beyond outer cross vein for a short distance. Length, 3 mm.

The female is identical with the male except in the sexual organs.

Holotype.—♂, Cartago, November 21, 1909, swept over mud. Type No. 6034.

Paratypes.—1 male, December 12, 1909, swept over muddy road, and 1 female same date as type from same locality.

Leptocera (*Limosina*) *fuscinervis* Malloch

1912. *Limosina fuscinervis* Malloch, Smiths. Miss. Coll. lix, No. 17, 6.

This species is represented amongst the Costa Rican material by specimens from the following localities: Cartago, October 27, 1909, 1 specimen; Cartago, February 19, 1910, 1 specimen; Cahí, March 10, 1910, 6 specimens taken at stagnant pool near bank of Rio Reventazon; Alajuela, September 15, 1909, swept at 3100 feet

altitude, 1 specimen; Rio Siquiara, Turrucares, December 19, 1909, 1 specimen; Juan Viñas, May 3, 1910, near brook, forest edge, 2500 feet altitude, 1 specimen.

These specimens run rather larger in size than the type in Washington but are evidently the same species. Originally described from Panama.

Leptocera (Limosina) breviseta new species (Fig. 2.)

Male.—Black, slightly shining. Frons, except on the stripes where the bristles are situated, grayish pollinose; face and cheeks gray pollinose. Mesonotum covered lightly with grayish pollen and generally with indications of a black (bare) central stripe; pleura opaque, black. Abdomen opaque black. Legs black, or with the bases of the tarsi brownish. Wings clear, veins brown. Halteres clear yellow.

Frons slightly convex; besides the 2 strong orbital bristles there are 2 or 3 setulae on inner margin of orbits; the central bristles are strong, distinctly lengthening towards anterior margin; antennae of moderate size, standing well clear of the eyes; arista pubescent, in length not exceeding the width of frons at vertex; face keeled, slightly concave in profile; labrum protruding; cheek over one-third the height of eye; buccal bristle long and strong, upcurved; vibrissa strong; eye as high as long. Mesonotum with the post-humeral bristle very strong, incurved; 3 pairs of dorso-centrals present; discal setulae numerous, acrostichals stronger than other setulae from near to anterior margin; pleura and scutellum as in *m-nigrum*. Abdomen shorter than thorax, ovate, flattened on dorsum, the second segment much elongated; hypopygium normal; apical segments of abdomen with several post-marginal bristles on lateral margins. Legs normal; mid tibia with dorsal bristles strong; 2 ventral bristles present, 1 near to middle, the other stronger at apex. Wing with venation as in figure 2; last section of third vein bend distinctly forward as in *fontinalis* Fallen. Length, 3 mm.

Holotype.—♂, Cartago, November 21, 1909, by sweeping over mud. Type No. 6035.

Paratypes.—Same locality as type, 2 specimens same date, and 1 specimen dated February 19, 1910.

Leptocera (Limosina) m-nigrum Malloch

1912. *Limosina m-nigrum* Malloch, Smiths. Miss. Coll. lix, No. 17, 7.

There are specimens of this species amongst the Costa Rican material from the following localities: Filadelfia, muddy beach of Rio Tempisque, January 18, 1910, 14 specimens; Cartago, from October 10, 1909, to February 19, 1910, 65 specimens; Peralta Station, August 10, 1909, 1 specimen; 1 specimen from Alajuela, September 9, 1909; La Carpintera, December 1, 1909, 3 specimens;

Cachi, March 9-10, 5 specimens; and 1 specimen from Turrueares, December 19, 1909.

Originally described from Panama.

Sphaerocera pallipes Malloch

1914. *Sphaerocera pallipes* Malloch, Ent. News, xxv, 31.

A single specimen taken at Turrueares, December 20, 1909, by sweeping over mud of a small stream north of Rio Siquiares. Agrees with the typical description except that the third and fourth veins are parallel.

PHORIDAE

Dohrniphora setigera new species

This species may be separated from *venusta* and its allies by the following characters:

Black, glossy; antennae and palpi yellow; abdomen opaque black; anal protuberance yellow; legs yellow more or less obscured with brown. Halteres black. Wings slightly infuscated at apex and along costa.

There are 2 strong post-antennal bristles on frons; the arista is almost bare; the palpi are broad and strongly bristled. The last abdominal segment has several strong posterior marginal bristles. The fore tibia has one strong bristle at basal third and a series of short setulae (6-7) from a short distance beyond it to apex; the hind tibia is bare except for a bristle at apex on dorsal surface and a series of short postero-dorsal setulae. Wings as in *venusta* but the costal bristles are about three times the length of the costal diameter. Length, 4 mm.

Holotype.—Cartago, January 3, 1910, swept over mud. Type No. 6036.

Dohrniphora venusta Coquillett

1895. *Phora venusta* Coquillett, Can. Ent. xxvii, 107.

There are a number of specimens referable to this species from Cartago and Alajuela in the material before me. They average both much larger and darker than specimens from the United States and West Indies.

NEODOHRNIPHORA new genus

This genus may be distinguished from all the other genera in the family by its possession of the following combination of characters: Frons with 3 rows of 4 bristles each, the post-antennal bristles being absent and their normal position occupied by the central pair of first row; antennae enlarged, third joint subconical,

arista terminal; proboscis not protruding; palpi normal. Scutellum exceptionally small, with 2 bristles. Male hypopygium much as in *Dohrniphora*, the anal protuberance very long, papilla like. Tibiae devoid of bristles except the apical spurs. Wings almost similar to those of *Dohrniphora* in venation.

Type of genus: *Neodohrniphora calverti* new species.

***Neodohrniphora calverti* new species**

Male.—Yellow, slightly shining. Frons brown. Mid coxae with a black spot on posterior surface. Abdomen browned on sides of segments, leaving only a narrow yellow central stripe; hypopygium brown. Wings clear, veins brown. Knob of halteres blackened.

Frons with a subtriangular depression in front of ocelli, and a weak impressed line extending anteriorly from it for a short distance; width of frons slightly over that of either eye; length of frons about $1\frac{1}{3}$ times its greatest width; central pair of bristles in preocellar row higher placed than outer pair; arista very slightly pubescent, its length equal to length of frons; palpi with a few black bristles; cheeks with several distinct bristles, no one of which is conspicuous. Mesonotum with 1 pair of dorso-centrals; scutellum 3 times as broad as long; anterior to the two strong bristles there are 2 very weak hairs on the lateral margins. Hypopygium large and knob-like, anal protuberance with 2 long end bristles. Legs normal in shape; fore coxa with 2-3 black bristles at apex; mid and hind coxae with more numerous and longer bristles at apices; hind femora with 2-3 long black bristles on basal half of ventral surface; all tibiae without distinct bristles or rows of setulae. Costa distinctly short of wing middle, first division almost $1\frac{1}{2}$ times as long as 2-3; angle at fork of third vein acute; third section of costa about half as long as second; fringe fine and close; fourth vein almost straight at base and ending almost at wing tip. Length, 1.75 mm.

Holotype.—Alajuela, September 15, 1909, 3100 feet altitude. Type No. 6037.

This genus bears a resemblance to *Dohrniphora* Dahl, but the weak proboscis, small scutellum, and absence of leg bristles readily separate it from that genus.

Named in honor of Dr. P. P. Calvert.

***Hypocera crassineura* new species**

Male.—Black. Frons glossy; thorax shining; abdomen dull black; hypopygium glossy, brownish. Antennae and palpi yellowish. Legs yellow-brown, mid and hind femora blackened, shining. Wings clear, costa and first and third veins black, the other veins indistinct. Halteres brown-black, yellowish at base of stalk.

Frons convex, distinctly broader than long; post-antennal bristles weak; three rows of bristles of 4 each on frons; antennae of moderate size, third joint rounded; arista shortly pubescent, its length equal to over $1\frac{1}{2}$ times

the width of frons; palpi small, moderately bristled; vertex not raised; ocellar region not raised. Mesonotum with 1 pair of dorso-centrals; scutellum very small, with 2 long marginal bristles. Hypopygium exerted, of moderate size; anal protuberance but slightly protruding, hairy. Legs rather thick; fore tarsi thickened distinctly, the basal joint noticeably so; hind femora much thickened; fore tibia without bristles; mid tibia with the usual 2 at basal third, which are rather weak; hind tibia with 1 at middle on antero-dorsal surface. (These are all the bristles I can detect on the type, but the legs are in awkward positions for examination.) Costa to middle of wing, first division of costa slightly longer than second, fringe short, about equal in length to diameter of costal vein; third vein thickened, distinctly broader than costal vein; fourth vein gently arcuated, ending at a little before wing tip; veins 6-7 indistinct at apices. Length, 1.25 mm.

Holotype.—Alajuela, September 15, 1909, 3100 feet altitude, by sweeping. Type No. 6038.

Apocephalus curvinervis new species (Fig. 1.)

Female.—Yellow, slightly shining. Frons brown, paler anteriorly. Antennae, proboscis, and palpi yellow. Abdomen with basal two-thirds of each segment dull black, apical third of each segment yellow; ovipositor brown-black, shining. Legs entirely yellow. Wings clear, costa browned beyond apex of third vein; veins brown, 4 and 5 slightly infuscated. Halteres yellow, knobs black.

Frons slightly longer than broad; vertical row of bristles normal, pre-ocellar row with the two center bristles in transverse line with lower margin of anterior ocellus, the outer pair close to eye margin and distinctly lower on frons; front row consisting of two large, divergent, post-antennal bristles which are not very closely approximated, and an outer pair close to eye margins distinctly above the level of these; surfaces of frons with numerous short setulae; ocelli very well developed; antennae of moderate size, third joint pear shaped, its apex not extending beyond the level of base of post-antennal bristles; arista bare, basal joints swollen and distinct, total length of arista equal to that of frons; proboscis small; palpi small with very few bristles; eye facets becoming larger as they near lower margin. Pleura bare; scutellum in type without any bristles, nor can I trace any marks that would indicate that there have been any present, though normally I should expect that there should be 2. Abdomen elongate, the ovipositor slightly longer than high, knife-shaped, the upper surface at apex with 2 small knob-like protuberances which have a few hairs on their surfaces. Legs elongate; hind femora with 3-4 bristly hairs on their basal fourth; hind tibial setulae very short, but distinct. Wing venation as in figure 1; fourth vein leaving at slightly beyond fork of third and bent downward at apex; costal fringe very short. Length, 2.5 mm.

Holotype.—Alajuela, September 15, 1909, swept at 3100 feet altitude. Type No. 6039.

If this species really has no scutellar bristles it will be peculiar in this respect, and I cannot trace any indications of their presence in the type specimen.

PARAPHIOCHAETA new genus

This genus may be distinguished from *Aphiochaeta* Brues, which has *nigriceps* Loew as type, by the presence of two rows of setulae on the hind tibiae (fig. 5), instead of the single row which is present in all the species in *Aphiochaeta*.

Type of genus: *Paraphiochaeta biseriata* new species.

Paraphiochaeta biseriata new species (Fig. 5.)

Male.—Reddish yellow, slightly shining. Abdomen with a large brown subtriangular mark on either side of each segment anteriorly, which show indications of coalescing. Legs entirely yellow. Wings yellowish tinged. Halteres yellow.

Frons narrow, occupying about $1\frac{1}{3}$ as wide a space as either eye, its length distinctly more than equal to its greatest breadth; only 1 pair of post-antennals present; central pair of bristles of first row slightly below level of post-antennals and nearer to those than to eye margin, outer pair close to eye margin and situated much higher on frons; central pair of second row about midway between outer pairs of first and second rows; antennae small, third joint oval; arista slightly pubescent, in length slightly exceeding length of frons; palpi normal in size, moderately bristled; proboscis normal; cheek bristles short. Mesonotum with 1 pair of dorso-centrals; mesopleura with numerous short setulae and three bristles on posterior upper margin which increase much in length from the lower to the upper bristle; scutellum with 4 subequal bristles, the middle pair situated on disk instead of on margin as is usual. Second abdominal segment slightly the longest, its lateral surfaces with a few bristles; hypopygium normal in size, and protuberance of moderate size. Legs slightly elongated; fore coxae with 3-4 long black bristles at their apices; mid tibia with the antero-dorsal row of setulae confined to the basal half, the postero-dorsal row entire; hind tibia with both rows entire, the postero-dorsal row (10-11) much the strongest. Wings rather narrow, their length being equal to $2\frac{1}{2}$ times their greatest width; costa extending to three-fifths the wing length, first division about two-thirds as long as second; fourth vein leaving at fork of third with a slight bend and ending with a slight droop at almost the wing tip; costal fringe very close and fine, in length barely exceeding the diameter of costal vein. Length, 2.75 mm.

Holotype.—Bonnetil Farm, Rio Surubres, October 16, 1909. Taken by sweeping at 800 feet altitude. Type No. 6040.

This genus will include several other American species which I placed in my "Group C," in my paper dealing with the Phoridae in the U. S. National Museum.

APHIOCHAETA Brues

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pilosa new species	

- Costa with distinct, though short, setulae; legs not particularly hairy, hind tibial setulae distinct.....*rectangulata* new species
13. Black-brown species; hind tibial setulae very long, equalling at their longest part the diameter of tibia.....*exaltata* new species
- Yellow species; hind tibial setulae generally very much shorter than diameter of tibia.....*lutea* Meigen

Aphiochaeta femoralis Enderlein

1912. *Aphiochaeta femoralis* Enderlein, Ent. Zeit., 1912, 39.

There are 3 specimens belonging to this species in the material before me from the following localities: Alajuela, September 8, 1909, 3100 feet altitude, swept over brook; near Cartago, December 15, 1909, south slope of Irazú, over mud, 5000 feet altitude; and Turrucaras, December 22, 1909, swept over mud.

To the description given by Enderlein I may add that the mesopleura are bare.

Aphiochaeta littoralis new species

Male.—Shining black. Frons glossy black, palpi yellow. Legs black-brown, fore pair, including coxae, yellow, bases of mid and hind tibiae yellowish. Wings yellow at base, veins brown. Halteres black.

Lower pair of post-antennal bristles about three-fourths as large as upper pair; first row of frontal bristles convex; antennae of average size; palpi large, rather strongly bristled. Scutellum with 2 bristles; mesopleura bare. Abdomen rather broad, soft haired; anal protuberance yellow, large. Legs strong; fore tarsi slightly thickened; hind femur with 2-3 short bristles on ventral surface at apical third; hind tibial setulae (8-9) increasing in size from base to near apex, the largest slightly shorter than tibial diameter. Costa to beyond wing middle; first division shorter than second, the angle formed by junction of first vein with costa acute; fork of third vein at an obtuse angle; fourth vein leaving at beyond fork of third with a decided curve and ending slightly recurved at in front of wing tip; costal fringe long, close and rather shaggy. Length, 1.75 mm.

Holotype.—♂ near San Isidro, August 21, 1909, swept near river. Type No. 6041.

Paratype.—Same data.

Aphiochaeta polita Enderlein

1912. *Aphiochaeta polita* Enderlein, Stett. Ent. Zeit., 1912, 39.

There are 2 specimens referable to this species amongst the material I have before me from Alajuela, September 8, 1909, swept over brook, 3100 feet altitude.

The mesopleura in this species are bare.

Aphiochaeta pruinosa new species

Male.—Black shining. Frons covered with grayish pollinosity, palpi yellow. Mesonotum slightly pollinose; pleura shining, the upper third pollinose. Abdomen colored as mesonotum; anal protuberance yellow. Legs black-brown, fore pair and bases of posterior pairs of tibiae yellowish. Halteres yellow. Wings clear, veins black-brown.

Frons with distinct central furrow, as in *litoralis*, lower post-antennal bristles minute, upper pair and all frontal bristles strong; central bristles in first row distinctly lower on frons than outer pair; third antennal joint above the average size; arista pubescent, slightly lower than frons; palpi normal in size and bristling. Scutellum with 4 bristles, the basal pair the weaker; mesopleura bare. Abdomen rather broad; second segment with 4-5 lateral bristles; anal protuberance large, the apical hairs present. Legs stout; fore tarsi slightly broadened throughout their entire length; hind femora bare ventrally at apex; hind tibial setulae of moderate strength. Costa to slightly short of wing middle; first division distinctly, but not greatly larger than 2+3; the angle at junction of vein 1 with costa obtuse; fork of third forming an obtuse angle; fourth vein gently arcuate; costal fringe close and of moderate length, each bristle being about 3 times as long as costal diameter. Length, 2 mm.

Holotype.—Near Cartago, December 15, 1909, south slope of Irazú, over mud. Type No. 6042.

Aphiochaeta sylvicola new species

Female.—Shining brown-black. Frons slightly pollinose; antennae brown; palpi yellow. Mesonotum slightly pollinose; pleura glossy, the upper portions pollinose. Abdomen opaque black. Legs brown, fore pair, including coxae, clear yellow, mid and hind pairs with tibiae yellowish. Wings clear, veins brown. Halteres black-brown.

Frons slightly broader than long; central furrow distinct; lower pair of post-antennal bristles very minute, upper pair strong; central pair of bristles in first row almost in transverse line with upper post-antennals and slightly lower than outer pair in same row, the latter more widely separated from the central pair than that pair are from the post-antennals; surface hairs on frons very short and close; antennae normal in size and shape; arista pubescent, distinctly longer than frons; palpi as large as third antennal joint, moderately bristly. Mesonotum with short dark surface hairs; mesopleura bare; scutellum with 2 bristles and 2 weak hairs. Abdomen ovate; second segment with 3-4 hair-like bristles on lateral margins. Fore tarsi slightly thickened; hind femora with short hairs on the ventral surface; hind tibial setulae 8-9 in number, increasing in size to beyond middle and then slightly decreasing, the longest part not equal to the tibial diameter. Wing with costa to distinctly beyond middle, first and second costal divisions subequal, angle of fork of third vein acute; fourth vein leaving with a gentle curve at slightly beyond fork and ending, recurved, at well in

front of wing tip; costal fringe about twice the length of costal diameter; regular and close. Length, 2 mm.

Holotype.—Juan Viñas, May 2, 1910, forest brook, 3300 feet altitude. Type No. 6043.

Aphiochaeta flavopleura new species

Female.—Shining brownish yellow. Frons glossy dark brownish; antennae yellowish; palpi yellow. Pleura pale yellow, becoming darker on upper third. Abdomen opaque dark brown. Legs yellow, the posterior pair slightly obscured with brown. Wings with a slight yellow tinge, veins brown. Halteres black-brown.

Frons with distinct central furrow; lower pair of post-antennal bristles about half as large as the strong upper pair; central pair of bristles in first row incurved, situated in transverse line with the upper post-antennals and almost directly in vertical line with the outer pair in same row; surface hairs not so close and larger than in *sylvicola*; antennae normal; arista pubescent, distinctly longer than frons; palpi narrow, the bristles rather numerous and strong. Mesopleura bare; scutellum with 2 bristles. Abdomen slender, second segment without distinct bristles. Legs normal; hind tibia without distinct setulae. Wings with costa to beyond middle, first division slightly shorter than second; angle at apex of first vein acute; angle at fork obtuse, almost a right angle; fourth vein leaving at beyond fork with a slight bend and ending, recurved, at well in front of wing tip; costal fringe about 4 times as long as costal diameter. Length, 1.5 mm.

Holotype.—♀, Rio Siquiaries, Turrucares, December 19, 1909. Type No. 6044.

Paratype.—Alajucla, September 8, 1909, sweeping over brook, 3100 feet altitude.

Aphiochaeta latimanus new species

Male.—Black-brown shining. Frons glossy, almost black; palpi brown. Pleura yellowish brown, shining. Abdomen opaque, black. Legs brownish yellow. Wings slightly grayish, veins heavy, brown. Halteres black-brown.

Frons with distinct central furrow; lower pair of post-antennal bristles almost as large as upper pair; central pair of bristles in first row slightly below upper post-antennals and well below the outer pair in same row though not nearly in vertical line with these; surface hairs on frons rather long; antennae small; arista pubescent, distinctly longer than frons; palpi larger than antennae, strongly bristled. Mesopleura with numerous short bristles; scutellum poorly preserved but with 2 bristles remaining. Abdomen tapering, second segment without distinct bristles, surface of all segments slightly haired; anal protuberance not large. Legs with fore tarsus flattened, joints 2 and 3 subequal, both together shorter than metatarsus, and equal to joint 4 which is subequal with 5; hind tibial setulae distinct

but not strong. Wings with costa to middle; first division subequal with second, angle at apex of first vein slightly obtuse; angle at fork of third obtuse; third section of costa about one-third as long as second; fourth vein as in *flavopleura*; costal fringe very long, about 6 times as long as costal diameter; only about 7 bristles from end of vein 1 to fork. Length, 1.5 mm.

Holotype.—Cartago, October 10, 1909, sweeping over mud. Type No. 6045.

Aphiochaeta alajuelensis new species

Male.—Almost identical in coloration with *flavopleura*, the halteres only being rather paler in color.

Frons with distinct central furrow; lower pair of post-antennal bristles very small, upper pair strong; center pair of bristles in first row incurved, situated very close to outer pair and comparatively far separated from the post-antennals; surface hairs short and numerous; antennae of good size, third joint slightly pointed; arista shortly pubescent, its length slightly more than equal to that of frons; palpi larger than third antennal joint, strongly bristled. Abdomen tapering; surface with pale hairs; hypopygium of moderate size; anal protuberance normal, yellow; ventral organs protruding, pale yellow. Fore tarsus normal; hind tibial setulae distinct but weak. Wing with costa to middle; first division slightly longer than second, angle at apex of vein 1 acute; angle at fork obtuse; fourth vein as in *latimanus*; costal fringe long, about equal in length to four times the costal diameter, 5-7 bristles from end of vein 1 to fork. Length, 1.5 mm.

Holotype.—♂, Alajuela, September 15, 1909, swept, 3100 feet altitude. Type No. 6046.

Paratypes.—1 male same locality as type, swept over brook, September 8, 1909; one female, Turrucare, December 22, 1909, swept over mud.

Aphiochaeta seticauda new species

Male.—Black-brown, subshining. Frons almost black, the surface pollinose. Antennae brownish yellow; palpi yellow. Pleura yellow, upper portions brownish. Abdomen opaque, posterior margin narrowly yellow; anal protuberance clear yellow. Legs yellow, apices of hind femora black. Wings clear, veins yellowish. Halteres with brown stalk and lemon yellow knob.

Frons with very distinct central furrow; only 1 pair of distinct post-antennals present; central pair of bristles in first row situated well below level of outer pair and much nearer to center of frons; outer pair not very close to eye margin; surface hairs very short; antennae large, about $\frac{1}{3}$ as large as eye, third joint oval, darkened above; arista about $1\frac{1}{2}$ times as long as frons, indistinctly pubescent; palpi smaller than antenna, moderately bristly. Mesopleura bare; scutellum with 2 bristles. Abdomen broad at base, tapering posteriorly; second segment elongated, 3-4 distinct bristles on lat-

eral margins. Hypopygium very large, laterally with several strong bristles; anal protuberance very long, its surface with numerous hairs, apical hairs present. Legs strong, fore tarsi normal; posterior tibia with strong setulae, almost equalling the tibial diameter. Costa to slightly short of wing middle; first costal division distinctly shorter than second; angle at apex of vein 1 not acute; fork of third vein very small, the enclosed space not broader than the veins enclosing it; fourth vein slightly bent at base, and running almost straight to wing margin, ending at slightly in front of wing tip; costal fringe about $1\frac{1}{2}$ times the costal diameter. Length, 2.25 mm.

Female.—Similar to the male except in the form of the abdomen.

Holotype.—♂, South slope of Irazú, near Cartago, 5000 feet altitude, December 15, 1909. Type No. 6047.

Allotype.—♀, same locality and data.

Aphiochaeta pilosa new species (Fig. 4.)

Female.—Black-brown. Antennae and palpi brownish yellow. Legs reddish yellow. Halteres yellowish. Wings clear, veins yellow, those on disk of wing very pale. Bristles and hairs yellow.

Frons with the suture indistinct; post-antennal bristles almost erect, rather weak; first row of bristles as in previous species; surface hairs long; third antennal joint globose, rather small; arista swollen at base, pubescent, in length about equal to length of frons; palpi narrow, moderately bristled. Mesonotum with the surface hairs of good length; pleura and scutellum in poor condition. Abdomen narrow, surface with yellow hairs. Legs rather long, fore tarsi thickened, throughout their entire length as wide as tibia; hind tibia without any dorsal ridge or setulae, mid tibial spur weak, hind tibia with apical spurs very minute; all legs with soft surface hairs. Wing with costa to distinctly beyond middle, first division subequal with second, angle at apex of vein 1 not acute; angle of fork very obtuse, almost rectangular, the inner branch very thin and weak; fourth vein leaving at fork with a distinct bend and running nearly straight to near wing tip; costa very short and close haired (fig. 4). Length, 1.5 mm.

Holotype.—Alajuela, September 8, 1909, swept over brook, 3100 feet altitude. Type No. 6048.

This species may really belong to the genus *Beckerina*, but from its rather unsatisfactory condition I am unable to say definitely.

Aphiochaeta rectangulata new species

Female.—Yellow. Frons brown, surface pollinose; antennae reddish yellow, palpi clear yellow. Mesonotum slightly shining reddish yellow; pleura yellow. Abdomen brownish, the dorsum yellow. Legs yellow. Wings clear; veins brownish yellow. Halteres yellow.

Frons with distinct central furrow; lower post-antennal about half the size of the strong upper pair; center pair of bristles in first row distinctly

below the outer pair and nearer to them than to the post-antennals; surface hairs very short; antennae normal; arista pubescent, longer than frons; palpi normal. Mesopleura bare; scutellum with 2 bristles. Anal segments bristled at the apices. Legs normal; hind tibial setulae about half as long as the diameter of tibia. Wing with costa to middle; first costal division equal to 2+3; angle at apex of vein 1 acute; fork of third vein almost rectangular; fourth vein arcuate, finishing in front of wing tip; costal fringe about three times as long as diameter of costa. Length, 1.25 mm.

Holotype.—Alajuela, September 15, 1909, swept at 3100 feet altitude. Type No. 6049.

***Aphiochaeta exaltata* new species**

Female.—Black-brown, shining. Frons slightly pollinose; antennae brownish yellow; palpi yellow. Abdomen black, shining at apex. Legs black-brown, fore legs paler, the tibiae and tarsi yellowish; apices of mid and hind femora yellow, mid tibia yellowish, base and apex of hind tibia yellow, tarsi yellow. Wings clear, veins black-brown. Halteres with yellow knobs.

Frons with distinct suture; upper pair of post-antennal bristles widely separated and placed very high on the frons being about in line with midway between the central and outer bristles of first row; lower post-antennals very close together and about three-fourths as large as upper pair; central pair of bristles in first row much lower on frons than outer pair and not much further from eye margin than these; surface hairs short; antennae small, third joint round; arista pubescent, distinctly longer than frons; palpi slightly dilated, moderately bristly. Mesopleura bare; scutellum with 2 bristles. Abdomen with the segments subequal; the lateral margins of second segment with only weak hair-like bristles. Legs very strong, hind femora dilated; fore tibia with dorsal setulae; hind tibial setulae very strong; hind tibia with double row of setulae. Wing with costa to wing middle, first division slightly shorter than second; angle at apex of first vein acute; fork of third weak rather acute; costal fringe strong and long; fourth vein leaving at slightly before fork, curved at base and ending well in front of wing tip. Length, 1.75 mm.

Holotype.—Alajuela, September 8, 1909, swept over brook, 3100 feet altitude. Type No. 6050.

***Aphiochaeta lutea* Meigen**

1830. *Phora lutea* Meigen, Syst. Besch., vi, 219.

There are four specimens amongst the material before me which evidently belong to this species. The localities are: Rio Siquiars, Turrucars, August 14, 1909, 2200 feet altitude; Rio Surubres, October 21, 1909, 2 specimens by sweeping at 800 feet altitude; and 1 near Tierra Blanca, April 6, 1910.

Puliciphora flava new species

Male.—Yellow. Abdomen dark brown. Wings clear, veins brown. Halteres yellow.

Frons weakly bristled, the surface with yellow hairs; arista pubescent, longer than width of frons; palpi of good size, distinctly bristled. Scutellum with 2 bristles. Hypopygium large and protruding. Legs strong and long; mid and hind tibial spurs very minute. Wings with costa to distinctly beyond the middle; first costal division half as long as second, costal fringe shorter than diameter of costal vein; fourth vein almost straight, seventh vein distinct. Length, 1 mm.

Holotype.—Rio Siquiares, Turrucare, August 14, 1909, 2200 feet altitude. Type No. 6051.

*
AGROMYZIDAE**Agromyza meridionalis** new species

Female.—Shining black. Head yellow, only the ocellar region, orbits posteriorly, and back of head black; arista darkened. Mesonotum with lateral margins broadly lemon yellow, the upper margins of pleura and central vertical suture narrowly margined with same color. Legs shining black, only the fore knees narrowly yellowish. Wings slightly grayish, veins black. Squamae and halteres lemon yellow.

Frons narrow, distinctly narrower than width of either eye; four orbital bristles present; orbits bare except for the large bristles; antennae of moderate size, second joint with distinct dorsal bristle, third joint rounded in front; arista tapering at base, slightly pubescent, its length equal to from its base to vertex; cheek at posterior margin slightly more than equal to width of third antennal joint, marginal hairs distinct; vibrissa slightly differentiated; eyes higher than long, bare. Mesonotum with 2 distinct pairs of dorso-central bristles, the disk covered with numerous short setulae, the pair of bristles usually present between the posterior dorso-centrals not differentiated from the other setulae. Legs stout; the normal pair of bristles on posterior surface of mid tibiae very weak. Wings with costa to fourth vein; veins 3-4 divergent; fourth vein ending at wing tip; inner cross vein at slightly beyond middle of discal cell; outer cross vein at about its own length from inner and directly below end of first vein; last section of fifth vein rather more than twice as long as penultimate section. Length, 1.5 mm.

Holotype.—♀, Alajuela, September 15, 1909, taken by sweeping at an altitude of 3100 feet. Type No. 6052.

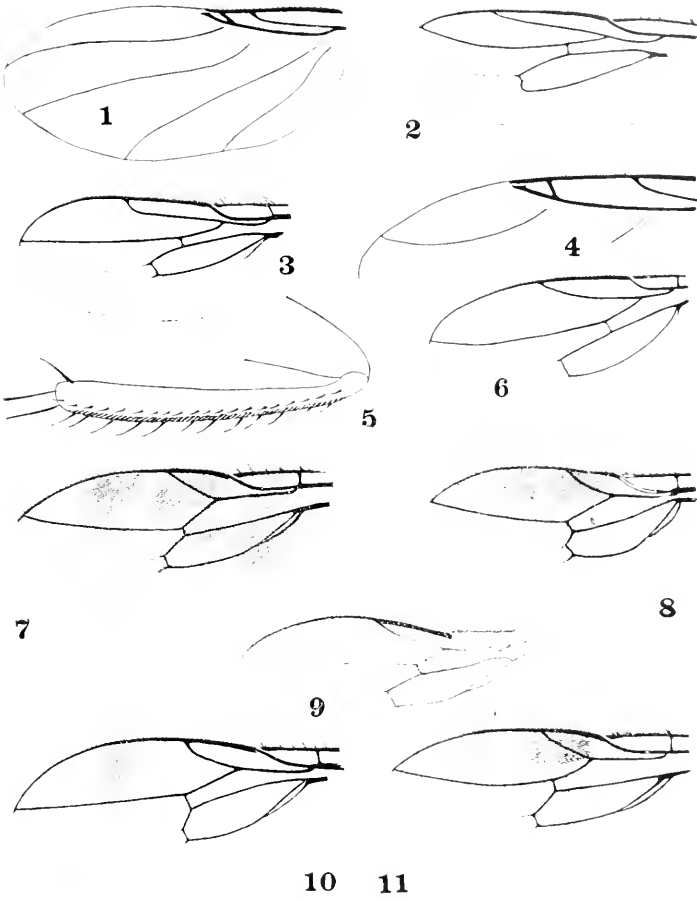
Paratypes.—3 specimens with same data.

This species belongs to the same group as *platyptera* Thomson, but the color of the antennae, long arista, and bristling of the mesonotum readily separate it from that species. In its stout build and black legs, as well as the wing venation it most closely resembles *platyptera* amongst the American species.

EXPLANATION OF PLATE I

- FIG. 1.—*Apocephalus currinervis*, wing $\times 35$.
 “ 2.—*Leptocera breviseta*, wing $\times 35$.
 “ 3.— “ *rectangularis*, wing $\times 35$.
 “ 4.—*Aphiochaeta pilosa*, wing in part $\times 55$.
 “ 5.—*Paraphiochaeta biseriata*, hind tibia $\times 55$.
 “ 6.—*Leptocera pallicornis*, wing $\times 35$.
 “ 7.— “ *vittata*, wing $\times 55$.
 “ 8.— “ *poeciloptera*, wing $\times 55$.
 “ 9.— “ *varicosta*, wing in part $\times 55$.
 “ 10.— “ *monticola*, wing $\times 55$.
 “ 11.— “ *meridionalis*, wing $\times 55$.

Note that the magnification is linear.



MALLOCH COSTA RICAN DIPTERA

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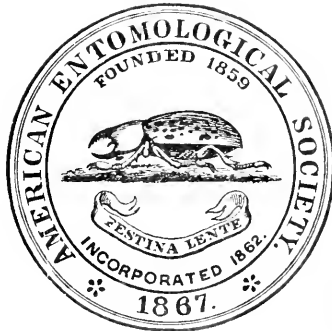
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PHILADELPHIA

SUBSCRIPTION PRICE FOUR DOLLARS PER VOLUME

A REVISION OF THE ORTHOPTEROUS GROUP INSARAE (TETTIGONIIDAE, PHANEROPTERINAE)

BY JAMES A. G. REHN AND MORGAN HEBARD

Recent extensive collections made in the southwestern United States by the authors have afforded so much material of this little known group, that it has been deemed advisable to study all of the forms and the results of this work are presented in the present paper.

The group Insarae (Hormiliae of Authors) belongs to the family Tettigoniidae and the subfamily Phaneropterinae, in Brunner's classification being preceded by the Tylopsiae and followed by the Scudderiae.

The Insarae are distinguished by the tympanum of the cephalic tibiae being open on both sides, while the limbs are long and slender and the femora have the genicular lobes more or less decidedly produced. The pronotum has the lateral lobes either angularly or roundly inserted, in which latter case it is more or less decidedly sellate. The subgenital plate of the males bears two disto-lateral processes, which in different species are mere tubercles or rather long processes, constituting non-articulate styli-form appendages or articulate styles. The ovipositor is short, strongly compressed and more or less decidedly arcuate or bent-arcuate, with dorsal and ventral margins serrate or serrulate distad and having the distal portion of the disk also more or less armed or roughened. No apterous species are known and there is but one species having the tegmina aborted and the wings concealed in the male sex. Certain species are strongly dimorphic in wing length.

The rimate tympanum of the cephalic tibiae readily separates the Tylopsiae from the present group.

The Scudderiae differ in having the male subgenital plate very long and attenuate, curved dorsad with the caudal margin emarginate or fissate (excepting in some species of *Symmetropleura*). The American species of the genus *Symmetropleura* are in fact in some respects intermediate between the two groups, agreeing with the Scudderiae in the general facies, more ample pronotum, shorter limbs and more delicate tegminal venation; the subgenital plate and

cerci of the male showing, however, much closer similarity to the type found in the more northern species of *Insara*, and the armed ventro-cephalic margins of the cephalic and median femora are a not unusual condition in the Insarae, while this character is not found as pronounced elsewhere in the Scudderiae.

The colors given in the treatment of the genus *Arcthaea* are taken from Ridgway's recent "Color Standards and Color Nomenclature," in the treatment of the other genera the same authors earlier "Nomenclature of Colors" is used.

The number of specimens examined in the preparation of the present paper was 514; 282 males, 197 females, 1 gynandromorph and 34 nymphs. Of these, 263 were collected by the authors. Through the kindness of other workers and curators we have been able to have before us the historic material in America belonging to this group with but one or two exceptions, and of the few remaining historic specimens of the group now in Europe a number have also been examined. Our thanks to those who have assisted us in this work are more adequately expressed in the discussion of the material in the revisions of the larger genera.

It would have been very pleasing to furnish much more definite keys and generic descriptions, but, through study of the material before us, we have found that one can not be as definite in giving various characters as Brunner in his "Monograph der Phaneropteriden" and "Additamenta zur Monographie der Phaneropteriden," without making misleading and false statements when all of the species are considered.

KEY TO THE GENERA OF THE GROUP INSARAE

- A. Cephalic and median femora not subcarinate disto-dorsad. (Lateral lobes of pronotum angularly inserted.¹ Abdominal segments not dilated, with dorsal margins not produced mesad.)

¹ In using this term some explanation is needed to avoid confusion. Our meaning is that the lateral lobes of the pronotum are joined to the dorsum at an angle, so that these portions are separated by a distinct line. Among the species of the group having this character there are some which have this line further defined by low but distinct carinae, while in *Insara covillea* the line is distinct but least pronounced.

The opposite condition is found in the genus *Arcthaea*, in which there is no pronounced demarkation between the dorsum and lateral lobes of the pronotum.

- B. Genicular lobes of cephalic, median and caudal femora bearing two spines. Lateral lobes of pronotum with cephalic and caudal margins not directed obliquely ventro-cephalad. Fastigium of vertex smooth and subhorizontal proximad, declivent distal, not in contact with frontal fastigium. Tegmina elongate lanceolate with apex rounded. (Lateral lobes of pronotum with length greater than width. Cerci crassate, apex heavily toothed. Subgenital plate of male very elongate, supplied with articulate styles which are very long for the group.) **Callinsara** Rehn
- BB. Genicular lobes of cephalic, median and caudal femora bearing a single spine. Lateral lobes of pronotum with cephalic and caudal margins directed obliquely ventro-cephalad. Fastigium of vertex declivent, tri-tuberculate proximad, in partial contact with frontal fastigium. Tegmina very broad with apex obliquely truncate. (Lateral lobes of pronotum with length less than width. Cerci crassate proximad, becoming long and slender with apex sharp. Subgenital plate of male not elongate, supplied with small bulbous non-articulate points.) **Dolichocercus** new genus
- AA. Cephalic and median femora briefly subcarinate disto-dorsal.
- B. Fastigium of vertex subhorizontal, in full contact with frontal fastigium with which it presents a deplanate cephalic surface. Lateral lobes of pronotum angularly inserted. Dorsal abdominal segments with margins acute-angulate produced mesad. (Abdominal segments dilated.²)
- C. Fastigium of vertex with dorsal surface on one level. Lateral lobes of pronotum vertical or nearly so. Tegmina long or abbreviate, not aborted. Wings with distal portion exposed, never rudimentary. (Subgenital plate of male bearing articulate styles or non-articulate styliform appendages. Genicular lobes of cephalic and median femora unispinose or bispinose. Tegmina obliquely truncate or rounded at apex.) **Insara** Walker
- CC. Fastigium of vertex with dorsal surface on three distinct levels. Lateral lobes of pronotum inserted at a more obtuse angle, regularly diverging ventrad. Tegmina aborted. Wings concealed and rudimentary. (Subgenital plate of male bearing non-articulate knobs. Genicular lobes of cephalic and median femora bispinose. Tegmina broadly rounded.) **Brachyinsara** new genus
- BB. Fastigium of vertex declivent, weakly in contact with frontal fastigium with which it does not present a deplanate cephalic surface. Lateral lobes of pronotum roundly inserted (so that the pronotum is more or less decidedly sellate). Dorsal abdominal segments with margins straight or crenulate, not acute-angulate produced mesad.

² The abdomen is more dilated in the species of *Insara* and *Brachyinsara* than in the species of *Arethaea*. Naturally, however, females of all the species have the abdomen usually much more dilated than the males.

(Abdominal segments not as much dilated.) (Lateral lobes of pronotum more or less bullate. Tegmina very long, abbreviate or aborted. Wings with distal portion exposed in all but extremely brachypterous females. Genicular lobes of cephalic and median femora bispinose. Subgenital plate of male very long, supplied with non-articulate styliform appendages or tubercles which vary from rather long to short for the group.).....**Arethaea** Stål

CALLINSARA Rehn

This genus, which includes the single species *Callinsara clupei-pennis*, has recently been described and fully treated by the senior author.³ Although nearer relationship is shown to *Dolichocercus* than to the other genera of the group *Insarae*, the present genus differs greatly in general appearance, tegminal structure and important characters of the armament of the limbs, form of fastigium, pronotum, tegmina, wings and genitalia.⁴ This genus is at present known only from the unique male type from the Misiones, in extreme northeastern Argentina, South America, which specimen is in the collection of the Academy of Natural Sciences of Philadelphia.

DOLICHOCERCUS⁵ new genus

1891. *Hormilia* Brunner, Add. Monogr. Phaner., p. 116. (In part.)

1897. *Hormilia* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, p. 317. (In part.)

1906. *Insara* Kirby, Synon. Catal. Orth., II, p. 413. (In part.)

Genus monotypic. GENOTYPE—*Dolichocercus latipennis* [*Hormilia latipennis*] (Brunner).

This genus is a member of the Phaneropterinae and of the group *Insarae* and is known only from Central America. It shows no close relationship to any other genus of the group, but agrees with *Callinsara* in the non-dilated abdominal segments which have their dorsal margins not produced mesad.⁶

³ 1913. *Callinsara clupei-pennis* Rehn, Proc. Acad. Nat. Sci. Phila., 1913, pp. 361 to 364, figs. 25 to 28.

⁴ The most important of these characters are given in the generic key for the group *Insarae* on page 39.

⁵ Δολιχός = long, and κερκίς. In allusion to the very long cerci of the male.

⁶ The two South American species described as *Hormilia fasciata* and *Hormilia peruviana* agree with the present genus in this character and are certainly not members of the genus *Insara*. An attempt to correctly place these species without an examination of the types would be unsatisfactory, but it appears probable that one or both will be found to belong either to the present genus or to closely allied new genera.

Generic Description.—Fastigium of vertex narrow, compressed; bearing three pyramidal projections, one meso-caudad, the others on each side placed at a short distance cephalad of the median projection; this fastigium declivent, in partial contact with the facial fastigium. Eyes sub-globose. Antennae suberassate proximad. Lateral margins of dorsum of pronotum not constricted, rounded; lateral lobes of pronotum perpendicular to dorsum but set obliquely to it in such a way that the ventro-cephalic angle lies in a position considerably cephalad of the dorso-cephalic angle. Tegmina long and very broad, particularly toward the apex which is obliquely truncate. Wings present. Abdomen weakly dilated, dorsal segments of same not produced mesad. Disto-dorsal segment of male abdomen weakly bilobate; cerci of male exceedingly long, crassate proximad, distal third incurved. Subgenital plate of male with lateral margins produced distad in small, glabrous, bulbous, non-articulate points. Cephalic and median femora with genicular margins not produced meso-dorsad; genicular lobes of same weak, bearing a single spine; ventro-cephalic margins of these femora armed with five or six heavy teeth. Cephalic tibiae with proximal extremity extremely swollen, narrowing very abruptly below the tympanum which organ is open on both sides, dorsal margins of same unarmed except for a single apical spine.

Dolichocercus latipennis (Brunner) (Figs. 1 and 23.)

1891. *Hormilia latipennis* Brunner, Add. Monogr. Phaner. pp. 117-118. [Chiriqui, Panama (not Costa Rica).]

1897. *H[ormilia] latipennis* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318, 320. [Chiriqui, Panama (record repeated).]

Type.—♀; Chiriqui, Panama (not Costa Rica). [Dohrn Collection.]

Description of Type.—(Ex Brunner.) “Fusco-testaceous, marmorate with fuscous. Antennae slender, annulate with fuscous and white. Front rounded, punctate with fuscous. Pronotum with lateral lobes roundly inserted, higher than long. Elytra in middle one and one-half times as broad as the length of the pronotum, broader toward the apex, obliquely truncate, radialramus forked, disappearing before the apex of the elytra, ulnar vein not ramose. Wings acuminate. Anterior femora? Intermediate and posterior femora rounded above, the former distinctly twice annulate with sulphur, below spinulose. Ovipositor a little narrowed, superior margin wholly, inferior margin apically crenulate. ♀.”

Allotype here Selected.—♂ ; Porto Bello, Panama. March 10, 1911. (A. Busck.) [U.S.N.M.]

Description of Allotype.—Size medium for the group, structure delicate. Fastigium of vertex as given in generic description, strongly sulcate cephalad of meso-caudal projection and with lateral margins somewhat thickened cephalad; facial fastigium presenting a flat cephalic surface; antennae beyond proximal joints extremely slender, peculiarly marked and with joints proportionately longer than in the species of *Insara*. Dorsum of pronotum deplanate with a medio-longitudinal and two transverse sulci very weakly indicated, lateral margins subsinuate; lateral lobes of pronotum as given in generic description, the cephalic margin weakly concave in dorsal half and weakly convex in ventral half, ventrocephalic angle broadly rounded at an angle of a little more than ninety degrees, ventral margin rounding evenly into caudal margin which is straight, humeral sinus very broad and deep, roundly angulate at an angle of a little more than ninety degrees. Tegmina and wings as given in the generic description, very delicate in structure. Disto-dorsal segment of abdomen weakly bilobate; supranal plate elongate, lanceolate; cerci exceedingly long, crassate and moderately tuberculate proximad then slender and smooth, narrowing very gradually to sharp apex, distal third curving gently inward thus forming nearly a right-angle; subgenital plate as given in the generic description. Cephalic and median femora as given in generic description, very slender with extreme disto-dorsal portion weakly constricted from base of genicular lobes. Caudal tibiae with all but the proximal portion of the ventral margins armed, genicular lobes elongate although but little produced beyond apex of tibiae and terminating in a single short spine.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of caudal femur	Length of ovipositor
♀ Chiriqui, Panama. (<i>Type</i> ⁷).....	15	2.8	23	5	18.5	6
♂ Porto Bello, Panama. (<i>Allotype</i>)	14.8	3	20.5	5	17.5	

⁷ The measurements here given for the type are quoted from Brunner's original description.

Color Notes.—General color mummy brown shading to walnut brown on limbs and tegmina. The tegmina are somewhat iridescent and the wings, suffused with dark brown, are particularly so. Eyes vandyke brown. Antennae mummy brown, at considerable intervals narrowly and regularly annulate with whitish and very dark brown. Cerci with crassate base and curved apical portion mummy brown, central portion translucent yellowish. The insect has a much more delicate appearance than any species of *Insara*.

Distribution.—The present species is known from but two localities, one in extreme western Panama, the other in the central part of the isthmus.

Remarks.—Though we have been unable to examine the type of Brunner's *Hormilia latipennis*, described from a single mutilated female, we feel assured that the male specimen before us belongs to that species and the characters found warrant the erection of the new genus under which it is here placed.

Specimens Examined: 1; 1 male.

Porto Bello, Panama, March 10, 1911, (A. Buseck), 1♂. *Allotype*. [U.S. N. M.]

INSARA Walker

1859. *Phaenoptera* Saussure (not of Serville, 1831), Rev. et Mag. de Zool., 2e Ser. XI, p. 201.
1869. *Insara* Walker, Cat. Dermap. Saltat. Br. Mus., II, p. 267.
1873. *Hormilia* Stål, Öfv. Vetensk.-Akad. Förh. xxx. No. 4, p. 41.
1874. *Hormilia* Stål, Recens. Orth., II, p. 28.
1878. *Hormilia* Brunner, Monogr. Phaner., p. 230.
1891. *Hormilia* Brunner, Add. Monogr. Phaner., p. 116. (In part.)
1895. *Hormilia* Bruner, Bull. Lab. Nat. Hist. Univ. Iowa, III, Pt. 3, p. 65.
1896. *Hormilia* Griffini, Boll. Mus. Zool. Univ. Torino, XI, No. 232, p. 13.
1897. *Hormilia* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, p. 317. (In part.)
1900. *Hormilia* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 96.
1900. *Hormilia* Cockerell, Amer. Nat., XXXIV, p. 290.
1900. *Arethaea* Scudder (not of Stål, 1876), Can. Ent., XXXII, p. 332.
1900. *Hormilia* Biolley, Tomado del Informe Mus. Nat. Costa Rica, 1899-1900, p. 50.
1902. *Hormilia* Scudder and Cockerell, Proc. Davenp. Acad. Sci., IX, p. 52.
1902. *Hormilia* Rehn, Trans. Amer. Ent. Soc., XXIX, p. 20.
1904. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542.
1904. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 572.
1905. *Hormilia* Caudell, Proc. U. S. Nat. Mus., XXVIII, p. 477.

1906. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 806.
1906. *Insara* Kirby, Synon. Catal. Orth., II, p. 442. (In part.)
1907. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 58.
1907. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 78.
1907. *Hormilia* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 78.
1909. *Hormilia* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 167.
1909. *Hormilia* Rehn and Hebard, Acad. Nat. Sci. Phila., 1909, p. 474.

Genus monotypic. GENOTYPE—*Insara strigulata* Walker = *Insara tolteca* [*Phaneroptera tolteca*] (Saussure).

This genus is a member of the Phaneropterinae and of the group Insarae (*Hormiliae* of Brunner, 1878), to which group the genera *Callinsara*, *Dolichoecreus*, *Brachyinsara* and *Arethaea* also belong. The genus appears to be peculiar to North and Central America; the two species credited to it (as *Hormilia*) from South America belonging with little doubt to an allied genus. The remaining described genera belonging to the group Insarae are also peculiar to North and Central America, with the exception of *Callinsara* which is known only from South America.

Generic Description.—Fastigium of vertex narrow, compressed, subequal, subhorizontal, with a decided medio-longitudinal sulcation, lateral margins roundly elevated; fastigium of vertex in contact with facial fastigium, the two presenting a flat cephalic surface, their lateral aspect presenting an outline which forms a sharply rounded angle of a little more than ninety degrees. Antennae subcrassate proximad, from three to five times the length of the body. Pronotum not at all or decidedly constricted in the mesocephalic portion; dorsum flat or deeply sellate, bounded laterad by clearly defined angulations or low but distinct lateral carinae; lateral lobes angularly inserted, perpendicular or nearly so, caudal margin of same more or less arcuate; humeral sinus distinct or indicated only by a very feeble sinuation. Tegmina very long or abbreviate, rather broad or very narrow; apex of same obliquely truncate or rounded. Wings present. Abdomen more or less dilated; dorsal segments more or less acute-angulate produced mesad; disto-dorsal segment of males having a more or less pronounced and extensive depression. Cerci of males short or long, straight or incurved either evenly or with a decided angulation, crassate; apex of same toothed, this tooth directed meso-dorsad or dorsad at an angle to the cercus. Subgenital plate of male short, lateral margins narrowing distad and produced in articulate or

non-articulate styliform appendages; distal margin between these appendages broadly and roundly emarginate or sinuato-truncate or obtuse-angulate produced. Ovipositor from about one to one and two-thirds times the length of the pronotal disk, deep, more or less sharply bent upward at base, arcuate; apex more or less roundly acuminate; bent portion of dorsal margin and distal portion of ventral margin finely serrate. Subgenital plate of female short or elongate, triangular or lanceolate or scutiform, with immediate apex rounded or angulato-emarginate; a medio-longitudinal sulcus present proximad. Limbs more or less elongate. Cephalic and median femora carinate disto-dorsad for a short distance with distal margin of same more or less produced; genicular lobes of same produced, unispinose or bispinose. Cephalic tibiae with proximal extremity much swollen, narrowing decidedly or appreciably below tympanum which organ is open on both faces.

Classification.—From a systematic standpoint the present genus is divided into two natural groups, the first of these has the genicular lobes of the cephalic and median femora produced in a single dentiform process. All of the species having this character are further separable by characters of the tegmina, which are obliquely truncate at the apex, and of the male subgenital plate, which is supplied with distinct articulate styles. The species belonging to this first group are *I. tolteca*, *intermedia*, *bolivari* and *prasina*. Of these, the first three species are closely related, while the latter species is a very aberrant and distinctive insect, distinguished particularly by its size, coloration and great tegminal width. No species belonging to this group is found as far north as the Rio Grande.

The second group of the genus has the genicular lobes of the cephalic and median femora produced in a dentiform process, but having in addition a small spine on the ventral margin of this process. All of the species having this character are further separable by characters of the tegmina, which are rounded at the apex, and of the male subgenital plate, which is supplied with distinct but non-articulate styliform appendages or knobs. The first two species belonging to this group, *I. phthisica* and *gracillima*, are also southern in distribution and are very different from any of the others; they differ from the three normal species of the first group in the group characters given above, and also in being more at-

tenuate and lacking the distinctive dorsal abdominal marking which is present in all of those species, but in appearance they show a decided general similarity to those species and agree with the first group also in the character of the proximal portion of the cephalic tibiae, which is more swollen and narrows more abruptly below the tympanum than in any of the other species of the second group. All of the forms found north of the Rio Grande, *I. elegans*, *elegans consuetipes*, *apache*, *covilleae* and *gemmicula*, show a general relationship, one of the most striking features of which is the pale green coloration, more or less maculate in all but *I. apache*. To the second group also belongs *I. lamellata*, known only from Lower California. The remaining species, *I. abbreviata*, is a very aberrant member of the second group, unique in form of pronotum, tegmina and male subgenital plate; it is known only from central Mexico.

Notes on Spination.—The armament of the distal portion of the cephalic and median femora is constant in the present genus and furnishes important characters. It has, on the other hand, seemed undesirable to include in the specific descriptions data concerning the armament of the ventro-cephalic margins of the cephalic and median femora, (the ventro-caudal margins are always unarmed) owing to the fact that the small spines there found are exceedingly variable in number and are, not infrequently, wholly absent in species which usually possess them. We have, however, noted that *I. prasina* bears in most cases the greatest number of such spines (as high as 6-5 for the cephalic and 5-4 for the median femora), while individuals of the other species, belonging to the group of which *I. tolteca* is a member, are usually supplied with several spines on each of these margins.⁸ The remaining species of the genus have in most cases one or two of these spines on each of the ventro-cephalic margins of the cephalic and median femora with the exception of *apache*, *abbreviata*, *gemmicula* and *covilleae* which species have these margins unarmed.

Morphological Notes on Genitalia.—Important characters of the male subgenital plate exist, as given in the above classification. Cercal characters are present in this genus and may be used to separate a number of the species. The cerci are, however, not forked or serrate in any of the species, the differences lying in their

⁸ See footnote under description of *I. phthisica*, p. 47.

length, heaviness, degree and regularity of curvature and the size and direction of the apical tooth with which they are always armed. Characters of the ovipositor are few, differences in the degree of sharpness of the upward curvature being sometimes important, particularly in separating *I. elegans* from *I. elegans consuetipes*, which latter geographic race has the ovipositor not nearly as sharply bent upward. The margins of the ovipositor do not acquire serrations until the mature condition is reached; these serrations are in the shape of isosceles triangles, their apices frequently blunt and rounded. The subgenital plate in the females presents several distinct forms as treated in the generic description, but a certain amount of specific variation is found and it seems advisable to use this character only in conjunction with a general study of each species.

Notes on Tegmina.—The venation of the tegmina does not appear to be of importance as a source of group or specific characters. The tegminal outline is of the greatest use in separating the genus into two groups and is also important in separating *I. elegans* from its geographic race, *elegans consuetipes*. Variation in tegminal length is pronounced in *I. intermedia* alone. In the other species of the present genus the tegminal length is found to vary to a decidedly limited degree.

Notes on Color Pattern.—In the present group the color pattern is important and affords, in a number of cases, valid specific characters. In the normally brown species which are streaked and speckled with darker, *I. tolteca*, *intermedia*, *bolivari*, *phthisica* and *gracillima*, we find that the first three species bear meso-dorsad on the second and third dorsal abdominal segments a distinctive and striking trapeziform spot; in the remaining two species the sides of the median and first four dorsal abdominal segments are more irregularly and much less strikingly marked with dark brown. *I. prasina* is distinguished from all of the other species by its apple green coloration and the fact that the fourth abdominal segment bears on each side a conspicuous small rounded black spot or dot, situated near the caudal margin of the segment. The only species of the genus having the dorsal abdominal segments immaculate are *I. apache* and *abbreviata*; the former species is immaculate chromium green in general coloration, the latter is the only species which is practically immaculate in general coloration yet exhibiting both a

pale green and a brown color phase. The remaining forms, *I. elegans*, *elegans consuetipes*, *covilleae* and *gemmicula*, known almost wholly from north of the Mexican boundary, all (excepting *elegans consuetipes*) invariably have a dark brown maculation present on each side of the fourth abdominal segment near its caudal margin, which margin caudad of this maculation is paler than the general coloration of the abdomen. This marking is greatly intensified and specialized in *gemmicula*; much intensified, with the pale caudal margin very pronounced, in *covilleae*; not strikingly prominent in *elegans*, and very much reduced, often absent in *elegans consuetipes*. The general color pattern is distinctive in each of these species.

History.—In 1869, Walker erected the monotypic genus *Insara*⁹ and described the species *strigulata*; Kirby, in 1906,¹⁰ recognizing this species to be a synonym of Saussure's *Phaneroptera tolteca*,¹¹ described in 1859, correctly associated these names.

Unfortunately Walker's genus *Insara* was unrecognized by Stål in 1873, which resulted in his erecting the synonymic genus *Hormilia*¹² which latter name has been used throughout the literature to the present date excepting in Kirby's Catalogue.

In 1878, Brunner¹³ described four species as *H. gracillima*, *intermedia*, *abbreviata* and *fasciata*. The first three species belong to the present genus, but the South American species, *fasciata*, which the author suggested might be considered a member of a different genus, does not belong to *Insara* as the characters given for that species unquestionably show.

The same author also described two species in 1891¹⁴ *H. peruviana* and *latipennis*. The original descriptions prove that these species are not members of the genus *Insara* and we have been enabled through the examination of a male of *latipennis* to erect for it a new genus, *Dolichoecreus*, in the present paper.

Griffini, in 1896, described a single species, *H. bolivari*¹⁵ and the

⁹ Cat. Dermap. Saltat. Br. Mus., II, p. 267.

¹⁰ Synon. Catal. Orth., II, p. 442.

¹¹ Rev. et Mag. de Zool., 2e Ser., XI, p. 201.

¹² Ofv. Vetensk.-Akad. Förh., XXX, No. 4, p. 41.

¹³ Monogr. Phaner., p. 231.

¹⁴ Add. Monogr. Phaner., p. 117.

¹⁵ Boll. Mus. Zool. Univ. Torino, XI, No. 232, p. 13.

following year two species, *H. phthisica* and *prasina*, were described by Saussure and Pictet.¹⁶

In 1900, Scudder described *H. elegans*¹⁷ and but little later in the same year *Arctiaca consuetipes*,¹⁸ which latter species we have found through previous examination of the type and present study of the paratype to be a geographic race of *I. elegans*. Scudder referred this species to *Arctiaca* through failure to compare his material with *I. elegans*, apparently basing his decision solely on Brunner's incorrect key character regarding the presence or absence of styles on the male subgenital plate as separating *Insara* (*Hormilia*) from *Arctiaca*.

Rehn, in 1907, described a single species as *H. apache*.¹⁹

Material Examined.—239; 124 males, 99 females, 1 gynandromorph and 15 nymphs.

Nearly half of these specimens (111) were taken by the authors on recent trips and are located in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia. Of the remaining specimens we find 65 in the Hebard Collection; 33 in the Academy of Natural Sciences of Philadelphia and 12, the entire series of the genus in the United States National Museum, were loaned to us through the kindness of Mr. A. N. Caudell. The remaining 18 specimens we have been able to examine through the kindness of the authorities in charge of the British Museum, Scudder Collection, American Museum of Natural History, Brooklyn Institute of Arts and Sciences, and the University of Kansas. To those who have so kindly assisted us we wish to express our hearty thanks.

In the preparation of the present paper the types of the following species have been examined by us.

(*Insara strigulata* Walker, synonym of *Insara tolteca* (Saussure).)

Insara prasina (Saussure and Pictet)

Insara phthisica (Saussure and Pictet)

Insara elegans (Scudder)

Insara elegans consuetipes (Scudder)

¹⁶ Biol. Cent.-Amer., Orth., I, p. 318.

¹⁷ Proc. Davenport Acad. Sci., VIII, p. 96.

¹⁸ Can. Ent., XXXII, p. 332.

¹⁹ Proc. Acad. Nat. Sci. Phila., 1907, p. 58.

Insara apache (Rehn)

Insara covilleae n. sp.

Insara gemmicula n. sp.

Insara lamellata n. sp.

KEY TO THE SPECIES OF THE GENUS *INSARA*

- A. Subgenital plate of male with distinct articulate styles. Genicular lobes of cephalic and median femora produced in a single dentiform process bearing no small supplementary spine. (Cephalic tibiae with proximal extremity much swollen, narrowing sharply distad of tympanum.) Tegmina obliquely truncate at apex. Dorsal abdominal segments strongly acute-angulate produced mesad.
- B. Tegmina narrow, distal width greater than mesal width. (General color varying from ochraceous to seal brown, more or less marmorate with darker browns; rarely suffused with green.)
- C. Lateral carinae of dorsum of pronotum from narrowest point gently concavo-divergent in the cephalic third, then as arcuately divergent caudad without a distinct angulation. (Tegmina reaching beyond distal extremities of caudal femora. Lateral lobes of pronotum with length subequal to depth.)
tolteca (Saussure)
- CC. Lateral carinae of dorsum of pronotum from narrowest point distinctly convexo-divergent in the cephalic third, then arcuately divergent caudad with a decided though obtuse angulation.
- D. Size smaller. Tegmina usually not reaching distal extremities of caudal femora. Lateral lobes of pronotum with length slightly less than depth.....**intermedia** (Brunner)
- DD. Size larger. Tegmina reaching beyond distal extremities of caudal femora. Lateral lobes of pronotum with length often considerably less than depth.
bolivari (Griffini)
- BB. Tegmina very wide throughout, distal width subequal to mesal width. (Lateral lobes of pronotum with length subequal to depth. General color immaculate apple green.)
prasina (Saussure and Pictet)
- AA. Subgenital plate of male bearing non-articulate styliiform appendages. Genicular lobes of cephalic and median femora produced in a single dentiform process bearing a small supplementary spine. Tegmina rounded at apex, (proximal width the greatest). Dorsal abdominal segments weakly acute-angulate produced mesad.
- B. Cephalic tibiae with proximal extremity much swollen, narrowing sharply distad of tympanum. Structure very slender. General color varying from ochraceous to seal brown, more or less marmorate with darker browns.
- C. Structure showing extreme attenuation. Lateral lobes of pronotum with length much greater than depth.
phthisica (Saussure and Pictet)

- CC. Structure not as attenuate. Lateral lobes of pronotum with length greater than depth. **gracillima** (Brunner)
- BB. Cephalic tibiae with proximal extremity somewhat swollen, narrowing gradually distad of tympanum. Structure not as slender. General color green (with exception of brown color phase of *I. abbreviata*).
- C. Dorsum of pronotum deplanate.
- D. Lateral lobes of pronotum with length subequal to depth. Lateral margins of dorsum of pronotum not carinate.
- E. Limbs normal.
- F. Structure slender. Tegmina narrow.
- G. Size medium. Distal portion of tegmina and wings narrow.
- II. Structure slender. Marginal field of tegmina narrowing abruptly distad from proximal third. Ovipositor bent sharply upward. Tegmina marked with a herringbone pattern, often very decidedly.
elegans (Scudder)
- III. Structure more slender. Marginal field of tegmina narrowing gradually distad. Ovipositor bent broadly upward. Tegmina immaculate or nearly so.
elegans consuetipes (Scudder)
- GG. Size very small. Distal portion of tegmina and wings exceedingly narrow. (Marginal field of tegmina narrowing abruptly distad from proximal third. Insect strikingly marked with cinnamon, cream color, black and white.) **gemmicula** new species
- FF. Structure robust. Tegmina broad, marginal field narrowing gradually distad. (Ovipositor bent sharply upward. General color immaculate green.) **apache** (Rehn)
- EE. Limbs unusually short and heavy with ventral margins of cephalic and median femora becoming sub-lamellate distad. (Ovipositor very long, evenly and gently arcuate.) **lamellata** new species
- DD. Lateral lobes of pronotum with length considerably greater than depth. Lateral margins of dorsum of pronotum carinate. (Tegmina abbreviate. Limbs very long and attenuate. Humeral sinus indicated by a very slight sinuation. General color immaculate green or nearly immaculate brown.) **abbreviata** (Brunner)
- CC. Dorsum of pronotum not deplanate, pronotum extremely sellate. (Other key characters the same as those given for

I. elegans excepting color pattern. Tegmina conspicuously marked with a series of large spots, white or pale greenish in color.).....**covilleae** new species

Insara tolteca (Saussure) (Figs. 3 and 4.)

1859. *Phaneroptera tolteca* Saussure, Rev. et Mag. de Zool., 2e Ser., XI, p. 201. [Mexico.]
 1869. *Insara strigulata* Walker, Cat. Dermap. Saltat. Br. Mus., II, p. 268. [Oajaca, Mexico; Orizaba, Mexico.]
 1874. *H[ormilia] tolteca* Stål, Recens. Orth., II, p. 28. [Mexico.]
 1878. *H[ormilia] tolteca* Brunner, Monogr. Phaner., pp. 231, 232. [Mexico.]
 1897. *Hormilia tolteca* Saussure and Pictet, Biol. Cent-Amer., Orth., I, pp. 318, 319, pl. 15, figs. 10-13. (In part.) [Mexico; Cordova, Mexico; Atoyac, Vera Cruz, Mexico; Orizaba, Mexico; Teapa, Tabasco, Mexico; Las Mercedes, Guatemala; Torola, Guatemala; San José, Costa Rica.]
 1900. *H[ormilia] tolteca* Biolley, Inf. Mus. Nat. Costa Rica, 1899-1900, p. 51. [San José, Costa Rica.]

The present species is closely related to *I. intermedia* and *I. bolivari*, though the lateral carinae of the dorsum of the pronotum are distinctive. From the former species it may be further distinguished by its greater size, usually longer tegmina and wings, less constricted dorsum of the pronotum and somewhat shallower lateral lobes of the same. From *bolivari* it may be also separated by its much less constricted dorsum of the pronotum and considerably shallower lateral lobes of the same. In the slight degree of constriction of the dorsum of the pronotum the present species rather resembles *I. gracillima*. The superficial resemblance of this species to the longer winged individuals of *intermedia* and to *bolivari* is striking, and both *I. phthisica* and *I. gracillima* have also a superficially similar appearance, though these latter species are much more slender.

Type.—♀; Mexico. [Presumably in Geneva Museum.]

The following description is based upon a specimen identified and recorded as *tolteca* by Saussure and now in the Academy of Natural Sciences of Philadelphia.

Description.—♂; Teapa, Tabasco, Mexico. March. (H. H. Smith.)

Size medium for the genus, form rather slender. Head with greatest width contained about one and three-quarters times in the depth, occiput rounded, slightly declivent toward the fastigium, the latter narrow, com-

pressed, subequal, with an appreciable medio-longitudinal sulcus on the dorsal surface, lateral margins roundly elevated, fastigium in contact with frontal fastigium for the full width of both; eyes large, prominent, ovate in outline, slightly less in length than the infra-ocular portion of the genae. Pronotum with dorsal length about one and four-tenths the greatest, caudal dorsal width; dorsum of pronotum very slightly depressed within the margins; lateral carinae of dorsum of pronotum gently concavo-divergent in the cephalic third, then as gently arcuato-divergent caudad without a distinct angulation; cephalic margin of dorsum of pronotum straight, caudal margin of same arcuate, lightly emarginate mesad; lateral lobes of pronotum with length subequal to depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle rather broadly rounded, the caudal margin arcuate, the humeral sinus deep, roundly acute-angulate. Tegmina long and narrow, the distal width greater than the mesal width, the tegmina reach beyond the distal extremities of the caudal femora and are obliquely truncate at the apex with the angles very narrowly rounded; marginal field of tegmina narrowing evenly distad from point of greatest width which is proximal. Disto-dorsal segment of abdomen with greater part of surface occupied by a subdepressed area, hexagonal in shape; supra-anal plate rather long, broadly trigonal, with lateral margins somewhat convex; cerci short, straight, crassate, tapering to a blunt apex, the apex toothed, this tooth directed at an angle meso-dorsad; subgenital plate short, lateral margins convergent distad, distal extremity sinuato-truncate, bearing lateral short slender articulate styles, cephalad from the base of the styles extend slightly divergent rounded elevations which become obsolete about the middle of the plate. Cephalic and median limbs slender, the cephalic and median femora carinate dorso-distad for a very short distance with distal margin of same bluntly rectangulate, genicular lobes spiniform; cephalic tibiae with proximal extremity much swollen, narrowing sharply below the tympanum, median tibiae slightly expanded proximal. Caudal femora shorter than the tegmina by more than the greatest pronotal length, the proximal half moderately bullate, genicular lobes decidedly acute-angulate produced with the immediate apex narrowly rounded.

A female, bearing the same data as the male here described, furnishes the additional information given below.

Description of Female.—Very much like male in size and general appearance. Ovipositor nearly equal to cephalic femur in length, broad, sharply bent at the base, the bent portion of dorsal margin and distal half of ventral margin finely serrate; subgenital plate elongate-lanceolate with immediate apex very narrowly rectangulate emarginate, in transverse section this plate is narrowly U-shaped and embraces the base of the ovipositor.

Measurements (in millimeters) of individuals treated above

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Teapa, Tabasco, Mexico.....	16	3.8	24.8	3	3.6	28.9	20	
♀ Teapa, Tabasco, Mexico.....	16	3.8	24.5	2.9 ²⁰	3.4 ²⁰	27.9	19.6	5

Color Notes.—The general color of the two specimens, here treated fully, is raw umber darkening to mummy brown on face, sides of head, lateral lobes of pronotum, proximal portion of marginal field of tegmina and on all of the femora; the cephalic and median femora, however, are distinctly once-banded with the lighter shade. The tegmina are irregularly and finely marked with darker brown, which gives the insects a more or less speckled and streaked appearance. The second and third dorsal abdominal segments are marked dorsad with a large and striking trapeziform spot of velvety-appearing bistre, this spot is sometimes margined laterad with a very fine yellowish line. One specimen before us from San Rafael (Jicaltepec), Vera Cruz, Mexico is noticeably suffused with greenish and in life was probably quite green in color.

Distribution.—The species is known to occur in Mexico, north as far as Jicaltepec, Vera Cruz, southward to Oaxaca, and Tonalá, in Chiapas, and eastward to Teapa in Tabasco and La Zacualpa in Chiapas; south of this it has been taken at Las Mercedes, Olas de Moka and Torola in Guatemala and San José in Costa Rica, this latter the southernmost record.

Biological Notes.—Professor P. Biolley gives us the following note on the habits of the insect about San José, Costa Rica. "It jumps about in the grass with much agility, the insect reaches maturity in August or September."

Synonymy.—In 1869, Walker described the genus *Insara* and the species *strigulata*; this species is a synonym of Saussure's *tolteca* as Kirby stated in his Synonymic Catalogue of Orthoptera

²⁰ These two measurements are taken from another female of the same size as that sent by Saussure, as in the latter specimen the tegmina are much damaged.

in 1906. We have examined the types of *Insara strigulata* and, from these, here select as the single type a female from Oaxaca, Mexico now in the British Museum.

Specimens Examined: 10;²¹ 5 males, 5 females.

San Rafael (Jicaltepec), Vera Cruz, Mexico, July 1, 1♂, 1♀, [Hebard Collection].

Motzorongo, Vera Cruz, Mexico, February 13, 1903, (L. Bruner), 1♂, [Hebard Collection].

La Buena Ventura, Vera Cruz, Mexico, 1909, 1♂, [Am. Mus. Nat. Hist.].

Teapa, Tabasco, Mexico, March, (H. H. Smith), 1♂, 1♀, [A. N. S. P.].

La Zacualpa, NE. of Tuxtla, Chiapas, Mexico, 1909, 1♂, [Am. Mus. Nat. Hist.].

Tonala, SW. of Tuxtla, Chiapas, Mexico, August, 1909, 2♀, [Am. Mus. Nat. Hist. and Hebard Collections].

Olas de Moka, Solola, Guatemala, September, 1898, (Englehardt), 1♀, [U. S. N. M.].

Insara intermedia (Brunner) (Figs. 5 and 6.)

1878. *H[ormilia] intermedia* Brunner, Monogr. Phaner., pp. 231, 232. [Cordova, Mexico; Guatemala.]

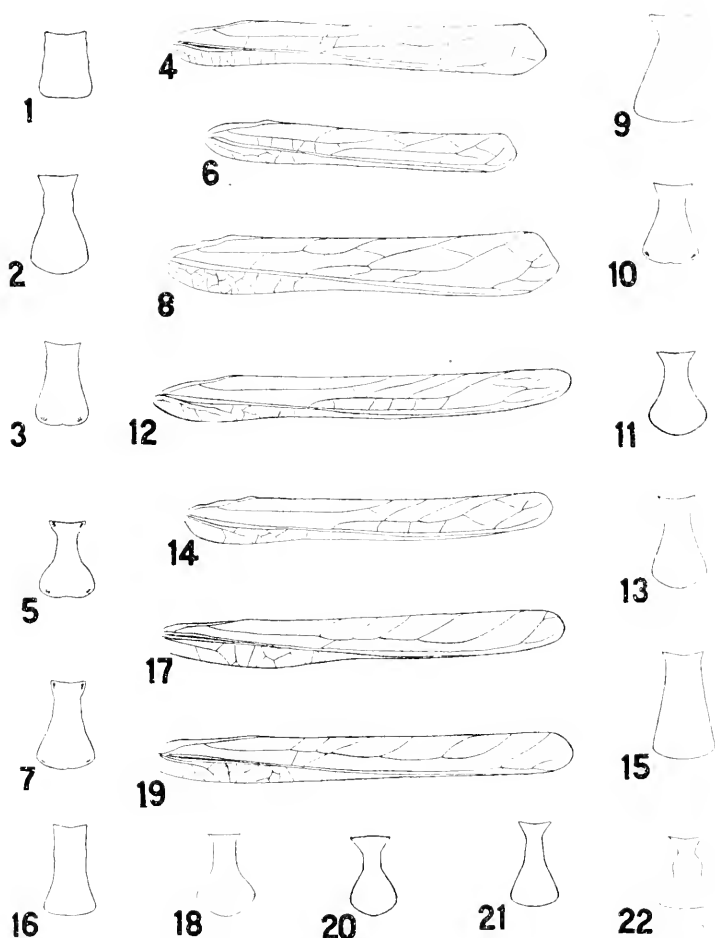
1897. *Hormilia intermedia* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318, 319. [Orizaba, Mexico; Capetillo, San Geronimo, Guatemala; Chontales, Nicaragua; Cahé, Costa Rica.]

1900. *H[ormilia] intermedia* Biondelli, Inf. Mus. Nat. Costa Rica, 1899-1900, p. 51. [San José, Costa Rica.]

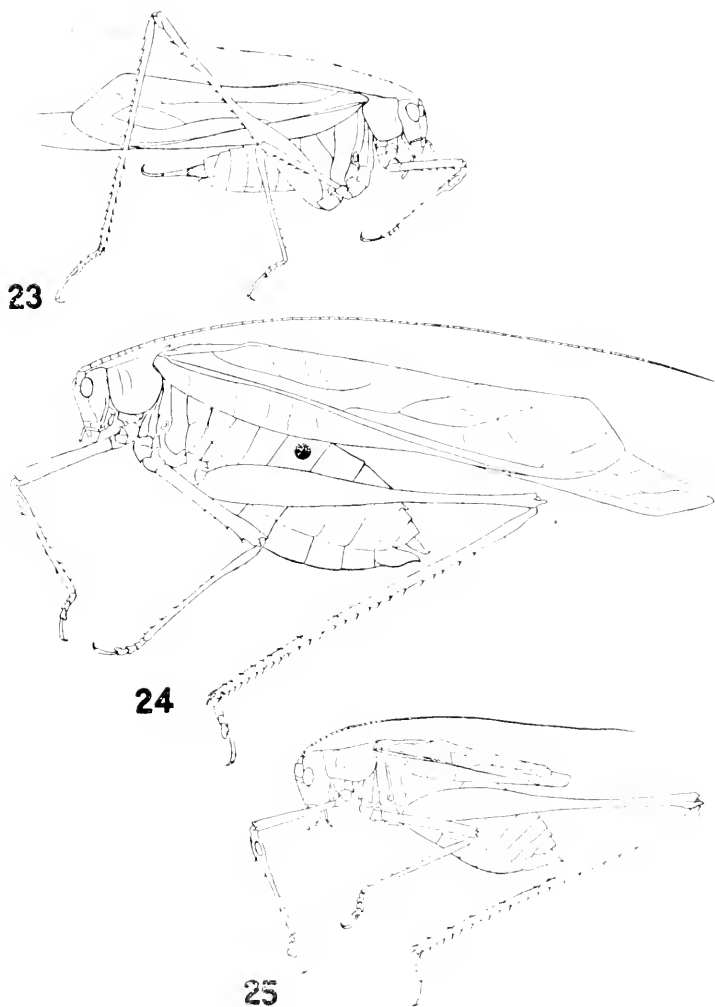
1906. *Hormilia intermedia* Rehn, Proc. Acad. Nat. Sci. Phila., 1905, p. 806. [Monte Redondo, Costa Rica; Guatel, Costa Rica; Piedras Negras, Costa Rica.]

The present species, though very closely allied to *I. tolteca*, may be readily distinguished by its smaller size, more compact structure, usually considerably shorter tegmina and wings, more constricted dorsum of the pronotum and somewhat deeper lateral lobes of the same. In its compact structure, constricted dorsum of the pronotum and lateral lobes with length less than depth, this insect shows a very close affinity to *I. bolivari*, which species is, however, much larger, longer in fact than *tolteca*, with long tegmina and wings, while the lateral lobes of the pronotum in *bolivari* differ in having their length usually considerably less than their depth.

²¹ The specimens recorded as this species in the Biología have been examined and all found to be correctly determined with the exception of the individuals from the Volcan de Chiriqui, Panama, which belong instead under *Insara bolivari* (Griffini).



Male tegminal outline and dorsal outline of pronotum of species of *Dolichocercus*, *Insara* and *Brachyinsara*. Tegminal outlines $\times 2$ unless otherwise indicated, pronotal outlines $\times 3$. Fig. 1, *Dolichocercus latipennis*; 2 and 12, *Insara phthisica*; 3 and 4, *I. tolteca*; 5 and 6, *I. intermedia*; 7 and 8, *I. bolivari*; 9, *I. prasina*; 10 and 14, *I. gracillima*, 11 and 17 ($\times 2\frac{1}{2}$), *I. elegans*; 13 and 19 (♀ , $\times 2\frac{1}{2}$) *I. elegans consuelipes*; 15, *I. apache*; 16, *I. abbreviata*; 18, *I. covilleae*; 20, *I. gemmicula*, 21, *I. lamellata*, 22, *Brachyinsara magdalenae*.



Lateral outlines of males here described. ($\times 2$) Fig. 23 *Dolichocercus latipennis*; 24, *Insara prasiua*; 25, *Insara abbreviata*.

The small size and usually short wings of *intermedia* give the species a different general appearance from any of the other forms.

Types.—♂ and ♀; Cordova, Mexico; Guatemala. [All in Geneva Museum.]

The following description is based upon a male taken at a locality from which the authors have a large series of specimens.

Description.—♂; Juan Viñas, Costa Rica. March 1, 1902. (L. Bruner.) [Hebard Collection.]

Size fairly small for the genus, form rather more compact than usual. Head and eyes very much as in *I. tolteca*. Pronotum with dorsal length about one and four-tenths the greatest (caudal) dorsal width; dorsum of pronotum slightly depressed within the margins; lateral carinae of dorsum of pronotum distinctly convexo-divergent in the cephalic third, then arcuato-divergent caudad with a decided though obtuse angle: cephalic margin of dorsum of pronotum straight, caudal margin of same arcuate, lightly emarginate mesad, this emargination more pronounced than in *tolteca*; lateral lobes of pronotum with length less than depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle rather broadly rounded, these angles differing less noticeably from each other than in *tolteca*, the humeral sinus deep, roundly acute-angulate. Tegmina rather short and narrow, the distal width very slightly greater than the mesal width, marginal field as in *tolteca*; in this specimen the tegmina reach the distal extremities of the caudal femora and are truncate at the apex, less obliquely than in *tolteca*. Disto-dorsal segment of the abdomen similar to that of *tolteca* but shorter; supra-anal plate as in that species; cerci short, straight, crassate, scarcely tapering to a blunt apex, the apex toothed, this tooth directed meso-dorsad at a right angle; subgenital plate similar to that of *tolteca*, very slightly broader. Limbs much as in *tolteca*, the caudal femora proportionately shorter and more bullate.

A female bearing the same data as the male described above furnishes the additional information given below.

Description of Female.—Somewhat more compact than the male with proportionately shorter tegmina and wings which do not reach the tips of the caudal femora, though the caudal femora are likewise shorter than in the male. Ovipositor similar to that of *tolteca*; subgenital plate elongate, scutiform, considerably emarginate laterad with narrow apex broadly rounded, in transverse section cephalad this plate is W-shaped, rotundato-angulate with the median sulcation shallow, and embraces the base of the ovipositor.

Color Notes.—The general color of the male specimen described above is a pale shade of raw umber which darkens to mummy brown on face, sides of head, dorsal portion of lateral lobes of pronotum and proximal portion of the marginal field of the tegmina, and to raw umber on the limbs; this color pattern is practically the same as that found in *tolteca* and the cephalic and median femora

are likewise once banded with the lighter shade. The tegmina are also finely and irregularly marked with darker brown which gives the insects a more or less speckled and streaked appearance. The second and third abdominal segments are marked as in *tolteca*, the spot in the present species being even more intense and the lateral yellowish line by which it is margined is usually very distinct. Half of the specimens before us are of this general coloration.

The female described above has the general color hair brown, with the dorsal surface of the head and disk of the pronotum buff, while all the other markings are in sharper contrast and the general aspect is darker. The other half of the series before us agrees with this specimen, with the exception of the two longer-winged males referred to in the measurements given above, and a very short-winged female from San José, Costa Rica, the color of which three specimens indicates that in life they were much suffused with pale green of an olive shade.

Professor Biolley, in speaking of living individuals of this species, states that "they differ from the former species (*tolteca*)—above all by the green color of the feet and abdomen" The writer comments on not having seen this character of coloration mentioned in descriptions of the species, probably because the authors had no fresh specimens at hand. None of the specimens before us have retained the slightest trace of such coloration.

Measurements (in millimeters) of individuals treated above

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudad tennar	Length of ovipositor
♂ Juan Viñas, Costa Rica	15.8	3.1	20.8	2.8	3	24	19	
♀ Juan Viñas, Costa Rica	14.5	3.1	15.5	2	2.2	17.5	16.9	4.9

The series before us indicates that the females of this species, as a rule, have the tegmina and wings shorter than the males. The average length of the tegmina in five males and five females from Juan Viñas, Costa Rica, is as follows: males 20.4, females 17.5. Two males from the same locality, but not included in the above measurements, have wings and tegmina quite as long as in the more abbreviate individuals of *tolteca*; these two specimens have a tegminal length of 22.5 and 23.5, and a wing length of 24.6 and 26.8.

Distribution.—The species occurs as far north as Orizaba, Mexico, thence southward it is found through Nicaragua to the latitude of Guatel in Costa Rica.

Biological Notes.—In his treatment of the present species, Professor Biolley states that it has done great damage to rose bushes in his garden at San José, Costa Rica.

Specimens Examined: 33; 17 males, 13 females, 3 nymphs.

Juan Viñas, Costa Rica, March 1, 1902, (L. Bruner), 11♂, 5♀, [Hebard Collection].

San José, Costa Rica, (P. Biolley), 3♀, [A. N. S. P.].

Monte Redondo, Costa Rica, January, 1903, (C. F. Underwood), 6♂, 2♀, 1♂n., [A. N. S. P. and Hebard Collection].

Guatel, Costa Rica, April 20 to 22, 1902, (C. F. Underwood), 1♀, 1♀n., [A. N. S. P.]

Pozo Azul, Costa Rica, (Carriker), 1♀, [Hebard Collection].

Piedras Negras, Costa Rica, (Schild and Bergdorf), 1♀, [A. N. S. P.].

Surubres, Costa Rica, October 19, 1909, (P. P. Calvert), 1♀n., [A. N. S. P.].

Insara bolivari (Griffini) (Figs. 7 and 8.)

1895. *Hormilia tolteca* Bruner (not *Phaneroptera tolteca* of Saussure, 1859), Bull. Lab. Nat. Hist. Univ. Iowa, III, pt. 3, p. 65. [Castillo, Nicaragua.]

1895. *Hormilia fasciata* Bruner (not of Brunner, 1878), Bull. Lab. Nat. Hist. Univ. Iowa, III, pt. 3, p. 65. [Castillo, Nicaragua.]

1896. *Hormilia bolivari* Griffini, Boll. Mus. Zool. Univ., Torino, XI, No. 232, pp. 13 to 15. [Colon, Panama.]

1897. *Hormilia tolteca* Saussure and Pictet (not *Phaneroptera tolteca* of Saussure, 1859), Biol. Cent.-Amer., Orth., I, p. 319. (In part.) [Volcan de Chiriqui, Panama.]

1897. *Hormilia bolivari* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318 to 320. [Colon, Panama.]

This insect is of larger size and somewhat heavier build than either of its close allies, *I. tolteca* and *I. intermedia*. From the former species it may be further separated by the constricted dorsum of the pronotum (which is of the same type as that of *intermedia*, though somewhat more expanded caudad), by the lateral lobes of the same with length less than depth and by the longer and wider tegmina. From *intermedia* the present species may be further separated by the lateral lobes having their length noticeably, instead of slightly, less than their depth, and the fact that, while *intermedia* has the smallest tegmina and wings of the three

closely allied species, *bolivari* has these organs developed to the greatest extent.

Type.—♀; Colon, Panama. (Dr. E. Festa.) [Zoological Museum of Turin.]

The following description is based upon a male, taken at a locality the nearest to that of the type at which the species has been captured since its description.

Description.—♂; Peralta, Costa Rica. March 26, 1910. (P.P. Calvert.) [A. N. S. P.]

Size a little larger than medium for the genus, form moderately slender though somewhat heavier than *I. tolteca*. Head and eyes much as in that species. Pronotum with dorsum similar to that of *I. intermedia* but slightly more expanded caudad and with caudal margin very lightly emarginate mesad;²² lateral lobes also similar to that species but slightly deeper,²³ humeral sinus deep, roundly, and, when compared with that of *intermedia*, more broadly acute-angulate. Tegmina long and wide when compared with those of *tolteca*, the distal width greater than the mesal width, the tegmina reaching beyond the extremities of the caudal femora and obliquely truncate at the apex with angles very narrowly rounded; marginal field of tegmina narrowing evenly distad, from point of greatest width which is proximad, as in *tolteca*. Disto-dorsal segment of abdomen very much as in *intermedia*; supra-anal plate as in *tolteca*; cerci fairly long, longer than in *tolteca* or *intermedia*, crassate, tapering to a blunt apex, the shaft deflected slightly inward at the middle, apex toothed, this tooth directed meso-dorsad at nearly a right-angle; subgenital plate similar to that of *tolteca*. Limbs and armament of the same much as in *tolteca*, caudal femora proportionately longer with the genicular lobes more produced.

A female taken at a locality adjacent to that of the described male, furnishes the data given below.

Description of Female.—♀; Forest near Santa Cruz, Costa Rica. January 25, 1910. (Tristan and Calvert.) [A. N. S. P.]

Very much like male in size and general appearance. Tegmina reaching the distal extremities of the caudal femora. Ovipositor much as in *tolteca*; subgenital plate rather elongate, scutiform, not emarginate laterad, apex narrowly rounded, in transverse section much as in *intermedia*.

²² We find the degree of this mesal emargination to be variable in *I. tolteca*, *intermedia* and especially *bolivari*; one specimen of the latter species before us has this emargination pronounced, while in two individuals it is scarcely perceptible.

²³ Two individuals from Nicaragua show somewhat deeper lateral lobes of the pronotum than the rest of the series, which would indicate that a certain amount of variability exists in this character.

Measurements (in millimeters) of individuals treated above

	Length of body ²⁴	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Peralta, Costa Rica . . .	16	3.8	27	4	4.3	31.8	21.1	
♀ Santa Cruz, Costa Rica	20	4	24.4	3	3.4	27	21	5.3

The females before us indicate that in this sex the tegmina are more or less shorter than in the males.

Color Notes.—The coloration of the two specimens here treated fully is almost exactly like that of the female of *intermedia*, the coloration of which is described in the present paper under that species. The specimens before us from Nicaragua are, however, more fuscous, and the coloration of one individual indicates that in life it was much suffused with pale green of an olive shade.

Distribution.—The species is now known to range from Castillo, Nicaragua southward to Colon, Panama.

Synonymy.—No synonyms of the present species exist, but, in 1895, Bruner recorded this species as the related *I. tolteca* and also the very different South American *fasciata* of Brunner (which latter species, though described as a member of the genus *Hormilia*, does not agree with that genus in certain characters of great importance).

Saussure and Pictet also included three specimens of the present species in the series of *I. tolteca* recorded by them in the *Biologia* in 1897.

Remarks.—The placing of this species apart from *tolteca* and *intermedia* by Saussure and Pictet in the *Biologia Centrali-Americana*, would certainly not have taken place had they recognized specimens of the insect in their collections; the forking of the median vein of the tegmina can not be used to separate these three species.

Specimens Examined: 9; 4 males, 5 females.

Castillo, Nicaragua, February and March, 1893, (B. Shimeck), 1♂, 3♀, [Hebard Collection ex Bruner].

²⁴The body length in the present paper is always given as probably correct in the fresh condition.

Peralta, Costa Rica, March 26, 1910, (P. P. Calvert), 1♂, [A. N. S. P.].

Forest near Santa Cruz, Costa Rica, January 25, 1910, (Tristan and Calvert), 1♀, [A. N. S. P.].

Volcan de Chiriqui, Panama, (Champion), 2♂, 1♀, [Brit. Mus.].

Insara prasina (Saussure and Pietet) (Figs. 9 and 24.)

1897. *Hormilia prasina* Saussure and Pietet, Biol. Cent.-Amer., Orth., I, pp. 318, 319 to 320, pl. 15, fig. 14. [Mazatlan, Sinaloa, Mexico; [Imagen], Guerrero, Mexico.]

1904. *Hormilia prasina* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [Guadalajara, Jalisco, Mexico.]

This species is the largest of the genus and is the only form with apple green coloration and very broad wings. No resemblance or generality of structural characters would appear to show close affinity of this species to any other in the genus. The subgenital plate of the male indicates that the species finds its nearest relatives in the group to which *tolteca* belongs, while the coloration is more like that of the *elegans* group.

Described from a pair from the states of Sinaloa and Guerrero, Mexico.

Single Type here selected: ♂; Hacienda de la Imagen, Guerrero, Mexico. Elevation 4000 feet. (H. H. Smith.) [Biologia Collection in British Museum.]

We here describe the only non-alcoholic specimen at present before us.

Description.—♂; Guadalajara, Jalisco, Mexico. August 12, 1893. (J. F. McClendon.) [A. N. S. P.]

Size very large and form rather heavy for the genus. Head with greatest width contained one and eight-tenths times in depth, occiput rounded, slightly declivent toward the fastigium, the latter narrow, compressed, subequal in width with an appreciable longitudinal sulcus on the dorsal surface, lateral margins roundly elevated, fastigium in full contact with frontal fastigium for full length of both, this sulcus dorso-arcuate; eyes small, but moderately prominent, narrowly ovate in outline, in length less than that of the infra-ocular portion of the genae. Pronotum with dorsal length about one and four-tenths the greatest (caudal) dorsal width; dorsum of pronotum very slightly depressed within the margins; lateral carinae of dorsum of pronotum faint and widely divergent in less than the cephalic third, then sharply defined and widely divergent caudad with a distinct angulation, the lines of divergence scarcely arcuate; cephalic margin of dorsum of pronotum straight, caudal margin very broadly arcuate; lateral lobes of pronotum with length subequal to depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle rather broadly rounded, the

caudal margin arcuate, the humeral sinus rather deep, roundly acute-angulate. Tegmina long and very broad, distal width subequal to mesal width, the tegmina reaching considerably beyond the distal extremities of the caudal femora and obliquely truncate at apex with angles somewhat narrowly rounded; marginal field of tegmina very broad for nearly half the tegminal length, narrowing gently distad from the point of greatest width which is proximad. Disto-dorsal segment of abdomen with greater part occupied by a subdepressed area, in shape hexagonal with angles somewhat rounded; supra-anal plate rather long, rather broadly trigonal, with lateral margins somewhat convex; cerci long for the group, crassate, gently and regularly incurved, tapering evenly and sharply to apex which is considerably flattened above and armed with a rather long tooth, the end of which is hooked inward, this tooth directed dorsad at an obtuse angle; subgenital plate short, lateral margins convergent distad, distal extremity broadly and roundly emarginate, bearing laterad slender and very short articulate styles, while cephalad from the base of the styles extend slightly divergent rounded elevations which become obsolete about the middle of the plate. Cephalic and median limbs slender, the cephalic femora carinate dorso-distad for a very short distance with distal margin of the same bluntly acute-angulate, genicular lobes triangular, dentiform; cephalic tibiae with proximal extremity greatly swollen, narrowing sharply below the tympanum which organ is apert, median tibiae slightly expanding proximad. Caudal femora shorter than the tegmina by about the length of one of the cephalic femora, the proximal half mildly bullate, genicular lobes triangular, dentiform, with blunt apex.

♀; Tepic, Mexico. (Dried alcoholic.) [Hebard Collection.]

Description of Female.—Very much like male in size and general appearance. Ovipositor considerably less than cephalic femur in length, broad, bent sharply upward at base, the bent portion shorter than in *tolteca*, the distal half of the dorsal margin, and distal extremity only of the ventral margin, finely serrate; subgenital plate short, triangular, with narrow apex broadly rounded, the plate is sulcate meso-proximad and can scarcely be said to embrace the base of the ovipositor.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Guadalajara, Mexico, (See above)	21.5	4.7	31.7	5.7	5.7+	37.6	23	
♂ Hacienda de la Imagen, Guerrero, Mexico. <i>Type</i>	16.4	4.2	31	4.7	6.2	35.6	21	
♀ Tepic, Mexico. (See above)	20	4.1	27.6	5.1	5.1	33	22.1	4.8

Color Notes.—The general color of the non-alcoholic male now before us is immaculate apple green, which has faded considerably on body and proximal portion of the tegmina to straw color. Antennae nearly black, annulate with very dark green. The apices of the wings are burnt sienna, and the fourth dorsal abdominal segment bears on each side a small and conspicuous rounded black spot situated near the caudal margin of the segment. The dried alcoholic specimens have lost all trace of original coloration with the exception of these two small black spots which in these individuals are as prominent as in the non-alcoholic specimen.

Distribution.—The species is known to occur on the west coast of Mexico, from Mazatlan southward to the state of Guerrero. Guadalajara is more interior than any other locality at which the species has been taken.

Specimens Examined: 6; 3 males, 3 females.

Mazatlan, Sinaloa, Mexico, (Forrer), 1 ♀. *Allotype.* [Brit. Mus.]

Tepic, Mexico, 1 ♂, 2 ♀, dried alcoholics, [Hebard Collection].

Guadalajara, Jalisco, Mexico, August 24, 1903, (J. F. McClendon), 1 ♂, [A. N. S. P.].

Hacienda de la Imagen, Guerrero, Mexico, elevation 4000 feet, (H. H. Smith), 1 ♂. *Type.* [Brit. Mus.]

Insara phthisica (Saussure and Pictet) (Figs. 2 and 12.)

1895. *Hormilia gracillima* Bruner (not of Brunner, 1878), Bull. Lab. Nat. Hist. Univ. Iowa, III, pt. 3, p. 65. [Castillo, Nicaragua.]

1897. *Hormilia phthisica* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, pp. 318, 319. [Temax, Yucatan.]

This species is closely related to *I. gracillima* from which it may be readily separated by its much more attenuate structure and, in the male, by the much longer and more decidedly and regularly curved cerci. Though bearing a striking general resemblance to the species allied to *I. tolteca*, and showing relationship to them in the fact that the cephalic tibiae have the proximal extremities much swollen and narrowing sharply below the tympanum, the insect differs widely from those species in many important respects. The absence of articulate styles on the subgenital plate of the male, the small supplementary spine on the genicular lobes of the cephalic and median femora and the rounded apex of the tegmina indicate that the present species is more closely related to the very different appearing northern species related to *I. elegans*.

Type.—♂; Temax, Yucatan. (Gaumer.) [Biologia Collection in British Museum.]

We here describe the single male of the present species in our possession.

Description.—♂; Castillo, Nicaragua. February 1893. (B. Shimek.) [Hebard Collection ex Bruner.]

Size a little larger than medium for the genus, form most attenuate of all the species. Head with greatest width contained about one and four-fifths times in greatest depth, similar to that of *I. tolteca* but with eyes not quite so prominent. Pronotum with dorsal length almost twice the greatest (caudal) dorsal width; dorsum of pronotum slightly depressed within the margins; lateral carinae of dorsum of pronotum very weak, in cephalic fifth divergent in a straight line, then subparallel for an equal distance, for remaining three-fifths very slightly convexo-divergent caudad; cephalic margin of dorsum of pronotum straight, caudal margin of same arcuate with a very slight emargination indicated mesad; lateral lobes of pronotum with length decidedly greater than depth, the ventro-cephalic angle obtusely rounded, the ventro-caudal angle very broadly rounded, humeral sinus deep and roundly subrectangulate. Tegmina very long and very narrow, their dorsal and ventral margins subparallel, these organs reaching to the distal extremities of the caudal femora and rounded at the apex; marginal field of tegmina very small, narrowing evenly distad from point of greatest width which is proximad. Disto-dorsal segment of abdomen very broadly arcuate caudad, median section showing a rounded depressed area; supra-anal plate small, trigonal, with lateral margins somewhat convex. Cerci very long and, beyond the base, very slender for the genus, tapering rather sharply at base, then nearly uniform in diameter to apex which bears a large blunt tooth, this tooth directed slightly dorsad of the curve of the shaft of the cerci; subgenital plate short, lateral margins convergent distad and produced in non-articulate styliform appendages, cephalad from the base of these appendages extend slightly divergent rounded elevations which become obsolete about the middle of the plate, distal extremity of plate between the produced lateral margins obtuse-angulate produced, the sides of this angle slightly concave.²⁵ Cephalic and median limbs long and slender, cephalic femora carinate dorso-distad for a considerably greater distance than in *tolteca* and having the distal margin of same produced in a bluntly acute-angulate tooth, genicular lobes similarly much produced but bearing a small supplementary spine;²⁶ cephalic tibiae with proximal extremity

²⁵ The distal extremity of the subgenital plate varies from this type to one which is truncate between the lateral non-articulate styliform appendages, as is shown in the type, this is also found to be true in *I. gracillima* as is shown by our specimens of that species.

²⁶ We do not give the armament of the ventral margins of the cephalic femora as we have much evidence to show that this is too variable to be of any service as a character. In the present specimen the number of small

greatly swollen, narrowing sharply below the tympanum which organ is apert, median tibiae expanding slightly proximad. Caudal femora long, with genicular lobes produced in long blunt teeth.

Allotype here selected: ♀; Yucatan. (Schott.) [Hebard Collection.]

Description of Allotype.—Quite similar to type in size and general appearance. Tegmina reaching the distal extremities of the caudal femora. Ovipositor similar to that of *tolteca*, except that it is somewhat less broad, as in *I. gracillima*; subgenital plate of the same type as found in *gracillima*.²⁷

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest length of lateral lobe	Greatest depth of lateral lobe	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Temax, Yucatan. Type.....	16.8	3.7	3.6	2.6	28.1	2.9	32.3	24.3	
♂ Castillo, Nicaragua.....	17.5	4.1	3.6	2.7	28.5	2.8	34.4	26	
♀ Yucatan. Allotype.....	17.5	3.9	3.5	2.6	27.8	2.4	33.4	26	4.9
♀ Aspinwall, Tehuantepec, Mex. .		4.2	3.3	2.8	28.9	2.4	32	25.3	

The above measurements show that there is some variation in the present species and larger series may eventually prove it to be a geographic race of *I. gracillima*, to which species it is closely allied.

Color Notes.—General color of body and antennae pale russet, shading to wood brown on limbs and organs of flight, the latter obscurely marked with darker shades. Median segment and first four dorsal abdominal segments marked on each side with seal brown, thus forming two somewhat arcuate dark bands, somewhat

trigonal spines on the ventral margins of the cephalic femora is 5-2 on the cephalic, and 0-0 on the caudal margins, these spines irregularly distributed. Unfortunately Saussure and Pietet have used this as the character to separate the present species from *I. gracillima*, in their key in the Biologia giving the difference as 2 trigonal teeth for *I. phthisica* and 3-4 small spines for *gracillima*. Our series of *gracillima* show a range of 3-1 on the cephalic and 0-0 on the caudal ventral margins of the cephalic femora, while *phthisica* shows a range of 5-1 and 0-0 on these margins.

²⁷ In the allotype this plate is somewhat shrivelled, owing probably to the fact that the specimen was once preserved in alcohol.

irregular in outline but with convexity dorsad, these bands with least separating width on the third abdominal segment. The outer distal portions of the cephalic and median femora and the outer proximal portions of the cephalic and median tibiae are darkened, approaching prout's brown in color. The original description indicates that the male specimen here described is somewhat less heavily marked with the darker shades than the type, the spot referred to there as "a large black maculation near the extremity of the tegmen" is, in the specimen before us, indicated merely by a narrow dark marking one millimeter in length. From the series of *Insara* of similar coloration before us, it is evident that often the darker markings fade considerably in drying with the exception of those found on the dorsal surface of the abdomen.

Distribution.—The present species has been taken at Temax in northern Yucatan, at Aspinwall Barrio on the Isthmus of Tehuantepec and at Castillo in southern Nicaragua.

Specimens Examined: 4; 2 males, 2 females.

Yucatan, (Schott), 1 ♀. *Allo'ype*. [Hebard Collection]

Temax, Yucatan, (Gauger), 1 ♂. *Type*. [Brit. Mus.]

Aspinwall Barrio, Isthmus of Tehuantepec, Mexico, (Sumichrast), 1 ♀, [Seudder Collection].

Castillo, Nicaragua, February 1893, (B. Shimek), 1 ♂, [Hebard Collection ex Bruner].

Insara gracillima (Brunner) (Figs. 10 and 14.)

1878. *H[ormilia] gracillima* Brunner, Monogr. Phaner., p. 231, pl. 5, fig. 70. [Guatemala; Cordova, Mexico.]

1897. *Hormilia gracillima* Saussure and Pictet, Biol. Cent.-Amer., Orth., I, p. 318. [Durango or Sinaloa, Mexico; Cordova, Mexico; Orizaba, Mexico; Teapa, Tabasco, Mexico; Guatemala; Volcan de Chiriqui, Panama.]

This insect differs from its close relative *I. phthisica* in having a less attenuate structure and in the male a different disto-dorsal segment of the abdomen and shorter cerci, the shaft of which latter is less decidedly curved and has a noticeable inward deflection at the middle. An even greater general resemblance to the species allied to *I. tolteca*, than is found in *phthisica*, is in consequence shown. The relationship, however, to the northern species near *I. elegans* is quite as close as is found in *phthisica*.

Types.—♂ and ♀; Guatemala. [Geneva Museum; Bruner Collection 6989] Cordova, Mexico. [Geneva Museum]

We have described below a male taken about twelve miles from one of the type localities.

Description.—♂: Orizaba, Vera Cruz, Mexico. December, 1887. (L. Bruner.) [Hebard Collection]

Size medium for the genus, form very attenuate but not as attenuate as in *I. phthisica*. Head and eyes very similar to those of that species. Pronotum with dorsal length about one and one-half the greatest (caudal) dorsal width; dorsum of pronotum, lateral carinae and cephalic and caudal margins of same similar to *phthisica*, but the general form shorter as shown in the proportions given above; lateral lobes of pronotum with length distinctly greater than depth, similar to *phthisica* but general form shorter in accord with the less attenuate structure of the insect, very little longer and considerably shallower than in *I. tolteca*, although not as shallow as in *phthisica*. Tegmina similar to those of *phthisica* but not so attenuate, with larger marginal field. The tegmina reach beyond the distal extremities of the caudal femora. Disto-dorsal segment of abdomen very broadly arcuate caudad, median section showing a considerably depressed area bounded on either side by straight carinae which are convergent cephalad; supra-anal plate small, trigonal, with lateral margins somewhat convex; cerci medium in length for the genus,²⁸ not as robust but longer than in *I. tolteca*, less slender and shorter than in *phthisica*, tapering rather sharply at base then gradually to the apex which is somewhat flattened above and armed with a tooth, this tooth directed meso-dorsad at an angle of a little more than ninety degrees to the distal portion of the cercus; subgenital plate as in *phthisica* with elevations and produced portions slightly less pronounced.²⁹ Limbs not so long and slender as in *phthisica*, but otherwise similar.³⁰

A female bearing the same data as the male here described furnishes the additional information given below.

Description of Female.—Quite similar to male in size and general appearance. Tegmina do not reach the distal extremities of the caudal femora. Ovipositor similar to that of *tolteca* except that it is somewhat less broad; subgenital plate elongate-lanceolate with immediate apex very narrowly acute-angulate emarginate, the plate showing a widening sulcation in the proximal two-thirds and embracing weakly the base of the ovipositor.

So few specimens are known of this species and of *phthisica* that little can be established concerning the relative proportions of the two species.

²⁸ Brunner in his original description states that the cerci of this species are very long. This is due to the fact that, when the present species was described, all of the known males of the other species of the genus possessed short cerci with the exception of *fasciata*, which species does not belong in the genus.

²⁹ See foot note regarding the distal extremity of this plate under the description of *I. phthisica*.

³⁰ See footnote 26 on page 66, concerning the variability of the armament of the cephalic femora.

It appears certain, however, that the tegmina and wings of *phthisica* are uniformly longer, and the lateral lobes of the pronotum shallower, than in *gracillima*. The measurements given for *gracillima* show that there is a certain amount of variation in that species, though the specimens agree in general proportions and all important characters.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Orizaba, Mexico.....	16.5	3.5	25.1	2.9	30.1	21.3	
♂ San Rafael, Mexico.....	15	3.8	26.5	2.7	31	23	
♂ Costa Rica.....	16.5	4	26.6	2.6	31.1	24.2	
♀ Orizaba, Mexico.....	18	3.9	24.8	2.9	28.3	23.2	5

*Color Notes.*³¹—General color of insect bistre, shading to raw umber on the limbs. The cephalic femora are narrowly twice-banded with vandyke brown,³² while the tegmina are irregularly and finely marked with a darker brown than the ground color, which gives the insect a more or less speckled and streaked appearance. The dorsal abdominal segments are marked with darker brown similarly as described in this paper under *phthisica*.

Distribution.—The present species is found from Chiriqui, Panama, northward through Costa Rica and Guatemala to Mexico, where it has been taken in the southern states of Tabasco and Vera Cruz, and northward in Durango or Sinaloa.

*Specimens Examined:*³³ 4; 3 males, 1 female.

Costa Rica, 1♂, [Hebard Collection].

San Rafael, Vera Cruz, Mexico, 1♂, [Hebard Collection].

Orizaba, Vera Cruz, Mexico, December 1887, (L. Bruner), 1♂, 1♀, [Hebard Collection].

Insara elegans (Scudder) (Figs. 11, 17 and 27.)

1900. *Hormilia elegans* Scudder, Proc. Davenport Acad. Sci., VIII, p. 96, pl. III, fig. 1. [Las Cruces, New Mexico; Mesilla, New Mexico.]

³¹ All of the specimens before us show that they have become somewhat discolored in drying, and their markings, although now faded and irregular in most cases, indicate that, when fresh, all of the specimens were probably distinctly marked as described.

³² The specimen from Costa Rica has the median femora similarly twice-banded.

³³ These specimens are in the Hebard Collection.

1900. *Hormilia elegans* Cockerell, Amer. Nat., XXXIV, p. 290. [Mesilla Valley, New Mexico; Salt River Valley, Arizona.]
1902. *Hormilia elegans* Scudder and Cockerell, Proc. Davenport Acad. Sci., IX, p. 52. [Las Cruces, New Mexico; Mesilla, New Mexico.]
1904. *Hormilia elegans* Rehn, Proc. Acad. Nat. Sci. Phila. 1904, p. 572. (In part.) [Florence, Arizona.]
1905. *Hormilia elegans* Caudell, Proc. U. S. N. M., XXVIII, p. 477. [Huachuca Mountains, Arizona; Catalina Mountains, Arizona.]
1907. *Hormilia elegans* Rehn, Proc. Acad. Nat. Sci. Phila. 1907, p. 58. [Benson, Arizona; San Bernardino Ranch, Cochise County, Arizona.]
1907. *Hormilia elegans* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 78. (In part.) [Phoenix, Arizona.]
1909. *Hormilia elegans* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 167. [Deming, New Mexico.]

The present species differs from its more western race, *I. elegans consuetipes*, in being less slender in structure and the marginal field of the tegmina narrows more abruptly distad from the proximal third,³ moreover typical *elegans* shows a herring-bone pattern of greater or less intensity on the tegmina, while in the western geographic race these organs are immaculate or nearly so. From *I. covilleae*, the species showing nearest relationship, *elegans* may be easily separated by the very different pronotum, less abruptly narrowing marginal field of the tegmina and striking differences both in coloration and color pattern.

Described from three females from two adjacent localities in central southern New Mexico.

Single Type here chosen.—♀; Mesilla, New Mexico. Elevation 3865 feet. June 30, 1897. (A. P. Morse.) [Scudder Collection.]

Description of Type.—Size medium for the genus, form rather slender. Head with greatest width contained about one and three-fifths times in greatest depth; occiput rounded, slightly declivent toward fastigium, the latter narrow, compressed, subequal, with an appreciable medio-longitudinal sulcus on the dorsal surface, lateral margins roundly elevated, fastigium in contact with frontal fastigium for full length of both, widening slightly more than in *I. tolteca* above this sulcus; eyes large, prominent, ovate in outline, equalling in length the infra-ocular portion of the genae. Pronotum with dorsal length about one and three-tenths the greatest (caudal) dorsal width, dorsum of pronotum deplanate, slightly elevated caudad;

³The figure which accompanies the original description is poorly drawn and fails completely to show this character and the tegmen as it really is.

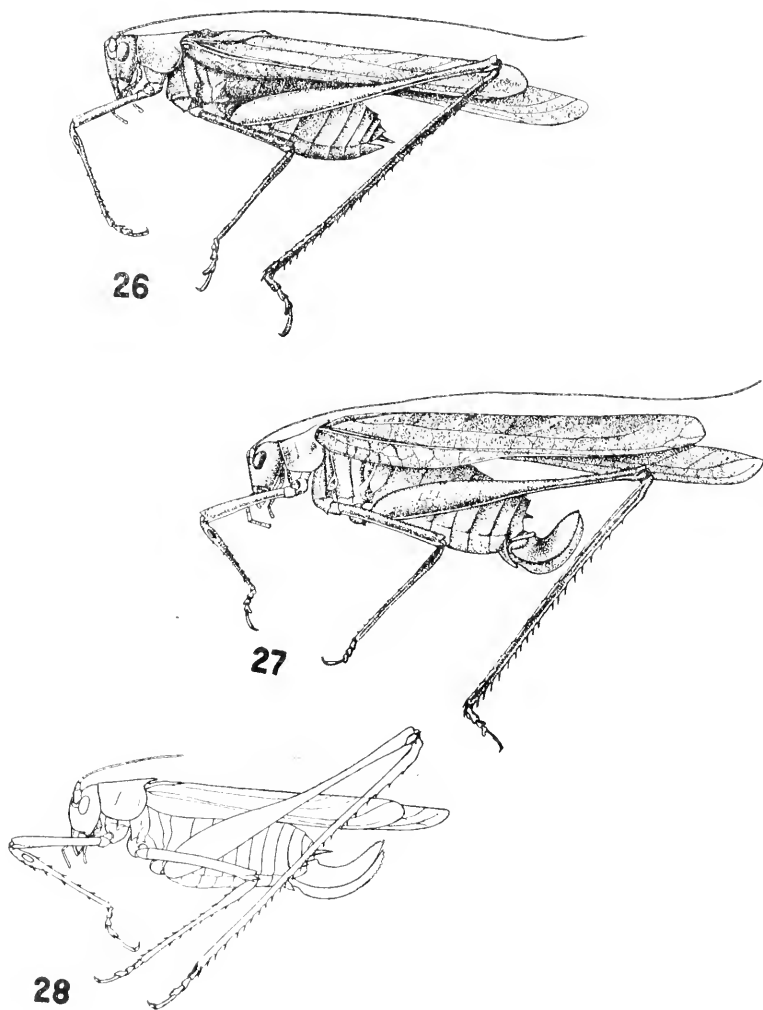


Fig. 26. *Insara elegans consuetipes*. Lateral view of male paratype. ($\times 2$) Fig. 27. *Insara elegans*. Lateral view of type. Female. ($\times 2\frac{1}{2}$) Fig. 28. *Insara lamellata*. Lateral outline of type. Male. ($\times 2$)

lateral margins of dorsum of pronotum³⁵ in cephalic fifth divergent, then subparallel for an equal distance, for half of the remaining distance divergent in a straight line, then strongly divergent with a very slight convexity; these parts of the margins joining without angulation; cephalic margin of dorsum of pronotum gently arcuate-emarginate, caudal margin of same strongly arcuate,³⁶ this margin with a decided convexity ventrad and having the inner edge of this convex area subangulate; lateral lobes of pronotum with length equal to depth, the ventro-cephalic angle obtuse and sharply rounded, the ventro-caudal angle broadly rounded from a point at the middle of the ventral margin of the lateral lobes to the humeral sinus, humeral sinus distinct, subrectangulate and rather broadly rounded; a peculiar raised callosity occupies the ventro-caudal portion of the lateral lobes, extending from the middle point on the ventral margin to the humeral sinus and bounded on the inside by a nearly straight line between these two points. Tegmina long and narrow, the distal width little less than the mesal width, the tegmina reaching considerably beyond the distal extremities of the caudal femora and rather broadly rounded at the apex;³⁷ marginal field of tegmina narrowing rather abruptly from cephalic third. Ovipositor nearly equal to the cephalic femur in length, deep,³⁸ sharply bent dorsad at base, the bent portion of the dorsal margin and distal portion of the ventral margin finely serrate; subgenital plate elongate, lateral margins compressed, the plate is sulcate meso-proximad and can scarcely be said to embrace the base of the ovipositor. Cephalic and median limbs slender; the cephalic femora carinate dorso-distad for a very short distance with the distal margin of same slightly but rather sharply produced, genicular lobes dentiform and bearing a small supplementary spine on the ventral margin; cephalic tibiae with proximal extremity somewhat swollen, narrowing gradually below the tympanum which organ is apert; median tibiae slightly expanding proximad. Caudal femora shorter than the tegmina by the

³⁵ These margins appear to the naked eye as Scudder has given in his original description; "Pronotum with strongly arcuate and pronounced lateral carinae, making the disk twice as narrow in the middle as behind."

³⁶ A very slight median emargination of the caudal margin of the dorsum of the pronotum is indicated in this specimen, but this character is exceedingly variable, often absent, as is shown by the series of the present species before us, and is therefore valueless.

³⁷ Scudder in his original description gives, "apex roundly and obliquely subtruncate," though the figured specimen shows no trace of oblique truncation at the tegminal apex. It is true that the lectotype might be said to fit the original description, but the tegminal apex is more properly described as broadly rounded, and all of the other specimens in the series before us have the apex of the tegmina rounded with no trace of oblique truncation.

³⁸ In the present species the ovipositor narrows much more gradually beyond the bent portion than in *tolteca*, and, in consequence, *degnans* has that portion of the ovipositor considerably deeper.

length of the cephalic femur, slightly bullate for somewhat more than the proximal half, not nearly as much so as in *I. tolteca*, genicular lobes acute-angulate produced and bearing a small sharp spine at apex.

A male taken but a few miles from Mesilla, New Mexico, is here chosen as the *Allotype*.

Allotype.—♂; Las Cruces, New Mexico. September 27. (T. D. A. Cockerell.) [U.S.N.M.]

Description of Allotype.—Very similar to female in general appearance but somewhat smaller. The marginal field of the tegmina narrows more abruptly distad from proximal third than in the female. Disto-dorsal segment of abdomen with median section showing a shallow depressed area, in cross section the lateral margins are formed by distinct angles, these margins are straight, convergent cephalad; supra-anal plate small, trigonal, with lateral margins convex; cerci medium in length for the genus, not quite as robust at base as in *I. gracillima*, gently tapering and slightly incurved for two-thirds of their length, then of uniform diameter and more decidedly incurved to apex which is suddenly flattened above and armed with a sharp tooth, this tooth directed meso-dorsad at an angle of a little more than ninety degrees to the distal portion of the cercus; subgenital plate short, lateral margins convergent distad and produced in non-articulate styliform appendages, cephalad from the base of these appendages extend slightly divergent rounded elevations which become obsolete about the middle of the plate, distal extremity of plate between the produced lateral margins obtuse-angulate produced, the sides of this angulation slightly concave.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♀ Las Cruces, New Mexico. <i>Type</i>	17	3.7	26.1	3.1	29.6	19.6	5.4
♀ Las Cruces, New Mexico. <i>Paratype</i>	15.5	3.8	27.5	3.1		19	5.5
♂ Mesilla, New Mexico. <i>Allotype</i>	15.2	3.5	23.8	2.7	27.4	19.2	
♀ San Antonio, Texas.....	15.5	3.9	27.9	3	31.7	21.5	5.7
♂ San Antonio, Texas.....	16	4	24	2.8	29	20.4	
♂ Pueblo, Colorado.....	15.2	3.5	21	2.2	24.3	17.6	
♀ Florence, Arizona.....	18.3	3.8	27.2	2.7	31.7	20	5.8
♂ Florence, Arizona.....	13.7	3.7	22.2	2.3	23.7	17.7	

The material before us shows that, although there is a certain amount of size variation in the present form, the proportions are quite constant.

Further measurements of specimens from Deming, New Mexico, and Florence, Arizona, have been given by Rehn and Hebard,³⁹ but no geographic increase or decrease in size over certain portions of the insects range can be admitted. The large series now before us shows numbers of large and small individuals from the same locality from various portions of the range of the species.

When compared with its western race, *I. elegans consuetipes*, this form is seen to have, as a rule, considerably less attenuate proportions.

Color Notes.—General color of insect pale bice green, in dried specimens this color has almost always faded to mummy brown on the body and proximal portions of the appendages; eyes wood brown. A dark brown maculation is almost invariably present on each side of the fourth dorsal abdominal segment near the caudal margin, which margin caudad of this maculation is buffy. Caudal extremity of anal field of tegmen usually marked with a small dark spot. The pale bice green general coloration of the tegmina becomes much paler along the veins which approach the sutural margin diagonally, and between these the coloration is frequently intensified and sometimes very minutely speckled with brown; this gives the tegmina a distinctive "herring-bone" pattern in the present form. This color pattern ranges from a very pronounced type to one quite as immaculate as in *I. elegans consuetipes*. The specimens of the very pronounced "herring-bone" pattern before us are from Brewster County, Texas, and Pima County, Arizona. The great majority of the series have this pattern moderately indicated while a very few specimens from San Antonio, Cotulla and Uvalde, Texas, are immaculate. There are four specimens before us which have the general coloration very pale buff and in these the "herring-bone" pattern is very faint; these individuals are from Del Rio and Neville Spring, Texas and Deming, New Mexico.

The opinion expressed by Rehn and Hebard that "this species is exceedingly variable in coloration" was caused by specimens of the very different and strikingly colored *I. covilleae* being confused with the present species. As is found in many species of Orthoptera, there is a great amount of variation in the intensification and recession of the color pattern of *elegans*, but when this pattern is present it is almost uniform, the only differences being found in the fact that in some specimens all of the veins which approach the

³⁹ 1909. Proc. Acad. Nat. Sci. Phila., 1909, p. 167.

sutural margin of the tegmina diagonally are paler, while in others only a few of these veins are so defined.

Distribution.—The present species has been taken from San Antonio and Benavides, Texas, westward to the region where it mingles with *I. elegans consuetipes* along the low divides east of the Colorado River in Arizona. The most northern record is Pueblo, Colorado, west of which locality it has not been taken north of southern New Mexico and central Arizona. We have but one Mexican record, Tlahualilo, in northeastern Durango, though the species is probably widely distributed over all northern Mexico adjacent to the United States from the Gulf of Mexico to the Gulf of California.

Biological Notes.—From our field notes we find that this species is very partial to mesquite, having been found in that bush at almost every locality at which it was taken. At Uvalde, Texas, the notes state that these insects were stridulating in numbers soon after dark on mesquite, but later in the night fewer were to be heard. Dog Cañon, Brewster County, Texas and Deming, New Mexico, are the only localities at which we have taken specimens attracted to light at night. The favorite habitat of the species when found in the desert is the heavier vegetation along usually dry washes. Our notes for Snyder's Hill, Pima County, Arizona, afford the following information, "Greasewood (*Corillea tridentata*) flat where mesquite (*Prosopis velutina*) and an acacia (*Acacia greggii*) predominated along the dry washes. *Elegans* kept up a whirring in the two latter bushes (after dark), this sound had no harshness and could be heard scarcely over five feet distant. About every fifth bush examined after dark contained one of these singers."

The capture of a few specimens of this species in the creosote bush (*Corillea tridentata*), at El Paso, Texas, was surprising, as at no other place was it found on this bush, which is the host-plant of the monotypic *I. covilleae*.

Specimens Examined: 89; 51 males, 32 females and 6 nymphs.

San Antonio, Texas, 1885. (M. Newell), 1 ♀, [Hebard Collection ex Bruner]; August 15, 1912, (R. & H.), 1 ♂, 1 ♂n.

Cotulla, Texas, August 13, 1912, (R. & H.), 1 ♂.

Benavides, Texas, August 9, 1912, (R. & H.), 3 ♂, 1 ♀.

Laredo, Texas, August 12, 1912, (R. & H.), 3 ♂.

Uvalde, Texas, August 21, 1912, (R. & H.), 1 ♂.

Del Rio, Texas, August 22, 1912, (R. & H.), 1 ♂.

Two miles N. of Bone Spring, Brewster County, Texas, September 9, 1912, (R. & H.), 3♂.

Dog Cañon, Brewster County, Texas, September 3, 1912, (R. & H.), 2♂, 1♀.

Neville Spring, Brewster County, Texas, September 8, 1912, (R. & H.), 8♂.

Franklin Mountains, El Paso, Texas, elevation 3800 feet, September 16, 1912, (H.), 4♂, 1♀.

El Paso, Texas, elevation, 3700 feet, September 16, 1912, (H.), 3♂, 3♀, 1♀n.

Pueblo, Colorado, elevation 4660 feet, September 15, 1898, 1♂, [Hebard Collection].

Mesilla, New Mexico, elevation 3865 feet, June 30, 1897, (Morse), 1♀.
Type. [Scudder Collection]

Las Cruces, New Mexico, elevation 3883 feet, September 27, October, (Cockerell), 1♂, 2♀. *Allotype* and *paratypes*. [U. S. N. M. and Scudder Collection]

Deming, New Mexico, elevation 4315 feet, July 20, 1907, (R. & H.), 2♀.

Benson, Arizona, elevation 3576 feet, July, 1♀, [Bklyn. Inst. A. & S.].

San Bernardino Ranch, Cochise County, Arizona, elevation 2500 feet, August, (Snow), 1♀, [Univ. Kansas].

Huachuca Mountains, Arizona, August 15, 1903, (Oslar), 1♀, [U. S. N. M.]

Snyder's Hill, Pima County, Arizona, elevation 2500 feet, October 11, 1910, (R. & H.), 7♂.

Sycamore Cañon, Baboquivari Mountains, Arizona, elevation 3700 feet, October 6 to 9, 1910, (R. & H.), 1♀.

Hot Springs, Arizona, elevation 1697 feet, (H. S. Barber), 1♂, [U. S. N. M.]

Phoenix, Arizona,⁴⁰ elevation 1082 feet, September 5, 6, October 15, (Kunzé), 9♂, 11♀, [Hebard Collection and U. S. N. M.].

Florence, Arizona, elevation 1493 feet,⁴¹ June 8, 14, July 13, 20, 23, September 20, 1903, (Biederman), 1♂, 5♀, 2♂n., 2♀n., [A. N. S. P.].

Tlahualilo, Durango, Mexico, elevation 3500 feet, July, 1905, (A. W. Morrill), 1♂, [U. S. N. M.].

Insara elegans consuetipes (Scudder) (Figs. 13, 19 and 26.)

1900. *Archaea consuetipes* Scudder, Can. Ent., XXXII, p. 332. [Indio, California.]

This geographic race of *I. elegans* might easily be considered a distinct species so striking are the characters which separate it from that species, were it not for the fact that a series of specimens from

⁴⁰ The majority of these specimens are intermediates between *I. elegans* and *I. elegans consuetipes*, while a number are typical of *elegans* and a few approach the western geographic race closely.

⁴¹ Of these specimens two of the adults and the four nymphs were taken in June.

Phoenix, Arizona, shows unquestionably that *consuetipes* is no more than a geographic race of *elegans*, in that the majority of the specimens from that locality are absolute intermediates between the two, while there are a few specimens which closely approach *consuetipes* and a number which show a still closer affinity to *elegans*. The geographic race may be distinguished from typical *elegans* in its more slender structure, gradually narrowing marginal field of the tegmina, much less sharply bent ovipositor in the female, and in the tegminal coloration which is immaculate.

Types.—2 ♂; Indio, California. July 9, 1897. (A. P. Morse.) [Morse and Scudder Collections.]

Lectotype here selected:—♂, in Morse Collection bearing the data given above. The original description shows clearly that the measurements given are taken from the specimen in the possession of Professor Morse, and we have consequently selected that specimen as the type.

Description of Paratype.—Size near that of *I. elegans*, form more slender. Head with greatest width contained about one and one-half times in greatest depth, similar to that of *elegans*; eyes also as in that species. Pronotum with dorsal length about one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deplanate, lateral margins as in *elegans* but much less strongly divergent, making the disk not twice as narrow mesad as it is caudad, so that they appear but moderately arcuate to the naked eye; cephalic and caudal margins of dorsum of pronotum as in *elegans*; lateral lobes of pronotum with length slightly greater than depth, otherwise as in *elegans* except that the raised callosity is not so distinct. Tegmina as in *elegans* except that the marginal field of the same narrows gradually distad from proximal third. Disto-dorsal segment of abdomen, supra-anal plate, cerci and subgenital plate as in *elegans*. Limbs and armament of same as in *elegans* but with form slightly more slender.

A female, taken from a place nearest the type locality at which that sex of the present species has been captured, is here chosen as the *Allotype*.

Allotype.—♀; Colorado, Imperial County, California. October 1, 1910. Elevation, 130 feet. (R. & H.) [Hebard Collection.]

Description of Allotype.—This sex differs from that of *elegans* in the differential characters which are common to both sexes given above and also in the much less sharply bent and consequently longer ovipositor.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen
♂ Indio, California. <i>Type</i> ³²	16	4.75	25	
♂ Indio, California. <i>Paratype</i>	17.5	3.9	23.3	2.7
♀ Colorado, California. <i>Allotype</i>	20.3	4.2	28.2	2.9
9♂♂ Colorado, California. Averages, and extremes.....	16.5 (14.9-18.7)	4 (3.9-4.2)	24.4 (22.9-26.1)	2.7 (2.5-3)
9♀♀ Colorado, California. Averages and extremes.....	18.1 (15-20.3)	4.1 (3.8-4.3)	27.4 (25.6-28.4)	2.8 (2.6-3)
♂ Las Vegas, Nevada.....	15.8	3.9	25	2.9
♂ Las Vegas, Nevada.....	16	4	24.7	2.9
♀ Las Vegas, Nevada.....	17.2	4.4	27	3

	Length of wing	Length of caudal femur	Length of ovipositor
♂ Indio, California. <i>Type</i> ⁴²	29.5	21	
♂ Indio, California. <i>Paratype</i>	27.6	18.8	
♀ Colorado, California. <i>Allotype</i>	32.6	22.8	6
9♂♂ Colorado, California: Averages and extremes.....	28.8 (26.5-30.9)	20 (19-20.5)	
9♀♀ Colorado, California. Averages and extremes.....	31.8 (31.1-33.3)	21.6 (20.2-23)	6.2 (5.8-7.1)
♂ Las Vegas, Nevada.....	28.9	19.9	
♂ Las Vegas, Nevada.....	29.1	20.9	
♀ Las Vegas, Nevada.....	32	21	6.2

Color Notes.—General color of insect pale bice green, in the dried specimens this has faded and the body and proximal portions of the appendages are in most cases mummy brown; eyes wood brown; a small dark maculation is frequently found on each side of the fourth

⁴² The measurements of this specimen are quoted from Scudder's original description which is insufficient and misleading in some respects. The pronotal length is incorrect.

dorsal abdominal segment near the caudal margin, and the caudal extremity of the anal field of the tegmina is occasionally marked with a small dark dot. In coloration the insect is one of the most immaculate of the genus.

Distribution.—The present species is known to range from Caliente and Las Vegas in southern Nevada, southward along the Colorado River to Yuma, Arizona, and westward over the Colorado Desert of southern California as far as Indio. The present geographic race is found to merge with true *elegans* in the country about Phoenix, Arizona, and the eastern limit of the distribution of typical *elegans consuetipes* is undoubtedly to be found in the first low divides east of the Colorado River in Arizona.

Biological Notes.—This geographic race was found in the low river bottom at Colorado, California, on Arrow-wood (*Pluchea sericca*); constant beating during an entire morning secured the series here recorded. One specimen was taken across the Colorado River at this point in the town of Yuma, Arizona, attracted there to light at night. At Las Vegas, Nevada, the species was first heard stridulating in a thick mesquite tree some twenty feet in height after darkness had fallen; very many individuals were heard in this tree but, owing to the height at which most of the insects were perched and the thorns, very few could be taken, and these only because they were singularly unafraid. Each specimen taken rested quietly while the branch upon which it was perched was slowly pulled downward and the insect was thereby brought within reach. When, however, an incautious attempt is made at night to capture a specimen, the same unexpected agility is shown as is true of *elegans*, the insect slipping away into the dark quickly and noiselessly, using both legs and wings in its escape. The female specimen taken at Las Vegas was captured during the day on bare soil near an arroyo. The specimens captured at Caliente, Nevada, were beaten from a dense growth of *Chrysothamnus lanccolatus* in the valley bottom; these two individuals were found only after considerable effort.

This geographic race shares with typical *elegans* a truly deserticulous distribution, and, like *elegans*, it is there found to prefer to live in bushes near water or where water is to be found after rains, the desert vegetation in such situations showing this fact by being heavier and more luxuriant.

The stridulation of the insect is a soft whirring note which seems indistinguishable from that of *elegans*; so faint is this stridulation that it can not be detected farther than 15 or 20 feet on the stillest night.

Specimens Examined: 29; 13 males, 15 females and 1 gynandromorph.

Indio, California, July 9, 1897, (A. P. Morse), 1♂. *Paratype*. [Scudder Collection]

Colorado, Imperial County, California, October 1, 1910, elevation 130 feet, (R. & H.), 9♂, 12♀, including ♀ *allotype*.

Yuma, Yuma County, Arizona, October 1, 1910, (R. & H.), 1♀.

Arizona, 1♀, [U. S. N. M.].

Caliente, Lincoln County, Nevada, September 3, 1909, elevation 4400 feet, (R. & H.), 1♂, 1 gynandromorph.

Las Vegas, Lincoln County, Nevada, September 2, 1909, elevation 2028 feet, (R. & H.), 2♂, 1♀.

Insara apache (Rehn) (Fig. 15.)

1907. *Hormilia apache* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 58.

[Carr Canyon and Palmerlee in Huachuca Mountains, Arizona.]

1912. *Hormilia apache* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 101. (Type fixation.)

Although no close relationship exists between the present species and any other member of the genus, some degree of affinity is indicated between it and *I. elegans consuetipes* in the pronotum and tegmina, although in *apache* the former is very much more simple and the latter much broader; in these two species also, the cephalic tibiae in both sexes, and the disto-dorsal segment of the abdomen and subgenital plate in the male, are similar: considerable difference from *elegans consuetipes* is to be found in the robust build of *apache*, very different cerci in the male and more sharply bent ovipositor in the female. Although the cerci are very different from any other species and show the highest specialization found in the genus *Insara*, they suggest an extreme development of the type found in *I. intermedia*. The insect is unique in general appearance.

Type.—♂; Carr Canyon, Huachuca Mountains, Arizona, August, 1905. (H. Skinner.) [A.N.S.P.]

Description of Type.—Size medium, form robust when compared with the species allied to *I. elegans*. Head with greatest width contained one and seven-tenths times in the depth, in form similar to that of *elegans* but with occiput more globose and eyes smaller in proportion to the head. Pronotum with dorsal length one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deplanate, lateral margins of dorsum of pronotum expanding very moderately and regularly caudad with, however, a

very slight expansion cephalad at the cephalic margin, the point of least width of dorsum consequently close to the cephalic margin; cephalic margin of dorsum of pronotum gently arcuato-emarginate, caudal margin of same very broadly arcuate with a very faint median emargination indicated; lateral lobes of pronotum with length slightly less than the depth, the ventrocephalic angle obtuse and rounded, the margin from this angle to the humeral sinus rather regularly arcuate, humeral sinus distinct and angulate but not wide or deep. Tegmina rather long and broad, exceeding the caudal femora in length, narrowing evenly from point of greatest width at the caudal margin of the tympanum to the broadly rounded apex. Disto-dorsal segment of abdomen with median section showing a rounded, slightly depressed area; supra-anal plate small, trigonal; cerci very long and rather slender, slightly incurved, tapering from the base rather sharply for one-third the length, then uniform to apex which is broadly and deeply flattened above and bowed out below, the apex armed with a flattened tooth which is directed dorsad at a right angle;⁴³ subgenital plate of moderate length, lateral margins subparallel, somewhat elevated caudad and produced in slightly divergent, slender, and non-articulate styliform processes, caudal margin broadly and roundly emarginate. Cephalic and median limbs long and rather heavy for the genus; cephalic femora much as in *elegans*, and, as in that species, the genicular lobes bear a small supplementary spine; cephalic tibiae likewise similar. Caudal femora much as in *elegans* but longer and slightly heavier, with genicular lobes produced in longer and more uniformly slender dentiform processes.

The allotypic female, bearing the same data as the type, affords us the data given below.

Description of Allotype.—Similar to male in size and general appearance. Tegmina equal to caudal femora in length. Ovipositor less than cephalic femur in length, bent sharply upward at base, the bent portion of the dorsal margin and the distal extremity of the ventral margin finely serrate; subgenital plate elongate, lateral margins compressed; the plate is sulcate meso-proximad and does not embrace the base of the ovipositor.

The single paratype, a female from Palmerlee, Arizona, is now in the Hebard Collection.

Measurements (in millimeters) of individuals here treated

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
Carr Canyon, Huachuca Mountains, Arizona							
♂ <i>Type</i>	17	4.8	25	5	28.3	22	
♀ <i>Allotype</i>	16.5	5	23.5	4.5	21.6	23.5	5.8

⁴³ In the original description both the figure and description of the cerci are faulty and misleading.

Color Notes.—The general color of the type specimens is chromium green; the antennae are marked with about seven irregularly disposed dark brown annuli on the distal third. The entire dorsal surface of the abdomen is immaculate.⁴⁴

Distribution.—The present species is known only from Cochise County, Arizona; it has been taken there only at the localities given below.

Specimens Examined: 3; 1 male, 2 females.

Palmerlee, Huachuca Mountains, Arizona, (Schaeffer). 1 ♀. *Paratype*. [Hebard Collection ex Bklyn. Inst. A. & S.]

Carr Canyon, Huachuca Mountains, Arizona, August, 1905, (H. Skinner), 1 ♂, 1 ♀. *Type, allotype*. [A. N. S. P.]

Insara abbreviata (Brunner) (Figs. 16 and 25.)

1878. *H[ormilia] abbreviata* Brunner, Monogr. Phaner., pp. 231, 233. [Cuernavaca, Mexico.]

1897. *Hormilia abbreviata* Saussure and Pictet, Biol. Cent.-Amer., Orlh, I, pp. 318, 320. [Cuernavaca, Mexico.]

1902. *Hormilia gracillima* Rehn (not of Brunner, 1878), Trans. Am. Ent. Soc., XXIX, p. 20. [Cuernavaca, Mexico.]

The form of the pronotum, tegmina and subgenital plate in this species is unique, and a much greater disparity exists in the tegminal length when compared with the length of the caudal femur than is found in any of the other known species of the genus. Although differing in many important respects, *I. abbreviata* finds its closest relationship with *I. apache*, to which species it bears a somewhat similar resemblance, if the brevity of tegmina is disregarded, and affinity is shown in similar tympanal and cercal structure.

Type.—♀; Cuernavaca, Morelos, Mexico. [Brunner Collection 7152.]

The following description is based upon the allotypic male here selected.

Description of Allotype.—♂; Cuernavaca, Morelos, Mexico. September. (O. W. Barrett.) [A. N. S. P.]

Size medium, form compact. Head with greatest width contained one and four-fifths times in depth, similar in form to *I. prasina* except that in

⁴⁴ As in all the species of this group which are pale green in color, these specimens when dried have turned, wholly or in part, pale yellowish, and we would not feel able to make the statement given above, were it not true that, in all the other species of the genus which have markings on the dorsal surface of the abdomen, these markings remain distinct after the specimens have been dried.

the present species the fastigial suture is straight, transverse; eyes much as in *prasina* but less prominent. Pronotum with dorsal length about twice the greatest (caudal) dorsal width; dorsum of pronotum very slightly depressed within the margins; lateral carinae of dorsum of pronotum parallel in the cephalic half and very slightly sinuate, moderately arcuate-divergent in caudal half, the point of least width mesad; cephalic margin of dorsum of pronotum almost straight, a very shallow angulate emargination indicated; caudal margin of same very broadly arcuate; lateral lobes of pronotum with length one and one-half times the depth, the ventro-cephalic angle sharply angulate at slightly more than ninety degrees, the ventro-caudal angle broadly rounded, caudal margin arcuate, the humeral sinus indicated only by a very slight sinuation. Tegmina abbreviate, about three-fifths the length of the caudal femora, broad in proportion to length, narrowing with a very slight and even convexity from point of greatest width at caudal margin of tympanum to the rather sharply rounded apex; marginal field of tegmina broad in proportion to tegminal width. Disto-dorsal segment of abdomen truncate caudad with a very slight medio-longitudinal depression;⁴⁵ cerci rather long and more slender than in other species peculiar to Mexico, slightly incurved, this curvature more pronounced near base and apex, tapering rather sharply for one-third the length, then uniform to apex which is suddenly and considerably flattened above and armed with a tooth the end of which is slightly hooked, this tooth directed meso-dorsad at almost a right-angle; subgenital plate short and narrow, lateral margins slightly convergent distad, distal extremity produced mesad and laterad in short distinct knobs, the median protuberance slightly the greater, the caudal margin of the plate being in consequence angularly brace-shaped in general outline. Cephalic⁴⁶ limbs slender, the cephalic femora carinate dorso-distad for a very short distance with distal margin of same rather sharply acute-angulate and genicular lobes bearing a supplementary spine, ventral margins of cephalic femora unarmed; cephalic tibiae somewhat swollen, narrowing gradually below tympanum,⁴⁷ which organ is apert. Caudal femora mildly bullate proximad for a distance a little more than half their length, genicular lobes triangular, dentiform, but with blunt apices.

As the female of this species is known from the type alone, we learn from Brunner's original description only that the size of that sex is somewhat smaller than that of the male, that the length of the pronotum and tegmina is greater, and that the pronotal length is equal to that of the ovipositor. No mention is made of the sub-

⁴⁵ The supra-anal plate is invisible in this specimen.

⁴⁶ The median limbs are missing in the specimen before us.

⁴⁷ This character agrees perfectly with that found in the northern species of the genus and may be used to separate readily this species from all other known forms peculiar to Mexico.

genital plate. In other respects the two sexes appear to be very similar.

Measurements (in millimeters) of only specimens known

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Cuernavaca, Morelos, Mexico. <i>Allotype</i>	15.8	4.	12.2	3.1	13	20.5	
♂ Cuernavaca, Mexico.....	15	4.1	13.6	2.9	15	20.4	
♂ Cuernavaca, Mexico.....	13	4	14	3	15.4	21.8	
♀ Cuernavaca, Mexico.....							
<i>Type</i> . ⁴⁸	15	5	17	2.5			5

Color Notes.—The general color of the allotype and the longer male is immaculate bice green,⁴⁹ probably very intense in life. The lateral carinae of the pronotum are sharply outlined in cream buff and bordered on the inner side by very dark maroon purple; so narrow is this border that the color is scarcely discernible without the aid of a microscope. The other male before us is wood brown in general coloration, the tegmina extremely faintly mottled with darker. The general coloration shades to raw umber on the limbs. The lateral carinae of the pronotum are outlined in paler brown but not as sharply as in the green specimens.

Distribution.—The present species is known only from Cuernavaca, Morelos in central Mexico.

Specimens Examined: 3; 3 males.

Cuernavaca, Morelos, Mexico, September, (O. W. Barrett), 1♂. *Allotype*. [A. N. S. P.]: January 4, 1899, 2♂. [Hebard Collection]

Insara covilleae⁵⁰ new species (Figs. 18 and 30.)

1904. *Hormilia elegans* Rehn (not of Scudder, 1900), Proc. Acad. Nat. Sci. Phila., 1904, p. 572. (In part.) [Florence, Arizona.]

1907. *Hormilia elegans* Rehn (not of Scudder, 1900), Proc. Acad. Nat. Sci. Phila., 1907, p. 78. (In part.) [Phoenix, Arizona.]

⁴⁸ The measurements of the type are quoted from the original description.
⁴⁹ This is the only species of this genus peculiar to Mexico which has the entire dorsal surface of the abdomen immaculate.

⁵⁰ This name is chosen owing to the fact that the species is monotypic, inhabiting the desert shrub *Covillea tridentata*.

1909. *Hormilia elegans* Rehn and Hebard (not of Scudder, 1900), Proc. Acad. Nat. Sci. Phila., 1909, p. 474. [Cottonwood, San Bernardino County, California.]

The authors have in the past most unfortunately confused the present species with *I. elegans*, to which it shows a definite relationship, but from which it differs not only in a number of minor characters but also in the strikingly different pronotum, the more abruptly narrowing marginal field of the tegmina, the general coloration, and the very different color pattern. Moreover, although the two species show probably closer relationship to each other than to any of the other species of the genus and are found in distribution to overlap over a wide area, still they may be readily distinguished from each other by their stridulation, and while *I. corilleae* is only found upon the creosote bush (*Corillea tridentata*), *elegans* is almost never found on that plant but inhabits a large variety of other desert bushes which grow especially along washes in the desert. The large and conspicuous white or pale greenish spots on the tegmina of the present species and the extremely sellate pronotum, may serve to separate the insect easily from all other known species of the genus.

Type.—♂; Tumamoc Hill, Tucson Mountains, Pima County, Arizona. October 3 to 4, 1910. Elevation, 2500 feet. (R. & H.) [Hebard Collection.]

Description of Type.—Size and form much as in *elegans*. Head with greatest width contained about one and four-fifths times in the greatest depth, except for the somewhat narrower proportions very much like that of *elegans*; eyes large, more prominent than in *elegans*, ovate in outline, in length slightly exceeding the infra-ocular portion of the genae. Pronotum with dorsal length about one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deeply sellate; lateral margins⁵¹ of dorsum of pronotum diverging in the cephalic fifth, then sub-parallel for one-half the remaining distance, from that point strongly concave-divergent to nearly the caudal margin where a slight convexity is noticeable, these parts of the lateral carinae joining without angulation and the carinae much less sharply defined and in section more broadly rounded than in *elegans*; cephalic margin of dorsum of pronotum almost straight, caudal margin of same strongly arcuate, this margin with a decided convexity ventrad and having the inner edge of this convexity sub-angulate; lateral lobes of pronotum with

⁵¹ The lateral margins of the dorsum of the pronotum in this species appear to the naked eye even more arcuate than in *elegans* but not as pronounced.

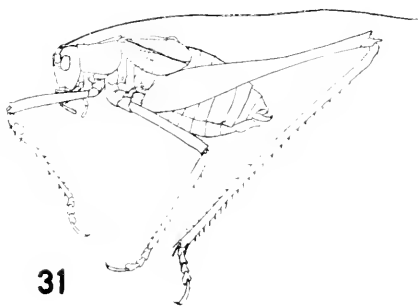
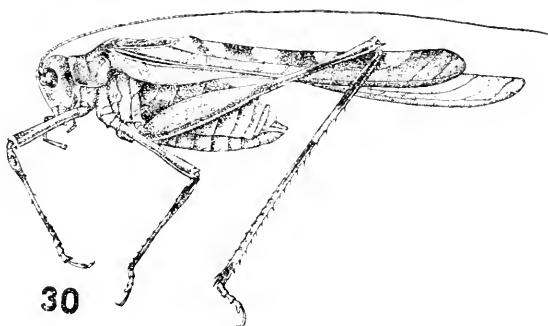
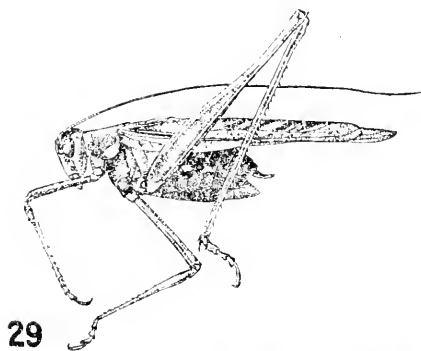


Fig. 29. *Insara gemmicula*. Lateral view of type. Male. ($\times 2$)
Fig. 30. *Insara covilleae*. Lateral view of type. Male. ($\times 2$) Fig. 31.
Brachyinsara maydalanae. Lateral view of type. Male. ($\times 2$)

length less than depth, much deeper caudad than cephalad, the ventro-cephalic angle very broadly obtuse and rounded, the ventro-caudal angle sub-rectangulate and broadly rounded, humeral sinus distinct but not as deep; as in *elegans*, sub-rectangulate and rather broadly rounded; a striking and much elevated callosity occupies the caudal portion of the lateral lobes, this callosity extending from a point on the ventral margin a little cephalad of the deepest portion of the humeral sinus to the humeral sinus and bounded on the inside by a nearly straight line between these points; over the remaining portion of their surface the lateral lobes are rather deeply excavate. Tegmina very similar to those of *elegans* except that the marginal field narrows very abruptly and disappears beyond the proximal third. Disto-dorsal segment of abdomen showing a shallow depressed area, in cross section the lateral margins are formed by distinct angles, the margins of the depression are arcuate-convergent cephalad; supra-anal plate as in *elegans*; cerci of same type as in *elegans* but less decidedly and more evenly incurved throughout their length; subgenital plate short, narrowing caudad, more narrow than in *elegans*, the lateral margins convergent distad and produced in non-articulate styliform appendages, cephalad from the base of these appendages extend rounded elevations which are sub-parallel for a distance equal to the distance between the appendages, then slightly divergent without angulation and becoming obsolete about the middle of the plate, distal extremity of plate between the produced lateral margins obtuse-angulate, produced slightly more than the styliform appendages, the sides of this angulation slightly concave.⁵² Cephalic and median limbs shorter and somewhat more slender than in *elegans*; the cephalic femora carinate dorso-distad for a very short distance with the distal margin of the same noticeably and very sharply produced, genicular lobes long, dentiform, bearing a small supplementary spine on the ventral margin; cephalic and median tibiae much as in *elegans* though shorter and somewhat more slender. Caudal femora shorter than the tegmina by the length of the median femur, when compared with those of *elegans* they are found to be very much shorter, more bullate for somewhat more than proximal half but in the remaining distal portions somewhat more slender than in that species.

A female, bearing the same data as the type, is the *Allotype*.

Description of Allotype.—Size larger than male, form somewhat more attenuate than in that sex, very similar in general appearance. The marginal field of the tegmina narrows not quite so abruptly in this sex, which condition is also true in the female sex of *elegans*. Ovipositor and subgenital plate similar to *elegans*.

In addition to the *Type* and *Allotype* the following series may be considered paratyptic:

Tucson, Arizona; October 2, 1910, (R. & H.), 2 ♂.

⁵² In the series of males of the present species before us, the caudal margin of the subgenital plate is variable in form, but the non-styliform appendages are almost always very short knob-like protuberances and the angulation between always extends as far or farther caudad than these.

Tumamoc Hill, Tucson Mountains, Pima County, Arizona;
 October 3 to 4, 1910. Elevation 2000 to 3092 feet. (R. & H.)
 3 ♂, 1 ♀, 2 ♀ n.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen
♂ Tumamoc Hill, Arizona. <i>Type</i>	15.4	3.7	24	2.2
♀ Tumamoc Hill, Arizona. <i>Allotype</i>	17.4	4	25.7	2.5
♂♂ Tumamoc Hill, Arizona. Average of paratypic series....	14.3	3.6	21.8	2
♀ Tumamoc Hill, Arizona. <i>Paratype</i>	(13.5-15.5)	(3.3-4)	(21-23)	(2-2.2)
♂ Yuma, Arizona.....	18.2	3.8	26.6	2.3
♂ Yuma, Arizona.....	13.7	3.7	21.4	1.8
♂ Yuma, Arizona.....	14.5	3.3	21.7	1.9
♀ Yuma, Arizona.....	17.2	3.9	26.9	2.3
♀ Yuma, Arizona.....	17.9	3.8	24.6	2.1
♂ Inyo Mountains, California	16	3.6	22.2	2.1
♀ Lincoln County, Nevada (near Lyons, California).....	20.4	3.9	27.6	2.4
♀ Lordsburg, New Mexico.....	13.9	3.2	21.3	2.1
♀ Lordsburg, New Mexico.....	14.4	3.5	23	2.2
♀ Lordsburg, New Mexico.....	14.9	3.6	22	2.3

	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♂ Tumamoc Hill, Arizona. <i>Type</i>	2.9	28.2	16.8	
♀ Tumamoc Hill, Arizona. <i>Allotype</i>	3	29.4	18.1	5.4
♂♂ Tumamoc Hill, Arizona. Average of paratypic series....	2.3	25.9	15.8	
	(2.1-2.6)	(24.8-28.)	(14.5-18)	
♀ Tumamoc Hill, Arizona. <i>Paratype</i>	3	29.5	18.2	5.2
♂ Yuma, Arizona.....	2.1	24.8	14.4	
♂ Yuma, Arizona.....	2	24.9	15.9	
♀ Yuma, Arizona.....	2.7	30.3	19.3	5.4
♀ Yuma, Arizona.....	2.3	28.4	19.4	5.2
♂ Inyo Mountains, California...	2.2	23.5	15.7	
♀ Lincoln County, Nevada (near Lyons, California).....	3	30.8	18.2	5.6
♀ Lordsburg, New Mexico.....	2.4	24.1	14.9	4.9
♀ Lordsburg, New Mexico.....	2.5	26.2	16.4	5.4
♀ Lordsburg, New Mexico.....	2.9	24.9	16.2	5.2

These measurements at once show that, when compared with *elegans*, the proportions of the present species differ chiefly in the mesal and distal width of the tegmina and the length of the caudal femora.

Color Notes.—The general color of the great majority of the specimens before us is a dark shade of bice green, a few individuals are tinged with prout's brown while one or two have the general color prout's brown shaded with olive green on the tegmina and exposed portions of the wings. The convexity on the caudal margin of the dorsum of the pronotum and the raised callosities on the ventro-caudal portion of the lateral lobes are white, sometimes tinged with greenish; the inner border of this marking on the caudal margin of the dorsum of the pronotum is acute-angulate emarginate mesad. The tegmina are strikingly marked with a regular succession of large spots, white in the majority of specimens, but more or less tinged with green in a few individuals. These spots are four to six in number, those situated proximad being well rounded while those situated distad are more drawn out, the last being indicated frequently by a mere transverse lineation; all are in contact with the sutural margin of the tegmen. The cephalic and median tibiae have the non-swollen portions white or pale greenish, the caudal femora have the proximal half of the non-swollen distal portion of the same color and this is likewise found to be true of those portions of the caudal tibiae which lie adjacent to the light portions of the caudal femora when the limbs are closed. The fourth dorsal abdominal segment is heavily marked with vandyke brown, becoming darker in shade caudad to the caudal margin, which margin is strikingly defined by a broad band of white. As in the other species of the genus, particularly those of green coloration, a number of specimens of the present species have faded considerably in drying, especially about the body.

Distribution.—The series before us shows that the present species is found over a wide range in the desert regions of the Southwest where the creosote bush (*Covillea tridentata*) flourishes. The distribution of that bush, however, covers a much greater area than that of this monotropic species, as has been proven by the authors' careful examination of the creosote bush over almost its entire range. The insect has been found from Lordsburg, New Mexico, westward through the desert portions of southern Arizona, north-

ward to Lincoln County, Nevada near Lyons, California, and in California as far north as Lyons and the Inyo Mountains and as far west as Cottonwood Station in the Mojave Desert and Palm Springs on the western edge of the Colorado Desert. The southward distribution of the species in Mexico is unknown.

Biological Notes.—This species inhabits the creosote bush (*Covillea tridentata*) and is found on no other vegetation. In this bush in the proper situations both nymphs and adults are to be found in the daytime hidden in the terminal clusters of leaflets, always in few numbers and not to be secured except by vigorous and constant beating, as the peculiar coloration of the insects makes them practically invisible in such surroundings.

The present species although amply equipped with organs of flight does not appear to fly about as much at night as does *elegans*: this is indicated by the fact that the authors have not as yet taken a single specimen of *covilleae* attracted to lights, which occasionally bring *elegans* not only to camp fires but into towns at night.

At Snyder's Hill, Pima County, Arizona, the species was found more abundant than at any other locality the authors have visited and ample opportunity was afforded after dark to hear its stridulation and compare it with that of *elegans*. The sound produced is a whirring note very similar to that of *elegans* but slightly harsher with a ticking sound in the whirr much more distinct. These differences were so easily recognized that immediately upon detecting a songster the species could at once be determined and thereupon the insect, if *covilleae*, was invariably found in a creosote bush and if *elegans*, in mesquite or other desert bush but not in *Covillea tridentata*.⁵³

The individuals of this species were observed to climb about the creosote bush with a slow cautious movement, the males stopping frequently to stridulate, both sexes, if molested, fluttering rapidly from one part of the bush to another.

Synonymy.—Unfortunately the authors have confused specimens of the present species with *elegans* three times in the past; this was due to the fact that *elegans* was very unsatisfactorily described, few specimens of it were known, and these showed sufficient variability

⁵³ See note of capture of a few specimens of *elegans* in creosote bush in biological notes for that species.

to make it uncertain at that time whether they should be considered mere variations, geographic races or different species. Each time, however, that the error was made, the individuals were mentioned as differing from the typical form.

Remarks.—Nymphs of the present species are similar to the adults in coloration and markings, their wing-pads are unicolorous. Female nymphs have the ovipositor sheath with dorsal and ventral margins smooth without any indication of serrations. This is also found to be true in all the known nymphal females not only of this genus but of *Dichoptala* as well.

Specimens Examined: 42; 20 males, 16 females, 3 male nymphs, 3 female nymphs.

Lordsburg, New Mexico, October 15, 1910, elevation 4250 to 4600 feet, (R. & H.), 3 ♀.

Tucson, Arizona, October 12, 1910, (R. & H.), 2 ♂, *Paratypes*.

Tumamoc Hill, Tucson Mountains, Arizona, October 3 to 4, 1910, elevation 2000 to 3092 feet, (R. & H.), 4 ♂, 2 ♀, 2 ♀ n., *Type, allotype, paratypes*.

Snyder's Hill, Pima County, Arizona, October 11, 1910, elevation c. 2500 feet, (R. & H.), 6 ♂, 2 ♀, 1 ♂ n.

Florence, Arizona, July 13, 22, (C. R. Biederman), 1 ♂, 1 ♀, [A. N. S. P.].

Phoenix, Arizona, September 6, 7, 8, 1904, (R. E. Kunz), 1 ♂, [U. S. N. M.]; 1 ♀, [A. N. S. P.]; 2 ♀, [Hebard Collection].

Yuma, Arizona, October 1, 1910, (R. & H.), 2 ♂, 2 ♀.

Lincoln County, Nevada, near Lyons, California, September 1, 1909, elevation 3000 to 3800 feet, (R. & H.), 1 ♀.

Inyo Mountains, California, July 7, 1911, (Wickham), 1 ♂, [Hebard Collection].

Lyons, San Bernardino County, California, September 1, 1909, elevation 2800 to 3000 feet, (R. & H.), 1 ♀.

Cottonwood Station, San Bernardino County, California, September 9, 1907, elevation 2274 feet, (H.), 3 ♂, 2 ♂ n, 1 ♀ n.

Palm Springs, California, February 14, (Hubbard), 1 ♀, [U. S. N. M.].

Insara gemmicula⁵⁴ new species (Figs. 20 and 29.)

The present insect differs so greatly from all the other known species of the genus that it is difficult to find to which of these it is most nearly related. Some relationship to *I. lamellata* is apparent. These species show some affinity to *I. elegans* in the general contour of the head and pronotum, but even in these parts marked differences are evident. From *elegans* we find the present species to differ in the much smaller size; the proportionally longer dorsum of the pronotum which is less expanded caudad; the lateral lobes

⁵⁴ In allusion to the diminutive size and pleasing appearance of the species.

of the pronotum, with length noticeably greater than depth; the tegmina and wings, which are much more attenuate distad; the different disto dorsal abdominal segment and somewhat different cerci and the very different and striking coloration.

Type.—♂; Echo Mountain, San Gabriel (Sierra Madre) Range, Los Angeles County, California. In chaparral. August 26, 1909. Elevation 2700 to 3500 feet. (Rehn.) [Hebard Collection.]

Description of Type.—Size very small for the genus, form attenuate. Head and eyes much as in *elegans*. Pronotum with dorsal length about one and six-tenths times greatest (caudal) dorsal width; dorsum of pronotum deplanate; lateral margins of dorsum of pronotum strongly divergent in straight lines for slightly more than cephalic fifth, then with a rounded obtuse-angulation parallel for an equal distance, the remaining portion gently divergent with a slight convexity indicated caudad; cephalic margin of dorsum or pronotum almost straight, very gently arcuate, caudal margin of same strongly arcuate; lateral lobes of pronotum with length greater than depth, the ventro-cephalic angle obtuse and very sharply rounded, the ventro-caudal angle broadly rounded as in *elegans*, humeral sinus distinct, shallow and broadly rounded at an angle of somewhat more than ninety degrees; a peculiar raised callosity occupies the ventro-caudal portion of the lateral lobes extending from about the middle of the ventral margin to the base of the humeral sinus and bounded on the inside by a convex line between these two points. Tegmina much smaller than in *elegans* and narrowing greatly distad, the distal width considerably less than the mesal width, the tegmina do not reach the distal extremities of the caudal femora and are sharply rounded at the apex; marginal field of tegmina narrowing much as in *elegans*. Disto-dorsal segment of abdomen with entire dorsal surface showing a considerably depressed area, in cross section the lateral margins of this depressed area are formed by distinct, acute and sharply rounded angles, the margins are straight and convergent cephalad; supra-anal plate very small, trigonal, with margins convex; cerci medium in length for the genus, very little enlarged at base, very gently tapering and slightly incurved for half their length, then of uniform diameter and almost straight to apex, which is very suddenly and slightly flattened above and armed with a sharp tooth, this tooth directed meso-dorsad at an angle of a little more than ninety degrees to the distal portion of the cercus; sub-genital plate much as in *elegans* though slightly narrower with the distal extremity between the produced lateral margins rectangular, produced, the sides of the angulation decidedly concave. Limbs and armament of same similar to *elegans*.

The female of the present species is unknown.

In addition to the type a single specimen bearing the same data as the type except that it was taken on September 18, 1910, may be considered paratypic.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur
♂ Echo Mountain, California <i>Type</i>	13.7	3.3	17	2.4	1.3	19.5	15.9
♂ Echo Mountain, California <i>Paratype</i>	14.4	3.3	16	2.5		19	16

Color Notes.—Head and cephalic appendages parrot green; the face marked with four narrow vertical cream colored bands, two of these directed downward from the base of the eyes and two from the antennal scrobes; vertex cream colored and back of the eyes extend two narrow cream colored parallel bands between which the dorsal surface of the head is claret brown; eyes mars brown. Dorsum of pronotum claret brown, lateral carinae sharply defined in buff while the lateral lobes are parrot green with the raised callosity on the ventro-caudal margin white and a small mark of the same color at the ventro-cephalic angles of the lateral lobes. Tegmina bice green with cephalic margin marked with a herring-bone pattern of mummy brown, the tympanum and interstices between the slanting mummy brown maculations vinaceous; marginal field of tegmina translucent, the veinlets giving a greenish white suffusion. Exposed tips of the wings bice green. The cephalic and median femora are parrot green and the swollen portions of the corresponding tibiae are of the same color, the remaining portions of these tibiae are greenish white much suffused with liver brown, this latter color being that of the feet; the caudal femora are parrot green with the ventral surfaces cream buff, the caudal tibiae are parrot green with a faint whitish annulus indicated at the end of the proximal third and shading from the distal third through greenish white to white much suffused with liver brown. Ventral portion of the body parrot green, dorsal surface of abdomen claret brown heavily marked on either side of the third and fourth abdominal segments with seal brown, in the centre of this dark marking on the third abdominal segment is a large nearly circular white blotch which runs into the caudal margin of the segment, the fourth dorsal abdominal segment has also a few narrow white markings along its

caudal margin. The cerci are buff and bear vandyke brown teeth, while the supra-anal plate is parrot green.

The paratype specimen is faded, particularly about the body, but shows a similar coloration and color pattern throughout.

Distribution.—This insect is known only from Echo Mountain, one of the western foothills of the San Gabriel Range back of Los Angeles, California.

Biological Notes.—The two specimens known were both beaten from the heavy chaparral which clothes the steep slopes of Echo Mountain. Long continued search and vigorous beating during both days spent at the locality failed to reveal other specimens.

Remarks.—This is the frailest as well as the most highly colored species of the genus and is the only one found on the Pacific slopes of the southern Californian mountains.

Specimens Examined: 2, 2 males.

Echo Mountain, San Gabriel (Sierra Madre) Range, Los Angeles County, California, in chaparral, elevation 2700 to 3500 feet. (Rehn), August 28, 1909, 1♂. *Type.* [Hebard Collection]. September 18, 1910 (Rehn), 1♂. *Paratype.* [A. N. S. P.]

*Insara lamellata*⁵⁵ new species (Figs. 21 and 23.)

The present species shows some affinity to *I. gemmicula*, but unfortunately we are unable to give the chief differential characters, owing to the fact that this species is known only from females and *gemmicula* only from males. This insect, though resembling *gemmicula* in some respects, shows much more robust proportions than that species, the lateral outline of the dorsum of the pronotum is somewhat different, and the ventral margins of the cephalic and median femora are distinctive. The ovipositor is longer, and more gently and evenly arcuate than in any other species of the genus.

Type.—♀; San José del Cabo, Lower California. (Dried alcoholic.) [Hebard Collection.]

Description of Type.—Size medium for the genus, form robust. Head and eyes much as in *I. elegans*. Pronotum with dorsal length nearly one and six-tenths times the greatest (caudal) dorsal width; dorsum of pronotum deplaneate, lateral margins of same divergent in straight lines for slightly more than the cephalic fifth, then with a rounded obtuse-angulation weakly concavo-divergent for an equal distance, the remaining portion gently divergent caudad with a slight concavity apparent; cephalic margin of dorsum of pro-

⁵⁵ In allusion to the peculiar lamellate development of the ventral margins of the cephalic and median femora.

notum gently arcuate-emarginate, caudal margin of same weakly arcuate; lateral lobes of pronotum more ample in area than in *I. gemmicula*, with humeral sinus even more shallow, otherwise quite similar. Tegmina short, rather broad, narrowing gradually distad, not reaching the extremities of the caudal femora and rounded at the apex, the veinlets rather prominent; in general contour and prominence of the veinlets the tegmina of this species show a certain similarity to those of *I. apache*. Ovipositor longer than the cephalic femur, deep, evenly and gently arcuate, the distal half of the dorsal margin and distal portion of the ventral margin finely serrate; subgenital plate triangular, broader than long, the lateral margins weakly convex, this plate is more than usually flattened and can scarcely be said to embrace the base of the ovipositor. Limbs shorter and heavier than in *elegans*, with ventral margins of cephalic and median femora becoming sub-lamellate distad, this character more pronounced in the cephalic femora.

The male of the present species is unknown.

In addition to the type, three females bearing like data may be considered paratyptic.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Mesal width of tegmen	Distal width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
♀ San José del Cabo, Lower California. Type.....	15.8	3.9	17	2.7	1.9	19	20.3	7
♀ San José del Cabo, Lower California. Paratype.....	16.9	4.2	16.5	2.9	2	18	20.7	7
♀ San José del Cabo, Lower California. Paratype.....	15.7	3.6	16.4	2.7	1.8	18	18.4	6.8
♀ San José del Cabo, Lower California. Paratype.....	15	3.8	15.3	3	1.9	16.8	19.4	6.7

Color Notes.—All of the specimens are dried alcoholics and show no trace of original coloration or color pattern, except that two specimens show that the occiput and dorsum of the pronotum were originally dark.

Distribution.—The species is known from the type locality only, that place situated at the extremity of Lower California.

Specimens Examined:—4; 4 females.

San José del Cabo, Lower California, 4♀. *Type, paratypes.* [Hebard Collection]

BRACHYINSARA new genus

Genus monotypic. GENOTYPE—*Brachyinsara magdalenae* new species.

The present genus is a member of the Phaneropterinae and of the group Insarae, and is known only from Magdalena Island, Lower California. It shows nearest relationship to the genus *Insara*, from which it differs in the peculiarly irregular and more sulcate fastigium of the vertex, the peculiarly shaped lateral margins of the dorsum of the pronotum, the lateral lobes of the pronotum, which in transverse section are more diverging ventrad, the aborted tegmina and concealed rudimentary wings and the striking bilobate disto-dorsal segment of the male abdomen. Closer relationship to the second section of the genus *Insara*, (to which *I. cleigans* belongs) is shown in *Brachyinsara* by the bispinose genicular lobes of the cephalic and median femora and the subgenital plate of the male with lateral margins produced in non-articulate knobs.

Generic Description.—Fastigium of vertex narrow, compressed (particularly so dorsad); subhorizontal, but with dorsal surface on three distinct levels this caused by there being two distinct steps on the dorsal surface; dorsal surface very decidedly sulcate medio-longitudinally; fastigium of vertex in contact with facial fastigium, the two presenting a flat cephalic surface, their lateral aspect presenting an outline which at the juncture of the dorsal and cephalic surfaces presents an angle of a little less than ninety degrees. Antennae subcrassate proximad. Lateral margins of dorsum of pronotum decidedly biconstricted. Tegmina aborted, wings rudimentary. Abdomen much dilated, dorsal segments of same weakly acute-angulate produced mesad. Disto-dorsal segment of male abdomen bilobate. Cephalic tibiae with proximal extremity swollen, narrowing rather gently below tympanum, which organ is open on both sides, median tibiae slightly expanded proximad.

Brachyinsara magdalenae new species (Figs. 22 and 31.)

Type.—♂; Magdalena Island, Lower California. March 1889. (Chas. D. Haines.) [Hebard Collection.]

Description of Type.—Size medium for group, form very robust. Head with greatest width contained about one and four-fifths times in depth; eyes globose, strongly exerted, much less in length than infra-ocular portion of the genae. Pronotum with dorsal length equal to the greatest (caudal) dorsal width; dorsum of pronotum in general deplanate, slightly

elevated cephalad and caudad; lateral margins of dorsum of pronotum obscure and strongly concavo-divergent in cephalic fifth, then pronounced in remaining four-fifths, for half of which portion it is strongly convex but weakly divergent then as decidedly convex and very strongly divergent, the angles formed by these margins all broadly rounded: cephalic margin of dorsum or pronotum weakly emarginate, caudal margin of same very broadly arcuato-truncate; lateral lobes of pronotum with length slightly greater than depth (slightly deeper caudad than cephalad), the ventro-cephalic angle obtusely rounded, the ventro-caudal angle broadly rounded, ventral margin nearly straight, very weakly sinuate, humeral sinus indicated by a very shallow, broadly rounded, obtuse angulation. Tegmina aborted, extending little beyond the distal extremity of the tympanal area, distal margin broadly rounded with this arcuation continued into the costal margin without angulation; the wings are present as mere atrophied slips wholly concealed by the tegmina. Disto-dorsal segment of abdomen produced mesad with that portion of caudal margin truncate, the segment deeply cleft mesad and divided into two large evenly arcuate lobes which nearly envelop the cerci; cerci short, rather strongly incurved, crassate, tapering but little to the flattened apex which is toothed, this tooth directed meso-dorsad at an angle; sub-genital plate very short and broad with lateral margins arcuate-convergent distad, distal extremity shallowly obtuse-angulate emarginate, bearing laterad blunt knobs, cephalad these knobs are continued as slightly divergent rounded elevations which become obsolete about the middle of the plate. Cephalic and median femora slender; these joints carinate dorso-distad for a very short distance with distal margin bluntly reetangulate produced; genicular lobes of same produced in a broad (blunt or finely spined) tooth which tooth bears a supplementary spine on its ventral margin; distal portion of ventro-cephalic margin of cephalic femora bearing 1 to 2 small teeth. Caudal femora heavy with proximal half bullate; genicular lobes broad, acute-angulate produced, with immediate apex bluntly rounded.

In addition to the type a nymphal male bearing the same data may be considered paratyptic.

Measurements (in millimeters)

	Length of body	Length of pronotum	Length of tegmen	Greatest width of lateral field of tegmen	Tympanal width	Length of caudal femur	Greatest width of caudal femur
♂ Magdalena Island, Lower California. <i>Type</i>	15	3.3	5.2	3.4	3	17.6	2.4

Color Notes.—Both specimens are dried alcoholics but still show traces of dorsal markings. The type indicates that the fourth dorsal abdominal segment was heavily marked, while in the nymph

the entire dorsal surface of the abdomen still shows traces of a decided color pattern.

Distribution.—The present species is known only from Magdalena Island, situated off the Pacific coast of Lower California in 25° N. Lat.

Morphological Notes.—The half grown nymph shows the peculiar development of the fastigium of the vertex more sharply pronounced than in the adult, the former also has the genicular lobes sharper and the dorsal abdominal segments more decidedly acute-angulate produced mesad. The pronotum in this specimen, however, only mildly indicates the peculiar dorsal outline so decidedly pronounced in the adult.

Specimens Examined: 2; 1 male, 1 nymph.

Magdalena Island, Lower California, March, 1889, (Chas. D. Haines) 1♂, 1♂n. *Type, paratype.* [Hebard Collection.]

ARETHAEA Stål

1870. *Ephippitytha* Thomas (not of Serville, 1839), Proc. Acad. Nat. Sci. Phila., 1870, p. 76.
1871. *Ephippitytha* Thomas (not of Serville, 1839), Prelim. Rep. U. S. Geol. Surv. Wyoming, p. 265.
1872. *Ephippitytha* Thomas (not of Serville, 1839), Prelim. Rep. U. S. Geol. Surv. Montana, p. 445.
1872. *Ephippitytha* Glover (not of Serville, 1839), Illustr. N. Amer. Entom., Orth., pl. IX, p. 11.
1876. *Arethaea* Stål, Bihang till Kongl. Svenska Vetensk.-Akad. Handl., IV, no. 5, p. 55.
1877. *Aegipan* Scudder, Proc. Boston Soc. Nat. Hist., XIX, p. 39.
1878. *Arethaea* Brunner, Monogr. der Phaneropt., p. 234.
1885. *Arethaea* Bruner, Bull. Washb. Coll., I, p. 127.
1891. *Arethaea* Brunner, Verhandl. K.-K. Zoolog.-botan. Gesell. Wien, XLI, p. 16.
1900. *Arethaea* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 67.
1900. *Dichopetala* Scudder (not of Brunner, 1878), Canad. Entom., XXXII, p. 331.
1902. *Arethaea* Scudder and Cockerell, Proc. Davenp. Acad. Sci., IX, p. 52.
1903. *Arethaea* Caudell, Proc. U. S. Nat. Mus., XXVI, p. 801.
1904. *Arethaea* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542.
1904. *Arethaea* Caudell, Sci. Bull. Brookl. Inst. Arts and Sci., I, no. 4, p. 114.
1905. *Arethaea* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1904, p. 795.
1905. *Arethaea* Isely, Trans. Kansas Acad. Sci., XIX, p. 245.
1906. *Arethaea* Kirby, Synon. Catal. Orth., II, p. 443.
1907. *Arethaea* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 61.
1907. *Arethaea* Rehn, Ibid., 1907, p. 74.

1907. *Arethaea* Rehn and Hebard, *Ibid.*, 1907, p. 300.
1908. *Arethaea* Rehn and Hebard, *Ibid.*, 1908, p. 398.
1909. *Arethaea* Rehn and Hebard, *Ibid.*, 1909, p. 168.
1912. *Arethaea* Rehn, *Kansas Univ. Sci. Bull.*, V, p. 306.

The genus was based on a single species. GENOTYPE.—*Arethaea gracilipes* (Thomas) [*Ephippitytha gracilipes*].

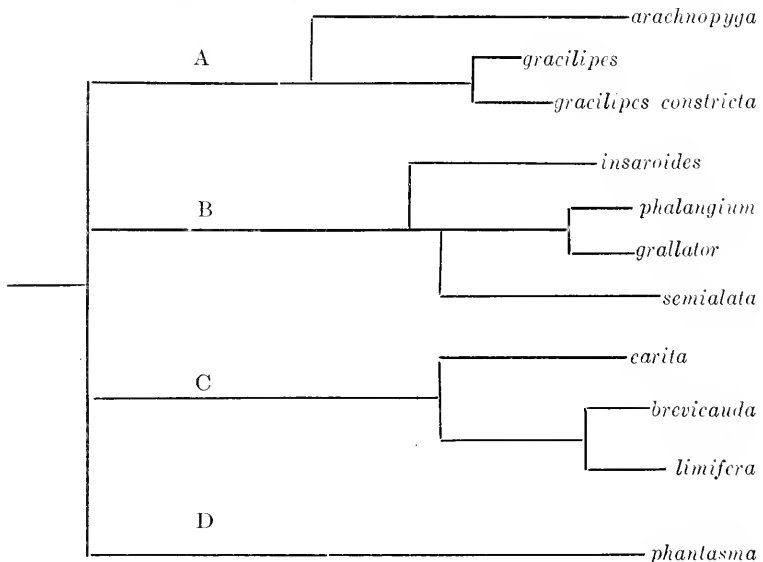
Generic Description.—Body elongate. Head having great freedom of movement permitting vertical or subhorizontal position, occiput tumescent; fastigium declivent, narrowing cephalad, in contact with the frontal fastigium, sulcate; internal margin of antennal scrobes ampliate; eyes prominent, elongate-elliptical to ovoid; antennae very elongate, brittle, proximad subcrassate. Pronotum more or less decidedly sellate, disk concave, compressed on prozona, more or less deplanate on metazona, caudal margin of disk produced, arcuate to acute-angulate, no lateral carinae or angles present but strumose lines of pattern on prozona simulating same; transverse sulcus distinct, passing regularly from disk to lateral lobes; lateral lobes longer than deep, narrowing cephalad, caudal margin oblique-truncate or rotundate, with a strumose thickening, caudal portion of lobes moderately to decidedly bullate laterad. Tegmina elongate in male sex, with generally subparallel margins, or in female of similar form but shorter or extremely abbreviate, acute-ovate and shorter than the pronotal disk; apex more or less rounded or acute (in extremely brachypterous females); marginal field roundly developed proximad, evanescent mesad and distad; discoidal vein in distal half emitting two to six rami to sutural margin and apex; anterior ulnar vein straight; stridulating field of male tegmina as long as or distinctly shorter than pronotal disk, stridulating vein oblique, nearly straight or arcuate, margin of the field not at all or decidedly produced at the apex of the stridulating vein, more or less angularly emarginate distad of the same. Wings in all but extremely brachypterous females surpassing the tips of the tegmina. Meso- and meta-sternum lobate. Abdomen of male sex with or without a dorsal elevated development on the proximo-dorsal segment. Cerci of male simple, attenuate, distal extremity sharply bent or faintly arcuate inwards, apex depressed or conically acute; subgenital plate of male with distal margin truncate or emarginate, true free styles never present, lateral processes substyliiform or mere knobs. Ovipositor short, moderately or very deep, margins serrulate distad, disk of ovipositor distad with lamellate teeth ar-

ranged in regular series. Limbs elongate, slender, terete, cephalic and median femora disto-dorsad with or without an angular and subspiniform production, ventro-cephalic margins of same unarmed; genicular lobes of cephalic and median femora bispinose, of caudal femora unispinose. Tympanum of cephalic tibiae open on both faces.

Classification.—From a systematic standpoint the characters of greatest value in the differentiation of the species of the genus are: in both sexes, general form of the body, character of the margins of the dorsal abdominal segments, shape of the eye and the character of the disto-dorsal margin of the femora; in the male, form of the pronotum, form and proportions of the stridulating field of the tegmina, the character of the development of the apex of the stridulating vein, the shape of the speculum and form of the supra-anal plate, subgenital plate and cerci; in the female, form of the pronotum, form and relative length of the tegmina and the form of the ovipositor. The general form shows a moderate amount of specific variation in robustness and that chiefly in the female sex, the brachypterous forms and those with reduced tegmina and wings being the more robust, much more so than the males of the same species. The form of the eye is of considerable importance as a diagnostic character, several species (*phalangiium* and *grallator*) having very elongate elliptical eyes, over twice as deep as wide, while in the other species the form though ovate, elliptical or ovoid is never so narrow proportionately. The form of the pronotum is in general subject to considerable variation, due to differences in the amount of sellation of the whole, the width of the disk, the caudal margin of the same and the degree of bullation of the lateral lobes. The general form of the pronotum is very distinctive in one species (*phantasma*), not being even approached by the other forms, the texture and coloration of the same section being equally characteristic. The degree of bullation of the lateral lobes needs careful attention when used as a character in this genus, as frequently specimens which have in nature a considerable bullation of these lobes will show little in the dried condition. This appears to be due to compression in pinning the specimen or shrinkage in the drying process. As a rule, aside from such relatively evident cases, the amount of this bullation is constant and specific, but in *A. gracilipes* it is much less stable and as uncertain there as a number of other features in that plastic species. The relative length

of the tegmina in both sexes and the stridulating field in the male are of the greatest diagnostic importance. The tendency toward brachypterism in the females of this genus is apparently specialization, correlated in its extreme condition (in group C) with the highest development of the male sound-producing apparatus. Two other of the four species-groups show pronounced brachypterous tendencies, the forms exhibiting the same (*arachnopyga* in group A and *semialata* in group B) being divergent from the main phyla of these groups and apparently the most specialized of each. In *gracilipes constricta* we find tendencies toward brachypterism developing within the race, the normal condition of which is as truly macropterous as is true *gracilipes*. In the male tegmina the relative proportions of the stridulating field, its length compared with that of the pronotal disk, the production of the apical section of the stridulating vein, the form of the margin and of the speculum are the chief characters of importance. The genitalia, which are discussed below in more detail, are of diagnostic importance in a few of the species, but in one case (the plastic *gracilipes*) the male cerci might be called polymorphic.

The following diagram illustrates our ideas regarding the group relationship of the species.



These groups might be generally characterized as follows:

- Group A. $\left\{ \begin{array}{l} \textit{arachnopyga} \\ \textit{gracilipes} \\ \textit{gracilipes constricta} \end{array} \right\}$ Angulate but not decidedly produced apex to stridulating vein of male tegmina. Cerci of male with distal extremity bent. Abdominal segments of both sexes having non-crenulate margins. Female never decidedly brachypterous.
- Group B. $\left\{ \begin{array}{l} \textit{insaroides} \\ \textit{phalangium} \\ \textit{grallator} \\ \textit{semialata} \end{array} \right\}$ Apex of stridulating vein of male tegmina not angulate, rounded. Cerci of male with distal extremity bent. Abdominal segments of both sexes having non-crenulate margins. Female never decidedly brachypterous.
- Group C. $\left\{ \begin{array}{l} \textit{carita} \\ \textit{brevicauda} \\ \textit{limifera} \end{array} \right\}$ Apex of stridulating vein of male tegmina decidedly produced, progressively developing into an elongate peg-like process. Cerci of male with distal extremity not bent. Abdominal segments of both sexes having decidedly crenulate or non-crenulate margins. Female decidedly brachypterous.
- Group D. $\left\{ \textit{phantasma} \right\}$ Apex of stridulating vein of male tegmina not decidedly produced. Cerci of male with distal extremity bent. Abdominal segments of both sexes having decidedly crenulate margins. Female macropterous. (Form of pronotum, stridulating field of male tegmina, texture of pronotum and tegmina and coloration distinctive.)

Group A has a divergent form in *arachnopyga* which is strikingly specialized in the male sex, the form of the supra-anal plate and the disto-dorsal abdominal segment being unique in the genus, the female also showing specialization in tegminal length which.

however, is approached in certain females of the plastic *A. gracilipes constricta*. The species *gracilipes* with its geographic race *constricta* is the most plastic unit in the genus, probably on account of its adaptability, ranging as it does over the greater part of the territory in which the genus occurs. A number of the characters which are important as diagnostic in other forms vary appreciably in this variable type.

Group B is composed of three elements; *insaroides* apparently primitive in a number of respects, as the form of the pronotum and the stridulating field of the male tegmina; *phalangiium* and *grallator* specialized in the development of the extremity of the cephalic and median femora and the extreme angulation of the caudal margin of the disk of the pronotum, macropterous, however, in both sexes, and *semialata* which has a tendency toward angulation at the apex of the stridulating vein of the male tegmina and an approximation toward group C in the slenderer ovipositor.

Group C is quite homogenous, *carita* standing slightly apart from the others in the lesser degree of brachypterism in the female and the lesser degree of production of the apex of the stridulating vein of the male tegmina. The crenulation of the abdominal segments is not indicated (*brevicauda*) or decided (*carita* and *limifera*). The specialization of the sound-producing apparatus of the male reaches its greatest extreme in this group (i.e. *limifera*).

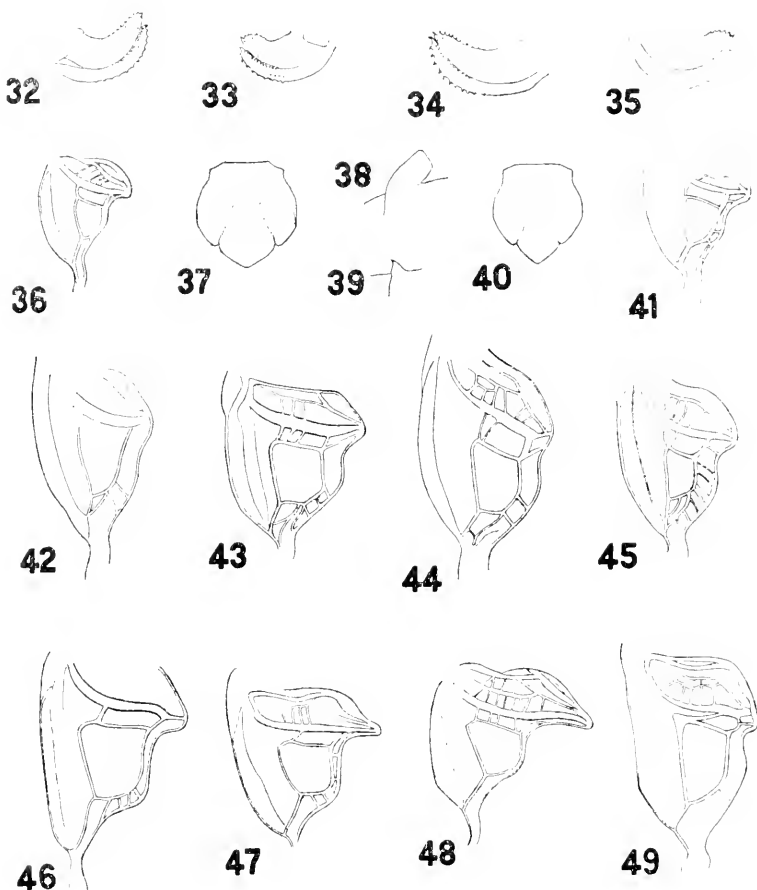
Group D is very decidedly separated from the other forms of the genus, differing in a number of features. The coloration and general appearance of the single species comprising the group is distinctive.

Morphological Notes on Male Genitalia.—The supra-anal plate presents three general types in this genus; one, the more prevalent, being more or less tongue-shaped, usually as long as broad, occasionally with parallel sides and distad more or less rounded, rather weakly or not at all sulcate proximad; another; found in the species of group C, is distinctly transverse with the lateral and distal margins more or less arcuate, and the third, found only in *arachnopyga*, is large, slightly longitudinal, rectangular, deeply sulcate for the greater part of its length and recessed into the disto-dorsal segment, which is rectangularly excised to receive it, a feature not found in any of the other forms. The cerci are in general of similar form in all the species except those of group C, the distal

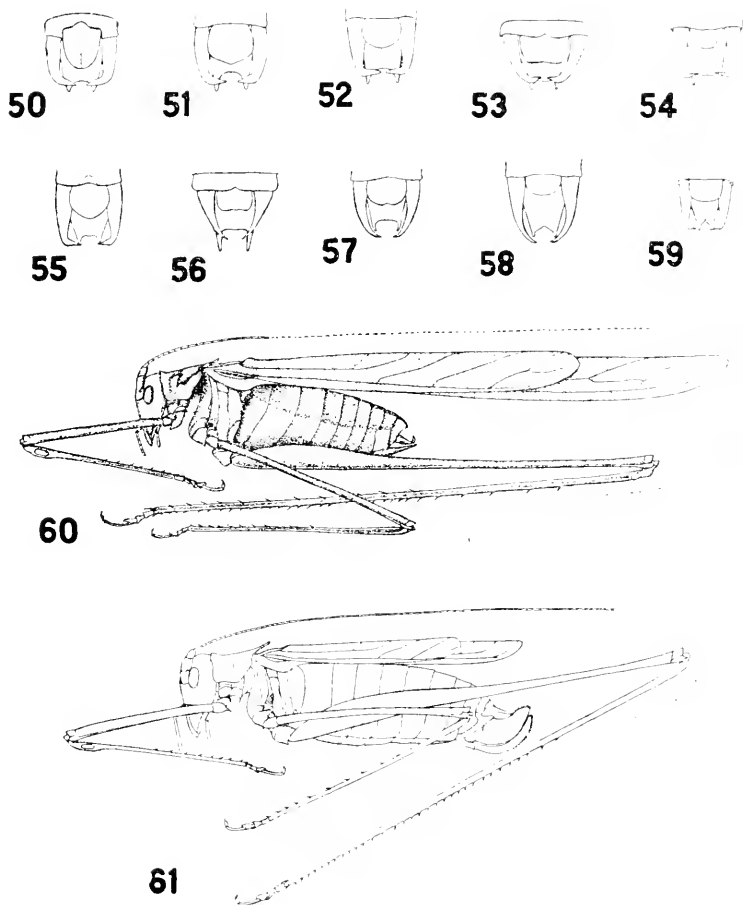
fourth or so sharply bent inwards, there acute or subdepressed. In group C the distal extremity tapers and is gently arcuate inwards. The plastic *A. gracilipes* is an exception to the rule in this respect, as in certain others, and very rarely specimens of it occur with the distal section of the cerci much as in group C. The subgenital plate always has the lateral margins more or less converging distad, the distal margin varying in width, often individually in *gracilipes*, and from truncate to deeply triangular-emarginate, the latter decided in group D, where the lateral arms of the emargination are sigmoid. The lateral processes of the distal extremity of the plate are more or less produced, never very long and occasionally only knobs, in *gracilipes* varying greatly in individuals. The ventral surface of the subgenital plate is distinctly tricarinate in *insaroides* and *phantasma*.

Morphological Notes on Female Genitalia.—The supra-anal plate of the female shows very slight variation, this also being true of the subgenital plate. The ovipositor is more sharply arcuate in *insaroides*, *phantasma*, *phalangium* and *grallator*, in fact almost bent in certain of these, while in group C and *semialata* it is much narrower. The dorsal margin is armed with regular serrations or serrulations distad, the ventral margin with recurved serrulations distad, generally passing into crenulations mesad. The surface of the valves is armed distad with low lamellate teeth, which are arranged in longitudinal rows on the dorsal valves and in transverse rows on the ventral valves, of which latter those along the lateral suture are generally the most decided and regular. The cerci are tapering and little differentiated in the species.

Abdominal Features.—In the great majority of the species the abdomen is marked laterad by longitudinal bars of color, generally contrasted whitish and purplish. The caudal margin of the dorsal abdominal segments is, in certain species, more or less angularly produced at these bars and more rarely in a similar fashion mesad, where a less distinct bar is occasionally present. The surface is generally more or less strumose at these color bars, but in one species (*phantasma*) the production of the margin is present while the color bars have become obsolete. The margins of the dorsal abdominal segments occasionally (*carita*, *limifera* and *phantasma*) are distinctly crenulate, in *phantasma* thickened points are present between the crenulations. The most decided abdominal structure



Ovipositor outline of (fig. 32) *Arethaea gracilipes constricta*, Dallas, Texas; (33) *A. insaroides*, allotype; (34) *A. semialata*, allotype; (35) *A. phantasma*, allotype. ($\times 3$) Dorsal outline of pronotum of male of *Arethaea gracilipes*, Raton, New Mexico (fig. 37) and *A. gracilipes constricta*, Kerrville, Texas (fig. 40). ($\times 4$) Lateral outline of appendage of the proximo-dorsal abdominal segment of *Arethaea gracilipes*, Raton, New Mexico (fig. 38) and *A. gracilipes constricta*, Kerrville, Texas (fig. 39). ($\times 4$) Outline of stridulating field of male tegmina; fig. 36, *Arctaea arachnopyga*, type; 41, *A. gracilipes*, type; 42, *A. insaroides*, type; 43, *A. phalangium*, Thomasville, Ga.; 44, *A. grallator*, type; 45, *A. semialata*, type; 46, *A. carita*, allotype; 47, *A. brevicauda*, allotype; 48, *A. limifera*, type; 49, *A. phantasma*, type. ($\times 8$)



Outline of apex of male abdomen seen from the dorsum. ($\times 4$) Fig. 50, *Arethaea arachnopyga*, type; 51, *A. gracilipes*, Raton, New Mexico; 52, *A. insaroides*, type; 53, *A. phalangium*, Thomasville, Ga.; 54, *A. grallator*, type; 55, *A. semialata*, type; 56, *A. carita*, allotype; 57, *A. brevicauda*, allotype; 58, *A. limifera*, type; 59, *A. phantasma*, type. Fig. 60, Lateral view of *Arethaea arachnopyga*, type. ($\times 2$) Fig. 61, Lateral outline of allotype of same. ($\times 2$)

found in this genus is noticed only in the male sex and then in but a portion of the species. The caudal section of the proximo-dorsal segment is elevated dorsad into a process which may be moderately low and sub-obliquely or arcuato-truncate cephalad or comparatively high, slightly recurved cephalad, inflated, bulbous and more or less finely haired. Apparently this structure is a specialized fold of the chitinous integument, as in a few of the species possessing it the caudal aspect evidences its origin, but in the more highly modified structure found only in certain individuals of *gracilipes* this feature is not so evident. The very peculiar feature regarding this development is that it is not even a specific character in *semialata*, specimens from the northern part of the range of which have a well developed process, while those from the more southern localities have no trace of this structure. In *gracilipes* specimens from the higher elevations have the extreme bulbous type present, while those from the lower altitudes have the simpler, more usual type of process. Taken altogether this structure is one of the most puzzling features in the external morphology of the genus, the fact that such a marked development should be variable within specific limits being most unusual. The process is present in all of the form of group A, present (*insaroides*) or absent (*phalangium* and *grallator*) in group B, present (*brevicauda* and *limifera*) or absent (*carita*) in group C and absent in group D (*phantasma*) and present or absent in the species *semialata*. Thus the appendage is seen to be present or absent in species which are evidently members of the same phyla. What the function of this structure may be we do not know and can only suggest that it may be the orifice of a scent gland.

Notes on Tegminal Structure.—In the male sex the highly specialized structure of the stridulating field of the tegmina affords excellent specific characters, which we have utilized to great advantage in the present paper. Two tendencies are noticed in the development of this field, one in the formation of an ample area, long and broad, with a but little differentiated margin and a non-produced apex to the stridulating vein (exemplified in *phantasma*, *phalangium* and *grallator*) and another in the more or less pronounced abbreviation of the field, which is broadest at the stridulating vein, the apex of which becomes progressively produced into a peg-like process, the extreme type of which is as long as the remaining width of the field (*limifera*). This latter tendency appears to us to be the great-

est specialization in the genus, correlated as it is with the reduction in tegminal length in the female. This broadening at the stridulating vein is accompanied by an abbreviation of the speculum and a pronounced angulato-emargination of the distal portion of the free margin of the field. The male sex is invariably macropterous, while the female is macropterous in six species, decidedly brachypterous in three⁵⁶ (group C) and moderately brachypterous in two (*arachnopyga* and *semialata*). As stated above the reduction in size of the flight organs is in direct ratio to the specialization in structure of the apex of the stridulating vein of the male tegmina. In one of the species generally macropterous in the female (*gracilipes*), certain individuals approach the type of brachypterism found in *semialata* and *arachnopyga*. The number of rami to the discoidal vein⁵⁷ varies from two to six and in two species (*carita* and *brevicauda*) as much as from two to five. The number of these has been considered diagnostic by previous authors, but our studies show that as specific criteria no value can be placed on them, varying as they often do on the two tegmina. The number present in the series of each species is treated under the respective Morphological Notes. Very frequently the proximal rami, and occasionally others, are forked and the distal one of the forks has been annexed by the next distad complete ramus. This is generally effected through the agency of an adventitious more or less distinct medio-longitudinal false nervure connecting the rami, breaking in one or more places. In similar fashion the anterior ulnar vein occasionally annexes the proximal discoidal rami.

Color Pattern.—The main features of the color pattern consist of more or less distinct postocular bars of whitish and purplish, continued over the cephalic portion of the prozona, broad edgings of the same tones on the caudal margins of the lateral lobes of the pronotum and narrower continuations of the same on the caudal margin of the pronotal disk, and more or less decided lateral abdominal bars of whitish or yellowish and purplish, and in certain species a median one. The face frequently has distinct pale infra-ocular bars, while the dorsum of the prozona and of the abdomen is fre-

⁵⁶ This sex is unknown in one of these three (*limifera*), so this statement is made on the basis of affinity of the male sex.

⁵⁷ The proximal one of these rami is really the median vein, but as it does not differ at all in character from the other rami we have counted it as one.

quently punctulate with purplish. The femora are almost always washed more or less with purplish, occasionally overlaid with whitish. The great majority of the species follow this general pattern more or less closely, but *phantasma* is unique in having the margins of the pronotum beaded with purplish and the lateral abdominal bars obsolete.

Distribution.—Extending from southern California (San Luis Obispo County), southern Nevada (Crestline) and central northern Nebraska (Niobrara), east to eastern Kansas (Fairmount) and eastern Texas (Rosenberg), south to southern Mexico (Tonala, Chiapas) and west to Guadalajara, Mexico and the shores of the Pacific in southern California. A single species, *A. phalangium*, exhibits a most interesting case of discontinuous distribution, its range being complete removed from the main area of distribution of the genus as it is found in the southeastern United States (Georgia and Florida). Vertically the genus ranges from near sea-level (Brownsville, Texas; Tonala, Chiapas) up to at least 7500 feet (Livermore Peak, Texas). The region in which the genus reaches its greatest diversity is south-western Texas and the adjacent portion of northern Mexico, its origin doubtless being Sonoran.

History.—In 1870, Thomas⁵⁸ described the first species of the present genus from southern Colorado, assigning it to the Old World genus *Ephippitytha*, to which, however, it is not at all related. In 1876, Stål, recognizing the peculiar character of Thomas's species, erected⁵⁹ the genus *Arethaea* for it. Scudder, in 1877, apparently unaware of Stål's name, created the genus *Aegipan*⁶⁰ for two new species of the present genus, *phalangium* from Georgia and *grallator* from Texas. In 1878, Brunner, in his classic revision of the Phaneropterinae,⁶¹ described two species of the genus, *multiramosa* from Georgia and *constricta* from Texas. Scudder, in 1900, in describing from southern California the first brachypterous female individual of the genus,⁶² referred it to the quite different genus *Dichopetala* as *D. brevicauda*, an error Morse pointed

⁵⁸ Proc. Acad. Nat. Sci. Phila., 1870, p. 76.

⁵⁹ Bihang till Kongl. Svenska Vetensk.-Akad. Handl., IV, no. 5, p. 55.

⁶⁰ Proc. Boston Soc. Nat. Hist., XIX, p. 39.

⁶¹ Monogr. der Phaneropt., p. 234.

⁶² Canad. Entom., XXXII, p. 331.

out several years later,⁶³ while in the same paper Scudder⁶⁴ described a species from the same region as *Arethaea consuetipes*, which we now know to be a member of the genus *Insara*. In 1902, Scudder described a second brachypterous female individual from New Mexico as *A. carita*.⁶⁵ Rehn, in 1907, based the species *A. sellata*⁶⁶ on a macropterous male from Arizona.

The recognition of Thomas's species has been the greatest difficulty with most of the previous authors, Brunner first erroneously determining it, in which he was followed by Scudder, who in so doing, relegated to the synonymy a perfectly valid name of his own.

Material Examined.—272; 156 males, 98 females, 18 immature specimens.

The majority (153) of these specimens were taken by the authors on recent trips and are located in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia. Of the remaining specimens we find 23 in the Hebard Collection; 20 in the Academy of Natural Sciences of Philadelphia; 24 in the Scudder Collection at the Museum of Comparative Zoology, and 26 in the United States National Museum, loaned to us through the kindness of Mr. A. N. Caudell. The material of the genus in the collections of the Brooklyn Institute of Arts and Science, the American Museum of Natural History, the University of Kansas and the University of Nebraska was also placed at our disposal by the authorities in charge. To all those who so kindly assisted us in our work we wish to express our sincere thanks.

In the preparation of the paper the types of the following species have been examined by us.

- Arethaea arachnopyga* n. sp.
- Arethaea gracilipes* (Thomas)
- Arethaea insaroides* n. sp.
- Arethaea phalangium* (Scudder)
- Arethaea grillator* (Scudder)
- Arethaea semialata* n. sp.
- Arethaea carita* (Scudder)

⁶³ Psyche, IX, p. 381.

⁶⁴ Canad. Entom., XXXII, p. 332.

⁶⁵ Proc. Davenp. Acad. Sci., IX, p. 52.

⁶⁶ Proc. Acad. Nat. Sci. Phila., 1907, p. 61.

(*Arethaea sellata* Rehn = *A. carita*, ♂)

Arethaea brevicauda (Scudder)

Arethaea limifera n. sp.

Arethaea phantasma n. sp.

The only types belonging to the genus which we have not examined are those of *A. multiramosa* and *constricta* Brunner, both of which names have been placed without difficulty.

KEY TO THE SPECIES OF THE GENUS ARETHAEA

The present key is admittedly artificial, as it is impossible to express in such shape the shades of difference in proportions and other relative features, which make up the majority of the differential characters in this genus, and which would have to be used in a truly natural key. In consequence the emphasis here placed on many of the differential features is by no means a true index to their natural, or taxonomic, value. The sequence of the species groups and their natural affinities have already been discussed. Female specimens are considerably more difficult to assign satisfactorily than are the males, possessing as the latter do the highly characteristic stridulating field of the tegmina.

In the case of the female sex of *arachnopyga* it has been necessary to make a separate entry, distinct from the male sex, but in all of the other forms the two sexes are treated in unit alternatives. We would strongly recommend that the figures illustrating the characters of the species be consulted in connection with the key.

- A. Stridulating field of the male tegmina very broad proximad, with its greatest breadth subequal to or but little less than the length of the same area, apex of the stridulating vein decidedly or excessively produced; tegmina of female shorter than or but little exceeding the length of the pronotal disk. Cerei of the male not strongly bent inwards distad.
- B. Male tegmina with stridulating field proportionately narrowed proximad, distal margin of apical process of stridulating vein not as long as the width of the speculum; proximo-dorsal abdominal segment of male without a dorsal process. Female tegmina slightly longer than the pronotal disk..... **carita** Scudder
- BB. Male tegmina with stridulating field proportionately broader proximad, distal margin of apical process of stridulating vein as long as (*brevicauda*) or longer than (*limifera*) the width of the speculum. Proximo-dorsal abdominal segment of male with a dorsal process. Female tegmina distinctly shorter than the pronotal disk (female of *limifera* unknown).

C. Limbs moderately elongate (caudal femora 22.8 mm. to 26.7). Apical process of stridulating vein of male tegmina not as long as the width of the remaining portion of the field; marginal field of male tegmina moderately developed. Cerci of male more robust. Abdominal segments of both sexes with margins not distinctly crenulate. **brevicauda** (Scudder)

CC. Limbs greatly elongate (caudal femora 27.5 mm. to 30.6). Apical process of stridulating vein of tegmina subequal in length to the width of the remaining portion of the field; marginal field of male tegmina excessively developed. Cerci of male slenderer. Abdominal segments with margins distinctly crenulate. (Female unknown.) **limifera** new species

AA. Stridulating field of the male tegmina narrower proximad, with its greatest breadth distinctly less than the length of the same area, or when very nearly subequal to the length the latter is decidedly less than that of the disk of the pronotum (*gracilipes* and *arachnopyga*), apex of the stridulating vein not decidedly (*i. e.*, peg-like) produced; tegmina of female at least twice as long as the pronotal disk. Cerci of male strongly bent inwards distad (except in occasional specimens of *gracilipes*).

B. Supra-anal plate of male greatly developed, elongate subrectangulate, deeply sulcate for the greater portion of its length and recessed into the disto-dorsal abdominal segment. (Female moderately brachypterous—see alternative with *semialata*.)

arachnopyga new species ♂

BB. Supra-anal plate of male normally developed, frequently transverse, not deeply sulcate and never recessed into the disto-dorsal abdominal segment. (Females macropterous or moderately brachypterous.)

C. Cephalic and median femora with the disto-dorsal extremity strongly compressed, angularly produced, subspiniiform. Eyes very elongate-elliptical, more than twice as deep as wide.

D. Size larger (tegmina, ♂ 28 to 32 mm., ♀ 30.5 to 34). Stridulating field of the male tegmina shorter than the pronotal disk; tegmina of both sexes somewhat broader at the distal fourth than at the proximal third.

phalangium (Scudder)

DD. Size smaller (tegmina, ♂ 20.7 to 26.5 mm., ♀ 23 to 29). Stridulating field of the male tegmina subequal to the length of the pronotal disk; tegmina of both sexes subequal in width at the distal fourth and the proximal third.

grallator (Scudder)

CC. Cephalic and median femora with the disto-dorsal extremity not at all or but little compressed, never angularly produced or subspiniiform. Eyes ovate, ovoid or elliptical, but never twice as deep as wide.

D. Margin of the stridulating field of the male tegmina gently arcuate and not at all projecting at the apex of the stridulating vein. Pronotum very short and broad. Proximo-dorsal abdominal segment of male with process. (Subgenital plate of male weakly tricarinate ventrad. Ovipositor very broad).....**insaroides** new species

DD. Margin of the stridulating field of the male tegmina appreciably produced though rounded at the apex of the stridulating vein. Pronotum more elongate.⁶⁷ Proximo-dorsal abdominal segment of male with or without process.

E. Stridulating field of male tegmina elongate, subequal to the disk of the pronotum in length, broad. Pronotum deeply sellate; lateral lobes quite elongate, broadly rounded caudad; texture of pronotum and tegmina coriaceous. Abdominal segments with margins strongly crenulate. Ovipositor broad. (Subgenital plate of male deeply V-emarginate, ventral surface of plate tricarinate. Female macropterous.)

phantasma new species

EE. Stridulating field of male tegmina more or less decidedly shorter than the length of the pronotal disk, as a whole narrower. Pronotum not deeply sellate; lateral lobes at most but moderately elongate, oblique caudad; texture of pronotum and tegmina not coriaceous but as in other species of the genus. Abdominal segments with margins not crenulate. Ovipositor never broad.

F. Stridulating field of the male tegmina not sharply narrowing distad, but slightly produced at the apex of the stridulating vein. Female with the tegmina not surpassing the apex of the abdomen.

{ **semialata** new species ♂ & ♀⁶⁸
 { **arachnopyga** new species ♀⁶⁸

FF. Stridulating field of male tegmina sharply narrowing distad, considerably produced at the apex of the stridulating vein. Female with the tegmina surpassing the apex of the abdomen.

⁶⁷ The female of *semialata* approaches the opposite category in this respect, but the ovipositor in that form is far slenderer than in *insaroides*.

⁶⁸ The females of these species can be readily separated as follows:

Ovipositor over twice as long as deep; caudal margin of pronotal disk arcuate. *semialata*.

Ovipositor not more than twice as long as deep; caudal margin of pronotal disk rectangular. *arachnopyga*.

G. Head broader. Pronotum with the disk broader in proportion to its length, caudal margin of disk roundly obtuse-angulate to rectangulate..... **gracilipes** (Thomas)

GG. Head narrower. Pronotum with the disk narrower in proportion to its length, caudal margin of disk acute-angulate.

gracilipes constricta Brunner

Arethaea arachnopyga⁶⁹ new species (Figs. 36, 50, 60 and 61.)

This species, in certain respects, occupies as unique a position as *A. phantasma*, having no very close relationship to the other forms of the genus. The male can immediately be distinguished from all of the other forms by the larger, longitudinally sulcate supra-anal plate, the margin of the disto-dorsal abdominal segment being deeply emarginate to receive the plate. From *A. semialata*, to which it bears a more pronounced superficial resemblance than to any other, the present form can, in addition to the character given above, be separated by the narrower disk of the pronotum, the more acute-angulate caudal margin of the disk, the more oblique caudal margin of the lateral lobes of the pronotum, the less extensive stridulating field of the male tegmina, which in general more resembles that of *gracilipes*, and by the heavier ovipositor.

The male sex in many features is very close to *A. gracilipes constricta*, but the genital characters are different and the female is moderately brachypterous instead of macropterous as in *gracilipes*.

Type.—♂; Marathon, Brewster County, Texas. Elevation 3940 to 4160 feet. August 26 to 27, 1912. (Rehn and Hebard.) [Hebard Collection.]

Description of Type.—Size medium; form moderately compressed. Head with the greatest width, which is immediately ventrad of the eyes, contained one and one-half times in the depth of the head; occiput rounded, moderately declivent to the fastigium; fastigium narrow, lanceolate, acuminate, sulcate medio-longitudinally, apex subdepressed; frontal fastigium briefly truncate dorsal and in contact with the fastigium of the vertex; eyes prominent, elliptical, the greatest width about two-thirds the greatest depth, the latter subequal to the depth of the infraocular portion of the genae; antennae more than three times the length of the body. Pronotum considerably compressed, the lateral lobes somewhat expanding caudal when seen from above,

⁶⁹ *Αράχνης spider, πυγή buttocks*; in allusion to the resemblance of the supra-anal plate of the male to the jaws of a spider.

general form of the pronotum subsellate, the dorsal line nearly straight when seen from the side, appreciably ascending in the vicinity of the cephalic margin; surface of the disk of the pronotum greatly constricted mesad, the greatest caudal width of the disk approximately two-thirds the length of the disk; cephalic margin of disk sinuato-truncate with a median rudimentary tubercle, caudal margin rectangulate with the immediate angle faintly produced and narrowly rounded, no trace of lateral angles or shoulders present; transverse sulcus forming an obomegoid figure on the disk; lateral lobes with the greatest dorsal length appreciably surpassing the greatest depth of the same, cephalic margin sinuate, ventro-cephalic angle roundly rectangulate, ventral margin sinuate, ventro-caudal angle in general obtuse with the immediate angle rounded, caudal margin oblique, subsinuately truncate, humeral sinus decided but not deep, roundly obtuse-angulate, callosed caudal section of the lateral lobes rather narrow and not sharply defined. Tegmina equal to about one and two-thirds times the length of the body, moderately narrow, the width at the distal fourth contained about seven and one-half times in the length of the same and distinctly greater than the width at the proximal third; lobate marginal field very short, but little longer than the stridulating field, the margin sharply sheared distad; distal portion of costal margin gently arcuate to the narrow but rounded apex; discoidal vein with three rami, the proximal one diverging slightly proximad of the middle of the tegmen; stridulating field distinctly shorter than the pronotal disk, its greatest width about two-thirds of its length, free margin produced at the apex of the stridulating vein into an acute process which is arcuate proximad and nearly straight transverse distad, the immediate apex narrowly rounded, free margin distad of process sinuate, the field narrowing distad, anal vein moderately arcuate, stridulating vein slightly oblique, robust, subarcuate, speculum subtrigonal, rather small. Exposed portion of wings about two-fifths the tegminal length. Abdomen with the process of the proximo-dorsal segment considerably elevated, not recurved, in fact much as in *A. gracilipes constricta*; disto-dorsal abdominal segment strongly transverse, distal margin truncate laterad, strongly brace-shaped emarginate mesad for half the depth of the segment; supra-anal plate with its base recessed within this emargination of the preceding segment and its length greater than its width, lateral margins subparallel, apex bluntly, roundly and broadly obtuse-angulate, surface with a moderately deep medio-longitudinal sulcus for the greater portion of the length of the plate, distad thickly pilose. Cerci moderately robust, tapering, at about the distal third strongly recurved at a right angle, the extremity also directed somewhat dorsal, the apex acute, slightly depressed; subgenital plate very broad, the proximal width subequal to the length, lateral margins narrowing distad, distal margin subtruncate with a very faint median angulate emargination, lateral styloform processes brief. Cephalic and median femora with bispinose genicular lobes, caudal femora with unispinose genicular lobes. Cephalic femora more than twice as long as the pronotal disk; cephalic tibiae with elliptical foramina. Median

femora about three and one-half times the length of the pronotal disk. Caudal femora almost twice the length of the body, moderately inflated proximad; caudal tibiae exceeding the femora by about the length of the pronotum.

Allotype.—♀; Data same as of the type.

Description of Allotype.—The following characters are those of difference from the description of the male sex. Pronotum with the disk less constricted mesad and less expanded caudad than in the male, the greatest caudal width of the disk but slightly more than half the length of the same; caudal margin of disk slightly acute; lateral lobes with the greatest depth but two-thirds the dorsal length of the same, humeral sinus but a weak arcuate emargination. Tegmina in length subequal to twice that of the head and pronotum together, not surpassing the tips of the median femora, lanceolate, narrow, the margins subparallel for the greater portion of their length, distad the costal margin is rather strongly arcuate to the narrowly rounded apex which is sutural in position; discoidal vein with the proximal of the three rami diverging at three-fifths the length of the tegmina. Exposed portion of the wings surpassing the tegmina by nearly the length of the pronotum. Abdomen with no trace of a proximo-dorsal abdominal process; disto-dorsal abdominal segment transverse and with its distal margin arcuate-emarginate mesad; supra-anal plate tongue-shaped, distinctly longer than broad, the lateral margins subparallel proximad and arcuate-convergent distad, the apex blunt rectangulate, surface of plate sulcate medio-longitudinally on proximal half; cerci tapering, acuminate, faintly depressed distad; ovipositor in length equal to the pronotum and half of the head, the greatest depth equal to half of the length, arcuate, the margins converging distad, dorsal margin serrato-dentate on distal two-thirds, ventral margin with recurved serrato-dentations distad, passing into crenulations mesad, surface with decided lamellate dentations on the distal section, these arranged irregularly in five longitudinal series on the dorsal valves, the ventral of the five series with a great number of subcontiguous teeth, and on the ventral valves transversely and very irregularly distributed, along the sulcus, however, rather thickly placed; subgenital plate transverse trigonal, blunt. Median femora three times as long as the pronotal disk. Caudal femora a third again as long as the body exclusive of the ovipositor.

Paratype Series.—We have before us two adult male and one immature female paratypes from the type locality.

Measurements (in millimeters)

	Length of body (exclusive of ovipositor in females)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Marathon, Texas. <i>Type</i>	14.8	4.2	2.4	24.5	3
♂ Marathon, Texas. <i>Paratype</i>	17	4	2.2	24	2.9
♂ Marathon, Texas. <i>Paratype</i>	17.2	3.8	2	22.8	2.7
♀ Marathon, Texas. <i>Allotype</i>	18.7	3.4	2.3	14	1.6
♀ Montelovez, Coahuila, Mexico.....	18	3.2	2	7	1.1

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Marathon, Texas. <i>Type</i>	9.6	9.7	14.2	29	
♂ Marathon, Texas. <i>Paratype</i>	9	8.7	13.1	26.7	
♂ Marathon, Texas. <i>Paratype</i>	9.4	8.9	13.3	28.6	
♀ Marathon, Texas. <i>Allotype</i>	3.9	9.5	13.3	28.2	4.8
♀ Montelovez, Coahuila, Mexico.....	.6	9.8	13.3	26.5	4.2

Color Notes.—General color of the body ranging from straw yellow and pale chalcedony yellow on the head and thorax to ochraceous-rufous and amber yellow on the abdomen, the tegmina passing from the thoracic color to light bice green and rinnemann's green on the distal half of the tegmina and the exposed portion of the wings. In the allotype (female) the head and thorax are inclined toward chrysolite green, becoming lumiere green ventrad, the abdomen chalcedony yellow. Head with traces of infra-antennal bars of greenish white; occiput more or less yellowish with traces of purplish punctulations; postocular bar narrow, arcuate dorsad, cream white irregularly edged with purplish; eyes army brown to mars brown; antennae of the general color with the three proximal joints washed ventrad more or less decidedly with cadmium orange to burnt sienna. Pronotum with the converging prozonal continuations of the postocular bars and the margining of the caudal margin of the disk composed, as in the other species, of contiguous lines of pansy purple to burnt lake and sulphur yel-

low to pale yellow-green, the pale section of the prozonal lines occasionally weak; dorsum of the pronotum more or less thickly, completely and decidedly punctulate with pansy purple to burnt lake, lateral lobes occasionally (in allotype) with similar punctulations. Tegmina with the area of the male stridulating field between the speculum and the anal vein seal brown, the anal vein lined with madder brown. Abdomen with the lateral lines only indicated by narrow areas of the general color unmarked by punctulations of pansy purple to burnt lake, which thickly and uniformly cover the remainder of the dorsal and lateral aspects of the abdomen, coalescing into a line ventrad of the pale line on the proximo-dorsal abdominal segment. Extremity of the abdomen of the male more yellowish than the body, inclining toward aniline yellow. Limbs more or less washed with purplish as in other species of the genus, rarely with a suffusion of hoary white as well (in allotype), tibiae of the general color. Ovipositor with denticulations blackish brown.

Distribution.—The present species is only known from two localities, one (Marathon) in western Texas, the other (Montelovez) in Coahuila, Mexico. The former locality is directly east of the main chain of elevations of that region.

Biological Notes.—This very peculiar species was found by us to be very scarce, occurring in an area of high green grasses interspersed with various plants. Here it was taken adult August 26 and 27 and again September 12 and 13. A single female in the instar preceding maturity was taken on the first visit, so it is probable that the species does not reach maturity much before the latter part of August.

Morphological Notes.—The only important difference in structure noticed in the series is also one of size. The two females exhibit a disparity in the length of the tegmina and wings, as shown in the table of measurements. The allotype has the tegmina about reaching the tips of the caudal femora and subequal in width for a considerable portion of their length, the wings of the usual form and surpassing the tegmina by more than a quarter of the length of the latter. In the Montelovez female the tegmina are only half as long as in the allotype, tapering regularly for the greater part of their length, with a very narrowly rounded apex, the wings surpassing the tegmina as mere tips. This variation in alar length

appears to be individual, but there exists a possibility of the Montelovez specimen representing a form of which the male is at present unknown.

Remarks.—This species is apparently localized in distribution, occurring only in suitable habitats, but how widely it ranges we cannot even estimate, as the conditions wherein it was found at Marathon were exceptional for western Texas in many respects.

Specimens Examined: 6; 3 ♂, 2 ♀, 1 immature ♀ :

Marathon, Brewster, Company, Texas, elevation 3900 to 4160 feet, August 26 and 27 and September 12 and 13, 1912 (R. & H.), 3 ♂, 1 ♀, 1 immature ♀. *Type, allotype, paratypes.*

Montelovez, Coahuila, Mexico, 1 ♀, [Scudder Collection].

Arethaea gracilipes (Thomas) (Figs. 37, 38, 41, 51 and 62.)

1870. *E[phippitytha] gracilipes* Thomas, Proc. Acad. Nat. Sci. Phila., 1870, p. 76. [Southern Colorado.]
1871. *Ephippitytha gracilipes* Thomas, Prelim. Rep. U. S. Geol. Surv. Wyoming, pp. 265, 268. [Southern (page 268) or southeastern (page 265) Colorado.]
1872. *Ephippitytha gracilipes* Thomas, Prelim. Rep. U. S. Geol. Surv. Montana, p. 445, pl. II, fig. 11. [Northern Arizona.]
1872. *Ephippitytha gracilipes* Glover, Illustr. N. Amer. Entom., Orth., pl. XI, fig. 11.
1900. [*Arethaea*] *gracilipes* Scudder, Proc. Davenp. Acad. Sci., VIII, p. 67. (Part.) [Colorado; Arizona.]
1902. *Arethaea constricta* Scudder and Cockerell (not of Brunner), Proc. Davenp. Acad. Sci., IX, p. 52. (Part.) [Ten miles west of La Luz, New Mexico.]
1902. *Arethaea gracilipes* Scudder and Cockerell, Ibid, p. 52. [La Trementina, New Mexico.]
1904. *Arethaea gracilipes* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [Casas Grandes, Chihuahua, Mexico.]
1906. [*Arethaea*] *gracilipes* Kirby, Synon. Catal. Orth., II, p. 443. (Part.) [Colorado; Arizona.]
1907. *Arethaea constricta* Rehn (not of Brunner), Ibid, 1907, p. 74. [Tucson, Arizona.]
1909. *Arethaea constricta* Rehn and Hebard (not of Brunner), Ibid, 1909, p. 168. [Fort Wingate, New Mexico.]

The present species and its geographic race *constricta* stand so much apart from the other forms of the genus that the characters given in the key will readily differentiate them from the other species. In many respects *gracilipes constricta* shows relationship to the species-group B, while *gracilipes sensu strictiore* has a con-

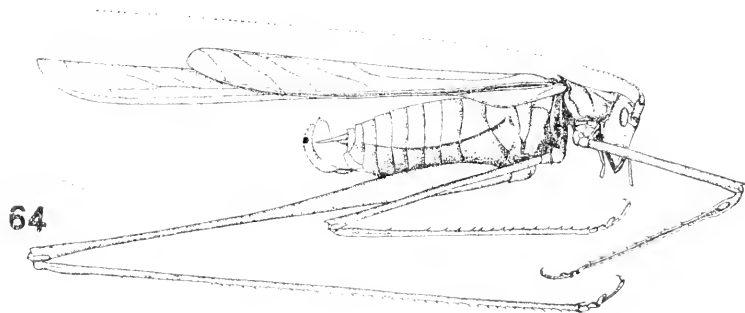
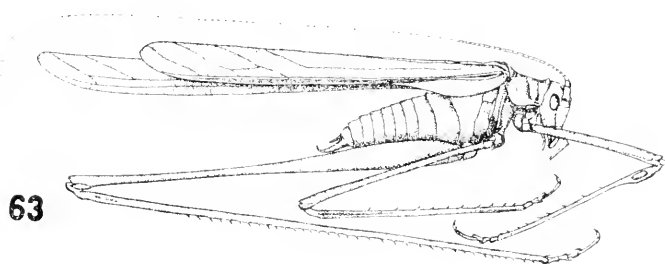
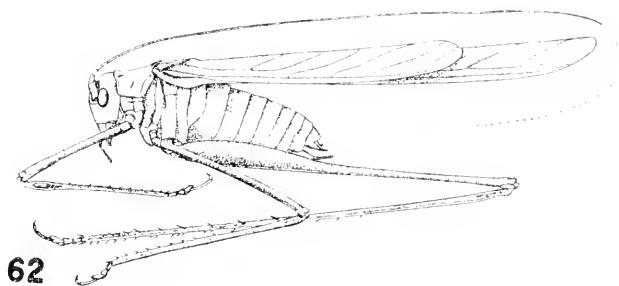


Fig. 62. Lateral view of type of *Arctiaca gracilipes*. ($\times 2$) Fig. 63. Lateral view of type of *A. insaroides*. ($\times 2$) Fig. 64. Lateral view of allotype of *A. grillator*. ($\times 2$)

siderable superficial resemblance to *A. carita* in the bullation of the male pronotum. The extremes of the two races are quite different in general appearance, but an analysis of the differences and the examination of series reduces the degree of real difference. True *gracilipes* in general differs from the race *constricta* in having the head broader, the fastigium broader with the margins of the same more decidedly arcuato-divergent caudad, the pronotum more inflated and sub-bullate, the disk (particularly in the male) broader in proportion to the length, the caudal margin of the same roundly rectangular, the process of the proximo-dorsal abdominal segment of male more elevated and subrecurved, generally very high and bulbous distad, the proportionately shorter, and in the male broader, tegmina and the limbs slightly shorter.

Type.—♂; Southern Colorado. 1869. [United States National Museum.] Dried from alcohol and colorless.

Description of Male.—As the type is in such poor condition we here describe a male from Raton, New Mexico, August 26, (Cockerell), [United States National Museum].

Size small; form very elongate, subcompressed. Head relatively broad, the greatest width immediately ventrad of the eyes contained slightly less than one and one-half times in the greatest depth of the head; occiput sub-bullate; fastigium rather broad proximad, elongate trigonal, strongly narrowing distad, lateral margins well elevated, arcuato-sublamellate, a decided medio-longitudinal sulcus present, apex of fastigium low, narrowly subtruncate and in contact with the fastigium of the face; eyes quite prominent, elliptical in outline, their length subequal to that of the infra-ocular portion of the genae. Pronotum moderately inflated, sub-bullate across the lateral lobes, sellate, the dorsal outline weakly concave when seen from the side; disk considerably expanded caudad, the greatest width there appreciably more than half the pronotal length; cephalic margin of disk very shallowly and imperfectly obtuse-angulate emarginate, caudal margin of disk roundly obtuse-angulate, the immediate angle completely rounded, lateral margins of disk completely rounding into the lateral lobes; transverse sulcus forming a broad obomegoid figure mesad on the disk; lateral lobes with the greatest depth of the same two-thirds of the greatest length of the lobes, cephalic margin of the lobes sinuato-emarginate, ventro-cephalic angle rotundato-rectangulate, ventral margin sigmoid, i.e., concavo-emarginate and arcuate caudad, ventro-caudal angle broadly rounded, caudal margin obliquely truncate, humeral sinus roundly obtuse-angulate, rather shallow, surface of the lobes with a considerable area along the caudal margin callosos-inflated. Tegmina about one and one-half times the length of the body, appreciably narrower at the proximal third than at the distal fourth, the width at the latter contained about seven and one-half times in the length; apex narrowly rounded; lobate marginal field very slightly longer than the disk of the pronotum; stridulating field distinctly shorter than

the pronotal disk, the greatest width about two-thirds of the length, free margin at the apex of the stridulating vein briefly acute-produced, the immediate angle of the production rounded, margin distad of the projection sinuate, stridulating vein almost horizontal, arcuate, not at all heavy, anal vein strongly arcuate; discoidal vein with three rami. Exposed portion of the wings in length surpassing the tegmina by about twice the pronotal length. Abdomen with the proximo-dorsal segment bearing a high, somewhat recurved process, the apex of which is rounded and sub-bulbous, the caudal face of the process deeply folded; disto-dorsal abdominal segment sub-arcuate emarginate mesad; supra-anal plate with its distal margin subtruncate; cerci moderately elongate, robust, the distal fourth subrectangularly inbent, acute, the whole slightly and the extremity decidedly depressed, the internal margin of the cercus with a slight ridge; subgenital plate broad, moderately elongate, the distal margin deeply arcuato-emarginate, brief but rather robust styliform processes present lateral. Femora with the apices non-produced dorsad; cephalic and median femora with bispinose genicular lobes and caudal pair with unispinose lobes. Cephalic femora about twice the length of the pronotal disk; cephalic tibiae with elliptical foramina. Median femora about half again as long as the cephalic femora. Caudal femora subequal to the tegmina in length, moderately inflated proximad; caudal tibiae surpassing the femora by about the length of the pronotal disk.

Description of Female.—For the female sex we describe one from Tucson, Arizona, October 12, 1910, (Rehn and Hebard), [Hebard Collection].

The characters here given are those of difference from the description of the male sex. Fastigium narrower and more compressed than in the male sex.⁷⁰ Pronotum with the caudal margin of the disk obtuse-angulate with the immediate angle narrowly acute; calloused area along the caudal margin of the lateral lobes less inflated than in the male. Proximo-dorsal abdominal segment without a trace of a dorsal process; disto-dorsal abdominal segment with a transverse median impressed area, the cephalic margin of which is arcuate, distal margin of segment subtruncate but slightly arcuato-emarginate at the bases of the cerci; supra-anal plate semi-elliptical, having a medio-longitudinal sulcus proximad; cerci moderately elongate, tapering; ovipositor moderately deep, slightly longer than the pronotal disk, moderately arcuate and appreciably narrowing distad, the immediate apices of the valves blunted, dorsal and ventral margins for half of their length serrato-dentate, the teeth of the ventral margin recurved, surface of distal third of dorsal valves with decided spiniform tubercles rather irregularly arranged in sub-linear series, the ventral row the most regular, ventral valves with a similar decided series bordering the sulcus, elsewhere on distal half with scattered rugose tuberculations; subgenital plate short, trigonal, apex blunted. Cephalic femora slightly more than twice the length of the pronotal disk; median femora about three times as long as the pronotal disk; caudal femora slightly longer than the tegmina.

⁷⁰ This is probably as wide in New Mexican females as in the males, but unfortunately none are available for study.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Southern Colorado. <i>Type</i>		3.5 ⁷¹	2.5	21	2.5
♂ Raton, New Mexico. (U.S.N.M.).....	13.7	3.9	2.2	23.1	2.8
♂ Fort Wingate, New Mexico. (A.N. S.P.).....	15.7	3.2	2	20.7	2.6
♂ West of Luluz, New Mexico. (Seudder Collection).....	14.2	3.8	2.4	22.3	2.8
♂ Marathon, Texas.....	15.2	3.5	2.2	22.8	2.9
♂ Snyder's Hill, Arizona.....	13.2	3.3	2.3	21.5	2.5
♂ Espinosa Ranch, Arizona.....	14.5	3.6	2.2	22.7	2.7
♂ Sycamore Canyon, Arizona.....	14.8	4	2.4	24.6	2.6
♀ Tucson, Arizona. (Deser. spec.).....	16.4	3.9	2.4	24	2.2
♀ Tucson, Arizona.....	16	3.6	2	22	2.3
♀ Pine, Arizona. (Hebard Collection).....	14.4	3.9	2.2	23.7	2.6
♀ Tumamoc Hill, Arizona.....	17.9	3.7	2.2	22.7	2.5
♀ Sahuaro Plain, Arizona.....	18.6	3.4	2.2	23.5	2.5
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	13.8	3.7	2.3	22.5	2.2
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	15.5	3.6	2.1	22.6	2.4

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovi-postor
♂ Southern Colorado. <i>Type</i>	8	7.8	11.6	25	
♂ Raton, New Mexico. (U.S.N.M.).....	7.7	7.2	11.2	22.6	
♂ Fort Wingate, New Mexico. (A.N. S.P.).....	9	7.2	11.2	24	
♂ West of Luluz, New Mexico. (Seudder Collection).....	11	8.2	13	27.2	
♂ Marathon, Texas.....	9.6	8.2	12.4	26	
♂ Snyder's Hill, Arizona.....	8.8	7.5	11.8	24.6	
♂ Espinosa Ranch, Arizona.....	8.7	8.5	13	27	
♂ Sycamore Canyon, Arizona.....	9.1	8.6	13.7	28.4	
♀ Tucson, Arizona. (Deser. spec.).....	7.2	8.9	12.5	26.4	4.5
♀ Tucson, Arizona.....	8	8.9	12.8	26.5	4.6
♀ Pine, Arizona. (Hebard Collection).....	8.8		13.4	28	5.1

⁷¹ Caudal margin not included as it has been broken away by the pin.

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♀ Tumamoc Hill, Arizona.....	9.6	9.2	13.5	30	4.2
♀ Sahuaro Plain, Arizona.....	8.5	9.7	14.2	28	4.6
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	7.9	9.2	13.5	27.5	4.5
♀ Sycamore Canyon, Baboquivari Mountains, Arizona.....	7.8	9	13.3	26.7	4.5

In the male sex, specimens from the higher elevations in New Mexico average smaller than those from the lower elevations in southern Arizona, but in the absence of female individuals from New Mexico it does not seem advisable to emphasize this apparent geographic size variation. The individual variation seen in the two females from Tucson and those from Sycamore Canyon is not very great, although in several characters the two former ones represent the extreme measurements.

Color Notes.—General color of the whole body quite uniform in the individual, in different specimens ranging from a greenish extreme to a brownish one; to be exact from as deep as winter green through tiber green and pale veronese green to yellowish citrine and, finally, to clay color. In a number of the individuals having the latter base color, the distal half or so of the tegmina and the exposed portion of the wings are green, often as strongly colored as winter green, while in the others the color lightens to cinnamon buff or even pinkish buff on the head, pronotum and immediate base of the tegmina. Face in numerous greenish specimens with broad subvertical whitish to wax yellow infra-antennal bars, caudal margin of genae similarly colored; antennae ranging from wax yellow to light dull green-yellow, the two proximal joints occasionally more or less completely orange, again their ventral surface and the adjacent portion of the remainder of the antennae frequently washed with garnet brown; eyes varying from russet to chestnut-brown; fastigium frequently washed with garnet brown; postocular bars always more or less indicated, but usually weak, arcuate, narrow, garnet brown dorsad and creamy white to green-

ish white ventrad. Pronotum with converging continuations of the postocular bars indicated more or less distinctly on the prozona, similar in color, the garnet brown occasionally fairly broad and the enclosed portion of the prozona almost always more or less finely punctulate with the same; caudal margin of pronotal disk margined with the same two colors, rarely the garnet brown is absent but frequently it is much weakened; lateral lobes with the callosed caudal margin hoary white, creamy white or yellowish white. Tegmina of male with the broad arcuate section of the stridulating field between the speculum and anal vein infuscate, generally deeply so and ranging from seal brown, with the immediate vicinity of the anal vein madder brown, to verona brown with the anal vein cinnamon-buff; vicinity of the same portion of the anal vein in the female more or less distinctly lined with vinaceous-rufous. Abdomen with the usual pale lateral line always more or less indicated, ranging from cream color to clay color, frequently more or less contrasted dorsad by a parallel edging of garnet brown, the latter often absent, the dorsum of the abdomen between the pale lines frequently closely and finely punctulate with garnet brown. Cerci of male more or less yellowish, tips blackish; ovipositor of female with the distal extremity deeper in tone than the proximal section. Limbs, as in other forms of the genus, more or less suffused with garnet brown, this often very pale and rarely absent, generally limited to the femora, but occasionally in a tintured form coloring the tibiae as well, on the cephalic and median femora generally tinting the entire part, the caudal femora usually having the proximal and distal extremities of the base color.

Taken as a whole the individuals from southern Arizona are paler and more buffy than those from the more elevated sections in New Mexico and western Texas, no buffy specimens being in our series from the latter regions, while full greenish individuals are the exception from southern Arizona. The buffy individuals as a whole show less color contrasts, but the converse deduction that the greenish ones all show more contrasts does not hold true, occasional greenish specimens having very little contrast, although the greatest contrasts are in that extreme. The paleness of the Arizona specimens appears to be suitably explained by the more decided desert habitat in which they occur.

Distribution.—The range of typical *gracilipes* extends from southern Colorado south to northern Chihuahua, Mexico (Casas Grandes), east to western Texas (Marathon) and west to central (Pine) and central southern (Baboquivari Mountains) Arizona, apparently passing into *gracilipes constricta* in west central Texas and western Kansas. Of our material that from northern and central New Mexico is most typical, while the specimens from western Texas are not typical, although nearer the present form than *gracilipes constricta*. The vertical distribution of the present race is, from the evidence of the material before us, from about 2200 feet (Tucson) to about 7000 feet (Fort Wingate).

Biological Notes.—The present form inhabits a variety of country, but usually is found in grama or other grasses varying from six inches to several feet high, which frequently grow in park-like country under mesquite and acacia, and again the insect has been taken in rabbit weed (various species of composites). On numerous occasions it has been taken attracted to light at night. On one occasion it was taken drinking water at the edge of a rock tinaja or basin. It is in general a rather scarce species, although so widely distributed.

The earliest date we have for the insect is July 22 (Pine, Arizona) and the latest October 12 (Tucson). Immature specimens were taken as late as October 11 (Tucson), which shows that the latest date given above is doubtless considerably before the actual latest date of seasonal occurrence.

Morphological Notes.—The form of the fastigium varies somewhat in the male sex, this being as described in the greater portion of the specimens from New Mexico, but narrower in the Arizona, west Texas and Fort Wingate individuals of that sex. The bullation of the pronotum and width of the same across the expanded lateral lobes is less in the individuals from western Texas than in any others, in all the females, however, less pronounced than in the males. The form of the caudal margin of the pronotal disk in the male varies from regularly arcuate to roundly obtuse-angulate regardless of locality, the same margin in the female always more decidedly angulate though equally variable, the immediate angle occasionally acute produced. The tegmina of male with three to five rami to the discoidal vein. The abdomen of the male always bears

a well developed process on the proximo-dorsal segment, this placed mesad by the caudal margin and in the New Mexican specimens as above described under the male sex, but in the west Texas and Arizona individuals this process is lower, more trigonal when seen from the side, not at all recurved or bulbous but just as decidedly erect and sulcate caudad and always more apparent than in *A. gracilipes constricta*. The cerci of the male vary greatly in form, ranging from a tapering type with the distal fourth bent incurved at a right angle and with the apex very acute, to one with the recurved distal fourth strongly depressed and lamellate, with the apex blunt acute but marginal and not at all aciculate, and to another type with the distal fourth hardly at all curved, following much the same direction as the main portion of the cercus and with the apex decidedly aciculate. The first type is by far the most numerous, occurring in the New Mexico and Arizona specimens, the second in two males (all seen) from western Texas, although suggested in another from Luluz, south central New Mexico, the third only in Chihuahua material. The study of a far larger series of specimens from that region of which El Paso is the geographic center may show that these cercal forms are characteristic of definite regions or elevations, and that the recognition of more races would be advisable, but the present day evidence is not sufficient to make any such deductions. The sub-genital plate of the male shows very considerable variation in the form and width of the distal emargination and in the length of the styliform processes. The latter feature has no geographic significance as far as we can determine, and we do not possess sufficient series from single localities to make any statement regarding the constancy of certain forms of the margin. The ovipositor of the female shows some little variation in size but the form shows no noteworthy differences.

Synonymy.—From an examination of *gracilipes* and a study of topotypes of *constricta* Brunner, it is evident that they are only geographic forms of the same species. Brunner erroneously used the name *gracilipes* for the very different species which Scudder had previously named *grallator*. Of the records given for both of the forms and based on specimens we have examined all but four, two belonging to the present form. These are Thomas's 1872 record from northern Arizona and Scudder and Cockerell's La

Trementina specimen. The former is unquestionably the present race and the latter is presumably the same.⁷²

Remarks.—The examination of the type of this form, shrivelled and discolored though it is, permitted us to correctly place the “*gracilipes*” of Brunner and other authors, as the species named *grallator* by Scudder. The form of the stridulating field of the tegmina and the structure of the extremities of the cephalic and median femora readily place the type specimen. The extremes of the two races of this species have such different appearances that with only a few typical specimens one could easily consider them distinct species, but the possession of a considerable number of individuals enables us to see their close relationship. Each form is typical in a certain definite geographic area, probably intergrading over a portion of western Nebraska, Kansas and west central Texas, for while we lack absolute intermediates we possess specimens which show the lines of variation away from one type toward the other. True *gracilipes* is developed more highly in the elevated portion of northern New Mexico and adjacent Colorado than elsewhere, varying slightly away from the typical form southward and also somewhat westward; the specimens from southern Arizona, while *gracilipes* in general sum total of characters, being less decided than those from the higher elevations in or near the main uplift of the Rocky Mountains.

Specimens Examined; 41; 21 ♂, 18 ♀, 2 immature ♀ :

Southern Colorado, 1869, 1 ♂. *Type*. [U. S. N. M.]

Raton, Colfax County, New Mexico, August 26, (Cockerell), 1 ♂, [U. S. N. M.].

Las Vegas Hot Springs, New Mexico, August 12, (H. S. Barber), 1 ♂, [U. S. N. M.].

Jemez Hot Springs, Bernalillo County, New Mexico, July 29, 1911, (John Woodgate), 1 ♂, [Hebard Collection].

Fort Wingate, McKinley County, New Mexico, August 17, 1910, August 28, 1903, (John Woodgate), 2 ♂, [Hebard collection and A. N. S. P.].

Albuquerque, New Mexico, 1 ♂, [Hebard Collection ex Bruner].

Arroyo ten miles west of La Luz, Otero County, New Mexico, August 28 (at light), (C. H. T. Townsend), 1 ♂, [Scudder Collection].

New Mexico, (H. Meeske), 1 ♂, [Hebard Collection ex Bruner].

⁷² Prof. Cockerell writes us that the specimen was sent to Scudder and kept by him. It could not be found in the Scudder series by us.

Pine, Gila County, Arizona, July 22, 1889, 1 ♀, [Hebard Collection ex Bruner].

Tucson, Arizona (F. H. Snow), 1 ♀, [Univ. of Kansas]; October 12, 1910, (R. & H.), 5 adult and 1 immature ♀.

Tumamoc Hill, Tucson Mountains, Arizona, elevation 2400 to 3090 feet, October 3 and 4, 1910, (R. & H.), 1 ♂, 5 ♀.

Sonora Road Canyon (Roebles Pass), Tucson Mountains, Arizona, elevation about 3000 feet, October 11, 1910, (R. & H.), 2 ♀.

Sabuaro Plain between Tucson and Coyote Mountains, Pima County, Arizona, October 5, 1910, (R. & H.), 1 ♀.

Snyders Hill, Pima County, Arizona, elevation about 2500 feet, October 11, 1910, (R. & H.), 1 ♂.

Roebles Ranch, Pima County, Arizona, October 5, 1910 (attracted to light), (R. & H.), 1 ♂.

Palo Alto Ranch, Altar Valley, Pima County, Arizona, elevation about 3000 feet, October 6 to 8, 1910, (R. & H.), 1 ♂.

Near Espinosa Ranch, Altar Valley, Pima County, Arizona, elevation about 3200 feet, October 9, 1910, (R. & H.), 1 ♂.

Sycamore Wash and Canyon, Baboquivari Mountains, Pima County, Arizona, elevation 3400 to 4700 feet, October 6 to 9, 1910, (R. & H.), 2 ♂, 3 ♀. Arizona, 1 ♂, [U.S.N.M.].

Marathon, Brewster County, Texas, elevation 3900 to 4160 feet, September 12 and 13, 1912, (R. & H.), 1 ♂.

Canyon behind Pulliam Bluff, Chisos Mountains, Texas, elevation 4600 to 5000 feet, September 7, 1912, (R. & H.), 1 ♂.

Casas Grandes, Chihuahua, Mexico, September, 1902, (W. E. Hughes), 2 ♂, 1 immature ♀, [A.N.S.P.].

***Arethaea gracilipes constricta* Brunner (Figs. 32, 39 and 40.)**

1878. *Arethaea constricta* Brunner, Monogr. der Phaneropt., p. 236. [Dallas, Texas.]

1885. *Arethaea gracilipes* Bruner (not of Thomas), Bull. Washb. Coll., I, p. 127. [Barber County, Kansas.]

1900. *Arethaea constricta* Scudder, Proc. Davenport Acad. Sci., VIII, p. 67. [Texas.]

1900. *Arethaea gracilipes* Scudder (not of Thomas), Ibid., VIII, p. 67. (Part.) [Kansas.]

1904. *Arethaea gracilipes* Caudell (not of Thomas), Sci. Bull. Brooklyn Inst. Arts & Sci., I, no. 4, p. 114. [Esperanza Ranch, Brownsville, Texas.]

1905. *Arethaea gracilipes* Isely (not of Thomas) Trans. Kansas Acad. Sci., XIX, p. 245. [East of Fairmount, Kansas.]

1906. *Arethaea constricta* Kirby, Synon. Catal. Orth., II, p. 443. [Texas.]

1906. *Arethaea gracilipes* Kirby (not of Thomas), Ibid., II, p. 443. (Part.) [Kansas.]

The characters separating the present race from *A. gracilipes* s.s. have been emphasized under the typical form.

Type.—♂; Dallas, Texas. [Berlin Museum.]

Description of Male.—The following characters, which are purely comparative with the same sex of true *gracilipes*, are drawn up from a male bearing the following data; Victoria, Victoria County, Texas, July 26 to 27, 1912, (Hebard), [Hebard Collection].

Size medium. Head with the depth greater in proportion to the width immediately ventrad of the eyes; occiput more compressed, lanceolate, margins nearly straight cephalad but moderately divergent caudad; eyes slightly narrower in proportion to the length than in true *gracilipes*. Pronotum less inflated, not bullate across the lateral lobes, dorsal outline more concave when seen from the side, than in the other race; disk distinctly longer and proportionately narrower, the greatest width of the disk caudad hardly more than half the length of the same; cephalic margin of the disk bisinuate with a median blunt angle, caudal margin of disk acute-angulate; obomegoid figure of transverse sulcus narrower; lateral lobes with the caudal margin obliquely sinuato-truncate. Tegmina with the lobate marginal field no longer than the pronotum; stridulating field much shorter than the pronotal disk, structure of the field as in true *gracilipes* except that the stridulating vein is more obliquely arcuate. Process of the proximo-dorsal abdominal segment not strongly erect nor recurved, trigonal when seen from the side, the dorsal outline oblique, the caudal vertical, the whole appendage low, in form more decidedly a fold of the plate than an elevated specialized appendage as in *gracilipes* s.s. Disto-dorsal abdominal segment with the distal margin sinuato-truncate; supra-anal plate semi-elliptical in form; cerci as in true *gracilipes* but with the distal fourth not bent rectangularly, but obliquely directed inwards and the same portion slenderer; subgenital plate with the distal margin moderately broad, subtruncate, lateral styliform processes moderately long. Cephalic and median femora proportionately as in *gracilipes* s.s. Caudal femora a third again as long as the tegmina, very slender.

Description of Female.—As typical of the female sex we have selected a topotype; Dallas, Texas, September 25 to 26, 1912, (Rehn and Hebard), [Hebard Collection]. The features of the female have been almost entirely covered in the preceding description of *gracilipes* (female) and the male of the present form, so that it is only necessary to call attention to several points. Fastigium lower and less developed than in the male. Caudal margin of the disk of the pronotum equally as acute-angulate as in the male. Appendages as in the female of *gracilipes* s.s., but ovipositor not quite so deep and the apex of the dorsal valves slightly sharper.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Niobrara, Nebraska. (Univ. of Nebraska).....	13.3	3.8	2	20	2.1
♂ Barber County, Kansas. (Hebard Collection).....	15.5	3.8	2.1	20.5	2.2
♂ Wichita, Kansas. (U.S.N.M.).....	14.4	3.7	2	19	2.2
♂ Dallas, Texas. <i>Type</i> . (Ex Brunner)..	15	3.8		20	
♂ Shovel Mount, Texas. (A.N.S.P.).....	13.5	3.5	1.9	19.7	2.1
♂ Kerrville, Texas.....	15	3.5	1.9	20.5	2.
♂ Beeville, Texas.....	17	4.2	2.2	22.8	2.4
♂ Victoria, Texas. (Deser. spec.).....	17	4.5	2.2	22.2	2.4
♂ Benavides, Texas.....	14.5	3.7	2	19	2
♂ Uvalde, Texas.....	14.5	3.7	2	21	2.2
♂ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	14	4	2.2	20.5	2.4
♂ Tonala, Chiapas, Mexico. (A.M.N.H.)	13	3.3	1.9	19	⁷³
♀ Barber County, Kansas. (Hebard Collection).....	15.2	3.7	2	19.7	2.
♀ Wichita, Kansas. (U.S.N.M.).....	18.5	4.2	2.2	18.2	1.9
♀ Dallas, Texas. (Deser. spec.).....	19.6 ⁷⁴	3.7	2	17.5	1.9
♀ Dallas, Texas. (U.S.N.M.).....	12.6	3.1	2	19.2	1.9
♀ Ciseo, Texas.....	15.7	3.3	2	17.8	1.9
♀ Shovel Mount, Texas. (A.N.S.P.).....	14.2	3.3	2	18.7	2
♀ Beeville, Texas.....	15.8	4.2	2.2	21.8	2.5
♀ Beeville, Texas.....	18	4.2	2.3	21.5	2.4
♀ Clip, Goliad County, Texas.....	17	4.2	2.4	21.5	2.3
♀ Benavides, Texas.....	15	4	2	21.2	2.1
♀ Uvalde, Texas.....	16	4	2.1	22.8	2.3
♀ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	12.8	3.9	2	22.8	2

⁷³ Curled in drying from alcohol.⁷⁴ Abdomen distended abnormally in stuffing.

	Length of wing distal of teg- men	Length of cephal- ic femur	Length of me- than femur	Length of caudal femur	Length of ovi- positor
♂ Niobrara, Nebraska. (Univ. of Ne- braska).....	6.8	7.4	10.5	22.2	
♂ Barber County, Kansas. (Hebard Col- lection).....	9.5	9.2	14.3	29	
♂ Wichita, Kansas. (U.S.N.M.).....	7.2	7.8	12	24.5	
♂ Dallas, Texas. <i>Type</i> . (Ex Brunner)....				27	
♂ Shovel Mount, Texas. (A.N.S.P.).....	7.9	8.2	12.7	25.5	
♂ Kerrville, Texas.....	8.7	9.5	13.6	28	
♂ Beeville, Texas.....	8.3	9.3	14.8	29.3	
♂ Victoria, Texas. (Descr. spec.).....	9.3	9.7	15.1	31	
♂ Benavides, Texas.....	9.8	8.9	14.2	28.3	
♂ Uvalde, Texas.....	8.9	9	14.2	28.3	
♂ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	8.3	9.5	13.6	28.2	
♂ Tonalá, Chiapas, Mexico. (A.M.N.H.)	9.5	8.1	11.8	24.5	
♀ Barber County, Kansas. (Hebard Collection).....	7.3		11.7	25.3	4.2
♀ Wichita, Kansas. (U.S.N.M.).....	6.4	8.5	12	25.8	5
♀ Dallas, Texas. (Descr. spec.).....	8.2	8.7	12.5	25.6	4.5
♀ Dallas, Texas. (U.S.N.M.).....	8	8.9	13.3	26.4	3.9
♀ Cisco, Texas.....	6.9	8.3	12.1	25.5	4
♀ Shovel Mount, Texas. (A.N.S.P.).....	7	8.5	12.5	25.2	4
♀ Beeville, Texas.....	8.3	10.3	15	30.3	4.5
♀ Beeville, Texas.....	8	9.4	15	30	4
♀ Clip, Goliad County, Texas.....	9.2	10.4	15.5	32.1	4.5
♀ Benavides, Texas.....	8.4	8.9	13.3	27.5	4.4
♀ Uvalde, Texas.....	8.6	9.6	14.2	28	4.2
♀ Esperanza Ranch, Brownsville, Texas. (Bklyn. Inst. A. & S.).....	8	10	13.5	29.6	4.5

It is evident that in the Coastal and Fayette Prairie Regions of Texas the present form reaches its maximum size, the series of specimens from Victoria, Beeville and Clip showing the greatest proportions found in the series. Individuals from Nebraska, Kansas, northern Texas and the Edwards Plateau region (Shovel Mount and Kerrville) are appreciably smaller than the coastal individuals, while the isolated specimen from Tonalá, Chiapas, Mexico is also quite small. The small size of some of the proportions of the latter

may be partly due to shrivelling as the specimen has been dried from alcohol.

Color Notes.—Color pattern and tones as a whole the same as found in *A. gracilipes* s.s. The general color is as deep as winter green in only a few specimens, in the majority of the greenish specimens nearer light oriental green, the brownish extreme with no specimen as deep as clay color, the majority cinnamon-buff and a few washed with pinkish cinnamon. The intensification of the green on the distal portion of the tegmina and the exposed section of the wings is found in a large number of the greenish individuals, some specimens of a pinkish buff general color having the same area tinged with pale greenish. The number of specimens showing at least traces of greenish far outnumber those not exhibiting the same, and it seems that the brownish phase is a reaction to environmental conditions, although we have little positive evidence on this point. In a large portion of the series the abdomen is far more yellowish than the remainder of the body, but a very considerable portion of this is due to drying.

When compared with the color description of *A. gracilipes* s.s., the following noteworthy features of difference are apparent. Caudal margin of the pronotal disk frequently having the garnet brown portion of the edging reduced to a mere thread; disk of the pronotum and occiput in the majority of the specimens with a more or less distinct thread-like medio-longitudinal line of creamy. Tegmina with the immediate vicinity of the rami of the anterior ulnar and discoidal veins adjacent to the sutural margin frequently pale in the greenish specimens, usually opaline green; sutural margin of the entire tegmen frequently edged, in both sexes, with deep vinaceous to seal brown and hessian brown. Pale lines on the sides of the abdomen decided in the majority of the specimens and almost always bordered ventrad with a line of from pale garnet brown to very deep maroon, the dorsal dark line of the marking less distinct than in *A. gracilipes* s.s., often a mere morocco red wash and quite frequently absent, dorsum of the abdomen between these lines often punctulate with garnet brown.

Distribution.—The present form ranges from as far north as Niobrara, in extreme northern Nebraska, south as far as Tonala, Chiapas, Mexico, east to northeastern Kansas (Fairmount), east-central (Dallas, Calvert and Victoria) and southern (Brownsville) Texas,

westward apparently passing into *A. gracilipes* s.s., in western Kansas and west-central Texas, specimens from as far west as Clark County, Kansas and Uvalde and Carrizo Springs, Texas representing *constricta*. The specimen from Montelovez, Coahuila, Mexico is included with this form, although being from alcohol we feel some uncertainty regarding its real position.

The highest known elevations from which we have seen the present race are 1950 feet in Clark County, Kansas and 1526 to 1725 feet at Kerrville, Texas, while at Tonala and Brownsville its distribution almost touches sea-level.

Biological Notes.—Isely took the present form in open prairies east of Fairmount, Kansas. The present authors have taken it in numerous situations in Texas: in short grass in open spots between oak thickets (Dallas and Beeville), in the very short and sparse vegetation on out-crops of shell-limestone (Weatherford), among green weeds in rather moist bottom land (Uvalde), in dry sorghum (Laredo), in long dry grass along railroad tracks (Clip), in fields more or less thickly overgrown with grasses and low plants (Victoria and Benavides) and also beaten from oak (Cisco). One immature female taken at Brownsville by Mathewson is labelled "on huisache" (*Vachellia farnesiana*). It thus can be seen to frequent a variety of habitats, although in our experience most numerous in well grassed fields dotted with low bushes and plants. In such situations at Victoria it occurred in company with *A. grallator* and at Benavides with *A. phantasma*.

The earliest date for an adult of this race is May, at Brownsville, the next June 11, at Wichita, Kansas, the latest, October 4, at Shovel Mount, Texas. A female individual in the instar preceding maturity, from Brownsville, Texas, taken May 23 has been examined by us.

Morphological Notes.—The general form of the pronotum varies slightly in character in the present race, but its features as differential from *A. gracilipes* s.s., remain constant. A certain amount of artificial dilation and compression of the pronotum, due to pressure when pinning, is occasionally noticed, but the former is easily recognized as such when compared with the bullation found in the typical form of the species. The caudal margin of the pronotum varies from rectangulate to distinctly acute-angulate, the margins laterad of the angle frequently subarcuate and again the apex acute-

tuberculate. Cephalic margin of the pronotal disk with or without a median tubercle, this generally absent in northern specimens and almost always present in southern (from Victoria and Beeville south) individuals. The proximo-dorsal abdominal process of the male is almost always lower than in the typical form and never bulbous in character. The cerci of the male exhibit a gradual narrowing of the distal portion when specimens from Nebraska south to southern Texas are examined, the Niobrara, Nebraska and Barber County, Kansas individuals having the recurved section as sharply bent as in *gracilipes*, broad and sublamellate, with the immediate apex not at all attenuate and with the main shaft thickened, from which type there is a gradual drawing out of the appendage, until in the material from southern Texas the cerci are as given in the description of this race, the exact angle of the bend of the distal fourth varying somewhat, but the shaft slenderer and the form tapering with the apex aciculate. On the other hand the single Tonalá individual has the cerci broader, the distal section much depressed and lamellate, the general form much as in the specimens from western Texas referred to true *gracilipes*. The form of the subgenital plate of the male varies as in the typical form.

Remarks.—The race to which the name *constricta* is restricted, is a unit exhibiting within itself considerable variation, this in size and to a less extent in structure, but as a whole it shows less plasticity than *A. gracilipes* s.s. The differentiation of the material of the two races is not difficult and, we feel, completely warranted by the series before us.

Specimens Examined: 70; 42 ♂, 27 ♀, 1 immature ♀:

Niobrara, Knox County, Nebraska, August 2, 1902, (W. D. Pierce), 2 ♂, [Univ. of Nebraska].

Clark County, Kansas, elevation 1950 feet, August 25, 1911, (F. X. Williams), 1 ♂, [Univ. of Kansas].

Barber County, Kansas, (F. W. Cragin), 2 ♂, 2 ♀, [Hebard Collection ex Bruner].

Wichita, Sedgwick County, Kansas, June 11, 1909, (F. B. Isely), 1 ♂, [Univ. of Kansas]; July 13 to 20, 1 ♂, 1 ♀, [U.S.N.M.].

Kansas, 1 ♂, [U.S.N.M.].

Dallas, Texas, 1 ♀, [U.S.N.M.]; September 25 and 26, 1912, (R. & H.), 1 ♀.

Weatherford, Parker County, Texas, elevation 1000 to 1100 feet, September 23, 1912, (R. & H.), 1 ♀.

Cisco, Eastland County, Texas, 1450 to 1550 feet, September 21 and 22, 1912, (R. & H.), 1 ♀.

Calvert, Robertson County, Texas, (G. H. Harris), 1 ♂, [U.S.N.M.].

Shovel Mount, Burnet County, Texas, June 18, July 7 to 28, August 8 to 18, September 5 and October 4, 1901, (F. G. Schaupp), 6 ♂, 6 ♀, [A.N.S.P.].

Kerrville, Kerr County, Texas, elevation 1525 to 1800 feet, August 17 to 18, 1912, (R. & H.), 3 ♂.

San Antonio, Texas, June 16, (M. Newell), 1 ♂, [Hebard Collection ex Bruner]; August 15 and 16, 1912, (R. & H.), 1 ♂.

Victoria, Texas, July 26 and 27, 1912, (H.), 5 ♂.

Clip, Goliad County, Texas, August 27, 1912, (H.), 1 ♀.

Beeville, Bee County, Texas, July 28, 1912, (H.), 9 ♂, 8 ♀.

Benavides, Duval County, Texas, August 9 and 10, 1912, (R. & H.), 1 ♂, 2 ♀.

Esperanza Ranch, Brownsville, Texas, May and August 28, (Schaeffer), 1 ♂, 2 ♀, [Bklyn. Inst. A. & S.]; May 23, 1913, (Mathewson; on huisache), 1 immature ♀, [Hebard Collection].

Laredo, Webb County, Texas, elevation 500 to 550 feet, August 10 to 12, 1912, (R. & H.), 1 ♂.

Carrizo Springs, Dimmit County, Texas, June, 1885, (A. Wadgymar), 1 ♂, 1 ♀, [Hebard Collection ex Bruner].

Uvalde, Texas, elevation 1000 to 1100 feet, August 21 and 22, 1912, (R. & H.), 1 ♂, 1 ♀.

Montelovez, Coahuila, Mexico, 1 ♂, [Scudder Collection].

Tonala, Chiapas, Mexico, 1909, 1 ♂, [Amer. Mus. Nat. Hist.].

Arethaea insaroides new species (Figs. 33, 42, 52 and 63.)

This rather isolated species is in general related on one hand to the remaining species of group B (*phalangium*, *grallator* and *semialata*) and on the other to the very peculiar and in fact unique *A. phantasma*. From *phalangium* and *grallator* this form can be readily distinguished by the abbreviate pronotum, which has a rounded caudal margin to the disk instead of a sharply angulate one, and the non-produced femoral apices. From *semialata* the present species can be distinguished by the shorter pronotum, the form of the stridulating field of the male, the more elongate tegmina of the female and the broader ovipositor. From *A. phantasma* the species here described differs in the much shorter and more inflated pronotum, the proportionately shorter and broader stridulating field of the male tegmen, which has its sutural margin less sinuate, the margins of the same formed by the anal veins being regularly converging distad, the subtruncate distal margin of the male subgenital plate, the proximo-dorsal abdominal segment of

the male which has a distinct compressed medio-marginal elevation and in the ovipositor of the female being more scabrous on the disk.

Type.—♂; Jimulco, Coahuila, Mexico. November. (Lawrence Bruner.) [Hebard Collection ex Bruner.]

Description of Type.—Size rather small; form moderately elongate. Head with the greatest breadth ventrad of the eyes contained one and one-half times in the greatest depth of the head; occiput very short, subinflated, very weakly declivent to the fastigium, considerably declivent to the antennal scrobes; fastigium subcompressed, lateral margins arcuato-elevated, converging cephalad, immediate apex very low and narrow, medio-longitudinal sulcus well impressed; frontal fastigium acute, very narrowly in contact with the fastigium of the vertex; face evenly rounded transversely, no distinct elevated ridges present; eyes moderately prominent, in outline elliptical, the greatest width contained about one and one-half times in the depth of the same, the depth subequal to that of the infra-ocular portion of the genae; antennae imperfect. Pronotum strongly sellate, appreciably inflated ventrad, the greatest transverse width across the ventral portion of the lateral lobes subequal to the length of the pronotal disk; disk considerably constricted mesad, somewhat elevated caudad and with the greatest caudal width about two-thirds of the length, cephalic margin of disk arcuato-emarginate mesad, arcuato-subproduced laterad, caudal margin of disk obtuse-angulate with the immediate angle rounded, disk broadly rounding into the lateral lobes, the faintest possible indication of converging angles present on the prozona, rounded indications of shoulders present in the usual positions; transverse sulcus distinct, continuous, on the disk forming a median rectangulate figure; lateral lobes slightly longer than deep, cephalic margin sinuate, ventro-cephalic angle subrectangulate, ventral margin subarcuato-emarginate cephalad, subarcuate caudad, ventro-caudal angle rounded, caudal margin obliquely arcuato-truncate, humeral sinus obtuse-angulate and broad surface of the metazonal section of the lobes sub-bullate. Tegmina about twice as long as the body, elongate lanceolate, narrow, subequal; lobate marginal field in length about equal to one-fourth of the tegminal length, similar in form to that found in other species of the genus; costal margin gently curving distad to the rounded apex; stridulating field slightly longer than the disk of the pronotum, its greatest width about two-thirds of its length, anal vein regularly arcuate, sutural margin of field broadly arcuate at the apex of the stridulating vein, distad of which it is subsinuate, stridulating vein heavy, oblique, arcuate, speculum with the external outline subarcuate; discoidal vein with three rami placed in distal two-fifths of tegmina; anterior ulnar vein reaching sutural margin of tegmina slightly distad of middle, with three well defined rami. Wings surpassing the apex of the tegmina by about a third the length of the latter. Abdomen subdepressed; proximo-dorsal abdominal segment having a greatly compressed subtrigonal disto-median elevated process; disto-dorsal abdominal segment with the distal margin

sinuato-truncate; supra-anal plate slightly transverse, in general form similar to the type found in the majority of the species of the genus; cerci similar in general form to those of other species, sharply bent inwards at distal fourth, the angle hardly rectangulate, the apex acute, depressed; subgenital plate narrowing distad, in general rather broad, distal margin broad, subtruncate, lateral styliform processes short, tapering, ventral surface with prominent rounded lateral carinae and a less decided subangulate median one, the latter not quite reaching the distal margin, the lateral ones continuous with the styliform processes. Limbs not greatly elongate, dorso-genicular region of cephalic and median femora subcompressed but not acute produced, genicular lobes of same femora bispinose, of caudal femora unispinose; cephalic femora slightly less than three times as long as the pronotum, cephalic tibiae with elongate elliptical foramina; median femora subequal to the body in length; caudal femora slightly longer than the tegmina, moderately inflated proximad, caudal tibiae surpassing the femora by more than the pronotal length.

Allotype.—♀; Same data as the type.

Description of Allotype.—The following characters are those of difference from the description of the type. Fastigium smaller, less elevated and more compressed than in the male, sulcus equally impressed; face more flattened cephalad than in the male and with indications of infra-antennal ridges; eyes very slightly more longitudinal than in the male. Pronotum with the greatest transverse width across the ventral portions of the lateral lobes slightly greater than the dorsal length of the pronotal disk, the latter less elevated caudad than in the male and with the greatest caudal width less than two-thirds of the length, caudal margin of disk subrectangulate with the immediate angle not rounded; lateral lobes appreciably longer than deep, surface of the metazonal section of the lobes less bullate than in the male. Tegmina a fourth again as long as the body (exclusive of the ovipositor); lobate marginal field slightly more than a fourth of the length of the entire tegmen; anterior ulnar vein reaching the sutural margin distinctly distad of the middle and with its rami much less apparent than in the male. Proximo-dorsal abdominal segment without erect process; disto-dorsal abdominal segment deplanate dorso-mesad, the flattened area angularly margined laterad, distal margin of segment subarcuate, flattened mesad; supra-anal plate much as in male; cerci terete, moderately elongate; ovipositor slightly surpassing the femora in length, moderately deep, regularly arcuate, distal half of dorsal margin serrato-dentate, greater part of ventral margin crenulate becoming serrato-dentate distad, the serrations all recurved and smaller than those on the dorsal margin, distal extremity of the valves rounded in outline, surface of distal half of valves scabroso-dentate, the denticles in general arranged as in the other species of the genus, but the series are less regularly defined; subgenital plate trigonal, bicarinate mesad. Median femora about three-fourths the length of the body. Caudal femora about a third again as long as the tegmina.

Measurements (in millimeters)

	Length of body (exclusive of ovipositor)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Jimuleo, Coahuila, Mexico. <i>Type</i>	12.8	3.3	2.3	24.8	2.8
♀ Jimuleo, Coahuila, Mexico. <i>Allotype</i> ..	16.8	3.9	2.5	20	2.2
	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Jimulco, Coahuila, Mexico. <i>Type</i>	8	9	12.7	27.2	
♀ Jimuleo, Coahuila, Mexico. <i>Allotype</i> ..	6.9	10	13	27.2	4.2

*Color Notes.*⁷⁵—General color baryta yellow becoming opaline green to chrysoprase green on the tegmina and wings, the dorsum of the pronotum dull veronese green. Head inclining toward martius yellow; eyes cinnamon brown to prout's brown. Pronotum with the dorsum (as well as much of the occiput) weakly, sparsely and irregularly sprinkled with purplish; caudal margin of the lateral lobes broadly, and of the disk narrowly, margined with creamy white, the only trace of the usual accompanying purplish being on the caudal margin of the disk. Tegmina with the vicinity of the rami of the anterior ulnar and discoidal veins touched with whitish, forming a pattern resembling that found in certain species of the genus *Insara*; sutural margin in the male lined with garnet brown; stridulating field with the vicinity of the free margin yellowish, the vicinity of the anal vein auburn. Wings more (♀) or less (♂) honey yellow proximad. Abdomen of male very thickly sprinkled with burnt lake punctations on the dorsal segments, paired arcuate pale yellowish lines present laterad on the same; cerci of male buff yellow, black at apex. Limbs of the general color, the median and cephalic femora more or less purplish for the greater part of their length; caudal femora punctulate or washed with purplish dorsad, vicinity of the ventral sulcus of the proximal

⁷⁵ The female has discolored considerably in drying, so the following notes are based primarily on the male.

portion of the caudal femora more or less creamy white. Ovipositor becoming blackish brown distal.

Distribution.—The present species is only known from a single locality in southwestern Coahuila, Mexico. Nothing is known regarding the habits of the species.

Remarks.—The position held by *insaroides* is peculiar, sharing as it does quite a few characters with two very different groups of the genus, to one (Group B) of which, however, it is closely enough related to be included. In general it may be said to show greatest affinity to *A. semialata*, but it does not have the sexual dimorphism in wing length found in that species, the apex of the stridulating vein of the male is less produced and the ovipositor deeper.

Specimens Examined: Jimulco, Coahuila, Mexico, November, (Lawrence Bruner), 1 ♂, 1 ♀. *Type and allotype*. [Hebard Collection ex Bruner.]

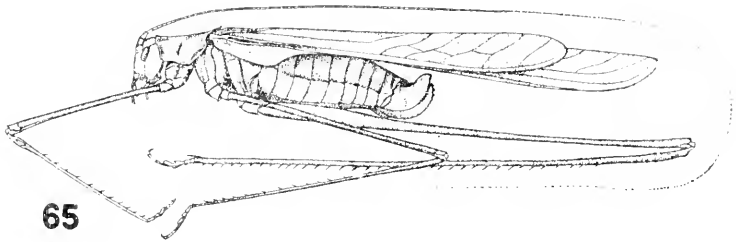
Arethaea phalangium (Scudder) (Figs. 43, 53 and 65.)

1877. *Aegipan phalangium* Scudder, Proc. Bost. Soc. Nat. Hist., XIX, p. 40. [Georgia.]
1878. *A[rethaea] multiramosa* Brunner, Monogr. Phaneropt., p. 235. [Georgia.]
1900. [*Arethaea*] *phalangium* Scudder, Proc. Daveup. Acad. Sci., VIII, p. 67. [Georgia.]
1905. *Arethaea phalangium* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1904, p. 795. [Thomasville, Georgia.]
1906. *A[rethaea] phalangium* Kirby, Synon. Catal. Orthopt., II, p. 443. [Georgia.]
1907. *Arethaea phalangium* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1907, p. 300. [Gainesville, Florida.]

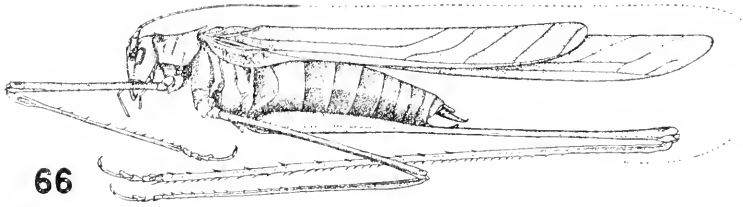
This striking species, which is one of the largest in the genus, has no close relationship to any other form of the genus but *A. grallator*, to which it is closely related, differing chiefly in the larger general size, very slightly longer tegmina and wings, the shorter stridulating field of the tegmina of the male, which is shorter than the pronotum, in the tegmina being somewhat broader at the distal fourth than at the proximal third, in the distal extremity of the male subgenital plate being broader and less arcuato-emarginate with the styliform processes more distant, and in the simpler coloration.

Type.—♀; Georgia.⁷⁶ (H. K. Morrison.) [Scudder Collection.]

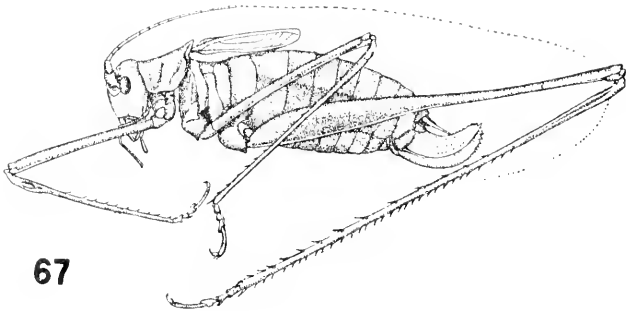
⁷⁶ Scudder originally measured both sexes and gave male characters as well as those of the female, but we are able to find only one typical female in the series.



65



66



67

Fig. 65. Lateral view of female of *Arthaea phalangium*, Thomasville, Ga. ($\times 2$) Fig. 66. Lateral view of type of *A. semialata*. ($\times 2$) Fig. 67. Lateral view of type of *A. carita*. ($\times 2$)

Description of Female.—Gainesville, Alachua County, Florida, August 16, 1905, (Rehn & Hebard), [Hebard Collection]. Size large; form elongate and compressed. Head with the greatest width immediately ventrad of the eyes contained one and one-half times in the greatest depth; occiput considerably and regularly declivent; fastigium acute trigonal, low, elongate fossulato-sulcate mesad, apex subdepressed, well separated from the low, broad, slightly acute frontal fastigium; eyes prominent, slightly compressed, very elongate elliptical, the greatest width contained twice in the depth, the latter slightly greater than that of the infra-ocular portion of the genae; antennae several times as long as the body.⁷⁷ Pronotum moderately sellate, nearly straight dorsad when seen from the side, but slightly elevated cephalad and caudad, as a whole considerably compressed, the disk narrow, moderately compressed mesad with the greatest caudal width of same contained twice in the length; cephalic margin of disk sinuato-truncate, caudal margin of disk moderately produced, very slightly acute-angulate; lateral portions of disk with traces of angles cephalad and indications of shoulders caudad; surface of disk slightly caudad of middle with a broad V shaped impressed figure; lateral lobes with the greatest depth contained one and one-half times in the greatest dorsal length, cephalic margin sinuato-truncate, ventro-cephalic angle rotundato-rectangulate, ventral margin sinuato-truncate, ventro-caudal angle roundly obtuse-angulate, caudal margin obliquely truncate, humeral sinus very broad, shallow, arcuate, the surface of the lobes appreciably impressed immediately cephalad of the same. Tegmina a third again as long as the body (exclusive of ovipositor), the width at distal fourth contained about eight times in the length of the same, the width at the proximal third being slightly but appreciably less than at distal fourth; marginal field considerably expanded on proximal fourth of tegmen, subarcuate, more sharply rounded distad than proximal; distal extremity narrowly rounded; discoidal vein with five to six rami, the proximal of which is in the usual position of the median vein and with which it appears to be analogous. Wings projecting distad of the tegmina a distance equal to about a third the length of the latter, subacute, the costal margin broadly arcuate distad. Abdomen subcompressed proximad; disto-dorsal segment truncate distad, slightly arcuato-emarginate at the base of the cerci; supra-anal plate semi-elliptical in form, with a medio-longitudinal sulcus which is also indicated on the distal portion of the adjacent segment; cerci terete, acute; ovipositor subequal in length to that of the dorsum of the abdomen, deep, the greatest depth nearly two-thirds the greatest length, decidedly bent-arcuate proximad, margin of the dorsal valves serrulate on distal half, margin of ventral valves finely crenulate for almost its whole length, becoming serrato-dentate distad, surface of the dorsal valves distad with approximately seven rows of low tooth-like ridges, the ventral row with more numerous teeth than the others, surface of the ventral valves with a number of similar tooth-like ridges placed transversely on the distal section, these regularly spaced only along the

⁷⁷ Not complete in the present specimen.

junction of the two valves; subgenital plate acute-trigonal, elevated and bicarinate mesad. Limbs very slender and elongate; cephalic and median femora with the dorsal margin of the distal extremity compressed and produced into a triangular point or spiniform process, all genicular lobes of the same limbs bispinose. Cephalic femora over two and a half times as long as the disk of the pronotum; cephalic tibiae with an elliptical tympanum. Median femora about half again as long as the cephalic femora. Caudal femora nearly twice the length of the median femora, little inflated proximad, genicular lobes unispinose; caudal tibiae surpassing the femora by about the pronotal length.

Description of Male: Thomasville, Thomas County, Georgia, June 29, 1903, (Collected for Hebard), [Hebard Collection]. The following characters are those of difference from the female sex. Head and pronotum as in the female but with a very weak and fine medio-longitudinal ridge on the dorsum of the pronotum. Tegmina with the form as a whole as in the female, but in length half again as long as the body and with the discoidal vein bearing five rami on each tegmen; stridulating field appreciably shorter than the dorsum of the pronotum, its greatest width about two-thirds its greatest length, stridulating vein heavy, oblique, subarcuate, margin of field but little produced at the apex of the stridulating vein, there rotundato-rectangulate, sinuate distad of the same, speculum crudely quadrate. Wings projecting distad of the tegmen slightly more than a third the length of the latter. Disto-dorsal abdominal segment having the distal margin subarcuate with a faint median truncate section; supra-anal plate slightly transverse, subrectangulate in general form but with the margins and angles rounded; cerci tapering, with the distal fourth rather sharply bent inwards, subdepressed in the same section, apex acute; subgenital plate elongate, narrowing distad, ventral surface with five carinae distad, one mesad (this extending greatly proximad) and two closely placed pairs laterad, distal extremity with brief substyliform processes, between which the margin is arcuato-truncate. Limbs as in the female.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Georgia. (Ex Scudder).....	15.5			29	
♂ Georgia. (Ex Brunner- <i>multiramosa</i>) ..	20	5		32	
♂ Augusta, Georgia. (Hebard Collection)	22.6	5.1	2.8	30	3.1
♂ Thomasville, Georgia. (Hebard Collection)	18.3	5	2.8	28	3.4
♂ Sanford, Florida. (Scudder Collection)	18	4.8	2.8	28.2	3.1
♂ Homestead, Florida.....	20.5	5.3	2.8	31.3	3.4
♀ Georgia. <i>Type</i>	18.5	5	2.9	30.5	3.9
♀ Florida. (Hebard Collection).....	24.3	5.8	2.9	33	3.8

Measurements (in millimeters)—Continued

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♀ Gainesville, Florida. (Hebard Collection)	24.5	5.4	2.9	32.5	3.9
♀ Sanford, Florida. (Scudder Collection)	19.2	5.7	3	34	3.8
♀ Biscayne Bay, Florida. (Scudder Collection)	20	5.3	3	32	3
♀ Homestead, Florida	24.8	5.8	3.2	32	3.7
♀ Homestead, Florida	24	5.8	2.9	32.3	3.5
	Length of expanded portion of wing	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Georgia. (Ex Scudder)				36	
♂ Georgia. (Ex Brunner- <i>multiramosa</i>)					
♂ Augusta, Georgia. (Hebard Collection)	8.5	12.3	17.3	33.6	
♂ Thomasville, Georgia. (Hebard Collection)	9.3	11.8	17.7	34.5	
♂ Sanford, Florida. (Scudder Collection)	9.4	12	17.4	32	
♂ Homestead, Florida	9.4	13	19.6	37.6	
♀ Georgia. <i>Type</i>	9.	13	18.8	35.8	5.8
♀ Florida. (Hebard Collection)	10.3	14.5	20.8	39.4	5.1
♀ Gainesville, Florida. (Hebard Collection)	8.6	14.5	20.8	39	5.3
♀ Sanford, Florida. (Scudder Collection)	10	14.2	20.2	38.2	5.4
♀ Biscayne Bay, Florida. (Scudder Collection)	9.5	14.7	21.2	40	5.1
♀ Homestead, Florida	8.5	15.4	20.8	38	5
♀ Homestead, Florida	9	15.5	21.3	37	5

From the foregoing measurements it is evident that in this species there is but a comparatively small amount of variation and that purely individual.

Color Notes.—General color varying from course green to light hellebore green, paling to amber yellow and light chalcedony yellow on the head, lateral lobes (and sometimes much of the dorsum) of pronotum, pleura and part of the base of the abdomen; the venter

of the abdomen generally approaching wax yellow, but occasionally more greenish and then near apple green. Head with a narrow postocular line of pansy purple lined ventrad with creamy, rarely the creamy alone present; fastigium washed more or less with pansy purple; eyes ranging from oil yellow to vinaceous-russet; antennae with the two proximal joints of the general color, remainder ranging from martius yellow to buff yellow, occasionally washed ventroproximad with very dilute pansy purple. Pronotum with the caudal margin of the lobes and disk edged (the former broadly and the latter narrowly) with pansy purple and creamy, the latter external; a continuation of the postocular stripe of the head more or less distinctly indicated in the usual position on the cephalic fourth of the pronotum. Tegmina with the greater portion of the stridulating field of the male mustard yellow, the extreme proximal portion of the same field of the general color and that along the anal vein infusate, the latter vein lined with very dull pansy purple; in the female the anal field is occasionally mustard yellow as well as considerable of the proximal portion of the tegmina, other individuals of the same sex having the anal field of the base color, while all of the females have a touch of dull pansy purple at the base of the anal vein. Abdomen with a more or less distinct fine arcuate lateral line of dull pansy purple and creamy, extending distad to the base of the cerci in both sexes, the dorsum of the abdomen between the same blotched with hoary in one specimen, the same region in most of the individuals largely punctulate or finely marmorate with pansy purple. Ovipositor of the general color, darkest distad. Limbs with the femora more or less decidedly washed on the distal three-fourths or so with pansy purple, this broken up and clouded more or less decidedly with hoary white, the distal extremity of the femora and all of the tibiae of the general color. Occasionally the caudal femora are of the general color proximad.

Distribution.—The present species has a range quite isolated from the remainder of the genus, being found only from southwestern and east central Georgia (Thomasville and Augusta) south to the extreme southern point of the mainland of Florida (Homestead). It is not known from west of Thomasville, although it may occur there as well as north of the same point, but not for a great distance in the latter direction the fall line probably marking the limit of its northward distribution in Georgia. It does not, as far as known, occur on the Florida Keys, but does reach the extreme point

of the pine belt along the east coast. The isolation of this Austro-riparian species from its congeners of this otherwise Sonoran genus is similar to that of the Florida Jay (*Aphelocoma cyanax*) and less typically to that of the Florida Burrowing Owl (*Speotyto cunicularia floridana*), the latter, however, having West Indian relatives which may have been the parent stock of the peninsular form.

Biological Notes.—All known concerning the habitat of this species is that it usually occurs in or near pine woods, in the undergrowth of which it was taken at Gainesville. The three specimens from Homestead were found dead in spider webs on the railroad station, to which spot they had been attracted by lights, the locality being surrounded by pine woods. The specimen from Augusta, however, was found among grasses in a sandy scrub oak area just above the fall line.

From the material before us it is seen to occur adult as early in the year as June 29 (Thomasville), August 16 being our latest date. A female in the instar preceding maturity was taken by Davis on April 23 (Fort Myers).

Morphological Notes.—The number of rami of the discoidal vein varies in the present species from four to six, two males having 4-4, one male and three females having 4-5, one male having 5-5, one female having 4-6, one female having 5-6 and one male having 6-6. The number of these rami has no geographic significance. There is some little variation in the acuteness of the angle of the caudal margin of the pronotal disk in both sexes, also in the exact form of the speculum of the male, the Thomasville one having, as well, a more marked sinuation of the sutural margin of the stridulating field than in the others of that sex. The Sanford and Homestead males have the expanded marginal field of the tegmina larger and more elongate than in the Thomasville male, in the two former this being more than and in the latter less than a fifth of the tegminal length, while in the females from Homestead the length of the expanded marginal field is contained slightly more than four times in the tegminal length and in the Sanford and Gainesville females slightly less than four times in the same.

In the Thomasville male the cerci are slightly more robust than in the others of that sex. The medio-longitudinal thread on the pronotal disk described in the male varies in definition in the series, being absent in some specimens and completely or partially indicated in others regardless of sex.

Synonymy.—It is perfectly evident that Brunner's *Arethaea multiramosa* is an absolute synonym of Scudder's *Aegipan phalangium* of a year earlier date. The two were described from the same state, where but a single species of the group occurs, and the descriptions are not separable.

Remarks.—The present form is very close to the Texan *A. grallator*, from which it can be separated by the characters given above as diagnostic; in addition *phalangium* generally has the ulnar vein reaching the sutural margin of the tegmina nearer the apex than in *grallator* and the pronotum more compressed than in the latter species. One of the characters used by Brunner, i.e., number of rami to the discoidal vein is of no value as a diagnostic feature, the series before us showing a variation from four to six, moreover the extremes have been found in a single individual.

Specimens Examined: 13; 4 ♂, 8 ♀, 1 ♂ nymph.

Georgia, (H. K. Morrison), 1 ♀. *Type*, [Scudder Collection].

Augusta, Ga., July 29, 1913, (R. & H.), 1 ♂, [Hebard Collection].

Thomasville, Ga., June 29, 1903, 1 ♂, [Hebard Collection].

Hastings, St. John County, Florida, 1 ♀, [Morse Collection].

Gainesville, Fla., August 16, 1905, (R. & H.), 1 ♀, [Hebard Collection].

Sanford, Florida, (S. B. Frazer), 1 ♂, 1 ♀, [Scudder Collection].

Fort Myers, Florida, April 23, 1912, (W. T. Davis), 1 ♀ nymph, [W. T. Davis Collection].

Biscayne Bay, Florida, 1 ♀, [Scudder Collection].

Homestead, Dade County, Florida, July 10-12, 1912, (R. & H.), 1 ♂, 2 ♀.

Florida, 1 ♀, [Hebard Collection ex Bruner].

***Arethaea grallator* (Scudder) (Figs. 44, 54 and 64.)**

1877. *Aegipan grallator* Scudder, Proc. Bost. Soc. Nat. Hist., XIX, p. 39. [(Dallas), Texas; Texas.]

1878. *Arethaea gracilipes* Brunner (not *Ephippitytha gracilipes* Thomas, 1870), Monogr. Phaneropt, p. 235. [Dallas, Texas.⁷⁸]

1900. *Arethaea gracilipes* Scudder (not of Thomas, 1870) Proc. Davenport Acad. Sci., VIII, p. 67. (Part.) [Texas.]

1903. *Arethaea phalangium* Caudell (not of Scudder, 1877), Proc. U. S. Nat. Mus., XXVI, p. 804. [Vicinity of Victoria, Texas.]

1906. *A[rethaea] gracilipes* Kirby (not of Thomas, 1870), Synon. Catal. Orth., II, p. 443. (Part.) [Texas.]

1907. *Arethaea gracilipes* Rehn (not of Thomas, 1870), Proc. Acad. Nat. Sci. Phila., 1907, p. 62. (Key.)

This species is closely related to but one of the other forms of the genus, the preceding *A. phalangium*. The characters separating the two are given in the diagnosis under *phalangium*.

⁷⁸ The record from Arizona quoted by Brunner from Thomas refers to true *gracilipes*.

Types.—Texas, "May to August," (G. W. Belfrage), two females; Dallas, Texas, "June 13 to 26," (J. Boll), five males, three females. Labeled "Scudder's Type 1876." [All in Scudder Collection.]

Single Type here chosen.—♂; Dallas, Texas. (J. Boll.) [Scudder Collection.]

Description of Type.—The characters are almost entirely those of difference from the same sex of *A. phalangium*. Size moderately large. Fastigium low, compressed, acute lanceolate, narrower than in *phalangium*, longitudinally excavate; eyes slightly less prominent than in *phalangium*, proportions of eyes similar. Pronotum slightly less compressed, the dorsum proportionately broader, when seen from the side the dorsal outline is hardly elevated cephalad; cephalic margin of disk subtruncate, caudal margin of disk rotundato-rectangulate; lateral portions of disk with distinct carinate ridges on the prozona, these directed in a sinuate fashion dorso-caudad and moderately converging caudad, stopping abruptly at the transverse sulcus, the latter forming a broad V-shaped pattern on the disk, lateral portions of the disk on the metazona rounding into the lateral lobes cephalad and with very blunt rounded angles caudad, median portion of disk with a very fine medio-longitudinal slightly raised line; lateral lobes with the greatest depth contained one and one-half times in the dorsal length of the same, margins as in *phalangium* except that the caudal margin is more vertical and less oblique, when viewed from the dorsum the ventral portion of the lobes are seen to diverge more laterad than in *phalangium*. Tegmina about a half again as long as the body, the width at distal fourth contained slightly more than eight times in the length of the same, the width at the proximal third being hardly greater than at the distal fourth; marginal field and apex of tegmina as in *phalangium*; discoidal vein with three to four rami; stridulating field subequal to the pronotum in length, its greatest width about two-thirds its greatest length, stridulating vein not at all heavy, straight, strongly oblique, margin of field hardly produced at the apex of the stridulating vein, there moderately arcuate, immediately distad of the same sinuato-arcuate, thence obliquely arcuato-truncate. Wings with the exposed portion almost equal to half the tegmina length. Supra-anal plate more semi-elliptical than in *phalangium*; cerci with the distal fourth bent inwards at a right angle, the tips more acute than in *phalangium* but otherwise similar; subgenital plate carinate as in *phalangium*, the distal extremity slightly narrower, distal margin arcuato-emarginate, the styliiform processes shorter and blunter. Limbs essentially as in *phalangium*, the character and proportions similar.

Allotype here selected.—♀; Same data as the selected type.

Description of Allotype.—The following characters are those of difference from the male sex of the present species and the corresponding sex of *phalangium*. Tegmina in proportions and form as in the male; discoidal vein with four rami on each side. Wings with the exposed portion equal to

about two-fifths the tegminal length. Ovipositor slightly shorter and deeper than in *phalangium*, the apical extremity rather more blunted, marginal and discal teeth as in *phalangium*.

Paratypic Series.—The remainder of the original series in addition to the selected type and allotype, four males and four females listed above, is paratypic.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Dallas, Texas. <i>Type</i>	15.9	4	2.4	22.7	2.8
♂ Dallas, Texas. <i>Paratype</i>	19	5	3	26.5	3
♂ Dallas, Texas. <i>Paratype</i>	16.3	4.8	2.5	23.3	3
♂ Dallas, Texas. <i>Paratype</i>	17	4.8	2.8	23.5	2.8
♂ "Texas." <i>Paratype</i>		4.3	2.5	23	2.6
♂ Shovel Mount, Texas. (A.N.S.P.)....	14	4	2.6	21.8	2.3
♂ Victoria, Texas.....	15	4.1	2.4	20.7	2.7
♂ Victoria, Texas.....	16	4.2	2.5	22.5	3.3
♂ Victoria, Texas.....	17.2	4.3	2.4	24	2.9
♂ Victoria, Texas.....	19.5	4.6	2.6	24	3
♂ Victoria, Texas.....	19.5	5	2.8	26.2	3
♀ Dallas, Texas. <i>Allotype</i>	16.2	4.5	2.7	25.2	2.9
♀ Dallas, Texas. <i>Paratype</i>		5	2.7	27.6	3.2
♀ Dallas, Texas. <i>Paratype</i>		4.3	2.5	23	2.6
♀ Victoria, Texas.....	18	4.8	2.8	24.5	3
♀ Victoria, Texas.....	18.3	4.7	2.7	24.3	2.7
♀ Victoria, Texas.....	19.4	4.6	2.5	26.8	2.9
♀ Victoria, Texas.....	19	5	2.6	28	3
♀ Victoria, Texas.....	22	5.3	2.7	29	3.2

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Dallas, Texas. <i>Type</i>	10.7	10	15	31.3	
♂ Dallas, Texas. <i>Paratype</i>		11		34.5	
♂ Dallas, Texas. <i>Paratype</i>		10.5	17	32.5	
♂ Dallas, Texas. <i>Paratype</i>		10.3	15.3	32.3	
♂ "Texas." <i>Paratype</i>		10	15.7		
♂ Shovel Mount, Texas. (A.N.S.P.)....	8.8	9.5	13.9	27.3	

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Victoria, Texas	9.5	9.3	13.7	28.5	
♂ Victoria, Texas	10.2	10.3	15.7	31.4	
♂ Victoria, Texas	9.6	11.4	16.8	31.7	
♂ Victoria, Texas	11.6	11.5	17.5	35.7	
♂ Victoria, Texas	12	11.9	18.5	37	
♀ Dallas, Texas. <i>Allotype</i>	10.5	10.5	15.5	32.4	4.3
♀ Dallas, Texas. <i>Paratype</i>		12.2	19		5
♀ Dallas, Texas. <i>Paratype</i>		10	15.7		
♀ Victoria, Texas	10	10.3	16.5	34.3	4
♀ Victoria, Texas	8.7	11	17.3	34.5	4
♀ Victoria, Texas	9.8	11.1	17.2	35	4
♀ Victoria, Texas	11.8	12	18.5	37	4.2
♀ Victoria, Texas	10.7	13	20.2	39.5	4

From the above table of measurements it is evident that the species varies greatly in size, this being purely individual in character. The Victoria series alone includes four minimum and seven maximum measurements in the male sex and two minimum and nine maximum measurements in the female sex. The single Shovel Mount male is quite small, having four of the minimum measurements, but this individual is almost exactly matched by a Victoria male and the two Rosenberg males are hardly larger.

Color Notes.—General color varying from chamois and deep colonial buff to apple green, the average condition rather strongly wax yellow on the pleural region, the dorsum of the pronotum generally washed with amber to wax yellow and the tegmina in greater part biscay green to bice green. Pattern of creamy, hoary or even silvery white and pansy purple to burnt lake essentially as in *phalangium*, the latter element of the pattern frequently suffusing some of the surface adjacent to it, particularly on the dorsum of the prozona. Head with the eyes sorghum brown to chocolate; antennae more greenish than in *phalangium*. Pronotum with the continuation of the postocular bar always decided, occasionally almost no trace of the darker element being evident; fine pale medio-longitudinal pronotal line almost always subobsolete. Teg-

mina with only the immediate proximal section of the general color, the remainder of the tone described above; distal portion of the stridulating field of the male more primuline yellow to old gold, the proximal section of the field almost always contrastingly colored with green, ranging from light yellow green to cedar green, rarely uniform with the adjacent pronotal disk; the vicinity of the anal vein in the male decidedly infuscate with madder brown to hessian brown, vicinity of the anal vein in the female similarly but less decidedly infuscate. Abdomen with the dark element of the pattern occasionally blackish brown; dorsum of the abdomen between the lines of the pattern occasionally punctulate as in *phalangium*. Limbs as in *phalangium*.

Distribution.—The present species has a rather limited range, all within the state of Texas and almost entirely in the east central part of the state. It ranges from as far north as Dallas, south at least to Victoria, east to Rosenberg, and west as far as Shovel Mount, Burnet County. Vertically it ranges from near sea-level at Victoria and Rosenberg to the vicinity of a thousand feet elevation on the edge of the Edwards plateau at Shovel Mount.

Biological Notes.—According to Scudder the present species is frequently attracted to lights, while Caudell took it flying in open prairie, where it usually made short flights, as a rule never more than fifty to one hundred yards. Our experience with the species has been much the same as that of the latter author, as we found it at Victoria and Rosenberg more or less common in fields which were thickly overgrown with grasses, low plants and even knee-high weeds, occasionally with patches of taller plants such as coffee bean (*Sesban macrocarpa*) and huisache (*Vachellia farnesiana*) bushes as high as twelve to fifteen feet. Here the insects were very easy to secure, as they would climb up for about two feet in the higher weeds and, when approached, would flutter up and with tegmina and wings set and legs extended permit the wind to carry them. They rarely drifted more than a few feet, were easily picked up and appeared incapable of quick motion.

Adults, according to Scudder, were taken by Belfrage as early as May (exact date unknown), while the earliest date on the material before us is June 21. The latest date known is August (ex Scudder), the latest on our material is July 26 (Victoria). On the latter date the species was unquestionably at its prime, as it was ex-

tremely numerous and the material was in excellent condition, so it is quite probable that it lasts considerably past the end of July.

We have seen no nymphs of the species and, in consequence, cannot give any data regarding that condition.

Morphological Notes.—There is some little variation in the character of the angle of the caudal margin of the pronotal disk, this in numerous specimens being more distinctly rectangulate and not quite so rounded as in the type specimen; in many the immediate angle is produced as a more or less evident point. The number of rami to the discoidal vein varies from three to five, four being the average number. The series shows the following combinations in the number of discoidal rami: 3-3, 2 ♂♂, 1 ♀; 3-4, 8 ♂♂, 2 ♀♀; 4-4, 16 ♂♂, 9 ♀♀; 4-5, 2 ♂♂, 6 ♀♀; 5-5, 2 ♂♂, 3 ♀♀. It will be seen from this that the lower combinations predominate in the male and the higher ones in the female sex, but how much importance should be attached to this apparent correlation is doubtful, as the material is not equally divided between the sexes. It is evident, however, that in eighteen of the specimens examined the number of rami on the two tegmina do not agree. The form of the margin of the stridulating field in the male shows no appreciable variation. The apex of the subgenital plate of the male shows some variation in width and also in the depth and rotundity of the emargination, but the general form departs very little from that described and figured.

Synonymy.—It is very evident from an examination of Brunner's description of *gracilipes* as understood by him, that it refers to the present species and not to the form to which Thomas originally gave that name. The key characters alone—the form of the apex of the stridulating vein of the male tegmina and the produced dorso-genicular extremities of the cephalic and median femora—show immediately that he had a member of the *phalangium-grallator* group, while his measurements, color details and locality remove the former, which he there described as *multiramosa*, from consideration. •Caudell's reference of Victoria, Texas specimens to *phalangium* is erroneous, an examination of the material showing that it belongs under the present species.

Remarks.—The present form is a western complement of *phalangium*, differing chiefly in characters which are not striking but constant. In size there is a considerable amount of individual varia-

tion, but the average is smaller than in *phalangium*. In distribution the present form occurs in a region occupied by none of the other forms of the genus except the widely distributed *gracilipes*, being found entirely northeast of the range of *phantasma* and east of that of the other forms of the genus found in the United States except *phalangium*.

Specimens Examined: 53; 29 ♂, 24 ♀.

Dallas, Texas, (J. Boll), 5 ♂, 3 ♀. *Type, allotype, paratypes*. [Seudder Collection]; 1 ♀, [U.S.N.M.].

Shovel Mount, Burnet County, Texas, June 30, 1901, (F. G. Schaupp), 1 ♂, [A.N.S.P.].

Columbus, Colorado County, Texas, 1 ♀, [U.S.N.M.].

Rosenberg, Fort Bend County, Texas, July 25 and 26, 1912, (H.), 2 ♂.

Lavaca County, Texas, June 21, 1 ♂, 2 ♀, [U.S.N.M.].

Victoria, Victoria County, Texas, July 26 and 27, 1912, (H.), 17 ♂, 15 ♀; June, (Caudell), 1 ♂, 1 ♀, [U.S.N.M.].

Texas, (Linsecum), 1 ♂, 1 ♀, [Seudder Collection]; 1 ♂, [U.S.N.M.].

Arethaea semialata new species (Figs. 34, 45, 55 and 66.)

1902. *Arethaea constricta* Seudder and Cockerell (not of Brunner), Proc. Davenp. Acad. Sci., IX, p. 52. (Part.) [Near Organ Mountains, Mesilla Valley, New Mexico.]

This form needs comparison only with the members of species-group C, i.e. *carita*, *brevicauda* and *limifera*, toward which it diverges from the other members of its own species-group B. From all three species of Group C the male sex can immediately be separated by the less decidedly sellate pronotum and the narrower stridulating field of the tegmina, which has the portion at the apex of the stridulating vein far less produced and the general form of the speculum more longitudinal. In the female sex the tegmina, instead of being lanceolate and abbreviate or ovate and sublobate, are at least half as long as the body, the integument of the body is smooth instead of strumose at the longitudinal bars and the margins of the dorsal abdominal segments are entire instead of distinctly crenulate. From the other members of Group B (i.e. *insaroides*, *phalangium* and *grallator*) the present form can be distinguished by the greater production of the apex of the stridulating vein of the male tegmina, the narrower ovipositor and moderately brachypterous female. The male bears considerable superficial resemblance to the same sex of *gracilipes*, but the two can be read-

ily distinguished by the more elongate stridulating field of the tegmina of *semialata*.

Type.—♂; Moss Well, Chisos Mountains, Brewster County, Texas. Elevation 4500 to 5000 feet. September 5 to 8, 1912. (Rehn and Hebard.) [Hebard Collection.]

Description of Type.—Size moderately large; form compressed. Occiput very considerably declivent; fastigium acute trigonal, the margins moderately elevated, sulcate, apex acute and subdepressed, very narrowly in contact with the frontal fastigium; eyes quite prominent, elliptical, the greatest width contained about one and one-half times in the depth, the latter subequal to that of the infra-ocular portion of the genae; antennae incomplete (surpassing the tips of the wings in several specimens). Pronotum moderately sellate, faintly bullate across the lateral lobes when seen from the dorsum, the dorsal line when seen from the side weakly elevated cephalad and caudad; disk of the pronotum weakly constricted mesad, the greatest caudal width of the same two-thirds the length; cephalic margin of the disk very weakly arcuato-emarginate, caudal margin of disk roundly obtuse-angulate, transverse sulcus forming a broad V-shaped figure on the disk; lateral lobes of the pronotum with their greatest depth about two-thirds their greatest dorsal length, cephalic margin slightly oblique, sinuate, ventro-cephalic angle blunt obtuse, ventral margin sinuato-truncate, ventro-caudal angle roundly obtuse, caudal margin oblique truncate, humeral sinus moderately deep, roundly obtuse-emarginate. Tegmina elongate, failing to reach the genicular extremity of the caudal femora by about the pronotal length, the width at the distal fourth contained about eight times in the length of the tegmina and slightly greater than the width at the proximal third; lobate marginal field equalling one-fourth the entire tegminal length, broad, costal margin there strongly arcuate; apex of tegmina rather narrowly rounded; stridulating field slightly longer than the disk of the pronotum, the greatest width of the field (to tip of stridulating vein) about two-thirds the length of the field, free margin arcuate proximad of the apex of the stridulating vein, the latter well produced but rounded, distad of this vein the margin is rather deeply sinuato-emarginate and again much less distinctly so at the apex of the field, stridulating vein greatly oblique proximad and very slightly oblique distad, anal vein nearly straight in the proximal three-fifths and arcuate distad, speculum elongate subrectangulate; discoidal vein with four rami; anterior ulnar vein reaching the sutural margin very slightly distad of the middle. Exposed portion of the wings over twice the length of the pronotal disk. Abdomen with the surface of the segments non-strumose at the lateral pale lines, nor with the margins there produced, the margins of the dorsal segments not distinctly crenulate, no process present on the proximo-dorsal segment; disto-dorsal segment with the margin truncate; supra-anal plate ovoid, the width distad of the base greater than at the base, the greatest width subequal to the greatest length, apical margin roundly obtuse-

angulate, the surface of the plate impressed, non-sulcate; cerci of the type usual in the genus, the main portion tapering with a low sublamellate ridge on the internal face, distal fourth bent nearly at a right angle, subdepressed, acuminate; subgenital plate moderately elongate, narrowing distad, distal margin deeply truncate-excised between rather long styliform lateral appendages. Femora non-produced distad; genicular lobes of cephalic and median femora bispinose, of caudal femora unispinose. Cephalic femora about two and a half times as long as the pronotal disk; cephalic tibiae with the tympanum elliptical. Median femora slightly longer than half the tegminal length. Caudal femora twice as long as the median femora, very slender, though appreciably inflated proximad; caudal tibiae surpassing the femora by nearly twice the pronotal length.

Allotype.—♀; Data same as for the type.

Description of Allotype.—The characters here given are those of difference from the description of the male. Form (for the genus) subrobust. Fastigium with the margins less elevated than in the male sex, weakly sulcate; eyes slightly shorter than the infra-ocular portion of the genae. Lateral lobes of the pronotum with the greatest depth equal to three-fourths the greatest dorsal length of the same, caudal margin of the lobes slightly more vertical than in the male, humeral sinus shallow, arcuato-emarginate. Tegmina short, slightly shorter than the median femora, narrow, the distal two-thirds subequal in width, the width at the distal fourth contained nearly seven times in the tegminal length; lobate marginal field decidedly arcuate, in length about one-third that of the entire tegmina; apex well rounded. Wings very slightly surpassing the tips of the tegmina. Disto-dorsal abdominal segment sinuato-emarginate at the base of the cerci; supra-anal plate half-elliptical, with a shallow medio-longitudinal sulcus proximad, which is also indicated on the adjacent portion of the disto-dorsal segment; ovipositor half the length of the cephalic femora, not as deep as in most of the species of the genus, the greatest depth half the length, arcuate, dorsal margin serrato-dentate on distal half, ventral margin with recurved serrato-dentations on distal half, these becoming crenulations mesad, surface with the lamellations arranged in sublinear series, longitudinal on the dorsal valves, transverse on the ventral valves, as usual in other species of the genus; subgenital plate short, transverse, subtrigonal, the apex blunt, subsinuate. Median femora slightly longer than the tegmina. Caudal tibiae exceeding the femora by slightly more than the length of the pronotal disk.

Paratypic Series.—We have selected as paratypes four adult males from the type locality and one adult male and two adult females from the Canyon behind Pulliam Bluff, Chisos Mountains, Texas, a point very close to the type locality.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Near Organ Mountains, New Mexico. (Scudder Collection).....	15.7	3.7	2.3	24	2.9
♂ Franklin Mountains, Texas.....	14.1	3.5	2.3	22.5	2.4
♂ Maguire's Ranch, Davis Mountains, Texas.....	17.7	3.5	2.4	23.2	2.3
♂ Livermore Peak, Davis Mountains, Texas.....	14.3	3.9	2.1	25.6	2.7
♂ Garden Spring, Texas.....	20	3.6	2.2	26.5	3
♂ Moss Well, Chisos Mountains, Texas. <i>Type</i>	18.9	3.9	2.5	25.4	3.1
♂ Moss Well, Chisos Mountains, Texas. <i>Paratype</i>	17.5	4	2.5	27.5	3.2
♂ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	17.2	3.6	2.5	26.6	3.1
♀ Franklin Mountains, Texas.....	18.7	4.2	2.5	13.8	1.7
♀ Maguire's Ranch, Davis Mountains, Texas.....	17	4.2	2.4	12.2	1.6
♀ Moss Well, Chisos Mountains, Texas. <i>Allotype</i>	18.2	4.3	2.6	13	1.9
♀ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	21.5	4.4	2.7	13.8	1.7

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Near Organ Mountains, New Mexico. (Scudder Collection).....	8	9.6	13.3	27.3	
♂ Franklin Mountains, Texas.....	6.7	8.3	11.8	24	
♂ Maguire's Ranch, Davis Mountains, Texas.....	7.5	10.7	14	27.1	
♂ Livermore Peak, Davis Mountains, Texas.....	6.9	10.4	14.3	26.6	
♂ Garden Spring, Texas.....	8.2	10.4	15.6	31	
♂ Moss Well, Chisos Mountains, Texas. <i>Type</i>	8.9	9.9	14.3	28.8	

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Moss Well, Chisos Mountains, Texas. <i>Paratype</i>	7.2	10.5	15.5	31.2	
♂ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	8.3	10.5	14.5	30	
♀ Franklin Mountains, Texas.....	3.3	9.3	12.5	24.4	5
♀ Maguire's Ranch, Davis Mountains, Texas.....	3.2	10.3	13.9	27	5.2
♀ Moss Well, Chisos Mountains, Texas. <i>Allotype</i>9	10.4	14.2	28.8	5.2
♀ Canyon behind Pulliam Bluff, Chisos Mountains, Texas. <i>Paratype</i>	2.5	10.9	15	29.2	5.7

From the above measurements it will be seen that the specimens from the Franklin and Davis Mountains average slightly smaller than those from Garden Spring and the Chisos range.

Color Notes.—General color of the head and thorax varying from pale glass green to pale cartridge buff, more or less suffused with hoary white and in certain males with buff-pink; abdomen with the base color ranging from deep sea-foam green to mustard yellow and cream color; tegmina and exposed portion of wings varying from light bice green to winter green, in numerous males becoming pale ochraceous-tawny proximad on the tegmina. Head with the fastigium more or less washed with dragon's-blood red; eyes varying from walnut brown to bay; antennae largely chamois to colonial buff, becoming of the general color distad, proximal section more or less washed ventrad with raw sienna to cadmium orange; post-ocular line arcuate, weak, dead white occasionally with a dorsal edging of pansy purple to burnt lake. Pronotum with the continuations of the postocular lines more or less indicated on the prozona, occasionally almost absent, converging, the purplish variable in intensity, rarely as brilliant as pomegranate purple, the area between the same, and frequently to a lesser extent the whole dorsum of the pronotum, more or less punctulate with the same tone; caudal margin of the disk edged with whitish as usual

in the genus, the accompanying purplish occasionally absent, the whitish occasionally subobsolete mesad; caudal margin of the lateral lobes with the usual whitish edging broad, rarely very slightly indicated and occasionally suffused with light buff. Tegmina of male with the area of the stridulating field between the speculum and stridulating and anal veins varying from cinnamon-brown to mummy brown, the vicinity of the anal vein hay's russet to hazel; tegmina of female with the proximal section of the vicinity of the anal vein more or less suffused with purplish, the interstitial areas of the tegmina in the vicinity of the sutural margin washed with brownish. Abdomen with the lateral lines of the base color, usually emphasized by an increase in number of the adjacent purplish punctulations (in but a single specimen, and that nymphal, is the purplish dense enough to form a solid line), the whole dorsum of the abdomen thickly and the lateral aspects of the same more sparsely punctulate with purplish, rarely with the distal section of the dorsal segments thickly overlaid with hoary white; ventral surface of the abdomen with a broad medio-longitudinal bar of lemon yellow to light cadmium; ovipositor of the general color, the teeth and lamellations raw umber tipped with black. Limbs more or less washed with purplish as in other species of the genus, this suffusion usually limited to the femora and often accompanied more or less with hoary white, rarely the latter completely masks the underlying purplish.

Distribution.—The present species ranges from as far north as the vicinity of the Organ Mountains, Donna Ana County, New Mexico (Mesilla Valley), south to the Chisos Mountains in the southern portion of the bend of the Rio Grande, western Texas. The most eastern locality from which it is known is Garden Spring, fourteen miles south of Marathon, Texas, while the northern locality is the most westerly known for the species. The vertical range is from about 4000 feet (Franklin Mountains) to 7500 feet (Livermore Peak).

Biological Notes.—This form was generally found in more or less abundant grasses as well as among scattered plants and oak shoots under oaks in a canyon bottom (Maguire's Ranch), while nowhere was the species abundant. At Garden Spring it occurred in scattered grasses and low plants on a hill slope of broken pebbly rock. In this latter situation the insect was climbing and jumping clumsily

about. The nymphs taken September 15 and 16 on the Franklin Mountains are in the second instar preceding maturity, while the other nymphs, taken August 29 to September 11, are in the first instar preceding maturity. As the specimen from one of the highest elevations (6750 feet) is that taken on August 29, and the September 15 to 16 individuals are from the lowest locality for the species, it would seem that altitude has little or no effect on the date of development.

Morphological Notes.—The fastigium in both sexes exhibits considerable variation in the amount of compression, the margins regularly diverging caudad or being subparallel. The pronotum shows some variation in the amount of bullation laterad, but this is not very decided. The caudal margin of the pronotal disk is regularly rounded in certain males and roundly obtuse-angulate in others. In the male sex the number of rami of the discoidal vein varies from three to four, three specimens having 3-3, five having 3-4 and five having 4-4. In the female sex one individual has these rami 3-4, three have them 4-4 and one bears 5-5. The proximo-dorsal abdominal segment of the male sex has a distinct disto-dorsal process in the specimens from the Mesilla Valley and the Franklin Mountains, but the males from the other more southern localities have no trace of this process. There is an appreciable amount of variation in the width of the distal margin of the male subgenital plate, this margin being more frequently subtruncate than subarcuate-emarginate.

Synonymy.—The specimen recorded as *A. constricta* by Seudder and Cockerell from Mesilla Valley near the Organ Mountains, is now before us, so we are able to properly associate it with the material collected by us in western Texas.

Remarks.—The present species has certain peculiarities and combinations of peculiarities not found in any of the other forms of the genus. The combination of short tegmina and wings in the female and ample stridulating field of the male tegmina are the striking features of the species, as all of the other forms having short tegmina and wings in the female have the stridulating field of the male shorter, with the apex of the stridulating vein considerably or greatly produced. The regular and non-crenulate abdominal segments, taken in company with the above characters, enable one readily to recognize the species.

Specimens Examined: 28; 13 ♂, 5 ♀, 3 immature ♂, 7 immature ♀.

Near Organ Mountains, Mesilla Valley, New Mexico, August, (Cockerell), 1 ♂, [Scudder Collection].

Franklin Mountains, El Paso County, Texas, 4000 to 5500 feet, September 15 and 16, 1912, (R. & H.), 2 ♂, 1 ♀, 1 immature ♂, 1 immature ♀.

Maguire's Ranch, Upper Limpia Canyon, Davis Mountains, Texas, 5600 to 5800 feet, August 29 and 30, 1912, (R. & H.), 1 ♂, 1 ♀.

Slopes of Pine Mountain, Davis Mountains, Texas, 6750 feet, August 29, 1912, (R. & H.), 1 immature ♀.

Livermore Peak, Davis Mountains, Texas, 7500 feet, August 30, 1912, (R. & H.), 1 ♂.

Garden Spring, Brewster County, Texas, September 11, 1912, (R. & H.), 2 ♂, 1 immature ♀.

Moss Well, Chisos Mountains, Texas, 4500 to 5000 feet, September 5 to 8, 1912, (R. & H.), 5 ♂, 1 ♀. *Type, allotype, paratypes*; 1 immature ♂, 3 immature ♀.

Canyon behind Pulliam Bluff, Chisos Mountains, Texas, 4600 to 5000 feet, September 7, 1912 (R. & H.). 1 ♂, 2 ♀, *paratypes*; 1 immature ♂, 1 immature ♀.

***Arethaea carita* Scudder** (Figs. 46, 55, 67 and 68.)

1902. *Arethaea carita* Scudder, in Scudder and Cockerell, Proc. Davenport Acad. Sci., IX, p. 52, pl. IV, fig. 5. [Mesilla Park, New Mexico.]

1904. *Arethaea carita* Rehn, Proc. Acad. Nat. Sci. Phila., 1904, p. 542. [Casas Grandes, Chihuahua, Mexico.]

1906. *A[rethaea] carita* Kirby, Synon. Catal. Orth., II, p. 444. [New Mexico.]

1907. *Arethaea sellata* Rehn, Proc. Acad. Nat. Sci. Phila., 1907, p. 61, figs. 13 and 14. [Palmerlee, Cochise County, Arizona.]

1908. *Arethaea sellata* Rehn and Hebard, *Ibid.*, 1908, p. 398. [Palmerlee, Arizona.]

1912. *Arethaea sellata* Rehn, Kansas Univ. Sci. Bull., V, p. 306. [Santa Rita Mountains, 5000 to 8000 feet, Arizona.]

The present form and *A. brevicauda* and *limifera* constitute a well marked group of species, characterized by having very short or abbreviate tegmina in the female⁷⁹ and crenulate margins to the dorsal abdominal segments of the same sex (this character excepted in *brevicauda*), both sexes having more (♂) or less (♀) distinct strumose lateral longitudinal lines on the abdomen, while the male sex has the stridulating field of the tegmina broad and with its free margin strongly or abnormally produced at the apex of the stridulating vein, while the male cerci are not abruptly recurved at the tips.

⁷⁹ Presumably so in *limifera*, but the female of that species is not known.

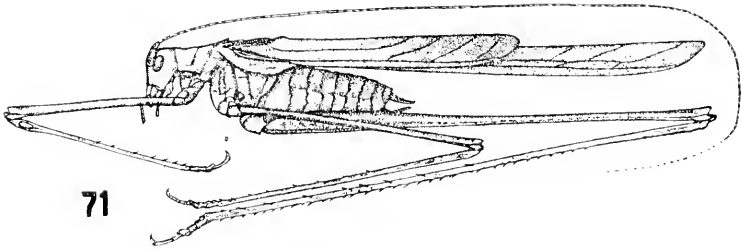
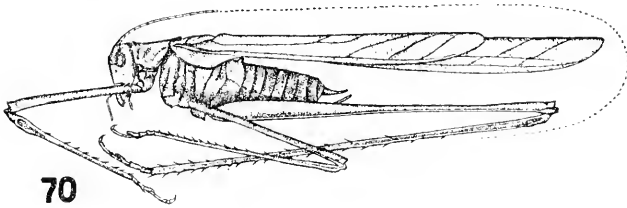
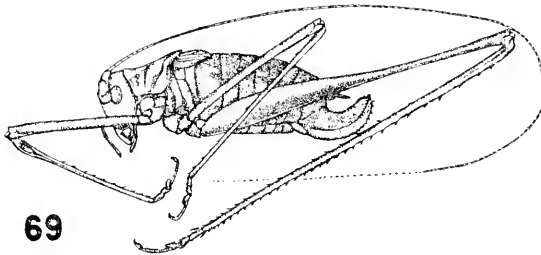
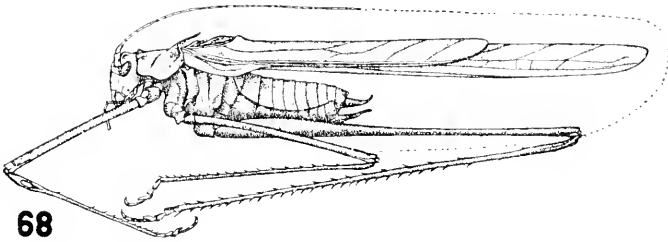


Fig. 68. Lateral view of allotype of *A. carita*. ($\times 2$) Fig. 69. Lateral view of type of *A. brevicauda*. ($\times 2$) Fig. 70. Lateral view of allotype of *A. brevicauda*. ($\times 2$) Fig. 71. Lateral view of type of *A. phantasma*. ($\times 2$)

The characters separating *A. brevicauda* and *limifera* from *A. carita* are given under their respective headings.

Type.—♀; Mesilla Park, Donna Ana County, New Mexico. September 12. (Cockerell.) [Scudder Collection.]

Description of Type.—Size moderately large; form subcompressed. Occiput moderately inflated, strongly declivent cephalad to the fastigium; fastigium elongate, narrow, subequal, narrowly and not deeply sulcate mesad, apex low and with its margin truncate, squarely in contact with that of the fastigium of the face; eyes ovate, the greatest width contained one and a half times in the depth, the latter appreciably surpassed by that of the infra-ocular portion of the genae; antennae imperfect.⁵⁰ Pronotum compressed, sellate, the dorsal line when seen from the side slightly ascending near the caudal margin and considerably ascending near the cephalic one; disk slightly constricted mesad, the greatest caudal width of the disk slightly more than half the length of the same, cephalic margin subtruncate, caudal margin obtuse-angulate, transverse sulcus forming a V-shaped figure slightly caudad of the middle of the disk, lateral portions of the disk broadly rounding into the lateral lobes, a trace of a shoulder caudad; lateral lobes with the greatest depth three-fourths the greatest dorsal length, cephalic margin slightly oblique, sinuato-truncate, ventro-cephalic angle rotundato-rectangulate, ventral margin sinuato-truncate, ventro-caudal angle roundly obtuse-angulate, caudal margin oblique, gently arcuate, humeral sinus very shallow, arcuato-emarginate. Tegmina abbreviate, slightly more than one and one-half times as long as the pronotum, narrow, the distal half subequal in width; lobate marginal field limited to proximal half of the tegmina; apex of tegmina narrowly rounded. Wings reaching to the tips of the tegmina but not surpassing the same.⁵¹ Abdomen with the dorsal margins multiterenulate, position of the usual pale lines indicated by weakly strumose ridges; disto-dorsal abdominal segment with the margin subtruncate; supra-anal plate tongue-shaped, slightly longer than the proximal width, with a moderately distinct medio-longitudinal sulcus on proximal section and adjacent portion of the distal abdominal segment; cerci tapering, about twice the length of the supra-anal plate, apex blunt; ovipositor about one and one-quarter times the length of the pronotum, arcuate, slightly tapering, dorsal margins with distinct serrato-dentations for half the length, ventral margins with similar recurved ones for about one-third the length, crenulate mesad, surface of dorsal valves with three distinct series of lamellate dentations, of ventral valves with a single series, all disposed as usual in the genus; sub-genital plate transverse, trigonal, apex subtruncate. Femora with no dorso-distal genicular spiniform projections; genicular lobes of cephalic and median femora bispinose, lobes of caudal

⁵⁰ In other females having these appendages more or less complete they are seen to at least surpass the body in length.

⁵¹ The other females of the species seen have the wings very slightly surpassing the tegmina.

femora acute but without traces of distinct spinulations.⁸² Cephalic femora over twice the length of the pronotum; cephalic tibiae with the tympanum elliptical in form. Median femora three times the pronotal length. Caudal femora about twice the length of the median femora, considerably inflated proximad; caudal tibiae surpassing the femora by about the pronotal length.

Allotype.—♂; Palmerlee, Cochise County, Arizona.⁸³ July 30, 1905. (C. Schaeffer.) [Brooklyn Institute of Arts and Science.]

Description of Allotype.—Size medium; form moderately elongate. Head with the occiput gently declivent to the moderately elevated fastigium, lateral margins of the latter regularly converging cephalad, distinctly sulcate, apex depressed; facial fastigium trigonal, slightly deeper than broad, the borders marginate; eyes very prominent, elliptical, greatest width about two-thirds the greatest depth; antennae over three times the length of the body. Pronotum strongly sellate, the dorsum constricted mesad, dorsal line when seen from the side very briefly ascending cephalad and with the caudal half regularly and decidedly oblique-arcuate ascending dorso-caudad, greatest caudal width of the disk about two-thirds the greatest dorsal length of the same; cephalic margin of disk very broadly triangular emarginate, caudal margin semi-ovate in outline, lateral lobes on metazona, when seen from the dorsum, strongly bullate; transverse sulcus placed mesad on disk, there finely and narrowly obomegoid in outline, on lateral lobes decided dorsad; lateral margins of the pronotal disk slightly strumose cephalad on the prozona and in direction diverging cephalad, absent mesad, the disk there rounding into the lateral lobes, on caudal two-thirds of metazona forming distinct but non-carinate shoulders, immediately ventrad of which the lateral lobes are impressed; lateral lobes of the pronotum with their greatest depth two-thirds the greatest dorsal length, cephalic margin oblique, subsinuate, ventro-cephalic angle narrowly rotundato-rectangulate, ventral margin arcuato-emarginate, ventro-caudal angle rounded, caudal margin obliquely arcuate, humeral sinus rotundato-rectangulate. Tegmina about four-fifths the length of the caudal femora, moderately narrow; marginal field moderately expanded and arcuate, the length of the same about one-fourth that of the entire tegmen; costal margin evenly arcuate distad apex narrowly rounded; discoidal vein with three rami; stridulating field with its greatest width (to apex of stridulating vein) three-fifths the length of the same field, free margin strongly produced at the apex of the stridulating vein, distad of this near the base of the speculum strongly arcuato-emarginate and less deeply arcuato-emarginate at the apex of the same, speculum with its greatest width subequal to its length, stridulating vein strongly arcuate proximad, slightly sinuate distad, anal vein gently arcuate. Portion of the wings projecting distad of the tegmina nearly as long as the median femur. Abdomen with

⁸² True, though very minute, spinulations are present in the other females of the species examined.

⁸³ This is the holotype of *A. sulcata* Rehn.

the dorsum subtectate, the segments substrumose at the pale lateral lines where the margins of almost all the segments are slightly produced caudad; proximo-dorsal segment with no trace of a process; disto-dorsal segment with the margin truncate; supra-anal plate transverse, the greatest width one and one-half times the length, rectangulate, the angles rounded; cerci tapering, rather stout proximal, the apex sharp and slightly incurved but not at all bent; subgenital plate elongate, narrowing caudad, distal margin arcuato-emarginate, lateral styliform processes elongate. Limbs slender; cephalic and median femora with bispinose, caudal femora with unispinose genicular lobes. Cephalic femora slightly more than twice the length of the pronotum. Median femora about two-thirds the length of the tegmina. Caudal femora subequal to the combined length of the pronotum and tegmina, rather weakly inflated proximal; caudal tibiae surpassing the femora by about three-fourths the pronotal length.

Color Notes.—General color varying from pale cendre green to paris green, always slightly paler on the genae, face and lateral lobes of the pronotum, and more whitish on the pleura, but otherwise the general tone is quite uniform. Head with more or less distinct infra-antennal bars of creamy white to pale shrimp pink, these narrowing ventrad in the female and reaching to the angle of the clypeus, in the male as a whole narrower and converging ventrad, in both sexes margining the clypeus laterad; postocular bars well indicated in the male and frequently very weak in the female, arcuate, greenish white to pale shrimp pink, generally margined dorsad by a line of pansy purple to burnt lake; eyes varying from light ochraceous-salmon to bister; antennae varying from pale green yellow to apricot yellow, the three proximal segments more or less washed ventrad with deep chrome to orange. Pronotum with the continuations of the postocular bars more or less pronounced, rarely subobsolete and then only in the female, converging caudad and not crossing the principal sulcus, in tone similar to the same on the head, the purplish variable in intensity and the area between the bars more or less punctulate with purplish, pale section of the bars margined ventrad by a thread of purplish in the majority of the males, caudal margin of the disk and the lateral lobes whitish, frequently tinged with greenish and rarely with shrimp pink, the edging relieved by the usual purplish lining similar to the postocular bars, the purplish variable in intensity in both sexes and rarely absent on the lateral lobes, the pale edging variable in width on the lobes and occasionally no wider than the narrow edging on the disk. Tegmina with the hyaline stridulating field

of the male sex washed with pale sayal brown to pale bister, the free margin more greenish, the vicinity of the anal vein of the field touched proximad and distad more or less distinctly with claret brown. Abdomen with the lateral bars variable in intensity, when decided consisting of a pale line, very pale viridine yellow to pale shrimp pink, and a distinct ventral and usually less distinct dorsal line of pansy purple to burnt lake. In addition to the lateral bars there is present on the abdomen of all the males a more or less decided medio-longitudinal bar of the same three components; surface of the dorsal segments of the abdomen more or less thickly punctulate with purplish. In the female the lateral bars are less decided, with little or no purplish and no evident median bar. Limbs of male largely pale yellow-green to baryta yellow, the femora more or less completely washed with vinaceous-purple, this rarely decided and then less extensive than in the more weakly colored individuals. In the female there is little or no trace of purplish on the limbs, while the type has much hoary white on the femora.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Palmerlee, Arizona. <i>Allotype</i> ; type of <i>sellata</i> . (Bklyn. Inst. A. & S.).....	16.	4	2.5	20.5	2.2
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.).....	15.3	4.2	2.7	20.9	2.4
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.).....	15.3	4.2	2.7	20.8	2.2
♀ Phoenix, Arizona. (Hebard Collection).	13.6	4.2	2.5	19.2	2.2
♂ Fort Grant, Arizona. (U.S.N.M.).....	14.3	4	2.8	20	2.2
♀ Santa Rita Mountains, Arizona. (Bklyn. Inst. A. & S.).....	14.5	4.2	3	22	2.5
♀ Mesilla Park, New Mexico. <i>Type</i> . (Seudder Collection).....	17.8	4.2	2.4	6.7	1.2
♀ Casas Grandes, Chihuahua, Mexico. (A.N.S.P.).....	— ⁸¹	4.3	2.2	6.7	1
♀ Camacho, Zacatecas, Mexico. (Hebard Collection).....	17.5	4	2.6	7.6	1.2

⁸¹ As the apex of the abdomen of this specimen has been destroyed we cannot give the body length or the ovipositor length.

Measurements (in millimeters)—Continued

	Length of wing distal of tegmen	Length of cephalic femur	Length of mesothoracic femur	Length of caudal femur	Length of ovipositor
♂ Palmarice, Arizona. <i>Allotype</i> ; type of <i>scillata</i> . (Bklyn. Inst. A. & S.)	11.8	9.5	12.5	25	
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.)	12.4	8.6	11.7	23.8	
♂ Huachuca Mountains, Arizona. (Bklyn. Inst. A. & S.)	13.3	10.2	13.6	26.3	
♂ Phoenix, Arizona. (Hebard Collection)	11.8	9	12.4	23.3	
♂ Fort Grant, Arizona. (U.S.N.M.)	12.6	9.2	13		
♂ Santa Rita Mountains, Arizona. (Bklyn. Inst. A. & S.)	14	9.1	12.7	25.2	
♀ Mesilla Park, New Mexico. <i>Type</i> . (Scudder Collection)		9.3	13.3	26	5.2
♀ Casas Grandes, Chihuahua, Mexico. (A.N.S.P.)	.6	9.8	14	27	—
♀ Camacho, Zacatecas, Mexico. (Hebard Collection)	.5	10	13	26	5.4

Distribution.—The range of *carita* extends from southern New Mexico (Mesilla Park) and south-central Arizona (Phoenix and Fort Grant) south to northern Zacatecas (Camacho), Mexico, the latter locality also being the most eastern, while the most northern (Phoenix) is the western extreme. The vertical distribution can only be given approximately, as almost all of the material is without exact elevation data. Judging from the localities from which the species is known it would seem to range from under two thousand feet (Phoenix) to at least six thousand feet (Camacho). The Santa Rita records, 5000 to 8000 feet, are too indefinite for their maximum elevation to be given.

Biological Notes.—Nothing is known of the immature condition or habits of the species. The period of occurrence in the adult condition covers at least portions of three months, as specimens have been examined which were taken as early as July (specifically 15th and 30th) and as late as September (specifically the 12th).

Morphological Notes.—The fastigium varies in width in the male sex as in *semialata*, while in the three females it varies in form from

that found in the type to one with the margins converging much as, but to a less extent than, in the male. Pronotum of the male with the cephalic margin of the disk varying from the type described to arcuato-emarginate, while the caudal margin of the same is rotundato-rectangulate in a few specimens of both sexes. The number of rami of the discoidal vein varies from two to five in the male sex, one specimen having 2-2, seven 3-3, five 3-4, two 4-4 and one 4-5. In the female sex one individual has 2-3 rami, one 3-3 and one 3-4. The usual spine on the genicular lobe of the caudal femora is practically absent in the type, but indicated in the other specimens. The male genitalia show little variation aside from that frequently found in the distal margin of the subgenital plate, which is occasionally arcuato-emarginate instead of truncate, and in the length of the styliform processes of the same.

Synonymy.—That *A. sellata* represents the macropterous male of the same species to which Scudder, on the basis of a brachypterous female, gave the name *carita*, is evident to us after studying the types and all the known material bearing on the question. At the time *A. sellata* was described (and in fact to the present time), sexual dimorphism in wing length in this genus was unknown, and in the two very different looking sexes of the present species there is little in the way of general or superficial characters which would associate them. However, certain of the more obscure characters, as the structure of the abdominal segments, certain pronotal features and details of the form of the head, enable us to place the two in their proper relation.

Remarks.—The present form is the least specialized of the group of three species to which it belongs, the others (*brevicauda* and *limifera*) representing more divergent developments along the same lines. The sexual dimorphism is greater than in *arachnopyga* and *semialata*, but less than in *brevicauda*, while the stridulating field of the male tegmina in structure occupies a position between *gracilipes* and *arachnopyga* on one hand and *brevicauda* and *limifera* on the other. The form of the abdomen and appendages shows the greatest relationship to be with *brevicauda* and *limifera*.

Specimens Examined: 20; 17 ♂, 3 ♀.

Mesilla Park, New Mexico, September 12, (Cockerell), 1 ♀. *Type.*
[Scudder Collection]

Palmerlee, Cochise County, Arizona, July 30, 1905 (I). (C. Schaeffer), 2 ♂ (one = *Allo'ypc* = type of *sellata*), [Bklyn. Inst. A. and S.]; July 15, (H. Kaerber), 1 ♂ [A.N.S.P.].

Huachuca Mountains, Arizona, (C. Schaeffer), 7 ♂, [Bklyn. Inst. A. and S.].

Phoenix, Arizona, (R. E. Kunz), 1 ♂, [Hebard Collection].

Fort Grant, Arizona, 1 ♂, [U.S.N.M.].

Fort Buchanan, south of Tucson, Arizona, 1 ♂, [Scudder Collection].

Santa Rita Mountains, Arizona, 5000 to 8000 feet, July. (F. H. Snow), 2 ♂. [Univ. of Kansas]; same data without elevation, 2 ♂, [Bklyn. Inst. A. and S.].

Casas Grandes, Chihuahua, Mexico, September, (W. E. Hughes), 1 ♀, [A.N.S.P.].

Camacho, Zacatecas, Mexico, September, (L. Bruner), 1 ♀, [Hebard Collection].

Arethaea brevicauda (Scudder) (Figs. 47, 57, 69 and 70.)

1900. *Diehopetala brevicauda* Scudder, *Canad. Entom.*, XXXII, p. 331. [Cahon Pass, California.]

1902. *Arethaea brevicauda* Morse, *Psyche*, IX, p. 381. (Generic Assignment.)

1906. *A[rethaea] brevicauda* Kirby, *Synon. Catal. Orth.*, II, p. 444. [California.]

This species needs comparison with only two forms, *A. carita* and *limifera*. From *carita* it can readily be separated in the male sex by the stridulating field of the tegmina being shorter and broader, with its free margin much produced at the apex of the stridulating vein and the same vein straight, in the narrower distal section of the subgenital plate and more crassate cerci, as well as the proximo-dorsal abdominal segment of the same sex having a decided process; the female sex differs from that of *carita* in the very abbreviate, sublobate and overlapping tegmina, which are shorter than the pronotal disk. From the male of *limifera* (the only sex known of that species) the same sex of *brevicauda* differs chiefly in the projection at the apex of the stridulating vein being less decided and not as peg-like. Additional features separating *brevicauda* and *limifera* exist, these being treated under the latter species.

Type.—♀; Cahon Pass, California. July 18, 1897. (A. P. Morse.) [Scudder Collection.]

Description of Type.—Size rather small; form subcompressed. Head with the greatest breadth immediately ventrad of the eyes contained about one and one-half times in the depth of the head; occiput moderately in-

flated, but little declivent to the fastigium, which latter is strongly bent ventrad and almost subvertical, narrow, strongly compressed but not much elevated, slightly narrowing distad, the apex bluntly and narrowly truncate, in contact with the facial fastigium, entire length of the fastigium considerably sulcate; eyes moderately prominent, elliptico-ovate, the greatest width very slightly more than two-thirds the depth, the latter appreciably greater than the same dimension of the infra-ocular portion of the genae; antennae at least twice as long as the body. Pronotum sellate, the lateral lobes appreciably bullate ventrad, median section subconstricted, dorsal line when seen from the side concave, regularly ascending caudad; disk with the greatest caudal width contained almost twice in the length; cephalic margin of disk gently arcuato-emarginate, caudal margin obtuse-angulate with the immediate angle subtruncate, lateral portions of disk rounding into the lobes, a weakly strumose condition present at the prozonal section of the postocular bars; transverse sulcus forming a V-shaped figure mesad on the disk, strongly impressed on the greater portion of the lateral lobes; lateral lobes with the greatest depth about two-thirds the greatest dorsal length, cephalic margin sinuato-emarginate, ventro-cephalic angle rotundato-rectangulate, ventral margin arcuato-emarginate cephalad, rounding into the ventro-caudal angle caudad, caudal margin moderately oblique subarcuate, humeral sinus indicated only by a very broad and shallow arcuate emargination. Tegmina about three-fourths the length of the pronotal disk, lobiform, overlapping mesad, ovoid, greatest width about two-thirds of the greatest length, narrowing distad, apex rectangulate with the immediate angle slightly produced; costal margin arcuate proximad, thence oblique, but nearly straight, sinuate, sutural margin arcuate, venation formed by the principal veins and transverse reticulations. Wings aborted, not reaching the tips of the tegmina. Abdomen with the segments distinctly strumose at the lateral bars and less decidedly so medio-longitudinally, the margins of the segments weakly and roundly produced at the lateral bars and at the median dorsal bar; proximo-dorsal abdominal segment with no process; disto-dorsal segment subtruncate mesad; supra-anal plate briefly tongue-shaped; cerci about twice the length of the supra-anal plate, tapering, the tips blunted; ovipositor somewhat longer than the pronotal disk, the greatest depth contained slightly more than twice in the length, arcuate, apical section bluntly acuminate, margins and disk armed as in other species of the genus; subgenital plate trigonal, with a distinct medio-longitudinal sulcus bordered laterad by parallel rounded ridges. Limbs but moderately elongate; femora with the dorsal genicular sections not spiniform produced; genicular lobes of the cephalic and median femora bispinose, of caudal femora more or less distinctly unispinose. Cephalic femora slightly more than twice the length of the pronotal disk. Median femora with their length surpassing that of the cephalic femora by about the tegminal length. Caudal femora robust for the genus, considerably inflated in the proximal half, their length nearly twice that of the median femora; caudal tibiae surpassing the femora by slightly more than the tegminal length.

Allotype.— σ ; San Jacinto River, elevation 2500 feet, San Jacinto Mountains, Riverside County, California. July 25. (For-
dyce Grinnell, Jr.) [Acad. Nat. Sci. Phila.]

Description of Allotype.—The following characters are those of difference from the description of the male of *carita*. Fastigium compressed, moderately elevated, narrowing distad, the margin arcuate when seen from the side, apex narrow, subtruncate and subdepressed, sulcate; facial fastigium shorter and broader than in *A. carita*; eyes as in the female of the species; antennae at least more than twice the length of the body. Pronotum somewhat less sellate than in *A. carita*, the dorsal line when seen from the side straighter and less ascending cephalad and caudal, the dorsum considerably constricted mesad; cephalic margin of disk emarginato-truncate, caudal margin semicircular in outline. Tegmina very slightly shorter than the caudal femora, rather narrow, the width at distal third one-ninth the total length; marginal field shorter than in *carita*, nearly a fifth of the total tegminal length; discoidal vein with four rami; stridulating field with its greatest width (to apex of stridulating vein) very slightly less than the length of the same field, free margin greatly produced at the apex of the stridulating vein, distad of this near the base of the speculum rectangularly emarginate and distinctly arcuato-emarginate at the apex of the same, the speculum with its greatest (proximal) width slightly greater than its length, stridulating vein slightly oblique, very faintly sigmoid, anal vein in the field considerably arcuate. Portion of wings projecting distad of the tegmina three-fourths to five-sixths the length of the median femora. Abdomen with the segments as in *carita*, but the margin non-crenulate and the projections of the same at the lateral pale bars more rounded; proximo-dorsal segment with a decided erect trigonal process, which is clearly a chitinous fold, excavate caudad and obliquely subtruncate cephalad; disto-dorsal segment with the margin undulato-truncate; supra-anal plate as in *carita* but the lateral margins and angles are more broadly rounded; cerci more crassate than in *carita*, less distinctly tapering, the apex more distinctly incurved but not at all bent or even rotundato-angulate; subgenital plate regularly and decidedly narrowing distad, the distal width not a third the proximal width (a half in *carita*), distal margin deeply arcuato-emarginate, lateral styloform processes brief. Limbs moderately short (for the genus), the caudal femora proportionately more inflated; cephalic and median femora with bispinose, caudal femora with unispinose genicular lobes. Median femora little more than half the tegminal length. Caudal femora very slightly longer than the tegmina; caudal tibiae surpassing the femora by about two-thirds the pronotal length.

Measurements (in millimeters)

	Length of body (in ♀ exclusive of ovipositor)	Length of pro- notum	Greatest dorsal (caudal) width of pronotum	Length of teg- men	Width of tegmen (in ♂ at distal fourth, in ♀ at middle)
♂ San Jacinto River, California. <i>Allotype</i> . (A.N.S.P.)	15.2	3.7	2.4	21.3	2.3
♂ Los Angeles County, California. (U.S.N.M.)	15	3.7	2.7	23.5	2.6
♂ Los Angeles County, California. (U.S.N.M.)	14.3	3.4	2.5	21	2.5
♂ Los Angeles County, California. (U.S.N.M.)	15.2	3.4	2.7	23.5	2.5
♂ San Bernardino County, California. (U.S.N.M.)	15	3.8	2.7	18	2
♀ Cahon Pass, California. <i>Type</i> . (Scudder Collection)	12.4	4.2	2.2	3	2
♀ Crestline, Nevada	18	3.9	2.4	3.6	2
	Length of wing distad of teg- men	Length of cephal- ic femur	Length of me- dian femur	Length of caudal femur	Length of ovi- positor
♂ San Jacinto River, California. <i>Allotype</i> . (A.N.S.P.)	9	8.7	11.5	22.8	
♂ Los Angeles County, California. (U.S.N.M.)	11.4	9.2	12.8	25.2	
♂ Los Angeles County, California. (U.S.N.M.)	9.3	8.6	11.3	23	
♂ Los Angeles County, California. (U.S.N.M.)	10.4	10	13.3	26.7	
♂ San Bernardino County, California. (U.S.N.M.)	10	9.1	12	25.4	
♀ Cahon Pass, California. <i>Type</i> . (Scudder Collection)		9	11.7	21.7	4.5
♀ Crestline, Nevada		8.9	10.9	22.5	5.2

The discrepancy in body length in the females is due to the fact that the type has shrunk and the Crestline individual was stuffed.

Color Notes.—The pattern of the male is exactly the same as in *carita*, showing almost all the same variations,⁵⁵ but the tones are paler and weaker, ranging from pale yellow-green and light turtle green (on tegmina) to straw yellow and glass green (on tegmina). The purplish edging of the postocular bars and the caudal margins of the pronotum is almost always weaker than in *carita*, the orange suffusion proximad on the antennae is weaker, sometimes subobsolete, and again more brownish. On the male tegmina there is a tendency toward a more or less extensive brownish delineation of the rami of the discoidal and the ulnar veins and their rami, occasionally this is not noticed and again both margins of the tegmina are more or less brownish, the costal in one case pencilled with pale pansy purple. Abdomen with the proximo-dorsal appendage more or less brownish; lateral and dorsal lines of the abdomen varying in about the same proportion as in *carita*. Of the female sex we have but one individual (that from Crestline) which has retained the original coloration. It is pale lumiere green on the head and pronotum, becoming hoary white on the pleura and baryta yellow to ochraceous-buff on the abdomen, the limbs greenish white passing more or less distinctly into pale cendre green on the tibiae. The pale areas on the head, pronotum, lateral bars on the abdomen and pleural edgings hoary white with little or no accompanying purplish. Tegmina pale cendre green with the costal margin touched with hoary white. The abdomen has no median bar, but the dorsal section, *i.e.* that between the lateral bars, shows traces of a hoary white suffusion; ovipositor ochraceous-buff passing into prout's brown distad, the teeth on the distal sections of the margins blackish.

Distribution.—The present species is apparently limited in distribution to southern California and southern Nevada. In California it occurs from as far north and west as the country between San Luis Obispo and San Simeon Bay, in San Luis Obispo County, south at least to the western slopes of the San Jacinto Mountains in Riverside County. The record from Tighes is probably even more southern than that from the San Jacinto range, as we

⁵⁵ The whitish areas in the males are more yellowish than in *carita*, but we believe this is due to the fact that none of the material of that sex of *breviceauda* has been stuffed and the yellowish tone is in consequence due to discoloration.

have reason to believe that the locality is in San Diego County, but numerous efforts to place Tighes have been unsuccessful. In Nevada we have only a single record from Crestline, Lincoln County. Two of the records given for the species from California are indefinite county records, Los Angeles and San Bernardino Counties, and we are unable to say where in these geographically varied areas, comprising parts of the Mohavan desert, the elevated Sierra Madre ranges and the coastal valley section, the species occurs. The occurrence of the species at Crestline, Nevada, at a considerable elevation and north of the Mohave Desert leads us to believe that it will be found to have a rather extensive distribution over the mountain ranges of the great Basin. Two of the exact Californian records are in the coastal region, the other (Cahon Pass) being at the summit of the divide between the coastal and Mohavan regions.

We have or can ascertain elevations for but three of the records: 2500 feet (San Jacinto River), approximately 3800 feet (Cahon Pass) and 6000 feet (Crestline).

Biological Notes.—All we know regarding the habits of this species is that it was taken at Crestline in bunch grass near junipers (*Juniperus utahensis*), where there was hardly any other vegetation. The locality is on an elevated gently rolling plateau, covered with scattered groves of juniper and occasional piñon. Here the ground is pebbly and practically bare in the groves, while in the open are tracts of sage brush and areas of scant grasses and occasional low yellow-flowered bushes.

The dates of occurrence are few, these extending from July 18 (Cahon Pass) to September 4 (Crestline).

Morphological Notes.—In the male sex there is some variation in the extent of the bullation of the pronotum and quite a little in the degree of concavity of the dorsum of the same, the type representing one extreme while the other approximates *carita* in this respect. The degree of bullation appears in large measure to be due to the handling in pinning and to the drying process. The cephalic margin of the pronotal disk varies in shape from that found in the allotype to one which is very broadly obtuse emarginate, while the caudal margin varies from semicircular to roundly obtuse-angulate in outline. The number of rami to the discoidal vein in the male varies from two to five, one individual having

2-2, one 2-3, two 3-4, three 4-4 and one 4-5. The one having 2-2 is depauperate in size. The dorsal abdominal process is similar in form in all of the males, while the distal margin of the disto-dorsal segment varies from truncate to undulato-truncate. The cerci show no noteworthy variation, while the subgenital plate varies only in the shape of the distal margin, which is occasionally angularly emarginate, and in the length of the styliiform processes. The females show no noteworthy variations.

Synonymy.—This species was erroneously described by Scudder as a *Dichopetala*, the correct generic assignment having been given several years later by Morse. The brachypterous condition of the type unquestionably influenced Scudder to refer the species to *Dichopetala*, to which, however, it is in no way related.

Remarks.—The association of the sexes in the present species, as in *carita*, is indicated by both sexes sharing certain characters which are more decided than in other species, the chief of these being the broader head, the more inflated caudal femora and the decidedly tri-strumose abdomen.

Specimens Examined: 11; 8 ♂, 3 ♀.

Between San Luis Obispo and San Simeon Bay, California, (Palmer), 1 ♂, [Scudder Collection].

Los Angeles County, California, (Coquillett), 4 ♂, [U.S.N.M.].

San Bernardino County, California, (Coquillett), 2 ♂, [U.S.N.M.].

Cahon Pass, California, July 18, 1897, (A. P. Morse), 1 ♀. *Type.* [Scudder Collection]

San Jacinto River, elevation 2500 feet, San Jacinto Mountains, California, July 25, (Fordyce Grinnell, Jr.), 1 ♂. *Allotype*, [A.N.S.P.].

Tighes, California, 1 ♀, [Scudder Collection].

Crestline, Lincoln County, Nevada, elevation 6000 feet, September 4, 1909, (R. & H.), 1 ♀.

Arethaea limifera new species (Figs. 48 and 58.)

This species is an extreme development of the phylum to which *brevicauda* belongs and from which form it differs most strikingly in the stridulating field of the tegmina of the male (the only sex known) being more specialized, the stridulating vein more elongate and excessively developed at the free margin into a peg-like process, while the speculum is decidedly broader than long. As all the material of the new form consists of two males dried after immersion in alcohol, and consequently considerably shrivelled and without any trace of the original color, only the most obvious dif-

ferences are given as diagnostic. These are, in addition to the form of the stridulating field, the broader marginal field and more abruptly arcuate costal margin of the tegmina, the decidedly crenulate margins of the abdominal segments, the slenderer cerci and more elongate limbs.

Type.—♂; Environs of Guadalajara, Jalisco, Mexico. 1901. (M. Diguet.) [Amer. Mus. Nat. Hist.]

Description of Type.—The following description is largely comparative with *A. brevicauda* and also, on account of the character of the material, restricted to features which appear to be unaffected by the condition of the specimens. Size slightly larger than *A. brevicauda*. Fastigium more inflated, higher, the margins regularly converging cephalad and arcuate when seen from the side, apex depressed, sulcate; eyes prominent, ovoid, the apex dorsad, the greatest width contained one and one-half times in the depth, the latter very slightly greater than the depth of the infra-ocular portion of the genae. Pronotum sellate, the dorsum considerably ascending caudad, cephalic margin of disk very broadly angulato-emarginate, caudal margin very roundly obtuse-angulate, the immediate angle emarginato-truncate; transverse sulcus broadly V-shaped on the disk, deeply impressed on the dorsal section of the lateral lobes; lateral lobes with the greatest depth about two-thirds the greatest dorsal length, cephalic margin oblique subsinuate, ventro-cephalic angle sub-rectangulate, ventral margin subtruncate, ventro-caudal angle roundly obtuse, caudal margin moderately oblique, more vertical than in the other species, arcuato-truncate, humeral sinus rotundato-rectangulate. Tegmina quite elongate, about seven times as long as the pronotal disk, the width at the distal fourth about one-ninth the length of the same; marginal field very broad, its greatest breadth very decidedly proximad of the middle of the field, thence tapering distad, costal margin rather abruptly arcuate to the blunted apex; discoidal vein with three rami; stridulating field with its greatest width (to apex of stridulating vein) subequal to the length of the field, free margin excessively produced at the apex of the stridulating vein into a peg-like process, which is longer from the adjacent angle of the speculum than the remainder of the stridulating vein, remainder of the free margin much as in *brevicauda* but less arcuate between the two emarginations, stridulating vein nearly transverse, faintly sinuate, speculum subtrigonal with its apex proximad, the greatest width more than the direct greatest length. Abdomen with a decided proximo-distal process similar in character to that of *brevicauda*, margins of dorsal segments strongly and regularly crenulate; subgenital plate strongly transverse, narrow, margin arcuate; cerci as in *brevicauda* but slightly slenderer and less arcuate distad; subgenital plate as in *brevicauda* but slightly broader distad, margin arcuato-angulate emarginate, lateral angles mere knobs and not styliform processes. Limbs very elongate; femora with the dorsal genicular section not spiniform produced, genicular lobes of the cephalic and median femora

bispinose, of the caudal femora with or without spiniform points. Cephalic femora two and one-half times as long as the pronotal disk. Median femora slightly longer than half the tegminal length. Caudal femora slightly surpassing the tegmina in length, moderately inflated proximad; caudal tibiae exceeding the femora by the length of the head and pronotum together.

Paratype Series.—A single paratype male, bearing the same data as the type, has been examined.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of tegmen at distal fourth
♂ Guadalajara, Mexico. <i>Type</i> . (A.M.N.H.).....	13.2 ⁸⁶	4	2.8	23	3
♂ Guadalajara, Mexico. <i>Paratype</i> . (A.M.N.H.).....	12.5 ⁸⁶	3.8	2.7	26.2	2.7

	Length of wing distal of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur
♂ Guadalajara, Mexico. <i>Type</i> . (A.M.N.H.)..	7.6	..	16	30.6
♂ Guadalajara, Mexico. <i>Paratype</i> . (A.M.N.H.)	7.2	9.5	13.6	27.5

Color Notes.—As both of the available specimens are entirely without any trace of the original color tones, we are unable to give any indication of the same. The pattern, however, appears to have been much the same as that of *brericaula*.

Distribution.—This species is only known from the type locality in Jalisco, Mexico.

Remarks.—The paratype shows no noteworthy differences from the type except that the rami of the discoidal vein number four and five.

Specimens Examined: 2 ♂.

Environs of Guadalajara, Jalisco, Mexico, 1901, (M. Digue), 2 ♂. *Type*, *paratype*. [A.M.N.H.]

⁸⁶ Abnormal on account of shrivelling.

Arethaea phantasma new species (Figs. 35, 49, 59 and 71.)

This very strongly marked species differs from all of the other forms of the genus in the structure of the pronotum, of the margins of the abdominal segments and the form of the anal vein of the tegmina. In the texture of the tegmina it is different from the majority of the species, the non-produced dorsal margins of the genicular extremity of the cephalic and median femora separate it immediately from *phalangium* and *grallator*, the long-winged female from *semialata*, *arachnopyga* and probably all the species of group C, while the non-produced extremity of the stridulating vein distinguishes it from *gracilipes*.

Type.—♂; Benavides, Duval County, Texas. August 9 and 10, 1912. (Rehn & Hebard.) [Hebard Collection.]

Description of Type.—Size medium; form very slender. Head with the greatest width across genae contained one and one-half times in the greatest depth of the head; occiput moderately declivent to the fastigium and strongly so to the antennal scrobes; fastigium very broad, strongly rounded when seen from the lateral aspect, narrowing cephalad, lateral margins sharp, with a moderate medio-longitudinal sulcus, apex low and subobsolete, interfastigial suture distinct; facial fastigium low, median ocellus ovate, deeply impressed, large; eyes short elliptical, less than twice as deep as the greatest width of the same, the depth slightly greater than that of the infra-ocular portion of the genae, very prominent; antennae about two and a half times as long as the tegmina. Pronotum strongly sellate, when seen from the side the dorsal outline is rather sharply elevated cephalad and more gradually elevated caudad, the disk and dorsal portion of the lateral lobes considerably impressed mesad; cephalic margin of disk arcuato-emarginate, caudal margin of same strongly arcuate, slightly flattened, all of the margins of the pronotal disk and lateral lobes with more or less regularly placed calloused points or beads; disk with a median impressed V-shaped figure, the lateral portions of which design are continued obliquely ventro-cephalad over a considerable portion of the lateral lobes; disk completely rounded into the lateral lobes and only the faintest possible indication of angles present cephalad and caudad; lateral lobes with the greatest depth (caudal) contained about one and one-half times in the greatest dorsal length of the same, cephalic margin of lobes sinuato-emarginate, ventro-caudal angle bluntly rectangulate, ventral margin arcuato-emarginate on cephalic three-fifths, caudal two-fifths of ventral margin and caudal margin broadly arcuate, humeral sinus broad, deep, rotundato-rectangulate, surface of ventro-caudal portion of the lobes rugulose. Tegmina (as well as the greater portion of the exposed area of the wings) coriaceous in texture, venation decidedly elevated, the length exceeding that of the body by about a fourth, narrow, at proximal third distinctly but not greatly narrower than at distal fourth; marginal field considerably expanded but limited to proximal

fourth, distal fourth of costal margin curving to the rather narrow and blunt apex, which latter is sutural in position; discoidal rami three in number, the proximal one diverging but a short distance distad of the middle of the vein; stridulating field with the stridulating vein strongly oblique, arcuate proximal to base of tegmen, speculum longitudinal, the greatest width contained one and one-half times in the greatest length of the same, apex of speculum acute, sutural margin of stridulating field broadly arcuate proximal of the apex of the stridulating vein, then briefly sinuato-emarginate distad and finally oblique subtruncate to the major portion of the sutural margin. Wings surpassing the tegmina by slightly more than half the length of the latter; greatest depth of wings in repose subequal to the greatest depth of tegmina, apex of wings moderately acute. Dorsum of the abdomen with no proximal erect process; margins of the dorsal segments multierenulate, the points of the crenulations being formed by minute thickened callous nodes; disto-dorsal abdominal segment with margin entire, truncate; supra-anal plate transverse arcuate; cerci moderately robust, tapering, slightly depressed, nearly straight, distal fourth bent inwards at a right angle, the tips aciculate; subgenital plate elongate, subcompressed, tricarinate ventrad, the median carina more decided and elevated than the lateral ones, distal margin deeply subtriangularly emarginate, the emargination sinuate laterad, brief substyliform processes present laterad of the emargination. Limbs very elongate. Cephalic and median femora with the supragenicular portion of the extremity subcompressed, blunt angulate, not at all produced or spiniform; genicular lobes of the same limbs bispinose, of the caudal femora unispinose. Cephalic femora slightly less than twice the length of the head and pronotum; cephalic tibiae with tympanum elliptical. Median femora nearly one and one-half times the length of the cephalic femora. Caudal femora slightly less than twice the length of the body, little inflated proximad; caudal tibiae exceeding the femora by about the length of the head and pronotum.

Allotype.— ♀; Data same as type.

Description of Allotype.—The following characters are chiefly those of difference from the male sex. Head and pronotum as in the male. Tegmina subequal to the body (exclusive of ovipositor) in length, at proximal third not narrower than at distal fourth; discoidal rami four in number, the proximal one diverging mesad. Wings as in male. Disto-dorsal abdominal segment with margin entire, arcuato-truncate; supra-anal plate semielliptico-trigonal, the proximal half and the adjacent distal half of the disto-dorsal abdominal segment with a deeply impressed medio-longitudinal sulcus; cerci moderately elongate, terete; ovipositor robust very short, sharply curved, greatest depth distinctly greater than half the length of the same, dorsal margin with the distal half moderately serrato-dentate, the size of the serrations increasing distad, distal third of the ventral margin with recurved serrato-dentations, the median third finely crenulate, the proximal third straight and smooth, surface of the distal third of the ovipositor with series of sharp ridge-like teeth arranged in linear fashions, there being about six series on the dorsal valves, the ventral series of which has

many more very closely placed teeth than the others, the ventral valves having three series arranged longitudinally but with the individual teeth placed transversely; subgenital plate small, trigonal, impressed, with two converging carinae mesad. Caudal femora about half again as long as the body (exclusive of the ovipositor).

Paratyptic Series.—We have selected as paratyptic a series of nine males and three females from Benavides.

From the appended measurements it will be seen that the size variation is chiefly individual, although the Carrizo Springs specimens are somewhat above the average of the others in proportions. Apparently this is in line with a corresponding increase in size in the Carrizo Springs region of other forms, as *Dichopetala gladiator*, having much the same distribution as the present species. In the case of *phantasma* our material is too scanty to more than state the probability of such geographic variation.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest dorsal (caudal) width of pronotum	Length of tegmen	Width of distal fourth of tegmen
♂ Benavides, Texas. <i>Type</i>	16.6	3.9	2.2	21	2.5
♂ Benavides, Texas. Average and extremes of <i>type</i> and five <i>paratyptics</i>	17 (16.6-18.1)	3.9 (3.8-4.1)	2.2 (2.2-2.3)	20.9 (19.8-22)	2.4 (2.2-2.7)
♂ Katherine, Texas...	14.5	3.9	2.2	18.1	2.4
♂ Katherine, Texas...	17	4.1	2.6	21.6	2.7
♂ Carrizo Springs, Texas.....	20.2	4.1	2.8	22.4	3
♂ Carrizo Springs, Texas.....	16.4	4	2.5	22.6	2.5
♀ Benavides, Texas. <i>Allotype</i>	20.7	3.9	2.2	21.5	2.4
♀ Benavides, Texas. Average and extremes of <i>allotype</i> and three <i>paratyptics</i>	19.7 (17.7-22)	4 (3.9-4.4)	2.4 (2.2-2.5)	22.3 (21.5-23)	2.7 (2.4-3)
♀ Katherine, Texas...	14.5	4.2	2.3	22	2.4
♀ Katherine, Texas...	19.8	4.2	2.2	22.4	2.7
♀ Carrizo Springs, Texas.....	19			24.8	2.8

Measurements (in millimeters)—Continued

	Length of wing distad of tegmen	Length of cephalic femur	Length of median femur	Length of caudal femur	Length of ovipositor
♂ Benavides, Texas. Type.....	11.7	11.1	16.2	30.2	
♂ Benavides, Texas. Average and extremes of type and five paratypes.....	11.9 (11.5-12.7)	10.8 (10-11.2)	15.5 (14.7-16.3)	30 (28.3-31.4)	
♂ Katherine, Texas....	11.3	10.2	15	29.2	
♂ Katherine, Texas....	12.2	11.3	15.5	30	
♂ Carrizo Springs, Texas.....	11.4	11.4	16.7	32.2	
♂ Carrizo Springs, Texas.....	12.2	10.9	15.2	29	
♀ Benavides, Texas. Allotype.....	12.5	10.2	14.1	30.2	4.1
♀ Benavides Texas. Average and extremes of allotype and three paratypes.....	12.3 (11.8-13)	11.3 (10.2-12)	15.6 (14.1-17)	32.5 (30.2-35.3)	4.1
♀ Katherine, Texas....	10.7	10.3	15	31	4
♀ Katherine, Texas....	11.4	11.6	16.4	31.5	4.2
♀ Carrizo Springs, Texas.....	12.9	12.5	18.3	35	4.8

Color Notes.—General color varying from pale honey yellow through pale greens to civette green, the deepest color almost invariably found only on the distal portion of the tegmina and wings, the tibiae and the genicular portion of the femora; the average tone of coloration being chrysolite green. The head, pronotum, and abdomen always and the proximal portion of the tegmina almost always paler, sometimes hoary and frequently quite yellowish in contrast to the remainder of the coloration, ranging from chartreuse yellow to chamois. Head frequently with an irregular postocular patch of creamy white finely and very unevenly sprinkled with pompeian red; eyes ranging from walnut brown to blackish brown. Dorsum of the head and pronotum with the coloration more yellowish than on the lateral aspect of the same;

margins of the pronotum more or less edged with pompeian red to vandyke red, varying in depth and width on different parts of the margins and also individually, occasionally almost no trace of this red being present and again in the other extreme very strongly indicated, these margins always beaded with hoary white, alternating with the reddish; lateral lobes of the pronotum, in the highly colored specimens, more or less stippled with the reddish color cephalad and caudad, occasionally this being over hoary white; a very faint irregular and broken indication of the postocular marking of the head present on the pronotum at the lateral margins of the disk. Tegmina with the stridulating field broadly marked with bay along the anal vein, rarely the greater portion of the whole field weakly washed with the same; tips of the veins adjacent to the sutural margin occasionally touched with paler green than the general color or even with whitish. Wings with exposed portion washed proximad along the veins with pomegranate purple. Pleura very rarely with a pair of ovato-quadrangle spots of vandyke red. Limbs with the femora frequently more or less washed with pompeian red to vandyke red, particularly the median pair, all of the femora generally sprinkled with small hoary white areas. Ovipositor with the distal margins and teeth blackish brown.

Distribution.—The present species is only known from southern Texas, its range extending at least as far north as San Diego, Duval County, northwest to Carrizo Springs, Dimmit County and south as far as Ringgold Barracks, Starr County. Its vertical range is limited, extending from near sea-level at Katherine to about 800 feet elevation at Carrizo Springs.

Biological Notes.—At Katherine, in the sandhill region, the present species was found uncommon in tall grasses and weeds and also in the scrub oak (*Quercus virginianus*) areas. At Benavides it was occasional in cleared old pasture, which was much overgrown with various very dry and not very dense weeds. Here the insects would, when frightened, flutter in a ghost-like fashion from one clump of brush to another, which action suggested the specific name. In the same situation at Benavides, *A. gracilipes* was also found.

From the dates with the material, the present species would seem to mature as early as May and also be found in that condition

as late as August 28, probably much later as nymphs were taken at Benavides on August 10.

Morphological Notes.—The structural variation found in the species is not very great aside from that of the number of discoidal rami. The caudal margin of the disk of the pronotum is rarely considerably emarginate mesad, while the humeral sinus of the same is always rectangulate in general form, but with its immediate angle occasionally rounded. The number of discoidal rami varies from three to five, the latter number present equally on both tegmina in two males and on a single tegmen in one male and one female. The more frequent number is three or four, generally equal in number on the two tegmina, the number unequal in eight specimens of both sexes. In the male cercus there is some slight variation in the robustness of the distal extremity and very faintly of the whole cercus. Some male individuals show slight variation from the more normal type in the amount of depression of the whole cercus. These features of the pronotum, tegmina and genitalia are purely individual and have no geographic significance.

Remarks.—The present form is probably as a whole the most sharply defined of the genus. The combination of a very decidedly sellate pronotum with full rounded lateral lobes, which latter also have a peculiarly modified surface, a different texture to the tegmina as well as a very large tambourine of the same in the male, unarmed dorso-genicular regions of the cephalic and median femora and short elliptical eyes will readily serve to differentiate this species. It is limited in distribution to a region shared with a number of equally peculiar forms of Orthoptera.

Specimens Examined: 27; 17 ♂, 7 ♀, 3 ♂ nymphs.

San Diego, Duval County, Texas, July 12, (E. A. Schwarz), 1 ♂, [U.S.N.M.].

Benavides, Duval County, Texas, August 9 and 10, 1912, (R. & H.), 10 ♂, 4 ♀. *Type, allotype paratypes:* 2 ♂ nymphs.

Katherine, Willacy County, Texas, August 8, 1912, (R. & H.), 2 ♂, 2 ♀, 1 ♂ nymph.

Ringgold Barracks, Starr County, Texas, (Schott), 1 ♂, [Scudder Collection].

Carrizo Springs, Dimmit County, Texas, May, 1886, June, 1885 and August 28, 1885, (A. Wadgymar), 3 ♂, 1 ♀, [Hebard Collection and U.S. N.M.].

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Insara bolivari (Griffini), p. 60, figs. 7 and 8 (p. 56).
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Insara elegans (Scudder), p. 70, figs. 11 (p. 56), 17 (p. 56) and 27 (p. 72).
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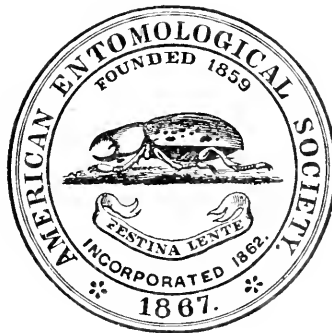
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TRANSACTIONS

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PHILADELPHIA

SUBSCRIPTION PRICE FOUR DOLLARS PER VOLUME

ON A COLLECTION OF MYRIAPODS FROM COSTA RICA

BY RALPH V. CHAMBERLIN

Cambridge, Massachusetts

These notes are based upon a small but very interesting collection of chilopods and diplopods made by Dr. Philip P. Calvert in Costa Rica during 1909-1910. Fifteen species are represented, of which seven appear to be new. The collection will be placed in the Academy of Natural Sciences of Philadelphia, with some duplicates in the Museum of Comparative Zoology at Cambridge, Massachusetts.

The following species were taken from among the leaves of members of the Bromeliaceae:

Chilopods

Otocryptops melanostomus (Newport)

Newportia longitarsis (Newport)

Scolopendra viridis (Say)

Diplopods

Aphelidesmus calverti sp. nov.

Aphelidesmus sp.

The crowded expanded bases of the leaves of the bromeliads accumulate dust and humus and catch and retain a considerable amount of moisture, so that they would seem naturally to furnish favorable retreats for myriapods. A larger list of myriapods found inhabiting these plants is given by Picado,¹ and there seems no reason to doubt that the list may in time be extended to include a large proportion of the myriapod fauna of the region. I am under obligation to Dr. Calvert for the privilege of studying this material.

CLASS CHILOPODA

SCOLOPENDROIDEA

CRYPTOPIDAE

Cryptops sp.

A single specimen from Juan Viñas (June 23 to 29, 1910). The anal legs are missing, making accurate determination of the species difficult.

¹ G. Picado: Les Broméliacées Epiphytes Milieu Biologique, Bull. Scientif. de France et Belgique, October, 1913.

Newportia longitarsis (Newport)

One specimen taken from a bromeliad in the Reventazon Valley below Juan Viñas (October 3, 1909).

This is a widely distributed species occurring also in the West Indies and in South America.

Otocryptops melanostomus (Newport)

One specimen taken in an arboricolous bromeliad on the Rio Reventazon (March 6, 1910)

A species widespread in the East Indies as well as throughout the West Indies, Central America and South America from Argentina northward.

SCOLOPENDRIDAE

Scolopendra viridis (Say)

A single specimen taken from a bromeliad below railroad track, Juan Viñas (April 26, 1910).

A species distributed from Central America northward through Mexico to the southern United States.

CLASS DIPLOPODA

COLOBOGNATHA

SIPHONOPHORIDAE

Siphonophora costaricae sp. nov.

Uniform light or yellowish brown.

Head subpiriform. Rostrum moderately long, a little shorter than the head.

Antennae long, much exceeding the rostrum; distally strongly crassate, clavate, the proximal articles being much narrower.

First tergite with anterior border deeply emarginate.

Number of segments 94 (♀).

Length near 36 mm.

Locality.—Juan Viñas (June 23 to 29, 1910). This species seems to be close to *S. cornuta* Pocock, described from Guatemala. It may readily be separated, however, by the conspicuously crassate antennae, these in *cornuta* being of nearly uniform diameter from the base to the distal end. The antennae are decidedly longer than in *brevicornis* which also has fewer segments to the body and is smaller.

*SPIROBOLOIDEA***SPIROBOLIDAE****Rhinocricus plesius** sp. nov.

Color deep shining black; first tergite narrowly margined anteriorly and posteriorly with brown and the anal tergite similarly margined posteriorly and the anal valves mesally. Antennae and legs light brown.

Body a very little narrowed caudad from middle and also narrowed slightly cephalad. Metazonites weakly protruding. Scobina detectable back as far as the thirty-sixth segment.

Head smooth and shining. Suleus across vertex deep; ending considerably above level of antennal sockets. A fine median longitudinal sulcus reappearing between antennae and extending to labrum, becoming more distinct ventrad. A deep foveola each side of median line a little dorsad of margin of labrum and a second, smaller and shallower one farther laterad at very edge of labrum.

Antennae short as usual, all the articles with the exception of the second as wide as or wider than long. Terminal sensory cones numerous (Group *Polyrhachi* of Brölemann).

Eyes subtriangular. Ocelli 24 to 27 in 6 series: 5, 6, 5, 4, 3, 1 and 6, 6, 6, 4, 3, 2.

First dorsal plate with anterior margin nearly straight, being but very slightly convex between points near level of lower corners of eyes; below level of eyes the margin is incurved or emarginate and slants obliquely ventrocaudad to the well rounded lateral end. A sharply impressed transverse sulcus on each side at about one-fourth the length from caudal margin, this sulcus curving cephalad at ectal end. A second, somewhat obscure and irregular depression parallel with and cephalad from the first. Several short striae extending caudad from anterior margin on each side at or near level of eye. Marked across median region with a considerable number of obscure, irregular, short and fine lines.

Second tergite extending considerably below ends of the first; its ventral margin slightly indented at middle of its length, behind which the plate is thickened or somewhat nodular.

Anterior division of prozonites separated from the posterior by a fine but very distinct circumferential stria, which is a little wavy and which terminates on the ventral side at an angle in a transverse stria extending entirely across the prozonite; a transverse stria at level of pore across anterior division; anterior division marked densely with fine, irregular concentric striae which are fewer toward the caudal division; from the dividing stria above there extend a series of short coarser longitudinal impressed lines. Caudal division of prozonite very densely roughened or coriarius, the impressions small but deep and the elevations between them narrow and forming a close, irregular reticulation. Metazonite short, smooth and shining; a series of obscure, short longitudinal impressed lines along suture above. Suleus straight and distinct; not bent at pore or on some of caudal segments a little angulate. Pore contiguous with or very close to suture.

Anal tergite with sides meeting posteriorly at angle of about 90° or a little greater, the angle narrowly rounded. Not covering the upper angles of anal valves which extend clearly farther caudad. Anterior portion of surface under lens seen to be weakly and finely coriarius the caudal portion more strongly so but much weaker than on posterior division of prozonite of trunk segments.

Anal valves with mesal edges compressed and conspicuously protruding but with no margining sulcus. Smooth and shining or under lens showing obscure coriarius markings.

Anal scale caudad extended in linguiform process which is distally subacute. Process smooth and shining, the other parts finely roughened.

The gonopods are very similar to those of *R. costaricensis* Brölemann. The accessory branch is very broad, laminate, and is distally more acute than in *costaricensis*. The stile is straight and slender, longer and distally more acute than in the other species. The gonopod curves evenly, being not at all geniculate.

Number of segments 44 (σ^7).

Length about 93 mm.

Locality.—Rio Oro Valley near Cachi (March 8, 1910). One male.

Closely related to *R. costaricensis* Brölemann, but differing, among other points, in having the posterior division of the prozonites strongly roughened instead of smooth; in differently shaped anal tergite which does not cover angles of valves; in having scobina on a much larger number of segments; and to some extent in the gonopods.

POLYDESMOIDEA

PERIDONTODESMIDAE

Peridontodesmus electus sp. nov.

Dorsum uniform testaceous to light brown, individuals in full color showing typically along dorsum a median longitudinal black line. Venter and legs lighter, yellow to testaceous.

Body narrowing slightly cephalad and more decidedly caudad.

Vertex of head crossed by a short sharp sulcus which is deepest at inferior end. Head clothed with numerous fine short hairs over vertex as well as over frontal and more ventral region. Antennae similarly clothed over entire length but more sparsely proximally.

First dorsal plate about equal in width to head inclusive of mandibles. Anterior margin widely convex, taken with anterior half of each lateral margin semicircular, the median tooth of lateral margin at point farthest laterad. Anterior margin bearing about 16 setiferous tubercles which increase in size laterad and pass gradually into the teeth of the lateral margin which are 4 in number. In addition there are numerous similar tubercles

over the entire surface, these rather irregularly arranged but referable to 5 (or 6) transverse rows.

Second tergite with keels horizontal and of good size, longer than median portion of metazonite, bent a little cephalad. Anterior margin of keel nearly straight, the anterior angle subrectangular and the caudal one similar but a little rounded; lateral teeth 5, or 1 of these subcaudal in position, the teeth on caudal side of keel 3, 3 transverse rows of tubercles.

The immediately succeeding tergites similar to the second, but the keels shorter and not bent forwards; the caudolateral angles also becoming more and more rounded or obliterated as such so that the lateral and caudal margins together form an even and continuous curve; the anterior angle subacute. The 3 teeth referable to lateral edge smaller than those properly belonging to the caudal edge. The more caudal plates with anterior margin of keels becoming more and more convex and slanting more caudad, the anterior angle becoming rounded while the caudal angle reappears and becomes more and more acute, in the last 2 or 3 plates rather conspicuously produced caudad.

Anal scutum with process bluntly rounded; bearing the usual 2 setigerous tubercles. Dorsal surface with numerous setigerous tubercles.

Anal valves distinctly margined mesally. Lateral margins substraight. A large setigerous tubercle just ectad of middle of mesal margin on each valve.

Gonopods of male in general similar to those of *flagellatus* but the longer ventral rod at proximal end bent ectad instead of mesad and distally not evenly curving, but ending in an abruptly more slender falciform division as shown in the figure. Stile extending distad and not bending proximad in the more usual way.

Length ♀♀ near 9 mm.; width, 1.5 mm. Of ♂♂ near 7 mm.; width 1+ mm.

Locality.—Juan Viñas: Laguna (elevation 3300 ft. October 1, 1909). Numerous specimens taken under a log, some noted as pairing.

In color and size very similar to *P. flagellatus* but more slender; gonopods especially differing conspicuously as above noted.

PLATYRACHIDAE

Platyrachus montivagus Carl

One male from the Reventazon Valley, near Cachi (March 6, 1910).

Described from Costa Rica originally, and previously recorded from several localities in that country.

Platyrachus antius sp. nov.

Dorsum black, with keels yellow, the black extending more or less along caudal margin of keels, the dark band in part may be of deep chocolate

brown tinge; the yellow lateral band across the keels of each side distinctly narrower than the median black band; on some of the tergites (in female from Reventazon Road) a rather obscurely outlined paler spot may be present in border of black band on each side. Head black excepting labial border which is yellowish. Antennae and legs uniform brown.

Head roughened, finely coriarius and shagreened, excepting labial area which remains smooth; bordering upper edge of labrum a conspicuous transverse setiferous ridge. Vertex with a conspicuous larger tuberele on each side. Median sulcus distinct, passing into a broad depression between antennae. Rim of antennal sockets on dorsal side elevated and thickened. A median longitudinal ridge-like elevation beginning between antennae and passing ventrad to bifurcate at clypeal region like an inverted Y, the branches coarser and more tubereular in character; area between branches smoother than other parts excepting the labrum (this ridge more indistinct in female from Reventazon Road).

Antennae reaching a little caudad of posterior border of first dorsal plate. Sixth segment long and, as commonly so, of smaller diameter than the preceding segments.

First dorsal plate wider than the head. Anterior margin lightly convex; margin laterally slanting back ectocaudad to the posterior angle which is less than rectangular, this lateral part of margin distinctly sinuate, there being four crenations. Caudal margin between angles bow-shaped but with median portion straight. A row of small tubercles along anterior and posterior borders. Entire surface granular or shagreened.

Keels of second tergite bent forwards. Both anterior and posterior angles rounded but the latter less so. Lateral margin conspicuously crenate, the elevations regular.

In succeeding tergites the keels become more and more nearly transverse; the posterior corner becomes more angular and then produced caudad at first weakly and then more strongly and acutely, in posterior segments becoming spinose; on nineteenth tergite the processes of keels are large but bluntly rounded while those of the eighteenth are subacute though broader and less sharp than in preceding segments. Lateral margin of keels in proceeding caudad becoming conspicuously irregular and often deeply notched, but in eighteenth and nineteenth wholly smooth. Anterior edge of keels from eleventh to eighteenth finely serrulate and the caudal margin serrulate from sixth or seventh to seventeenth. Pores large; on all but last two tergites removed by less than twice their diameter from nearest point on margin. Surface of all tergites densely finely tubereular or shagreened.

Anal tergite with caudal margins rounded, semi-circular. Proximal portion finely shagreened, the distal portion under lens appearing more finely coriarius.

Anal valves with mesal margins elevated. Two setigerous tubercles just ectad of mesal marginal elevation on each side, one behind the other. Surface irregularly tubereular.

Anal scale with caudal margin between tubercles straight or weakly incurved.

Sternites not sulcate. Each one from fourth caudad with four distinct tubercles, one at base of each leg, these conspicuous and subconical on the anterior plates but becoming more and more inconspicuous caudad. In the male the two tubercles present at bases of seventh legs well developed. No conical process on fourth sternite such as described by Pocock for *P. tristani*.

Gonopods of male with proximal portion nearly straight, distally evenly curving, first in a cephalomeso-dorsal direction, then dorsad and then back a little caudad of ectad. Distal end broad, laminate. The stile short and rather slender, bending across the laminate division as shown in the figure.

Length 76 (♂) to 78 mm.; width of ♂ type cir. 14 mm.

Localities.—Juan Viñas: "Nearer Waterfall" (one male, type, April 26, 1910); Reventazon Road (one female, February 15, 1910).

Seemingly closely allied with *P. tristani* Pocock from which I separate it chiefly because of the following differences: the greater relative width of the dorsal black band; especially the more irregular lateral margins of the keels which are in some segments conspicuously incised, with the pores larger and uniformly closer to the margin and never removed by as much as twice their diameter excepting in the most caudal segments; the lack of a conical process on the fourth sternite in the male. There are various other minor differences. The gonopods in the two species are very similar.

***Aphelidesmus calverti* sp. nov.**

Anterior portion of metazonites above chocolate brown, posterior border and entire keels yellow. Antennae light brown with seventh joint brown.

Head smooth. Sulcus across vertex deep, ending at level of antennae. Between bases of antennae a pair of bristles on light spots, a similar but much more widely separated pair midway between these and the labial margin.

Antennae inserted close together, moderately short, articles in order of length 6, 5, 4; 3 and 2 subequal and but little differing from the fourth.

First tergite much wider than head. The anterior and lateral margins together forming a continuous even curve which is subsemicircular, a slight indentation marking point of juncture. Carinae narrowly rounded.

Anterior corners of all carinae well rounded. Second, third and fourth with an obscure blunt tooth on ectal side near anterior corner which is not evident on more caudal keels, the edges of which are smooth. Edges of keels in pore-bearing plates thickened, the pore on edge near base of caudal process. Posterior angles of all carinae distinctly produced caudad, spiniform. Surface of all tergites smooth, with no sulci or sculpturing.

Anal tergite of moderate width; sides weakly convex, converging caudad; caudal margin convex, not at all emarginate (see figure).

Anal valves strongly margined as usual.

Anal scale with caudal margin convex, weakly convexly protruding between the setae and mesally slightly indented.

Gonopods of male with stile arising on ectal side of distal division and curving ventrad of it proximal of its middle, then running distad behind (dorsad of) a thin plate-like division as shown in the figures.

Genital processes on second legs of male very small, subconical.

Length of type (♂) near 27 mm.; width 3.25 mm.

Locality.—La Emilia (November 16, 1909). Named in honor of Dr. Calvert.

***Aphelidesmus intermedius* sp. nov.**

Deep chocolate brown, the outer portion of carinae and the caudal portion of anal tergite light yellow. Antennae and legs pale brown.

Head smooth. Sulcus across vertex deep; terminating abruptly at level of edge of antennal sockets. A long bristle springing from a light spot just below base of each antenna and a transverse row of similar bristles across clypeal region.

Antennae inserted very close together, short. Sixth article much the longest, the second and fifth, and the third and fourth, not much differing in length, the first two slightly longer than the latter.

First dorsal plate much wider than head. Surface finely and densely granular. Anterior margin convex. Keels rather strongly bent down, with anterior margin sloping back caudoectad; the caudal margin nearly transverse, and the outer end of keel well rounded.

Second dorsal plate with anterior corner of keel rounded, a small blunt tooth on its outer side. Caudal corner subrectangular, but the caudal margin extending a little caudad of ectad. Third and fourth plates nearly like the second but marginal tooth farther caudad. Succeeding plates lacking the small tooth, the anterior corner more strongly rounded, the side from it rounding back obliquely a little ectad of caudad to the caudal corner which becomes rather strongly and acutely produced and spiniform. Processes of nineteenth segment short. Surface of tergites from second caudad showing polygonal areas marked off by paler lines but area not elevated nor lines sulciform; one row of areas on prozonite and two on metazonite. Margin of keel on pore-bearing segments strongly thickened with the pore always strictly lateral in position.

Anal tergite with sides strongly converging caudad, as in type species of genus, with the caudal margin widely rounded though median portion not very convex.

Anal scale with caudal margin between setae wide and only very weakly convex, nearly straight.

Length (♀) about 31 mm.; width near 3.5 mm.

Locality.—Juan Viñas (June 23 to 29, 1910). The type is a female.

Aphelidesmus sp.

Locality.—La Emilia.

A single immature female specimen from a bromeliad along with *Aphelidesmus calverti*, which species it resembles in coloration but with polygonal areas outlined on prozonite and metazonite as in *A. intermedius*, the limiting paler lines not at all impressed. Antennae less clavate than in *A. calverti*.

Aphelidesmus sp.

Locality.—Juan Viñas: Reventazon Road (February 15, 1910).

A very young female of uncertain species.

CHELODESMIDAE

Aceratophyllus dux sp. nov.

Dorsum between keels brown; a deeper brown circular spot just proximal of each keel; the keels and caudal border of metazonites more yellowish brown and in part of dilute orange cast; an interrupted longitudinal median dorsal dark line over caudal half of body. Distal half of sixth article of antennae rufous. Legs light brown.

Vertex of head glabrous; crossed by a sharply impressed sulcus which extends to level of antennae. On each side of sulcus in upper frontal region a pair of setigerous foveolae; bristles present below this level, these increasing in length and number ventrad, the lower ones long.

Antennae long; fifth and sixth articles distinctly the longest.

First dorsal plate much wider than the head. Anterior margin mesally straight, at ends curving back about the rounded anterior corners. Caudal corners subrectangular.

Second dorsal plate with anterior corners also rounded; a single small tooth on ectal side of corner; caudal corners rectangular or slightly produced caudad. The immediately succeeding plates similar but anterior corner more angular, the single tooth at or near corner present in all. The pore-bearing plates with edge conspicuously thickened about pore, the thickening regularly decreasing from pore toward each corner. In proceeding caudad the plates increase in size and their caudal corners become more and more produced, the processes in the most caudal ones moderately long and acute. In all tergites the keels are bent up dorsad so that their lateral edges are above level of median portion of tergites.

Anal tergite with distal portion bluntly rounded or with the median apical portion truncate; bearing 2 shorter and 2 very long bristles at tip, a pair farther proximal and a pair of short ones on ventral side. Proximal subtriangular portion with a pair of long bristles near each lateral margin.

Anal valves with mesal border strongly margined. Two bristles just ectad of elevated margin on each valve.

Anal scale with caudal margin evenly convex; bearing a long bristle a short distance each side of median line.

Gonopods of male of usual type. Outer branch of distal division distally truncate, not acute as in *unicolor* Carl. Inner branch (stile) not geniculate, not distally expanded in button-like form as in *unicolor* nor deeply and unevenly notched as in *lamellifer* Brölemann (see figure).

Seminal processes of second legs in male long and slender, distally acute. Length of type (σ^7) near 31 mm.; width 5 mm.

Locality.—Juan Viñas (June 23 to 29, 1910). One male.

Readily separated from other species by character of male gonopods.

EXPLANATION OF PLATE II

Fig. 1.—*Siphonophora costaricae* sp. nov. Head and first two tergites, dorsal view.

“ 2.—*Rhinocricus plesius* sp. nov. Distal portion of male gonopod.

“ 3.—*Peridotodesmus clectus* sp. nov. Left gonopod of male, ventral view.

“ 4.—*Platyraechus antius* sp. nov. Right keel of tenth segment, dorsal view.

“ 5.—The same. Left gonopod of male, ectal view.

“ 6.—*Aphclidesmus calverti* sp. nov. Right gonopod of male, ventral view.

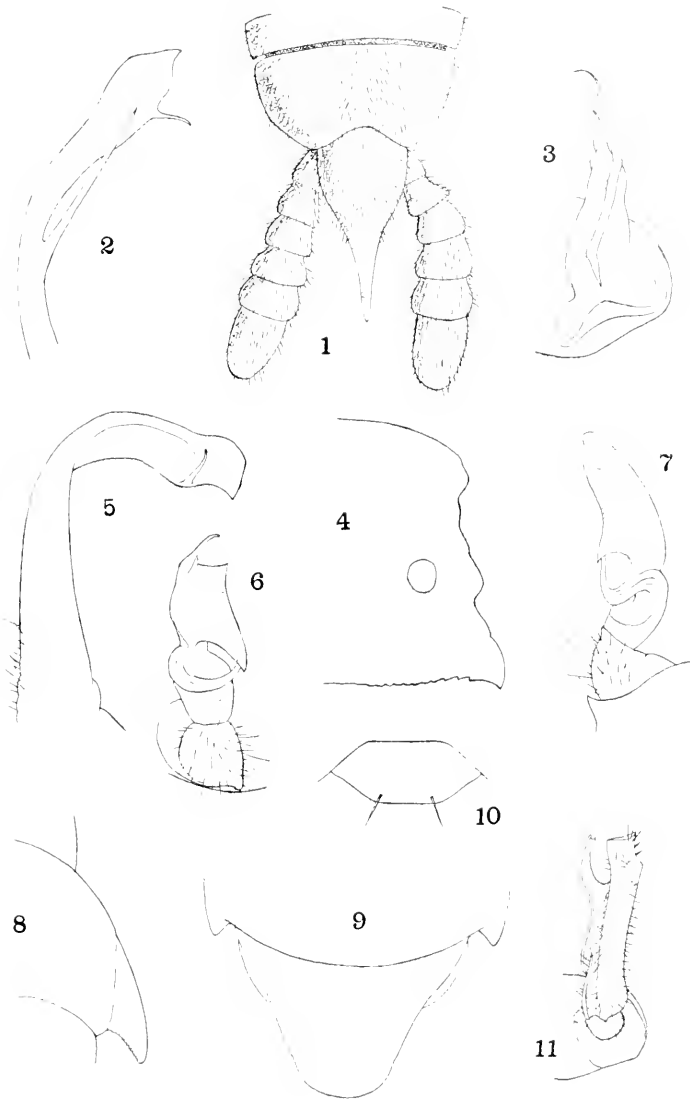
“ 7.—The same. Left gonopod of male, lateral view.

“ 8.—*Aphclidesmus intermedius* sp. nov. Right keel of fifteenth segment, dorsal view.

“ 9.—The same. Last tergite.

“ 10.— “ “ Anal scale.

“ 11.—*Aceratophyllus dux* sp. nov. Left gonopod, ventral view.



CHAMBERLIN—COSTA RICAN MYRIAPODA

STUDIES IN THE GENUS *THANAOS*

BY HENRY SKINNER, M.D., SC.D.

These butterflies for many years have presented great difficulties and have been stumbling blocks to students. In 1870, S. H. Scudder and Edward Burgess published a paper in the Proceedings of the Boston Society of Natural History, entitled, "On the Asymmetry in the Appendages of Hexapod Insects." In this paper they described eleven new species from genitalia alone. It seems that the remarkable asymmetry of the genital appendages was accidentally discovered. Their remarks on the subject are of interest. "In a recent study of the external genital organs of the males of butterflies we chanced to examine those of certain native species of *Nisoniades*, and found not only a great difference between allied species, but a most remarkable asymmetry between the opposite clasps of the same individuals; this has led to an examination of all the North American species of which we could obtain specimens for dissection and the results are embodied in this paper." This interesting and valuable essay has never received the study and attention it so well deserved and the attitude of students toward it has been somewhat peculiar.

W. H. Edwards in his Catalogue of Diurnal Lepidoptera, published in 1884 makes no mention of these species. In his Catalogue of Diurnal Lepidoptera of America North of Mexico, published in the Transactions of the American Entomological Society (1877) he says, "The species credited to Scudder-Burgess, were characterized solely from peculiarities in the genital armor. I do not regard such characterization as a "description" entitling a species to recognition, and declined to admit these in the Synopsis. But in deference to Mr. Lintner's wishes I give them here as I would in exceptional cases give manuscript names. How valueless the genital armor is for specific distinctions may be inferred from the synonymy." His reference to the synonymy means that he put nearly all of the Scudder and Burgess species as synonyms of *juvenalis* Fabricius.¹ Strecker (Rhop. et Het., p. 118) refers to them as follows: "These separated from the old species and each

¹ In his 1884 Catalogue he says in regard to these names, "Described solely from the genitalia and not recognizable."

other only by a twist or two in the shape, or the millionth of an inch difference in the size of the organs of generation."

This was the general attitude of the students of butterflies at that period and even at present there are some persons who refuse to consider the genitalia of any importance in specific separation. One of my objects in studying the genus from a genitalic standpoint was to discover the amount of individual variation in a given species and then estimate their value for specific differentiation.

I was not sure that Scudder and Burgess had dissected enough specimens to determine the amount of individual variation in the species. That they did not, may be inferred from the fact that Dr. Scudder mistrusted some of their conclusions in their paper, as he subsequently put some of the species into the synonymy.

A number of years ago I wrote to him asking for the technic or method of extracting and mounting the genitalia for study. He replied that he could not tell me as all that part of the work had been done by Burgess who was dead. It will be noted that these slides or whatever form they are in, are the types of Scudder and Burgess of certain species of *Thanaos* and they have therefore become of considerable importance. I wrote to Mr. Samuel Henshaw asking if he knew where they were,² also to Mr. Charles W. Johnson³ and Dr. L. O. Howard.⁴

² "Museum of Comparative Zoölogy, Cambridge, Mass., Oct. 4, 1913. Scudder's microscopic slides were in considerable confusion when received at the Museum but I have at last searched without however finding any that can be considered types of any of the species described by Scudder Burgess. I have also asked Burgess's brother thinking that the chance of any in the hands of the family should not be overlooked and here again I was disappointed. The only source I can think of is the Boston Society of Natural History. They have or had a microscopic collection and Burgess may have given them to the Society. Johnson should be able to let you know. I do not believe there is any chance of finding them in the U. S. National Museum though Burgess sold his Diptera to the Museum when Riley had charge and he may have included material other than Diptera."

³ "Boston Society of Natural History, Oct. 13, 1913.

I have looked over all of our microscopic slides and can find none that pertain to the Scudder-Burgess article on the genitalia of *Thanaos*."

⁴ "All the likely men have been consulted and search has been made, and the genitalia of *Thanaos* from the Scudder-Burgess types cannot be found. It is the recollection of both Mr. Schwarz and myself (and we were both here at the time) that the Burgess collection bought by Professor Riley contained only Diptera."

I mention this search trusting that calling attention to the matter will result in eventually finding the types. These species cannot be disregarded on the ground that they were described solely from the genitalia. There is no doubt whatever, that in a number of species, the genitalic characters are far more positive as a means of differentiation than the color and maculation. My own studies have shown that the individual variation in the genitalia is slight and that some species looking very much alike in color and markings have totally different genitalic structure. This is illustrated by *icelus* and *brizo* and *juvenalis* and *horatius*. *Tristis* and *clitus* also are very much alike in appearance yet totally different genitally. Two species have been confused for years under the name *pacuvius*, yet they are very readily separated by differences in the sexual characters.

The method I have adopted for the study of the genitalia is a very simple one. The latter half of the abdomen is broken off and boiled for about two minutes in a ten per cent water solution of potassium hydrate (caustic potash). The genitalia are dissected out under water, by the aid of needles mounted in wooden handles. The parts are then put in 95 per cent alcohol and left there for at least an hour. They are then dried on a blotter, put on an ordinary glass slide moistened with xylol and mounted in balsam damar in benzole with the ordinary cover glass over the mount.

I have found the structure of the clasps or harpes quite sufficient, as differential characters, but have also studied the other parts ("upper organ" and penis) as well and have found them useful for the confirmatory evidence. The structure of the genitalia makes it difficult to mount the whole organ intact without distortion, or the possibility of having a different view in each specimen. I have therefore, wherever I found it necessary or expedient mounted the various parts separately on the slide. More than one hundred slides have been made and they have all been numbered to correspond with the pin numbers on the insects.

Interesting genitalic studies of some of our species were made by Godman and Salvin and illustrated in the *Biologia Centrali Americana* and their work was a step in advance. Dr. H. G. Dyar gives a synopsis of the species both from the maculation and genitalic standpoints.⁵ Mabille in the *Genera Insectorum, Hesperidae*,

⁵ Journ. New York Ent. Soc., xiii, 120 to 122, 1905.

p. 79 gives a generic diagnosis and a list of the species. Dr. W. J. Holland, in the Butterfly Book, gives some good figures of some of the species and says, "The genus *Thanaos* is one of the most difficult genera to work out in the present state of our knowledge of the subject. The species are not only obscurely marked but they vary in the most extraordinary manner. Except by a microscopic examination of the genital armature, which can be carried on only when the student possesses considerable anatomical knowledge and an abundance of material, there is no way of reaching a satisfactory determination in many cases."

I have kept all the specimens of this genus collected or received in exchange and have also had access to the other collections that have become the property of the Academy of Natural Sciences of Philadelphia. This aggregation makes what I think is the largest and most complete collection of the genus extant. All the references to the literature of the subject have not been given in the following pages, but only those considered important or useful. This also applies to figures and illustrations, the best and most exact being chosen. The main object of the study is to aid students in the determination of these difficult butterflies.

The older authors in their descriptions attached great importance to the size and position of the vitreous spots on the primaries. As used they had very little value for specific differentiation. A careful study of the spots from large series of a given species would doubtless be of value in an effort to obtain the limits of individual variation. The sexes in *Thanaos* are very easily determined by the presence or absence of the costal fold of the primaries, as it is a male secondary sexual character.

Before we can have an absolutely stable specific nomenclature it will be necessary to absolutely fix the types. We do not know what some of the older species represent. The description of *juvenalis*, for instance, will not enable us to say whether it may not be *horatius* that was described by Fabricius. Indeed the description agrees better with *horatius* than it does with *juvenalis*. An examination of the genitalia of the type of *tristis* Boisduval would make an addition to our knowledge. *Pacurius* may be *pacuvius* of authors, or may be an allied species described later.

It has always been supposed that the black-fringed species are all related to each other and that the white-fringed species form a

natural group of the species. Study of the genitalia shows that such is not the case, but that change in environment has brought about this different color in the fringe of the wings. This may be illustrated by an examination of the figures given. *Terentius*, a black-fringed species, is very nearly related to *funeralis*, a white-fringed species. At present I see no essential difference in harpes of the two although differences in the other parts may eventually be found. *Juvenalis* and *clitus* are very close to each other. *Lilius* and *pacuvius* are equally close, and in fact can only be separated by the color of the fringe. Additional material will be necessary to determine their exact relationship. The discovery that *burgessi* and *scudderi* are so different in the anatomy of the genitalia from *brizo* and *pacuvius* respectively has been a great surprise, and would not have been suspected had it not been for these studies. I have had specimens of both species for more than thirty years.

The text figures of the genitalia are merely outline drawings, made with the aid of the camera-lucida, of the harpes as they appear on the micro-slide. No attempt is made to show perspective or other details, including pilosity and bristles. The right and left given is in relation to the position or sides of the insect. There is generally a slit shown about the middle near the large appendage. This is a break in the chitin due to flattening on the micro-side. Magnification twenty diameters. The magnification is the same as in the figures given by Scudder and Burgess. The drawings were made by Mr. E. T. Cresson, Jr.

Thanaos icelus Scudder and Burgess, Proc. Boston Soc. Nat. Hist., xiii, 288, 1870, figs. 3L, 3R, 3U (genitalia).

Lintner, Twenty-third Annual Report of the New York State Cabinet of Nat. Hist., Entomological Contributions, p. 162 (p. 30), 1872, pl. 7, figs. 5, 6, male.

Scudder, Butterflies Eastern U. S. and Canada, ii, 1507, 1889, pls. 9, 28, 77, 85.

Holland, Butterfly Book, pl. 48, fig. 17, male.

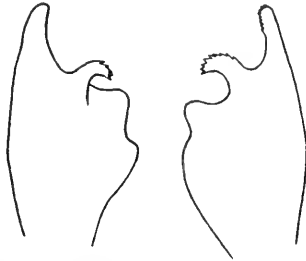
Male.—Expanse, 12 to 15 mm. Upperside. Primaries: outer half of fringe light brown, inner half gray; marginal line narrow and black; parallel to this a row of seven brown spots, extending from the costa nearly to the inner margin; crossing the wing beyond the disk is an irregular row of spots, the upper half composed of narrow lines and the lower of four rings; in the end of the cell is a small ring and another just below it, but not in the disk. The outer half of the wing is covered with grayish white scales, most promi-

nent beyond the cell and giving the appearance of a hoary spot. Secondaries light brown with about a dozen small light yellow spots. Underside. Primaries light brown with a row of six spots crossing the wing from the costa to near the inner margin. Secondaries light brown with the yellow spots of the upperside repeated.

The female is marked in a similar manner and expands from 16 to 18 mm.

Distribution.—From Northern Canada to Georgia and Florida. Westward to Colorado, Arizona and Washington.

Records.—Oldham, Nova Scotia, VII, 11; Beulah, Manitoba, V, 5; Johnstown and Elmwood, Rhode Island, V, 12 to 17; North Carolina; Georgia, IV, 21, (Abbot); Oakland County, Michigan, V, 25 to VI, 6; Southwestern Colorado; Silver Lake, Utah, VII, 15; Cloudercroft, New Mexico, V, 23; Olympia, Washington, V.



• *Thanaos icclus* Scudder and Burgess.

This interesting little species is liable to be confused with *brizo* and its variety *somnus*. It is just possible the Florida records were *somnus*. It averages smaller in size than *brizo* and the prominence of the hoary scales at the end of the disk, between the bands, will usually serve to distinguish it. Scudder says that it is single brooded and appears as early as May 10th in New England. Lintner took it abundantly at Centre, New York, from the 9th to the 25th of June, his earliest capture being May 25th.

Thanaos brizo Boisduval and Leconte, Lep. Amer. Sept., 66, 1863. The male and female and the underside of the male are figured, also the larva and chrysalis.

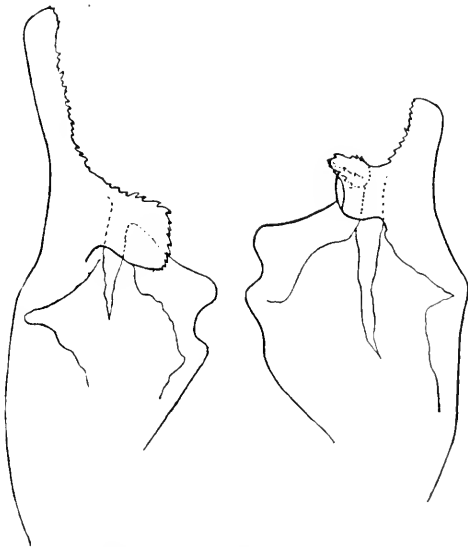
Scudder and Burgess, Proc. Boston Soc. Nat. Hist., xiii, 289, 1870. Figures and descriptions of the genitalia.

Scudder, Butterflies of the Eastern U. S. and Canada, ii, 1500, 1899. The species figured, also various stages and genitalia.

Holland, Butterfly Book, p. 332, pl. 45, f. 7, female. (1898).

Male.—Expanse 14 to 19 mm. Upperside. Primaries dark brown with a band of spots crossing the wing midway between the disk and the margin; these spots are centrally bluish-white scales encircled by wedge-shaped black lines; there is a similar band crossing the wing at the end of the disk but it is more obscure. The secondaries are dark brown with a double row of small, obscure, yellowish spots; these are usually more marked in the female. Underside. Primaries; there is a very obscure band of spots crossing the wing at the position of the disk. The spots on the secondaries are more distinctly repeated.

The female expands 17 to 19 mm. The area on the primaries at the end of the disk and between the two bands is usually much lighter in color in this sex and the spots on the secondaries are more pronounced.



Thanaos brizo Boisd. and Lee.

Distribution.—From Canada to Florida and from the Atlantic to Pacific oceans.

Records.—Beulah, Manitoba, V, 5; Vancouver Island, British Columbia, (James Fletcher); Framingham, Mass., V, 8; Arcola, Penna., V, 5; Westville, N. J., VI; Woodbury, N. J., IV, 29; Clementon, N. J., X, 5; Manumuskim, N. J., V, 8; Round Mountain, Blanco County, Texas, III, 25 to IV, 5; Durango, Colorado, V, 21; Stockton, Utah, VI, 1; Silver City, New Mexico, V, 8.

Boisduval (Ann. Soc. Ent. France, (2), X, 310, 1852) records the species from California. Other records: Halifax, Nova Scotia, (T. Belt and J. M. Jones); Quebec, V and VI, (A. F. Winn); Maine, (Fernakl); Pittsburgh,

Penna., (Engel); New York, N. Y., (Beutenmuller); Michigan, (Newcomb); Omaha, Nebraska, IV and V, (Leussler).

Seudder says it is single brooded in the North. In southern New Jersey it is common in the dry sandy districts among scrub oaks.

var. **somnus** Lintner, Papilio, i, 73, 1881.

Described from one male and one female. *Type locality*.—Indian River, Florida. Types in the Edwards collection, Carnegie Museum, Pittsburgh, Penna. Holland, Butterfly Book, pl. 48, fig. 2, male.

Male expands (one wing) 15 to 18 mm.

"Dark brown in color, approaching *T. persius*. Primaries, without the antepical white spot above, and the large patch of bluish-white scales resting on the discal cross-vein of *T. icclus*. The black transverse bands are almost lost in the ground color. Secondaries, nearly as dark as the primaries, showing indistinctly the two rows of pale brown spots."

The female expands 17 mm. and is lighter in color than the male and has a conspicuous patch of whitish scales on the discal cross-vein.

It has thus far been found in Georgia and Florida only.

Records.—Thomasville, Georgia, III, 21 (Morgan Hebard); Georgiana, Indian River, Florida; Ormond, Florida, III, 27; Osprey, Florida, III, 11.

It appears to be a dark, smoky variety of *brizo*. I have been unable to find any essential difference between the genitalia of *somnus* and *brizo*. The females of the two differ more than the males in appearance. I have intermediates in color between the two from southern New Jersey (Clementon, April 24). *Brizo* and *somnus* differ as do some other butterflies that have a northern and southern range as for example *Papilio turnus*, *ajax*; *Limenitis archippus*.

Thanaos callidus Grinnell, Ent. News, xv, 114, 1904, figs. 1, 2, 3, genitalia.

lacustra Sright, Butterflies of the West Coast, p. 253, 1905, pl. 32, figs. 480, 480a.

Grinnell, Ent. News, xvi, 339, 1905 (puts *lacustra* as a synonym of *callidus*).

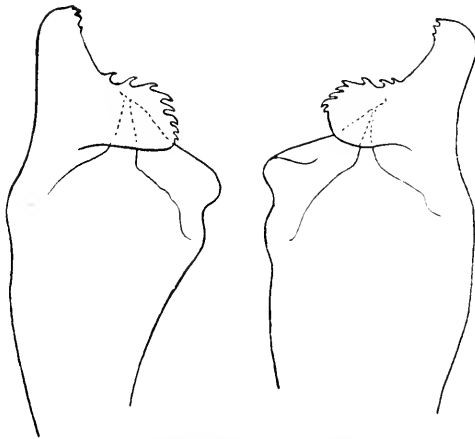
Callidus was taken on Mt. Wilson, Sierra Madre Mountains, Los Angeles Co., California. Altitude 5886 feet, June 6. The types of *lacustra* came from Blue Lakes, California, May 10. Dyar (Journ. New York Ent. Soc., 13, 121, 1905) says, from an examination of the type, that *callidus* is a rather small, narrowly marked *brizo*, with dark ground color. All that I know of this species is the figure given by Wright. It appears to be closely related to *brizo* if it is not the same thing.

Thanaos burgessi new species.

This is allied to *brizo* and looks very much like it in color and maculation but has a different facies that is difficult to describe. Genetically it is quite distinct from *brizo*. The band of spots crossing the primaries in both species is less sagittate in the new species and the secondaries are more nearly immaculate. It has also a greyer look. There is a tendency for the fringes to whiten and in one specimen the fringe is almost entirely white.

Described from seven males and three females from Arizona. Two of these were taken in Arizona in 1883, by H. G. Morrison and the remainder by the same collector at Mt. Graham in that State in 1882. The single type, a male, in the collection of the Academy is from the latter locality.

There have also been tentatively associated with these specimens from Stockton, Utah, VI, 1, (Spalding); Silver City, New



Thanaos burgessi new species

Mexico, V, 18, (Gerhard); Durango, Colorado, V 21, (Oslar); Platte Canyon, Colorado, V, (Oslar). Named in memory of Mr. Edward Burgess who made the original genitalic studies of the genus.

Thanaos persius Scudder, Proc. Essex Inst., iii, 170, 1863.

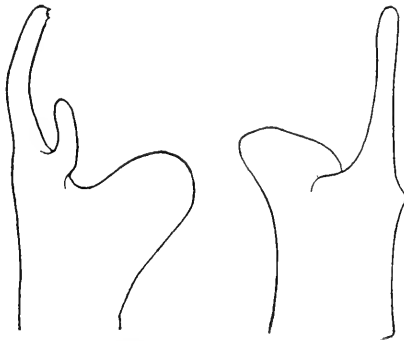
Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 286, 1870 (genitalia).

Scudder, Butterflies Eastern U. S. and Canada, ii, 1468, pl. 9, fig. 1, etc.

Holland, Butterfly Book, pl. 48, fig. 1.

Wright, Butterflies West Coast, 252, pl. 32, fig. 461, male.

"This species is spoken of by Harris as a local variety of *N. juvenalis*, but it is a distinct species; the distinctions mentioned by Harris in the spots on the wings are not persistent, but it differs from *N. juvenalis* in its smaller size, and in the fact that the male and female are exactly alike in the markings, while in *N. juvenalis*, the female differs from the male in having very much larger spots and in the marked ash-grey tints of the apical half of both primaries and secondaries above, differing so much as readily to be taken for a distinct species. *N. persius* has exactly the general appearance in coloration of the male of *N. juvenalis* the distinction of the male and female is marked in Abbott's figures. The description of larva and chrysalis in Harris' Insects apply to this insect and not to *N. juvenalis*, as specimens in his cabinet show. Meadows, somewhat common; early August." (Original description.)



Thanaos persius Scudder.

Type Locality.—New England. Expanse. Male 14 to 17 mm., female 16 mm.

This species has a very wide distribution being found from Alaska to the Gulf of Mexico and from the Atlantic to the Pacific oceans.

Records.—Laggan, Alberta; Calgary, Alberta; Red Deer River, Alberta, VI, 20; Eagle, Alaska, VI, 3; Framingham, Mass., V, 11; Johnston, Rhode Island, VI, 17; Fite's Eddy, Penna., VIII, 20; Westville, N. J., IV, 9; Omaha, Nebraska, (Leussler); Round Mountain, Blanco County, Texas; St. Ignatius, Montana, VI, 28; Southwest Colorado, VII, 14; Fort Klamath, Oregon; Santa Cruz County, California, VII, 30; San Bernardino Mountains, California, VII, (Wright); Riverside, California.

var. **lucilius** Scudder and Burgess, Proc. Boston Soc. Nat. Hist., xiii, 287, 1870, figs. 2L, 2R, 2U.

Lintner, Twenty-third Report New York State Cabinet of Nat. Hist., 162, 1872 (Entomological Contributions, 32, pl. 7, f. 1, 2, 1872).

Scudder, Butterflies New Eng. and Canada, ii, 145S, pl. 9, f. 4, 1889.

Holland, Butterfly Book, pl. 4S, fig. 10. (I think this represents *T. martialis*.)

Expanse. Male 14 mm., female 15 mm.

"Smaller than *persius*. Conspicuous cinereous patch enclosed between vitreous spots of the fore wings—scarcely more than indicated in *persius*. Lighter gray hue of apical half of fore wing, submarginal row of dark spots recedes less from outer border of lower half of fore wing than in *persius*." (Scudder, Butterflies New Eng., ii, p. 1462.)

The following distribution is given by Scudder. London, Ontario; Yellowstone Park; Holyoke Range, Amherst, Andover, Princeton, Boston, Springfield, Cape Cod, Wood's Hole in Massachusetts; New Haven, New Britain, Guilford, Connecticut; Michigan (Newcomb).

Lintner says it is a common species at Schoharie, New York and also gives the following data for captures during the year 1870. Bethlehem, Albany Co., New York, May 16, July 9, 28, August 26, September 9, 14. Centre, New York, July 6. On August 25 and 28, five butterflies were obtained from larvae collected at Bethlehem. September 9, young larvae were taken. He says there are two annual broods and possibly a third. The transformations are described (Lintner, Thirtieth Report of the New York State Museum of Nat. Hist., for the year 1876; Ent. Contributions No. 4, p. 67). Larvae reared on *Aquilegia canadensis*.

Strecker (Catl. Amer. Macrolep., 187, 1878) considered *lucilius* a variety of *persius*.

Scudder quotes Edwards as having reared it on pig-weed (*Chenopodium album*). He also figures the male in color (Butterflies E. U. S. and Can., iii, pl. 9, f. 4). Lintner in describing the species gives the following differences between it and *persius*. "The males of the two species are not liable to be confounded. In *persius* the anterior wings are of a uniform fuliginous hue, and consequently much less conspicuously marked than those of *lucilius*. The hyaline spots are smaller and less constant. Very rarely are there two of these spots present between the median nervules; often the apical ones only appear, and occasionally these are obsolete."

Beutenmuller (Bull. Am. Mus. Nat. Hist., v, 300, 1893) gives descriptions of the larvae and chrysalis, and the food plants as Wild Columbine (*Aquilegia*) and *Chenopodium*.

Lucilius and *persius* compared. I have never been satisfied that we had two species represented by these names. The records and distribution given for them would seem of doubtful value as

evidence of two species on account of the difficulty of differentiation and the probability of misidentification. The difference in the recorded food plants may mean much or it may mean nothing as butterflies have a number of food plants. Further studies of the life histories appear necessary to establish specific identity. The only tangible differences I can find to separate them are first—*lucilius* is smaller; second—If a line be drawn from the costal vitreous spots to the inner margin it will divide a lighter colored area. On the inner side this gives the appearance of a lighter spot which is absent or faintly indicated in *persius*.

The question of broods is not settled as there are late records for *persius*. The vitreous spots vary alike in each and give no help. There may be none, one or two, below the costal spots, in both *lucilius* and *persius*. I have not been able to discover any tangible differences in the genitalia of the two and must conclude that the question as to whether we have to deal with a single species and a variety, or with two species, is still in doubt.

var. **afra**nianus Lintner, Thirtieth Report N. Y. State Cabinet of Nat. Hist., 175, 1878 (Ent. Contributions No. 4, p. 63, 1878).

Elrod, Butterflies Montana, p. 150, fig. 110.

Biologia Centrali-Americana, Lepid., ii, 459, tab. 91, figs. 24, 25, 26.

“Thorax and abdomen above, black; beneath, with brown hairs. Palpi clothed with long brown hairs. Legs fuscous. Primaries with the costal margin nearly as straight as in *N. persius*, but rounded toward the apex; moderately bent basally. Outer margin more rounded than in any male *Nisoniades* known to me (the females, as a rule, having more rounded wings), as much so as in *N. brizo* female. Inner angle rounded, with internal margin short. The usual black markings in the basal region of the wing; the remainder clouded with brown, distinctly relieving the transverse line of elongated black spots and the row of rounded submarginal black spots; a few gray scales are sprinkled over the brown ground. The black spots of the transverse band above vein two are more elongated in proportion to their width, more acute toward the outer margin, and more sharply defined than in any other species—even than in *N. ausonius*. The line of four small, antepical, white, hyaline spots is sensibly drawn inward toward the base, so that an imaginary line traversing these spots will cut the outer margin within its apical half. A white hyaline spot rests on the black spot in cell three, and the three black spots in cells two and one b, have some grey scales centrally. There is a trace of a small whitish, hyaline, discal spot. The terminal margin is without the black line seen in *N. martialis*. Secondaries, dark umber-brown with the two rows of brown spots, similar to those in *N. persius* female. Wings beneath, a rich umber-brown, showing on the primaries the discal and antepical spots more plainly above, and a white

spot each in cells three and two. The rows of pale brown spots on the secondaries are strongly relieved by the dark ground. The margins of the wings bear a black marginal line, obsolete toward the apex of the primaries. Expanse of wings 1.10 inch; length of body 4.08 inch. Habitat Colorado." Described from a single example.

I am unable to separate this from *persius*. Differences in the genitalia have not been found. It may be considered a light colored variety of *persius*.

Records.—Yosemite, California (Dyar); Arizona, 1883, (Morrison); Prescott, Arizona, VII, VIII, IX; Northern Sonora (Morrison).

var. **pernigra** Grinnell, Ent. News, xvi, 14, 1905.

"Upperside: primaries entirely blackish-slate, with a very thin sprinkling of grayish hairs; three very small, white dots arranged diagonally, in the costo-apical part of the wing. Secondaries: entirely seal-brown, with long hairs along the inner margin and basal part of wing. Underside of both wings entirely Van Dyke brown; three costo-apical white spots visible through the wing. Abdomen and thorax same color as adjacent parts of the wings. Palpi clothed with long hairs. Antennae entirely of same color as the primaries on the upperside.

Habitat: Mt. Tamalpais, Marin Co., California. Collected by Mr. F. X. Williams, May 19, 1904, in Mill Valley, on the slopes of Mt. Tamalpais. Only a few were captured but others were seen; the species is no doubt extremely local in distribution. Type 1 male, to be deposited in the collection of the California Academy of Sciences."

"This species is very distinct from any other by its small size, and very dark, almost uniform color. Owing to a curious asymmetry in the clasps of the single male I possess, the description of these organs will have to be deferred till more specimens are available."

Of course the asymmetry Grinnell describes is the normal condition in this genus. We have two males from the type locality, taken May 27 and 28 and presented by Mr. F. X. Williams. *Pernigra* is evidently a dark form of *persius*. Dyar (Journ. N. Y. Ent. Soc., XIII, 121, 1905) says *pernigra* represents the eastern *persius* in California, but is separable therefrom by the very dark coloration.

Thanaos lifius Dyar, Proc. U. S. National Museum, xxvii, 788, 1904.

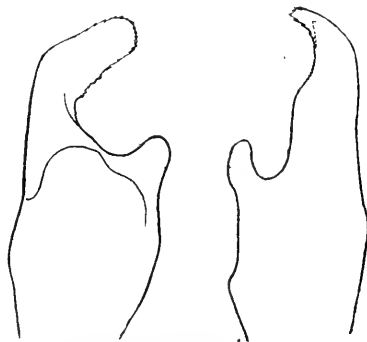
"Two specimens, May 31, June 4. This form resembles *lucilius* Lintner, but is larger, the wing more variegated with brown, which shows distinctly in a patch at the end of the cell, cut by an erect dark line on the cross vein. Otherwise it is very similar. The size is that of *martialis*, but the markings are diffused and not as contrasted as in that species. It is the western representative of *lucilius*, probably a geographical race of it, but is as much entitled to specific rank as several other species of the genus. I have speci-

mens from Easton, Washington (Koebele), and Yosemite Valley, California, June 16th and August 5th (Dyar.) Type. Cat. No. 7333, U. S. National Museum." (Original description.)

Dr. Dyar's specimens were from the Kootenai district of British Columbia. Our specimens were received from Mr. J. W. Cockle and were taken at Kaslo, B. C., June 20 (male) and June 5 (female). Also a specimen from Fort Klamath, Oregon. We also have a specimen from Westville, New Jersey, that is almost identical with the Kaslo specimens. The genitalia are like those of *pacuvius* and it is also like the latter in maculation except that the fringe is black.

Thanaos martialis Scudder, Trans. Chicago Acad. Sci., i, 335, 1869.

"This butterfly is most nearly related to *N. persius* Scudder, and agrees with it in size; it differs from it in the great distinctness and definition of the darker markings upon the upper surface of the wings; in the distinctness with which the markings of the under surface of the secondaries can be seen upon the upper surface; in the sagittate character of the submarginal row



Thanaos martialis Scudder.

of spots upon the under surface of the secondaries; and in the usually brighter color of the tips of the antennae. The specimens were taken on the open prairie and were most abundant in the latter part of July. 9 males, New Jefferson, July 21-24th. One male, lower half of Dallas county, in the early half of August (worn.)" (Original description.) The localities given are for the state of Iowa.

Expanse. Male 13 to 15 mm. Female 16 mm.

Distribution.—Atlantic states to Florida. Westward to Colorado and Arizona.

Records.—Centre, New York, V, 3 and 27, VI, 11; Harvey's Lake, Penna., VI, 16; Reading, Penna., VII, 29; Woodbury, N. J., IX, 5; North Carolina;

Fulton County, Georgia, VII, 14; Omaha, Nebraska, V and VII, (Leussler); Chimney Gulch, Colorado, VI, 20. (Osler); Clear Creek Canyon, Colorado, VI, 11, (Osler); Mount Graham, Arizona.

Thanaos ausonius Lintner, Twenty-third Report New York State Cab. Nat. Hist., 166, 1872, figs. 11, 12, pl. 7.

Cook (Journ. New York Ent. Soc., xv, 125, 1906), puts *ausonius* as an aberration of *martialis*. There is no doubt but that Mr. Cook is correct in this. *Ausonius* has never been found since it was originally described.

Thanaos juvenalis Fabricius, Ent. Syst., iii, 339, no. 291, 1793.

Butler, Catl. of Diurnal Lep. described by Fabricius, in the collection of the British Museum, p. 287, 1869. ("Georgia. From Mr. Milnes' collection." British Museum.)

Smith and Abbot, Ins. Georgia, pl. 21, 1797. (A male *Thanaos* is figured and is like *brizo* and has no vitreous spots. The female figured may be *horatius*, *juvenalis*, etc. The larvae is figured.)

Boisduval and Leconte, Lep. Amer. Sept., t. 65, f. 1, male, f. 2 (underside), fig. 3, female, f. 4, larva, f. 5, chrysalis. This represents *juvenalis* as treated in the present paper.

Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 279, 1870 (genitalia). Scudder, Butterflies East. U. S. and Can., ii, 1476, pl. 9, f. 13, 14, 1889.

Holland, Butterfly Book, pl. 48, fig. 11, female.

Wright, Butterflies West Coast, pl. 32, f. 462 (probably the female of *properlius*).

enniuis Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., 13, 296, 1870 (genitalia).

The original description of *juvenalis* is as follows . . . "Alis ecaudatis fuscis: anticis atro maculatis alboque punctatis. Habitat in America. Dom. Jones. Statura omino *H. Flefi*. Alae omnes supra fuscae.

Anticae maculis atris punctisque albis, sparsis, posticae striga submarginali e maculis cinereis, puncto atro notatis, subtus concolores.

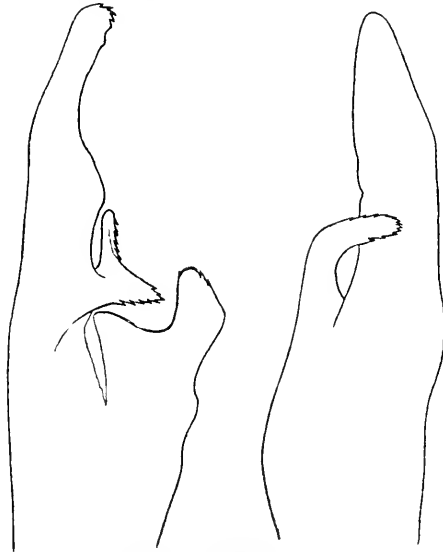
Papilio juvenalis. Jon. fig. piet. 6. tab. 78, fig. 1."

Wings dark brown without tails. Anteriors with black spots and white points. Size of *H. flefi*. All wings fuscous above. Anteriors with black spots and a few white points. Posteriors with submarginal streaks and cinereous spots, marked with a black dot, below concolorous. (Translation.)

Distribution.—Vancouver; Ontario; Quebec; Maine to Florida; Mississippi Valley.

Records.—Framingham, Mass., VI, 4; Cumberland Mills, Rhode Island, V, 11; Johnston, Rhode Island, V, 21 to 25, VI, 179 Philadelphia, Penna.; Pittsburgh, Penna.; IV, 23; South Amboy, N. J., V, 5 to 15; Riverton, N. J., V, 9; Camden, N. J.; Westville, N. J., IV, 3; Clementon, N. J., V, 5 to 18; Iona, N. J., IV, 30; Manumuskim, N. J., V, 8; North Carolina; Thomasville,

Georgia, III, 25; (M. Hebard); Biscayne Bay, Florida, (Mrs. Slosson); Carbondale, Illinois, IV, 15; Omaha, Nebraska, IV, 3 to IX, 7, except VII, (Leussler); Highrolls, New Mexico, VI, 13.



Thanaos juvenalis Fabr.

Thanaos propertius Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 298, 1870 (genitalia).

tibullus Scudder and Burgess, l. v., p. 299.

Lintner, Papilio, i, 71, 1881.

Wright, Butterflies West Coast, pl. 252, pl. 32, fig. 463.

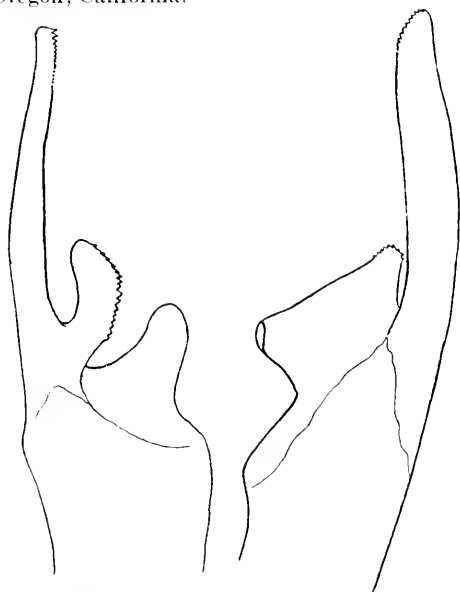
"Size of *N. juvenalis*: the primaries more pointed; the submarginal row of sagittate and black spots is more oblique, being more drawn inwardly toward the base as it approaches the internal margin, whence it follows that, while in *juvenalis*, of the two subelliptical whitish spots in cell 1b, the lower one is as near to the outer margin as that in cell 3; in this species it is always further removed. The hyaline spot in the discal cell is smaller than in *N. juvenalis* and is much less conspicuous underneath. Of the four costapical hyaline spots, 1, 3 and 4 are in line, or 3 is somewhat nearer to the base of the wing; 2 is nearer the apex and is elongated. The thorax and abdomen are fuscous, instead of umber-brown. In general color it is darker, more approaching *N. persius*—the black spots not offering so strong a contrast with the ground as in *N. juvenalis*: the primaries are nearly covered with bluish hairs, which is perhaps the best characteristic feature of the species."

This is Professor Lintner's description from the material in the Scudder collection. He says it is very doubtful if the genitalia

form *N. tibullus* of Scudder and Burgess can be separated from *propertius*.

Distribution.—The original description cites California as the locality. Lintner says he examined eight examples in the Scudder collection, two from Mokiah Pass, Palmer Collection; one from Sierra Nevada; four from California; one from the Juniper Mountains. I do not know where Mokiah Pass is. There are Juniper Mountains in Oregon, Nevada and Arizona.

Records.—Southwestern Colorado, VII, (Oslar), (Tolman); Payson Canyon and Stockton, Utah, VII, 4. (Spalding); Corfield, Vancouver, V. 12 to 19; Umatilla, Oregon; California.



Thanaos propertius Scudder and Burgess.

Thanaos horatius Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 301, 1780 (genitalia).

Scudder Butterflies N. England and Can., ii, 1486, pl. 9, f. 7, 10, 1889.

Holland Butterfly Book, pl. 48, f. 15. This is a female and probably does not represent the species.

virgilius Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 302, 1870 (genitalia).

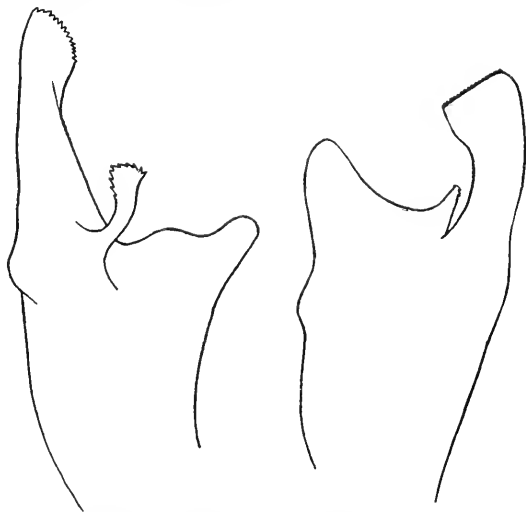
petronius Lintner, Papilio, 1, 70, 1881.

Lintner's description of *petronius* ends with the following comparisons: "Described from four males and one female from the Indian River, Florida.

This is the largest species known to us in the genus. It is separable from *N. juvenalis* and *proportius* by its darker color, less distinct ornamentation, less rounded wings, absence of the white spots of secondaries in cells six and seven. From *N. naevius* with which it is associated, it is distinguished by its larger size, more distinct markings and contrasting lighter shade of the palpi."

Distribution.—From Connecticut to Texas and westward to Missouri, Colorado and Arizona.

Records.—Amherst, Foxboro, Andover and Boston, Mass.; Avon, Hartford County, Connecticut, (R. C. Williams); New Haven, Connecticut; Beaver Dam, Pike County, Penna., VII, 17; Little Log Tavern, Pike County, Penna., VII, 20; Childs Park, Pike County, Penna.; Philadelphia, Penna., VII, 17; Elizabeth, N. J., VIII, 8; Jamesburg, N. J., VII, 4; Mount Holly, N. J., VII, 4; Westville, N. J., IV, 30; Woodbury, N. J., V, 4; Ateo, N. J., IX, 4; Manumuskin, N. J., V, 8; Maryland; District of Columbia; Cranberry,



Thanajos horatius Scudder and Burgess.

N. C., VII, 4 to 8, (Thomas); Wilmington, N. C., III, IV, 26, Isle of Pines, South Carolina, VII; Thomasville, Georgia, III, 18 to 21, (M. Hebard); Central Florida; Indian River, Florida; Georgiana, Florida; Miami, Florida, I, 4, II; Nashville, Tennessee, VI, 20; Dakota; Omaha, Nebraska, VII, IX, X, (Leussler); Eureka Springs, Arkansas, VII; Mississippi; Round Mountain, Texas, IX, 4; Durango, Colorado, VII, (Oslar); Prescott, Arizona, VII, 8 to VIII, 4.

The type localities were New England and Texas.

This is a very common species in southern New Jersey. It has been confused with *juvenalis*.

Thanaos terentius Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 292, 1870.

Scudder, Butterflies New Eng. and Can., ii, 1490, pl. 9, f. 15, 1889.

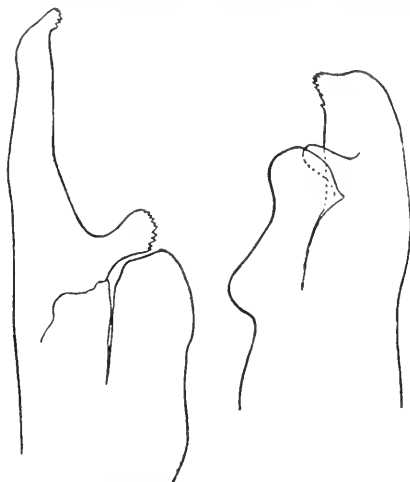
ovidius Scudder and Burgess, Proc. Bost. Soc., Nat. Hist., xiii, 295, 1870.

naevius Lintner, Papilio, i, 69, 1881.

Lintner in his description of *naevius* says, "This may possibly be the *N. terentius* of Scudd.-Burg., based on the genital armature; but as the differences presented between the genitalia of this species, which have been carefully observed, and those of *N. terentius* are described and illustrated, are greater than those which serve to separate other of the genitalic species, it would not be proper to accept the two as identical."

The males (one wing) expand 16 to 18 mm.

This is a dark, smoky species with none, one, or sometimes two small vitreous spots, below the ordinary costal series, the latter



Thanaos terentius Scudder and Burgess.

numbering, sometimes three and sometimes four, otherwise the wing is nearly immaculate. The species is very close to *horatius* in appearance, but the latter is larger, lighter in color and the markings less obscure. The type locality was Florida and the types of *naevius* Lintner were three males collected at Indian River, Florida.

Distribution.—According to Scudder the species is found from Connecticut and Massachusetts to Florida.

Records.—Wilmington, North Carolina, VII, 13; Morganton, North Carolina, (Morrison); Isle of Pines, South Carolina, VII; Atlanta, Georgia; St. Augustine, (Johnson); Sanford, Key West, Miami, I, 20 to 30, II, 6,

Florida; Texas. Also specimens from Georgiana, Indian River, Florida; Omaha, Nebraska, IV, V, VII, IX, (Leussler.)

Thanaos pacuvius Lintner, Thirtieth Annual Rept. New York State Museum Nat. Hist., 1876 (Entomological Contributions, No. 4, p. 60, 1878). Godman and Salvin, Biol. Cent. Amer., Lepid., ii, 458, 1899, t. 91, figs. 16, 17. male.

Holland, Butterfly Book, pl. 48, f. 9, female.

"Head and palpi thickly clothed with bristling brown and gray hairs, the obtuse tip of the third joint of the palpi only visible; antennae brown above, the joints bordered with white beneath and within. Thorax and abdomen beneath with long brownish hairs; legs brown with pale hairs at their joints. Wings approaching those of *N. persius* in shape, but the primaries somewhat narrower.

Primaries umber-brown, mottled with black as in *martialis*; near each extremity of the cell, conspicuously marked with a large black spot, the outer one having the hyaline white cellular spot on its outer margin. A row of black spots cross the nervules, upon which are the following white hyaline spots; four costo-apical ones, of which the costal one is scarce more than a dot, the second the largest and quadrate, the third and fourth quite small with their longest diameter in the direction of the breadth of the wing; in cells two and three each, a triangular spot with the apex directed toward the outer margin of the wing—that in cell two but partially hyaline; in cell 1b, two triangular spots (not hyaline), marked with white scales so obscurely in the somewhat imperfect specimen, that possibly they may prove to be a constant feature. Some white hairs and scales separate this row of black spots from a subterminal row of rounded black spots, which is again separated by a few similar white scales from the black terminal margin. Fringes umber-brown, their base cut by some white scales projected from the black margin.

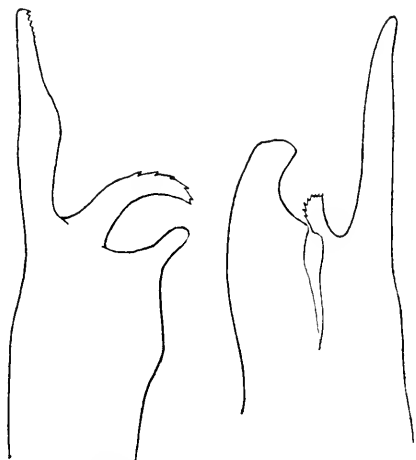
Secondaries fuscous, faintly marked by some brown spots and an indistinct subterminal row of brown dots. Fringes snow-white with some brown-scales of the terminal margin cutting their base, and at the apical angle of the wing, extending nearly to their outer edge.

Beneath, primaries pale brown, the hyaline spot in cell 3 showing conspicuously, and with white scales covering the extreme apical portion of the wing. Secondaries reddish brown basally and medially, with a double row of pale brown spots before the outer margin between veins 1b and 4. Fringes as above. Expanse of wings 1.38 inch. Length of body .58 inch. Habitat, New Mexico. Described from one male in the collection of Mr. W. H. Edwards." (Original description).

"This species may be recognized among all those of the genus known at present, by the white fringes of the secondaries, less sharply defined at their base than in *N. tristis*, by its smaller size, less pointed primaries and a less projected anal angle of the secondaries than in that species" (Lintner).

Distribution.—I have only seen this species from Colorado, New Mexico and Arizona. It appears to be two brooded.

Records.—Chimney Gulch, Golden, Colorado, IV, V, (Oslar); Platte Canyon, Colorado, VIII (Oslar); Southwestern Colorado, (Tolman); Mt. Graham, Arizona (Morrison); Carr Canyon, Arizona, VIII (Skinner); Reef, Arizona, IX, (Biederman); Jemez Springs, New Mexico, VI, 13 to 26, (Woodgate).



Thanaos pacuvius Lintner.

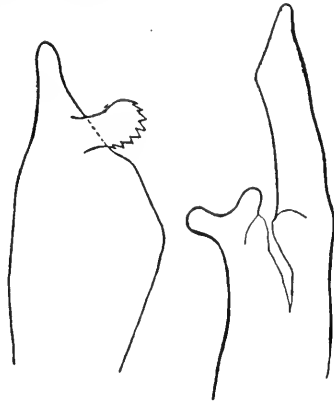
***Thanaos scudderi* new species**

Male.—Expanse 9.5, 12.5, 13.5 mm. One of the specimens is probably abnormally small (9.5 mm). Upperside. Primaries with the usual four costo-apical vitreous spots, and below these a single spot and another at the end of the discoidal cell. The markings are otherwise essentially those of *pacuvius* and *clitus* except that the latter two usually have two spots below the costal four. The secondaries are dark brown with white fringes. The undersides of the wings are marked in the usual way and present no marked difference from the allied species. The genitalia show that this is a very distinct species and readily separated from the others. A large series may show good maculation characters to separate it from *pacuvius*.

Described from five specimens taken by H. K. Morrison, at Fort Grant, Arizona in 1883.⁶

⁶ "Morrison's sets, when sent abroad, were usually labelled 'Sonora,' and have thus been included in the Biologia Centrali-Americana. When sent to American workers, however, they are labelled 'Arizona.' They were probably all made, however, in the Graham Mountains, near Ft. Grant (Arizona), and above Ft. Huachuca." Schwarz, Proc. Ent. Soc. Wash., iv, 209, 1897.

The type, including the genitalic mount, is in the collection of the Academy of Natural Sciences of Philadelphia.



Thanaos scudderi new species.

Thanaos tatus Edwards, Papilio, ii, 179, 1882.

Edwards, Papilio, iii, 65, 1883.

Male.—Expands 1.6 inch. “Upper side of primaries umber-brown, blackish on disk and to base, the outer limb free from white scales; on outer edge of disk towards costa a light brown patch; on costa four sub-apical silvery dots, in a zigzag line; one such dot in upper median interspace, and one, rather obscure, against end of cell; along hind margin a row of small patches of bluish-white scales; the usual (in this genus) extra-discal band is made up of large lanceolate and elongated black spots, separated, each edged on the outer sides by bluish-white scales, which scales form a conspicuous serrated line across the wing.

Secondaries black-brown with an indistinct series of lighter patches beyond the disk; fringes of primaries concolored; of secondaries white, cinereous at outer angle.

Under side of primaries lighter, the spots repeated, the one against cell distinct; along hind margin a row of white points, and at inner angle a white patch; beyond the disk an indistinct series of whitish patches, almost obsolete in the middle of the wing; the apical area dusted white. Secondaries uniform blackish-brown; along the edge of hind margin a macular white band represented by dots on the upper half.

Body above dark brown, beneath same, but the thorax with many grey hairs; legs dark brown with dull white hairs interspersed; antennae black, on the underside ringed white; bulb black above, under side and tip ferruginous. From a single male. This fine species is readily distinguished from any of the white-fringed allies by the pure brown color of the marginal area of primaries, with no dusting of white, and by the conspicuous extra-discal band and its whitish serrated edging.” (Original description.)

Type locality.—Mt. Graham, Arizona. The type of this species is not in the Edwards collection, now in the Carnegie Museum at Pittsburgh, Penna. I do not know this species.

Thanaos clitus Edwards, Papilio, ii, 180, 1882.

Edwards, Papilio, iii, 65, 1883.

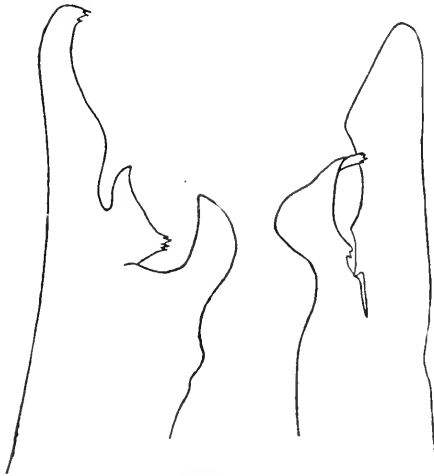
maestus Godman and Salvin, Biol. Cent.-Amer., Lepid., ii, 457, 1889, pl. 91, fig. 18, male.

tristis Staudinger (not Boisduval), Exot. Schmett., pl. 100.

Holland Butterfly Book, pl. 45, f. 8, male.

Wright, Butterflies West Coast, pl. 32, no. 464 is the female of *funeralis* and not *clitus*.

Male.—Expands from 1.5 to 1.7 inch. Upper side of primaries umber-brown so much dusted with whitish scales and clothed with white hair as to



Thanaos clitus Edwards.

discover the ground color only in small patches, as along the hind margin, and also a little within the margin and on basal area the usual extra-discal spots are black, on the upper half of the wing long, acute, below broad, lanceolate; on middle of disk a broad, black cross band, reaching inner margin, and the basal area is mottled with black; a clear brown, but not well defined patch, at end of cell; on costal margin four sub-apical diaphanous dots, three in straight line, the fourth a little inside; a similar dot in upper median interspace, and one at the end of cell. Secondaries uniform, black-brown; fringes of primaries black-brown, of secondaries white, cinereous at outer angle.

On under side the spots are repeated, a little enlarged; primaries have a marginal row of white points, sometimes meeting; also an extra-discal series of light-brown patches more or less dusted with white scales; in some ex-

amples, however these also are wanting, unless next inner margin, and the whole limb is thinly white, through which runs a submarginal series of brown patches; in all cases there are many white scales over apical area. Secondaries immaculate, except for a few whitish points along posterior part of hind margin, which sometimes are developed into a white macular band. Body above black-brown, thorax and abdomen beneath grey-brown; legs dark brown, with ferruginous hairs on under side; palpi dark brown, the tips of the hairs whitish; antennae black, on under side slightly annulated white; club black above, ferruginous below and at tip. From six males. This species is allied to *tristis* Bd."

Type locality.—Mt. Graham, Arizona (Morrison).

All my specimens are from Arizona, most of them from the type locality. The Mexican localities mentioned in the *Biologia* are Pinal and Puebla. Godman and Salvin also had Arizona material taken by Morrison.⁷ A single pair recently received are from Chimney Gulch, Golden, Colorado, VI, (Osler).

Thanaos tristis Boisduval, Ann. Ent. Soc. France, (2), x, 311, 1852.

Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 303, 1870 (genitalia).

Lintner, Thirtieth Report New York State Mus. Nat. Hist., 173, 1878 (Ent.

Contributions, 4, 62, 1878).

Godman and Salvin, Biol. Cent.-Amer., Lepid., ii, 457, t. 91, f. 15 (male genitalia).

Wright, Butterflies West Coast, p. 253, pl. 32, f. 469. This represents a male and not a female. It may or may not be *tristis*.

Oberthür, Etudes Léop. Comparée, ix, pt. 1, pl. 240, fig. 2081.

"Wings dark fuscous; the superiors with a central spot, transverse, whitish; the inferiors with a white border. It has the shape and size of *juvenalis*. Wings dark brown, with the border of the inferiors white. The superiors with a few darker undulations, as in the allied species and presenting on the middle a small whitish spot, followed by a curved line of six similar points, separated into two groups, the one of four, near the edge, the other of two, below the median nervure. The under side paler than the upper. In this species, as in *juvenalis*, the small points are placed on some obscure nervures. From California." (Translation of original description.)

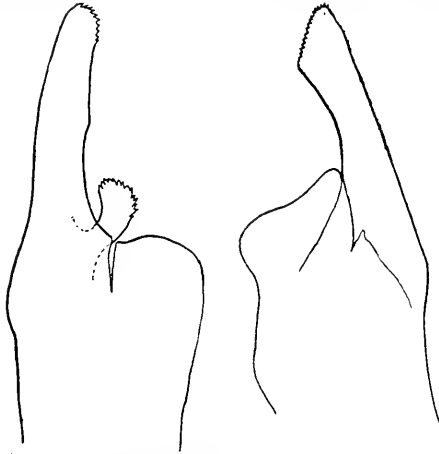
Distribution.—California, Arizona and Texas.

Records.—Fairfax, Marin County, California, IX, 12, (Huguenin); Santa Cruz Mts., Santa Clara County, California, IX, 1, (Huguenin); Palo Alto, California, IX, 22; Ben Lomond, California, IX, 20; Arizona, (H. K. Morrison), 1883; Goldwad, Arizona, X, 25, (Haskin); Southern Arizona, (Poling).

Genitalia from specimens I have examined agree with the figures of the genitalia figured by Scudder and Burgess and Godman and Salvin. *Funeralis* is such a common species in California that I

¹ See footnote on page 215.

thought that *tristis* Boisduval might be the same as the *funeralis* of Scudder and Burgess, but since Mons. Oberthür has figured the type of *tristis* we can be reasonably certain that no error has been made, although to make the matter absolutely certain an examination of the genitalia of the type of *tristis* should be made. The fixation of a single type has become a necessity for systematic work. The following interesting communication has been received from Mr. F. D. Godman, "I have lately received from Mons. Oberthür his fascicule 9, *Etudes de Lépidopterologie Comparée* and have in it read your letter to him. I see you are in some doubt whether *Thanaos funeralis* Scudder, is not the same as *T. tristis* Bois. In



Thanaos tristis Boisduval.

the 'Biologia' I figured the genitalia of the two species which, as may be seen, t. 91, differ considerably. The only point was whether I had the true *T. tristis* from Durango (Mexico) and I therefore figured a male Californian specimen, having only Mexican females. Mons. Oberthür's figures of *tristis* (type) is identical with my Californian specimens dissected, and I therefore think there can be no doubt about the distinctness of the two species. I hope this note may help to solve your difficulty."

Thanaos funeralis Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 293, figs. 7L, 7U, 7R, 7Ub, 7Rb. 1870. Described from genitalia alone. Type locality: Texas.

Lintner, Thirtieth Report New York State Mus. Nat. Hist., 173, 1878 (Ent. Contributions, 4, 61, 1878).

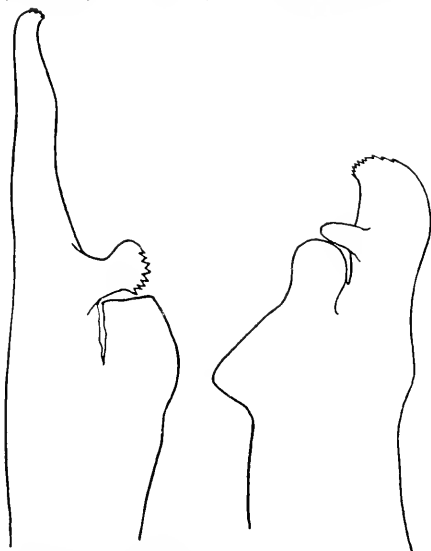
Godman and Salvin, *Biologia Cent-Amer.*, Lepid., ii, 456, t. 91, figs. 10, 11, 12, male, 13, 14, female.

Holland Butterfly Book, p. 336, pl. 48, fig. 12, male.

Wright, *Butterflies West Coast*, pl. 32, f. 468, female and fig. 464, female (not *clitus*).

Distribution.—Colorado, Utah, New Mexico, Arizona, Texas, California; Mexico; Central America; Colombia.

Records.—Platte Canyon, Colorado, V, VII, (Oslar); Chimney Gulch, Golden, Colorado, VI, (Oslar); Southern Utah, (Poling); New Mexico, (Snow); Bastrop, Texas, (Lintner); Round Mountain, Blanco County,



Thanaos funeralis Scudder and Burgess.

Texas, VI, 23, (Schaupp); New Braunfels, Texas, (Schaupp); Southwestern Texas, (Aaron); Rio Grande, Texas, (Lintner); Jerome, Arizona, IX, 9, (Haskin); Goldwad, Arizona, IX, 19, (Haskin); Florence, Arizona, (Biederman); Reef, Arizona, X, 11, (Biederman); Carr Canyon, Huachuca Mountains, Arizona, VIII, (Skinner); Mount Graham, Arizona, 1882, (Morrison); Los Angeles County, California, IV; Soldiers Home, Los Angeles County, California; Burbank, California, IV, 9, (Haskin); San Bernardino, California, VI; San Diego, California; Nogales, Sonora, Mexico, VIII, 12, (Calvert); La Joya, Mexico, VIII, 10, (Hoag); Colima, Mexico.

The early date of the Colorado record may be incorrect.

Expanse 17, 19, 20 mm.

This species is appropriately named as it is very dark and sombre looking with few markings and has a conspicuous pale patch on

the primaries beyond the cell. The white fringe on the under side of the secondaries extends to the apex of the wing. It has a much wider distribution than was formerly supposed. It would be interesting to know its northern limit in California and its relation to *tristis* from the standpoint of distribution.

Nisoniades plautus Scudder and Burgess, Proc. Bost. Soc. Nat. Hist., xiii, 304, 1870, figs. 16L, 16R, 16LB., 16Rb.

Type locality.—Florida. From the peculiar construction of the right harpe (fig. 16R) I doubt that this species belongs to the genus *Thanaos* and at present I have been unable to recognize the species.

Nisoniades llano Dodge, Can. Ent., xxxv, 78, 1903.

Dyar (Journ. New York Ent. Soc., xiii, 119, 1905), says he examined the type of *llano* and the species was *Chiomara gesta* Herrich-Schaeffer. See Biol. Cent. Amer., Lepid., ii, 455, t. 91, figs. 7, 8, 9, male. *Distribution*.—Texas, Mexico, Central America, South America, Cuba, Jamaica.

Nisoniades protillo Lucas, Sagra, Hist. Cuba, 461, 1856.
Doll. Ent. News, xv, 351, 1904. Brownsville, Texas.

This belongs to the genus *Cabares*, Biol. Cent. Amer., Lepid., ii, 337, t. 80, figs. 24, 25, 26, 1894. *Distribution*.—Texas, Mexico, Central America, South America, Cuba, Jamaica.

The species may be listed as follows:

icelus	horatius
brizo	<i>virgilius</i>
var. <i>somnus</i>	<i>petronius</i>
callidus	propertius
<i>lacustra</i>	<i>tibullus</i>
burgessi	clitus
persius	tatius
var. <i>pernigra</i>	terentius
var. <i>lucilius</i>	<i>ovidius</i>
var. <i>afranius</i>	<i>naevius</i>
martialis	funeralis
<i>ausonius</i>	tristis
juvenalis	lilius
<i>ennius</i>	pacuvius
	scudderi

ON A COLLECTION OF CRANE-FLIES FROM BRITISH GUIANA (TIPULIDAE, DIPTERA)¹

BY CHARLES P. ALEXANDER

Ithaca, New York

The present paper is the result of the study of an extensive series of crane-flies collected in British Guiana by the well-known entomologist, Mr. H. S. Parish, during 1912 and 1913. The material at hand consists of some 1200 specimens representing fifty-five species of which twenty-four are herein considered as new. Unless stated otherwise the specimens were taken at light as explained under Mr. Parish's account of his trip. The habit of many of the species of ovipositing at twilight or during the night explains why so many of the individuals secured at the lights were females.

The types and uniques are deposited in the collection of the author. Paratypes of several of the species have been placed in the collections of the United States National Museum, the Hungarian National Museum, the Academy of Natural Sciences of Philadelphia and the Museum of Comparative Zoology.

Mr. Parish's Account of the Trip:

I boarded my steamer at New York and after a journey lasting seventeen days I arrived at Georgetown, the capital of British Guiana, on November 28, 1912. On the second day after my arrival at Georgetown I caught the river boat that plies between there and Bartica, which latter place I reached after a pleasant trip of about 40 miles up the Essequibo River. Bartica is a pretty little village having a population of between 800 and 1000 including the Indians. The weather there is, on the whole, rather uncertain though one can generally depend on a little rain every day, excepting from September to November, during which months the rainfall is very slight. However, as I remarked above, one cannot place any dependance on the weather and it is well for the prospective collector to include in his impedimenta a good waterproof cape and an umbrella as a safeguard against fever and for his personal comfort.

¹ Contribution from the Entomological Laboratory of Cornell University.

This colony is thickly covered with forest, in the interior abounding in valuable hardwoods. The house at which I stopped while at Bartica was about 150 yards from the forest and formed an ideal location for one employed in my vocation. This house had two floors; the one on the second, facing the woods, was fitted with a gallery or balcony in which there were several windows. Darkness falls very quickly here, there being but little twilight, so that as soon as the sun set I would repair to the balcony I have described above and make preparations for the evening's work. The method I adopted was to hang a sheet under my oil-lamp that is provided with a reflector, thereby proving a great attraction for various insects. Then with net in hand and cyanide bottles within easy reach, I was ready for my evening's catch, that is to say as ready as is possible, for within an hour they were trooping in a good deal faster than I could handle them. Sometimes there would be as many as fifty or even one hundred crane-flies flying against the ceiling, besides numerous moths, beetles, etc. It was truly a happy hunting ground for the enthusiastic collector and one, much to the disgust of my landlord, from which I could hardly tear myself away.

My time for rising was six A. M. and from then on until eleven A. M. I would employ my time in drying, papering or pinning the specimens that I had captured on the previous day and night. From half past eleven until after five in the afternoon, I would go afield for specimens. My experience is, that for successful crane-fly collecting, one should select damp, shady spots, most of the species being found in such places though some are found on hilly ground. I never saw the crane-flies swarming as I have noticed them doing in Toronto, excepting at Mallali and then only three or four together.

After leaving Bartica I went back to Georgetown and from there took a steamer to Wismar which is the highest point at which the Demerara River is navigable by that steamer. I remained over night at this place and then took a smaller steamer for Mallali that is about 175 miles from the starting point. On steaming up the Demerara River, I noticed that almost all of the tall trees were dead, caused by the terrible forest fires that raged through the country a few years ago. These fires burned up everything, destroying all animal life for miles around and it is only now that the vegetation is springing up again. This was a great disappoint-

ment to me, as having visited this country before and having found a great variety of insect life, I had counted upon this to be so again. I had intended to push on further into the interior and I would have done so only for my becoming ill, which put an end to all my plans. In the meantime and before I was taken ill I captured a few interesting specimens in places where the ground was beginning to show green, but the variety of species was lacking.

Bartica.—Temperature in the sun, 110 to 120 degrees, in the shade, 80 to 84 degrees, during rain, 70 to 72 degrees. The ground is comparatively low, but a short distance back it rises into the hills.

Mallali.—Temperature in the sun, 110 to 120 degrees, in the shade, 80 to 84 degrees, during rain, 68 to 70 degrees. The altitude is from 75 to 100 feet above sea-level.

Family TIPULIDAE

Subfamily LIMNOBINAЕ

Tribe *Limnobiini*

Genus **DICRANOMYIA** Stephens

1829. *Dicranomyia* Stephens, Cat. Brit. Ins., ii, 243.

Dicranomyia eiseni Alexander

1912. *Eureomyia eiseni* Alexander, Canad. Entom., xlv, 338, pl. 11, fig. 8.

Bartica, January 9, 3 males; February 5, 1 male, in swamps.
Mallali, March 13, 1 female; March 19, 1 male.

Dicranomyia apicata sp. n.

♂ long; wings infumated at the tip; pleura without stripes.

Male,—length, 5-6.4 mm.; wing, 5.7-7 mm.

Female,—length, 7.1; wing, 6.4-6.9 mm.

Rostrum and palpi brown. Antennae brownish black throughout, flagellar segments rounded oval, more elongated distally. Head blackish with a light silvery gray bloom.

Mesonotal praescutum light brownish yellow with a very broad brown median stripe that is enlarged behind at the transverse suture; lobes of the scutum and the scutellum dark brown, remainder of these sclerites brownish yellow; postnotum lighter brown. Pleura light yellowish, not marked. Halteres moderately long, the base of the stem yellowish, the knob brown. Legs, coxae and trochanters yellow; base of the femora yellow soon passing into dark brown; tibiae and tarsi dark brown. Wings light brown, the stigma oval, dark brown; tip of the wing suffused with a paler brown. Venation:

(see pl. III, f. 1) Sc long extending far beyond the origin of the radial sector, Sc_2 near its tip; R_s long, more than twice as long as the deflection of R_{4+5} ; basal deflection of Cu_1 at or before the fork of M .

Abdominal tergites dark brown, the ninth segment somewhat paler; sternites brown.

Habitat.—Bartica, December 24, 1912 to April 14, 1913.

Holotype, ♂, Bartica, February 21, 1913.

Allotype, ♀, topotypic, December 24, 1912.

Paratypes, 4♂, 7♀, topotypic, December 31, 1912, to April 14, 1913.

Easily separated from the other known species of the genus that have the long subcosta by its lack of distinct spottings on the wings, the stigmal blotch and a more or less distinct infuscation at the apex being the only marks on the wing-surface.

Dicranomyia parishi sp. n.

Sc short, S_2 retracted far from the tip of S_{-1} . R_s long; wings hyaline or nearly so; halteres rather short.

Male,—length, 5 mm.; wing, 6.2 mm.

Female,—length, 5–6.2 mm.; wing, 5.3–6.4 mm.

Rostrum, palpi and head light brown, the latter with an indistinct grayish bloom when seen in certain lights.

Mesonotal praescutum with a light golden bloom, the lateral margins narrowly brown, the sclerite with three dark brown stripes of which the median one is broadest, the short lateral stripes beginning back of the pseudosutural foveae and continuing on to the scutum where they suffuse the lobes; scutellum and postnotum light brown. Pleura pale, whitish, the mesosternum strongly suffused with brown. Halteres quite short, brown, the knob darker. Legs, coxae and trochanters brownish yellow; femora brown, paler at the extreme base; tibiae and tarsi brown. Wings hyaline, veins brown, stigma indistinct. Venation: S_{-1} ending opposite the origin of R_s , Sc_2 retracted far back from its tip as in the *halterata* group; R_s long, nearly twice as long as the deflection of R_{4+5} .

Abdominal tergites dark brown, the sternites paler.

Habitat.—Bartica, January 11, 1913 to February 27, 1913. Mallali, March 6, 1913 to March 31, 1913.

Holotype, ♂, Mallali, March 15, 1913.

Allotype, ♀, topotypic, March 6, 1913.

Paratypes, 3♀, Bartica, January 11, February 27. One ♀, topotypic, March 31, 1913.

The only described regional species that can be confused with this form is *D. simillima* Alex. (Can. Ent., December 1912, 361,

pl. 11, fig. *n*; as *Furcomyia*), which has Sc_1 ending before the origin of R_s , R_s short, not much longer than the deflection of R_{4+5} , long slender halteres, etc.

Genus **RHIPIDIA** Meigen

1818. *Rhipidia* Meigen, System. Besch., i, 153.

Rhipidia domestica Osten Sacken

1859. *Rhipidia domestica* Osten Sacken, Proc. Acad. Nat. Sci. Phila., 1859, 208.

Bartica, six ♂, eight ♀, November 27, 1912 to February 5, 1913.
Mallali, one ♂, March 31, 1913.

Rhipidia annulicornis Enderlein

1912. *Rhipidia annulicornis* Enderlein, Zool. Jahrb., xxxii, pt. 1, 80, 81.

Bartica, two ♂, eight ♀ December 30, 1912 to April 14, 1913.

Mallali, a ♂ and a ♀, March 13 to 15, 1913.

Rhipidia conica sp. n.

Antennae black with the thirteenth segment pale; mesonotal praescutum produced into a high conical, somewhat spinous, tubercle; legs pale, the tarsi tipped with darker; wings with the costal margin yellow, remainder of the wing-membrane grayish with scattered brown markings.

Female,—length, 7.5 mm.; wing, 7.6 mm.

Rostrum and palpi dark brownish black. Antennae with the segments of the flagellum strongly serrated, the shafts of the segments short, antennae brownish black except segment thirteen which is abruptly yellow. Eyes almost contiguous on the vertex. A small median tubercle just behind the antennal bases. Head brown with golden yellow reflections in certain lights.

Pronotum reddish brown. Mesonotal praescutum produced dorsocephalad into a conspicuous conical spine; anterior half of the sclerite light reddish brown, dorsal posterior half, including the summit of the spine, rich dark brown except a pale median portion near the suture; scutum, scutellum and postnotum brown. Pleura light brownish yellow without any conspicuous markings. Halteres pale, the knob darker. Legs,—fore legs with the coxae and trochanters pale brownish yellow, femora yellowish brown passing into brown at the tip, tibiae and tarsi very pale yellow, excepting segments four and five and the posterior half of three of the tarsi which are dark brownish black; other legs similar but the middle femora are darker throughout and the posterior femora are lighter throughout and not darkened at the tip. Wings with the cephalic portion light cream yellow, the caudal portion including all of the cells behind *M* and much of the radial field grayish; dark marks on the wings as follows: a small brown blotch at the base of *M*; a large blotch at the origin of R_s and a nearly subequal blotch midway between these two last; a small rounded blotch at the end of S_1 ; darker suffusions at the fork of R_s , tip of R_1 , end of

R_{2+3} , Cu_2 , and 2nd A and along most of the veins and deflections of veins. Venation: see pl. III, fig. 2.

Abdominal tergites dark brown, the valves of the ovipositor reddish yellow; sternites dull yellowish indistinctly marked with black; a greenish tinge at the base of the abdomen may, or may not, be natural.

Habitat.—Bartica, February 17, 1913.

Holotype,—♀, Bartica, February 17, 1913.

Rhipidia conica separates off from all the described forms, with the exception of *punctipennis* Alexander, in the remarkable tubercle on the mesonotum; to what extent this character is developed in the male sex is uncertain. In another paper (Journ. N. Y. Ent. Soc., XXII, 117; 1914), I have erected the subgenus *Conorhipidia* to receive these two species, *conica* being the type of the subdivision.

Genus GERANOMYIA Haliday

1833. *Geranomyia* Haliday, Entomol. Magaz., i, 154.

Geranomyia insignis Loew

1851. *Aporosa insignis* Loew, Linnæa Entom., v, 395.

Many specimens of both sexes; Bartica, November 26, 1912 to February 9, 1913, a few in the deep swamps but more attracted to lights in the evening; Mallali, March 18 to March 20, 1913.

Geranomyia pulchella sp. n.

Lobes of the scutum and posterior pleural sclerites black; wings clear on the costal third, gray at the tip and on the caudal two-thirds; four dark blotches on the costal margin; legs unbanded.

Male,—length, excluding the rostrum, 5.5–5.8 mm.; rostrum, 3–3.1 mm.; wing, 6.5–6.6 mm.

Female,—length, excluding the rostrum, 6.4–7 mm.; rostrum, 2.9–3.2 mm.; wing, 6.7–7 mm.

Rostrum and palpi dark brownish black, the former moderate in length, the latter two-segmented. Antennae dark brown throughout. Head black with a light gray bloom.

Pronotum reddish brown. Mesonotal praescutum rich reddish brown, a yellowish blotch on the sides of the sclerite in the neighborhood of the pseudosutural foveae, behind which the whole side of the sclerite is covered by a large blackish blotch; an indistinct dark median vitta on the anterior part of the sclerite; scutum with the lobes black, median and caudal portions paler, yellowish brown; scutellum brown; postnotum dark brownish black. Pleura largely black, except the region around the wing-root, the propleurae, and the sternal sclerites which are brown. Halteres light yellow, the knob brown. Legs, coxae and trochanters brown, femora yellowish brown throughout, tibiae yellowish brown, the tarsi brown. Wings with the anterior third yellowish hyaline with four dark brown blotches, the

basal two very small, the third, at the stigma, and the fourth, at cross vein r , very large and conspicuous; caudal half of the wings strongly infumed with gray, the tip darker. Venation: (see pl. III, fig. 3) Sc ending slightly beyond the origin of R_s , Sc_2 at its tip; R_3 long, slightly angulated at origin, about four times as long as the deflection of R_{4+5} ; cell $1+M_2$ long and narrow as in *cinereinota* Alex.

Abdomen with the basal tergites dark brown, apical tergites reddish brown with a narrow indistinct darker median line; basal sternites yellowish, apical sternites brown, the hypopygium yellowish brown.

In the male paratype, the end of Sc is just beyond the origin of R_s .

Habitat.—Bartica, January 8, 1913, to February 14, 1913.

Holotype, ♂, Bartica, January 22, 1913, in deep swamps.

Allotype, ♀, with the type.

Paratypes, 5 ♀, 1 ♂, topotypic, January 8 to February 14.

Geranomyia tibialis Loew

1851. *Aporosa tibialis* Loew, Linnaea Entom., v, 397.

Eighteen specimens, from Bartica, January 4, 1913 to February 14, 1913, one taken in deep swamps, the others attracted to light at night.

Geranomyia cinereinota Alexander

1913. *Geranomyia cinereinota* Alexander, Ent. News, xxiv, 407, pl. 14, fig. 4.

Nearly two hundred specimens taken at Bartica from December 5, 1912 to April 14, 1913; Mallali, March 8 to 20, 1913. This form came in abundance to light and with *Gonomyia pleuralis* Williston is the most abundant form in the collection.

Geranomyia virescens Loew

1851. *Aporosa virescens* Loew, Linnaea Entom., v, 398.

One dark female that I refer to this species taken at Bartica on December 31, 1912. One typical male, Bartica, January 23, 1913.

Geranomyia pallida Williston

1896. *Geranomyia pallida* Williston, Trans. Ent. Soc. Lond., 1896, 284, pl. ix, fig. 53.

Three females at Bartica, December 19, 1912 to January 30, 1913, at light. One female from Bartica on February 5, 1913, in the swamps.

Tribe *Antochini*

Genus **RHAMPHIDIA** Meigen

1830. *Rhamphidia* Meigen, System. Besch., vi, 150.

Rhamphidia albitarsis Osten Sacken1887. *Rhamphidia albitarsis* Osten Sacken, Berl. Ent. Zeitsch., xxxi, 184.1896. *Rhamphidia albitarsis* Williston, Trans. Ent. Soc. Lond., 1896, 288, pl. 10, fig. 59.

One typical specimen, a ♂, from Bartica, November 26, 1912. A second specimen, ♀, from the same place on February 8, 1913, is quite normal but the tarsi are not whitish, being of a very light brown.

Rhamphidia uniformis sp. n.

Wings with crossvein *r-m* present; veins *Sc* and *R*₁ close together at their tips; inner end of cell *1st M*₂ about on a line with the base of *R*₃; tarsi light brown.

Female.—Length, 5-5.3 mm.; wing, 4.4-4.6 mm.

Rostrum rather long, slender, about as long as the head, dark brown, the palpi dark brownish black. Antennae short, very dark brown. Head very dark brown.

Pronotum and cervical sclerites dark brown. Mesonotum rather light brown, shining, the postnotum much paler, yellowish brown, this color suffusing the pleurites except the more dorsal ones which are brown; sternites pale like the ventral pleura. Halteres rather short, pale, the knob darker. Legs; coxae yellowish brown, the trochanters and femora dark brown, the latter a little paler at the base, tibiae dark brown, tarsi light brown, in some specimens quite pale. Wings almost hyaline, the veins brown, a faint brownish tinge in the region of the stigma. Venation: (see pl. III, fig. 4) *Sc*₁ and *R*₁ rather approximated at their tips; crossvein *r-m* present and distinct, situated far out toward the distal end of cell *1st M*₂ and in this respect suggesting the condition that obtains in the Old World *Cenosia*; cell *1st M*₂ unusually long, its inner end about on a line with the origin of the radial sector.

Abdomen dark brown, the genital segment elongate, the valves very slender, the upper pair acicular.

Habitat.—Bartica, January 28, 1913 to February 8, 1913.

Holotype, ♀, Bartica, February 1, 1913.

Paratypes, 2 ♀, topotypic, January 28, 1913; February 8, 1913.

Rhamphidia mirabilis sp. n.

Pale reddish yellow, the wings banded with brown.

Male.—Length, 5-5.6 mm.; wing, 5.1-5.3 mm.

Female.—Length, 5.8-6 mm.; wing, 4.8-5.3 mm.

Male: Rostrum elongate, much longer than the head, dark brown, the palpi brownish black. Antennae light brown, the verticils on flagellum long, black, conspicuous. Head blackish with a sparse gray bloom.

Pronotum light yellow. Mesonotal praescutum reddish yellow without apparent stripes; scutum with the outer cephalic half of each lobe dark

brown, scutellum and postnotum reddish yellow. Pleura light yellow, unmarked. Halteres pale throughout. Legs, coxae and trochanters yellow, the femora, tibiae and tarsi light brown. Wings yellowish hyaline with two broad dark brown bands, the first occupying the basal portion, the second the region of the cord and completely traversing the wing. Costa very strong, veins brown. Venation: see pl. III, fig. 5.

Abdomen reddish yellow, the seventh segment brownish black.

Female: Abdomen unicolorous; the dark brown spots on the scutal lobes not very evident.

Habitat.—Bartica, December 5, 1912 to February 20, 1913, the latter taken in deep swamps. Mallali, March 8 to 19, 1913. Described from 13 specimens, 6♂, 4♀, 3 broken.

Holotype, ♂, Mallali, March 14, 1913.

Allotype, ♀, topotypic, March 8, 1913.

Paratypes, 5♂ 3♀, 3 broken, Bartica, December 5, 1912 to February 20, 1913; Mallali, March.

Genus **STYRINGOMYIA** Loew

1845. *Styringomyia* Loew, Dipt. Beitr., i. 6.

Styringomyia americana sp. n.

Mesonotum pale medially, darker on the sides; fore legs banded, hind legs unbanded.

Male.—Length, 5 mm.; wing, 3.6-4.2 mm.

Rostrum and palpi yellowish brown. Antennae with the basal segments brown, the flagellum a little brighter colored. Head light reddish brown.

Pronotum pale on the dorsal median line, more brown laterally. Mesonotal praescutum rather pale medially, this mark broadest behind near the suture, sides of the praescutum and the scutum reddish brown, shining. Pleura dull yellowish. Halteres short, pale. Legs with the coxae and trochanters light yellow, the fore femora yellow with three brown bands, narrower subbasal and subapical ones and a broader medial one; tibiae yellow, broadly brownish beyond the base and before the middle, the tip narrowly browned; tarsi yellow, the last segment brown. Hind legs entirely light yellow, unmarked except the brown last tarsal segment. Wings tinged with light yellow, the crossvein *r-m* slightly suffused with brown. Venation: see pl. IV, fig. 1.

Abdominal tergites light yellowish, the apical fourth dark brown, the sternites yellow; hypopygium crushed.

Habitat.—Mallali, March 8, 1913.

Holotype, ♂, Mallali, March 8, 1913.

Paratype, sex? topotypic, on the same date.

Genus **ATARBA** Osten Sacken

1869. *Atarba* Osten Sacken, Mon. Dipt. N. Am., iv, 127.

Atarba varicornis Alexander

1913. *Atarba varicornis* Alexander, Ent. News, xxiv, 448, pl. xiv, fig. 10.

One male from Mallali, March 25, 1913.

This is the first male to be made known and I make it the allotype. The antennae in this sex are nearly as long as the rest of the body, the basal three-fifths of each segment blackish brown, the apical portions yellowish; the segments with long outspreading hairs.

Genus **CERATOCHEILUS** Wesche

1910. *Ceratocheilus* Wesche, Jour. Linn. Soc., Zool., xxx, 358.

Ceratocheilus americanum Alexander

1913. *Ceratocheilus americanum* Alexander, Psyche, xx, 49, 50, pl. 2, figs. e and j.

One typical dark female, Bartica, February 12, 1913.

Genus **TOXORHINA** Loew

1851. *Toxorhina* Loew, Linnaea Entom., x, 400 to 402.

Toxorhina centralis Alexander

1913. *Toxorhina centralis* Alexander, Psyche, xx, 52, 53, pl. 2, fig. i.

Three specimens from Bartica, December 10, 1912, a ♀, to February 28, 1913, a ♂.

A specimen of another species is represented by a single female from Bartica, December 12, 1912. It is allied to *brasiliensis* Westwood in the dark tibial apices, but it is very much smaller. I prefer to leave this form until more material becomes available.

Genus **TEUCHOLABIS** Osten Sacken

1859. *Teucholabis* Osten Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 223.

Teucholabis annulata Williston

1896. *Teucholabis annulata* Williston, Trans. Ent. Soc. Lond., 1896, 290, pl. 10, f. 63.

One male from Bartica, November 30, 1912; females from Bartica, November 30, 1912 and January 14, 1913.

Teucholabis trifasciata Enderlein

1912. *Teucholabis trifasciata* Enderlein, Zool. Jahrb., xxxii, pt. 1, 69, fig. R1.

One specimen, sex undeterminable because the abdomen is broken, from Bartica, December 4, 1912.

***Teucholabis melanocephala* Fabricius**1794. *Tipula melanocephala* Fabricius, Ent. Syst., iv, 241.1828. *Limn. bic melan. cephalo* Wiedemann, Aussereur. zweifl. Ins., i, 34.

Eight specimens, 4♂ and 4♀, Bartica, December 5, 1912 (♂) to April 14, 1913 (♂), a few in the swamps, the others attracted to light at night. Mallali, March 11, 1913, one large male.

I identify this large showy species as being the *Tipula melanocephala* of Fabricius described from Cayenne. My series do not agree in all respects with the rather detailed description given by Wiedemann but since they show considerable variation in color, I believe my determination of the form to be correct. The insect may be recharacterized as follows:

Male.—Length, 6.9 to 9.8 mm.; wing, 6.3 to 9.1 mm.

Female.—Length, 9 to 10.3 mm.; wing, 6.4 to 8 mm.

Male.—Rostrum rather short, dark brownish black, the palpi black. Antennae dark brown. Head reddish yellow, in some specimens with a conspicuous dark brown blotch on the vertex.

Pronotum reddish yellow, black anteriorly. Praescutum reddish with a broad dark brown mark extending from the lateral margin inward toward the median line; other specimens show a median dorsal stripe that is divided by a pale line; in some dark individuals the median line is dark brown and at its caudal end becomes confluent with the cephalic ends of the lateral stripes as described by Wiedemann; this leaves a large blotch of yellow on the sides of the sclerite in front of the pseudosuture and the median portion of the sclerite behind at the transverse suture. Lobes of the scutum largely dark brown; scutellum and postnotum pale, in dark individuals the caudal half of the latter very dark brownish black. Pleura largely blackish but this color largely concealed by a dense silvery pubescence; sternites reddish yellow. Halteres moderately long, the stem light brown, the knobs dark brown except their bases which are black. Legs, coxae and trochanters dull yellow, femora yellowish brown with a broad median and a subapical annulus of dark brown. Wings subhyaline with three brownish clouds, not strongly defined, the basal band irregular extending from the rounded blotch at the origin of *Rs* to the end of *2nd Anal*; the middle band begins at the darker brown rounded stigma caudad across the wing, including the outer end of cell *1st M*₂; the third band embraces the wing-tip and is moderately broad. The venation is shown in plate III, fig. 7.

Abdomen with the first tergite black, the remaining tergites dull yellow; sternites with the lateral margins of the segment brown; sternite seven with a broad rounded dark brown median blotch at the caudal end; sternite eight with a row of about seven strong curved hairs on either side of the middle line, these hairs directed inwards.

Female.—Similar to the male but the size averages smaller as is the rule in this genus, but the very long, slender abdomen makes up the greater part of this length; abdomen dark brown.

Teucholabis stygica sp. n.

Black; wings hyaline with the tip infumed and a brown mark along the cord.

Female.—Length, 5.5 mm.; wing, 4.8 mm.

Rostrum very long and slender, much longer than the head, dark brownish black, the palpi black. Antennae black, the apical flagellar segments broken. Head black.

Thoracic dorsum deep shiny black, unmarked. Pleura black with a very sparse grayish bloom in oblique lights, not shining, Halteres black, the knobs pale, dull yellow. Legs black, the tibiae and tarsi brown. Wings hyaline, the apex infumed with brown; a very large triangular blotch in the region of the cord, broadest along costa, ending on the basal deflection of Cu_1 ; a faint brown seam along the outer end of cell $1st M_2$. Venation: see pl. III, fig. 6.

Abdomen short, black, the valves of the ovipositor reddish chestnut.

Habitat.—Bartica, February 8, 1913.

Holotype, ♀, Bartica, February 8, 1913.

Teucholabis lugubris sp. n.

Abdomen long and slender; head black; thorax black with scanty reddish markings; wings hyaline with a small pale stigmal spot.

Female.—Length, 7.8 mm.; abdomen, 6.1 mm.; wing, 5.9 mm.

Rostrum rather short and stout, about as long as the head, this and the palpi dark brownish black. Antennae dark brown. Head black.

Pronotum black. Mesonotal praescutum black with a linear yellowish stripe beginning near the pseudosutural fovea extending caudad toward the suture but not attaining this; a conspicuous yellow blotch occupying the caudo-median portion of the praescutum and the cephalo-median portion of the scutum; remainder to the scutum black; scutellum black except a rounded blotch on the sides of the sclerite, obscure yellow; postnotum black. Pleura black with a silvery gray pubescence. Halteres black, the knob large, obscure yellow. Legs with the fore coxae tipped with yellow, trochanters brown, femora dark brown, most intense at the tip, tibiae and tarsi brownish black. Wings hyaline or nearly so, veins brown, costa more yellowish; a small rounded stigmal spot, pale brown and confined to the vicinity of the crossvein r . Venation: see pl. IV, fig. 3.

Abdomen very long and slender; tergites black, shiny, apices of segments seven and eight reddish; sternites black, the valves of the ovipositor chestnut brown.

Habitat.—Bartica, January 4, 1913, in deep swamps.

Holotype, ♀, Bartica, January 4, 1913.

A key to the American species of this large and difficult genus is appended. I have seen the types of over half the described forms and specimens of many of the remaining species. The key should always be supplemented by reference to the original descriptions and figures.

As indicated in earlier papers, *bifasciata* Fabricius is the same as *trifasciata* Enderlein, the latter name being the correct one. *T. venezuelensis* Macquart² is omitted from the key as I believe it to be synonymous with *T. melanocephala* Fabricius, a variable species. *T. polita* Osten Sacken is either an exceptionally small species or else Osten Sacken's type is shrunken and no allowance was made by him for this change in condition. The species identified by Williston as *complexa* (Trans. Ent. Soc. Lond., 1896, 289) is not this, but represents an apparently undescribed species that is quite widely distributed in Middle America and the Antilles.

A KEY TO THE AMERICAN SPECIES OF TEUCHOLABIS
OSTEN SACKEN

1. Wings spotted; cross-vein *r-m* obliterated by fusion. (Peru)
paradoxa Alexander³
Wings hyaline or banded, not spotted; cross-vein *r-m* present or lost by atrophy..... 2
2. Wings with the membrane hyaline or nearly so, unmarked except for the stigmal spot; in some species the membrane is slightly darkened but in such cases the stigmal spot is darker, distinct. 20
Wings with the membrane clouded or banded, or with a seam along the cord, or with the tip infumed or with the membrane darkened and the stigma indistinct..... 3
3. Wings with distinct bands..... 4
Wings with the darker markings reduced to very narrow seams along the cord or to indistinct clouding at the apex or else the whole wing is uniformly dark brown..... 12
4. Radial sector short, very arcuated, beginning opposite the tip of *Sc*₁ [head dark brown above; pronotum yellow; thorax shiny black; wings hyaline with a broad brown apex and brown markings along the cord.]. (Peru)..... **munda** Alexander⁴
Radial sector longer, less arcuated, beginning far before the tip of *Sc*₁..... 5
5. Thoracic praescutum shiny black, unmarked..... 6
Thoracic praescutum more or less orange-yellow or brownish... 8
6. Pronotum yellowish [head black; wings with the apical band including the distal end of cell *1st M*₂; basal band broadly diamond-shaped]. (Lesser Antilles, Colombia, French Guiana.)
trifasciata Enderlein⁵
= bifasciata Fabricius⁶

² 1846. *venezuelensis* Macquart, Dipt. Exot., suppl. 1, 19, pl. 2, fig. 7 (*Linnobia*).

³ 1913. *paradoxa* Alexander, Ent. News, xxiv, 415, 416, pl. 16, fig. 8.

⁴ 1913. *munda* Alexander, Ent. News, xxiv, 414, 445, pl. 16, fig. 7.

⁵ 1912. *trifasciata* Enderlein, Zool. Jahrb., xxxii, pt. 1, p. 69, 70, fig. 111.

⁶ 1805. *bifasciata* Fabricius, Syst. Antl., 31 (*Tipula*) = *trifasciata* Enderlein.

- Pronotum black. 7
7. Small species (σ^7 , length, 2.5-3 mm.); legs with the basal two-thirds yellowish-tawny [head black; halteres brown, knob yellow; apical band including the distal end of cell *1st M*₃]. (Brazil)
polita Osten Sacken⁷
- Larger species (♀ , length, 5 mm.); legs dark brown [head black; wings with the apical band not including the distal end of cell *1st M*₂ which is seamed with brown; basal band narrow, linear]. (Costa Rica, Panama.) **rostrata** Enderlein⁸
8. The apical band on the wings not including the distal end of cell *1st M*₂ 9
- The outer band on the wings including the distal end of cell *1st M*₂ 10
9. Basal band on the wings narrow, linear; mesothorax mostly yellow; femora without a medial band [thorax with a large black spot on the middle of the praesutum; pleura clear yellow; legs dark brownish black except the base of the femur which is paler]. (Brazil) **pulchella** Alexander⁹
- Basal band on the wings broad, diffuse; mesothorax mostly dark; femora with a brown medial band [colors on the wing-disc much paler, less well defined; head yellowish usually with a dark brown mark on vertex]. (Guiana) **melanocephala** Fabricius¹⁰
10. Wing markings not so extensive, the band along the cord narrow, not extending caudad of the basal deflection of *Cu*₁ and in no way connected with the apical band [head dark brown; pronotum very light yellow; mesonotum with a chestnut dorsal stripe; femora yellow with the tip black]. (Central America)
sackeni Alexander¹¹
- Wing markings extensive, the band along the cord broader, attaining the hinder margin of the wing and connected along the costal and caudal margins with the broad apical band and thus enclosing a large oval spot of hyaline. 11
11. Head black; pleura with a large blotch; basal cells of the wing suffused with dark color; size larger (♀ , 6.1 mm) [pronotum light yellow; hind legs blackish; halteres dark throughout]. (Peru)
jucunda Alexander¹²
- Head reddish brown; pleura unspotted; basal cells of the wings almost devoid of dark color; [pronotum yellow; halteres dark throughout]. (Bolivia) **laeta** Alexander¹³

⁷ 1887. *polita* Osten Sacken, Berl. Ent. Zeit., xxxi, pt. 2, 189.

⁸ 1912. *rostrata* Enderlein, Zool. Jahrb., xxxii, pt. 1, 68, 69, fig. Q1.

⁹ 1913. *pulchella* Alexander, Psyche, xx, 41, pl. 2, figs. b, l.

¹⁰ 1794. *melanocephala* Fabricius, Entomol. Syst., iv, 241 (*Tipula*).

¹¹ 1913. *sackeni* Alexander, Psyche, xx, 42, 43, pl. 2, fig. a.

¹² 1913. *jucunda* Alexander, Ent. News, xxiv, 441, 442, pl. 16, fig. 4

¹³ 1913. *laeta* Alexander; *ibid.*, 442, 443, pl. 16, fig. 5.

12. The wing membrane uniformly dark brown. 13
 The wing membrane mostly hyaline, the darker markings small, limited or indistinct. 14
13. Mesonotal praescutum in front with a longitudinal shining black median stripe; femora blackish with a rust-red band beyond the base. (South America). **schineri** Enderlein¹⁴
 Mesonotal praescutum entirely bright ochraceous yellow, unmarked with darker; femora uniformly yellowish without a rust-red ring. (Brazil, Peru). **flavithorax** Wiedemann¹⁵
14. Thoracic dorsum shiny black without markings [rostrum very long and slender; wings hyaline with the tip infumed with brown, a conspicuous seam along the cord]. (British Guiana)
 **stygica** sp. n.¹⁵
 Thoracic dorsum with more or less red or yellow. 15
15. Femora brown with a yellowish annulus before the tip [thorax yellow with brown stripes; wings a little yellowish, the tip scarcely brown; abdomen brown and yellow; length of the ♂ about 7 mm.]. (Brazil). **simplex** Wiedemann¹⁷
 Femora without a yellow annulus before the tip; head reddish. 16
16. Thoracic dorsum reddish yellow without darker markings. 17
 Thoracic dorsum more or less red but distinctly marked with dark brown stripes or spots. 18
17. Large (♂, length, 10 mm. or over); legs pale yellow, the femora with a brown band beyond the middle [head dark in front, pale yellow behind; brown markings on the wing consisting of a large rounded dark brown stigma and an indistinct seam along the deflection of R_{4+5} ; abdomen light yellow]. (Panama). **audax** Alexander¹⁸
 Small (♂, length, 4 mm.); legs uniformly brown beyond the base of the femur [head blackish brown; wings tinged with pale brown, the stigmal spot well-defined, brown; costa clouded with brown to the tip, some of the cord with brown seams; halteres brown; abdomen blackish brown, the male hypopygium with many thorn-like appendages]. (Colombia). **spinigera** Schiner¹⁹
18. Thoracic dorsum reddish yellow with three confluent black stripes that occupy nearly the whole mesonotum. 19
 Thoracic dorsum reddish yellow with three dark spots [head reddish; pronotum yellow; hind coxae reddish yellow like the other coxae; wings hyaline without a dark basal spot; abdomen with the basal tergites dark brown, the apical tergites yellowish]. (Peru).
 **fulgens** Alexander²⁰

¹⁴ 1912. *schineri* Enderlein, Zool. Jahrb., xxxii, pt. 1, 71, 72.

¹⁵ 1821. *flavithorax* Wiedemann, Dipt. exot., i, 43, no. 3 (*Limnobia*).

¹⁶ 1914. *stygica*, sp. n. this paper, pl. iii, fig. 6.

¹⁷ 1830. *simplex* Wiedemann, Aussereur. zweifl. Ins., i, 519 (*Limnobia*).

¹⁸ 1913. *audax* Alexander, Psyche, xx, 44, 45, pl. 2, fig. d.

¹⁹ 1868. *spinigera* Schiner, Novara Reise, Dipt., p. 14.

²⁰ 1913. *fulgens* Alexander, Ent. News, xxiv, 440, pl. 16, fig. 2.

19. Postnotum and scutellum black [front black, remainder of the head reddish; wings hyaline, rather narrow, stigma small, brown, bisected by cross-vein *r*, cord slightly clouded with brown; halteres brown; abdomen metallic black with the incisures reddish yellow]. (Mexico)..... *gracilis* Osten Sacken²¹
 Postnotum brownish black, scutellum light yellow [head reddish; pronotum yellow; hind coxae dark; wings hyaline with a conspicuous brown spot at the base, the tip infuscated; abdomen dark brownish black with the tergal apices yellow]. (Peru)
hilaris Alexander²²
20. Head black not metallic; thoracic dorsum with the color mostly black, shining..... 21
 Head generally not black, if so with metallic reflections; the thoracic dorsum with the color largely yellowish or reddish with or without scanty darker markings..... 25
21. Legs brownish black..... 22
 Legs with the femora yellow, tipped with brown, the coxae brown... 23
22. Legs pitch black, coxae bright yellow; general color shining black, the margin of the praescutum yellow; scutellum yellow; postnotum and pleura black, the latter with a yellow spot above the mesocoxa and another under the wing-root [wings hyaline, stigma blackish brown]. (South America). *morionella* Schiner²³
 Legs dark brownish black; pleura black, unmarked [abdomen long and slender; wings hyaline, the stigmal spot small]. (British Guiana)..... *lugubris*, sp.n.²⁴
23. A reddish mark on the humeral angles of the praescutum; legs brown, fore femora yellowish with two brown rings. (Brazil)
scapularis Macquart²⁵
 The reddish on the praescutum not in the shape of humeral marks; femora with only the apical brown annulus..... 24
24. Pronotum dull yellowish; pleura uniformly black; wings infused with brown, stigma dark brown, oval. (Peru). *tristis* Alexander²⁶
 Pronotum bright yellow; pleura with yellow spots; wings hyaline, stigma small, brown. (Mexico)..... *molesta* Osten Sacken²⁷
25. Cross-vein *r* indistinct or lacking, tending to be oblique, the tip atrophied [color light yellow throughout]. (Brazil)
parishi Alexander²⁸
 Cross-vein *r* present, conspicuous, vertical 26

²¹ 1886. *gracilis* Osten Sacken, Biol. Cent. Am., Dipt., i, 7.

²² 1913. *hilaris* Alexander, Ent. News, xxiv, 443, 444, pl. 16, fig. 6.

²³ 1868. *morionella* Schiner, Novara Reise, Dipt., 47 (*Limnobia*).

²⁴ 1914. *lugubris*, sp. n., this paper, pl. iv, fig. 2.

²⁵ 1838. *scapularis* Macquart; Dipt. Exot., i, pt. 1, 73, pl. 10, fig. 1 (*Rhamphidia*).

²⁶ 1913. *tristis* Alexander, Ent. News, xxiv, 439, 440, pl. 16, fig. 1.

²⁷ 1886. *molesta* Osten Sacken, Biol. Cent. Am., Dipt., i, 6, 7.

²⁸ 1913. *parishi* Alexander, Psyche, xx, 46, 47, pl. 2, figs. c, k.

26. Thoracic dorsum with three complete dark brown stripes 27
 Thoracic dorsum without three dark brown stripes 28
27. Wings broader, the tip not infuscated; femora yellow tipped with brown. (Eastern United States).... **complexa** Osten Sacken²⁹
 Wings narrower, the tip narrowly infuscated; femora yellowish brown at the tip and with a postmedial brown annulus. (Lesser Antilles; Guiana)..... **annulata** Williston³⁰
28. Thorax light yellow with a dark narrow pleural stripe. (Central America)..... **pleuralis** Alexander³¹
 Thorax without a pleural stripe..... 29
29. Head and abdomen with metallic reflections; prothorax brownish; femora brownish black. (Cuba).... **chalybeiventris** Loew³²
 Head gray without metallic reflections; prothorax dull yellow; femora yellow with the tips broadly brown. (Bolivia)
jocosa Alexander³³

Genus **ORIMARGA** Osten Sacken1869. *Orimarga* Osten Sacken, Mon. Dipt. N. Am., iv, 120.**Orimarga punctipennis** sp. n.

Thorax and head bluish gray; legs very pale, almost whitish; wings spotted with brown.

Male.—Length, 7 mm.; wing, 4.4 mm.

Rostrum rather elongated, dark brown, the palpi brownish black. Antennae with the basal segments light brown, the flagellum broken. Head with a uniform light gray bloom.

Thoracic dorsum brown with a thick blue-gray bloom. Pleura yellowish brown. Halteres rather short, brown, more yellowish at the base. Legs with the coxae and trochanters yellowish brown, the remainder very pale whitish brown except the apical tarsal segments which are brown. Wings almost hyaline, the veins brown; dark brown dots as follows: the largest at the tip of *Sc*, others at the base of *Rs*, tip of *R*₁, and on cross-vein *r*, basal deflection of *R*₄₊₅ and cross-vein *r-m* and faint marks on the basal deflection of *Cu*₁ and at the fork of *Cu*₁ and *M*₃. Venation: see pl. IV, fig. 3.

Abdominal tergites dark brownish black, the sternites paler.

Habitat.—Bartica, February 11, 1913.

Holotype, ♂, Bartica, February 11, 1913.

²⁹ 1859. *complexa* Osten Sacken, Proc. Acad. Nat. Sci. Phila, 1859, 223. (GENOTYPE).

³⁰ 1896. *annulata* Williston, Trans. Ent. Soc. Lond., 1896, 290, pl. x, fig. 63.

³¹ 1913. *pleuralis* Alexander, Psyche, xx, 45, 46.

³² 1861. *chalybeiventris* Loew, Wien. Entomol. Monatschr., v, no. 2, 33, 34 (*Rhamphidia*).

³³ 1913. *jocosa* Alexander, Ent. News, xxiv, 110, 111, pl. 16, fig. 3.

This is the third American *Orimarga* to be described and it is easily distinguished from the related species in this genus, and in *Diotrepha*, by its spotted wings.

Genus **DIOTREPHA** Osten Sacken

1878. *Diotrepha* Osten Sacken, Cat. Dipt. N. Am., ed. 2, 27 and 219.

Diotrepha atribasis sp. n.

Large species (length 8 to 10 mm.); the femora and tibiae tipped with black and the base of the tibiae black; tip of *R*₁ obliterated.

Male.—Length, 9 mm.; wing, 5.5 mm.

Female.—Length, 8 to 9.8 mm.; wing 5 to 6.3 mm.

Male.—Rostrum and palpi dark brownish black. Antennae with the elongated basal segment and the second globular segment dark brownish black; flagellum much paler brown, in some specimens almost white. Head light brown with a grayish bloom, very pale on the front and anterior portions of the vertex.

Thoracic dorsum light brownish gray. Dorsal pleurites a little grayish, the ventral pleurites and the sternites light yellow. Halteres rather short, pale, the knob brown. Legs, coxae and trochanters light yellow; femora pale whitish broadly tipped with dark brown; tibiae with the extreme base and tip narrowly dark brown; tarsi white, the apical segments becoming a light brown. Wings light gray, the veins brown. Venation: see pl. iv, fig. 4.

Abdomen dark brownish black throughout.

Female.—Similar, the abdomen of a lighter brown, especially the sternites which are ringed with darker apically.

Habitat.—Bartica, December 10, 1912 to February 8, 1913.

Holotype, ♂, Bartica, January 28, 1913.

Allotype, ♀, topotypic, December 10, 1912.

Paratypes, ♀, topotypic, February 8, 1913; another specimen with the abdomen broken, topotypic, January 21, 1913, in deep swamps.

This species is the largest and most showy of the forms known to me. It may be easily recognized by the black tibial bases.

Tribe *Eriopterini*

Genus **GONOMYIA** Meigen

1818. *Gonomyia* Meigen, Syst. Besch., i, 146.

Subgenus *LEIPONEURA* Skuse

1889. *Leiponeura* Skuse, Proc. Linn. Soc. N. S. Wales, ser. 2, iv, 795.

This group was represented in the collection by a great number of specimens the majority of which were females. It is no longer possible to determine isolated females in this genus or in *Molophilus*

and so the list of species as given below may not indicate the full number of species represented. There are a large number of specimens of a small species with uniform pleura which are possibly *puella* Williston but I have never seen a male that answers the figure given by Williston in his original characterization of the form.

The best criteria for working upon these insects are the presence or absence of a stigmal spot, the length of subcosta of the wings, an open or closed cell *1st M*₂, pleurae striped or uniform, character of the genitalia of the males, such as the appendages of the pleurites, the structure and length of the gonapophyses and penis guard, etc.

The American forms may be provisionally divided into groups of species as follows:

1: *cinerea* group with the cell *1st M*₂ open, due to the obliteration of the outer deflection of *M*₃; this includes *cinerea* Doane and *alexanderi* Johnson.

2: *pleuralis* group with the cell *1st M*₂ closed, stigma distinct, pleura distinctly striped; this includes *pleuralis* Williston, *amazona* Alexander, *recurvata* Alexander and *sacandaga* Alexander.

3: *manca* group with the cell *1st M*₂ closed, stigma lacking. This group includes a heterogeneous collection of forms such as *manca* Osten Sacken, *puella* Williston, *puer* Alexander, *calverti* Alexander and the new forms described below as *extensa*, *inermis* and *scimitar*. The males known to me may be separated by the following key:

1. Hypopygium small, tubular, the pleural pieces not distinct. (Costa Rica)..... *calverti* Alexander
Hypopygium with definite cylindrical pleurites which bear more or less prominent chitinized appendages..... 2
2. Pleurites not armed with a chitinized appendage; guard of the penis long, subcosta short..... 3
Pleurites armed with chitinized appendages..... 4
3. Pleurites long, slender, finger-like; ventral gonapophyses consisting of conspicuous divergent chitinized hooks. [Small species with uniform pleura.] (Eastern United States)..... *manca* Osten Sacken
Pleurites shorter and stouter; ventral gonapophyse an oval lobe with a few rather stout hairs. [Large species with indistinct pleural stripes.] (British Guiana)..... *inermis* sp. n.
4. Pleurites with the chitinized appendage almost straight beyond the base, expanded before the tip. [Pleura distinctly striped, *Sc* long, ending slightly before the origin of *R*_s.] (British Guiana)..... *extensa* sp. n.

- Pleurites with the chitinized appendage curved, sickle-shaped, sharp at the tip..... 5
5. Both the dorsal and ventral gonapophyses distinct; penis guard not prominent. [*Sc* long ending opposite or slightly beyond the origin of *Rs*; pleura distinctly striped.] (British Guiana)

scimitar sp. n.

The ventral gonapophyse an oval lobe with numerous slender hairs; penis guard long, extending far beyond the tips of the pleurites. [*Sc* ending just before the origin of *Rs*; pleural stripes not clear-cut.] (Florida; Haiti; British Guiana)..... **puer** Alexander

I have not included *puella* Williston because the male is not known to me; it is figured (Trans. Ent. Soc. Lond., 1896, pl. 10, fig. 60) as having a conspicuous recurved ventral appendage.

Gonomyia (Leiponeura) alexanderi Johnson

1912. *Eliptera alexanderi* Johnson, Psyche, xix, 3, fig. 6.

A female specimen, taken in the swamps, December 31, 1912. One female at light, also at Bartica, February 4, 1913. One female at light, Mallali, March 11, 1913.

Gonomyia (Leiponeura) pleuralis Williston

1896. *Atarba pleuralis* Williston, Trans. Ent. Soc. Lond., 1896, 289, pl. 10, fig. 61.

About four hundred specimens of which some fifty are males. This large series was taken at light at Bartica from December 9, 1912 to February 26, 1913 and at Mallali on March 14, 1913.

Gonomyia (Leiponeura) inermis sp. n.

Rather large species (wing over 3.5 mm.); subcosta short; pleura indistinctly striped; pleural pieces of the male hypopygium without chitinized appendages.

Male.—Length, 3.9 to 4.1 mm.; wing, 3.7 to 3.9 mm.

Female.—Length, 4 mm.; wing, 3.8 mm.

Rostrum above bright orange, the palpi dark brown. Antennae brownish black. Head grayish.

Thoracic dorsum grayish plumbeous, the scutellum, only, pale yellowish white. Pleura pale silvery white, a broad indistinct plumbeous stripe begins on the side of the neck and ends beneath the wing-root; sternites plumbeous. Halteres dark brown, the knob, only, a little paler. Legs, coxae and trochanters dull brownish yellow, remainder of the legs brownish black. Wings subhyaline without a stigmal spot. Venation: (Plate iv, fig. 5) *Sc* ends far before the origin of *Rs*, this space about equal to the cross-vein *m*.

Abdominal tergites brown, sternites a little paler, hypopygium dull yellow. Hypopygium with the pleurites long, clothed rather densely with long hairs, at the tip narrowed into an arm which is truncated at the apex and

bears two rather strong bristles; no chitinized hooks on the pleurites. Ventral gonapophyse expanded into a flat oval surface on its ventral face and provided with abundant rather stout black hairs.

Holotype, ♂, Bartica, January 28, 1913.

Allotype, ♀, topotypic, January 28, 1913.

Paratypes, 30 ♂ ♀, topotypic, December 31, 1912 to February 13, 1913.

Gonomyia (Leiponeura) extensa sp. n.

Small species (wing less than 3 mm.): subcosta rather long, ending just before the origin of *Rs*; pleural stripes distinct; pleurites of the hypopygium bearing a strong, nearly straight, chitinized appendage.

Male.—Length, 3.2 to 3.3 mm.; wing, 2.5 to 2.7 mm.

Female.—Length, 3.6 mm.; wing, 2.7 to 2.8 mm.

Rostrum and palpi dark brown. Antennae with the first segment black, second yellow, black on the sides, flagellum brownish black. Head light yellow.

Thorax light brown without distinct darker markings; lateral margin of the praescutum yellow; scutellum brownish of the anterior half, yellow behind; postnotum yellow with a conspicuous semilunar brown mark just behind the scutellum. Pleura brown with a broad conspicuous yellow stripe beginning on the fore coxa and ending on the sternites of the abdomen. Halteres brown, knob yellow. Legs, coxae yellowish, trochanters and femora dark brown, tibiae and tarsi brown. Wings subhyaline, iridescent, no stigmal spot. Venation: *Sc* ending slightly before the origin of *Rs*.

Abdominal tergites brown, broadly yellow laterally; sternites yellowish; hypopygium yellow, the chitinized appendages black. Hypopygium with the pleurites moderately long, the fleshy dorsal appendage rather short, very pale, the chitinized arm strong and powerful, bent at a sharp angle just beyond the base, thence extended caudad and expanded near the tip, apically bearing a sharp point; dorsal gonapophyses small, inconspicuous, the tips black, chitinized; ventral gonapophyses not chitinized.

Holotype, ♂, Bartica, January 11, 1913.

Allotype, ♀, topotypic, January 28, 1913.

Paratypes, 1 ♂, 50 ♀, topotypic, December 27, 1912 to February 13, 1913.

Gonomyia (Leiponeura) scimitar sp. n.

Similar to *G. extensa*, differing chiefly in the male hypopygium and the venation.

Male.—Length, 3.3 mm.; wing, 2.8 mm.

This species presents a superficial appearance that is quite similar to *Gonomyia extensa*. In the present species subcosta ends opposite or slightly beyond the origin of the radial sector. The pleural pieces of the male hypopygium are short and stout, the fleshy dorsal appendage being

short, stout and cylindrical, sparsely clothed with long hairs; ventral appendage a long chitinized sickle-shaped arm which is directed ventrad and then caudad and mesad, at the tip directed outwards; gonapophyses moderately prominent, the penis-guard not conspicuous.

Holotype, ♂, Bartica, December 23, 1912.

Paratype, ♂, topotypic, December 23, 1912.

Gonomyia (Leiponeura) puer Alexander

1912. *Gonomyia (Leiponeura) puer* Alexander, Proc. U. S. Nat. Mus., xliv, 506, pl. 66, fig. 14.

Bartica, ten ♂, ♀, January 3, 1913 to January 10, 1913.

Genus **ERIOPTERA** Meigen

1803. *Erioptera Meigen*, Illiger's Magazine, ii, 262.

Subgenus *MESOCYPHONA* Osten Sacken

1869. *Mesocyphona* Osten Sacken, Monograph Dipt. N. Am., iv, 152.

Erioptera (Mesocyphona) parva Osten Sacken

1859. *Erioptera parva* Osten Sacken, Proc. Acad. Nat. Sci. Phila., 1859, 227.

Twenty-one, ♂, ♀, Bartica, December 10, 1912 to February 8, 1913.

Erioptera (Mesocyphona) immaculata Alexander

1913. *Erioptera (Mesocyphona) immaculata* Alexander, Proc. U. S. Nat. Mus., xlv, 518, 519, pl. 66, fig. 20.

One ♀, Bartica, January 28, 1913.

Erioptera (Mesocyphona) bicinctipes Alexander

1913. *Erioptera (Mesocyphona) bicinctipes* Alexander, Proc. U. S. Nat. Mus., xlv, 519.

Three ♀, Mallali, March 11, 1913 to April 5, 1913.

Genus **GNOPHOMYIA** Osten Sacken

1859. *Gnophomyia* Osten Sacken, Proc. Acad. Nat. Sci. Phila., 1859, p. 223.

Gnophomyia arcuata sp. n.

Grayish black without yellow markings; halteres dark throughout; wings with the membrane hyaline, cell R_2 very broad at the tip, veins R_1 and R_3 being divergent apically.

Female.—length 6 mm.; wings, 5.4 mm.

Female.—Rostrum and palpi dark brownish black. Antennae brownish black. Head brownish black.

Thorax rather uniformly dark grayish black without yellow markings. Halteres dark throughout. Legs dark brown. Wings hyaline, the stigmal spot quite indistinct, pale brown; veins dark brown. Venation: (see pl. IV, fig. 6) basal deflection of R_{2+3} very arcuated, sub-perpendicular, the cross-

vein r just before the fork of R_{2+3} , R rather long, running parallel to R_1 , R_3 with its tip swung caudad toward the wing-tip so that cell R_2 is very wide at its distal end; cell $1st M_2$ narrowed at its base; basal deflection of Cu_1 just before the fork of M .

Abdomen dark grayish black, the end of the abdomen and the ovipositor being drawn out into a long slender tube.

Habitat.—Bartica, January 4 to 28, 1913.

Holotype, ♀, Bartica, January 28, 1914.

Paratype, sex indeterminable, topotypic, January 4, 1913.

This species may be easily separated from the other black forms with dark halteres (*luctuosa* Osten Sacken, *macstitia* Alexander, et al) in the divergence of veins R_2 and R_3 at their tips, the former being considerably shorter than the latter vein and consequently cell R_2 is very wide at its outer end.

Gnophomyia subhyalina Alexander

1913. *Gnophomyia subhyalina* Alexander, Proc. U. S. Nat. Mus., xlv, 523, pl. 66, f. 23.

Fourteen specimens 6♂, 8♀, taken at Bartica, December 18, 1912 to February 25, 1913; mostly attracted to light, a few in the swamps.

Gnophomyia decisa sp. n.

Color black; legs light yellow; wings light brown diversified with hyaline and brown; a supernumerary cross-vein in cell R_2 .

Male.—Length, without the head, 3.9 mm.; wing, 4.7 mm.

Male.—Head lacking.

Thorax including the pleura black. Halteres rather slender, brown. Legs with the coxae bark brown, trochanters dull yellow, femora and tibiae dull yellow, the latter a little darkened toward the tip, the tarsi brown. Wings light brown, diversified with darker and lighter spots and drops as follows: a subhyaline patch in cell Sc_1 just at the end of vein Sc , other light marks in cell R , $2nd R_1$, at the end of vein R_1 , in cells $1st$ and $2nd M_2$, etc. Dark brown marks in the base of cell R , at the origin of R_3 , end of Sc , around cross-vein r (stigmatal), along the cord, at the tip of R_2 , and R_3 , a seam along the supernumerary cross-vein in cell R_2 , seams along the basal deflection of Cu_1 , base of the outer deflection of M_3 and on cross-vein m . Venation: (see pl. III, fig. 8) a supernumerary cross-vein in cell R_2 , cell $1st M_2$ very long and narrow so that cross-vein m is beyond the middle of the outer free portion of M_3 .

Abdomen dark brownish black, the hypopygium slightly brighter, more reddish.

Habitat.—Mallali, March 15, 1913.

Holotype, ♂, Mallali, March 15, 1913.

This species is not a typical member of *Gnophomyia* in the posi-

tion of Sc_2 , that is at the tip of Sc_1 and not retracted backward toward the wing-base to a greater or less degree. It seems to be most nearly allied to this genus, however, and it is better to refer it here than to create a new group on insufficient material.

Genus **SIGMATOMERA** Osten Sacken

1869. *Sigmatomera* Osten Sacken, Mon. Dipt. N. Am., iv, 137, 138.

Sigmatomera apicalis sp. n.

Color yellowish; wings yellow banded and tipped with brown.

Male.—Length, 13.6 mm.; wing, 12.8 mm.; antennae, 6 mm.

Male: Rostrum short, dark brown, the palpi yellowish brown. Antennae dark brownish black, the second segment slightly paler basally, segments three to nine (the first seven flagellar) with the extreme apex pale, almost whitish; the first four segments of the flagellum show the deep constrictions that give to the segments the S-shaped appearance, but beyond these first four this appearance is gradually lost and the apical segments are elongated and but little constricted. Eyes large, nearly approximated above, so that the space on the vertex between them is very narrow and reduced; head blackish in front, yellowish red behind.

Thoracic dorsum rather shining reddish yellow, without apparent darker stripes. Pleura yellowish brown. Halteres rather long, dull yellow. Legs reddish yellow, the femora rather broadly tipped with darker; tibiae light brown tipped with darker; tarsi dark brown. Wings rather uniform light yellow, a rather narrow darker band along the cord, an interrupted basal band and the apex of the wings lighter brown. Venation: (see pl. III, fig. 9) cell *1st M*₂ closed.

Abdomen brownish yellow, darker toward the tip, the hypopygium and segment eight dark brown.

Habitat.—Bartica, February 21, 1913.

Ho'totype, ♂, Bartica, February 21, 1913.

In its closed cell *1st M*₂ this agrees most closely with the type of the genus which has only a narrow brown seam to the cord. The color pattern of the wing agrees much more closely with *amazonica* Westwood, but here the thorax is blackish and cell *1st M*₂ is open by the lack of the outer deflection of *M*₃.

A KEY TO THE SPECIES OF SIGMATOMERA OSTEN SACKEN

1. Cell *1st M*₂ open; thorax black [apical band on the wings narrow, barely including the outer end of cell *2nd R*₁; middle crossband broad; basal band suffusing most of the anal lobe]. (Brazil)
amazonica Westwood³⁴
- Cell *1st M*₂ closed; thorax yellowish..... 2

³⁴ 1881. *amazonica* Westwood, Trans. Ent. Soc. Lond., 1881, 366, pl. 17, fig. 3.

2. Wings nearly hyaline, not banded, only the costal cells yellowish. (Paraguay).....*occulta* Alexander³⁵
Wings yellowish, banded..... 3
3. Wings with the banding confined to a narrow mark along the cord. (Mexico).....*flavipennis* Osten Sacken³⁶
Wings with the apex broadly banded, the middle crossband narrow, darker brown; the basal band not suffusing the anal angle of the wings. (British Guiana).....*apicalis* sp. n.³⁷

Genus **MONGOMA** Westwood1881. *Mongoma* Westwood, Trans. Ent. Soc. Lond., 1881, 364.**Mongoma geniculata** sp. n.

Cross-vein *r* just before the fork of R_{2+3} ; wings with the veins seamed with gray, tip not infuscated; legs black with the tip of the femur and the base of the tibia narrowly white, the tarsi brown.

Female.—Length, 10.8 mm.; wing, 7.7 mm.

Rostrum and palpi brown, the latter darker; Antennae dark brownish black. Head brown.

Praescutum dark brown without distinct darker markings; scutum with the lobes dark brownish black, the median area paler, more yellowish; scutellum and postnotum brownish black. Pleura pale yellowish, the mesopleura a little infused with brown. Halteres brown. Legs with the coxae and trochanters yellowish brown; femora brownish black, the tip narrowly white; tibiae dark brown, the extreme base whitish; tarsi dark brown. Wings subhyaline, the stigma prominent, oval, dark brown; veins broadly seamed with gray, the tip not distinctly infuscated. Venation, see plate IV, fig. 7.

Abdominal tergites dark brown, the lateral margins yellow; sternites yellow.

Habitat.—Bartica, February 18, 1913.

Holotype, ♀, Bartica, February 18, 1913.

Mongoma pallipes sp. n.

Cross-vein *r* just before the fork of R_{2+3} ; tip of wing infuscated and the veins seamed with gray; legs with the tips of the femora broadly white, the extreme base of the tibiae similar; hind legs, only, with the tarsi and the tip of the tibiae white, the remaining tarsi brown.

Male.—Length, 9.4 mm.; wing, 7.3 mm.

Rostrum yellowish. Antennae broken. Head dark brown, more yellowish behind.

Praescutum light yellowish brown, more brownish behind near the suture; scutum with the lobes dark brown, the median space pale; scutellum and

³⁵ 1914. *occulta* Alexander, Ent. News, xxv, 209, pl. ix, fig. 5.

³⁶ 1873. *flavipennis* Osten Sacken, Mon. Dipt. N. Am., iii, ix (supplement).

³⁷ 1914. *apicalis*, sp. n., this paper, pl. iii, fig. 9.

postnotum brown. Pleura dull yellow. Halteres brown. Legs, the fore pair lacking; middle pair, coxae and trochanters pale dull yellow, femora brown the tip abruptly white, extreme base of the tibia white, the remainder brown, tarsi brown; hind pair with the coxae and trochanters dull yellow, femora brown with the tip broadly white, tibiae with the base narrowly and rather indistinctly white, the tip broadly white, tarsi white, the two terminal segments more browned. Wings subhyaline, the stigma dark brown; tip of the wing and most of the veins and deflections of veins and cross-veins seamed with gray. Venation, see plate IV, fig. 8.

Abdominal tergites dark brown; sternites pale yellowish brown.

Habitat.—Mallali, March 8, 1913.

Holotype, ♂, Mallali, March 8, 1913.

The described species of *Mongoma* belonging to the *bromeliadicola* group may be separated by the following key:

1. Femora not tipped with white. (For these species, see Proc. U. S. Nat. Mus., xlv, 500.)
Femora tipped with white..... 2
2. Wings without gray seams to the veins; cross-vein *r* rather far before the fork of R_{2+3} ; tips of all the tibiae yellowish white, tarsi brown. (Costa Rica)..... *bromeliadicola* Alexander³⁸
Wings with the veins seamed with gray; cross-vein *r* just before the fork of R_{2+3} ; tibiae either uniformly brown beyond the base or else only the hind pair tipped with white..... 3
3. Wings infumed with gray at the apex; hind tarsi white; white tips to the light brown femora broad. (British Guiana)..... *pallipes* sp. n.
Wings not infumed at apex; all the tarsi brown; white tips to the dark brown femora narrow. (British Guiana)..... *geniculata* sp. n.

Tribe *Limnophilini*

Genus **PSARONIUS** Enderlein

1912. *Psaronius* Enderlein, Zool. Jahrb., xxxii, pt. 1, 50.

1913. *Lecteria* Alexander, Proc. U. S. Nat. Mus., xlv, 493.

In an earlier paper cited above I did not consider this genus as being distinct from *Lecteria* Osten Sacken. A very considerable amount of new material has since come to hand and it now appears as though the two genera are analogous forms of their respective tribes, *Lecteria* being an Eriopterine with spurless tibiae, while *Psaronius* is a Limnophiline with spurred tibiae. The venation of the members of these genera is very similar and their true relationships will only be explained when the immature stages are discovered and the forms reared; since *Lecteria armillaris* Fabricius

³⁸ 1912. *bromeliadicola* Alexander, Entomological News, xxiii, 415 to 417.

and *Psaronius obscurus* Fabricius are common and widely distributed throughout the tropics of the New World, this work of breeding out the adults should not be very difficult.

The following corrections to my paper cited above should be made: *Lecteria conspersa* Enderlein is a *Limnophila* though not a member of the subgenus *Dactylolabis* as stated by its describer. *L. mattogrossae* Alexander (ibid., 496, 497) and *armillaris* Fabricius (ibid., 497) are members of *Lecteria* as above restricted; the other species are *Psaronii* and may be separated by means of the key given later.

***Psaronius fuscipennis* sp. n.**

Wings dark fuscous with darker and paler markings in the radial cells.
Male.—Length, 27 mm.; wing, 18.8 mm.

Female.—Length, 24 to 25 mm.; wing, 16 to 16.2 mm.

Similar to *P. obscurus* in size and general structure but the body coloration is very much darker. The body markings are dark brown instead of the ochraceous brown of *obscurus*; the four terminal tarsal segments uniformly brown, not pale tipped with brown. The wings are distinctly dark brown with darker markings at the origin of *Rs* and at the stigmal spot; paler, subhyaline, blotches before and after the origin of *Rs* and beyond the stigma.

Habitat.—Bartica, February 26 to April 14, 1913.

Holotype, ♂, Bartica, April 14, 1913.

Allotype, ♀, topotypic, February 28, 1913.

Paratype, ♀, topotypic, February 26, 1913.

***Psaronius obscurus* Fabricius**

1885. *Tipula obscura* Fabricius, Syst. Antl., 27.

1912. *Psaronius lituratus* Enderlein, Zool. Jahrb., xxxii, 50, 51, fig. E1.

Thirteen specimens, 7 ♂, 6 ♀, Bartica, January 21 to February 26, 1913; two females were taken in deep swamps, the remainder at lights.

***Psaronius pygmaeus* sp. n.**

Wings subhyaline with scanty darker markings; vein *R*₂ fusing with *R*₁ at its tip; metatarsus very pale, whitish.

Male.—Length, 21 to 22 mm.; wing, 13.5 to 14.4 mm.

Fore leg, femur, 9.4 mm.; tibia, 13.4 mm.; tarsus, 10.7 mm.

Hind leg, femur, 12.2 mm.; tibia, 12.4 mm.; tarsus, 7.9 mm.

Rostrum rather short, brown, palpi dark brown. Antennae with the elongated basal segment orange, remainder of the antennae dark brown. Head orange-brown, the margin adjoining the eyes narrowly silvery; sides of the vertex with abundant long hairs.

Thoracic notum light brown, dorsal stripes not apparent; the postnotum darker brown medially. Pleura rather pale, brownish yellow. Halteres brown, the extreme base pale. Legs with the coxae and trochanters rather bright yellow; femora brown, only the tips slightly darkened; tibiae brown, the tip narrowly dark brown; first tarsal segment very pale, almost white, remainder of the tarsus brown. Wings with a pale yellow suffusion, the costal cell brighter yellow; brown clouds at the origin of R_s , fork of R_{2+3} and the radial cross-veins and deflections of veins narrowly and indistinctly seamed with brown; cephalic half of the long cell R_2 infumed. Venation: (see plate IV, fig. 9) R_2 tending to atrophy, its tip fused with R_1 at the wing-margin.

Abdominal tergites light brown, beyond the third segment darkening into a deeper brown; sternites yellow, the apical segments darker.

Habitat.—Bartica, January 30 to February 21, 1913.

Holotype, ♂, Bartica, February 21, 1913.

Paratype, ♂, topotypic, January 30, 1913.

This form is the smallest of the described species with the exception of *obliteratus* Alexander; the forms may be separated by the appended key.

A KEY TO THE SPECIES OF PSARONIUS ENDERLEIN

1. R_2 entirely atrophied; cell 2nd R_1 entirely obliterated. (Paraguay)
abnormis Alexander³⁹
 R_2 present, at least basally; the tip may be fused with R_1 at the wing margin..... 2
2. R_2 fused with R_1 at its tip so that cell 2nd R_1 is very tiny, pointed at its distal end which does not attain the wing-margin..... 3
 R_2 free for its entire length, running sub-parallel to R_1 and R_2 so that cell R_2 is long, slender, its distal end at least as broad as its proximal end and attaining the wing-margin..... 4
3. Smaller; wing of male less than 12 mm.; wing suffused with brown; body coloration dull black; antennal flagellum black, the scape orange. (British Guiana)..... *obliteratus* Alexander⁴⁰
Larger; wing of male over 12 mm.; wing pale yellowish; body coloration orange-yellow; antennal flagellum brown, only the first segment orange. (British Guiana)..... *pygmaeus* sp. n.
4. Wings light yellow or brownish yellow; body coloration ochraceous yellow, the markings rather indistinct. (Guiana; Brazil)
obscurus Fabricius⁴¹
Wings dark brown; body coloration brown, the marking dark brown. (British Guiana)..... *fuscipennis* sp. n.

³⁹ 1914. *abnormis* Alexander, Ent. News, xxv, 211, pl. ix, fig. 9 (*Lecteria*).

⁴⁰ 1913. *obliterata* Alexander, Proc. U. S. Nat. Mus., xlv, 494 (*Lecteria*).

⁴¹ 1805. *obscura* Fabricius, Syst. Antl., 27 (*Tipula*).

Genus **POLYMERA** Wiedemann

1821. *Polymera* Wiedemann, Dipt. Exot., i, 40.

The species of this interesting genus have been considered by the author in earlier papers; the student is referred to the Proceedings of the U. S. National Museum, xlv, 526 to 535.

Polymera hirticornis Fabricius

1805. *Chironomus hirticornis* Fabricius, Syst. Antliar., 46.

Bartica, one male on January 28, 1913; two females on February 11, 1913, March 1, 1913.

Polymera niveitarsis Alexander

1913. *Polymera niveitarsis* Alexander, Proc. U. S. Nat. Mus., xlv, 532.

Bartica, one female, February 14, 1913.

Polymera obscura Macquart

1838. *Polymera obscura* Macquart, Dipt. Exot., i, pt. 1, 65.

Bartica, one male, December 30, 1912. Mallali, one female, March 13, 1913.

Polymera conjuncta Alexander

1913. *Polymera conjuncta* Alexander, Proc. U. S. Nat. Mus., xlv, 529.

Bartica, one specimen, sex uncertain, January 13, 1913. Mallali, one female, March 15, 1913.

Polymera pulchricornis sp. n.

Size medium; flagellar segments of the male antennae bi-nodose; wing with cell M_1 present; tarsi uniformly brown, similar in color to the rest of the legs; thoracic pleura with a prominent black stripe.

Male.—Length, 4.4 to 4.5 mm.; wing, 4.6 to 4.7 mm.; antennae about 7 mm.

Female.—Length, 5.7 mm.; wing, 5.2 mm.

Male.—Rostrum and palpi brown. Antennae very long and delicate, about half as long again as the body; segments brown, darkest at the nodes which are provided with groups of long out-stretched hairs; flagellar segments bi-nodose. Head grayish.

Thoracic dorsum light brown, unmarked. Pleura with a very broad dark brown lateral stripe; sternites and coxae light yellow. Halteres brown. Legs with the coxae as described above; trochanters dull yellow; femora light brown; tibiae and tarsi of all the legs brown. Wings with a light grayish brown suffusion; stigma not present. Venation: (see plate IV, fig. 10) Cell M_1 present; cell M_3 as long as its petiole; the space on R_1 beyond r about one-half that of R_1 between Sc_2 and r .

Abdomen dark brown throughout; pleurites of the hypopygium very long and slender.

Female.—Similar to the male but the antennae short and simple, extending about to the base of the first abdominal segment.

Habitat.—Bartica, December 10, 1912 to February 17, 1913.

Holotype, ♂, Bartica, February 17, 1913.

Allotype, ♀, topotypic, December 10, 1912.

Paratype, ♂, topotypic, January 28, 1913.

In my key to the species of *Polymera* (ibid., 527, 528) this form would run down to *P. inornata* Alexander, also from British Guiana, in which the color of the hind tarsi is not known; in *inornata*, however, the cross-vein *r* is almost midway between *Sc*₂ and the tip of *R*₁ and there is no pleural stripe on the thorax. *P. pulchricornis* agrees with *thoracica* Alexander and *albitarsis* Williston in its dark pleural stripe, but differs in the dark color of the tarsi. *P. grisea* Alexander has the cross-vein *r* very far out toward the tip of *R*₁, the basal deflection of *Cu*₁ beyond the fork of *M*, pleural stripe narrow, etc.

Tribe *Hexatomini*

Genus **ERIOCERA** Macquart

1838. *Eriocera* Macquart, Dipt. Exot., i, 74.

Eriocera kaieturensis Alexander

1914. *Eriocera kaieturensis* Alexander, Psyche, xxi, 41, 42, pl. 4, fig. 1.

Bartica, ♀, February 26, 1913; Bartica, ♂, April 15, 1913; St. Edwards, ♀, December 2, 1912.

Eriocera speciosa sp. n.

Head reddish; thoracic dorsum grayish brown; wings brown with a broad whitish band lying before the cord; basal segments of the abdomen orange-yellow, tip black.

Male.—Length, 10.4 to 11.6 mm.; wing, 10.1 to 10.8 mm.

Female.—Length, 13.1 to 14 mm.; wing, 11.4 to 12.5 mm.

Rostrum and palpi dark brownish black. Antennae with the first segment brownish orange, remainder brownish black. Head fiery orange-yellow.

Thoracic dorsum brown with a yellowish bloom; postnotum lighter brown. Pleura light brown. Halteres short, brown, lighter at the base. Legs dark brown. Wings dark brown, the anal cells scarcely if at all paler; a broad whitish band across the wing, this band lying entirely before the cord. Venation, see plate III, fig. 10.

Abdominal tergites 1 to 5 orange, 6 velvety black, brownish orange around the margin, 7 and 8 velvety black; hypopygium grayish brown;

sternites 1 to 5 yellow, 6 to 8 black. In some specimens an oval black median spot on tergite 5 near the caudal margin.

Holotype, ♂, Bartica, January 30, 1913, in swamps.

Allotype, ♀, topotypic, February 5, 1913, in swamps.

Paratypes, 11 ♂, 2 ♀, topotypic, January 25, 1913 to February 11, 1913, in swamps.

E. speciosa is closest to *E. melanacra* Wiedemann of Brazil but the thoracic dorsum is without black stripes, base of the wing not conspicuously pale, wing band proximad of the cord, first abdominal segment not black, no dark stripes on the yellow of the basal abdominal segments, etc.

Subfamily TIPULINAE

Tribe Dolichopezini

Genus MEGISTOCERA Wiedemann

1828. *Megistocera* Wiedemann, Aussereur. zweifl. Ins., i, 55.

Megistocera longipennis Macquart

1838. *Tipula longipennis* Macquart, Dipt. Exot., i, pt. 1, 57, pl. 5, fig. 1.

Bartica, one ♂, December 5, 1912, one ♂, January 18, 1913. Mallali, one ♀, March 20, 1913.

Genus BRACHYPREMNIA Osten Sacken

1886. *Brachypremna* Osten Sacken, Berlin. Entomol. Zeitschr., xxx, 161.

Brachypremna breviventris Wiedemann

1821. *Tipula breviventris* Wiedemann, Dipt. exot., i, 43.

Bartica, two ♀, January 16, 1913 to February 18, 1913; one ♂, January 31, 1913.

Tribe Tipulini

Genus OZODICERA Macquart

1834. *Ozodicera* Macquart, Histoire Naturelle des Insectes: Diptères, i, 92.

Ozodicera pectinata Wiedemann

1821. *Tipula pectinata* Wiedemann, Dipt. Exot., i, 24.

One female from Bartica, January 27, 1913.

Ozodicera noctivagans sp. n.

Very much smaller than any of the described species, length of wing under 12 mm.; thorax gray with four brown stripes; wings dusky, stigma brown.

Male.—Length, 12 to 12.1 mm.; wing, 10.8 to 0.9 mm.

Fore leg, femur, 7 mm.; tibia, 8.7 mm.; tarsal segment 1, 8.8 mm.; tarsal segments 2 to 5 about 7.5 mm.

Rostrum and palpi black. Frontal prolongation of the head yellow, the nasus very small, indistinct. Antennae with the scapal segments yellow, flagellum brownish black; segments 4 to 9 of the antennae unipectinate, the pectinations a little longer than the segment, except on the 9th where it is shorter, four apical segments simple. Head brownish gray, somewhat shiny around the base of the antennae.

Thoracic dorsum gray with four distinct brown stripes, the median pair longest, broad in front, ending in a point behind near the suture; lateral stripes short and broad, beginning behind the pseudosutural foveae, ending at the transverse suture; scutum gray, each lobe with a large brown blotch on the cephalic margin this being a continuation of the lateral praescutal stripe; scutellum gray, the caudal half dark brown; postnotum with a gray bloom showing brown in certain lights; this gray and brown pattern is variable in different lights. Pleura light brown with a gray bloom. Halteres rather long, dark brown, pale at the base. Legs, coxae and trochanters dull yellow, femora yellow narrowly dark brown at the tip, tibiae and tarsi brown. Wings with a slight dark suffusion; stigma brown; veins dark brown. Venation: cross-vein r connects with R_2 just beyond the origin of the latter; R_{2+3} longer than R_2 alone; cross-vein $r-m$ short, punctiform; cell 1st M_2 large; cell M_1 broadly sessile, the portion of M_2 that makes up the outer end of cell 1st M_2 about one-third as long as cross-vein m ; fusion of Cu_1 and M_3 slight equal to about one-third of the cross-vein m .

Abdominal tergite 2 with the basal half pale silvery gray, apical half black; tergite 3 brownish yellow indistinctly ringed with blackish before the middle and at the end of the segment, segments 4 to 6 brownish yellow tipped with black, apical abdominal segments rather uniformly dark; six basal sternites yellow, 7 and 8 brownish black, 9 yellow.

Holotype, ♂, Bartica, February 19, 1913, at light.

Paratype, ♂, topotypic, January 7, 1913, at light.

From the other species of *Ozodicera* with the antennae unipectinate, *pectinata* Wiedemann, *gracilis* Westwood, *griseipennis* Loew, *simplex* Walker and *bimaculata* Enderlein, this form differs conspicuously in its very small size and gray thoracic coloration. The species above listed have the wing over 15 mm. in length, *noctivagans* having it under 12 mm.

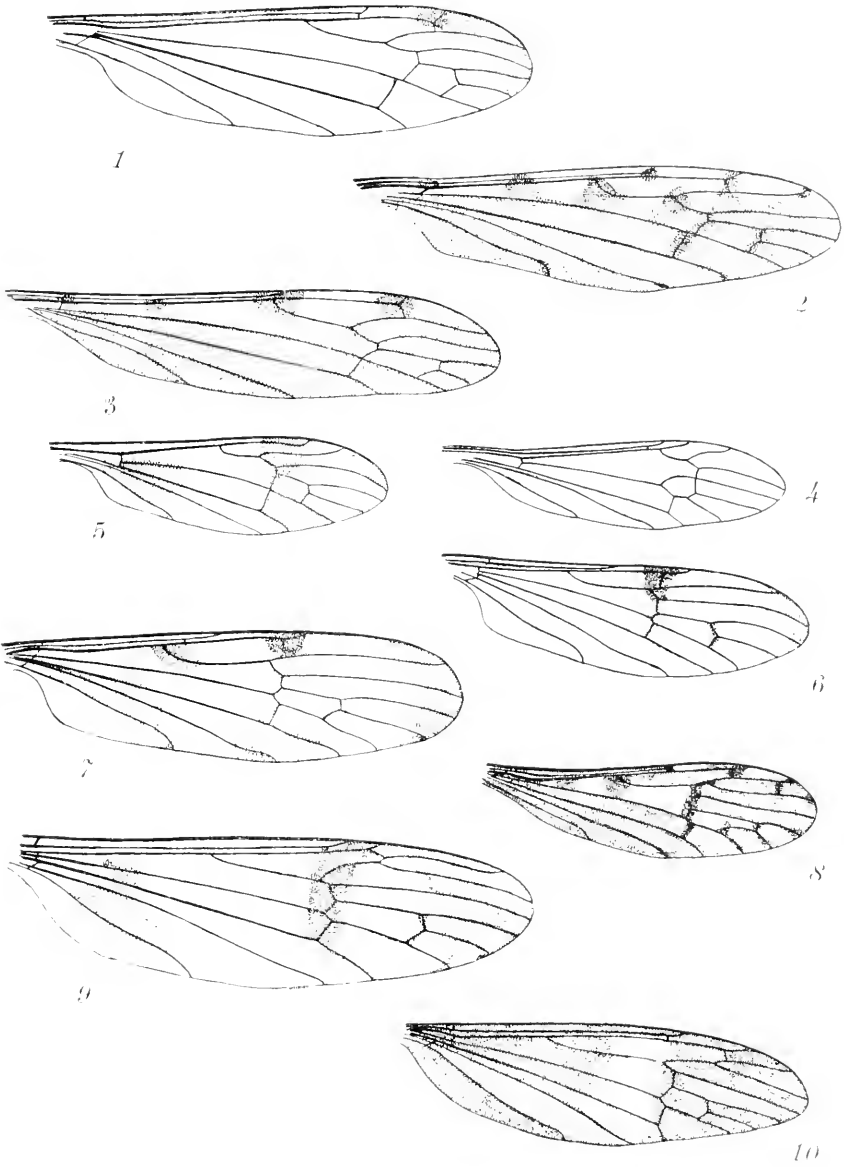
EXPLANATION OF THE PLATES

PLATE III

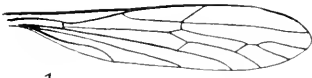
- FIG. 1.—Wing of *Dicranomyia apicata* sp. n.
FIG. 2.—Wing of *Rhipidia (Conorhipidia) conica* sp. n.
FIG. 3.—Wing of *Geranomyia pulchella* sp. n.
FIG. 4.—Wing of *Rhamphidia uniformis* sp. n.
FIG. 5.—Wing of *Rhamphidia mirabilis* sp. n.
FIG. 6.—Wing of *Teucholabis stygica* sp. n.
FIG. 7.—Wing of *Teucholabis melanocephala* Fabricius.
FIG. 8.—Wing of *Gnophomyia decisa* sp. n.
FIG. 9.—Wing of *Sigmatomera apicalis* sp. n.
FIG. 10.—Wing of *Eriocera speciosa* sp. n.

PLATE IV

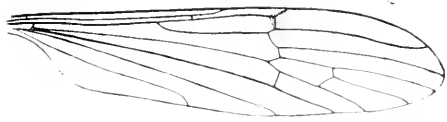
- FIG. 1.—Wing of *Styringomyia americana* sp. n.
FIG. 2.—Wing of *Teucholabis lugubris* sp. n.
FIG. 3.—Wing of *Orimarga punctipennis* sp. n.
FIG. 4.—Wing of *Diotrepha atribasis* sp. n.
FIG. 5.—Wing of *Gonomyia (Leipaneura) inermis* sp. n.
FIG. 6.—Wing of *Gnophomyia arcuata* sp. n.
FIG. 7.—Wing of *Mongoma geniculata* sp. n.
FIG. 8.—Wing of *Mongoma pallipes* sp. n.
FIG. 9.—Wing of *Psaromius pygmaeus* sp. n.
FIG. 10.—Wing of *Polymera pulchricornis* sp. n.



ALEXANDER BRITISH GUIANA TIPULIDAE



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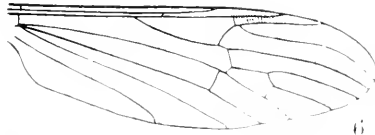
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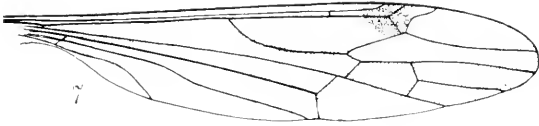
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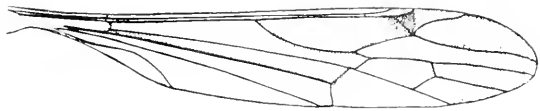
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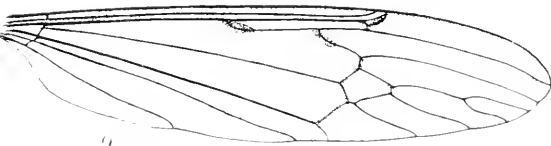
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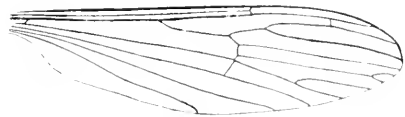
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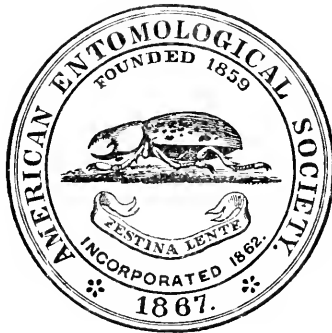
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DECEMBER 1914

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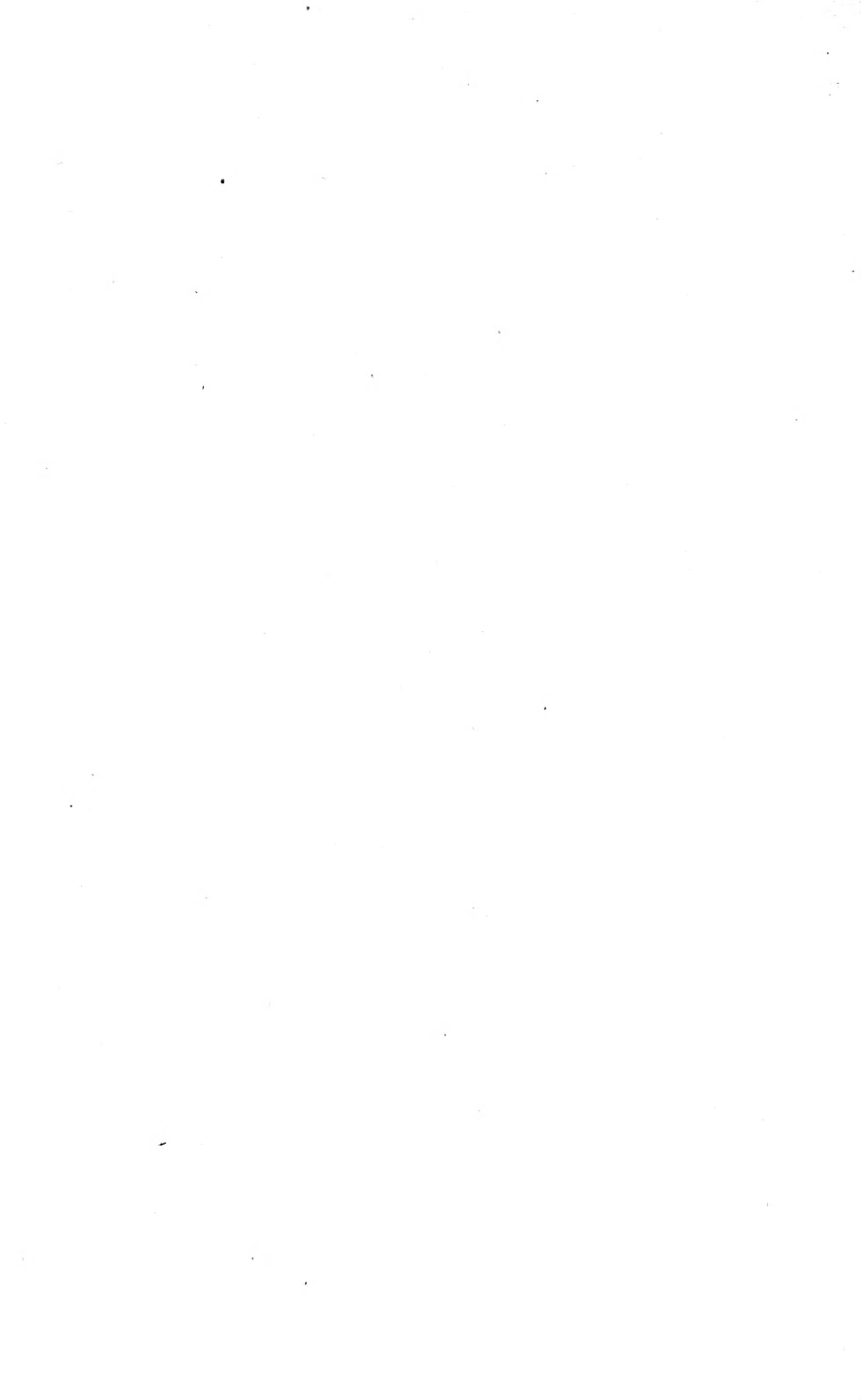
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ACADEMY OF NATURAL SCIENCES

PHILADELPHIA

SUBSCRIPTION PRICE FOUR DOLLARS PER VOLUME



TWENTY NEW COLEOPTERA FROM THE FLORISSANT SHALES

BY H. F. WICKHAM

Recent studies on the fossil Coleoptera of Florissant show that the subject is by no means exhausted. The writer has described, and for the most part figured, some two hundred and seventy-eight species additional to those made known by Scudder, Cockerell and Beutenmueller, the entire beetle fauna specifically characterized to date reaching four hundred and ninety-four. No other deposit is nearly as rich, as far as records show. About all of the larger families are represented, as well as many of the smaller ones, though the relative specific development in some groups seems to have been different at Florissant from what we see to-day. In the original discussions of this fauna, it was referred to the Oligocene, but it is now generally admitted to belong to the Miocene, chiefly on the testimony of the plant remains since no data as to the mammalian life are available.

The species described in the present paper are, in part, of particular interest. The occurrence of a beautifully preserved *Pactopus*, showing the generic characters in remarkable detail, is worthy of special note. Three new Cerambycidae are added to the already fairly good-sized representation of this family and two Tenebrionidae of types not hitherto known from these shales have been detected.

Arranged by families, the new species are:

CUCUJIDAE	CLERIDAE
<i>Lithocoryne coloradensis</i>	<i>Necrobia sibylla</i>
LATHRIDIIDAE	PTINIDAE
<i>Corticaria acterna</i>	<i>Gastrallanobium subconfusum</i>
THROSCIDAE	SCARABAEIDAE
<i>Pactopus americanus</i>	<i>Aphodius inundatus</i>
BUPRESTIDAE	<i>Serica cockerelli</i>
<i>Melanophila heeri</i>	

CERAMBYCIDAE

Scaptolenopsis wilmattae
Palaeosmodicum hamiltoni
Hylotrupes puncticollis
Acanthoderes lengii

CHRYSOMELIDAE

Lema lesquereuxi
Luperodes submonilis

TENEBRIONIDAE

Ulus minutus
Proteleates centralis

CISTELIDAE

Isomira aurora

MORDELLIDAE

Mordellistena scudderiana
Mordellistena nearctica
Mordellistena protogaea

All of the figures were drawn by the writer, using a camera lucida. They are intended to show the outlines of the sclerites as far as they can be discerned, and the courses of the principal lines of sculpture. Nothing has been restored. No attempt has been made to indicate adventitious markings due to imperfections of the stone or to bits of adhering foreign matter.

Lithocoryne coloradensis sp. nov. (Plate V, figs. 1, 2, 3.)

General form elongate, similar to that of *L. gravis*, but differing in thoracic outline. Head large though not as wide as the prothorax, front and vertex deeply and, relatively to the size of the insect, fairly coarsely punctured, closely along the anterior, posterior, and lateral margins but more sparsely at the middle. Eyes not well preserved, but what remains indicates them to have been of moderate size. Antennae not long enough to reach the prothoracic base, first joint large, about one and one half times as wide as the next, second to eighth subequal, about as long as wide, ninth to eleventh forming a well defined but hardly abrupt club, about twice as wide as the stem. Prothorax, if complete, about one and two-thirds times as broad as long, but one side is broken off. The other is nearly straight behind the middle, thence gently arcuate to apex, the front angle only slightly prominent, margin distinct and moderately broad. The prothorax was, therefore, of approximately equal width from the base to the middle, thence gently narrowed to apex. Punctuation less deep and more sparsely placed than on the head, but of about the same size. Scutellum strongly transverse. Elytra obscurely striatopunctate, the punctures less pronounced than those of the thorax though of slightly larger size near the base. Underside of head strongly and very closely punctate on the cheeks, middle smoother. Prosternum punctured at the sides of the base, fairly closely but much more finely than the head, the flanks apparently only slightly wrinkled, prosternal process roughened but with no defined punctures. Mesosternum strongly, almost confluent punctured in front of the coxae, side pieces finely sculptured. Metasternum weakly or finely sculptured at middle, more strongly at sides. Abdominal segments partly

covered by the legs (which are not shown in the sketch) the exposed portions closely, moderately finely and not deeply punctate. Legs short, none of them very well preserved. Length, from front of head to elytral apex, 5 mm.

Described from one specimen, with counterpart, found by myself on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

This is the third species assigned to *Lithocoryne*. All of them have the same type of antenna and agree in size and general form. They may be separated by the subjoined table.

Prothorax broadest anteriorly, sides nearly straight from near the front angles to the base.....	<i>gravis</i> Scudder
Prothorax with side margins strongly, regularly arcuate	<i>arcuata</i> Wickham
Prothorax broadest at base, side margins slightly arcuate	<i>coloradensis</i> n. sp.

Corticaria aeterna sp. nov. (Plate V, fig. 4.)

Form of the usual type of the genus except that the prothorax is wider than normal. Head only moderately prominent, eyes large, surface between them minutely closely punctured. Prothorax twice as wide as long, broadest near the base, sides almost regularly arcuate, surface relatively coarsely and extremely closely punctured. Elytra nearly four and one-half times the prothoracic length, punctuation confused, similar to that of the prothorax but a little finer, (more especially apically), and less close. Length, to abdominal apex, 2.90 mm.; to elytral tip, 2.65 mm.

Described from one specimen, with counterpart, collected by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

Distinguished from all the other Florissant forms assigned to this genus by its size and the relative proportions of the prothorax and elytra. It is larger than most of the modern species but is surpassed in this respect by some of them.

Pactopus americanus sp. nov. (Plate VI, fig. 10.)

Form rather stout for this family, broadest across the neighborhood of the humeri, well tapering posteriorly. Head finely but roughly punctate on the small portion of the front that can be seen. Eye not definable except a small portion which shows above the antenna and is rather coarsely faceted. Antennae well separated at base, first joint nearly twice as long as wide, second and third a little longer than any one of the five succeeding, which are subequal to each other, ninth, tenth and eleventh much longer, forming an obscure club. Prothorax strongly eribrately punctured

on the flanks, antennal grooves well marked and much arcuate, prosternum wedge shaped, narrowed behind, the front margin arcuate, face minutely punctulate, a deep longitudinal stria along each side. Mesosternum emarginate. Metasternum nearly smooth at middle, coarsely but not closely punctate laterally, the side pieces more coarsely and densely, tarsal grooves extending obliquely outwards and backwards from the middle coxae, very slightly arcuate. Hind coxal plates rather narrowly wedge shaped, their inner posterior margins, (perhaps accidentally), irregularly dentate. Under side of abdomen deeply, closely, and rather coarsely punctate, the punctures becoming more or less confluent longitudinally, which, with the coating of hairs, gives the appearance of irregular striation. Second, third and fourth abdominal segments subequal, first and fifth longer. Tarsal grooves convergently arcuate anteriorly, straight and divergent posteriorly, reaching to the apex of the third segment. Legs short, rather slender. Length, 3.80 mm.

Described from one specimen, showing the underside only, collected by myself on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

Not the slightest doubt can be entertained as to the relationships of this insect. It is a *Pactopus* in all characters of importance though plainly specifically different from the recent *P. hornii* of our Pacific coast. The modern insect has the prosternum and the middle of the metasternum much more strongly punctured, the antennal clavation a little less pronounced and the abdominal tarsal grooves more arcuate and convergent. Both are similarly hairy and of about the same size.

Melanophila heeri sp. nov. (Plate VI, fig. 11.)

Form moderately elongate. Head rather large, extremely closely but not coarsely punctate between the large eyes. Prothorax about twice as wide as long, damaged on one side, the other indicating that the greatest width is well in front of the middle and that there is no angulation, but the sides narrow regularly and arcuately anteriorly and are nearly straight posteriorly from the widest point. Surface punctuation moderately coarse, confluent transversely so as to give the appearance of striation in that direction. Elytra nearly four times as long as the prothoracic median line, the sides subparallel to behind the middle, apex of the more perfect one rounded but not so bluntly as in *M. cockerellae*. Surface finely punctured, the punctures a little coarser at sides and near the apex, not extensively confluent anywhere and generally well separated. Legs wanting. Length, to elytral apices, 10.50 mm.

Described from one specimen, with counterpart, collected by myself on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

Compared with recent North American species, this is most like *M. drummondi* though different in the form of the prothorax and the more finely sculptured non-costate elytra. It is easily distinguished from the Florissant fossil *M. handlirschi* by not having pointed elytral apices and from *M. cockerellae* in being much more slender. The under side of the prothorax has a reticulate sculpture giving it a scaly look like that of corresponding parts on *M. drummondi*.

Necrobia sibylla sp. nov. (Plate V, fig. 5.)

Form only moderately elongate, sides subparallel. Head roughly semi-circular in outline, the length, however, considerably less than the breadth, surface finely and sparsely punctured. Antenna clavate, not reaching to the prothoracic hind angle, the individual joints not well enough preserved for description. Prothorax about one and two-thirds times as broad as long, narrower at base, sides moderately arcuate, surface closely and regularly, moderately deeply but not coarsely punctured, each puncture with a minute point in the center which may mark the former attachment of a hair. Elytra moderately long, apices rounded, punctuation fine and deep but sparse and not arranged in striae. Legs short and slender. Length, to abdominal apex, 5.85 mm.

Described from one specimen collected by myself on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

Likely enough this is not a true *Necrobia*, but there is nothing upon which to base generic separation aside from the differently shaped prothorax and the nature of the elytral punctuation. This last is about like what we see in the recent *Enoclerus abruptus coccineus*, but the fossil can hardly belong to the latter genus. It is larger than *N. divinatoria* and differently proportioned as will be seen by a comparison of the figures.

GASTRALLANOBIUM gen. nov.

Form about that of *Gastrallus*. Eye large, transverse. Antennae with long basal and short intermediate joints, club apparently three-jointed, narrow. Prothorax strongly projecting over the head, the sharp side margin much less oblique than in *Gastrallus* and not deflexed anteriorly. Legs short. Elytral sculpture punctato-striate.

Type.—*G. subconfusum* sp. nov.

Gastrallanobium subconfusum sp. nov. (Plate VI, fig. 12.)

Form moderately elongate, parallel. Head of moderate size, evidently entirely concealed from above during repose, front just visibly punctured.

antennae rather short. Prothorax projecting anteriorly, the outline of the front edge of the flank strongly emarginate below the overhang, side margin strong, relatively little curved in profile, back only slightly arched, notum strongly and closely moderately coarsely punctured, flanks more sparsely. Elytra with fairly regular striae of small, rounded, distant punctures, the basal region confusedly punctate for the full width. Abdomen obscurely reticulate. Length, 2.65 mm.

Described from one specimen taken by myself at the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

Considering its small size, this insect is remarkably well preserved. It is more like *Gastrallus* than anything else that I know and if one could be sure that the antennal structure is correctly interpreted the assignment in this neighborhood might be made with a good deal of confidence.

Aphodius inundatus sp. nov. (Plate VII, fig. 15.)

Form quite stout. Head of moderate size, clypeus broadly rounded, anteriorly sparsely punctured, the punctuation becoming coarser and closer on the front and again finer and sparser on the vertex, but everywhere distinct and well separated. Prothorax narrower at apex than at base, sides broadly arcuate, surface about evenly and extremely closely though not confluent punctured. Elytra broad, the extreme tips not exposed, surface regularly striate, the striae practically equal in width to the interspaces, neither with any sign of punctuation. The interspaces are perfectly flat, as are also the bottoms of the striae. Scutellum small, triangular. Underside finely and, in the main, moderately closely punctured. Legs very short and stout. Length, as preserved, 6.25 mm.; in life, a little more.

Described from one specimen, with counterpart, collected by myself on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

The underside shows the clypeus a little better than the other and indicates that it may have had a broad shallow anterior emargination. I cannot find any recent species with just this type of sculpture and all the other Florissant fossil Aphodii differ by the same character. Possibly a perfect specimen would indicate another generic reference.

Serica cockerelli sp. nov. (Plate VII, fig. 16.)

Form stout, ventricose in side view. Head, in profile, about half the height of the prothorax, the latter not so high at apex as at base, sculpture weak and obscure. Elytra without defined sculpture, other than faint indications of alternations of striae and interstitial spaces. Abdominal

segment subequal, sutures regularly curved. Legs stout, too poorly preserved for description. Length, 11 mm.; of elytron, about 7 mm.

Described from one specimen, with counterpart, found by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

About the size of the recent North American *S. vespertina*, and apparently similarly sculptured on the elytra. It is much larger than *S. antediluviana*, the only fossil species heretofore known from Florissant.

SCAPTOLENOPSIS gen. nov.

Head of moderate size, narrower than the prothorax, mandibles stout, curved, projecting, labrum apparently closely connate, the suture entirely obliterated. Antennae 10-jointed, only very slightly serrate, second joint extremely short, third longer than the first. Prothorax margined, but the sides are partly hidden by the antennae so that the armature, if present, is obscured. Elytra obscurely and rather closely striate.

Type.—*Scaptolenopsis wilmattae* sp. nov.

Scaptolenopsis wilmattae sp. nov. (Plate VIII, fig. 19.)

Form moderately stout. Head, including the jaws, as long as the prothorax, length and width equal, sculpture extremely fine and close with vestiges of a covering of short delicate hairs. Labrum pointed at apex. Mandibles stout, outer edges arcuate, exposed on each side of the labrum and moderately roughly closely punctured in such a way as to give the effect of longitudinal striation. Antennae inserted in front of the main portion of the eyes and slightly between them, rather slender, joints beyond the third not very unequal in length, the entire organ less than one-half the length of the body. Prothorax not showing the lateral outlines at all well but it is narrowed anteriorly and, near the base, not far from twice as broad as long. The surface is minutely sculptured and finely, rather closely hairy. Scutellum small, triangular. Elytra subparallel at sides, apices broken, surface with a covering of fine, short, rather close hairs, striation neither very well defined nor deep, but rather close. Epipleural margin well shown on one elytron, apparently wide. Legs rather short, not much thickened, tarsi with the proximal three joints strongly pubescent beneath. Length, as preserved, 20 mm.

One specimen collected at Station 17, Florissant, Colorado, by Mrs. W. P. Cockerell, after whom it is named. The type is in the University of Colorado Museum.

This is a puzzling insect, having, at first sight, the general appearance of *Scaptolenus* in the Cebriioninae. Analysis of the

characters shown indicates the propriety of placing it in the Cerambycidae, where it seems to go into the Prioninae by the form, antennal structure and connate labrum. In general, it is probably allied to the Solenopterini, fairly well represented today in tropical America. The color seems to have been a uniform brown, like that of most modern Prioninae.

PALAEOSMODICUM gen. nov.

Form similar to that of most of the modern members of the Callidioides. Second antennal joint large. Eyes well developed, granulations not very coarse. Elytra not spinose at tip. Thighs clavate, front coxal cavities confluent.

Type.—*P. hamiltoni* sp. nov.

Palaeosmodicum hamiltoni sp. nov. (Plate VIII, fig. 20.)

Form subparallel, moderately elongate. Head short and broad, eyes suborbicular in vertical view. Antennae incomplete at apices, first joint moderately large and clavate, second about half the length of the third which is nearly equalled by the fourth. The following joints are not distinctly set off, so it is impossible to describe them. Prothorax broader than long, the sides nearly straight, the only visible sculpture a minute inconspicuous punctuation. Elytra unarmed and apparently bluntly pointed at apices, without maculation but finely punctulate, especially at their bases. Thighs clavate, the hind ones particularly so. Length, from front of head to abdominal apex, 18.50 mm.

The type is in my collection. It was collected on the Wilson Ranch, Florissant, Colorado.

This insect seems worthy of generic separation since the assemblage of structural characters, taken into consideration with the facies, does not permit its entry into any of the Callidioid genera that I know. It looks a good deal like a large *Smodicum*, but the confluent front coxal cavities forbid assignment to that genus. The specific name is given in remembrance of an old friend, the late Dr. John Hamilton of Allegheny, Pa.

Hylotrupes puncticollis sp. nov. (Plate VIII, fig. 21.)

Form moderately stout. Head of relatively larger size than in any of the living North American species, finely rugosely punctulate and somewhat hairy. Antennae not quite complete on either side, but what is left indicates that they reach nearly to the elytral apex. The first joint is only fairly enlarged, the second approximately one-third the length of the third, fourth and following shorter, not broad nor spinose as far as can be seen. Prothorax imperfect on the sides but one-half of the specimen

shows them fairly well, here they appear to be nearly regularly rounded, the apex a little narrower than the base, no spines, tubercles, nor other armature. The width is not far from twice the length. Pronotal sculpture of moderately coarse, very crowded punctuation, closer at the sides and leaving a nearly smooth fairly wide median line on the basal half, vestiture sparse and fine. Elytra long, four times the prothoracic length, sides subparallel, apices rounded, punctuation minute, sparse, each puncture with a fine, short hair. Legs short, only moderately stout, hairy. Length, to abdominal apex, 18.75 mm.; to elytral tip, 16 mm.; of one elytron, 11.15 mm.

Described from one specimen, with counterpart, collected by myself on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

Quite unlike any of the other described Florissant Cerambycidae. I have placed it in the Callidioides on account of the form, the short legs, and the relatively short third antennal joint, and have selected *Hylotrupes* to contain it for the present because it seems not unlike that genus in sculpture and leg structure. The description was made up from both slabs while the figure represents only the reverse. This will account for the appearance of certain characters in the diagnosis which are not brought out in the drawing.

***Acanthoderes lengii* sp. nov.** (Plate VIII, figs. 22, 23.)

Body formed much as in the recent *A. quadrigibbus*. Head short, broad, antennal tubercles strong. Antennae longer than the body but not excessively so, first joint clavate, second small, third elongate but nearly equalled by the fourth, the fifth, sixth and seventh successively a little shorter, eighth to eleventh not quite so long as the seventh but subequal among themselves. No antennal hairs are visible nor is there any evidence of coarse punctuation on the joints, though the scape is roughened. Prothorax broad and short, the front coxae well separated by the prosternum. Elytra, as preserved, rather strongly tapering posteriorly, not armed at apices. At their bases they show several scattered deep punctures, only a portion of which are represented on the figure. Legs wanting. Length, 11.25 mm.; of antenna, on chord of arc shown in the figure, 15.50 mm.

Described from a single specimen, with counterpart, collected on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

The characters of this fossil indicate that it is a good *Acanthoderes*. A specimen with counterpart in the Scudder collection, bearing the numbers 3916 and 7747, may also belong here, but

the preservation is rather poor. The insect is dedicated to Charles W. Leng of New York, to whom I am indebted for kindly help and many favors.

Lema Iesquereuxi sp. nov. (Plate VI, fig. 13.)

Form stout. Head wide, apparently short, front rather strongly but not coarsely punctate, vertex with a well marked median longitudinal groove flanked each side by an oblique stria. Eyes of moderate size. Antennae quite stout, the distal joints relatively broader. Prothorax with the sides poorly preserved, surface not visibly punctate even under high magnification. Scutellum small, triangular. Elytra distinctly punctate in rows, very strongly at base but faintly near the apex, the sutural row disappearing in a stria. Legs stout but not well displayed. Length, to abdominal apex, 4.35 mm.; to elytral apex, 4.15 mm.; of one elytron, 2.75 mm.

Described from one specimen, with counterpart, collected by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

Much smaller than *L. evanescens* and *L. fortior*. There is no doubt of the correctness of the generic reference.

Luperodes submonilis sp. nov. (Plate VI, fig. 14.)

Form moderately robust. Head of normal size, eye rounded, antenna slender, first and fourth joints long, second and third, though not very well set up, evidently short, fifth and following longer than either of these two but not equal to the fourth. Prothorax without evident sculpture. Elytron not striate, punctuation fine and scattered, distinct at base becoming effaced apically. Legs more or less crushed and distorted but apparently about of normal build. Length, in position preserved, 3.50 mm.

Described from one specimen, with counterpart. The type is in my collection and was found on the Wilson Ranch, near Florissant, Colorado.

Although of small size and fragile build, the fossil is well preserved and suggests *Luperodes* at first sight. The reference is borne out in a general way by the sculpture as well as the facies and the antennae are like those of *Luperodes* except that the shortening of the second and third joints and those succeeding the fourth is more pronounced in the fossil. It may be compared with the recent *L. marginalis* from Texas.

Ulus minutus sp. nov. (Plate VII, fig. 17.)

Form rather broadly oval. Head of moderate size and deeply sunken in the prothorax, sculpture rough but not very coarse. Prothorax with rounded sides, apex much narrower than the base, flanks coarsely, closely and subconfluently punctured, prosternum moderately broad between

the round coxae, much more finely and obscurely punctate than the flanks. Middle coxae a little smaller than the anterior, more widely distant, hind coxae transverse, separated by a broad, rounded, intercoxal process. Elytra about as wide at base as the prothorax, regularly and rather rapidly arcuately narrowing to the apex, striae broad and deep. The nearly uniform, close, and moderately coarse punctuation which shows on the elytra is probably that of the ventral surface of the abdomen since the elytra are overlaid by that part of the body. Legs short, rather stout, the tibiae not or but little expanded. Length, 2.99 mm.

Described from one specimen, found by myself on the Wilson Ranch near Florissant, Colorado. The type is in my collection.

The form, sculpture and general appearance are all those of *Ulus*. In size, it is below that of the recent species known to me. The genus now lives in sandy soil at the roots of plants and the Florissant species may well have had similar habits.

PROTELEATES gen. nov.

Generally similar to *Eleates* in outline and characters of the underside but differing in the round front coxae and presumably in the third and fourth ventral segments of the abdomen which are short, together not longer than the second.

Type.—*P. centralis* sp. nov.

Proteleates centralis sp. nov. (Plate VII, fig. 18.)

Form oblong, sides subparallel. Head not well displayed and, as seen from beneath, not exhibiting any characters of interest. Prothorax much wider than the head, broader at base than at apex, sides moderately arcuate and apparently not crenate or toothed. Flanks beneath moderately deeply, very coarsely and closely punctate, prosternum in front of the coxae transversely rugulose. Sides of the elytra strongly embracing the abdomen, their sculpture showing only on the edges where they are deeply and coarsely punctato-striate. Metasternum inconspicuously punctured at the middle, side pieces more strongly. Abdomen deeply, coarsely, and closely punctured, more finely apically, intercoxal process subtriangular, rounded at tip. Legs wanting. Length, 4.10 mm.

Described from one specimen found by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

This insect is about the size of *Eleates occidentalis*, now living in California, and on the whole seems to approach *Eleates* pretty closely. It differs from all of the *Boletophagini* known to me by the shortness of the third and fourth ventrals. From the recent *Boletotherus* and *Boletophagus* it departs also in the apparently simple prothoracic side margin.

Isomira aurora sp. nov. (Plate V, fig. 6.)

Form moderately elongate, subparallel for most of the length. Head of normal size, eyes not well defined but remote, front minutely punctulate. Antennae much longer than the head and prothorax united, slender, not serrate, the joints succeeding the second subequal in length. Prothorax much narrowed anteriorly, sides arcuate, width equal to about one and three-fourths times the length, surface minutely punctured and finely, moderately closely hairy. Elytral sculpture and vestiture similar but a little more pronounced. Legs slender, poorly preserved. Length, 10 mm.; to elytral apices, only a very little less.

Described from one specimen, with counterpart, found by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

The measurement is taken from the lower impression, which is not broken at the posterior extremity. The insect is pretty large for *Isomira*, but I think it belongs in that immediate vicinity and the *Cistelide* genera, at best, are often excessively poorly differentiated.

Mordellistena scudderiana sp. nov. (Plate V, fig. 7.)

Of the usual cuneiform outline, not very slender. Color apparently brownish or testaceous. Head rather small, antennae wanting. Prothorax moderately strongly arched dorsally, surface minutely but clearly punctulate and pubescent. Elytra more or less overlapping, too much damaged to allow their shape to be made out clearly, but the remaining portion is well preserved, showing a fine punctuation, stronger than that of the prothorax, and a pubescent vestiture. Anal style short and strong, pointed at apex. Ventral sclerites of thorax and abdomen smoother than the elytra. Legs lacking except one belonging to the hind pair which has a moderately thickened femur. Length, over all, 4.90 mm.

Described from one specimen, with counterpart, preserved in profile. It was collected by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

Closely related, as far as visible characters go, to *M. protogaea*, but of considerably greater size.

Mordellistena nearctica sp. nov. (Plate V, fig. 8.)

Form slender. Head and prothorax fused together by crushing so that the form of each is obscured. Eye large. Antennae wanting. Elytron narrow, the apex damaged so that its exact shape is not determinable. Abdomen extending well beyond the elytral apices, its tip pointed, the anal style rather long, not much tapered, apex blunt. Hind leg with stout and short femur and tibia, tarsus not defined. Length, to elytral apex, 3.25 mm.; to tip of anal style, 4.15 mm.

Described from one specimen, with counterpart, found by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

In comparison with the other Florissant fossil species, this would come nearest to *M. smithiana*, which is of about the same size. The present insect, however, has relatively a longer abdomen and style, giving it a more slender appearance. The sculpture is an extremely minute, close punctuation and the vestiture has left imprints of close, fine hairs.

Mordellistena protoŕaea sp. nov. (Plate V, fig. 9.)

Form only moderately slender. Head and prothorax fused by crushing, the shape of each being hardly definable. However, it may be seen that the head is broad and short, not much narrower than the prothorax which is wider posteriorly. Sculpture of both these parts fine and quite close, but readily definable under fairly high power, vestiture moderately dense and short. Elytra, seen from above, tapering posteriorly, apices separately rounded, sculpture similar to that of the prothorax but a little stronger, vestiture also much the same. Anal style short but well differentiated, apparently grooved above, the tip nearly pointed. Length, over all, 3.85 mm.; to apex of elytra, 3 mm.

Described from one specimen, with counterpart, preserved in dorsal and ventral aspects. It was collected by myself on the Wilson Ranch, near Florissant, Colorado. The type is in my collection.

Excepting the smaller size, shorter style and different punctuation, there is nothing definite upon which to separate this insect from *M. smithiana*, but that species is much smoother. The comparison of punctuation was made with a $1\frac{1}{2}$ inch objective and a 3x ocular. A hand lens will not bring it out well. The types of both species are preserved in similar shale and are in good condition as regards the surface characters. Both seem to have been brownish or testaceous in life.

EXPLANATION OF PLATES

PLATE V

- FIG. 1. *Lithocoryne coloradensis*.
“ 2. “ “ underside.
“ 3. “ “ antenna.
“ 4. *Corticaria acterna*.
“ 5. *Necrobia sibylla*.
“ 6. *Isomira aurora*.
“ 7. *Mordellistena scudderiana*.
“ 8. “ *nearctica*.
“ 9. “ *protogaea*.

PLATE VI

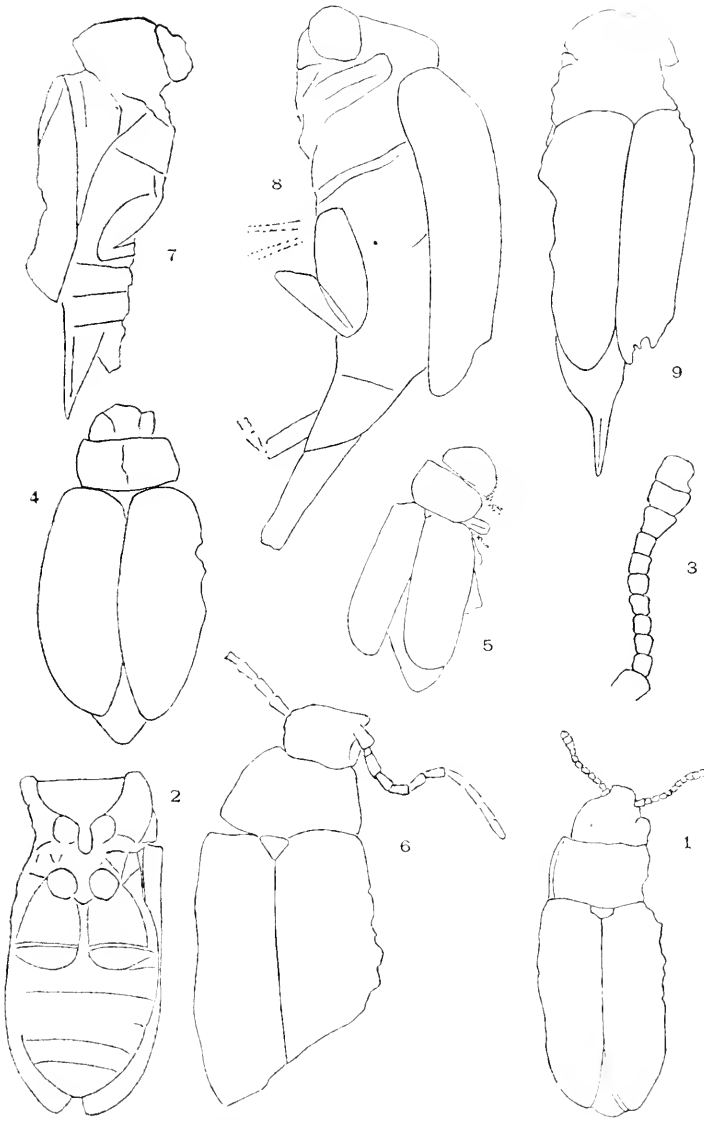
- FIG. 10. *Pactopus americanus*.
“ 11. *Melanophila h. eri*.
“ 12. *Gastrallanobium subconfusum*.
“ 13. *Lema lesquereuxi*.
“ 14. *Luperodes submonilis*.

PLATE VII

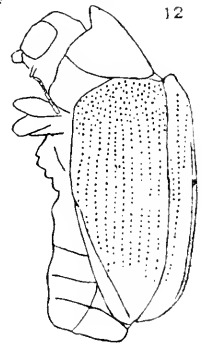
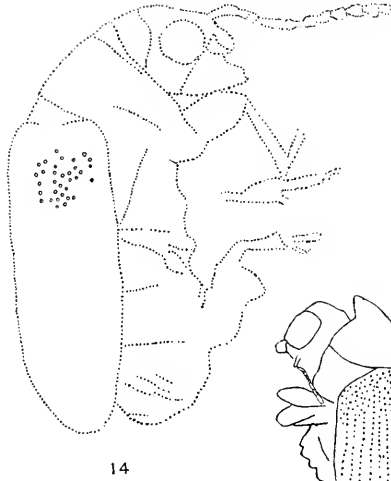
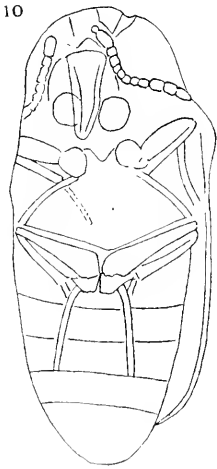
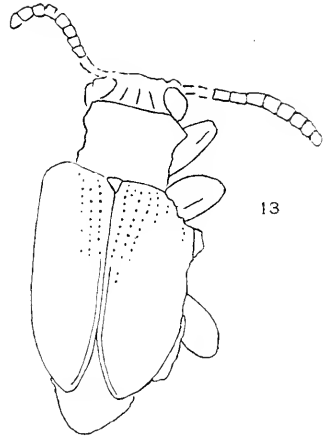
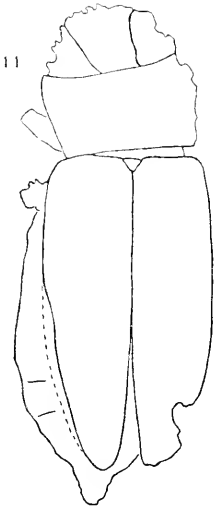
- FIG. 15. *Aphodius inundatus*.
“ 16. *Serica cockerelli*.
“ 17. *Ulus minutus*.
“ 18. *Proteleates centralis*.

PLATE VIII

- FIG. 19. *Scaptolenopsis wilmattæ*.
“ 20. *Palæosmodicum hamiltoni*.
“ 21. *Hylotrupes puncticollis*.
“ 22. *Acanthoderes lengii*.
“ 23. “ “ antenna.

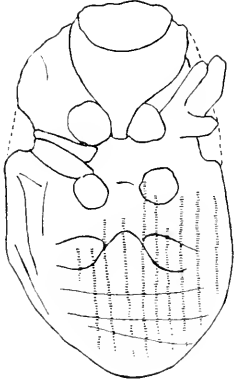


WICKHAM—FOSSIL COLEOPTERA



WICKHAM—FOSSIL COLEOPTERA

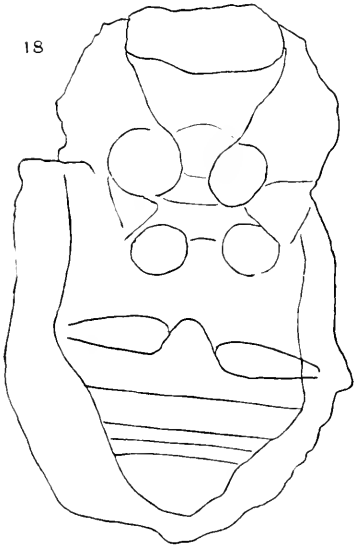
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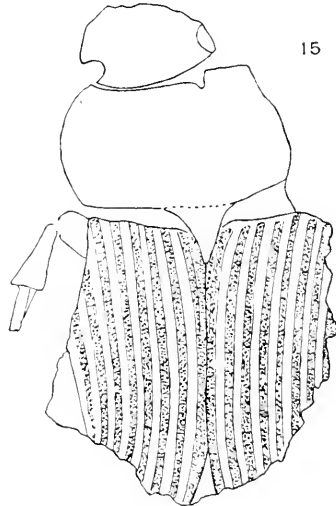
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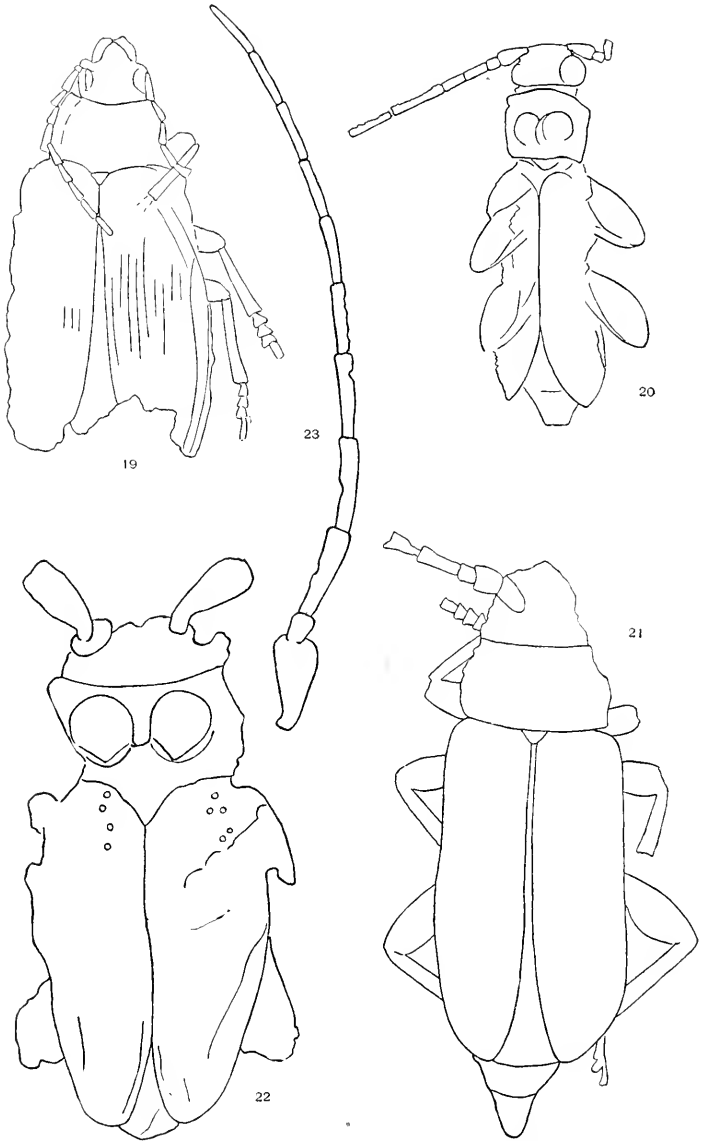
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WICKHAM—FOSSIL COLEOPTERA



WICKHAM—FOSSIL COLEOPTERA

STUDIES IN AMERICAN TETTIGONIIDAE (ORTHOPTERA)¹

I and II

BY JAMES A. G. REHN AND MORGAN HEBARD

The present general title is selected to cover a somewhat connected series of systematic and geographic papers on the Tettigoniidae of the Americas. The authors have in hand for study very extensive collections of the group and in the determination of these series it has been, and in the future also will be, necessary to consult the other important collections of the order. In a number of cases it has proved necessary to analyze and even completely revise genera to properly locate our series, and it is our intention to bring out as parts under the present general title the results of these studies.

Unless otherwise specified, the material listed in these papers as having been collected by the authors, jointly or individually, is to be found in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia. The abbreviations used for the sources of other material are in general use and clearly intelligible. In the case of smaller collections and institutions the source has been given at sufficient length to be clear to all.

The color terms used in the descriptions are based on Ridgway's standards (Color Standards and Color Nomenclature, 1912).

I

A SYNOPSIS OF THE SPECIES OF THE GENUS SCUDDERIA

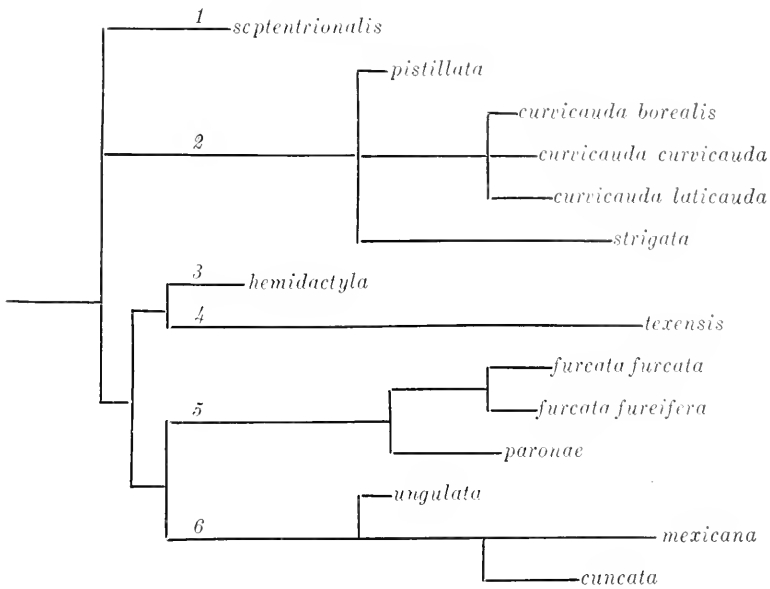
It has recently been necessary for the authors to record certain species of the present genus, and it was found impossible to do this correctly without study of all of the material before us. The present paper could be considered monographic, were it possible to include more complete data on the distribution of certain of

¹ Published with the aid of the Orthoptera Fund.

the very scarce forms, and on material from certain areas in the wide distribution of other well known species.

In 1898, Scudder revised the present genus, describing several new species and correcting certain mistakes in the nomenclature at that time in general use. In a number of places, however, his treatment is unsatisfactory, owing partly to the fact that the importance of geographic races was not appreciated by him. Other errors are attributable to that author's lack of knowledge of certain species; these included his misconception of *S. paronae* and his retention in the genus of the species *forcipata*, which latter insect is a member of the allied but very distinct genus *Chloroscirtus*.

The present work is based mainly upon the material in the Philadelphia collections and examination of the series in the Museum of Comparative Zoology, the Morse Collection and the United States National Museum. We are deeply indebted to the following gentlemen who have assisted us greatly in various ways during the preparation of the present paper: Prof. A. P. Morse, Mr. A. N. Caudell, Dr. Samuel Henshaw, Dr. J. Chester Bradley, Mr. William T. Davis and Dr. F. E. Lutz. The material before us includes all of the known species of the genus and has enabled us to correct a number of errors and ascertain more clearly the proper grouping of the species. This latter task is particularly difficult owing to the numerous lines of development found in the genus, as shown by the species which divide into numerous groups, each containing but very few forms. These groups are six in number: the first of these contains the primitive *septentrionalis*; the second, *pistillata*, the three races of *curvicauda* and the very aberrant *strigata*; the third, the anomalous and apparently rather primitive *hemidactyla*; the fourth, the specialized *texensis*; the fifth, the two races of *furcata* and *paronae* and the sixth *ungulata*, *cuneata* and *mexicana*. The correlation of these forms may be graphically demonstrated as follows:—



In some respects members of the different groups show a certain similarity to each other. Thus *septentrionalis* and *pistillata* both have coriaceous tegmina with heavier veinlets; all of the other species have the tegmina glossy, this being particularly marked in *hemidactyla*, due partially to the tegminal veinlets being reduced in this species to the minimum size found in the genus. A broadly and evenly areuate ovipositor is found in *septentrionalis*, *hemidactyla* and *ungulata*, and the greatest bend in that organ is found in the most highly specialized species, *texensis*, *strigata* and *mexicana*. The male supra-anal plate is not strongly produced and compressed in *septentrionalis* and *hemidactyla* only. The tegmina are very broad in *pistillata*, broad in *curvicauda* and its races, *septentrionalis* and *ungulata*, and narrow to varying degrees in the other species, this attenuation decided in *texensis* and *mexicana* but reaching an extreme condition in *strigata*.

The species of the present genus have the genicular lobes of all the femora bispinose; the ventro-cephalic margins of the cephalic femora often bear a very few small spines or denticulations, the ventro-caudal margins of the same one or two, but these are fre-

quently absent, the ventral margins of the median femora are always smooth, those of the caudal femora usually bear a few small spines but in *hemidactyla* these latter margins are distinctive, bearing instead small teeth.

In the present paper the body length measurements are taken from the vertex to the apex of the subgenital plate in both sexes. The ovipositor length is taken from the ventral apex of the basal plica to the apex of the ovipositor.

We have had before us the types of *curvicauda borealis*, *strigata*, *hemidactyla*, *furcata furcifera*, *ungulata* and *cuneata*; all of which, excepting *cuneata*, are in the Philadelphia collections. We have corrected all of the erroneous determinations for the present genus which we have made in the past and also the evident mistakes which have been made by other authors, where it has been possible for us to do so. Under each species the synonymy alone is given, except in the case of *curvicauda laticauda*, where all previous correct references are given, and in *furcata furcifera* and *paronae*, where it has been thought best to give all previous references which apply to these previously little known species. In the specific treatment here no description of previously described species are given, but an effort is made in every case to emphasize the most important characters of the species. We have not recorded here any material which has been previously correctly recorded. We have examined nearly 2000 specimens, while the number of individuals here listed is 1139.

KEY TO THE MALES OF THE GENUS SCUDDERIA

- A. Disto-dorsal abdominal segment subtriangular in outline with no median produced pistillate process. Subgenital plate not compressed distad. Cerci relatively long, not as strongly incurved distad with distal portion not, or but weakly, enlarged.
- B. Sides of disto-dorsal abdominal segment decidedly bisinuate, convex, and immediate apex truncate and subangulate excavate, segment elsewhere simple. Cerci gently arcuate throughout with apex not enlarged. Tegmina broad, coriaceous and dull, with heavy veinlets.
septentrionalis (Serville)
- BB. Sides of disto-dorsal abdominal segment weakly concave distad and apex bifid, V-emarginate, segment elsewhere complex. Cerci gently arcuate to apex which suddenly bent inward and weakly swollen, though not nearly as much so as in the majority of the species of the genus. Tegmina narrow, rather glossy, with very weak veinlets.
hemidactyla new species

- AA. Disto-dorsal abdominal segment with a median produced pistillate process. Subgenital plate compressed distad. Cerei relatively short, very strongly incurved distad with distal portion decidedly enlarged.
- B. Lateral angles of pronotum very broadly rounded. Tegmina extremely narrow, much narrower than length of pronotum. Production of disto-dorsal abdominal segment furcate at apex, with lateral processes short and dorsal surface of same strongly declivent distad.)..... **strigata** Seudder
- BB. Lateral angles of pronotum not broadly rounded. Tegmina not very narrow, width greater than length of pronotum.
- C. Production of disto-dorsal abdominal segment truncate at apex with a slight median projection and with strongly compressed vertical lateral flanges, which completely embrace and generally extend beyond the sides of the subgenital plate when in natural position..... **texensis** Saussure and Pictet
- CC. Production of disto-dorsal abdominal segment furcate at apex with no median projection.
- D. Furcate portion of production of disto-dorsal abdominal segment lobate, these lobes bearing ventrad small vertical longitudinal flanges.
- E. Lobes of furcate portion of production of disto-dorsal abdominal segment distinctly tapering distad when seen from above. (Tegmina very broad and short.)... **pistillata** Brunner
- EE. Lobes of furcate portion of production of disto-dorsal abdominal segment subequal in width when seen from above.
- F. Size small, form compact. Tegmina rather broad and short.
curvicauda borealis new subspecies
- FF. Size large, form less compact. Tegmina decidedly longer.
- G. Tegmina proportionately wider, lateral angles of pronotum decided..... **curvicauda curvicauda** (De Geer)
- GG. Tegmina proportionately narrower, lateral angles of pronotum less decided..... **curvicauda laticauda** Brunner
- DD. Furcate portion of production of disto-dorsal abdominal segment lobate, these lobes not bearing ventrad small vertical longitudinal flanges.
- E. Lobes of furcate portion of production of disto-dorsal abdominal segment not compressed laterad and not much longer than broad.
- F. Lobes of furcate portion of production of disto-dorsal abdominal segment decidedly swollen, broadest proximad when viewed from above..... **furcata furcata** Brunner
- FF. Lobes of furcate portion of production of disto-dorsal abdominal segment less decidedly swollen, broadest meso-proximad when viewed from above.
- G. Form less robust, limbs proportionately shorter. Antennae unicolorous..... **furcata furcifera** Seudder
- GG. Form more robust, limbs proportionately longer. Antennae annulate in typical material..... **paronae** Griffini

- EE. Lobes of furcate portion of production of disto-dorsal abdominal segment compressed laterad and at least twice as long as broad.
- F. Lobes of furcate portion of production of disto-dorsal abdominal segment not obliquely compressed, not emarginate mesad.
ungulata Scudder
- FF. Lobes of furcate portion of production of disto-dorsal abdominal segment obliquely compressed, emarginate mesad.
- G. Lobes of furcate portion of production of disto-dorsal abdominal segment very weakly emarginate mesad. Form moderate robust.....**cuneata** Morse
- GG. Lobes of furcate portion of production of disto-dorsal abdominal segment deeply emarginate mesad. Form exceedingly slender.....**mexicana** (Saussure)

Differential Characters found in the Ovipositor

Three species, *septentrionalis*, *hemidactyla* and *ungulata* have the ovipositor with both dorsal and ventral margins evenly and broadly arcuate, the latter species is further distinguishable by having the apex of this organ acute, not rounded as in all the other species of the genus. This broadly arcuate type of ovipositor is found in *curvicauda laticauda* also, but a suggestion of a sudden upward bend is shown in the dorsal margin; in this species the ovipositor is extremely broad with basal and mesal width subequal. This same type of ovipositor is found in *curvicauda curvicauda*, *curvicauda borealis* and *pistillata*, but in these the sudden upward bend of the dorsal margin is more decided and the ovipositor is not as broad, though with basal and mesal width subequal. In *furcata furcata*, *furcata furcifera*, *paronae* and *cuneata* a narrower ovipositor is found with a marked sudden upward bend of the dorsal margin and with the basal and mesal width subequal; in *furcata furcifera* the race develops an aberrational form in the southwestern United States in which the ovipositor is similar but very decidedly broader. In the remaining species, *texensis*, *strigata* and *mexicana*, not only is the dorsal margin of the ovipositor very suddenly and decidedly bent upward, but the shaft becomes narrower beyond this bend so that the ovipositor is much broader at the base than mesad.

When taken in conjunction with the differential characters of the various species it may be seen that females of all of the species are readily separable excepting those of *furcata furcata* and *cuneata*,

the difficulties involved in this case being fully discussed under the latter species.

Although Kirby² has referred *Locusta pallens* Fabricius,³ to *Scudderia*, we have omitted the species from the present treatment, as we are of the opinion that it does not belong to this genus.

The present genus is found from Nova Scotia to southern British Columbia, southward to the Isthmus of Panama, and in South America is known only from Trinidad (Caparo) and Dutch Guiana (Paramaribo). In the arid regions of the western United States and Mexico it is not to be found in the desert proper, but almost everywhere in the desert hills and mountains. The species of the genus are largely nocturnal, manifesting but little activity during the day. All but one of the species are normally uniform green in general coloration.

Scudderia septentrionalis (Serville) (Pl. IX, fig. 14; pl. X, fig. 29; pl. XI, fig. 31.)

1839. *Phaneroptera septentrionalis* Serville, Hist. Nat. Ins., Orthopt., p. 416. [North America.]

1894. *Scudderia truncata* Beutenmüller, Bull. Amer. Mus. Nat. Hist., vi, p. 252. [Vineland, New Jersey.]

Scudder in his revision of the Scudderidae,⁴ has incorrectly supposed Heer's name *Phaneroptera suturalis* to apply to the present species, and has sought to retain it for what from Heer's description, appeared to him to be a color form.

Heer described *Phaneroptera suturalis* from New Georgia,⁵ but in his treatment apparently mistook the locality for Georgia in the United States. The specimen was doubtless properly labelled "New Georgia," one of the Solomon Islands, since the description further shows the species to belong to the genus *Ductia*, not agreeing at all with any species of *Scudderia*.

Lugger has given two excellent figures of the sexes of the present species from Minnesota unfortunately calling them *S. pistillata*,⁶ he had doubtless both species before him. This record is the first which applies, at least in part, to this species from west of the Appalachians. Bruner's material shows that it was this

² Syn. Catal, Orth., ii, p. 446, (1906).

³ Mant. Ins., i, p. 234, (1787).

⁴ Proc. Amer. Acad. Arts and Sci., xxxiii, p. 286, (1898).

⁵ Insektenfauna der Tertiargebilde von Oeningen und Radoboj, Abth. ii, p. 4, (1849).

⁶ Orth. of Minn., p. 220, figs. 144, 145, (1898).

species from West Point, Nebraska, to which he has referred without a name.⁷

The present insect is readily separated in the male sex from all others of the genus by the triangular and simple disto-dorsal abdominal segment, and in the female by its small size and dull leaf-like tegmina accompanied by an extraordinarily long and gently curved ovipositor. The tegminal veinlets are heavier than in the other species of the genus excepting *S. pistillata*, to which insect the present species shows some approach in this respect as well as in its short heavy structure.

Measurements (in millimeters)

	♂ Marion, Massachusetts	♂ West Point, Nebraska
Length of body.....	18.4	18
Length of pronotum.....	4.7	4.7
Length of tegmen.....	28	25.2
Greatest width of tegmen.....	7	7.3
Length of caudal femur.....	19.4	18.1
Length of subgenital plate.....	5.4	5.7

The present insect has been found on the Atlantic coast from Norway, Maine, to Vineland, New Jersey, and has been taken as far west as West Point, Nebraska. The species is unquestionably one of the very scarcest forms of North American Orthoptera having a distribution so extensive.

Specimens Examined.—In addition to 3 males and 2 females previously recorded: 3; 3 males.

Marion, Massachusetts, VIII, 1906, (H.; undergrowth in woods), 1 ♂.

Lone Rock, Wisconsin, VII, 27, 1906, (J. D. Hood), 1 ♂, [U. S. N. M.].

West Point, Nebraska, VII, 27, 1887, (L. Bruner; in woods), 1 ♂, [Herbar Cln.].

Scudderia pistillata Brunner (Pl. IX, fig. 8; pl. X, fig. 24; pl. XI, fig. 30.)

1878. *Sc[udderia] pistillata* Brunner, Monogr. Phaner., p. 240. [New York; New Hampshire.]

Lugger unfortunately confused this species with *S. septentrionalis* and his figures which are credited to the present species belong in fact to that insect.⁸ The male figure has again been used most unfortunately in Blatchley's treatment of *pistillata* in his Orthoptera of Indiana,⁹ but there it is accompanied by Scud-

⁷ Publ. Nebr. Acad. Sci., iii, p. 29, (1893).

⁸ Orth. of Minn., p. 220, figs. 144, 145, (1898).

⁹ Orth. of Indiana, p. 347, fig. 79, (1903).

der's larger figure of the male supra-anal plate of the present insect.

The present species is separable from all others of the genus by the much broader tegmina which are dull and very leaf-like, this partially due to the veinlets which are heavier than in any other species of the genus. This insect, though distinctive in this character also, has the production of the supra-anal plate of the male somewhat similar in general development to *S. curvicauda* and has been confused with that species by several of the early authors. The distal flanges of this production are produced ventrad in strongly compressed vertical flanges, deepest proximad at their arcuate bases which are situated at the bifurcation of the distal portion of the plate; *curvicauda* and its races have homologous flanges which are shorter, evenly arcuate in outline and occupy the proximal two-thirds of the distal flanges.

Females of *pistillata* bear a close general resemblance to females of *S. curvicauda borealis*, but in addition to the tegminal characters given above, the eyes of the present insect are very decidedly smaller and the caudal limbs very much shorter.

Measurements (in millimeters) of extremes

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Great Cranberry Island, Maine.....	5.3-5.6	30.3-31.8	9.3-10.1	21.6-21.7	6.3-6.7
Saunderstown, Rhode Is- land.....	6	31.3	11	24.1	6.7
Pequaming, Michigan.....	4.7-5.7	30.2-33.2	9.3-10.4	21-21.8	6-6.3
Staples, Minnesota.....	4.8-5.4	29-29.3	9-9.5	21.5-22.1	5.8-6
Black Hills, South Dakota	5.7	31.7	9	22.4	6.6
♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
Great Cranberry Island, Maine.....	4.9	25.4	8	20	6.8
Pequaming, Michigan.....	4.9-5.4	25.7-28	7.8-8	20.2-21.1	6.2-6.7
Staples, Minnesota.....	5.3	27.3	8.3	19.7	6.4
Black Hills, South Dakota	5.3	26	7.9	20.9	6.7
Livingston, Montana.....	5.4	27	8.1	20.3	7.2

The present insect, which is found in greatest numbers in the southern portions of the Canadian Zone, is usually met with in clusters of low bushes, such as wild rose, hazel and alder, in the open. Males are least active of the species of the genus, taking wing much less often when disturbed. The females are even more secretive than the males and usually prove very hard to find. We have never seen this sex take wing.

The distribution of this insect is known to extend from Halifax, Nova Scotia, southward to Chester in northern New Jersey,¹⁰ and westward as far as Regina, Saskatchewan and Bozeman, Montana.

Specimens Examined: 46; 32 males, 13 females and 1 immature female.

Great Cranberry Island, Hancock County, Maine, VIII, 25, 1913, (H.; in wild rose tangle on edge of spruce forest), 4 ♂, 1 ♀.

Summit of Sargent Ridge, Mount Desert Island, Maine, VIII, 21, 1913, 850 feet, (H.; in huckleberry and other bushes on bare summit), 1 ♀ n.

Jaffrey, New Hampshire, IX, 4, 1896, (S. Henshaw), 1 ♂, [M. C. Z.].

Melrose Highlands, Massachusetts, VII, 21, 1908, (D. H. Clemons), 1 ♀, [U. S. N. M.].

Saunders town, Rhode Island, IX, 3, 1913, (H.; open near shore in bayberry bushes), 1 ♂.

Weekapaug, Rhode Island, 1 ♀, [U. S. N. M.].

Honesdale, Wayne County, Pennsylvania, IX, 7, 1 ♂, [Pa. St. Dept. Zool.].

White Mills, Wayne County, Pennsylvania, VIII, 7 to 9, 1 ♀, [Bklyn. Inst. A. and S.].

Lopez, Sullivan County, Pennsylvania, VIII, 4 to 10, 1913, (W. Stone), 3 ♂, 1 ♀, [A. N. S. P.].

East Lansing, Michigan, (C. F. Baker), 1 ♂, [Morse Cln.].

Cranmoor, Wisconsin, VIII, 4 to IX, 16, 1909 and 1910, (C. W. Hooker), 6 ♂, [U. S. N. M.].

Lone Rock, Wisconsin, VIII, 9, 1906, (J. D. Hood), 1 ♂, [U. S. N. M.].

Beaver, Lake County, Minnesota, VIII, 11 to 12, 1912, (W. Stone), 1 ♀, [A. N. S. P.].

Waldo, Lake County, Minnesota, VIII, 1906, (W. Stone), 1 ♂, 2 ♀, [A. N. S. P.].

Wright, Carlton County, Minnesota, VII, 24, 1909, (H.; under pines in wild strawberry patch), 1 ♀.

Staples, Minnesota, VII, 24, 1909, (H.; in ditch overgrown with high weeds), 3 ♂, 3 ♀.

¹⁰ Saussure and Pictet record the present insect in the *Biologia Centrali-Americana* from Georgia. The species appears to be correctly determined, but the locality is certainly in error as the insect is not known to occur in the Appalachians south of northern Pennsylvania.

Mandan, North Dakota, VII, 25, 1909, (H.; along stream in rolling hills), 2 ♂.

Bismarek, North Dakota, VIII, 9, 1885, 1 ♂, [Hebard Cln.]

Englewood, Black Hills, South Dakota, IX, (D. A. Haggard), 2 ♂, 1 ♀, [Hebard Cln.]

Custer, Black Hills, South Dakota, 1 ♂, [Hebard Cln.]

Livingston, Montana, VII, 29, 1909, 4500 feet, (R. & H.; beaten from bushes near river), 1 ♀.

Bozeman, Montana, (Wilcox), 1 ♂, [U. S. N. M.]

Newcastle, Weston County, Wyoming, VII, 25, 1909, 4300 to 4400 feet, (R.; hills covered with grasses and low plants), 1 ♂.

Fort Fetterman, Wyoming, 1 ♂, [U. S. N. M.]

Scudderia curvicauda borealis new subspecies (Pl. IX, fig. 9; Pl. X, fig. 27.)

1904. *Scudderia curvicauda* E. M. Walker, Can. Ent., XXXVI, p. 326. (In part.) [Toronto, Tobermory and Severn River, Ontario.]

1910. *Scudderia curvicauda* E. M. Walker, Can. Ent., XLII, p. 351. [Aweme, Manitoba.]

The records of *curvicauda* from "Boreal America" by F. Walker, Provancher, Thomas, Caulfield, Harvey and Knight and Scudder up to 1898, apply not to this race but to *S. pistillata*.

From the characters of the present geographic race a close resemblance to *S. pistillata* results, but that species may be readily separated by the smaller eyes, the much broader tegmina, shorter caudal limbs, much larger tympanal area of the male tegmina and excellent genital characters in that sex.

The measurements given below, when compared with those of *curvicauda curvicauda*, show the chief differences upon which this northern race is based.

Type—♀; Aweme, Manitoba. August 19, 1909. (N. Criddle; in tall dry vegetation.) [Hebard Collection.]

Description of Type.—Similar to *curvicauda curvicauda* but of smaller size and more compact structure. Pronotal disk broader in proportion to length with lateral angles somewhat more decided. Tegmina broader in proportion to length (width of same contained in length very slightly more than four times as an average), limbs proportionately shorter. Ovipositor very similar.

Allotype—♂; Aweme, Manitoba. August 22, 1909. (N. Criddle; on hillside.) [Hebard Collection.]

Description of Allotype.—Very similar in proportions to type. The produced portion of the supra-anal plate is similar to, but somewhat smaller than, that found in *curvicauda curvicauda*.

Measurements (in millimeters)

	Aweme, Manitoba				West Point, Nebr.	Whitneyville, Maine	
	♀ Type	♀♀ Paratypes	♂♂ Allotype	♂♂ Paratypes	♀	♂	♀♀
Length of body.....	20	18-20	20.5	18.2-21.2	19	22.3	20-20.4
Length of pronotum	5.3	5.2-5.4	5.2	5-5.3	5.3	5.4	5.1-5.3
Caudal width of pronotum.....	3.8	3.7-3.8	3.4	3.3-3.6	3.6	3.6	3.7-3.8
Length of tegmen...	26.1	25.2-26.8	28	27.5-28.3	29.7	29	26.3-27
Greatest width of tegmen.....	6.4	6-6.4	6.8	6.5-7	6.5	6.9	6.3-6.5
Length of caudal femur.....	22.4	20.8-22.6	21.8	21.8-22.4	22.2	22.7	21.3-21.9
Length of ovipositor	7.4	7-7.4			7		7-7.4
Length of subgenital plate.....			6.9	6.8-6.9		6.9	

When our measurements are compared with those given by E. M. Walker for material from Ontario, we find that some of the specimens from the Severn River show an even greater accentuation of the characters of the present race, while those from Toronto show some tendency toward *curvicauda curvicauda*. All of the material before us from Maine is typical. The single specimen from West Point, Nebraska, though not typical, shows a much closer resemblance to the present race than to *curvicauda curvicauda*.

In the series before us the decided lateral angles of the pronotum are in most cases weakly outlined in brownish white.

The present geographic race has a limited distribution which borders that of *curvicauda curvicauda* in the north and northwest; it is known from Whitneyville, Maine, to Aweme, Manitoba, being found typical only in the Canadian Zone.

Specimens Examined: 15; 6 males and 9 females.

Whitneyville, Maine, VIII, 12, 1913, (Morse; in bogs), 1 ♂, 2 ♀, [Morse Chn.].

Cherryfield, Maine, VIII, 8, 1913, (Morse; in bogs), 1 ♀, [Morse Chn.].

Orono, Maine, VIII, 30, 1913, (Morse; in bog), 1 ♀, [Morse Chn.].

Aweme, Manitoba, VIII, 19 to 22, 1909, (N. Criddle; sand hills, on hillside, dry prairie and in tall dry vegetation), 2 ♂, 3 ♀, *type, allotype, paratypes*; IX, 15, 1907, (N. Criddle), 3 ♂, 1 ♀, *paratypes*, [all Hebard Chn.].

West Point, Nebraska, (L. Bruner), 1 ♀, [Hebard Chn.].

Scudderia curvicauda curvicauda (DeGeer) (Pl. IX, fig. 7; pl. X, fig. 26.)

1773. *Loensta curvicauda* DeGeer, Mém. Hist. Ins., iii, p. 446, pl. 38, fig. 3. [Pennsylvania, probably Philadelphia.]

1841. *Phaneroptera angustifolia* Harris, Ins. Inj. Veget., 1st ed., p. 129. [Massachusetts.]

Lugger's figures of this species,¹¹ which he recorded from Minnesota as *S. furculata*,¹² are very poor, the figure of the entire insect is crude and the drawing of the genitalia in both this figure and that of the apex of the male abdomen is very incorrect.

Though structurally very distinct, the often similar appearing *S. texensis* is easily confused with the present insect in the female sex. The present senior author has once recorded this species as *S. texensis*¹³ from between Cedar Grove and Chatsworth, New Jersey. We find that *curvicauda curvicauda* is distinguishable from *texensis* in its somewhat more robust structure with proportionately shorter dorsum of the pronotum, wider tegmina and less glossy appearance; in the male the genitalia¹⁴ are very different and in the female the ovipositor is slightly less sharply bent upward and slightly more full toward the apex.

Measurements (in millimeters) of extremes

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Gun Lake, Michigan... (6) ¹⁵	5.4-6	33.2-37.2	7-7.8	25.2-26.8	7.2-7.8
Rye Beach, New Hampshire..... (1)	5.5	33.3	7.4	26.4	7
Marion, Massachusetts. (3)	5.6-5.9	34-35.3	7.7-8.1	25.9-26	7-7.4
Yonkers, New York.... (3)	6	32.8-36	7.7-8	27.4-29.5	7.5-7.6
Rockville, Pa..... (2)	6	35.9-36	8-8.1	27-29	7.5-7.6
Atsion, New Jersey.... (9)	5.8-6	34.6-36.1	7.3-7.7	26-26.4	7.6-7.8

¹¹ Orth. of Mim., p. 217, figs. 139, 140, (1898).

¹² Though a synonym of *S. mexicana*, as has been shown by Scudder, *furculata* has not only been confused with *S. curvicauda*, but with *S. furcata* as well.

¹³ Entom. News, xv, p. 330, (1904).

¹⁴ In the discussion under *pistillata* and in the key, the characters of the disto-dorsal abdominal segment of the present species are fully described.

¹⁵ In the tables of measurements throughout the present paper, the figures in parentheses immediately after the localities indicate the number of specimens measured.

Measurements (in millimeters) of extremes—Continued

♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
Gun Lake, Michigan... (3)	5.6-5.9	32.4-34.9	7.2-8.3	25.3-28.7	7.6-8
Marion, Massachusetts. (2)	5.6-5.8	33-35	7.7-7.8	26.4-29	7.7-7.8
Yonkers, New York... (2)	5.7-6.2	33.3-35.6	7-7.4	27-29	7.7-8
Rockville, Pa..... (31)	5.7-6.3	34.4-37.2	6.9-7.7	26.5-31	8-8.4
Chestnut Hill, Pa..... (1)	6.1	36.4	7.7	30.8	8
Atsion, New Jersey... (10)	5.5-6.1	31.9-35.1	7-7.3	27.7-31	8-8.3

In the series before us the specimens from the Pine Barrens of New Jersey have in almost every case the lateral angles of the pronotum outlined in yellowish. This coloration is only found in a few other specimens of the present series.

This species is common and widely distributed through the undergrowth of the woods in the Pine Barrens of New Jersey, in this region *S. texensis* is common but is found only in marshes, swamps or bogs.

At Reega, New Jersey, a typical pine barren locality, adults were found, in 1914, to appear about the middle of July, reaching their greatest abundance by the first of August and being represented almost entirely by females toward the end of that month. The species was heard there in the daytime giving at long intervals a brief note "zzikk" much as has been observed in *S. pistillata*; at night it was often to be heard giving single or a succession of rather resonant and loud stridulations.

East of the Appalachians, the present race is found from Fryeburg, Maine, and Brandon, Vermont, to southernmost New Jersey and Pennsylvania. Further west it is widely distributed from a narrow area of intergradation with *S. e. borealis*, southward to the much broader area of intergradation with *S. e. laticauda*, indications of which are first found in material from the latitude of southern Kentucky.

Specimens Examined: 185; 79 males, 104 females and 2 female nymphs.

Jaffrey, New Hampshire, VIII, 15 to IX, 11, 1896, (S. Henshaw), 2 ♂, [M. C. Z.].

Rye Beach, New Hampshire, IX, 2, 1913, (H.), 1 ♂.

Marion, Massachusetts, IX, 1, 1905, (H.), 3 ♂, 2 ♀.

Northfield, Massachusetts, (Mrs. D. Pierson), 1 ♀, [U. S. N. M.].

Melrose Highlands, Massachusetts, VII, 15, 1908, (D. H. Clemons), 1 ♀, [U. S. N. M.].

Milton, Massachusetts, VIII, 28, 1897, (F. H. Sprague), 1 ♂, 1 ♀, [M. C. Z.].

Forest Hills, Massachusetts, VIII, 16 to 22, 1877, 3 ♀, [M. C. Z.].

Wollaston, Massachusetts, VIII, 15 to IX, 1895, 1 ♂, 2 ♀, [M. C. Z.].

Seituate, Massachusetts, VIII, 29, 1897, (F. H. Sprague), 1 ♀, [M. C. Z.].

Walpole, Massachusetts, VIII, 1 to 30, 1897, (F. H. Sprague), 5 ♂, 3 ♀, [M. C. Z.].

Lake Mahopac, New York, (T. D. O'Connor), 1 ♀, [Hebard Chn.].

Yonkers, New York, VIII, 1910, (E. R. Casey), 3 ♂, 2 ♀, [Casey Chn.].

Beaver, Pennsylvania, VIII, 1, 1 ♂, [Pa. St. Dept. Zool.].

Beatty, Pennsylvania, (Brugger), 1 ♂, 3 ♀, [A. N. S. P.].

Heekton Mills, Pennsylvania, VIII, 31, 1909, 1 ♀, [Pa. St. Dept. Zool.].

Rockville, Pennsylvania, VII, 29 to VIII, 5, 22 ♂, 31 ♀, [Pa. St. Dept. Zool.].

Penryn, Pennsylvania, VIII, 18, 1 ♂, [Pa. St. Dept. Zool.].

Orrtanna, Pennsylvania, IX, 4, 1 ♀, [Pa. St. Dept. Zool.].

Chestnut Hill, Pennsylvania, IX, 13, 1903, (H.), 1 ♀.

East Plains, Ocean County, New Jersey, VIII, 24, 1914, (R. & H.; ground oak and pine and various heaths), 1 ♂, 5 ♀.

Atsion, New Jersey, VII, 30, 1911, (R. & H.), 8 ♂, 9 ♀; IX, 2, 1901, (R.; undergrowth in woods), 2 ♂.

Parkdale, New Jersey, VII, 30, 1911, (R. & H.; undergrowth in woods), 9 ♂, 9 ♀.

Stafford's Forge, New Jersey, VIII, 26 to 31, 1907, (R.), 4 ♀.

Mays Landing, New Jersey, VIII, 29, 1914, (H.; in boggy pine barrens), 1 ♀.

Reega, New Jersey, VII, 20 to VIII, 16, 1914, (H.; undergrowth in pine barrens), 8 ♂, 10 ♀, 2 ♀ n.

Sea Isle Junction, New Jersey, VIII, 3 to 8, 1908, (H. Fox), 1 ♂, 7 ♀, [A. N. S. P.].

Wildwood Junction, New Jersey, VII, 27, 1914, (H.; low plants in woods), 1 ♂, 1 ♀.

Dias Creek, New Jersey, VII, 20, 1914, (H.; undergrowth in oak woods), 1 ♂.

Cranmoor, Wisconsin, VIII, 6, 1909, (C. W. Hooker), 1 ♀, [U. S. N. M.].

Gun Lake, Michigan, VII, 13 to 26, 1912, (M. A. Carriker, Jr.), 7 ♂, 2 ♀, [Hebard Chn.].

Pawpaw, Michigan, VI, 1898, 1 ♀. [Hebard Chn.].

Scudderia curvicauda laticauda Brunner (Pl. IX, figs. 10 and 12; pl. X, fig. 25.)

1878. *Sc[udderia] laticauda* Brunner, Monogr. Phaner., p. 238. [Georgia.]

1897. *Scudderia laticauda* Saussure and Pietet, Biol. Cent. Amer., Orth., i, p. 330. (In part = 1st variety.) [Georgia.]

1907. *Scudderia laticauda* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1907, p. 300. [San Pablo and Gainesville, Florida.]

The present geographic race has been frequently recorded as *S. curvicauda* from the southeastern United States.

The characters given by Brunner in his description of *laticauda* are somewhat misleading. The lateral angles of the pronotum are only very slightly more rounded than in *c. curvicauda*, while the production and apical cleavage of the subgenital plate offers no differential factor. The lateral angles of the pronotum in *strigata* are very much more broadly rounded and it was Brunner's undue emphasis on this character which caused Scudder to name as a mere color form of the present insect that aberrant species, which can be further separated at a glance by the very decidedly narrower tegmina.

As *S. c. borealis* is the race of the extreme northern portions of the range of *curvicauda*, so *S. c. laticauda* is the race of the extreme southern portions of the range of that species. This race is chiefly distinguishable by its larger size, the proportionately narrower tegmina (by taking averages of the entire typical series before us we find that in *curvicauda curvicauda* the tegminal width is contained in the length of the same very little over $4\frac{1}{2}$ times, in *c. laticauda* nearly 5 times), slightly more rounded lateral angles of the pronotum, somewhat larger produced pistillate portion of the supra-anal plate of the male and decidedly larger ovipositor and subgenital plate of the female, with the former much more weakly bent upward and the ventral margin more broadly arcuate.

Measurements (in millimeters) of extremes

Material intermediate between *S. c. curvicauda* and *S. c. laticauda*

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Orange, Virginia.....(1)	6.2	38.3	8.3	30.5	8.2
Charlotte, N. C.....(3)	6.4-6.5	37-38.7	7-8.1	30.6-32	8.8-9
Stone Mountain, Ga....(1)	6.3	40.2	8	31.6	8.4
Doucette, Texas.....(2)	6.2-6.3	37-37.4	7.4-7.7	30.9-31.1	7.9-8.1

Material intermediate between *S. c. curvicauda* and *S. c. laticauda*

♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
Petersburg, Virginia... (2)	5.9-6	34.7-36.2	6.9-7.3	29.8-30.4	8.8-9
Charlotte, N. C..... (3)	5.7-6	35.3-36.2	7.1-7.2	29.5-31.2	8.7-9.1
Stone Mountain, Ga... (1)	6.7	40	8.3	32.7	9.2
Doucette, Texas..... (1)	6.3	36.7	7.4	33.4	9

S. curvicauda laticauda

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Winter Park, N. C..... (1)	6.7	36.9	7.7	31.8	8
Billy's Island, Ga.... (20)	6.4-7.3	35.8-39.7	8-8.3	32-32.7	8.2-8.7
Albany, Georgia..... (1)	6.1	33.2	7.1	28.7	8.1
Spring Creek, Georgia (1)	6.3	39.1	7.8	32	8.7

♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
Wilmington, N. C..... (1)	7	39	7.6	33.4	10.2
Yemassee, S. C..... (3)	6.5-6.7	36.5-37.8	7.1-7.5	31.6-32.5	9.7-10.2
Billy's Island, Ga.... (13)	6.1-7.1	35.7-39	7.2-8.3	31.4-33	9.6-10.3
Albany, Georgia..... (3)	5.9-6.1	36.3-38.8	6.7-7.9	30.3-31.4	9.4-9.6
Jacksonville, Florida... (4)	7.7-8.3	36.3-40	7.7-8.3	29.8-35.2	10.1-11.1

The ovipositor in *c. laticauda* averages 3.3 mm. in both proximal and mesal width.

The material before us from all of the localities in Virginia and North Carolina (excepting Wilmington and Winter Park), from the Piedmont plain and mountains of South Carolina and Georgia, from the mountains of Alabama and Tennessee, from southern Arkansas and Oklahoma and from all of Texas as far west as the species is distributed, is not typical of the present race. The great majority of these specimens average nearer to it than to *curvicauda curvicauda*,¹⁶ this is least pronounced in the series from northern Virginia, southern Arkansas and Oklahoma and from Texas. The area of intergradation is consequently found to be very wide in the present case.

¹⁶ Such an intermediate individual is the female recorded by the authors from Raleigh, North Carolina, as *S. curvicauda*, Proc. Acad. Nat. Sci. Phila., 1910, p. 636, (1911).

A very few specimens in the series before us have the lateral angles of the pronotum weakly outlined in yellowish.

Typical *S. c. laticauda* is found from Wilmington, North Carolina to Sanford, Florida, and westward as far as Monticello, Mississippi; the fall line constituting a considerable portion of the northern boundary of its range.

Specimens Examined: 63; 26 males and 37 females. Intermediates: 67; 28 males, 37 females and 2 immature males.

Wilmington, North Carolina, IX, 8, 1911, (R. & H.), 1 ♀.

Winter Park, North Carolina, IX, 7, 1911, (R. & H.), 1 ♂.

Denmark, South Carolina, VIII, 15, 1903, (Morse), 1 ♀, [Morse Cln.].

Yemassee, South Carolina, IX, 4, 1911, (R. & H.; in long-leaf pine woods with clumps of oaks on higher ground), 3 ♀.

Albany, Georgia, VIII, 1, 1913, (R. & H.; scarce in undergrowth of pine woods), 1 ♂, 3 ♀.

Spring Creek near Bainbridge, Georgia, VI, 1911, (J. C. Bradley), 1 ♂, 8 ♀, [Ga. State Cln.].

Mixon's Hammock, Okeefenokee Swamp, Georgia, VI, 16, 1912, (J. C. Bradley), 1 ♀, [Cornell Univ.].

Billy's Island, Okeefenokee Swamp, Georgia, VI, VII, IX, 1912 to 1913, (J. C. Bradley), 20 ♂, 13 ♀, [Cornell Univ.].

Jacksonville, Florida, VIII, 25, 1911, (R. & H.), 2 ♀; VIII, 1885, (Ashmead), 1 ♀, [Hebard Cln.]; IX, 7, 1913, (W. T. Davis), 1 ♀, [Davis Cln.].

Atlantic Beach, Florida, VIII, 24, 1911, (R. & H.; in dense low undergrowth between pine woods and "hammock"), 1 ♀.

Live Oak, Florida, VIII, 10, 1903, (Morse), 1 ♂, [Morse Cln.].

Flomaton, Alabama, VIII, 2, 1903, (Morse), 1 ♀, [Morse Cln.].

Nugent, Mississippi, VII, 20, 1905, (Morse), 2 ♂, 1 ♀, [Morse Cln.].

Intermediate material between *S. curvicauda curvicauda* and *S. c. laticauda*

Glencarlyn, Virginia, VIII, 12, (Caudell), 2 ♂, 2 ♀, [U. S. N. M.].

Orange, Virginia, VII, 24, 1913, (R. & H.), 1 ♂.

Wytheville, Virginia, IX, 2, 1903, (Morse), 1 ♂, [Morse Cln.].

Petersburg, Virginia, VII, 23, 1913, (R. & H.; in green vegetation in pine woods and in swampy spot), 2 ♀.

Norfolk, Virginia, IX, 8, 1903, (Morse), 1 ♀, [Morse Cln.].

Weldon, North Carolina, VII, 24, 1913, (R. & H.; undergrowth of huckleberry and other sand-loving bushes in pine and oak woods), 2 ♀, 1 ♂ n.

Charlotte, North Carolina, VII, 27, 1913, (R. & H.; not scarce among tufts of very green grass in restricted areas in short-leaf pine woods), 3 ♂, 3 ♀.

Fayetteville, North Carolina, IX, 9, 1911, (R. & H.; in moist place in woods), 1 ♀.

Morganton, North Carolina, VII, 20, 1903, (Morse), 1 ♀, [Morse Cln.].

Lookout Mountain, Tennessee, VIII, 23, 1903, (Morse), 1 ♂, [Morse Cln.].

Spartanburg, South Carolina, VIII, 6, 1913, (H.), 3 ♂.

Columbia, South Carolina, VII, 28, 1913, (R. & H.), 1 ♀.

Sand Mountain, Georgia, VII, 9, 1905 and VIII, 25, 1903 (Morse), 3 ♂, 3 ♀, [Morse Cln.].

Jasper, Georgia, VIII, 5, 1913, (R.), 1 ♂ n.

Marietta, Georgia, VII, 27, 1903, (Morse), 2 ♂, [Morse Cln.].

Currahee Mountain, Georgia, VIII, 5, 1913, (H.; scarce in luxuriant mountain vegetation), 3 ♀.

Vicinity of Stone Mountain, Georgia, VIII, 3, 1913, (R. & H.; undergrowth in pine woods), 1 ♂, 1 ♀.

Warm Springs, Georgia, VIII, 9 to 10, 1913, (R.; scarce in luxuriant vegetation), 2 ♀.

Macon, Georgia, VII, 30 to 31, 1913, (R. & H.; undergrowth in short-leaf pine woods), 2 ♀.

Valley Head, Alabama, VII, 11, 1905, (Morse), 1 ♀, [Morse Cln.].

Mena, Arkansas, VII, 30 and 31, 1905, (Morse), 3 ♂, 3 ♀, [Morse Cln.].

Eagleton, Arkansas, VIII, 3, 1905, (Morse), 3 ♂, 4 ♀, [Morse Cln.].

Howe, Oklahoma, VIII, 4, 1905, (Morse), 1 ♀, [Morse Cln.].

Haileyville, Oklahoma, VIII, 6, 1905, (Morse), 1 ♀, [Morse Cln.].

South McAlester, Oklahoma, VIII, 7, 1905, (Morse), 2 ♂, 1 ♀, [Morse Cln.].

Dallas, Texas, (Boll), 1 ♂, [Hebard Cln.].

Bonita, Texas, VIII, 14, 1905, (Morse), 1 ♀, [Morse Cln.].

Doucette, Texas, VII, 24, 1912, (H.), 2 ♂, 1 ♀.

Scudderia strigata Scudder (Pl. IX, figs. 6 and 13; pl. X, fig. 18.)

1898. *Scudderia laticauda* form *strigata* Scudder, Proc. Am. Acad. Arts and Sci., xxxiii, p. 280, fig. 4. [Jacksonville, Florida.]

In describing *S. laticauda*, which is the southern geographic race of *S. curvicauda*, Brunner has certainly emphasized much too strongly the slightly more rounded lateral angles of the pronotum which are found in this race, and has given this character a prominent position in his key. Following this character only, Scudder determined the pair of specimens at present under consideration as *laticauda* (for these have very broadly rounded lateral angles of the pronotum), ignoring the other striking differences which exist between them and any other species of the genus. He, however, gave for the present specimens the name *strigata* to designate what appeared to him to be a mere color variety of *laticauda*, and briefly described the more prominent differences in coloration. As these two specimens represent an otherwise unknown and very distinctive species, showing nearest affinity to *S. curvicauda*, the name *strigata* must be used for this species.

The characters of distinctive differentiation are the very narrow

tegmina, very broadly rounded lateral angles of the pronotum, striking coloration and the genitalia in both sexes.

Described from a pair from the same locality.

Single Type here chosen.—♂; Jacksonville, Florida. (T. J. Priddey.) [Hebard Collection ex Bruner.]

Description of Type.—Size large, form decidedly slender. Eyes slightly more prominent than in *S. curvicauda*. Pronotum more slender than in that species with lateral angles very broadly and strikingly rounded (very much more so than in *S. c. laticauda* which has these angles slightly more rounded than in *curvicauda curvicauda*); lateral lobes with ventral portion of caudal margin almost straight to a broadly rounded obtuse angulation just below the humeral sinus. Tegmina extremely narrow, much narrower than the pronotal length. Production of disto-dorsal abdominal segment similar to that of *curvicauda* but with furcate portion short, truncate, with dorsal surface of same strongly declivent distad. Subgenital plate much as in *curvicauda*.

The unique female, bearing the same data as the type, is the *Allotype*.

Description of Allotype.—Slightly larger but with proportions similar to the type. Ovipositor approximately as long as in *curvicauda* but of wholly different shape, having the dorsal margin bent sharply upward proximad while the ventral margin is evenly but more strongly areuate than in that species; beyond the bend the ovipositor becomes decidedly narrower.

Measurements (in millimeters)

	Jacksonville, Florida	
	♂	♀
Length of pronotum.....	5.3	5.7
Length of tegmen.....	33.4	34.2
Greatest width of tegmen.....	4.7	4.8
Length of wing.....	39.7	39.4
Length of subgenital plate.....	7.4	

We are unable to give the length of the caudal femora as these have been destroyed in both specimens. In the single female before us the ovipositor is 8.2 mm. in length, 2.7 mm. in width proximad, and 2.4 mm. in width mesad.

Both specimens are very strikingly and similarly marked. The general coloration is cource green, much faded except on the tegmina, these appendages have the region of the anal vein and sutural margin bone brown, thus forming a heavy line from the base to the apex of the tegmen, the anal field is cinnamon with a

bone brown marking at the proximal portion of the free margins forming a single large median spot when the tegmina are closed. The lateral angles of the pronotum are pale yellowish with the lateral lobes just below these marked with an obscure band of brown. The abdominal segments are marked meso-laterad with maculations of bone brown forming a broad but interrupted stripe. The cephalic and median femora are speckled with bone brown and are further irregularly and narrowly biannulate with this color. In the female the distal portion of the cerci and proximal portions of the basal plicae of the ovipositor are unusually dark for the species of the genus.

Jacksonville, Florida, is the only locality known for this unusual and striking species, which must be considered one of the rarest, most local and probably least widely distributed species of North American Orthoptera.

Specimens Examined: 2; 1 male and 1 female.

Jacksonville, Florida, (T. J. Priddey), 1 ♂, 1 ♀, *type, allotype*, [Hebard Chn. ex Bruner].

Scudderia hemidactyla new species (Pl. IX, figs. 11, 15, 16 and 17; pl. X, fig. 22.)

A very distinct and anomalous species showing a certain amount of affinity to *S. septentrionalis* in the decided reduction of the supra-anal plate in the male and in the similar subgenital plate in the same sex, which is however less decidedly angulate-emarginate distad. The production of the supra-anal plate in the male bears distad small, strongly compressed, vertical lateral flanges; the greatest similarity in this character is found elsewhere in the genus in *S. texensis*, but in all other characters of this reduced but greatly specialized appendage the species is unique. The species is very glossy, with rather more prominent eyes than is usual in the genus, in these respects resembling *S. paronae*. Characters of the pronotum and armament of the caudal femora separate the species further from any other of the genus.

Type.—♂: Caparo, Trinidad, June, 1913. (S. M. Klages.) [Acad. Nat. Sci. Phila., Type No. 524.]

Description of Type.—Similar in size to typical *S. furcata furcifera* but with deeper lateral lobes of the pronotum, more attenuate tegmina and shorter limbs. Head similar to *S. paronae*, but with inter-fastigial suture narrower; inter-ocular space decidedly narrower and eyes larger so that when seen from above the inter-ocular space is not as wide as one of

the eyes; antennae uniform in coloration. Pronotum short with nearly parallel lateral angles rounding everywhere evenly (and more broadly than in other species of the genus except *S. strigata*) into the lateral lobes which are distinctly deeper than long, cephalic margin of lateral lobes very broadly rounded, passing through the ventro-cephalic angle into the oblique, nearly straight caudal margin, humeral sinus shallower than in the other species of the genus. Tegmina shining, similar to those of *paronae* but proportionately narrower with transverse veinlets sub-obsolete and the entire surface an intricate network of minute veinlets; wings as in *paronae*. Supra-anal plate with proximal width greater than length, triangularly produced with lateral margins weakly concave and apex bifid, V-emarginate. This apex when seen from below is found to be made up ventrad of two lateral perpendicular folds with crassate margins which curve out and around the tips of the incurved cerci ventro-proximad and then join mesad on the ventral surface of the plate; near the very apex of these folds distad spring out from their sides small strongly compressed vertical lateral flanges which are triangular with apex rounded, these would if brought in contact with the subgenital plate embrace the same. Cerci nearly intermediate between the type found in *S. septentrionalis* and the normal type found in the genus; crassate, becoming evenly and very weakly more attenuate with a slight arcuation to apex, which is suddenly bent inward and armed with a sharp black tooth directed at a right angle to the distal portion of the cercal shaft. Subgenital plate depressed throughout, acute-angulate emarginate distad to a depth about one-half the distal width of the plate. Cephalic and median limbs similar to those of *paronae*, caudal limbs shorter and more robust than in that species. Caudal femora distinctive in having both ventral margins armed with small teeth (not spines), caudal tibiae with all four margins thickly supplied with heavy spines.

Allotype.—♀; same data as the type.

Description of Allotype.—Very similar to type but larger with proportionately broader tegmina. Ovipositor gently arcuate, not at all bent, long and broad to the immediate apex which is more suddenly rounded than in the other species of the genus, distal half of dorsal valves and extreme distal portion of ventral valves margined with small, even and rounded teeth. Subgenital plate triangular with truncate apex, this plate unusually short for the genus, not extending to the juncture of the ventral valves of the ovipositor. Limbs and armament of same as in the type.

Measurements (in millimeters)

	Paramaribo, Dutch Guiana		Caparo, Trinidad	
	♂	♂ Type	♀ Allotype	
Length of body.....	20.4	19.6	21	
Length of pronotum.....	5.1	5	5.7	
Caudal width of pronotum.....	3.3	3.1	3.8	
Greatest depth of lateral lobes of pronotum.....	3.8	3.7	4	
Greatest length of lateral lobes of pronotum.....	3.4	3.4	3.8	
Length of tegmen.....	28.7	29.9	32.9	
Greatest width of tegmen.....	5.8	5.7	6.9	
Length of caudal femur.....	21.4	22.9	25.8	
Length of subgenital plate.....	4.9	5.1		
Length of ovipositor.....			S.1, width 2.1	

The specimen from Paramaribo is very similar to the type, the pronotum has the lateral angles more divergent caudad, showing that this character is variable in the present species. In this respect the allotypic female is nearly intermediate between the two specimens discussed above.

In coloration the specimens before us are shining serpentine green, probably faded from a much brighter shade, with the lateral angles of the pronotum unmarked.

Specimens Examined: 6; 4 males and 2 females.

Caparo, Trinidad, VI, 1913. (S. M. Klages), 3 ♂, 2 ♀, *type, allotype and paratypes*, [A. N. S. P.].

Paramaribo, Dutch Guiana. (K. Mayo), 1 ♂, [A. N. S. P.].

Scudderia texensis Saussure and Pictet (Pl. IX, fig. 5; pl. X, fig. 23.)

1897. *Scudderia texensis* Saussure and Pictet, Biol. Cent.-Amer., Orth., i, p. 330, pl. xv, figs. 18, 19. [Dallas, Texas.]

Saussure and Pictet failed to associate the sexes of the present species and figured the female as *S. laticauda*.¹⁷ The present species has been recorded from Miami, Florida by the authors as *S. curvicauda*¹⁸ and all of the material recorded by Bruner from Kansas and Nebraska as *S. curvicauda* belongs to this insect.

¹⁷ Biol. Cent.-Amer., Orth., i, p. 330, pl. xv, fig. 15, (1897).

¹⁸ Proc. Acad. Nat. Sci. Phila., 1905, p. 42, (1905).

This name had been generally used by authors for *texensis* until Scudder's revision of the genus in 1898, and the present species was so recorded by Lugger in that year.

Males of the present species are readily separated from other species of the genus by the characters given in the key. Females, however, might often be confused with females of *S. curvicauda* were the differential characters not carefully studied. *S. texensis* has a decidedly more glossy appearance than *curvicauda* and is a more attenuate insect with the dorsum of the pronotum slenderer and the lateral angles usually weakly but appreciably concavo-divergent caudad, these lateral angles are usually outlined in yellowish in the present species but frequent specimens are found in which this marking is subobsolete or wholly absent. The obscurity or absence of this marking is more often met with in southern and western material than in series from the northern Atlantic States. Females of *texensis* may be further separated from those of *curvicauda* by the ovipositor which is more sharply bent upward, more slender and armed with somewhat heavier teeth than in that species.

Measurements (in millimeters) of extremes

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Saunderstown, R. I. . . . (6)	5.6-5.7	33-35.3	6.7-7.1	26-26.9	7.3-8
Tinicum Island, Pa. . . (19)	5.9-6.2	35.8-36.8	7.1-7.7	27.7-29	7.7-8
Yemassee, S. C. (15)	5.4-5.9	32.4-33.3	6.1-6.7	27-29	7-7.3
Miami, Florida. (2)	5.3-5.8	30.4-32	6.3-6.5	26.3-26.4	7-7.1
North Platte, Nebr. . . . (1)	6.5	37.6	7.4	29.2	7.9
La Marque, Texas. . . . (1)	6.1	34.5	7		7.8
♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
Saunderstown, R. I. . . . (3)	5.9-6	33-36.7	7-7.3	27-27.4	7.4-8
Tinicum Island, Pa. . . (11)	5.9-6	33.3-35.4	7-7.4	26.4-28	7-7.4
Yemassee, S. C. (13)	5.2-6	28.8-32.7	5.8-6.4	26.4-29.3	6.7-7.1
Miami, Florida. (1)	5.7	32	6.6	28.7	7
North Platte, Nebr. . . (6)	6-6.3	34-38.2	7-8.2	26-29	7.8-8.4
La Marque, Texas. . . . (4)	5.7-5.8	31.7-35	6.3-6.4	27-29.9	6.9-7

It is evident, from the material which we have examined, that the present species decreases somewhat in size in its southern distribution, but even greater variation is sometimes found in a series from a single locality.

The species is almost invariably found in or near marsh, swamp or bog. It is one of the very few destructive Phaeoapterids found in the United States, doing particular damage to cranberry crops.

During the summer of 1914 the species was frequently observed on the coast of New Jersey along the salt marshes, where, after dark, it would frequently be found locally abundant in areas of *Scirpus*, resting head down and motionless near the tips of these rushes and frequently beaded with dew. On bright warm afternoons it was observed in the taller vegetation near the border of the salt marshes, where the males were moving actively about emitting their rather prolonged and harsh stridulation.

This insect is known from Norway, Maine, to extreme southern Florida, while the westernmost localities at which it has been taken are¹⁹ Forsyth, Montana; Casper, Wyoming; Morton County, Kansas and Clarendon and Rosenberg, Texas.

Specimens Examined: 191; 104 males, 79 females, 5 immature males and 3 immature females.

Seabrook, New Hampshire, (H. A. Eaton), 1 ♂, [U. S. N. M.].

North Saugus, Massachusetts, IX, 12, 1906, (C. C. Gowdey), 1 ♂, [U. S. N. M.].

Melrose Highlands, Massachusetts, VII, 15, 1908, (D. H. Clemons), 1 ♂ n., [U. S. N. M.].

Saunderstown, Rhode Island, IX, 9, 1913. (H.; in bog), 6 ♂, 3 ♀.

Erie, Pennsylvania, 2 ♀, [Pa. St. Dept. Zool.].

Beaver, Pennsylvania, IX, 13, 1 ♂, [Pa. St. Dept. Zool.].

Indiana, Pennsylvania, VIII, 14, 1 ♂, [Pa. St. Dept. Zool.].

Duncannon, Pennsylvania, VIII, 8, 1 ♂, [Pa. St. Dept. Zool.].

Harrisburg, Pennsylvania, VIII, 8 to X, 15, 1909, 5 ♂, [Pa. St. Dept. Zool.].

Rockville, Pennsylvania, VII, 29 to VIII, 22, 3 ♂, 1 ♀, [Pa. St. Dept. Zool.].

Enola, Pennsylvania, IX, 7, 1909, 1 ♀, [Pa. St. Dept. Zool.].

Eberly's Mills, Pennsylvania, VIII, 27, 1909, 1 ♀, [Pa. St. Dept. Zool.].

Philadelphia Neck, Pennsylvania, IX, 21, 25, 1904, (H. W. Wenzel), 2 ♂, 2 ♀, [A. N. S. P.].

¹⁹ We feel certain that if Scudder's record for the species from Ogden, Utah, is correct, it is based upon an accidental importation of some sort.

Cornwells, Bucks County, Pennsylvania, IX, 7, 1914, (H.), 1 ♂, 2 ♀; X, 1906, (R. & H.), 1 ♂, 1 ♀.

Tinicum Island, Pennsylvania, VIII, 13 to IX, 29, 1904 to 1913, (R. & H.; in marsh), 19 ♂, 11 ♀.

Pemberton, New Jersey, IX, 6, 1913, (H. B. Scammell), 1 ♂, 2 ♀, [U. S. N. M.].

Stafford's Forge, New Jersey, IX, 16, 1905, (H.), 2 ♂.

Ventnor, New Jersey, VIII, 5 to 17, 1914, (H.; in marshy depressions of sand areas and on bayberry bushes), 3 ♂.

Margate City, New Jersey, VIII, 17 and 24, 1914, (H.; in salt marsh), 1 ♂ n., 2 ♀ n.

Pleasantville, New Jersey, VIII, 17, 1914, (H.; in salt marsh), 1 ♂.

Tuckahoe, New Jersey, VIII, 26, 1914, (H.; in fresh water marsh), 1 ♀.

Cedar Springs, New Jersey, VIII, 26, 1914, (H.; in fresh water marsh), 3 ♂, 3 ♀.

Ocean View, New Jersey, VII, 27, 1914, (H.; edge of salt marsh), 1 ♂.

Dennisville, Cape May County, New Jersey, VIII, 8, 1908, (H. Fox; in tall grass on edge of salt marsh), 1 ♀, [A. N. S. P.].

Peermont, Cape May County, New Jersey, VIII, 14, 1908, (H. Fox; open woods), 1 ♀, [A. N. S. P.].

Plummers Island, Maryland, VIII, 27, 1909, (Caudell), 1 ♂ n., [U. S. N. M.].

Virginia Beach, Virginia, VII, 2 and 4, 1903, (Morse), 1 ♂, 1 ♀, 1 ♀ n.; IX, 7, 1903, (Morse), 1 ♂, [all Morse Cln.].

Selma, North Carolina, VII, 7, 1903, (Morse), 1 ♂, [Morse Cln.].

Raleigh, North Carolina, VII, 9, 1903, (Morse), 1 ♀, [Morse Cln.].

Wrightsville, North Carolina, IX, 7, 1911, (R. & H.; edge of salt marsh), 1 ♂, 3 ♀.

Winter Park, North Carolina, IX, 7, 1911, (R. & H.), 1 ♂, 3 ♀.

Yemassee, South Carolina, IX, 4, 1911, (R. & H.), 15 ♂, 14 ♀.

Sand Mountain, Georgia, VII, 9, 1905, (Morse), 1 ♂, [Morse Cln.].

Tybee Island, Georgia, IX, 2, 1911, (R. & H.; in low undergrowth on sand dunes), 2 ♂, 2 ♀.

Jesup, Georgia, IX, 1, 1911, (R. & H.), 2 ♂, 2 ♀.

Billy's Island, Okefenokee Swamp, Georgia, VI, 1912, IX, 1913, (J. C. Bradley), 7 ♂, [Cornell Univ.].

Honey Island, Okefenokee Swamp, Georgia, VI, 1, 1912, (J. C. Bradley), 1 ♂, [Cornell Univ.].

Albany, Georgia, VIII, 1, 1913, (R. & H.; in undergrowth of long-leaf pine woods where low swamp-loving plants were present), 1 ♀.

Tifton, Georgia, IX, 8, 1910, (J. C. Bradley), 1 ♂, [Ga. State Cln.].

Bainbridge, Georgia, IX to X, 1910, (J. C. Bradley), 1 ♂, [Ga. State Cln.].

South Jacksonville, Florida, IX, 28, 1913, (W. T. Davis), 1 ♂, 1 ♀, [Davis Cln.].

Atlantic Beach, Florida, VIII, 24, 1911, (R. & H.), 1 ♂ n.

Live Oak, Florida, VIII, 26, 1911, (R. & H.), 1 ♂, 1 ♀ n.

- Newberry, Florida, XI, 19, 1911, (W. T. Davis), 1 ♀, [U. S. N. M.].
 Hastings, Fla., XII, 5, 1901, (A. J. Brown), 1 ♀, [Morse Cln.].
 Lake Maxinkuckee, Indiana, (Evermann), 1 ♂, [U. S. N. M.].
 Clarksville, Tennessee, X, 4, 1910, (S. E. Crumb; on tobacco), 1 ♂, [U. S. N. M.].
 Forsyth, Montana, VII, 27, 1909, (H.), 1 ♀.
 Casper, Wyoming, VIII, (McCook), 1 ♂, [Hebard Cln.].
 North Platte, Nebraska, VII, 28, 1910, 2800 feet, (R. & H.; marshy spots on river plain), 1 ♂, 6 ♀.
 Morton County, Kansas, VIII, 5, 1911, 2800 feet, (F. X. Williams), 1 ♂, [Univ. Kans. Cln.].
 Gulfport, Mississippi, VII, 21, 1905, (Morse), 1 ♂, [Morse Cln.].
 Buras, Louisiana, VII, 23, 1905, (Morse), 1 ♂, [Morse Cln.].
 Ashdown, Arkansas, VII, 27, 1905, (Morse), 1 ♀, [Morse Cln.].
 Base of Mount Sheridan, Oklahoma, VIII, 26, 1905, (Morse), 1 ♂, 3 ♀, [Morse Cln.].
 Cache, Oklahoma, VIII, 23, 1905, (Morse), 1 ♀, [Morse Cln.].
 Clarendon, Texas, VIII, 18, 1905, (Morse), 3 ♂, 1 ♀, [Morse Cln.].
 Denison, Texas, VIII, 12, 1905, (Morse), 1 ♂, [Morse Cln.].
 La Marque, Texas, VII, 23, 1912, (H.; areas of tall weeds on low prairie), 1 ♂, 4 ♀.
 Rosenberg, Texas, VII, 25, 1912, (H.; in area overgrown with coffee-bean), 1 ♂.

Scudderia furcata furcata Brunner (Pl. IX, figs. 1 and 2; pl. X, fig. 19.)

1878. *Sc[udderia] furcata* Brunner, Monogr. Phaner., p. 239, fig. 72a. [Maine; Texas.]

1894. *Scudderia fasciata* Beutenmüller, Bull. Amer. Mus. Nat. Hist., vi, p. 251. [West Woodstock, Connecticut.]

Scudder has correctly recognized *fasciata* as a color variation of the present insect. Such color variations, having no specific or racial importance, we do not consider of sufficient value to receive name designation and we consequently place the name *fasciata* in the synonymy here.

Decided geographic variation within the species, close relationship to *S. paronae* and great similarity of females of the present insect and *S. cuneata* over a large area in the southeastern United States, make the treatment of *S. furcata* unusually complex.

The large series at present before us gives ample evidence that not only does a valid geographic race of the present species exist in Mexico, but that two other races are being evolved at the present time, one in the desert mountains of the southwestern United States and the other on the northern Pacific coast of that country.

The area of intergradation between *furcata furcata* and typical *f. furcifera* in the United States comprehends the Rio Grande plain in Texas, and atypical *f. furcifera* is found further west from the Pecos River in western Texas northward to the vicinity of Fort Collins, Colorado, and westward across the southern portions of Utah and Nevada to southern California. This latter material we term atypical *f. furcifera* since in the form of the male supra-anal plate closer affinity to that race than to *f. furcata* is shown, but the females have a heavier and larger ovipositor than typical females of either of the above races. It is this character and the somewhat different proportions of this material which we believe indicates the incipient formation of a geographic race. In the northward distribution of this type the ovipositor shows a gradual decrease in size.

The Pacific coast material from British Columbia to south-central California (Santa Clara County) is perfectly typical of *furcata furcata* except that in the males the supra-anal plate is very much more decidedly enlarged apically. No other differential characters exist in either sex and we do not consider this material worthy of racial distinction but we do feel that again evidence of another incipient geographic race is present.

It may be noted that the material of *f. furcifera* from near the Mexican line in the southwestern United States (Chisos Mountains, Texas; Chiricahua, Huachuca and Baboquivari Mountains, Arizona and Los Angeles, California), though atypical, approaches that race more closely than does any other material from the United States, but as stated above the ovipositor is heavier and larger and besides the insects are usually large. Referring to *S. paronae* it may be seen that, although typically quite distinct from typical *f. furcifera*, Mexican material of *paronae* closely resembles the material here being discussed, as it is very much like typical *f. furcifera* but larger and having in the females a longer (but in this case proportionately shallower) ovipositor. The characters separating typical material of the races of this species and its nearest ally, *S. paronae*, are given in the key.

This insect varies geographically in size as follows, the tegminal length in males being given here, as it is approximately the best dimensions for showing such variation since very little tegminal variation in abbreviation or production is present in

this species. In New England the species is small (average about 28), in southward distribution along the Atlantic coast a moderate increase in size is found (average on Georgia coast about 31). In the latitude of New England little variation in size is found westward to the edge of the Great Plains, in southward distribution in the middle west an even greater increase in size is found from southern Kansas to northern Texas (average about 32) than on the Atlantic coast. From Georgia westward to the area of intergradation with *f. furcifera* scarcely any variation is to be found but the intermediate material is very slightly smaller (average about 29). West of these regions the species is almost wholly confined to the mountains and has been found from western Idaho to British Columbia and southward to south-central California; material from these regions is somewhat aberrant, slightly more robust than is usual in eastern material and not large (average about 29 mm.).

The length of the ovipositor by the greatest breadth of the same in females from the following localities is as follows. Marion, Massachusetts, 6.3 by 1.9 to 6.7 by 2; Saunderstown, Rhode Island, 6 by 2 to 6.1 by 1.8; Chestnut Hill, Pennsylvania, 6.2 by 1.8 to 6.4 by 2; Washington, District of Columbia, 6 by 2 and 6.2 by 1.8; Isle of Hope, Georgia, 6.8 by 2 to 6.9 by 2.1; Thomasville, Georgia, 7 by 2; St. Louis, Missouri, 6.5 by 2 to 6.7 by 1.9; Dallas, Texas, 7.3 by 2.1; Weatherford, Texas, 7.1 by 2.2; Beaumont, Texas, 6.2 by 2; Pullman, Washington, 6.5 by 2.1 to 6.7 by 2; Santa Clara Co., California, 6.9 by 2.1. Intermediate material between *f. furcata* and *f. furcifera*, Brownsville, Texas, 6.1 by 2.1 to 6.7 by 2.

Though normally uniform green in general coloration a number of specimens in the large series before us are more or less suffused with brown and in a single specimen the general coloration is russet marked with much darker brown. Only occasional specimens of the present species have the lateral angles of the pronotum outlined in yellowish. Nymphs of the species are frequently highly colored with strongly annulate antennae.

The present species appears in New Jersey (and probably in other regions as well) over a month later in the season than *S. curvicauda*. The present insect is somewhat more common than

that species in the pine barrens but does not reach the adult condition until after the middle of August.

Typical *S. furcata* is known from Brunswick, Maine south to Lakeland, Florida; around the Gulf coast to the vicinity of Corpus Christi, Texas, thence northward to Uvalde and Sweetwater, Texas; Glen, Nebraska, and Hot Springs, South Dakota. Other northernmost records are Cranmoor, Wisconsin; North Bay, Ontario and Montreal, Quebec. The distribution of the slightly atypical form found on the Pacific Coast and the area of intergradation with *S. f. furcifera* is discussed above.

Specimens Examined: 308; 171 males, 124 females, 10 immature males and 3 immature females. Atypical: 26; 14 males, 11 females, 1 immature female. Intermediates: 63; 37 males, 25 females, 1 immature female.

Seabrook, New Hampshire, (A. A. Eaton), 1 ♂, [U. S. N. M.].

Jaffrey, New Hampshire, IX, 14, 1896, (S. Henshaw), 2 ♀, [M. C. Z.].

Berkshire County, Massachusetts, 1887, 1 ♂, [Hebard Cln.].

Marion, Massachusetts, VIII to IX, 1905, (H.), 3 ♂, 3 ♀.

Saunderstown, Rhode Island, IX, 3 to 9, 1913, (H.; very common in clumps of bayberry growing along shore), 12 ♂, 9 ♀, 2 ♂ n., 1 ♀ n.

Wesquage Beach, Rhode Island, IX, 8, 10, 1913, (H.; few in bushes along beach dunes), 2 ♂, 1 ♀.

Lake Mahopac, New York, (T. D. O'Connor), 1 ♂, [Hebard Cln.].

Nyaack, New York, (Zabriskie), 1 ♀, [U. S. N. M.].

Lakehurst, New Jersey, IX, 30, 1906, 1 ♀, [Hebard Cln.].

Woodbury, New Jersey, X, 2, 1907, (C. B. Hardenberg), 1 ♀, [A. N. S. P.].

Manahawkin, New Jersey, IX, 8, 1906, (B. Long), 2 ♂, [A. N. S. P.].

West Creek, New Jersey, VIII, 28, 1914, (R.; in pine barrens), 2 ♂.

Stafford's Forge, New Jersey, VIII, 12 to IX, 5, 1907, 1908, 1914, (R.; in pine barrens), 9 ♂, 6 ♀.

Eagleswood Bog, Ocean County, New Jersey, VIII, 28, 1914, (R.; in pine barrens), 1 ♀.

Margate City, New Jersey, VIII, 17, 1914, (H.; in barren dune forest), 2 ♂ n.

Reega, New Jersey, VII, 31 to VIII, 29, 1914, (H.; in pine barrens), 1 ♂, 5 ♂ n., 1 ♀ n.

Formosa Bogs, Cape May County, New Jersey, IX, 9, 1908, (H. Fox), 1 ♀, [A. N. S. P.].

Swainton, New Jersey, VIII, 21, 1914, (H.; undergrowth in pine woods), 1 ♂, 1 ♂ n.

Pittsburg, Pennsylvania, 1 ♀, [Pa. St. Dept. Zool.].

Beatty, Pennsylvania, (Brugger), 1 ♂, [A. N. S. P.].

Sulphur Springs, Pennsylvania, 1 ♂, [U. S. N. M.].

South Sterling, Pennsylvania, IX, 17, 1906, (B. Long), 1 ♂, 1 ♀, [A. N. S. P.].

- Tobyhanna, Pennsylvania, IX, 1903, (H.; in burning, overgrown with low bushes), 1 ♂.
- Newport, Pennsylvania, VIII, 8, 1 ♂, [Pa. St. Dept. Zool.].
- Catawissa, Pennsylvania, IX, 4, 1 ♀, [Pa. St. Dept. Zool.].
- Harrisburg, Pennsylvania, VIII, 6 to IX, 8, 4 ♂, 2 ♀, [Pa. St. Dept. Zool.].
- Dauphin, Pennsylvania, IX, 15 to X, 3, 2 ♂, 1 ♀, [Pa. St. Dept. Zool.].
- Marysville, Pennsylvania, VIII, 15, 1909, 1 ♀, [Pa. St. Dept. Zool.].
- Campbill, Cumberland County, Pennsylvania, VIII, 18 to IX, 29, 2 ♂, 4 ♀, [Pa. St. Dept. Zool.].
- Paxtang, Pennsylvania, X, 1, 1 ♀, [Pa. St. Dept. Zool.].
- Orrtanna, Pennsylvania, IX, 4, 1 ♀, [Pa. St. Dept. Zool.].
- Fites Eddy, Pennsylvania, 1 ♂, [A. N. S. P.].
- Honesdale, Pennsylvania, IX, 25, 1 ♂, [Pa. St. Dept. Zool.].
- Cornwells, Pennsylvania, IX, 7, 1914, (H.; edge of river in plants and vines), 1 ♂, 1 ♀.
- Edgehill, Pennsylvania, IX, 25, 1906, (B. Long), 1 ♀, [A. N. S. P.].
- Chestnut Hill, Pennsylvania, IX, 13, 1903, (H.; low bushes, sweet fern, etc.), 2 ♂, 2 ♀.
- Castle Rock, Delaware County, Pennsylvania, IX, 19, 1909, (R. & H.; undergrowth of deciduous forest), 2 ♂.
- Tinicum Island, Pennsylvania, IX, 9, 1904, (R. & H.), 1 ♂.
- Swarthmore, Pennsylvania, VIII, 22, 1899, (R.), 1 ♂, 1 ♀, [A. N. S. P.].
- Collingdale, Pennsylvania, VIII, 24, 1899, (R.), 1 ♂, 1 ♀, [A. N. S. P.].
- Chestertown, Maryland, VIII, 26, 1909, (E. G. Vanatta), 2 ♂, [A. N. S. P.].
- Cabin John, Maryland, IX, 2, 1907, (F. Knab), 1 ♂, [U. S. N. M.].
- Plummers Island, Maryland, VIII, 29 to X, 11, 1906 to 1912, (Caudell, Fisher), 4 ♂, 10 ♀, [U. S. N. M.].
- Washington, District of Columbia, VIII, 1883, 3 ♂, 2 ♀, [Hebard Cln.].
- Pimmit Run, Virginia, IX, 6, 1908, (F. Knab), 1 ♀, [U. S. N. M.].
- Peaks of Otter, Virginia, (Wm. Palmer), 1 ♀, [U. S. N. M.].
- Linville, North Carolina, VIII, 30, 1903, (Morse), 3 ♂, 1 ♀, [Morse Cln.].
- Topton, North Carolina, VIII, 21, 1903, (Morse), 3 ♂, 1 ♀, [Morse Cln.].
- Governor Island, North Carolina, VIII, 20, 1903, (Morse), 1 ♀, [Morse Cln.].
- Fayetteville, North Carolina, IX, 9, 1911, (R. & H.; common in short-leaf pine undergrowth), 4 ♂.
- Wrightsville, North Carolina, IX, 7, 1911, (R. & H.), 1 ♀.
- Lake Waccamaw, North Carolina, IX, 8, 1911, (R. & H.), 3 ♂, 1 ♀.
- Tryon, North Carolina, (H. A. Dyar), 1 ♂, [U. S. N. M.].
- Highlands, North Carolina, IX, 1906, (F. Sherman, Jr.), 1 ♂, [U. S. N. M.].
- Yemassee, South Carolina, IX, 4, 1911, (R. & H.), 2 ♂.
- Sand Mountain, Georgia, VIII, 25, 1903, (Morse), 1 ♂, [Morse Cln.].
- Rome, Georgia, VIII, 21, 1910, 1 ♂, [Ga. State Cln.].
- Stone Mountain, Georgia, IX, 12, 1913, (J. C. Bradley), 1 ♀.

Isle of Hope, Georgia, IX, 3, 1911, (R. & H.; heavy undergrowth of green plants and vines in gray-bark pine forest), 2 ♂, 1 ♀.

Albany, Georgia, VIII, 1, 1913, (R. & H.; heavy undergrowth in long-leaf pine woods near river), 1 ♀.

Spring Creek, Georgia, (J. C. Bradley), 2 ♂, [Ga. State Cln.].

Jacksonville, Florida, IX, 6, 7, 1913, (W. T. Davis), 2 ♂, 1 ♀, [Davis Cln.].

Detroit, Michigan, IX, 1 ♂, [U. S. N. M.].

West Spring Green, Wisconsin, (C. W. Hooker), VIII, 13, 1906, 1 ♂, [Pa. St. Dept. Zool.].

Cranmoor, Wisconsin, IX, 18 to 21, 1909, (C. W. Hooker), 1 ♂, 1 ♀, [U. S. N. M.].

Columbus, Ohio, (C. M. Weed), 1 ♂, [Hebard Cln.].

Wyandotte, Indiana, VIII, 1905, (Caudell), 1 ♀, [U. S. N. M.].

St. Louis, Missouri, IX, 25 to X, 22, 1904, (C. L. Heink), 3 ♂, 3 ♀, [Hebard Cln.].

Pineville, Kentucky, 1 ♂, [Hebard Cln.].

Roan Mountain Station, Tennessee, VIII, 31 to IX, 3, 1903, (Morse), 2 ♂, 1 ♀, [Morse Cln.].

Morristown, Tennessee, VIII, 27, 1903, (Morse), 1 ♂, 2 ♀, [Morse Cln.].

Lookout Mountain, Tennessee, VIII, 23, 1903, (Morse), 1 ♂, [Morse Cln.].

Clarksville, Tennessee, IX, 19, 1910, (on tobacco), 1 ♀, [U. S. N. M.].

Selma, Alabama, IX, 11, (eating cotton leaves), 1 ♂, [U. S. N. M.].

Homer, Louisiana, XI, 8, 1907, (F. C. Pratt), 1 ♀, [U. S. N. M.].

Baton Rouge, Louisiana, XII, 12, 1899, 1 ♀, [U. S. N. M.].

Hot Springs, South Dakota, X, 1888, 1 ♂, 1 ♀, [Hebard Cln.].

Glen, Sioux County, Nebraska, VIII, 6 to 20, 1903, (L. Bruner), 1 ♂, 1 ♀, [Hebard Cln.].

Weeping Water, Nebraska, IX, 1909, (L. Bruner), 1 ♂, [Hebard Cln.].

Lincoln, Nebraska, IX, 4, 1893, (L. Bruner), 3 ♀, [Hebard Cln.].

Douglas County, Kansas, IX, 1 ♂, [A. N. S. P.].

Barber County, Kansas, (F. W. Cragin), 1 ♂,²⁰ [Hebard Cln.].

Independence, Kansas, VIII to IX, 1902, (A. Birekfield), 1 ♂, 2 ♀, [U. S. N. M.].

Fayetteville, Arkansas, IX, 5, 1905, (Morse), 5 ♂, 2 ♀, [Morse Cln.].

Winslow, Arkansas, IX, 2 to 4, 1905, (Morse), 8 ♂, 3 ♀, [Morse Cln.].

Van Buren, Arkansas, IX, 1, 1905, (Morse), 4 ♂, 1 ♀, [Morse Cln.].

Magazine Mountain, Arkansas, 2600 feet, VIII, 29, 1905, (Morse), 1 ♀, [Morse Cln.].

Blue Mountain Station, Arkansas, VIII, 28, 1905, (Morse), 1 ♂, 1 ♀, [Morse Cln.].

Dardanelle, Arkansas, VIII, 31, 1905, (Morse), 1 ♂, [Morse Cln.].

²⁰ This specimen is referred by Bruner to the present species with a question, Bull. Washb. Coll., i, p. 127, (1885). Material of the present species has been frequently recorded as *S. furculata*, which name is correctly a synonym of *S. mexicana* as established by Seudder.

- Ola, Arkansas, VIII, 30, 1905, (Morse), 2 ♂, [Morse Cln.].
 Little Rock, Arkansas, IX, 17, 1910, (E. S. Tucker), 1 ♀, [U. S. N. M.].
 Haileyville, Oklahoma, VIII, 6, 1905, (Morse), 1 ♂, [Morse Cln.].
 Wilburton, Oklahoma, VIII, 27, 1905, (Morse), 1 ♂, [Morse Cln.].
 South McAlester, Oklahoma, VIII, 7, 1905, (Morse), 2 ♂, [Morse Cln.].
 Wewoka, Oklahoma, VIII, 27, 1905, (Morse), 1 ♀, [Morse Cln.].
 Shawnee, Oklahoma, VIII, 26, 1905, (Morse), 5 ♂, 4 ♀, [Morse Cln.].
 Mount Sheridan summit, Oklahoma, = 2600 feet, VIII, 24, 1905, (Morse),
 1 ♀, [Morse Cln.].
 Mount Sheridan base, Oklahoma, VIII, 24, 1905, (Morse), 1 ♂, 3 ♀, [Morse
 Cln.].
 Cache, Oklahoma, VIII, 23, 1905, (Morse), 2 ♀, [Morse Cln.].
 Caddo, Oklahoma, VIII, 9, 1905, (Morse), 1 ♂, 1 ♀, [Morse Cln.].
 Paris, Texas, VIII, 21, 1904, (F. C. Bishopp), 1 ♂, [U. S. N. M.].
 Denison, Texas, VIII, 11, 1905, (Morse), 1 ♂, 1 ♀, [Morse Cln.].
 Wichita Falls, Texas, VIII, 16, 1905, (Morse), 1 ♂, 2 ♀, [Morse Cln.].
 Sweetwater, Texas, IX, 20, 1912, (R. & H.; in burdock and high weeds
 in depressions), 1 ♂, 1 ♀.
 Weatherford, Texas, IX, 23, 1912, (R. & H.; common in weeds especially
 about oak groves and on oaks), 6 ♂, 1 ♀.
 Sagamore Hill, Texas, IX, 27, 1912, (R. & H.; moderately common in
 oaks), 3 ♂, 3 ♀.
 Dallas, Texas, IX, 25, 26, 1912, (R. & H.; locally common in weeds, oaks
 and mesquite), 5 ♂, 1 ♀; IX, 10 and 15, 1908 and 1909, (E. S. Tucker, on
 blossoms of *Polygonum* sp.; F. C. Bishopp, on sycamore), 2 ♀, [U. S. N. M.].
 Mineola, Texas, X, 1, 1906, (F. C. Bishopp), 1 ♂, [U. S. N. M.].
 Shovel Mount, Texas, VII, 10 to X, 4, 1901, (F. G. Schaupp), 2 ♂, 1 ♀,
 [A. N. S. P.].
 Temple, Texas, IX, 24, 1912, (R. & H.; in weeds along stream border),
 1 ♂, 2 ♀.
 Calvert, Texas, (G. H. Harris), 1 ♂, [U. S. N. M.].
 Columbus, Texas, 1 ♂, [U. S. N. M.].
 San Antonio, Texas, VIII, 16, 1912, (R. & H.; near water hole in tall
 nettles and weeds), 1 ♂.
 Doucette, Texas, VII, 24, 1912, (H.), 1 ♀.
 Beaumont, Texas, VII, 23, 1912, (H.; on swampy ground in mainly de-
 ciduous forest), 1 ♂, 2 ♀.
 Dickinson, Texas, VII, 20, 1912, (H.; in green plant on edge of stream
 in pine woods), 1 ♂.
 Uvalde, Texas, VIII, 21 to 22, 1912, (R. & H.), 1 ♀.
S. furcata showing atypical tendencies.
 Evergreen, Washington County, Idaho, VIII, 12, 1910, (R. & H.; in dry
 wild rose bushes in forest of bull pine), 1 ♀.
 Diamond Springs, Washington County, Idaho, VIII, 13, 1910, 3000 feet,
 (R. & H.), 1 ♀.
 Pullman, Washington, (C. V. Piper), 4 ♀, [U. S. N. M. and Hebard
 Cln.].

- Olympia, Washington, VI, 17, 1897, 1 ♀, [U. S. N. M.].
 Council Crest, Portland, Oregon, VIII, 9, 1909, (H.), 1 ♀ n.
 Shasta County, California, 1885, (J. Behrens), 5 ♂, 1 ♀,²¹ [Hebard Cln.].
 Mount Shasta, California, VIII, 14, 1909, 4500 feet, (R.; in open chaparral), 1 ♂.
 Tehama, California, VIII, 16, 1909, (H.; in weedy field), 1 ♂.
 Colfax, California, VIII, 27, 1910, 2450-2800 feet, (R. & H.), 1 ♂.
 Marble Valley, Eldorado County, California, VII, 15, 1885, (in grape vines), 1 ♀ [U. S. N. M.].
 Menlo Park, California, I, 1905, (F. Hornung), 1 ♂, [U. S. N. M.].
 Santa Clara County, California, IV, 1902, (Coleman), 1 ♀, [Hebard Cln.].
 Visalia, California, (Culbertson), 1 ♂, [A. N. S. P.].
 Lindsay, California, VI, 4 to VIII, 25, 1898 to 1911, (J. R. Horton and C. E. Pemberton; on orange trees), 4 ♂, 1 ♀, [U. S. N. M.].
 Intermediates between *S. f. furcata* and *S. f. furcifera*.
 San Diego, Texas, V, 27, (E. A. Schwarz), 1 ♂, 1 ♀, [U. S. N. M.].
 Benavides, Texas, VIII, 9, 10, 1912, (R. & H.), 2 ♀.
 Laredo, Texas, XI, 24, 1905, (F. C. Pratt), 1 ♀, [U. S. N. M.].
 Lyford, Texas, VIII, 6, 7, 1912, (R. & H.), 7 ♂, 7 ♀, 1 ♀ n.
 Laguna del Gato, Hidalgo County, Texas, VIII, 6, 1912, (R. & H.), 1 ♂.
 Brownsville, Texas, VII, 31 to VIII, 5, 1912, (R. & H.; common in vegetation along river and very plentiful at night about lights in town), 26 ♂, 12 ♀.
 Piper Plantation near Brownsville, Texas, VIII, 3, 1912, (R. & H.; in heavy jungle), 2 ♂.
 Point Isabel, Texas, VIII, 2, 1912, (H.), 1 ♀.
 Matamoros, Tamaulipas, Mexico, VIII, 1, 1912, (H.), 1 ♀.

Scudderia furcata furcifera Scudder (Pl. X, fig. 20.)

1898. *Scudderia furcifera* Scudder, Proc. Amer. Acad. Arts and Sci., xxxiii, p. 282, fig. 7. (In part.) [Medellin and Venis Mecas, Mexico.]

1903. *Spilacris maculatus* Rehn and Cockerell, Proc. Acad. Nat. Sci. Phila., 1903, p. 630. [Pecos, New Mexico.]

1905. *Scudderia curvicauda* (not *Locusta curvicauda* DeGeer, 1773) Rehn in Baker, Inv. Pac., Orth., ii, p. 78. [San Marcos, Nicaragua.]

1906. *Scudderia furcata* Rehn, Ent. News, xvii, p. 288. [Beaver City, Utah.]

1906. *Scudderia furcata* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1906, p. 415. [Manitou, Colorado.]

We here select a male as single type and a female as allotype, which specimens were taken by the Rev. T. Heyde at Medellin,

²¹ This series was referred to by Bruner as belonging to a new species, Bull. Washb. Coll., i, p. 127, (1885), as his labels on the specimens indicate. They are all of the usual somewhat aberrant type found in that region which we have discussed under the present form, but further characters to separate them from *S. furcata furcata* are wanting.

Vera Cruz, Mexico, and are in the Hebard Collection ex Bruner. Unfortunately a series of dried alcoholic specimens of the closely related *S. paronae* from Tepic, Mexico, was confused with this insect by Scudder and included in his type series.

Rehn and Cockerell's *Spilaeris maculatus* was based upon a specimen in one of the earlier stages of development, determinable as an atypical example of the present race from the fact that it is very brilliantly colored with annulate antennae (as found in the early stages of *furcata* alone of the northern species), and was taken in a region where this race alone represents the genus.

The relationship of this geographic race to *S. furcata furcata* and to *paronae* is discussed under *f. furcata*. The intergradation between the present race and *f. furcata* is also discussed there, and the atypical development of the race in the mountain regions of the southwestern United States is commented upon.

Measurements (in millimeters) of extremes

S. furcata furcifera showing atypical tendencies

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur
Sycamore Canyon, Arizona.....(2)	6-6.2	34.8-35	6.9-7.1	25.9-26.8
Carr Canyon, Arizona.....(4)	5.8-6	34.7-36.2	7-7.3	24.3-25.9
Jemez Hot Springs, N. M.....(1)	5.8	32	6.7	24
Manitou, Colorado.....(2)	5.3-5.7	32.6-33.4	7-7.1	23.1-23.3
Denver, Colorado.....(1)	5.4	34.6	7.2	24
♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur
Sycamore Canyon, Arizona.....(1)	5.6	32.2	6.8	25.1
Carr Canyon, Arizona.....(8)	5.7-5.8	34-34.8	6.8-7.2	25-25.3
Jemez Hot Springs, N. M.....(1)	5	30	6.3	22.4
Beulah, New Mexico.....(1)	5.1	33	6.8	22.8
Manitou, Colorado.....(3)	5.4-5.6	31-31.3	6.8-6.9	22.9-23.2
Lost Mine Peak, Texas.....(1)	5.9	31.6	6.7	25

S. furcata furcifera typical material

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur
Medellin, Vera Cruz, Mexico. <i>Type</i>	5	29	6.6	23.7
Medellin, Vera Cruz, Mexico.....(4)	4.8-5.4	29-29.7	6.4-7	22.8-23.7
Vera Cruz, Vera Cruz, Mexico.....(1)	5.1	30	6.7	23.7
Orizaba, Vera Cruz, Mexico.....(2)	4.8-5	29.4-30.7	6.7-6.8	21.6-22

S. furcata furcifera typical material

♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur
Medellin, Vera Cruz, Mex. <i>Allotype</i>	5.1	31.1	6.7	25
Medellin, Vera Cruz, Mexico... (2)	5.1-5.3	30.7-31.2	6.6-6.7	24.4-25.3
Vera Cruz, Vera Cruz, Mexico... (2)	5.1-5.3	30.2-31	6.3-7	24.2-25.1
Orizaba, Vera Cruz, Mexico... (5)	4.9-5.1	29.5-31	6.4-6.9	22.6-23.6

The length by the greatest breadth of the ovipositor in females from a number of localities is as follows. Atypical *f. furcifera*. Lost Mine Peak, Texas, 7.7 by 2.6; Sycamore Canyon, Arizona, 7.3 by 2.4 mm.; Hot Springs, New Mexico, 7 by 2.4; Jemez Hot Springs, New Mexico, 6.7 by 2.3; Caliente, Nevada, 7.1 by 2.3; Manitou, Colorado, 6.6 to 7 by 2.3 to 2.4. Typical *f. furcifera*. Medellin, Mexico, 6.2 to 6.4 by 1.8 to 1.9; Vera Cruz, Mexico, 6.7 to 7 by 1.8 to 1.9; Orizaba, Mexico, 6.3 to 6.7 by 1.8 to 1.9 mm.

Typical material of the present geographic race is known only from San Marcos, Nicaragua; Cacao Trece Aguas, Guatemala; Merida, Yucatan; Rincon Antonio, Oaxaca, and a number of localities in the state of Vera Cruz, Mexico. The distribution in Mexico of the atypical form found in the southwestern United States is entirely unknown.

Specimens Examined: 26; 11 males and 15 females. Atypical: 16; 7 males, 8 females and 1 immature female.

Cacao Trece Aguas, Alta Vera Paz, Guatemala, 900 feet, (Barber), 1 ♂, [U. S. N. M.].

Merida, Yucatan, Mexico, (Gauger), 1 ♂, [Hebard Cln.].

Rincon Antonio, Oaxaca, Mexico, VI, 25, 1905, (F. Knab), 1 ♀, [U. S. N. M.].

Vera Cruz, Vera Cruz, Mexico, (T. Heyde), 1 ♂, 2 ♀, [Hebard Cln.].

San Rafael, Vera Cruz, Mexico, (Townsend), 1 ♂, [Hebard Cln.].

Medellin, Vera Cruz, Mexico, (T. Heyde), 5 ♂, 3 ♀, *type* and *allotype*, [Hebard Cln.].

Atoyac, Vera Cruz, Mexico, XII, 1887, (L. Bruner), 2 ♀, [Hebard Cln.].

Cordoba, Vera Cruz, Mexico, VI, 6, 1905, (F. Knab), 2 ♀, [U. S. N. M.].

Orizaba, Vera Cruz, Mexico, XI, 1887, (L. Bruner), 2 ♂, 5 ♀, [Hebard Cln.].

S. furcata furcifera showing atypical tendencies.

Lost Mine Peak, Chisos Mountains, Texas, IX, 6, 1912, 5800 feet, (R. & H.), 1 ♀.

Fort Wingate, New Mexico, VIII, 18, 1910, (J. Woodgate), 1 ♀, [Hebard Cln.].

Las Vegas, New Mexico, VIII, 8, (Barber and Schwarz), 2 ♂, [U. S. N. M.].

- Hot Springs, New Mexico, 7000 feet, 2 ♀, [Hebard Cln.].
 Jemez Hot Springs, New Mexico, VIII, 6, 1911, (J. Woodgate), 1 ♀ n.; IX, 23, 30, 1912, (J. Woodgate), 1 ♂, 1 ♀, [Hebard Cln.].
 Beulah, New Mexico, VIII, 17, (H. Skinner), 1 ♂, [A. N. S. P.].
 Glenwood Springs, Colorado, IX, 9, 1909, 6000 feet, (R. & H.; in low herbage under junipers on mountain slopes), 1 ♂.
 Denver, Colorado, (Beale), 1 ♂, [Hebard Cln.].
 Fort Collins, Colorado, VIII, 1898, 1 ♀, 1 ♀ n., [U. S. N. M.].
 Chiricahua Mountains, Arizona, VIII, 10, 1907, 8000 feet. (J. L. Webb), 1 ♀, [U. S. N. M.].
 Huachuca Mountains, Arizona, VIII, 18, 1903, (Ostar), 1 ♀, [U. S. N. M.].
 Sycamore Canyon, Baboquivari Mountains, Arizona, X, 6 to 9, 1910, 4700 feet, (R. & H.; in grasses on hillsides), 2 ♂, 1 ♀.
 Grand Canyon of the Colorado, Arizona, VII, 11, 1892, 1 ♀, [Hebard Cln.].
 Caliente, Nevada, IX, 3, 1909, 4600 feet, (R. & H.; on mountain side covered with scattered growth of sage and other bushes), 1 ♀.
 Los Angeles, California, 1 ♂, [Hebard Cln.].

Scudderia paronae Griffini

1896. *Scudderia paronae* Griffini, Boll. Mus. Zool. Univ. Torino, xi, No. 232, p. 11. [Colon, Panama.]

1897. *Scudderia curvicauda* Saussure and Pietet (not *Locusta curvicauda* DeGeer, 1773), Biol. Cent.-Amer., Orth., i, p. 331, pl. xv, fig. 20. [Orizaba and Atoyac, Vera Cruz, Mexico; Teapa, Tabasco, Mexico.]

1898. *Scudderia mexicana* Scudder, Proc. Amer. Acad. Arts and Sci., xxxiii, p. 280. (In part.) [Orizaba, Mexico.]

1898. *Scudderia furcifera* Scudder, Proc. Amer. Acad. Arts and Sci., xxxiii, p. 283. (In part.) [Tepic, Mexico.]

Scudder carelessly included the two males before him from Orizaba in his series of *S. mexicana* and confused his series of the present insect from Tepic, Mexico, with the closely related *S. f. furcifera*, this latter error due to the fact that he had never seen typical *paronae* and that the material from Tepic is dried alcoholic.

Typical *paronae* differs from *f. furcifera* in the somewhat larger size, slightly more prominent eyes, and antennae which are marked with broad and widely spaced pale annuli; the males have very similar genitalia but the females have a longer but proportionately slenderer ovipositor.

Allotype here selected: ♀; Ancon, Canal Zone Panama. November 16, 1913. (M. Hebard.) [Hebard Collection.]

Description of Allotype.—Similar to the male type as described by Griffini, the following characters being worthy of emphasis. Antennae at base of the general green coloration for a distance of nearly 4 mm., distad paler,

then brown for 3.4 mm., followed by a greenish white annulus 1.1 mm. in length, again brown for 7.1 mm., and with an annulus of similar coloration 1.9 mm. in length, then brown for 10 mm., with a similar annulus 1.1 mm. in length distad of this brown.²² Dorsum of pronotum rounding sharply into lateral lobes without decided lateral angles, except caudad at the humeral sinus. Ovipositor long and rather slender, curved and but weakly bent.

Although the only large series before us (Tepic) exhibits a very great amount of individual variation, the following measurements show that in the present species an increase in size takes place in its northward distribution. The females from Tepic average near the maximum measurements given below.

Measurements (in millimeters)

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Ancon, Panama.... ²³ (1)	5.4	30.7	6.6	25.4	5.5
Guatel, Costa Rica..(2)	5.2-5.4	30.1-31.3	6.2-7	23.6-24.9	5-5.3
Tepic, Mexico.....(1)	5.7	32.8	7	24.8	5.7
♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length by width of ovipositor
Ancon, Panama. <i>Allo-</i> <i>type</i>	5.3	30	6.3	26	7 by 1.9
Guatel, Costa Rica..(1)	5.3	33.3	6.3	24.8	7.1 by 1.8
Atoyac, Mexico.....(1)	5.7	33	7.2	27.7	7.3 by 2
Orizaba, Mexico....(1)	5.8	34.8	7	27.4	7.3 by 2
Tepic, Mexico.....(11)	5.3-6.7	31.3-37.6	6.4-7	25.2-31.2	6.1 by 1.6 to 7.2 by 1.9

In the present species the annuli of the antennae, so striking in typical material from Panama, appear to decrease rapidly in intensity in the northward distribution of the species. The specimens from Costa Rica have these annuli weakly indicated, while those from the state of Vera Cruz have them obsolete. This condition may be considerably emphasized in the material before us through these latter specimens being but indifferently

²² The male before us from Ancon has the antennae similarly marked.

²³ The type is somewhat smaller than this male.

preserved. In the Tepic series, which is dried alcoholic, practically all coloration is lost and only a few specimens show faint traces of antennal annuli.

The present species is known to range from Colon and Ancon, Panama, northward to Orizaba, Cuernavaca and Tepic, Mexico.

Specimens Examined: 24; 6 males, 15 females; 1 immature male and 2 immature females.

Culebra, Canal Zone, Panama, 1910, (H. H. Rousseau), 1 ♂, 1 ♂ n., 1 ♀ n., [U. S. N. M.].

Ancon, Canal Zone, Panama, XI, 16, 1913, (H.; in marshy spot at foot of hill in tall grasses), 1 ♂, 1 ♀. *Allotype*.

Guatel, Costa Rica, IV, 20 to 22, 1902, 2 ♂, 1 ♀, [Hebard Cln.].

Zacapa, Guatemala, I, 22, 1905, (C. C. Deam), 1 ♀ n., [U. S. N. M.].

Cuernavaca, Morelos, Mexico, (W. L. Tower), 1 ♂, [Am. Mus. Nat. Hist.].

Atoyac, Vera Cruz, Mexico, XII, 1887, (L. Bruner), 1 ♀, [Hebard Cln.].

Orizaba, Vera Cruz, Mexico, XI, 1887, (L. Bruner), 1 ♀, [Hebard Cln.].

Tepic, Tepic, Mexico, 1 ♂, 11 ♀, [Hebard Cln.].

Scudderia ungulata Scudder

1898. *Scudderia ungulata* Scudder, Proc. Amer. Acad. Arts and Sci., xxxiii, p. 280, fig. 6. [Tepic, Mexico.]

The present species is one of the largest and most robust of the genus. The males are readily separable from other species by the characters of the production of the supra-anal plate, in which relationship to *S. mexicana* is shown, but in the present insect this plate is much more simple. The females are distinguished by having much the largest ovipositor of any species of the genus, with the apex of the same much less rounded. This ovipositor is gently curved and not at all bent, a condition found elsewhere in the genus only in the apparently more primitive species *S. septentrionalis* and *S. hemidactyla*.

We here select as single type the female described by Scudder from Tepic, Mexico, and now in the Hebard Collection. The described male is consequently the allotype; it is in the same collection.

All of the material from Tepic is dried alcoholic but the series of seven specimens (six in A. N. S. P.) from Guadalajara shows the normal coloring of the species of the genus with lateral angles of the pronotum immaculate and both tegmina and antennae unicolorous, green and brown respectively.

Scudder's discussion as to the relationship of this species to *S. paronae* was due to the fact that at that time the female of that species was unknown in the literature, he had never recognized male specimens of that insect and the alcoholic condition of his types of the present species was confusing. The two species are very widely separated.

The median compressed lamina dependent between the cerci had been destroyed by pests in the male specimen described by Scudder (allotype), in the other males before us this part is quite as in the other species of the genus.

Measurements (in millimeters) of extremes

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Tepic, Mexico <i>Allotype</i> ...	6.2	37.6	7.8	28.4	8
Tepic, Mexico.....(1)	6.1	37.8	7.8		8 1
Guadalajara, Mexico...(4)	6-6.3	35.6-38.2	7.4-7.9	28.8-29.6	7.7-8
♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
Tepic, Mexico <i>Type</i>	6.1	35.6	7.2	27.7	10.7
Tepic, Mexico.....(4)	6-6.2	34.7-36.8	7-8	28.7-29.4	10.7-11.4
Guadalajara, Mexico...(3)	5.9-6.1	33.4-34.8	6.8-7.1	29.1-29.4	10.6-10.8

The ovipositor in the type has the proximal width 2.8 and the mesal width 2.4 mm., in the other females the proximal width of the ovipositor is 2.8 and the mesal width 2.4 to 2.6 mm.

The above measurements for material from Tepic, and those given for the described pair by Scudder, are as nearly correct as can be taken from dried alcoholic material. Scudder's ovipositor length is less than ours, as he measured from the dorsal margin of the base to the apex of the ovipositor, while our measurements are all taken from the ventral apex of the basal plicia to the apex of the ovipositor.

The present striking species is known as yet only from Guadalajara, Jalisco, and Tepic, Tepic, Mexico.

Specimens Examined: 15; 4 males and 11 females.

Guadalajara, Jalisco, Mexico, IX, 13, 1903, 3500 feet, (W. L. Tower;

bottom of La Barranca), 1 ♀, [Am. Mus. Nat. Hist.]; (D. L. Crawford), 2 ♂, 5 ♀, [A. N. S. P.].

Tepic, Mexico, 2 ♂, 5 ♀, *type* and *allotype*, [Hebard Chn.].

Scudderia cuneata Morse (Pl. IX, fig. 3; pl. X, fig. 21.)

1901. *Scudderia cuneata* Morse, Can. Ent., xxxiii, p. 130. [Alabama.]

The form of the supra-anal plate in the male of the present species is distinctive but shows that the insect is related more closely to *S. mexicana* than to any other species, from which form it differs decidedly in size and general structure. In these latter respects the present species much more closely resembles *S. furcata*, and the material before us shows that although specimens of the present species from Florida are separable through somewhat larger size and heavier proportions, the insect becomes smaller and slightly less robust in its northward distribution. As the female genital characters are practically identical with those of *furcata*, and as the two species are of almost exactly the same size and proportions from North Carolina to Georgia and Alabama, where both are found from the Piedmont region to the coast, separation of that sex of the two species is there decidedly difficult. The eyes in *cuneata* appear to be very slightly more rotundate and prominent than in *furcata*, while other similarly almost intangible characters are to be found in the contour of the tegmina and in the ovipositor.

Measurements (in millimeters) of extremes

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of subgenital plate
Fayetteville, N. C. (4)	4.7-5.2	27-30.8	5.3-5.7	25-25.7	5.9-6
Florence, S. C. (3)	5.1-5.2	30.7-32	5.8-5.9	26-28.2	6.4-6.6
Brunswick, Georgia . . . (1)	5.3	30.9	5.8	26.7	6.3
Jacksonville, Florida . . (1)	5.7	33.1	6.6	28.8	6.9
Miami, Florida (1)	6.7	34.2	6.9	29.2	7.1
♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
Fayetteville, N. C. . . . (10)	4.9-5.2	27.5-28.3	5.6-5.9	23.1-26.1	6.4-6.7
Florence, S. C. (4)	4.8-5	28.7-28.9	5.8-5.9	26.1-27.8	6.3-6.7
Pablo Beach, Florida . . (1)	5.7	32.3	6.4	28.2	7.4
Miami, Florida (1)	6.4	34.7	6.7	29.7	7.4

In general coloration the series before us is uniform green, many individuals have the lateral angles of the pronotum weakly outlined in yellowish.

Material from North and South Carolina has the least ovipositor width, ranging from 1.8 to 2 mm., in females from Florida this width is 2.2 (Pablo Beach) and 2.3 mm. (Miami).

The present species is known to range from Raleigh, North Carolina, south to Miami, Florida, and west to Alabama. It has been found to be a scarce but rather generally distributed species in the low country below the fall line in the region defined above.

Specimens Examined: 31; 15 males and 16 females.

Fayetteville, North Carolina, IX, 9, 1911, (R. & H.; common in short-leaf pine woods especially about scrub oaks) 4 ♂, 10 ♀.

Wrightsville, North Carolina, IX, 7, 1911, (R. & H.), 1 ♂.

Lake Waccamaw, North Carolina, IX, 8, 1911, (R. & H.), 1 ♂.

Florence, South Carolina, IX, 6, 1911, (R. & H.; in raspberry and other plants along "branch" in forest of gum, sweet gum, etc.), 3 ♂, 4 ♀.

Sandfly, Georgia, IX, 3, 1911, (R. & H.; heavy undergrowth of gray-bark pine forest), 2 ♂.

Brunswick, Georgia, VIII, 30, 1911, (H.; on palmetto flats), 1 ♂.

Billy's Island, Okefenokee Swamp, Georgia, VI to IX, 1912-13, (J. C. Bradley), 2 ♂, 2 ♀, [Cornell Univ.].

Jacksonville, Florida, IX, 7, 1913, (W. T. Davis), 1 ♂. [Davis Cln.].

Scudderia mexicana (Saussure) (Pl. IX, fig. 4; pl. X, fig. 28.)

1861. *Phaneroptera mexicana* Saussure, Rev. et Mag. Zool., 2e Ser., xiii, p. 129. [Mexico.]

1878. *Sc[udderia] fureulata* Brunner, Monogr. Phaner., p. 239, fig. 72b. [Mexico; Texas.]

With the exception of the very aberrant *S. strigata*, the present insect is the most attenuate of the species of the present genus. The genital characters of the male of *mexicana* are very distinctive as given in the key. The species is very different from its nearest allies *S. cuneata* and *ungulata*.

Measurements (in millimeters) of extremes

♂	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of wing	Length of caudal femur	Length of subgenital plate
Pasadena, California... (1)	5.7	36.7	6.7	44.7	28.7	7
Santa Monica, California... (1)	5.7	37.3	6.4	44.5	28.4	7.3
Sycamore Canyon, Ariz... (3)	5.7-5.9	34.1-36.5	5.8-6.5	41.3-44.4	26.2-28.3	7-7.8
Cuernavaca, Mexico... (10)	5.4-6	31.4-36.1	6-6.6	37.1-44.4	23.8-25.7	5.9-7.3
♀	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of wing	Length of caudal femur	Length of ovipositor
Los Angeles Co., California... (1)	5.9	36	6.6	42.7	28.3	6.9
Tumamoc Hill, Arizona... (2)	5.4-5.7	31-33.9	6-6.2	38.1-39.7	25.4-26.1	6.4-6.7
Sycamore Canyon, Ariz... (2)	5.6-5.7	34.8-35.4	6.1-6.5	42.3-42.4	27.9-28.3	6.9-7
Cuernavaca, Mexico... (8)	5.4-5.7	32.7-33.1	6.1-6.8	39.4-41.1	24.8-27	6.1-6.2

Normally uniform green in general coloration the series before us contains a few specimens which exhibit a more or less marked brownish suffusion. The lateral angles of the pronotum though usually immaculate are in a few specimens heavily outlined in yellowish.

The series before us from Cuernavaca shows that the variation in the present species is chiefly individual, the majority of specimens from that locality, however, approach the minimum measurements.

Intermediate material between *S. furcata furcata* and *S. f. furcifera* was found at Brownsville, Texas, by the authors, attracted to light at night in great numbers; the series before us of the present species from Cuernavaca shows that it responds similarly to lights at night.

In its northernmost distribution the present insect is found in the United States in the Chisos Mountains in Texas, in southeastern Arizona as far north as Fort Grant and on the California

coast to Pasadena.²⁴ In Mexico the species is widely distributed and is known from as far south as Guatemala.

Specimens Examined: 41; 24 males and 17 females.

Chisos Mountains, Texas, VI, 10 to 12, 1908, (J. D. Mitchell), 1 ♀, [U. S. N. M.].

Fort Grant, Arizona, 1882, 1 ♂, [U. S. N. M.].

Tumamoc Hill, Tucson Mountains, Arizona, X, 3 to 4, 1910, 2720 feet, (R. & H.; from yellow grass about culture frames at laboratory), 2 ♀.

Sycamore Canyon, Baboquivari Mountains, Arizona, X, 6 to 9, 1910, 3700 to 4700 feet, (R. & H.; scarce in grasses on hillsides), 3 ♂, 2 ♀.

Los Angeles County, California, (Coquillett), 3 ♂, 2 ♀, [U. S. N. M. and Hebard Cln.].

Coronado Beach, California, (Blaisdell), 2 ♂, [Hebard Cln.].

Lower California, (G. Eisen), 1 ♂, [Hebard Cln.].

Tepic, Mexico, 1 ♂, [Hebard Cln.].

Federal District, Mexico, (J. R. Inda), 1 ♂, 1 ♀, [U. S. N. M.].

Cuernavaca, Morelos, Mexico, V, 22 to VII, 5, 1905, (W. L. Tower; at light), 9 ♂, 8 ♀, [Am. Mus. Nat. Hist.]; XI, 1898, (O. W. Barrett), 1 ♂, [Hebard Cln.].

Oaxaca, Mexico, VI, 28, (C. C. Deam), 1 ♂, [U. S. N. M.].

Merida, Yucatan, Mexico, (Gauger), 1 ♂, 1 ♀, [Hebard Cln.].

²⁴ The Grant's Pass, Oregon, record published by Seudder (Proc. Amer. Acad. Arts and Sci., xxxiii, p. 280, (1898), is probably to be accounted for by an error in labelling, as we have examined the specimens and find the determination to be correct, but the locality is wholly inconsistent with our knowledge of the distribution of the insect.

II

A SYNOPSIS OF THE SPECIES OF THE GENUS *AMBLY-CORYPHA* FOUND IN AMERICA NORTH OF MEXICO

The present study was prompted by the difficulty encountered by the authors in determining certain individuals of this genus from the eastern and southwestern states. While the desirability of such a study has been apparent to us for some years, it was only in the past few seasons that we were able to take up field work in the regions from which material of this genus was particularly desired. Much still remains to be done in more fully mapping out the range of the different forms and corroborative evidence on certain matters of relationship is still desired, but both of these matters require more information than present material and literature will supply. In consequence we do not present this paper as a monographic treatise, but we do feel that the systematic and general distributional problems have been studied with sufficient thoroughness and with the authority of enough material to be conclusive.

We here record 756 specimens of the genus from the area covered by our studies, these comprising the series in the collections of the Academy of Natural Sciences of Philadelphia, of the junior author, the United States National Museum, the Museum of Comparative Zoology, of Prof. A. P. Morse of Wellesley; Massachusetts, the Pennsylvania State Department of Zoology and the Georgia State Collection. Material bearing on certain points has been loaned by Mr. W. T. Davis of New Brighton, New York, and from the collection of the University of Kansas, while a considerable number of individuals which have previously been recorded by us have also been re-examined. The latter are not generally included in the total of specimens given above and under the specific treatments. We wish to tender our thanks to the authorities in charge of the above mentioned collections and the other fellow entomologists, who so generously have assisted our work by placing their very necessary material before us for study. Of the total number of specimens given above, 285 were

collected by the authors, these representing all but two of the forms.

Within the area covered by the present paper we find the genus *Amblycorypha* represented by one or more species over a considerable portion of the country. The most northern points from which it is known are the White Mountain region, New Hampshire; Montreal, Canada and Minnesota, while it ranges south to the Florida Keys (Big Pine Key), the Gulf Coast and across Texas into Mexico and westward to east central Colorado (Manitou) and north central (Oak Creek Canyon) and southern Arizona. It does not, as far as known, reach the Pacific Coast and apparently is absent from the whole northwestern portion of the United States and western Canada. Over the greater portion of the area covered by the genus it is represented by two species, in other sections by only one species, in some by three and within the boundaries of the state of Texas six forms occur. The latter, of course, do not all occur in any one region in the state, although four forms have been secured in the vicinity of Dallas.

In the present genus, as is occasionally true of certain other genera of this family, we find specimens, occurring with others of normal green coloration, which are of a uniform pinkish color. Several authors have reported such individuals and there has been some speculation regarding the possible cause of the same. We do not intend to go into this question further than to say it appears to be a manifestation of the widespread dichromatic tendency of the group. However, we wish to call attention to the fact that we have examined such pinkish individuals of the following forms of the genus:

A. oblongifolia. One ♂. Mosholu, New York.

A. floridana. One ♀. San Pablo, Florida.

A. floridana carinata. One ♀. Wood's Hole, Massachusetts.
One ♂. Absecon, New Jersey. Two ♀. Cedar Springs, New Jersey.

A. rotundifolia. One ♀. No locality.

A. rotundifolia iselyi. One ♀. Iron Mountain, Missouri.

It is well to bear in mind that the females of this genus show considerable individual variation in the length (actual and relative) and relative depth of the ovipositor; in consequence this appendage is of diagnostic value chiefly through the general curve of the

margins and the extent and character of the armament of the same.

The North American species of the genus *Amblycorypha* fall quite naturally into two groups. Group I contains six forms of varying size, all having an elongate form with markedly elongate tegmina and distinctly projecting wing tips, individually subequal or longitudinal metasternal lobes, and a well marked humeral sinus. Certain features, as the form of the distal margin of the subgenital plate of the male and the character of the ovipositor margins, are of diagnostic value within the group, while the prominence of the lateral angles of the pronotal disk and the extent of the same show within the group the extremes of variation for the genus.

In the assemblage comprising group I certain affinities are evident which a linear arrangement cannot express. On the one hand *oblongifolia* and on the other *uhleri* are very distinct and isolated types, while the *floridana-huasteca-insolita* division is more homogeneous. *Insolita* is a desert representative of the *huasteca* type, while *floridana carinata* is distinctly divergent from *floridana floridana* in the direction of *oblongifolia*, to which, however, it is no way closely related. *Huasteca* and *floridana floridana* show quite a few features in common, but the differences in form of the ovipositor and of the male subgenital plate, as well as in the general shape of the stridulating field of the male tegmina prove their relationship to be by no means as close as would appear at first glance.

Forms of Group I

- | | | |
|-------------------------------------|---|--|
| Forms of large size, slender build. | { | <i>oblongifolia</i>
<i>floridana floridana</i>
<i>floridana carinata</i>
<i>huasteca</i>
<i>insolita</i> |
| Forms of small size, slender build. | | <i>uhleri</i> |

Group II contains three forms which are all closely related and undoubtedly geographic races of the same species, for which the name of the first known form—*rotundifolia*—must be used. These are all of medium size, moderately or decidedly abbreviate form, with ovate tegmina, slightly or not at all projecting wing tips,

individually transverse metasternal lobes and broad lateral pronotal lobes, which also have the humeral sinus very shallow or subsobsolete.

Forms of Group II

rotundifolia rotundifolia

rotundifolia parvipennis

rotundifolia iselyi

KEY TO THE FORMS

- A. Humeral sinus of lateral lobes of pronotum well impressed, at least reectangulate. Caudal margin of pronotal disk decidedly arcuate. Individual metasternal lobes not transverse. (Tegmina at least three times as long as greatest width.)
- B. Size large. Caudal femora at most but slightly surpassing apices of tegmina. Ovipositor not deeper distad of the middle than at the base. (Subgenital plate of male with distal margin V-emarginate except in *huasteca*.)
- C. Stridulating field of male tegmina very ample, area of same very much exceeding that of pronotal disk. Ovipositor of female regularly arcuate, margins of the same with decided teeth. (Lateral angles of pronotum decided, continuously indicated. General form of tegmina elongate elliptical, sutural margin distad of anal field regularly and considerably arcuate. Subgenital plate of male with distal margin V-emarginate) **oblongifolia** (DeGeer)
- CC. Stridulating field of male tegmina less ample, area of same not greatly exceeding that of pronotal disk. Ovipositor of female not as regularly arcuate as in alternative category, straighter proximad, margins of same with teeth or serrulations.
- D. Subgenital plate of male with distal margin V-emarginate. (Ovipositor elongate or of median length, when margins are serrulate the serrulations are closely placed. Lateral angles of pronotal disk continuously indicated or only so caudad.)
- E. Tegmina less elongate, distal half with margins more or less arcuate convergent and never as regularly narrowing as in opposite category. Caudal width of pronotal disk relatively narrower when compared with length of same. Fastigium distinctly more than twice as wide as proximal antennal joint. Ovipositor elongate, with decided teeth. **insolita** new species
- EE. Tegmina considerably elongate, distal half very distinctly and regularly narrowing, margins there straight converging. Caudal width of pronotal disk relatively broader when compared with length of same. Fastigium not more than twice as wide as proximal antennal joint. Ovipositor of medium length, with serrulations.

- F. Disk of pronotum with lateral angles subcarinate and that only caudad, rounded cephalad. Stridulating vein of male tegmina proportionately narrower, sutural margin of tegmina distad of anal field in male and female straighter. Ovipositor shorter; when compared with caudal femora, weaker..... **floridana floridana** R. & H.
- FF. Disk of pronotum with lateral angles more decided and angulate almost or quite continuously. Stridulating vein of male tegmina proportionately broader; sutural margin of tegmina distad of anal field in male and female more arcuate. Ovipositor longer; when compared with caudal femora, heavier..... **floridana carinata** new subspecies
- DD. Subgenital plate of male with distal margin truncate or subtruncate, never V-emarginate. (Ovipositor elongate, serrulations well spaced. Lateral angles of pronotal disk subangulate caudad, broadly rounded cephalad)..... **huasteca** (Saussure)
- BB. Size small. Caudal femora always slightly and generally decidedly surpassing apices of tegmina. Ovipositor deeper distad of the middle than at base. (Subgenital plate of male with distal margin truncate)..... **uhleri** Stål
- AA. Humeral sinus of lateral lobes of pronotum less impressed (and not rectangulate) or subobsolete. Caudal margin of pronotal disk much less arcuate. Individual metasternal lobes transverse. (Tegmina rarely over two and four-fifths times as long as greatest width.)
- B. Form more elongate, slenderer. Wings somewhat surpassing apices of tegmina. Disk of pronotum relatively narrower. Lateral lobes of pronotum relatively narrower dorsad.
 - rotundifolia rotundifolia** (Scudder)
- BB. Form less elongate, more robust. Wings never surpassing apices of tegmina. Disk of pronotum relatively broader. Lateral lobes of pronotum relatively broader dorsad.
- C. Form not decidedly robust. Tegmina more elongate, narrower and not decidedly coriaceous in texture. Dorsum of pronotum not unusually broad. Caudal femora quite elongate, moderately inflated proximad..... **rotundifolia parvipennis** Stål
- CC. Form decidedly robust. Tegmina less elongate, broader and decidedly coriaceous in texture. Dorsum of pronotum unusually broad. Caudal femora not decidedly elongate, proximal inflation relatively weak. **rotundifolia iselyi** Caudell

Amblycorypha oblongifolia (DeGeer) (Pl. XI, fig. 32; pl. XII, figs. 41 and 49.)

1773. *Locusta oblongifolia* DeGeer, Mém. Hist. Ins., iii, p. 445, pl. xxxviii, fig. 2. [Pennsylvania.]

1891. *Amblycorypha scudderæ* Bruner, Can. Ent., xxiii, p. 73. [Eastern Nebraska.]

It is quite evident from DeGeer's figure that the specimen in his possession belonged to the present species, the form of the ovi-

positor showing this to be the case. The possession of the type (♀; Omaha, Nebraska; September) of Bruner's *scudderac* enables us to place it as a synonym of *oblongifolia*. This specimen and others from Nebraska are inseparable from Pennsylvania individuals. The characters mentioned by Bruner are valueless, as he in all probability compared his species with specimens of *Amblycorypha floridana floridana* or *f. carinata* and not eastern *oblongifolia*.

From the material before us this species is seen to range from southern New Hampshire (Seabrook), southern Quebec (Montreal), central Iowa (Dallas County) and Albion, Nebraska, south to Plum Point, Maryland, Weldon, North Carolina, New Orleans, Louisiana, and Doucette and San Antonio, Texas, west to Manitou, Colorado. Walker (Can. Ent., xxxvi, pp. 329 and 330) has doubted the correctness of Caulfield's record of this species from as far north as Montreal, Quebec, being convinced that it should refer to *Scudderia pistillata*, but we have examined in the Scudder series in the Museum of Comparative Zoology a male individual of the present species from Montreal collected by Caulfield. Allard's record of *oblongifolia* from Thompson's Mills, Georgia, refers to *Amblycorypha floridana carinata*, the material having been examined by us.

Of the record recently given by Fox¹ for this species all the New Jersey material recorded except that from Canton belongs to the herein described *Amblycorypha floridana carinata*, as examination of the material shows. The Canton record probably relates to the same form but we are unable to verify this by the examination of the material.

Specimens Examined: 119; 74 ♂, 45 ♀.

Montreal, Quebec, Canada, (Caulfield), 1 ♂, [M. C. Z.].

Seabrook, New Hampshire, (A. A. Eaton), 1 ♂, [U. S. N. M.].

Woburn, Massachusetts, (J. Shute), 1 ♀, [M. C. Z.].

Chelsea, Massachusetts, X, 7, 1866, 1 ♂, [M. C. Z.].

Wollaston, Massachusetts, IX, 1895, (F. H. Sprague), 1 ♂, 3 ♀, [M. C. Z.].

Vicinity of Boston, Massachusetts, (Scudder), 1 ♂, 1 ♀, [M. C. Z.].

New Haven, Connecticut, (A. E. Verrill), 1 ♀, [U. S. N. M.].

Lake Mahopac, New York, VIII, (T. D. O'Connor), 1 ♂, [Hebard Cln.].

Dunwoodie, New York, VIII, (E. R. Casey), 2 ♂, 1 ♀, [Casey Cln.].

¹ Proc. Acad. Nat. Sci. Phila., 1914, p. 520.

- Mount Vernon, New York, (Miss C. M. Fitch), 1 ♂, [M. C. Z.]
 Mosholu, New York, IX, 6, 1 ♂, [Hebard Cln.]
 New York Botanical Garden, Bronx, New York, VIII, 15, 1907, (J. W. Rose), 1 ♀, [U. S. N. M.]
 Orange, New Jersey, VIII, 1 ♂, [U. S. N. M.]
 Cornwells, Pennsylvania, X, 1906, (R. & H.), 1 ♀; IX, 7, 1914, (Hebard; on shore of river in vines and bushes), 1 ♂, 1 ♀.
 Ashbourne, Pennsylvania, IX, 30, 1906, (Bayard Long), 1 ♂, [A. N. S. P.]
 Chestnut Hill, Pennsylvania, VIII, 15, 1911, IX, 22, 1903, X, 4, 1903, IX, 9, 1914. (H.; in vines and shrubbery), 9 ♂, 2 ♀, [Hebard Cln.]
 Mount Airy, Pennsylvania, IX, 24, 1914. (H.; in honeysuckle vines), 1 ♀.
 Tincum, Pennsylvania, IX, 9, 1904, (H.), 1 ♀.
 Harrisburg, Pennsylvania, IX, 5 (one specimen), 3 ♂, [Pa. St. Dept. Zool.]
 Wetzel's Swamp, Harrisburg, Pennsylvania, VIII, 19 and IX, 12, 1 ♂, 1 ♀, [Pa. St. Dept. Zool.]
 Highspire, Pennsylvania, VII, 28, 2 ♂, [Pa. St. Dept. Zool.]
 Camphill, Pennsylvania, VIII, 18, 1909, IX, 22, 3 ♂, 2 ♀, [Pa. St. Dept. Zool.]
 Eberly's Mill, Pennsylvania, VIII, 27, 1909, 2 ♂, [Pa. St. Dept. Zool.]
 Shiremanstown, Pennsylvania, VIII, 24, 1 ♂, [Pa. St. Dept. Zool.]
 Orrtanna, Pennsylvania, IX, 4, 1 ♀, [Pa. St. Dept. Zool.]
 Delaware, 1 ♂, [A. N. S. P.]
 Millington, Maryland, VIII, 23, 1913, (C. H. Blass), 1 ♂, [Casey Cln.]
 Blythedale, Maryland, VIII, 29, 1904, (G. M. Greene), 1 ♂, [A. N. S. P.]
 Chestertown, Maryland, VIII, 10 and 14, 1901, (E. G. Vanatta), 2 ♂.
 [A. N. S. P.]
 Plum Point, Maryland, VIII, 25, 1912, 1 ♂, [U. S. N. M.]
 Plummer's Island, Maryland, IX, 8, 1906, (W. L. McAttee), 1 ♀, [U. S. N. M.]
 Washington, District of Columbia, VIII, 17 and IX, 23, 1 ♂, 1 ♀, [Hebard Cln.]
 Virginia, VIII, 17 and X, 15, 1883, 2 ♀, [Hebard Cln.]
 Virginia shore of Potomac River opposite Plummer's Island, Maryland, X, 6, 1912, (Hood), 1 ♂, [U. S. N. M.]
 Mountains of Virginia, 1883, (A. Koebele), 1 ♂, [Hebard Cln.]
 Weldon, North Carolina, VII, 24, 1913, (R. & H.; in low bushes), 1 ♂, 1 ♀.
 Georgia, 1 ♂, [M. C. Z.]
 Chillicothe, Ohio, V-VII, 1887, (Denton), 1 ♂, [Morse Cln.]
 Agricultural College, Michigan, 1 ♂, [Morse Cln.]
 Evanston, Illinois, (L. N. Johnson), 1 ♀, [U. S. N. M.]
 Moline, Illinois, (McNeill), 1 ♂, [M. C. Z.]
 Chattanooga, Tennessee, VIII, 24, 1903, (Morse), 1 ♂, [Morse Cln.]
 Clarksville, Tennessee, VI, 28, 1912, (S. E. Crumb; feeding on tobacco), 1 ♂, [U. S. N. M.]
 New Orleans, Louisiana, VI, 18, 1883, (Shufeldt), 1 ♂, 1 ♀, [U. S. N. M.]

- Dallas County, Iowa, VIII-IX, 13, (Allen), 13 ♂, 5 ♀, [M. C. Z].
 Omaha, Nebraska, IX, 2 ♀, *type* and *paratype* of *Amblycorypha scudderæ*, [Hebard Cln.]; IX, 1 ♀, *paratype* of *A. scudderæ*, [M. C. Z].
 West Point, Nebraska, 1 ♀, *paratype* of *Amblycorypha scudderæ*, [Hebard Cln.]; 1 ♂, *paratype* of *A. scudderæ*, [M. C. Z].
 Weeping Water, Nebraska, IX, 24, 1909, (L. Bruner), 2 ♀, [Hebard Cln.].
 Lincoln, Nebraska, VIII, 1, IX, 3, 1909, (C. H. Gable), 1 ♂, 2 ♀, [Hebard Cln.].
 Albion, Nebraska, IX, 14, 1909, (L. Bruner), 1 ♀, [Hebard Cln.].
 Manitou, Colorado, VIII, 1889, 1 ♀, [Hebard Cln.].
 Ashdown, Arkansas, VII, 27, 1905, (Morse), 1 ♀, [Morse Cln.].
 Magazine Mountain, Arkansas, elevation 2600 feet, VIII, 29, 1905, (Morse), 1 ♂, [Morse Cln.].
 South McAlester, Oklahoma, VIII, 7, 1905, (Morse Cln.), 1 ♂, [Morse Cln.].
 Wister, Oklahoma, VII, 4, 1 ♂, [U. S. N. M.].
 Dallas, Texas, (Boll), VI, 5 ♂, 2 ♀, [M. C. Z.].
 Doucette, Texas, VII, 24, 1912, (H.), 1 ♂, 1 ♀.
 San Antonio, Texas, VIII, 15 to 16, 1912, (R. & H.), 1 ♀.

Amblycorypha floridana floridana Rehn and Hebard (Pl. XI, fig. 33; pl. XII, figs. 42 and 50.)

1905. *Amblycorypha floridana* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1905, p. 42, pl. i, fig. 5. [Chokoloskee and Miami (type locality), Florida.]

Our previously expressed belief that this form was but a southern geographic race of *oblongifolia*² we are now in a position to disprove, sufficient material being in hand to show the proper relationship of these two and other forms. The specimens from Thomasville, Georgia, then supposed to be intermediate between *floridana* and *oblongifolia* are intermediates, but not between those forms, instead connecting true *floridana* with a northern subspecies of the same stock, which in its turn is perfectly distinct from *oblongifolia*. This northern race we are here describing as *A. floridana carinata*. Both it and *oblongifolia* occur typically at localities where the ranges of the two forms overlap. The differential characters of *A. f. carinata* are given under that race.

The typical race of this species ranges from Big Pine Key and Detroit, southern Florida, as far north typically as Jacksonville, Fernandina and Atlantic Beach, in the same state, westward as far as eastern Texas (Dickinson and Virginia Point), intergrading, in the Atlantic coast region at least, into the northern subspecies (*carinata*) over an extensive area covering from southern Georgia

² Proc. Acad. Nat. Sci. Phila., 1907, p. 301.

(Billy's Island, Okeefenoke Swamp, Thomasville and Spring Creek) to eastern South Carolina (Ashley Junction and Yemassee).

Specimens Examined: 109; 49 ♂, 59 ♀, 1 ♀ n.

Fernandina, Florida, (W. H. Finn), 1 ♂, [U. S. N. M.].

Atlantic Beach, Florida, VIII, 24 to 25, 1911, (R. & H.), 7 ♂, 7 ♀.

Jacksonville, Florida, VIII, 1885, (Ashmead), 1 ♂, 1 ♀; (Priddey), 2 ♂, [Hebard Ch.].

Hastings, Florida, 1 ♂, [Morse Ch.].

Sanford, Florida, (S. B. Frazer), 2 ♂, 6 ♀, [M. C. Z.].

Enterprise, Florida, V, 21, 1 ♂, 1 ♀, [U. S. N. M.].

Biscayne Bay, Florida, V, 13, 1 ♂, [U. S. N. M.].

Virginia Point, Texas, VII, 21, 1912. (H.; in tall grass on edge of salt marsh), 1 ♀.

Dickinson, Texas, VIII, 20, 1912. (H.; in pine woods), 1 ♂, 1 ♀.

We have previously recorded this form from Miami, Chokoloskee, Homestead, Detroit, Big Pine Key, La Belle, Citrus Center, South Bay of Lake Okeechobee, Gainesville, San Pablo and Pablo Beach, Florida.

Intermediates between *A. f. floridana* and *A. f. carinata*.

Jacksonville, Florida, VIII, 1885, (Ashmead), 1 ♂, [Hebard Ch.].

Billy's Island, Okeefenoke Swamp, Georgia, VI and VII, 1912, IX, 1 to 5, 1913, (J. C. Bradley), 13 ♂, 3 ♀, 1 ♀ n. [Cornell University].

Honey Island, Okeefenoke Swamp, Georgia, VI, 1, 1912, (J. C. Bradley), 4 ♂, [Cornell University].

Thomasville, Georgia,³ VII, 29, VIII, 4 to 26, 1903, 2 ♂, 2 ♀, [Hebard Ch. and A. N. S. P.].

Spring Creek, Georgia, V, (J. C. Bradley), 1 ♂, 2 ♀, [Ga. St. Ch.].

Isle of Hope, IX, 3, 1911, (R. & H.; in heavy undergrowth in gray-bark pine woods), 1 ♀.

Yemassee, South Carolina, IX, 4, 1911, (R. & H.), 2 ♀.

Ashley Junction, South Carolina, VIII, 15, 1913, (R.; beaten in pine woods), 1 ♀.

Amblycorypha floridana carinata new subspecies (Pl. XI, fig. 34; pl. XII, fig. 51.)

1886. (?) *A[mblycorypha] saussurii* Bruner, Bull. Washb. Coll. Labor. Nat. Hist., i, p. 196.⁴

Differing from *floridana floridana* in the lateral margins of the pronotal disk being more angulate and carinate almost or quite continuously, in the stridulating field of the male tegmina being proportionately broader, in the sutural margin of the tegmina distad of the anal field being more arcuate and in having a longer and heavier ovipositor.

³ Recorded as *A. oblongifolia*, Proc. Acad. Nat. Sci. Phila., 1904, p. 795.

⁴ This name is based on a description of several words, of one character, which would fit the majority of the forms of the genus. In our opinion it is unrecognizable.

Type.—♂; Stafford's Forge, Ocean County, New Jersey. July 16, 1911. (Rehn.) [Acad. Nat. Sci. Phila., type no. 5240.]
Allotype.—♀; same data.

Differential Characters. Pronotum with the lateral margins of disk regularly indicated, rectangulate in transverse section, never broadly rounded cephalad; disk of pronotum decidedly and regularly expanding caudad (resembling *oblongifolia* in this respect). Stridulating field of male tegmina broader, more expanded, as wide as the caudal margin of the pronotal disk, stridulating vein more transverse; sutural margin distad of anal or stridulating field gently arcuate, distal portion and apex of tegmina appreciably broader than in typical *floridana*. Caudal femora less elongate than in *floridana floridana*. Ovipositor elongate, almost or quite equal to half the length of the caudal femur, less arcuate than in *floridana floridana*, relative depth of ovipositor not as great as in the typical form.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest (caudal) width of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
<i>f. floridana</i>						
♀ Miami, Florida. <i>Type</i>	21	7	4.5	32.5	28.5	11
♂ Homestead, Florida.....	25.8	6.7	4.5	35.8	30.4	
♀ Homestead, Florida.....	24.8	7.4	4.9	36.8	32.6	11.4
♂ Atlantic Beach, Florida.....	25	6.6	4.7	34.6	28.7	
♀ Atlantic Beach, Florida.....	28.3	7.2	4.7	32	32	11.5
♀ Atlantic Beach, Florida.....	27.2	7.3	4.9	33.6	32	12.2
Intermediates						
♂ Billy's Island, Georgia.....	22.5	6.2	4.3	33.5	28	
♂ Billy's Island, Georgia.....		7.5	5.4	39	34.4	
♀ Billy's Island, Georgia.....	26.2	7.6	5.2	36.7	33	13.3
♀ Billy's Island, Georgia.....	23.5	7.5	5	36.3	34.8	13.6
♀ Isle of Hope, Georgia.....	26.7	7.1	4.8	36	33.3	13.8
♀ Yemassee, South Carolina.....	25.2	6.8	4.9	32.7	30	13
♀ Yemassee, South Carolina.....	27	7	4.5	31	29.5	12.8
♀ Ashley Junction, S. C.....	27.6	7	4.3	31.6	31.6	12.8
<i>f. carinata</i>						
♂ Silver Lake, Georgia.....	22.9	6.5	4.5	37.5	31.8	
♂ Petersburg, Virginia.....	24	6.3	4.3	33	29	
♀ Petersburg, Virginia.....	27.2	7	5	35.5	32.6	11.5
♀ Washington, D. C.....	22	7	4.8	31	32	11.1
♂ Stafford's Forge, N. J. <i>Type</i>	20.8	7	4.9	35.5	29.4	
♀ Stafford's Forge, N. J. <i>Allotype</i>	21	6.9	5	33.2	29.5	11.5
♀ Stafford's Forge, N. J. <i>Paratype</i>	23.4	6.1	4.5	30	26.7	12.3
♀ Atsion, N. J. <i>Paratype</i>	25	7.1	4.9	33.6	31.2	13.3

It will be seen from this table that these forms present considerable individual variation, but when the relative proportions are considered the diagnostic size features hold true.

We have indicated as paratypes two males and two females taken at Stafford's Forge, New Jersey, on August 18 and September 5, 1908 (Rehn) and four males and two females taken at Atsion, New Jersey, on August 2, 1901 (Rehn) and July 30, 1911 (R. & H.).

This form ranges typically from north-central Georgia (Silver Lake and Thompson's Mills) and eastern North Carolina (New Berne) northward over southeastern Virginia and southern New Jersey to southern Massachusetts (Woods Hole and Nantucket), westward as far as known only to the fall line in Virginia (Petersburg and vicinity of Washington) and Pennsylvania (Philadelphia), but occurring typical in the Tennessee Valley drainage at Sand Mountain, Georgia, and southward passing into *f. floridana* as stated above. For records belonging to this form but recorded by Fox as *A. oblongifolia* see comments under the latter species.

Specimens Examined: 87; 44 ♂, 41 ♀, 2 ♀ n.

Woods Hole, Massachusetts, (Dr. Chas. Schäffer), 1 ♀, [A. N. S. P.]; (Mrs. S. F. Smith), 1 ♀, [M. C. Z.].

Nantucket, Massachusetts, (Scudder), 4 ♂, [M. C. Z.].

Cornwells, Pennsylvania, IX, 7, 1914, (H.; along river in vines and bushes), 1 ♂.

Philadelphia, Pennsylvania, (S. F. Gross), 1 ♂, [Hebard Cln.].

Stafford's Forge, New Jersey, VII, 16, 1911, VIII, 18 and IX, 1908, (R.; in high weeds on moist ground), 3 ♂, 3 ♀, *type*, *allotype* and *paratypes*, [A. N. S. P. and Hebard Cln.].

Atsion, New Jersey, VIII, 2, 1901, (R.), VII, 30, 1911, (R. & H.), 4 ♂, 2 ♀, *Paratypes*, [A. N. S. P. and Hebard Cln.].

Cedar Grove, New Jersey, VIII, 29, 1904, (R.), 1 ♂, [A. N. S. P.].

Tuckerton, New Jersey, VIII, 31, (W. T. Davis), 1 ♀, [Davis Cln.].

Mullica River meadows near New Gretna, New Jersey, VIII, 24, 1914, (H.; on edge of marsh), 1 ♀.

Reega, New Jersey, VII, 20, VII, 31, VIII, 10, VIII, 16, VIII, 29, 1914, (H.; in pine barrens, one colony in clump of vines and bushes), 11 ♂, 16 ♀, 2 ♀ n.

Absecon, New Jersey, 1 ♂, [A. N. S. P.].

Cedar Springs, New Jersey, VIII, 26, 1914, (H.; in marsh), 4 ♀.

Greenfield, New Jersey, X, 1, 1910, (H. Fox), 2 ♀, [A. N. S. P.].

Sea Isle Junction, New Jersey, (H. Fox), 1 ♀, [A. N. S. P.].

Ocean View, New Jersey, VIII, 15, 1910, (H. Fox), 1 ♀, [A. N. S. P.]; VII, 27, 1914, (H.; on edge of salt marsh), 1 ♂.

- Swainton, New Jersey, VIII, 21, 1914, (H.; in marshy meadow), 1 ♂.
 Wildwood Junction, New Jersey, VII, 27, VIII, 8, 1914, (H.; huckleberry bushes in oak woods), 4 ♂, 2 ♀.
 Dias Creek, New Jersey, VII, 20, 27, 1914, (H.; in deciduous forest on sandy soil), 1 ♂, 2 ♀.
 Dorsey, Maryland, VIII, 20, 1914, (Miss R. Jones), 1 ♂, [U. S. N. M.].
 Washington, District of Columbia, IX, 1883, 1 ♀, [Hebard Cln.].
 Falls Church, Virginia, VIII, 4, (A. N. Caudell), 1 ♂, [U. S. N. M.].
 Clarendon, Virginia, VIII, 1913, (H. A. Allard), 1 ♂, [U. S. N. M.].
 Petersburg, Virginia, VII, 23, 1913, (R. & H.; in grasses and low bushes in wet place near woods), 1 ♂, 3 ♀.
 Bayville, Virginia, VIII, 19, 1908, (R.), 1 ♂, [A. N. S. P.].⁵
 Raleigh, North Carolina, VII, 8, 1903, (Morse), 3 ♂, [Morse Cln.].
 New Berne, North Carolina, VIII, 24, 1908, (R.), 1 ♂, [A. N. S. P.].⁵
 Sand Mountain near Trenton, Georgia, VII, 9, 1905, (Morse), 1 ♂, [Morse Cln.].
 Thompson's Mills, Georgia, (H. A. Allard), 1 ♂, [U. S. N. M.].
 Silver Lake, Georgia, VIII, 10, 1913, 1 ♂, [Ga. St. Cln.].

Amblycorypha huasteca (Saussure) (Pl. XI, fig. 35; pl. XII, figs. 43 and 52.)

1859. *Ph[anacroptera] huasteca* Saussure, Revue et Magasin de Zoologie, 2e ser., xi, p. 205. [Tampico,⁶ Mexico.]

1862. *P[hylloptera] caudata* Scudder, Boston Journ. Nat. Hist., vii, p. 445. [Texas.]

We have been able to examine the single type specimen of Scudder's *caudata* and find it to be inseparable from Tampico topotypes of *huasteca*. The type of *caudata* is a large female with a heavy ovipositor, but it is readily matched in the numerous Texan individuals before us. The measurements of the type of *caudata* are as follows: length of body exclusive of ovipositor, 25.5 mm.; length of pronotum, 8; greatest (caudal) width of disk of pronotum, 5; length of tegmen, 39.3; greatest width of tegmen, 10.5; length of caudal femur, 35.5; length of ovipositor, 21.

Examination of the available series of this species shows that the distal margin of the subgenital plate of the male varies somewhat in the exact degree of truncation, this rarely being arcuate emarginato-truncate, the vast majority, however, having the margin straight truncate. In no specimen is there any approach to the v-emargination of the related forms.

The distribution of this species is seen to cover an area extending from northeastern (Fairmount) and central-southern (Barber

⁵ Previously recorded by us as *A. oblongifolia*, Proc. Acad. Nat. Sci. Phila., 1910, p. 637.

⁶ Vide Brunner, Monogr. der Phaneropt., p. 267.

County and Wichita) Kansas, south to at least Tampico, Mexico, reaching to the Gulf Coast at a number of Texan localities, having been reported from as far east as Louisiana, and extending as far west as Clarendon and Uvalde, Texas.

Specimens Examined: 98; 50 ♂, 45 ♀, 1 ♂ n., 2 ♀ n.

Wichita, Kansas, VII, 20, 1 ♀, [U. S. N. M.].

Barber County, Kansas, (F. W. Cragin), 1 ♀, [Hebard Cln.].

Cache, Oklahoma, VIII, 23 to 25, 1905, (Morse), 2 ♂, 4 ♀, [Morse Cln.].

Dallas, Texas, 1 ♀, [U. S. N. M.]; VI, 8, VII, 16, (Boll), 2 ♂, 6 ♀, 1 ♀ n., [M. C. Z.].

Weatherford, Texas, IX, 23, 1912, (R. & H.), 1 ♂.

Wichita Falls, Texas, VIII, 17, 1905, (Morse), 1 ♂, [Morse Cln.].

Clarendon, Texas, VIII, 18, 1905, (Morse), 1 ♂, [Morse Cln.].

Shovel Mount, Texas, VI, 20 to 29, VII, 3 to 21, 1901, (F. W. Schaupp), 8 ♂, 2 ♀, [A. N. S. P.].

Kerrville, Texas, VII, 17 to 18, 1912, (R. & H.; in ground vegetation on summit of hills), 1 ♂, 2 ♀.

Uvalde, Texas, VII, 21 to 22, 1912, (R. & H.), 1 ♂, 1 ♀.

San Antonio, Texas, VI, 16, (M. Newell), 3 ♂, [Hebard Cln.]; VII, 15 to 16, 1912, (R. & H.; in low, heavy and spiny bush), 1 ♂.

Flatonía, Texas, VIII, 19 to 20, 1912, (R. & H.), 5 ♂, 1 ♀.

Dickinson, Galveston County, Texas, VII, 20, 1912, (H.; edge of pine woods), 1 ♂.

La Marque, Galveston County, Texas, VII, 22, 1912, (H.; on wet prairie land), 1 ♂, 2 ♀.

Virginia Point, Galveston County, Texas, VII, 21, 1912, (H.; in tall grasses on edge of salt marsh), 1 ♀.

Galveston, Texas, VII, 19 to 21, 1912, (H.; occasional in low grass and weeds), 3 ♂, 3 ♀.

Columbus, Texas, 1 ♂, [U. S. N. M.].

Victoria, Texas, VII, 26 to 27, 1912, (H.; occasional on broad leaved plants in field), 4 ♂, 5 ♀; VI, (A. N. Caudell), 3 ♂, [U. S. N. M.].

Beeville, Texas, VII, 28, 1912, (H.; in weeds near low bushes), 2 ♂, 6 ♀.

Gregory, Texas, VII, 30, 1912, (H.), 2 ♂, 4 ♀.

Lyford, Texas, VIII, 6 to 7, 1912, (R. & H.), 2 ♂, 1 ♀.

Laguna del Gato, Hidalgo County, Texas, VIII, 6, 1912, (R. & H.), 1 ♂ n.

Brownsville, Texas, VII, 31 to VIII, 5, 1912, (H.), 1 ♂, 2 ♀, 1 ♀ n.; VI, 2, 1904, (H. S. Barber; on cotton), 1 ♂, [U. S. N. M.].

Piper Plantation, Cameron County, Texas, VIII, 3, 1912, (R. & H.), 2 ♂, 1 ♀.

Texas, (A. Agassiz), 1 ♀, [M. C. Z.]. *Type of Phylloptera caudata* Scudder.

Matamoros, Tamaulipas, Mexico, (L. B. Couch), 1 ♀, [M. C. Z.].

Tampico, Tamaulipas, Mexico, XII, 5, 1909, (F. C. Bishopp), 1 ♂, [U. S. N. M.].

Amblycorypha insolita new species (Pl. XI, fig. 40; pl. XII, figs. 44 and 54.)

1905. *Amblycorypha huasteca* Rehn (not of Saussure, 1859), Trans. Kansas Acad. Sci., xix, p. 226. [Southern Arizona.]

1907. (?) *Amblycorypha huasteca* Snow (not of Saussure, 1859), Ibid., xx, pt. 2, p. 163. [Oak Creek Canyon, Arizona.]

1909. *Amblycorypha huasteca* Rehn and Hebard (not of Saussure, 1859). Proc. Acad. Nat. Sci. Phila., 1909, p. 168. [Dry Canyon, Sacramento Mountains, New Mexico.]

This striking form is a development of the *huasteca* type, carrying some of the features of that species to a greater extreme and at the same time differing in other purely diagnostic characters. The pronotum has the lateral margins of the disk as broadly rounded cephalad as in *huasteca*, but caudad they are more decided than in that species, the tegmina and wings are much more elongate, appreciably surpassing the tips of the caudal femora, although of the same general form. The lateral lobes of the pronotum have the angles more rounded and the humeral sinus much more decidedly indicated. The stridulating vein of the male tegmina is rather short and very broad and heavy, while the distal margin of the subgenital plate of the same sex is V-emarginate instead of truncate as in *huasteca*. The ovipositor is of the same general form as in *huasteca*, but is relatively deeper with the teeth larger and much more distinct.

Type.—♂; Quitman Mountains, El Paso County, Texas. Elevation, 5200 feet. September 14, 1912. (Hebard.) [Hebard Collection.]

Description of Type.—Size large; form elongate, moderately compressed; surface of head and pronotum moderately polished. Head with greatest width ventrad of eyes contained one and one-half times in depth of head; occiput rounded, steeply declivent to the nearly vertical fastigium, latter somewhat constricted at the paired ocelli, interfastigial suture sinuate, greatest width of fastigium subequal to that of eye; antennae reaching to tips of wings; eyes moderately prominent, elliptical in outline, faintly pointed dorsad and ventrad. Pronotum deplanate, disk decidedly expanding caudad and with its greatest width contained about one and one-third times in length; lateral margins of disk broadly rounding into lateral lobes cephalad, distinctly angulate caudad; cephalic margin of disk shallowly arcuato-emarginate, caudal margin of disk strongly arcuate, transverse sulcus forming a faint obomegoid figure on the middle of the disk; lateral lobes of pronotum with depth slightly greater than greatest width, cephalic margin faintly arcuato-emarginate, ventro-cephalic angle rounded obtuse-angulate, ventral margin short, nearly straight, oblique, broadly round-

ing into the arcuate caudal margin, which passes rather regularly to the strongly indicated rectangulate humeral sinus. Tegmina surpassing tips of caudal femora by length of pronotum, elongate, lanceolate, greatest width (at proximal third) contained slightly more than four times in length; costal margin arcuate proximad, straight distad, sutural margin distad of stridulating field straight, obliquely converging to the roundly oblique-truncate apex; marginal field broad mesad, humeral trunk sinuate, much thickened and flattened proximad, median vein with its two distal rami reaching oblique portion of apical margin; stridulating field almost twice length of pronotal disk, greatest width about three-fourths of length of pronotal disk, general form similar to that of *huasteca* but more elongate, stridulating vein short, very thick, depressed. Wings surpassing apices of tegmina by about length of pronotal disk. Mesosternal lobes less elongate than in *huasteca*, distal section obliquely truncate mesad; metasternal lobes with proximo-lateral angle more decided and distal margin more arcuate than in *huasteca*. Cerei more elongate and regularly tapering than in *huasteca*, distal section less abruptly denticulate at apex; subgenital plate V-emarginate distad with lateral, articulate, brief and tapering styles. Cephalic femora with at most but three spines on ventro-cephalic margin. Median femora unarmed ventrad. Caudal femora similar in form to those of *huasteca* but with at most but three minute teeth on ventro-internal margin.

Allotype.—♀; Montelovez, Coahuila, Mexico. September 20. (E. Palmer.) [Hebard Collection.]

Description of Allotype.—When compared with female individuals of *huasteca* that sex of the present species differs in the characters given as diagnostic for the species and in those features possessed by both sexes which are detailed in the description of the male. The ovipositor is slightly more than two-fifths of the tegminal length, quite deep, arcuate, more strongly so distad; teeth on distal half of dorsal margin and distal fourth of ventral margin, decided, well spaced. Subgenital plate trigonal.

Color Notes.—General color course green to biscay green, occasionally paling to light chalcedony yellow on the abdomen (type) and always becoming lettuce green to light bice green on the head and pronotum, the exposed portion of the wings and distal extremity of the tegmina rarely (one specimen) washed with old gold. Eyes of the general color, lineate with yellowish to hazel. Pronotum with lateral margins of disk more or less completely lineate, distad with raw sienna, faintly bordered laterad, dorsad of humeral sinus, by clove brown, cephalad with ochraceous buff. Tegmina with stridulating field charaiois to cartridge-buff, with an oblique irregular maculation extending from base of field to distal section of free margin and a weak edging of same margin proximad

clove brown, stridulating vein occasionally raw sienna; discoidal field of tegmina with numerous small to medium-sized scattered ocelliform false fungous areas of clove brownish, sutural margin of same rarely weakly washed with same color. Tibiae more or less pinkish on dorsal surfaces, as strong as pompeian red on cephalic and median tibiae and flesh pink on caudal tibiae.

These notes have been made from only the individuals which show the best preserved coloration and have not been immersed in liquid preservative. Certain specimens of the latter character are of an entirely buffy color.

Measurements (in millimeters)

	♂ Quitman Mountains, Texas <i>Type</i>	♂ Dry Can- yon, New Mexico <i>Paratype</i>	♂ Comacho, Zacatecas, Mexico <i>Paratype</i>	♀ Southern Arizona	♀ Montelovez, Coahuila, Mexico <i>Allotype</i>
Length of body.....	27	24.5	19	20.2	24
Length of pronotum.....	6.4	8	6.1	7.2	7.6
Greatest dorsal width (caudad) of pronotal disk.....	5.1	5.2	4.6	5.2	5.6
Length of tegmen.....	42.3	42.7	37.7	39	41.6
Greatest width of tegmen.	10.3	10.4	8.8	10.3	11.4
Length of caudal femur...	29.8	31.7	27.7	30.5	31.5
Length of ovipositor.....				16.5	16.3

Distribution.—As far as known this most interesting species occurs only in the Sonoran desert areas of the southwestern United States and northern Mexico, extending from western Texas (Chisos Mountains, Sierra Blanca and Quitman Mountains) west to Southern Arizona (exact locality unknown), south to at least the state of Coahuila and the northern part of the state of Zacatecas (Comacho), Mexico and northward to southern New Mexico (Dry Canyon). It is practically certain that the material recorded by Snow from Oak Creek Canyon, central Arizona, belongs to this form, but all efforts to locate the specimens have failed.

In addition to the type and allotype we have examined a paratype male taken in Dry Canyon, Sacramento Mountains, Otero County, New Mexico, 5200 feet elevation, VII, 13, 1907 (R. & H.), another paratype of the same sex from Comacho, Zacatecas,

Mexico, taken by Bruner, XI, 1887, in the Hebard Collection, a paratype male and female bearing the same data as the allotype, in the collection of the Museum of Comparative Zoology and one paratype male from the Chisos Mountains, Texas, VI, 10 to 12, 1908, in the United States National Museum. A female from the collection of the University of Kansas bearing the locality "Southern Arizona," another of the same sex labelled "Chihuahua, Mexico," in the collection of the Museum of Comparative Zoology and an immature female taken at Sierra Blanca, El Paso County, Texas, 4524 feet elevation, IX, 13 to 14, 1912 (R. & H.), have also been examined. Several of these specimens have been immersed in alcohol and their coloration either entirely or in large part destroyed in consequence. The female nymph is in the instar preceding maturity and the characters of the species are fairly well indicated. The Comacho and Chisos Mountains males are appreciably smaller than the type, while the Montelovez male is similar to the latter size. The females show considerable individual variation in bulk, the southern Arizona representative being appreciably smaller than the others of that sex, which among themselves show less decided variation.

On the Quitman Mountains the species was taken in grasses near small oaks and junipers, the Sierra Blanca nymph was beaten from black brush (*Flourensia cernua*) and in Dry Canyon the insect was beaten from a small green tree growing in the piñon and juniper zone.

Specimens Examined: 10; 5 ♂, 4 ♀, 1 ♀ n.

Chisos Mountains, Brewster County, Texas, VI, 10 to 12, 1908, (Mitchell and Cushman), 1 ♂, [U. S. N. M.], *Paratype*.

Sierra Blanca, El Paso County, Texas, 4524 feet elevation, IX, 13 to 14, 1912, (R. & H.), 1 ♀ n.

Quitman Mountains, El Paso County, Texas, 5200 feet elevation, IX, 14, 1912, (H.), 1 ♂, *Type*.

Dry Canyon, Sacramento Mountains, Otero County, New Mexico, 5200 feet elevation, VII, 13, 1907, (R. & H.), 1 ♂, *Paratype*.

Southern Arizona, VIII, 1902, (F. H. Snow), 1 ♀, [Univ. of Kansas].

Montelovez, Coahuila, Mexico, IX, 20, (E. Palmer), 1 ♂, 2 ♀, [M. C. Z.], *Allotype and paratypes*.

Chihuahua, Mexico, 1 ♀, [M. C. Z.].

Comacho, Zacatecas, Mexico, XI, 1887, (Bruner), 1 ♂, [Hebard Cln.], *Paratype*.

Amblycorypha uhleri Stål (Pl. XI, fig. 36; pl. XII, figs. 45 and 53.)

1876. *A[mblycorypha] uhleri* Stål, Bihang till K. Svenska Vet.-Akad. Handl., iv, no. 5, p. 57. [Texas.]

This species is very plastic, varying considerably in size, both individually and geographically, and appreciably in the proportionate width of the tegmina and in the length and relative depth of the ovipositor. The area in which the species reaches greatest size is southern Georgia and northern Florida, but even in the material from that region there is much individual variation. In consequence of the lack of a sufficient representation of material from the coast region of Alabama, Mississippi, Louisiana and the Mississippi valley it seems best to give only a few measurements of average pairs and the extreme individuals of the species seen. The depauperate condition of the Uvalde minimum female is remarkable, the other specimens from that locality being distinctly above the average in size.

The range of this species extends from southern New Jersey, south to southern Florida, in the east extending as high as 1600 to 1800 feet elevation (Murphy, North Carolina, and Currahee Mountain, Georgia), west to eastern Oklahoma and west-central Texas (Uvalde), ranging north in the Mississippi valley region as far as Minnesota and central Indiana and Illinois, and south in Texas as far as Victoria. In Arkansas the species ranges as high as 2600 feet (Rich Mountain) and has been captured as high as 1700 feet in Texas (Kerrville).

	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
♂ Parkdale, New Jersey...	4.8	24.2	7	21	
♂ Weldon, N. C.....	5.3	27.2	8.5	24.2	
♂ Yemassee, S. C.....	5.5	26.2	8	24.7	
♂ Toccoa, Georgia.....	5	25	7.1	22	
♂ Spring Creek, Georgia..	6	29.8	9	26.7	
♂ Jacksonville, Florida...	5.6	26	7.9	22.7	
♂ Homestead, Florida....	5.8	26.5	8.1	26	
♂ Doucette, Texas.....	5	22.9	6.8	23.7	
♂ Rosenberg, Texas.....	6	26.5	7.2	24.6	
♂ Uvalde, Texas.....	6.2	26.5	7.6	27.8	

	Length of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
♀ Atsion, New Jersey.....	5.7	21.7	6.5	23.2	8.1
♀ Weldon, N. C.....	5.7	21.5	6.5	23.5	7.7
♀ Yemassee, S. C.....	5.6	22.2	6.7	23.5	8
♀ Toecoa, Georgia.....	5.3	21.2	6.5	22.7	7.7
♀ Spring Creek, Georgia..	5.9	28	8.6	27	10
♀ Jacksonville, Florida...	6.4	29	8.9	27.2	9.7
♀ Homestead, Florida....	7	26.3	7.5	28.5	9.1
♀ Doucette, Texas.....	5.3	25.7	7.3	25.5	7.8
♀ Rosenberg, Texas.....	6	24.5	6.7	26	7.4
♀ Uvalde, Texas.....	6.5	25.7	7	27.8	7.8
♀ Uvalde, Texas.....	5.2	19.3	5.3	21	6.2

Specimens Examined: 215; 127 ♂, 85 ♀, 2 ♂ n., 1 ♀ n.

Parkdale, New Jersey, VII, 30, 1911, (R. & H.; undergrowth in pine barrens), 1 ♂.

Atsion, New Jersey, VII, 30, 1911, (R. & H.; undergrowth in pine barrens), X, 8, 1903, (H.), 1 ♂, 1 ♀.

Reega, New Jersey, VIII, 10 (nymphs), VIII, 29, 1914, (H.; undergrowth in pine woods), 2 ♂, 2 ♀ n.

Sea Isle Junction, New Jersey, IX, 5, 1909, (Fox; field), 2 ♂, [A. N. S. P.], Delaware, 1 ♂, [A. N. S. P.].

Chestertown, Maryland, VIII, 12, 1901, VIII, 21, 1899, (E. G. Vanatta), 2 ♂, [A. N. S. P.].

Washington, District of Columbia, VIII, 1883, X, 3, (Pergande), 2 ♂, [Hebard Cln.]; VIII, 1909, 1 ♂, [U. S. N. M.].

Analostan Island, District of Columbia, IX, 6, 1912, 1 ♂, [U. S. N. M.].

Clarendon, Virginia, VIII, 1913, (Allard), 1 ♂, [U. S. N. M.].

Fredericksburg, Virginia, VII, 20, 1913, (R. & H.; in meadow land near woods), 1 ♂.

Murphy, North Carolina, VIII, 22, 1903, (Morse), 1 ♀, [Morse Cln.].

Weldon, North Carolina, VII, 24, 1913, (R. & H.; in low heavy bushes near forest), 3 ♂, 1 ♀.

Goldsboro, North Carolina, VII, 25, 1913, (R. & H.; in green grasses and weeds in damp spots in short-leaf pine woods), 2 ♂, 3 ♀.

Lake Waccamaw, North Carolina, IX, 8, 1911, (R. & H.), 1 ♂.

Charlotte, North Carolina, late VII, 1907, (F. Sherman), 1 ♀, [U. S. N. M.].

Columbia, South Carolina, VII, 28, 1913, (R. & H.), 1 ♂.

Denmark, South Carolina, VIII, 15, 1903, (Morse), 3 ♀, [Morse Cln.].

Port Royal, South Carolina, (Fowler), 1 ♂, [M. C. Z.].

Yemassee, South Carolina, IX, 4, 1911, (R. & H.; in undergrowth in pine woods), 8 ♂, 5 ♀.

Sand Mountain, near Trenton, Georgia, VIII, 25, 1903. (Morse), 1 ♂, 1 ♀, [Morse Cln.].

Currahee Mountain, Georgia, 1700 feet elevation, VIII, 5, 1913. (H.), 1 ♂, 1 ♀ n.

Toocoa, Georgia, VIII, 4 to 5, 1913. (H.; in grasses, vines and oak sprouts in clearings), 2 ♂, 4 ♀.

Jasper, Georgia, 1550 feet elevation, VIII, 5, 1913. (R.; beaten from scrub), 1 ♂.

Thompson's Mills, Georgia, X, 1909. (Allard), 1 ♂, 1 ♀, [U. S. N. M.].

Buckhead, Georgia, VIII, 2, 1913. (R. & H.; in weeds and vines in low spot in oak and pine woods), 3 ♂.

Stone Mountain, Georgia, IX, 12, 1913, 1 ♂, [Ga. State Cln.].

Augusta, Georgia, VII, 29, 1913. (R. & H.; in sandy scrub oak area), 2 ♀.

Macon, Georgia, VII, 30 to 31, 1913. (R. & H.; in undergrowth of short-leaf pine woods), 2 ♂.

Savannah, Georgia, VIII, 14, 1903. (Morse), 1 ♂, [Morse Cln.].

Isle of Hope, Georgia, IX, 3, 1911. (R. & H.; in undergrowth of gray-bark pine woods), 2 ♂.

Sandfly, Georgia, IX, 3, 1911. (R. & H.; in undergrowth of gray-bark pine woods), 1 ♀.

Brunswick, Georgia, VIII, 30, 1911. (H.; taken under green bushes in wet place), 1 ♀.

Albany, Georgia, VIII, 1, 1913. (R. & H.; in undergrowth in pine woods), 4 ♂, 1 ♀.

Spring Creek, Georgia, VII, 1912, VIII, 26 to 28. (J. C. Bradley), 3 ♂, 7 ♀, [Ga. State Cln.].

Bainbridge, Georgia, 1 ♀. [Ga. State Cln.].

Jacksonville, Florida, VIII, 1885. (Ashmead), 3 ♀, (Hebard Cln.); VIII, 25, 1911. (R. & H.), 1 ♂, 2 ♀.

Live Oak, Florida, VIII, 10, 1903. (Morse), 2 ♀, [Morse Cln.].

Crescent City, Florida, VII, 7. (on orange trees), 1 ♂, [U. S. N. M.].

Sanford, Florida. (G. B. Frazer), 1 ♂, [M. C. Z.].

Fort Barrancas, Florida, VIII, 3, 1903. (Morse), 1 ♀, [Morse Cln.].

Wyandotte, Indiana, VIII, 1905. (A. N. Caudell), 1 ♂, [U. S. N. M.].

Kentucky. (Garman), 1 ♂, [M. C. Z.].

Lookout Mountain, Tennessee, VIII, 23, 1903. (Morse), 1 ♂, [Morse Cln.].

Clarksville, Tennessee, X, 3, 1912. (S. E. Crumb; feeding on cotton), 1 ♀, [U. S. N. M.].

Hattiesburg, Mississippi, VII, 17, 1905. (Morse), 1 ♂, 1 ♀, [Morse Cln.].

Nugent, Mississippi, VII, 20, 1905. (Morse), 1 ♀, [Morse Cln.].

Bushberg, Missouri, IX, 14, 1877. 1 ♀, [U. S. N. M.].

St. Louis, Missouri. (Dr. George Engelmann), 1 ♀, [M. C. Z.].

Winslow, Arkansas, IX, 3, 1905. (Morse), 2 ♂, [Morse Cln.].

Magazine Mountain, Arkansas, 2000 feet elevation, VIII, 29, 1905. (Morse), 2 ♀, [Morse Cln.].

Rich Mountain Station, Arkansas, VIII, 2, 1905. (Morse), 1 ♂, [Morse Cln.].

- Summit of Rich Mountain, Arkansas, 2600 feet, VIII, 1, 1905, (Morse), 1 ♂, [Morse Cln.].
- Mena, Arkansas, VII, 30, 1905, (Morse), 4 ♂, 1 ♀, [Morse Cln.].
- Eagleton, Arkansas, VIII, 3, 1905, (Morse), 2 ♂, [Morse Cln.].
- De Queen, Arkansas, VII, 29, 1905, (Morse), 1 ♂, [Morse Cln.].
- Ashdown, Arkansas, VII, 27, 1905, (Morse), 1 ♀, [Morse Cln.].
- South McAlester, Oklahoma, VIII, 7, 1905, (Morse), 1 ♂, [Morse Cln.].
- Howe, Oklahoma, VIII, 4, 1905, (Morse), 1 ♂, 2 ♀, [Morse Cln.].
- Caddo, Oklahoma, VIII, 9, 1905, (Morse), 6 ♂, 4 ♀, [Morse Cln.].
- Plano, Texas, VII, (E. S. Tucker), 1 ♂, 1 ♀, [U. S. N. M.].
- Pittsburg, Texas, VII, 19, 1907, (F. C. Bishopp), 1 ♂, [U. S. N. M.].
- Dallas, Texas, 1 ♂, [U. S. N. M.]; (Boll), 9 ♂, 5 ♀, [M. C. Z.].
- Denison, Texas, VIII, 12, 1905, (Morse), 1 ♀, [Morse Cln.].
- Doucette, Texas, VII, 24, 1912, (H.; common in open in low bushes), 5 ♂, 2 ♀.
- Webster, Texas, VII, 19, 1912, (H.; occasional in clumps of weeds), 5 ♂, 1 ♀.
- Rosenberg, Texas, VII, 25 to 26, 1912, (H.; very common in park-like country), 14 ♂, 8 ♀.
- Columbus, Texas, VI, 6, 1879, 1 ♀, [U. S. N. M.].
- Lavaca County, Texas, VI, 21, 1 ♂, 1 ♀, [U. S. N. M.].
- Victoria, Texas, VI, (A. N. Caudell), 4 ♂, [U. S. N. M.]; VII, (J. D. Mitchell), 1 ♀, [U. S. N. M.].
- Granjeno, Texas, V, 24, 1895, 1 ♀, [U. S. N. M.].
- Kerrville, Texas, 1525 feet elevation, VIII, 17 to 18, 1912, (R. & H.; beaten from vines in river bottom), 1 ♀.
- Uvalde, Texas, VIII, 21 to 22, 1912, (R. & H.), 2 ♂, 3 ♀.

We have previously recorded this species from Lucaston and Sea Isle Junction, New Jersey, Raleigh and Winter Park, North Carolina, Tallapoosa, Toocoa and Thomasville, Georgia and Gainesville and Homestead, Florida.

Amblycorypha rotundifolia rotundifolia (Scudder) (Pl. xi, fig. 37; pl. xii, figs. 46 and 55.)

1862. *P[hylloptera] rotundifolia* Scudder, Boston Journ. Nat. Hist., vii, p. 445. [Massachusetts; Vermont; Connecticut; Rhode Island; Illinois.]

A careful search through the material of this species in the collection of the Museum of Comparative Zoology has failed to bring to light any of the original specimens on which the species was founded. The Rhode Island specimen was in the Harris Collection according to Scudder and in consequence it was in all probability destroyed with the other Orthoptera belonging to that series. The other specimens were probably given away or exchanged when individuals of the species with more exact data were obtained. The identification of the form is, however, so

easy that the examination of the type material was only desired to fill out the record of types studied.

This form is typical over southern New England, the eastern mountain, Piedmont and northern Coastal Plain regions, extending westward over the central Mississippi Valley region, also occurring typical on the summit of Rich Mountain in the Ozark Mountains of western Arkansas. The most northern definite locality from which the form has been recorded is the White Mountain region, while the most western in the Mississippi region is Moline, Illinois. The most southern localities from which we have seen typical *rotundifolia rotundifolia* are Spartanburg, South Carolina; Toocoa, Tuckoluge Creek and Blue Ridge, Georgia, and the summit of Rich Mountain, Arkansas. In northwestern and central Georgia and in the southern portion of the Coastal Plain we find the specimens of this species having an abbreviation of the wings, accompanied by a reduction of the humeral sinus and broadening of the dorsal section of the lateral lobes of the pronotum, thus approximating *rotundifolia parvipennis*. We have examined individuals exhibiting this intermediate condition from Winter Park, North Carolina; Macon, Warm Springs and Sand Mountain, Georgia, and Valley Head and Cheawha Mountain, Alabama.

Measurements (in millimeters) of average individuals of *rotundifolia rotundifolia*, *rotundifolia iselyi* and *rotundifolia parvipennis*, with certain measurements of the last mentioned two from other authors, are as follows:

	Length of pronotum	Greatest caudal width of pronotum	Greatest width of dorsal section of lateral lobes of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
<i>A. rotundifolia rotundifolia</i>							
♂ Parkdale, New Jersey.....	5.5	3.7	4	25.2	8.9	24	
♂ Beatty, Westmoreland County, Pennsylvania...	5.3	3.9	4.2	25.7	9.2	23.2	
♀ Orange, Virginia.....	5.6	4	4	25.5	8.5	22.5	
♂ Mt. Pisgah, N. C.....	5.5	3.9	4.2	24	8.2	21.8	
♂ Currahee Mountain, Ga...	5.9	4	4.6	27	9	25.5	
♂ Franklin County, Ind.....	5.2	3.7	3.9	24.5	9	23	

	Length of pronotum	Greatest caudal width of pronotum	Greatest width of dorsal section of lateral lobes of pronotum	Length of tegmen	Greatest width of tegmen	Length of caudal femur	Length of ovipositor
<i>A. rotundifolia rotundifolia</i> ⁷							
♀ Lyme, Connecticut	6.5	4.2	5	27	9.5	26	10.3
♀ Stafford's Forge, N. J.	6	4	4.6	24.3	8.4	24.8	10.8
♀ Beatty, Westmoreland County, Pennsylvania	6.2	4	5	24.3	8	24.6	9.3
♀ Orange, Virginia	6	4	4.6	26	9	25.7	10
♀ Jones' Knob, N. C.	6.4	4.2	5.1	24.6	8.6	23.5	10
♀ Spartanburg, S. C.	6	3.8	4.5	24	7.7	24.8	8.8
♀ Toxco, Georgia	5.8	4	5	23.7	8.1	25	9.6
♀ Fulton County, Indiana	6	4.1	5	24.5	9.4	25.8	9.8
<i>A. rotundifolia rotundifolia</i> x							
<i>A. r. parvipennis</i>							
♀ Winter Park, N. C.	7.4	4.8	5.8	28	9.6	28	10.7
♀ Macon, Georgia	6.3	4	5	24.8	8	25	9
♀ Warm Springs, Georgia	6.2	4	4.8	25.2	8.5	25	9.5
<i>A. rotundifolia parvipennis</i>							
♂ Texas (Ex Stål)				24	7	26	
♂ Texas (Ex Brunner)	6.8			23	8	28	
♂ Dallas, Texas	7.5	4.8	6.2	26.4	8.5	29.1	
♀ Texas (Ex Stål)				26	8	28	15
♀ Texas (Ex Brunner)	8			24	8	29	15
♀ Dallas, Texas	7.4	4.9		23.4	8		13.9
♀ Lavaca County, Texas	9	5.7	7.8	29.6	9.8	32.4	12.5
♀ Rich Mountain Sta., Ark.	7.2	5.1	6.1	28.1	9.3	29	10
<i>A. rotundifolia iselyi</i>							
♂ Little Rock, Iowa	6.5	4.4	5.2	22.7	8.2		
♂ Ames, Iowa	6.7	4.5	5.5	22.5	9	23.2	
♂ Wichita, Kan. <i>Paratype</i>	6.5	5	5.3	22.7	8.7	25.3	
♀ Ames, Iowa	6.6	5	5.5	21.2	8	23.2	10.3
♀ Iron Mountain, Missouri	6.9	4.7	5.5	23.5	8.5	25.4	11.5
♀ Wichita, Kan. (Ex Caudell) <i>Type</i>	8	5		25	9	26	10 ⁷

Specimens Examined: 102; 57 ♂, 45 ♀, 1 ♂ n., 1 ♀ n.

Milton, Massachusetts, VIII, 28, 1897, (F. H. Sprague), 4 ♂, 1 ♀ n.; N, S, 1897, (F. H. Sprague), 1 ♀, [M. C. Z.].

⁷ Measured to ventro-proximal point, as in our other measured specimens, the ovipositor of this individual shows 11.8 mm.

- Wollaston, Massachusetts, VIII-IX, 1895, (F. H. Sprague), 3 ♀, [M. C. Z.].
- Walpole, Massachusetts, VIII, 1 and 2, 1897, (F. H. Sprague), 3 ♂, [M. C. Z.].
- Cambridge, Massachusetts, 1 ♂, [M. C. Z.].
- Lyme, Connecticut, VIII, 21, 1910, (B. H. Walden), 2 ♀, [Hebard Cln.].
- Ithaca, New York, VIII, 5-22, 1890-1891, 3 ♂, 1 ♀, [Morse Cln.].
- Marlboro, New York, IX, 1 ♂, [Bklyn. Inst. A. & S.].
- West Creek, New Jersey, VIII, 28, 1914, (R.: in undergrowth in oak woods), 3 ♀.
- Parkdale, New Jersey, VII, 30, 1911, (R. & H.; in oak scrub), 2 ♂; VII, 30, 1911, (A. N. Caudell), 3 ♂, [U. S. N. M.].
- Reega, New Jersey, VII, 31, VIII, 16, VIII, 29, 1914, (H.; under pines and oaks, males stridulating at night), 2 ♂, 3 ♀.
- Wildwood Junction, New Jersey, VIII, 27, VIII, 8, 1914, (H.; in huckleberry bushes, etc., in oak woods), 1 ♂, 2 ♀.
- White Mills, Wayne County, Pennsylvania, VIII, 7 to 9, 2 ♂, [Bklyn. Inst. A. & S.].
- Rockville, Pennsylvania, VII, 22 to 29, VIII, 7 to 18, 2 ♂, 2 ♀, [Pa. St. Dept. Zool.].
- Beatty, Westmoreland County, Pennsylvania, (Brugger), 1 ♂, 1 ♀, [A. N. S. P.].
- Plummer's Island, Maryland, IX, 2, (A. N. Caudell), 1 ♂, 1 ♀, [U. S. N. M.].
- Glen Echo, Maryland, VII, 10, 1914, (H.; undergrowth in openings along edge of pine woods), 9 ♂, 1 ♀.
- Arlington, Virginia, VII, 9, 1914, (H.), 8 ♂, 7 ♀, 1 ♂ n.
- Glencarlynn, Virginia, VIII, 12, 1 ♀, [U. S. N. M.].
- Peaks of Otter, Virginia, (Wm. Palmer), 1 ♀, [U. S. N. M.].
- Cranberry, North Carolina, 1896, 1 ♀, [U. S. N. M.].
- Jones' Knob, near Balsam, North Carolina, VIII, 19, 1903, (Morse), 1 ♂, [Morse Cln.].
- Governor's Island, North Carolina, VIII, 20, 1903, (Morse), 1 ♂, [Morse Cln.].
- Topton, North Carolina, 3000 to 4000 feet, VII, 21, 1903, (Morse), 1 ♀, [Morse Cln.].
- Spartanburg, South Carolina, VIII, 6, 1913, (H.), 1 ♀.
- Tuckoluge Creek, Rabun County, Georgia, VII, 1910, (Davis), 3 ♂.
- Toccoa, Georgia, 1094 feet elevation, VIII, 4 to 5, 1913, (H.; in scant undergrowth of huckleberry bushes in dense forest of pine saplings), 1 ♀.
- Currahee Mountain, Georgia, 1700 feet elevation, VIII, 5, 1913, (H.), 2 ♂.
- Blue Ridge, Georgia, VII, 25, 1903, (Morse), 1 ♂, [Morse Cln.].
- Fulton County, Indiana, VII, 31, 1903, (W. S. Blatchley), 1 ♀, [A. N. S. P.].
- Franklin County, Indiana, (W. S. Blatchley), 1 ♂, [A. N. S. P.].
- Crawford County, Indiana, VII, 10, 1899, (W. S. Blatchley), 1 ♀, [U. S. N. M.].

Michigan, 1 ♀, [M. C. Z.].

Green River, Illinois, VIII, 20, 1 ♀, [M. C. Z.].

Moline, Illinois, VIII, 4, 1 ♂, [M. C. Z.].

Bee Spring, Kentucky, VI, 14 to 15, 1874, (F. G. Sanborn, 1 ♀, [M. C. Z.].

Summit of Rich Mountain, Arkansas, 2600 feet, VIII, 1, 1905, (Morse), 2 ♂, [Morse Cln.].

Intermediate between *A. r. rotundifolia* and *A. r. parvipennis*.

Winter Park, North Carolina, IX, 7, 1911, (R.: in wire grass in pine woods), 1 ♀.

Sand Mountain, Georgia, VII, 8, 1903, (Morse), 1 ♀, [Morse Cln.].

Macon, Georgia, VII, 30 to 31, 1913, (R. & H.), 1 ♀.

Warm Springs, Georgia, 850 to 1200 feet elevation, VIII, 9 to 10, 1913, (R.: in pine and oak woods), 1 ♀.

Valley Head, Lookout Mountain, Alabama, VII, 11, 1905, (Morse), 1 ♀, [Morse Cln.].

Chehaw Mountain, Alabama, 2600 feet, VII, 13, 1905, (Morse), 2 ♂, 2 ♀, [Morse Cln.].

We have also examined and reported *A. rotundifolia rotundifolia* from Jones' Knob, 6000 feet elevation, and Mt. Pisgah, 5740 feet elevation, North Carolina.

Amblycorypha rotundifolia parvipennis Stål (Pl. xi, fig. 38; pl. xii, figs. 47 and 56.)

1876. *Amblycorypha parvipennis* Stål, Bihang till K. Svenska Vet.-Akad. Handl., iv, no. 5, p. 58. [Texas.]

The present form is clearly a derivative of the *rotundifolia* stock inhabiting the southern prairie region, extending eastward and intergrading with *r. rotundifolia* in the southeastern states, for information regarding which see above under *A. r. rotundifolia*. Intergradation with *A. r. iselyi* has been assumed on the relatively minor importance of the characters separating the two forms, and more collecting in the proper regions will in all probability establish this affinity as clearly as our present material demonstrates that existing between *A. r. rotundifolia* and *A. r. parvipennis*.

The heavier form, abbreviate wings and robust pronotum, which latter has the humeral sinus much reduced and the lateral lobes broader dorsad, are the chief characters which separate *A. r. parvipennis* and *A. r. iselyi* from *A. r. rotundifolia*. In all the specimens seen of typical *parvipennis* and *iselyi* the wings are never evident when the tegmina are closed.

The two related forms (i.e. *r. parvipennis* and *r. iselyi*) can be best separated by the slenderer general form and more elongate

and narrower, as well as less coriaceous, tegmina of *parvipennis*, the generally narrower dorsum of the pronotum and the more elongate, yet relatively more inflated, caudal femora of the same race. There is some individual variation in the length and robustness of the styles of the male subgenital plate and also of the ovipositor in both forms.

The distribution of this race covers an area extending from the lower country of western Arkansas (Rich Mountain Station) and south central Oklahoma (Ardmore), south to at least Lavaca County, Texas. We have no information as to the eastern and western limits of typical *parvipennis*, but as shown under *r. rotundifolia* intermediates showing a great tendency toward *r. parvipennis* occur in the southeastern states.

Specimens Examined: 7; 4 ♂, 2 ♀, 1 ♀ n.

Rich Mountain Station, Arkansas, VIII, 2, 1905, (Morse), 1 ♀, [Morse Cln.].

Ardmore, Oklahoma, VI, 1, (C. R. Jones), 1 ♂, [U. S. N. M.].

Texas, (Belgrave), 2 ♂, [M. C. Z.].

Dallas, Texas, (Boll), 1 ♂ n., [M. C. Z.]; 1 ♂, [U. S. N. M.].

Lavaca County, Texas, VI, 21, 1 ♀, [U. S. N. M.].

Amblycorypha rotundifolia iselyi Caudell (Pl. XI, fig. 39; pl. XII, figs. 48 and 57.)

1904. *Amblycorypha iselyi* Caudell, Journ. New York Entom. Soc., xiii, p. 50. [Wichita, Kansas.]

The relationship of *r. iselyi* to *r. parvipennis* and *r. rotundifolia* is very evident to anyone examining the series of specimens of the three forms studied by us. As stated above the direct relationship of *r. iselyi* and *r. parvipennis* is close, although we have no positive proof of the assumed intergradation. We have given above under *r. parvipennis* the important differential characters separating this form from its relatives.

The range of *rotundifolia iselyi* extends from northwestern (Little Rock) and central (Dallas County) Iowa, south to eastern Missouri (Iron Mountain) and south-central (Wichita) Kansas.

Specimens Examined: 7; 4 ♂, 3 ♀.

Little Rock, Iowa, VII, 16, 1893, (E. D. Ball), 1 ♂, [A. N. S. P.].

Ames, Iowa, (E. D. Ball), 1 ♂, 2 ♀, [A. N. S. P. and Hebard Cln.].

Dallas County, Iowa, VIII, 20 to 23, (Allen), 1 ♂, [M. C. Z.].

Wichita, Kansas, VII, 29, 1904, (F. B. Isely), 1 ♂, *Paratype*, [Hebard Cln.].

Iron Mountain, Missouri, 1 ♀, [Hebard Cln.].

EXPLANATION OF PLATES

PLATE IX

- FIG. 1.—*Scudderia furcata furcata*. Disto-dorsal abdominal segment of male from dorsum. Shasta County, California. ($\times 12$)
- “ 2.—*Scudderia furcata furcata*. Disto-dorsal abdominal segment of male from dorsum. Lake Mahopac, New York. ($\times 12$)
- “ 3.—*Scudderia cuneata*. Disto-dorsal abdominal segment of male from dorsum. Florence, South Carolina. ($\times 12$)
- “ 4.—*Scudderia mexicana*. Disto-dorsal abdominal segment of male from dorsum. Baboquivari Mountains, Arizona. ($\times 12$)
- “ 5.—*Scudderia texensis*. Disto-dorsal abdominal segment of male

CORRECTION

These figures are all one-half the dimensions cited except Plate IX, figure 13 which is one and one-half times.

- “ 11.—*Scudderia hemidactyla*. Lateral outline of *type*. Caparo, Trinidad. ($\times 2$)
- “ 12.—*Scudderia curvicauda laticauda*. Lateral outline of female. Billy's Island, Georgia. ($\times 2$)
- “ 13.—*Scudderia strigata*. Outline of tegmen of male. Jacksonville, Florida. ($\times 2$)
- “ 14.—*Scudderia septentrionalis*. Disto-dorsal abdominal segment of male from dorsum. West Point, Nebraska. ($\times 12$)
- “ 15.—*Scudderia hemidactyla*. Disto-dorsal abdominal segment of male from dorsum. Caparo, Trinidad. *Type*. ($\times 12$)
- “ 16.—*Scudderia hemidactyla*. Disto-dorsal abdominal segment of male in lateral outline. Caparo, Trinidad. *Type*. ($\times 12$)
- “ 17.—*Scudderia hemidactyla*. Disto-dorsal abdominal segment of male from venter. Caparo, Trinidad. *Type*. ($\times 12$)

PLATE X

Care should be taken in comparing material with these figures, as the plane of the basal axis is not the same in all cases.

- FIG. 18.—*Scudderia strigata*. Outline of ovipositor. Jacksonville, Florida. (Greatly enlarged.)
- “ 19.—*Scudderia furcata furcata*. Outline of ovipositor. Saunders-town, Rhode Island. (Greatly enlarged.)
- “ 20.—*Scudderia furcata furcifera*. Outline of ovipositor. Chisos Mountains, Texas. (Greatly enlarged.)
- “ 21.—*Scudderia cuneata*. Outline of ovipositor. Miami, Florida. (Greatly enlarged.)
- “ 22.—*Scudderia hemidactyla*. Outline of ovipositor. *Allotype*. Caparo, Trinidad. (Greatly enlarged.)
- “ 23.—*Scudderia texensis*. Outline of ovipositor. La Marque, Texas. (Greatly enlarged.)
- “ 24.—*Scudderia pistillata*. Outline of ovipositor. Great Cranberry Island, Maine. (Greatly enlarged.)
- “ 25.—*Scudderia curvicauda laticauda*. Outline of ovipositor. Billy's Island, Georgia. (Greatly enlarged.)
- “ 26.—*Scudderia curvicauda curvicauda*. Outline of ovipositor. Rockville, Pennsylvania. (Greatly enlarged.)
- “ 27.—*Scudderia curvicauda borealis*. Outline of ovipositor. Aweme, Manitoba. *Type*. (Greatly enlarged.)
- “ 28.—*Scudderia mexicana*. Outline of ovipositor. Huachuca Mountains, Arizona. (Greatly enlarged.)
- “ 29.—*Scudderia septentrionalis*. Outline of ovipositor. No locality. (Greatly enlarged.)

PLATE XI

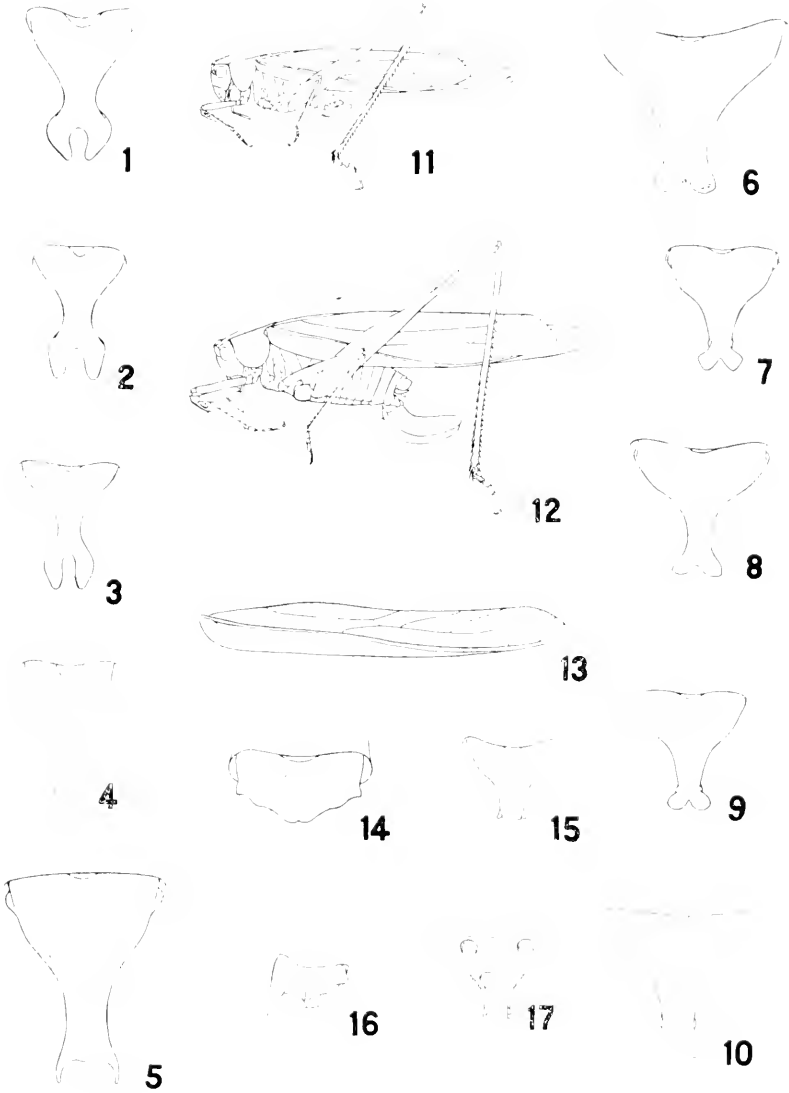
- FIG. 30.—*Scudderia pistillata*. Outline of male cercus. Pequaming, Michigan. (Greatly enlarged.)
- “ 31.—*Scudderia septentrionalis*. Outline of male cercus. West Point, Nebraska. (Greatly enlarged.)
- “ 32.—*Amblycorypha oblongifolia*. Lateral outline of pronotum, tegmen and exposed wing. Male. Chestnut Hill, Pennsylvania. (× 2)
- “ 33.—*Amblycorypha floridana floridana*. Lateral outline of pronotum, tegmen and exposed wing. Male. Homestead, Florida. (× 2)
- “ 34.—*Amblycorypha floridana carinata*. Lateral outline of pronotum, tegmen and exposed wing. Male. *Type*. Stafford's Forge, New Jersey. (× 2)

- FIG. 35.—*Amblycorypha huasteca*. Lateral outline of pronotum, tegmen and exposed wing. Male. Flatonia, Texas. ($\times 2$)
- " 36.—*Amblycorypha uhleri*. Lateral outline of pronotum, tegmen and exposed wing. Webster, Texas. ($\times 3$)
- " 37.—*Amblycorypha rotundifolia rotundifolia*. Lateral outline of pronotum, tegmen and exposed wing. Male. Parkdale, New Jersey. ($\times 3$)
- " 38.—*Amblycorypha rotundifolia parvipennis*. Lateral outline of pronotum and tegmen. Male. Dallas, Texas. ($\times 3$)
- " 39.—*Amblycorypha rotundifolia iselyi*. Lateral outline of pronotum and tegmen. Male. *Paratype*. Wichita, Kansas. ($\times 3$)
- " 40.—*Amblycorypha insolita*. Lateral outline of *type*. Quitman Mountains, Texas. ($\times 2$)

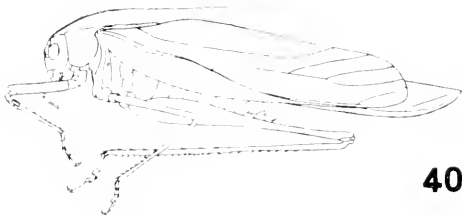
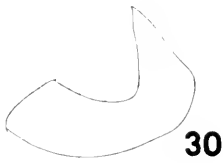
PLATE XII

- FIG. 41.—*Amblycorypha oblongifolia*. Stridulating field of male. Chestnut Hill, Pennsylvania. ($\times 4$)
- " 42.—*Amblycorypha floridana floridana*. Stridulating field of male. Homestead, Florida. ($\times 4$)
- " 43.—*Amblycorypha huasteca*. Stridulating field of male. Flatonia, Texas. ($\times 4$)
- " 44.—*Amblycorypha insolita*. Stridulating field of male. *Type*. Quitman Mountains, Texas. ($\times 4$)
- " 45.—*Amblycorypha uhleri*. Stridulating field of male. Webster, Texas. ($\times 4$)
- " 46.—*Amblycorypha rotundifolia rotundifolia*. Stridulating field of male. Parkdale, New Jersey. ($\times 4$)
- " 47.—*Amblycorypha rotundifolia parvipennis*. Stridulating field of male. Dallas, Texas. ($\times 4$)
- " 48.—*Amblycorypha rotundifolia iselyi*. Stridulating field of male. *Paratype*. Wichita, Kansas. ($\times 4$)
- " 49.—*Amblycorypha oblongifolia*. Outline of ovipositor. Cornwells, Pennsylvania. ($\times 4$)
- " 50.—*Amblycorypha floridana floridana*. Outline of ovipositor. *Type*. Miami, Florida. ($\times 4$)
- " 51.—*Amblycorypha floridana carinata*. Outline of ovipositor. *Paratype*. Stafford's Forge, New Jersey. ($\times 4$)
- " 52.—*Amblycorypha huasteca*. Outline of ovipositor. Flatonia, Texas. ($\times 4$)
- " 53.—*Amblycorypha uhleri*. Outline of ovipositor. Rosenberg, Texas. ($\times 4$)
- " 54.—*Amblycorypha insolita*. Outline of ovipositor. Southern Arizona. ($\times 4$)

- FIG. 55.—*Amblycorypha rotundifolia rotundifolia*. Outline of ovipositor.
Lyme, Connecticut. (× 4)
- “ 56.—*Amblycorypha rotundifolia parvipennis*. Outline of ovipositor.
Lavaca County, Texas. (× 4)
- “ 57.—*Amblycorypha rotundifolia islyi*. Outline of ovipositor. Ames,
Iowa. (× 4)









THE HEBES GROUP OF THE DIPTEROUS GENUS TIPULA LINNAEUS

BY W. G. DIETZ, M.D.

In his paper entitled, "Tipula fallax and Others,"¹ Professor Doane tabulates eight species of *Tipula*. Five of these he describes as new, the other three—*hebes*, *fallax* and *grata*—had been described by Loew. These species form a natural group, characterized by the structure of the eighth abdominal sternite and of the hypopygium, and which may briefly be described as follows (see plate XIII): First—The posterior margin of the eighth sternite is incised on each side, forming thus three lobes except in *aur-comeri*, the lobes always more or less densely clothed and fringed with hair; Second—Below the apical appendages the latero-inferior margin of the ninth sternite has an oval, or approximately circular emargination, filled with a whitish membrane which widens out beyond the posterior margin and forms an appendage, called by Professor Doane the lateral appendage and which must not be confounded with the apical appendages described by Mr. Robert E. Snodgrass.² From the margin of the appendage project processes—called arms by Professor Doane—generally two or three, called the upper or first, middle or second, and lower or third process, respectively. In general it may be said that the upper process is always chitinous, the middle generally so and the lower (third, when present) membranous and pendulous. In form these processes vary greatly, and it is here that they furnish the most important characters for the separation of the otherwise very closely allied species of the group. The arrangement of the mesonotal vittae is so nearly uniform as to be almost characteristic of the group. The lateral stripes are described in the text as concolorous and margined with

¹ Psyche, xviii, 160.

² The Hypopygium of the Tipulidae. Trans. Am. Ent. Soc., xxx, 179 et seq.

fuscous—Professor Doane describes them as fuscous or brown and divided by a line. The middle stripe is fuscous—except in *alia* and *clathrata*—and divided by a median line; the latter generally widens rapidly from the middle third in such a way that only a lateral margin is left. Perhaps it would have been more correct to consider the middle stripe as concolorous and margined, the margins encroaching upon and more or less concealing the ground color. The wing pattern presents great uniformity, the difference being one rather of degree than in kind. In those species with the wing pattern most pronounced, such as *alia* and *doanci*, the wing is conspicuously spotted with fuscous and white, between these and the almost unicolorous wing of *derelecta* we find different degrees of intensity, though the essential pattern remains the same. It should be stated, however, that the identical pattern of this group occurs in species of *Tipula* not at all related to these. It must also be remembered that the wing patterns in the females of *Tipula* are more striking than in the males.

To the eight species tabulated by Professor Doane I have to add seven more, making a total of fifteen. As the separation of the species is based essentially upon the hypopygial characters of the male, I have added an auxiliary synopsis of species, which may enable the student to separate and determine his species at least approximately. This applies especially to the females where the essential characters are not applicable. I wish to remark here that all Tipulidae taken in coitu should be so designated on the labels. *Tipula hebes* Loew was chosen to represent the group because of its being more generally known among students and collectors of the Tipulidae.

SYNOPTICAL TABLE OF SPECIES

- | | |
|--|---------------------|
| 1. Lateral appendages of ninth sternite without clawlike or pendulous processes..... | madera Doane |
| Lateral appendages with clawlike or pendulous processes..... | 2 |
| 2. Lateral appendages with two processes..... | 3 |
| Lateral appendages with three processes..... | 10 |
| 3. Lower process membranous, pendulous..... | 4 |
| Lower process distinctly chitinized, not pendulous..... | 5 |
| 4. Pendulous process slender throughout, bladelike processes nearly straight; upper process of lateral appendage scarcely widened distally. Flagellum fuscous..... | fallax Loew |

- Pendulous process larger, tapering from its base; bladelike processes strongly curved laterally, deeply sinuate at base posteriorly; upper process of lateral appendage greatly broadened distally. Joints of flagellum yellowish-fuscous, dark fuscous at base.
ottawaensis sp. n.
5. Lower process short, broadly rounded..... 6³
 Lower process not so, distal half at least slender, clawlike..... 7
6. The upper process ending in two small, subequal dentiform points.
coloradensis Doane
 Upper process large, spatulate..... *suspecta* sp. n.
7. Lower process slender, entirely clawlike..... 8
 Lower process broad in basal half with toothlike projection from its under margin..... *doanei* sp. n.
8. Upper process very slender with knoblike enlargement at the apex.
ingrata sp. n.
 Upper process not slender, not enlarged at the apex..... 9
9. Darker, more grayish; flagellum dark fuscous. Lower process shorter, less slender..... *rohweri* Doane
 More yellowish; flagellum yellowish fuscous. Lower process very slender..... *grata* Loew
10. The middle process of the lateral appendage entirely membranous, not clawlike..... 11
 Middle process clawlike, entirely chitinized..... 12
11. The middle process terminating in an acute spine. Larger. Wing pattern strongly marked..... *clathrata* sp. n.
 Middle process acutely triangular. Smaller. Wings almost unicolorous..... *derelicta* sp. n.
12. The upper process ending in two small, toothlike projections.
criddlei sp. n.
 Upper process single, rounded at tip..... 13
13. Bladelike processes broad in basal half, slender apically. Flagellum yellow, joints fuscous at base..... *hebes* Loew
 Bladelike processes not so formed. Flagellum brown..... 14
14. Eighth sternite trilobed; bladelike processes long and slender. Dividing line of middle mesonotal stripe gray. No fuscous spot at base of basal cells..... *alia* Doane
 Eighth sternite, emarginate; bladelike processes shorter, more triangular. Dividing line of middle mesonotal stripe fuscous. A fuscous spot at base of basal cells..... *newcomeri* Doane⁴

³ In his table Professor Doane states: "Lower arm of lateral appendage short, broad, flat. . . . *rohweri*;" whereas in the text, it is described as narrow and clawlike.

⁴ I include this species tentatively in the group under consideration. The eighth sternite is not incised on each side. A male specimen, received through the kindness of Professor Doane and bearing his label, does not

AUXILIARY SYNOPTICAL TABLE OF SPECIES

1. Joints of flagellum of antennae more or less distinctly bicolored. 2
 Joints of flagellum unicolorous. 4
2. All the flagellum joints distinctly bicolored; a fuscous stripe extends from neck to mesosternal suture. **hebes** Loew
 Outer joints of flagellum approximately unicolorous; fuscous line, when present, does not extend beyond the collare. 3
3. Joints of flagellum slender, cylindrical, more than twice as long as transverse diameter. **ottawaensis** sp. n.
 Joints of flagellum ovoidal, less than twice as long as transverse diameter. **criddlei** ♀ sp. n.
4. With fuscous pleural stripe. 5
 Without such a stripe. 10
5. Lower part of sternopleura infuscate. 6
 Lower part of sternopleura not infuscate. 8
6. Abdomen with median, longitudinal dorsal vitta. 7
 Abdomen without such a vitta. **coloradensis** Doane
7. Tergites 1 to 4 of abdomen with transverse lateral fuscous line.
 Tergites 1 to 4 without such lines. **doanei** sp. n.
 Tergites 1 to 4 without such lines. **madera** Doane
8. Pleural stripes well marked. Mesonotum margined with fuscous anteriorly, its median stripe concolorous, margined with fuscous. 9
 Pleural stripe feeble, incomplete. Mesonotum not margined with fuscous anteriorly, median stripe fuscous. **ingrata** sp. n.
9. Yellowish; the short fuscous line along the dividing line of the middle mesonotal stripe reaching the anterior margin of the mesonotum.
 Grayish-fuscous; the short fuscous line does not reach the anterior margin of the mesonotum. **clathrata** sp. n.
10. Wing markings distinct. 11
 Wing markings faint; white spot in second basal cell obsolete.
 derelecta sp. n.
11. Pleura entirely pale yellow. 12
 Pleura not entirely pale yellow. 15
12. All the posterior cells more or less white. **fallax** Loew
 Not all of the posterior cells white spotted. 13
13. A well marked fuscous stripe on side of neck extends across the propleura. **rohweri** Doane
 A fuscous spot on the propleura only. 14
14. Flagellum yellowish-fuscous. **grata** Loew
 Flagellum dark brown. **suspecta** sp. n.
15. Meso- and sterno-pleura only, infuscate. **criddlei** ♂ sp. n.
 Entire pleura grayish-fuscous. **newcomeri** Doane

agree with the description. Aside from minor differences the ninth sternite is simply emarginate, not completely divided; the lateral appendages are wanting entirely and the pleura are distinct. It bears the label, "Deer Park, Placer Co., Cal.," the type locality of the species.

Tipula ottawaensis spec. n. (Plate XIII, figs. 2 to 4; plate XIV, fig. 1.)

Color yellowish; joints of flagellum yellowish fuscous, dark fuscous at base; wing markings not very pronounced; bladelike processes of hypopygium strongly curved in two planes.

♂, Length, 13.5 mm.; wing, 15 mm.

Anterior leg: femur, 9 mm., tibia, 10.5 mm., tarsus, 15 mm.

Head yellowish; occiput grayish with median fuscous line or stripe and short black hairs on each side posteriorly. Palpi pale sordid yellow, joints 1 to 3 increasing in length, second and third joints paler, fourth joint infusate towards the tip, the entire palpus clothed with short black scattered hairs. Rostrum deeper yellow, nasus slightly infusate and beset with black hairs. Face creamy-white. Antennae long and slender, bent backward they reach to end of scutellum, scape and basal joint of flagellum yellow, the following joints passing from light yellowish-fuscous to light fuscous, all dark fuscous at base and each with three to four basal setae, of about one-half or three-fourths the length of the joint, joints of moderate thickness, each slightly emarginate below, beyond the basal enlargement.

Thorax: Collare pale cream yellow with median fuscous line. Mesonotum gray, lateral stripes concolorous and heavily margined with fuscous, median stripe dark brown, wide anteriorly and gradually narrowed posteriorly to transverse suture and divided by a median gray line, the latter narrow in its anterior third, wider and fusiform beyond; two ill-defined, nearly circular spots each side behind the transverse suture; scutellum yellowish-fuscous with darker median line. Metanotum yellowish gray; the space between the lateral and median thoracic vittae is clothed with moderately long fine whitish pubescence. Pleura pale yellow, grayish-white pollinose; a dark brown line on side of neck and extending upon and ending in a dark brown spot on the lateral part of the pronotum; Mesosternum somewhat infusate below. Halteres pale; knob, except apex, fuscous.

Abdomen sordid yellow, becoming suffused with fuscous on posterior part of tergum, with very distinct dark fuscous, median vitta, lateral margin of tergum, except first segment, margined with fuscous, very narrowly on second and third segments, becoming wider posteriorly, posterior margin and extreme lateral edge of tergites 3 to 7 indistinctly paler; the median vitta expands into a transverse line behind the anterior margin of tergites 2 to 4. Eighth tergite yellow, infusate along the middle; eighth sternite fuscous in middle portion, lateral incisures short, lobes of nearly equal width and fringed with short, coarse yellowish hair. Hypopygium moderately large, shining, and with the exception of the middle portion of the ninth sternite, dark brown. Ninth tergite longer than wide, narrowed posteriorly and apical part clothed with short, coarse hair, from the under surface of the apical margin project two pairs of blackish, downward directed teeth; ninth sternite pale yellow inferiorly, broadly and deeply emarginate in the middle, the emargination filled with a soft membrane; from the posterior margin arise in close proximity the bladelike processes,

which are broad in their basal three-fifths—viewed laterally—, deeply sinuate posteriorly, apical two-fifths slender, strongly angulate outwardly—posterior aspect—, apical part straight, projecting beyond the hypopygium and with their tips curved backward. Pleural suture absent. Upper apical appendage leaflike, pointed; middle appendage oblong-quadrate, united in its basal third with the former, a short, spinelike process extends from its anterior margin near the base; the lower appendage consists of a subquadrate basal portion terminating in two spatulate processes, the upper of which is a trifle longer, both rounded at tip and fringed with a row of short, stiff hairs. Lateral appendages with two processes, the upper large, strongly chitinized, pedicel wide, enlarged at tip, hatchet-shaped—see figure—lower process membranous, pendulous, tapering, with a small, triangular tooth on its inner margin near the base; the posterior margin of the lateral process between these two processes is obtusely angulate. Legs long and slender, yellow, apices of femora and tibiae and last two-thirds of tarsi infusate.

Wings rather wide, grayish subfuscous; stigma and spot over beginning of praefurca dark fuscous, apical three-fifths of first and second submarginal cells infusate, a whitish spot in second basal cell at about its outer third and at each end of which, the color of the wing is a trifle darker, an elongate pale fuscous spot about middle of anal cell limited at each end by a white spot, a white spot before and a more conspicuous larger white area beyond the stigma, a darker shade extends from the latter across the base of the second submarginal and first posterior cells.

♀, Length of body 22.5 mm.

Antennae when bent backward scarcely attaining base of wings; joints 1 to 4 yellow, following joints yellowish-gray, all joints of flagellum distinctly fuscous at base. Abdomen sordid yellowish fuscous, lateral fuscous line not distinct; seventh and eighth tergite grayish white. Ovipositor testaceous, upper valves long, bladelike, rounded at tip, longer than the basal piece; lower valves longer than the upper, very narrow, parallel, obtusely rounded at tip. Wing pattern more pronounced.

Holotype: ♂; Aweme, Manitoba, Canada. August 4, 1912. (N. Criddle.)

Allotype: ♀; Aymer, Quebec, Canada. April 24, 1913. (J. T. Beaulac.)

Paratypes: Ottawa, Canada. June 28, July 11 and 13. Aymer, June 24. Aweme, Manitoba, June 27 and 28, July 30, 1913. In author's collection.

In the coloration of the antennal flagellum this species resembles *Tipula hebes*, from which it is distinguished by the very different processes of the lateral appendage. The antennal flagellum is more inclined to fuscous. The formation of the bladelike

processes and the upper process of the lateral appendage of the male, distinguish this species from all others of the group with which I am acquainted.

Tipula suspecta spec. n. (Plate XIII, figs. 5 and 6; plate XIV, fig. 2.)

Color yellowish; flagellum, with exception of basal joint, fuscous; wing markings not pronounced; lateral appendages with two processes, the lower broad, obtusely pointed, not clawlike.

♂, Length 13 mm.; wing, 13.5 mm.

Anterior leg: femur, 6.5 mm.; tibia, 10.5 mm.; tarsus, 14 mm.

Head yellow; occiput grayish with rather wide median fuscous line, and short blackish hairs each side behind the eyes; front whitish pollinose with a small tubercle in the middle immediately above the antennae; face whitish pollinose. Rostrum yellow, scarcely as long as the longitudinal diameter of the eye; nasus beset with yellowish hairs. Palpi beset with rather long scattered black hairs; joints one to three dark yellow, first joint longer than the second; joints two and three subequal; fourth joint fuscous, nearly as long as the two preceding joints together. Antennae long and slender; bent back they reach to base of abdomen; scape yellow; flagellum fuscous, basal joint yellowish, infuscate towards the tip; segments slender, slightly incrassate at base and beyond the middle.

Thorax: Collare pale yellowish with median fuscous line. Mesonotum grayish-fuscous, pale gray on the sides; lateral stripes concolorous, strongly margined with fuscous except in basal half externally; median vitta broad, fuscous, anterior third narrowed, the median dividing line rather suddenly widened before the middle, thus leaving only a fuscous margin on the sides posteriorly; a pale fuscous spot on the sides behind the suture and a larger, ill-defined, similar spot each side of median line, the latter divided by a narrow, gray line. Scutellum yellowish with median fuscous line not reaching to the apex. Metanotum grayish, infuscate on the sides. Pleura pale yellowish, gray-white pollinose; a fuscous stripe each side of neck extending upon but not beyond the prosternum; Halteres infuscate, pedicels pale towards the base.

Abdomen yellow, paler towards the base, with three fuscous, longitudinal stripes, the latter less distinct anteriorly and almost evanescent on the first segment; latero-posterior margins of tergites 3 to 6 paler. Eighth sternite yellowish-fuscous. Hypopygium yellowish fuscous. Ninth tergite longer than wide, narrowed posteriorly, with two black, strongly chitinized divergent teeth from the underside of the posterior margin; upper apical appendage leaflike, subtruncate at apex; middle appendage dark fuscous, broadly triangular, acuminate above with a rounded, knob-like projection at its base anteriorly; lower appendage trapezoidal, narrowed at base, upper margin deeply incised at junction of first and middle third, the anterior part narrowed, curved, with knob-like enlargement apically, the latter fringed with short, stiff hairs, the posterior wider part rounded

and fringed with paler hairs. Lateral appendages with two processes, the upper spatulate, rather short and broad, apical margin blackish, the lower process broad, semichitinous apically, obtusely pointed and incurved towards the apex; bladlike processes wide at base, tapering towards the apex, the latter slightly curved backwards. Legs long and slender, yellowish, apices of femora and tibiae and the tarsi fuscous.

Wings grayish; a spot over the praefurca and stigma fuscous, the latter coloration extends into the bases of the second submarginal and first posterior cells, apical half of both submarginal cells pale fuscous; first posterior cell with exception of extreme base and ill-defined median spot, whitish, discal cell, except at apex, white; basal half of first and second submarginal cells, space between stigma and praefurca and a small area before the latter, white, basal two-thirds of second basal cell whitish with a grayish fuscous cloud before the middle extending across the anal cell; posterior margin of fourth and anterior and posterior margin of fifth posterior cells, margined with whitish.

Holotype: ♂; South Wales, New York. July. (M. C. Van Duzee.) In author's collection.

A single specimen received from Mr. M. C. Van Duzee as *Tipula grata*, which it resembles in its general yellowish color, but from which it is readily distinguished by the broad lower process of the lateral appendage, which is slender and clawlike in *grata*. The flagellum of the antennae is dark brown in *suspecta*, yellowish brown in *grata*.

Tipula doanei spec. n. (Plate XIII, figs. 7 and 8; plate XIV, fig. 3.)

Color yellowish gray; wing markings pronounced; lateral appendages with two processes, the lower process with an acute tooth on its lower margin.

♂, Length, 14 mm.; wing, 15 mm.

Anterior leg: femur, 9.5 mm.; tibia, 11.5; tarsus, 15 mm.

Head yellow; occiput gray with distinct median fuscous stripe and short scattered black hairs each side behind the eyes. Rostrum testaceous with fuscous lateral stripe, nasus yellowish fuscous, beset with blackish hairs. Palpi beset with scattered black hairs, first joint shorter than the second, this and the third joints about equal in length, the first three joints yellowish-fuscous, the last joint yellowish. Antennae long and slender, bent back they reach base of abdomen, scape yellow, flagellum fuscous, first joint yellowish towards the base, segments slightly emarginate beneath, densely pubescent and each segment with four or five black setae, those of the dorsal side about equal to length of segment, those on the underside approximately one-half its length.

Thorax: Collare pale, with median fuscous patch. Mesonotum dark yellowish gray, lateral stripes concolorous, strongly margined with fuscous;

median stripe fuscous, narrowly edged with darker, wide anteriorly, narrowing posteriorly, median dividing line gradually widening, subfusiform; spaces between the lateral and median stripes more yellowish and beset with fine yellowish pubescence; mesonotum behind the suture more grayish fuscous, stripes indistinct. Scutellum yellowish gray with median darker line. Metanotum gray with narrow median and wider lateral, fuscous lines. Pleura sordid yellowish, whitish pollinose dorsad to a dark brown stripe extending from the neck to mesosternal suture, ventrad the dark brown color gradually becomes effaced; mesosternum slightly infuscate. Halteres fuscous, pedicle pale at base.

Abdomen: Venter yellow, tergum yellowish gray, first tergite gray; a narrow median and wide lateral, longitudinal, dark brown stripes, interrupted by the pale latero-posterior margins of the segments and not extending beyond the sixth tergite; tergites 1 to 4 with a short, transverse line each side behind the anterior margin. Eighth tergite brown with yellow apical margin; eighth sternite dark brown, lateral incisions moderately deep, lobes yellowish, densely clothed with pale yellow hair, the median lobe narrower than the lateral lobes. Ninth tergite brown, slightly narrowed posteriorly and impressed above behind the apex, the posterior margin somewhat produced in the middle and from its inferior margin arises a short, downward projecting process which ends in a shorter median and two longer lateral teeth, the latter somewhat diverging; ninth sternite yellowish fuscous, with broad median chitinized suture, posterior margin broadly emarginate and from its middle arise a pair of slender, bladlike processes, their basal half strongly curved upwards, apical part straight, nearly horizontal; no pleural suture; upper apical appendage broad, leaflike, almost quadrate; the middle appendage apparently consisting of two plates, the outer conical, horizontal and ending in a prolonged point, a short rounded knob extends from near the base of the anterior margin, the inner plate arises from near the base of the outer, is broad, its posterior margin fringed with soft hair; the inferior appendage bilobed, the upper part expands into a rounded knob, fringed with short hairs, the lower part nearly quadrate, shorter and partially curved upon itself. The lateral appendage ends in two processes, the upper broad, strongly chitinized, of nearly equal width from base to apex, the latter rounded, fuscous; the lower process clawlike, chitinized, basal part rather broad with a toothlike process on its lower margin; the apical part blackish, very slender, acute, curved inwardly. Legs yellow, base of anterior and middle coxae, fuscous anteriorly, apices of femora and tibiae, and outer tarsal joints dark fuscous.

Wings grayish fuscous; costal and subcostal cells yellowish; stigma, a spot over the praefurca, an elongate patch in second basal cell along the margin of the fifth longitudinal vein and a spot in basal portion of anal cell, fuscous; the space beyond the stigma is conspicuously white, the space before the stigma less so; first posterior cell, except at base and ill-defined median patch, whitish; discal cell, except at apex, white; fourth and fifth posterior cells, basal and anal cells, more or less margined with white.

♀, Length, 20 mm.; wings, 17.5 mm.

Anterior leg: femur, 8.5 mm.; tibia, 11 mm.; tarsus, 12 mm.

Similar to male. Antennae bent back do not reach the base of the wings. Abdomen with ill-defined median fuscous ventral line. Ovipositor testaceous, upper valves very slender, much longer than the basal pieces; lower valves shorter, parallel and very little wider than the upper valves; wing pattern very pronounced, first axillary cell margined with white.

Holotype: ♂; Jemez Springs, New Mexico. August 12, 1913. (John Woodgate.)

Allotype: ♀; Jemez Springs, August 22, 1913.

Paratypes: Jemez Springs, July, August, six males, one female. All in author's collection.

In general appearance this species closely resembles *Tipula fallax*, *rohweri*, *clathrata* and *alia*. From *fallax* it differs by its general darker appearance, the heavy fuscous pleural stripe extends to the mesopleural suture and the lower process of the lateral appendage is clawlike and not pendulous and membranous as in *fallax*; the second basal and anal cells are margined with whitish. In wing pattern, *doanei* scarcely differs from the other three above mentioned species. In *rohweri* the fuscous pleural line is less distinct, broken, and scarcely reaches the mesosternal suture, the lower process of the lateral appendage is more slender and without toothlike process. The first posterior cell in *clathrata* is white in basal third only and *alia* has the venter strongly infuscate, especially towards the base. The lateral appendage of the last two species has three processes.

It gives me pleasure to name this species in honor of Professor Doane, for his contributions to our knowledge of the North American Tipulidae, and also for assistance extended to the writer in naming material and otherwise.

Tipula doanei var. **bifida** var. n.

Two male specimens from the same locality differ as follows: The whole insect has a distinctly darker appearance. Underside of rostrum yellowish fuscous; the dividing line of the middle mesonotal vitta is linear throughout. The toothlike process of the lower process of the lateral appendage is much larger, giving it an almost bifid appearance. A subfuscous patch in first basal cell along first longitudinal vein near the base, a subfuscous patch behind the outer white spot in second basal cell, two similar patches in basal half of anal cell.

Length, 16 mm.; wing, 15 mm.

Holotype: ♂; Jemez Springs, New Mexico. August 9, 1913.
(J. Woodgate.)

Paratype: ♂; Jemez Springs, New Mexico. August 22, 1913.
(J. Woodgate.)

In author's collection.

Tipula ingrata spec. n. (Plate XIII, figs. 9, 10 and 11; plate XIV, fig. 4.)

Color yellowish gray; wing markings not pronounced. Lateral appendages with two chitinized processes, the lower of which is clawlike.

♂. Length, 13.5 mm.; wing, 16 mm.

Anterior leg: femur, 8.5 mm., tibia, 10 mm., tarsus, 13.5 mm.

Head yellow; occiput gray with ill-defined median fuscous line and short black hairs each side behind the eyes; face whitish pollinose. Rostrum yellow, nasus brown towards the apex, beset with short black hairs. Palpi sordid yellow, second joint longer than the third, fourth joint scarcely longer than the two preceding joints together, the whole palpus beset with rather long scattered blackish hair. Antennae slender, bent back they reach to about the middle of the metanotum, scape yellow, flagellum pubescent, brown, the first joint yellow, infusate towards the apex, segments slightly thickened at base and beyond the middle, each with four or five basal setae.

Thorax: Collare pale, anterior margin and median longitudinal line fuscous. Mesonotum grayish brown, lateral stripes concolorous, broadly margined with fuscous, middle stripe brownish, wide and but little narrowed posteriorly, the median dividing line widening beyond the middle and occupying the greater part of the stripe; the spaces between the stripes beset with fine pale pubescence; no marking behind the transverse suture; scutellum and metanotum yellowish gray with median fuscous line. Pleura yellowish, whitish pollinose, a fuscous stripe extends from the neck across the pleura to about the mesopleural suture. Halteres fuscous, pale at base.

Abdomen: Venter yellow, tergum yellowish fuscous; dorsal vitta distinct, widened posteriorly to end of sixth tergite, lateral vitta wide, interrupted by the pale latero-posterior margin of tergites 2 to 4, tergites 2 to 5 with short fuscous transverse line each side behind the anterior margin, sixth and seventh tergites yellow; eighth sternite brown, incised each side, lobes of approximately equal width, thickly beset with coarse yellow hair. Hypopygium brown, shining; ninth tergite longer than wide, narrowed posteriorly and impressed behind the apical margin, the latter slightly emarginate each side and slightly projecting in the middle, and from its underside projects a strongly chitinized, black process ending in two clawlike, divergent teeth; ninth sternite with median chitinized suture, posterior margin broadly emarginate, and from its middle arise two bladelike processes, their basal portion strongly curved backward, the apical portion straight, tapering. No pleural suture. Upper apical appendage broad, leaflike, obtusely rounded at apex; the middle appendage consists of an

inner conical part and an outer subquadrate plate, the former fringed with hair along its free margin; the lower process incised on its posterior margin, the upper part somewhat enlarged outwardly and fringed with short hairs. Lateral appendages with two strongly chitinized processes: the upper of these is long, slender and expands into a blackish knob; the lower process strong, clawlike, apical half black. Legs slender, sordid yellow, anterior coxae with fuscous dot at base anteriorly; apices of femora, tibiae and tarsi, fuscous.

Wings rather wide, pale grayish fuscous; stigma fuscous, spot over praefurca pale fuscous; costal and subcostal cells pale yellow; a whitish ill-defined area before the stigma, a more conspicuous one behind the stigma, extends across basal half of second submarginal and first posterior cells and discal cell, becoming less distinct and evanescent along the vein separating the fourth and fifth posterior cells; two indistinct spaces and margins of second basal cell paler; two pale spots in anal cell connected by a subfuscous streak.

Holotype: ♂; Denver, Colorado. July 16, 1912. (Ernest Oslar.)

Paratypes: ♂♂; Bear Creek, Colorado. August 14, 1912; Chimney Gulch, Golden, Colorado. June 22, 1912. (Ernest Oslar.) Four specimens in my collection.

The nearest ally of this species is *T. grata*, from which it is at once distinguished by its general darker appearance, the first posterior cell white in basal part only, the antennal flagellum darker brown and essentially by the upper process of the lateral appendage being slender and conspicuously enlarged at the apex.

***Tipula clathrata* spec. n.** (Plate XIII, figs. 12 and 13; plate XIV, fig. 5.)

Color yellowish brown; median stripe of mesonotum concolorous with interrupted fuscous margins. Wing patterns strongly marked. Lateral appendage with three processes, the median process consists of two laminae.

♂, Length, 13.5 mm.; wing, 16.5 mm.

Anterior leg: femur, 9 mm.; tibia, 11 mm.; tarsus, 14.5 mm.

Head yellowish cinerous; occiput with median fuscous line and short blackish hairs each side behind the eyes. Rostrum sordid yellow with a fuscous line each side; nasus infusate, beset with blackish hairs. Front and face pale yellowish. Palpi fuscous, beset with scattered hairs, last joint sordid yellow; joints 3 and 4 equal, the fourth joint fully as long as the three preceding joints together. Antennae very slender, bent back they reach to about the middle of the metanotum; scape pale yellow; flagellum light brown, finely pubescent, segments a trifle paler at base, very little thickened at base and beyond the middle and each with four or five basal setae.

Thorax: Collare pale yellow, edged with fuscous anteriorly and a fuscous spot in the middle. Mesonotum yellowish brown, anterior margin to pleura dark brown; stripes concolorous, the laterals incompletely margined with fuscous, the median stripe narrowly margined externally with fuscous, a short line anteriorly each side of median line does not reach the anterior margin, interstices between the vittae a trifle paler with a row of pale hairs; behind the suture are two larger median and two smaller lateral, ring-like fuscous spots. Scutellum yellowish fuscous. Metanotum grayish fuscous with abbreviated fuscous median line and a darker patch each side. Pleura sordid yellow, whitish pollinose; a conspicuous dark brown stripe extends from the neck to the mesosternal suture, widening and somewhat paler posteriorly. Halteres fuscous, pale at base.

Abdomen: Venter yellowish fuscous; tergum a trifle darker, dorsal and lateral stripes inconspicuous, the lateral very narrow, more or less interrupted by the pale posterior margin of the segments, a short transverse fuscous line each side behind the anterior margin of tergites 2 to 4. Eighth sternite reddish brown, darker about the middle; incisions about two-fifths the visible length of the sternite, lobes fringed and beset with golden yellow hair. Ninth tergite brown, markedly narrowed posteriorly, apical margin rounded and slightly emarginate each side and impressed above, a short, downward directed process from the middle of its under margin ending in two divergent teeth. Ninth sternite yellowish brown, with moderately wide, chitinized median suture; posterior margin emarginate, from its middle arise two bladelike processes, nearly straight with a very deep emargination near the base posteriorly. Apical appendages very similar to those of *doanci*, except that the fringe of the inner plate of the middle appendage is much longer; the upper portion of the lower appendage is more conspicuously prolonged. Lateral appendages with three processes, the latter, excepting the first, membranous; this appendage consists of two laminae, converging posteriorly and forming the middle process, which is acutely triangular, pointed, at the upper margin of the inner plate is the upper chitinized process, rather broad, of medium length, slightly widened and blackish at the apex; between the two laminae is a connecting somewhat corrugated membrane; lower process pendulous, undulated, of moderate length. Coxae yellow, anterior fuscous at base anteriorly. Legs yellow, apices of femora and tibiae and outer tarsal joints fuscous.

Wings grayish, subfuscous towards the apex, costal, and subcostal cells and stigma yellowish, a fuscous spot at each end of the stigma; a similar spot over origin of praefurca; a subfuscous cloud across bases of first submarginal and first posterior cells, a subfuscous line in second basal cell beyond its middle and along the fifth longitudinal vein, the distal section of the latter and its end branches faintly margined with fuscous; a large white space beyond the stigma extends across basal half of second submarginal and first posterior cells into the discal cell; outer part of first and second and third posterior cells not at all white; the whitish space before the stigma not distinctly limited, extending diffusely into the first basal

cell, intersected here by a gray line of the ground color; a large white patch in second basal cell beyond the middle; a conspicuous white spot before and one beyond the middle in anal cell, the former extending broadly across the first axillary cell; both basal cells, anal and first axillary cells, fourth and fifth posterior cells along their dividing vein more or less distinctly margined with whitish.

♀, Length, 17.5 mm.; wing, 17.5 mm.

Anterior leg: femur, 8 mm.; tibia, 10 mm.; tarsus, 13.5 mm.

Differs from the male, aside from size, by its rather reddish yellow color and much shorter antennae; first three joints of palpi pale at tip. Abdomen: Longitudinal stripes of tergum broad, becoming almost confluent posteriorly. Ovipositor testaceous; upper valves twice the length of the basal pieces, very slender, lower valves three-fifths the length of the upper, parallel and wider than the latter. First posterior cell, except base and a median spot, white, second and third posterior cells white in basal part.

Holotype: ♂; Provo, Utah. July 30, 1912. (Tom Spalding.)

Allotype: ♀; Provo, Utah. August 1, 1912. (Tom Spalding.)

Paratypes: ♂♂, ♀; Provo, Utah. August 14, 1913. (Tom Spalding). Jemez Springs, New Mexico, August 14, 1913. All in author's collection.

For similarity to other species, see under *doanei*. The peculiar structure of the lateral appendage distinguishes this species from all other species of the group of which I have knowledge.

Tipula derelicta spec. n. (Plate XIII, figs. 14 and 15; plate XIV, fig. 6.)

Brown; wing markings very obscure. Lateral appendages with three processes, the middle one triangular, membranous.

♂, Length, 9.5 mm.; wing, length 10.5 mm.; width at widest part, 3.5 mm.

Anterior leg: femur, 5.5 mm.; tibia, 7.5 mm.; metatarsus, 5 mm.

Head yellowish gray; occiput with a large brown spot extending forward upon the front and beset with rather conspicuous black hairs each side behind the eyes. Front and face paler, whitish pollinose. Rostrum testaceous, dull; an ill-defined fuscous line each side and a similar line above extending upon the nasus, the latter beset with black hair. Palpi stout, fuscous, sparsely hairy, first joint short, second longer, thickened apically, the third joint conspicuously thicker in its whole length than the rest of the palpus and longer than the second joint, fourth joint thicker than usual and scarcely as long as the three preceding joints together. Antennae:⁵ scape yellow, flagellum dark brown.

Thorax grayish fuscous. Collare dusty yellow, a median spot and anterior margin fuscous. Mesonotum grayish fuscous, lateral stripes

⁵ Defective in all my specimens.

concolorous, heavily margined with fuscous, median stripe fuscous, slightly narrowed posteriorly, the dividing line widened from beginning of middle third and becoming fusiform, interspaces between the stripes a trifle paler and beset with pale hairs. No markings behind the suture. Scutel yellowish fuscous. Metanotum grayish fuscous. Pleura yellowish, whitish gray pollinose.

Abdomen: Venter yellowish fuscous with ill-defined, longitudinal median stripe. Tergum testaceous, dull, a blackish, wide, well defined dorsal stripe extends from base to hypopygium, interrupted by the pale posterior margins of tergites 3 to 5; an oblique lateral fuscous line on tergites 2 to 5, giving the lateral stripe a zigzag appearance. Eighth sternite brown, lateral incisions deep, somewhat oblique inwardly, the middle lobe much wider than the lateral lobes, all the lobes densely clothed with yellow hair. Hypopygium brown and rather short. Ninth tergite a little longer than wide and scarcely narrowed posteriorly, the apical margin broadly rounded, slightly emarginate each side of middle and transversely impressed immediately behind the latter; from the infero-posterior margin project two acutely triangular, rather distant teeth. Ninth sternite with pale, chitinized suture, emarginate posteriorly; the bladlike processes curved backward in basal part, apical part nearly straight, tapering, apex bent backwards. No pleural suture. Upper apical process leaflike, broadly ovate, acuminate; the middle apical appendage consists of a subovate inner plate, directed dorsad and drawn out into an acutely triangular apex, and an outer cylindrical part, directed caudad and widened outwardly, it bears on its apex a small, jointlike projection and is beset with coarse hair; the lower appendage is subquadrate and slightly incised on its posterior margin. The lateral appendages bear three processes; the upper process chitinized, robust, not thickened at distal end, the latter blackish, the middle and lower processes membranous, the former triangular, acute, the latter pendulous. Legs yellow; femora and tibiae at tip and outer tarsal joints fuscous.

Wings grayish subfuscous, almost unicolorous and relatively broad; costal and subcostal cells yellowish; stigma and a small spot over origin of praefurca fuscous; an indistinct whitish spot before, and a larger inconspicuous whitish area beyond the stigma, the latter extends interruptedly through basal half of second submarginal and first posterior cells into the discal and fourth posterior cells; a faint whitish spot in anal cell before its middle.

♀, Length, 12 mm. (from anterior margin of thorax to end of ovipositor); wing, 11 mm.

Hind leg: femur, 7 mm.; tibia, 8 mm.

(Head wanting.) Abdomen brown, mottled with yellow; the lateral stripe of tergum approximately straight, lateral margins of tergites 2 to 7 paler. Eighth segment brown, shining. Ovipositor testaceous, short—0.9 mm.—basal part as long as the upper valves, the latter tapering, lower valves a little wider than the upper, parallel and as long as the latter.

Wings: white area beyond the stigma more pronounced; outer part of second submarginal and first posterior cells, and a basal spot in second and third posterior cells, whitish.

Holotype: ♂; Kurakuck Country, 110 miles N. E. of Nome, Alaska. August 19, 1913. (August Kusche.)

Allotype: ♀; same locality, etc.

Paratype: ♂; same locality, etc.

All three specimens in my collection are defective. The general appearance of the insect is dusky. This species, aside from sexual characters, is distinguished from the others of the group by the relatively wide and almost unicolorous wings.

Tipula criddlei spec. n. (Plate XIII, figs. 16 and 17; plate XIV, fig. 7.)

Color, yellowish gray; wing markings distinct. Lateral appendages with three processes, the upper process ends in two small subequal teeth.

♂, Length, 11 mm.; wing, 13.5 mm.

Middle leg: femur, 7 mm., tibia, 9.5 mm., tarsus, 13.5 mm.

Head yellow; occiput gray with median fuscous line and short black hairs each side behind the eyes. Face and adjacent part of rostrum pale yellow. Rostrum yellow, testaceous above; nasus pale fuscous with short black hairs. Palpi yellowish fuscous with blackish, scattered hairs; first joint short, joints two and three equal, the former thickened outwardly, joints one to three pale at base, the fourth joint scarcely as long as the preceding three joints. Antennae slender, bent back they reach the scutellum; scape yellow, flagellum dark brown, finely pubescent, segments very little thicker at base and beyond the middle, each with four or five rather long basal bristles.

Thorax grayish fuscous. Collare sordid yellowish with transverse median fuscous patch and a very conspicuous blackish spot at each side behind the neck, a fuscous line extending from the neck upon the collare. Mesonotum grayish fuscous, the lateral stripes concolorous, margined with fuscous, the outer margin deficient near the base; the median stripe fuscous, narrowed posteriorly, the median dividing line widened rapidly at beginning of middle third, the interstices between the stripes not at all hairy; behind the suture are four incomplete annular fuscous spots, the middle ones distinctly larger than the outer. Scutellum and metanotum gray with fine median fuscous line. Dorso-pleural membrane pale yellowish. Meso- and sterno-pleura and lower part of pteropleura grayish fuscous, rest of pleura yellowish, with a grayish white bloom. Knob of halteres brown, stem pale fuscous, base pale.

Abdomen testaceous tinged with fuscous, posterior margin of segments 2 to 7 paler; venter infuscate along the middle; tergum somewhat darker, the very distinct blackish brown dorsal stripe becomes obsolete on tergites 6 and 7; the lateral fuscous stripes almost obsolete, lateral margins of ter-

gites somewhat paler. Eighth tergite short, brown, apical margin yellowish. Eighth sternite brown, short, deeply incised each side, median lobe relatively narrow, lobes and the margins densely covered with yellow silken hair. Hypopygium rather short. Ninth tergite narrowed posteriorly, about one-half longer than wide, rounded posteriorly and transversely impressed behind the posterior margin, the latter with small median emargination and from its underside project two acute distant teeth. Ninth sternite brown, emarginate posteriorly, bladelike processes slender, basal part nearly straight, outer portion curved in form of a sickle; no pleural suture; apical appendages smaller than usual; upper appendage narrowly elongate ovate, obtusely pointed at apex; middle appendage ovate, drawn out into an acute point above; lower appendage trapezoidal, circularly emarginate posteriorly, the upper lobe curved downward and enlarged into a ciliate knob, the lower lobe rounded and ciliate, the cilia longer, softer and less regular. The lateral appendages with three processes, the upper process rather broad at base, ending in two subequal, chitinized teeth; the middle process broad, ovate, semichitinous, apex subacute, curved inwardly; the lower process rather long, membranous and pendulous. Legs: coxae and femora yellow, the latter fuscous towards the apex; tibiae yellowish fuscous, darker at apex; tarsi dark fuscous.

Wings moderately wide, grayish subfuscous, apical part infuscate; stigma fuscous, a subfuscous cloud along anterior cross-vein; a small fuscous spot over origin of praefurca and end of subcostal vein; marginal cell between the origin of the praefurca and stigma white, a conspicuous white area beyond the stigma extends across basal half of second submarginal and first posterior cells into discal and fourth posterior cells; posterior margin of outer half of first posterior cell paler; the ground color along the dividing vein between the fourth and fifth posterior cells, is paler, a large white spot at about two-thirds of second basal cell and two similar but much smaller spots in anal cell.

♀, Length, 17.5 mm.; wing, 16 mm.

Anterior leg: femur, 6.5 mm., tibia, 8 mm., tarsus, 10 mm.

Antennae shorter and rather robust, the first five joints of flagellum dark yellow, fuscous at the base, outer joints merging into fuscous, darker at base. Mesonotal vittae less distinct, the fuscous color of the margins and the middle stripe not so dark and pronounced. Abdomen yellow; venter not fuscous along the middle; the dark fuscous dorsal stripe very distinct and extending from second to end of seventh tergite, the pale lateral margin of tergites is interruptedly edged with blackish. Ovipositor short, 1.25 mm., basal part brown; valves very short, .75 mm., pale yellow, bladelike; upper and lower valves of equal length. The legs are more distinctly yellow; femora black, tibiae infuscate, at apex. The white markings of wings more in evidence, the white area in marginal cell extending broadly into the first basal cell; the outer half of the first posterior cell is not paler posteriorly; the outer white spot in the anal cell is obliterated and the inner spot extends well into the first axillary cell.

Holotype: ♂; Aweme, Manitoba, Canada. July 20, 1912. (N. Criddle.)

Allotype: ♀; Aweme, Manitoba, Canada. June 19, 1912. (N. Criddle.)

Paratypes: two females; same locality, etc. June 1 and 20.

It gives me pleasure to name this species in honor of Mr. Norman Criddle, to whom I am under many obligations for material received. The only species of the group with which this species might be confounded, is *Tipula coloradensis* Doane. It agrees with the latter species in the two pointed upper process of the lateral appendage—evidently considered by that author as two distinct processes—but the lateral appendage of *coloradensis* is devoid of a third, or pendulous process, and it also lacks the very distinct dorsal stripe of the abdomen found in *criddlei*. The female is distinguished by its very short ovipositor—long and slender in *coloradensis*. In the more or less bicolored segments of the flagellum of the female, it might be confounded with females of *hebes* and *ottawacensis*, the antennae, however, are much more robust and the dorsal stripe of the abdomen very pronounced.

EXPLANATION OF PLATES

PLATE XIII

To avoid needless repetition the following abbreviations attached to the figures are the same for all: VIII. t—Eighth abdominal tergite; VIII. s—Eighth abdominal sternite; IX. t—Ninth tergite; IX. s—Ninth sternite; A—Upper or first apical appendage; B—Middle or second apical appendage; C—Lower or third apical appendage; Lat. ap.—Lateral appendage; up. pr.—Upper or first process; m. pr.—Middle or second process; l. pr.—Lower or third process; bl. pr.—bladelike process.

FIG. 1.—*Tipula hebes* Loew. Lateral view of hypopygium.

FIG. 2.—*Tipula ottawaensis* spec. n. Lateral view of hypopygium.

FIG. 3.—*Tipula ottawaensis* spec. n. Posterior view of hypopygium.

FIG. 4.—*Tipula ottawaensis* spec. n. Apical appendages, lateral appendage and processes and bladelike process, seen from within.

FIG. 5.—*Tipula suspecta* spec. n. Apical appendages, lateral appendage and processes, seen from without.

FIG. 6.—*Tipula suspecta* spec. n. Bladelike process.

FIG. 7.—*Tipula doanci* spec. n. Bladelike process.

FIG. 8.—*Tipula doanci* spec. n. Apical appendages and lateral appendage and processes, seen from without.

FIG. 9.—*Tipula ingrata* spec. n. Apical appendages seen from without.

FIG. 10.—*Tipula ingrata* spec. n. Lateral appendage and processes, seen from without.

FIG. 11.—*Tipula ingrata* spec. n. Bladelike process.

FIG. 12.—*Tipula clathrata* spec. n. Lateral appendage with processes, seen from without.

FIG. 13.—*Tipula clathrata* spec. n. Bladelike process.

FIG. 14.—*Tipula derelicta* spec. n. Apical appendages, lateral appendage and processes and bladelike process.

FIG. 15.—*Tipula derelicta* spec. n. Lateral view of hypopygium.

FIG. 16.—*Tipula criddlei* spec. n. Bladelike process.

FIG. 17.—*Tipula criddlei* spec. n. Apical appendages and lateral appendage with processes, seen from without.

PLATE XIV

FIG. 1.—*Tipula ottawaensis* spec. n. Wing of male.

FIG. 2.—*Tipula suspecta* spec. n. Wing of male.

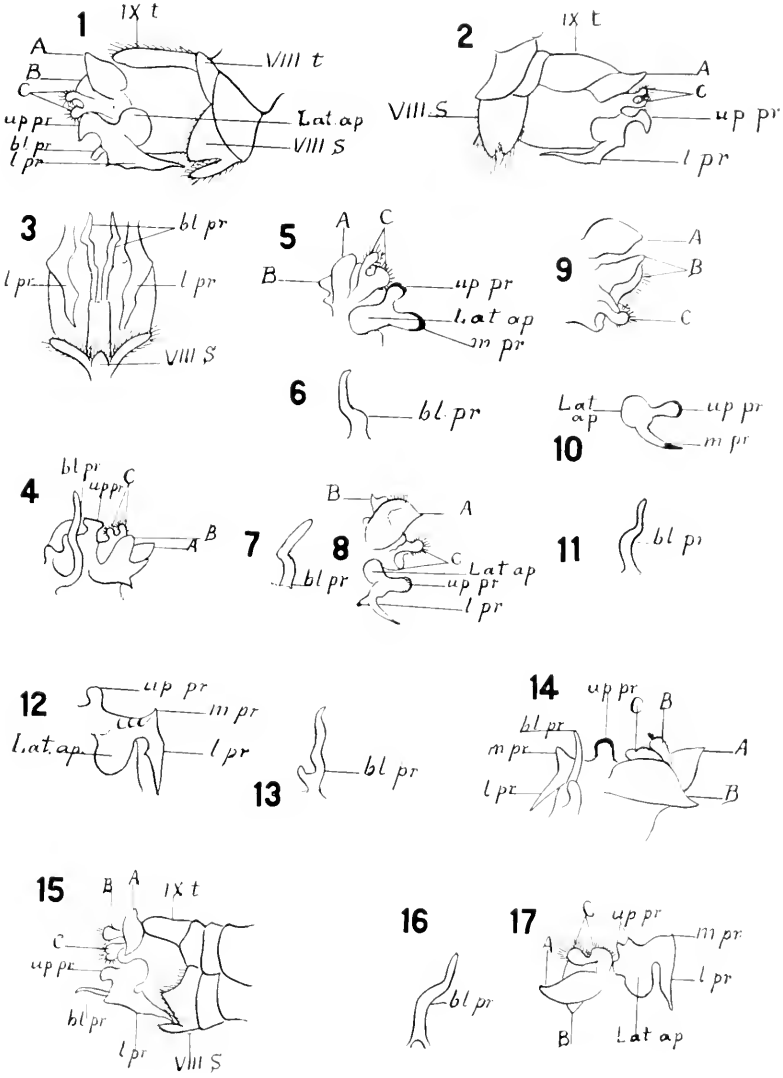
FIG. 3.—*Tipula doanci* spec. n. Wing of male.

FIG. 4.—*Tipula ingrata* spec. n. Wing of male.

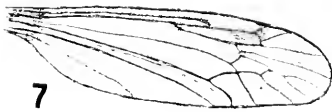
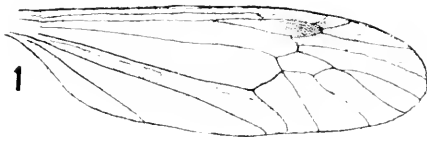
FIG. 5.—*Tipula clathrata* spec. n. Wing of male.

FIG. 6.—*Tipula derelicta* spec. n. Wing of male.

FIG. 7.—*Tipula criddlei* spec. n. Wing of male.



DIETZ GENUS TIPULA



DIETZ—GENUS TIPULA

STUDIES IN AMERICAN TETTIGONIIDAE
(ORTHOPTERA)

III

BY JAMES A. G. REHN AND MORGAN HEBARD

A SYNOPSIS OF THE SPECIES OF THE GENUS
NEOCONOCEPHALUS FOUND IN NORTH AMERICA
NORTH OF MEXICO¹

NEOCONOCEPHALUS Karny

1815. *Conocephalus* Thunberg, Mém. Acad. St. Petersburg, v, p. 271. (In part.)
 1906. *Conocephaloïdes* Kirby, Synon. Catal. Orth., ii, p. 241. (In part not of Perkins.)
 1907. *Necoconocephalus* Karny, Abh. k. k. zool.-bot. Ges. Wien, iv, p. 22.

GENOTYPE—*Necoconocephalus subulatus* [*Conocephalus subulatus*] (Bolivar), selected by Karny, 1907.

Differential Generic Characters.—When compared with the most nearly related genus, *Eucoconocephalus*, the present genus is given by Karny as differing in the form of the lateral lobes of the pronotum which are deeper with ventral margin obtuse-angulate or rounded, and in the tegmina which have the costal vein abbreviate or obscure and more distinctly divergent from the humeral vein.

History.—Kirby, in 1906, restricted the name *Conocephalus* to the genus called *Anisoptera* by Latreille in 1829, and *Xiphidion* by Serville in 1831, but his views on tautonymic generic and specific names impelled him to use the name *Anisoptera* for that genus and, in place of *Conocephalus* as generally understood by authors, he used the name *Conocephaloïdes*, which had been proposed by Perkins, in 1899, for an aberrant form of the subfamily from the Hawaiian Islands. The genus *Conocephaloïdes* is, however, distinct from the present aggregation. Karny, in 1907, recogniz-

¹ Published with the aid of the Orthoptera Fund.

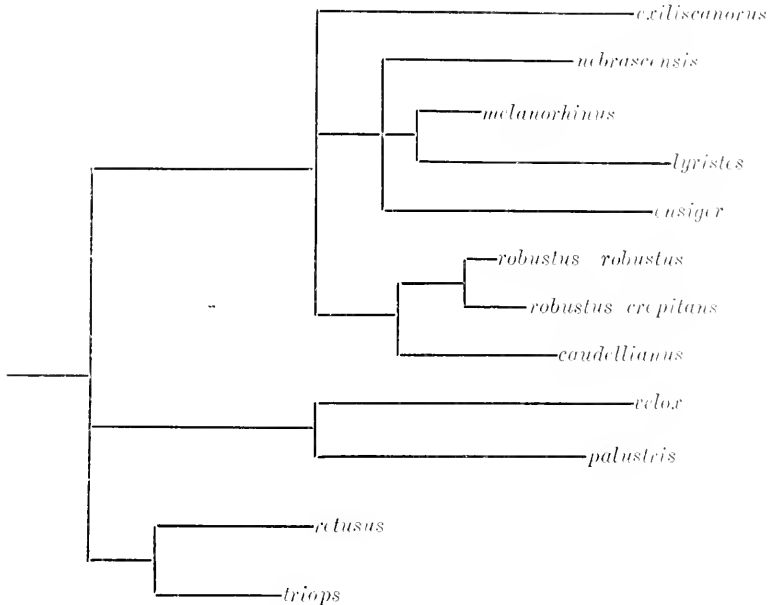
ing that the genus *Conocephalus* of authors was composed of a number of valid sections, erected subgeneric names for the same, *Neoconocephalus* being the one proposed for the present group. That author, however, at that time retained the name *Conocephalus* as a broad generic designation covering these subgenera. The same author, however, in 1912, recognizing the fact that *Conocephalus* by tautonymy should be transferred to the genus called *Anisoptera* by Latreille and *Xiphidion* by Serville, and convinced of the fact that his subgenera previously erected were of generic validity, elevated the names *Neoconocephalus*, *Euconocephalus* and *Homorocoryphus* to generic rank.² It is solely with his genus *Neoconocephalus* that we are dealing at present. Of the other two related genera, but one, *Homorocoryphus*, is represented by a single species, *H. malivolans* (Scudder), in the regions at present under consideration. Scudder's *Conocephalus acutulus*, described in 1878, belongs in the genus *Caulopsis*, as placed with a query by Karny in 1912; we believe that the specimen was recorded from California in error as that genus is confined to tropical America.

Distribution of Genus.—In America north of Mexico the genus is generally distributed east of the Rocky Mountains as far north as the southern limits of the Canadian Zone, west of these mountains it is found only short distances from the Mexican border where it is by no means abundant.

The brevity of some of the earlier descriptions of the species, the use of these names by different authors to designate different species and some recent misconceptions, have caused the literature on the North American species of the present genus to become in places decidedly involved. The eleven species, one of which divides into two geographic races, which are found in the region under consideration, are well defined and it is the purpose of the present paper to state briefly their differential characters and indicate the relative importance of these. The literature on the species under consideration has been carefully examined, but the only corrections made in the present paper are those of which we have the material or other conclusive evidence before us.

² Gen. Ins., Subf. Copiphorinae, pp. 29, 33 and 36.

The species at present under consideration are naturally grouped as follows:



Morphological Notes.—Degree of robustness is frequently of value in distinguishing certain species when the sum total of characters are considered. A certain amount of individual variation is often found in the shape of the vertex; in species having it produced, the female sex has the apex averaging slightly more acuminate. In species having the ventral surface of the vertex marked, the maculation varies individually in intensity in some few specimens of every large series, and in specimens in which the coloration is weak, the area covered by the same is always correspondingly reduced, this reduction being always greater proximal than distad. Thus, in species having the entire ventral surface of the vertex black, among specimens of the palest coloration exceptions occur in which this marking is less extensive, reaching only to the base of, and not including, the proximal tooth. In females the pronotum averages proportionately less ample, the tegmina and wings are more elongate and attenuate, than

in males from the same series. The shape and venation of the stridulating field of the male tegmen shows distinctive characters in almost every species, but these differences are often very difficult to define and are ill suited for use in a key, though in comparison of material their presence is readily noted. The genicular lobes of all the species under consideration are unispinose. The spination of the limbs shows decided variability and is of interest only in showing somewhat greater development or average greater number of spines in some species than in others; very small but conspicuous dark markings on the ventral margins of the caudal femora immediately under the spines are found in *N. palustris*, often in *triops* and sometimes present though weakly defined in *retusus*. In some species minor characters are to be found in the male genitalia; in the supra-anal plate of *exiliscanorus*; in the cerci of *retusus* and *triops*, and the styles of the subgenital plate are decidedly longer in *relox*, *palustris*, *retusus* and *triops* than in the other species studied. The ovipositor shows a greater upward curvature in *exiliscanorus* and *retusus* than in the other species here considered; it shows a distinct downward curvature in *lyristes* and to a less extent in *melanorhinus*; it is rather wider than usual in *exiliscanorus*, *melanorhinus*, *lyristes* and *palustris*, and in the three latter species, and particularly in *palustris*, the widening being more decided meso-distad.

Biological Notes.—The junior author has studied the song and habits of all of the species here treated excepting *N. nebrascensis*, and an opportunity to compare at the same time, or at least on the same day, *N. exiliscanorus*, *melanorhinus*, *lyristes*, *robustus robustus*, *caudellianus*, *palustris* and *retusus* in New Jersey during the summer of 1914, has been of decided assistance. The species either sing with a continuous buzzing or with a succession of brief buzzing notes; to this latter class belong *C. exiliscanorus*, *ensiger* and *caudellianus*.

The species under consideration are all more or less vagrant at times. The distance to which they may wander is problematical but in some cases probably considerable. The records of *N. exiliscanorus* from New Harmony, Indiana, Thompson's Mills, Georgia, and Dallas, Texas, are very possibly due to individuals having strayed long distances from their normal area of distribution, at least this is highly probable for the first two records which

are from regions where the species is very rare, if ever native. Frequently individuals are attracted to lights in cities at night; we have observed this in *N. exiliscanorus*, *robustus crepitans* (in numbers), *retusus* and *triops*. In the pine barrens of New Jersey, miles from their normal environment, several males of *N. lyristes* and one of *N. palustris* were found stridulating vigorously on the low oaks at night.

Key to the Species Treated

- A. Vertex decidedly longer than wide, not broadly and evenly rotundate.
 - B. Vertex strongly produced, much longer than basal width; narrowing decidedly to apex which is very narrowly rounded (except in *melanorhinus*).
 - C. Form robust. (Vertex slender, with ventral surface black as far as or including basal tooth.)
 - D. Vertex exceedingly long, with basal tooth very prominent. Ovipositor very much longer than caudal femur. Size medium to very large, form not as compact as in *nebrascensis*.
 - DD. Vertex not as long, with basal tooth not as prominent. Ovipositor much longer than caudal femur. Size medium, form very compact. **exiliscanorus** (Davis)
 - DD. Vertex not as long, with basal tooth not as prominent. Ovipositor much longer than caudal femur. Size medium, form very compact. **nebrascensis** (Bruner)
 - CC. Form slender.
 - D. Vertex heavy, with ventral surface black as far as or including basal tooth.
 - E. Vertex moderately produced, about twice as long as basal width, narrowing decidedly to abruptly truncate apex, which is broad and weakly rounded. Ovipositor distinctly shorter than caudal femur. Size small to large, form moderately slender. **melanorhinus** (Rehn and Hebard)
 - EE. Vertex very long, longer than in any other species except *exiliscanorus*. Ovipositor distinctly longer than caudal femur. Size medium, form very slender.
 - DD. Vertex slender (long, but not as long as in *lyristes*), with ventral surface narrowly but continuously margined laterad and distad with black. (Ovipositor much longer than caudal femur. Size medium, form slender.) **ensiger** (Harris)
 - BB. Vertex moderately produced (for the genus), distinctly longer than basal width, narrowing moderately or very weakly to apex (except in typical *robustus*), which is arcuato-truncate (except in typical *robustus* and to a less degree in *robustus crepitans*).
 - C. Form robust. Pronotum not elongate, not expanding evenly caudad. Ovipositor of normal width, long, slightly shorter than, to (normally) slightly longer than, caudal femur.

- D. Ventral surface of vertex immaculate, or rarely with a very small distal maculation. Longitudinal transparent area of male tegminal tympanum usually not darkened.
- E. Size large. Vertex longer, narrowing decidedly and with apex narrowly rounded. **robustus robustus** (Scudder)
- EE. Size large to (normally) very large. Vertex shorter, not narrowing as decidedly and with apex somewhat broader.
robustus crepitans (Scudder)
- DD. Ventral surface of vertex rather heavily outlined in black. Longitudinal transparent area of male tegminal tympanum usually darkened. (Size large. Vertex rather similar to but somewhat shorter than that of *robustus crepitans*.)
caudellianus (Davis)
- CC. Form of males slender, of females robust with abdomen decidedly enlarged.³ Pronotum elongate, expanding evenly caudad. Ovipositor wider than normal, short, (normally) slightly shorter than caudal femur.³ (Vertex narrowing very weakly to apex, which is broader than in *robustus* and narrower than in *caudellianus*, ventral surface immaculate.)
- D. Size of male rather large, form very slender. Head unusually long and narrow with genae somewhat swollen, vertex narrowing more gradually to somewhat more broadly rounded apex. Portions adjacent to bases of spines of ventral margins of caudal femora not darkened. **velox** (Rehn and Hebard)
- DD. Size of male small, form less slender. Head not unusually long with genae not swollen, vertex narrowing more decidedly (though very weakly) to apex which is less broadly rounded. Portions adjacent to bases of spines of ventral margins of caudal femora distinctly darkened. **palustris** (Blatchley)
- AA. Vertex wider than long to very slightly longer than wide, broadly and evenly rotundate (ventral surface narrowly margined distad with an arcuate black line).
- B. Size small to medium, form slender. Vertex small and usually slightly longer than wide. Ovipositor very much longer than caudal femur.
retusus (Scudder)
- BB. Size large, form robust. Vertex large and usually wider than long. Ovipositor slightly shorter than to (rarely) slightly longer than caudal femur. **triops** (Linnaeus)

Specimens Examined.—In the preparation of the present paper the types of the following species have been before us.

Neoconocephalus exiliscanorus (Davis)

Neoconocephalus nebrascensis (Bruner)

Neoconocephalus melanorhinus (Rehn and Hebard)

³The female of *velox* is unknown.

Neoconocephalus lyristes (Rehn and Hebard)

Neoconocephalus robustus robustus (Scudder)

Neoconocephalus robustus crepitans (Scudder)

Neoconocephalus caudellianus (Davis)

Neoconocephalus velox Rehn and Hebard

Neoconocephalus retusus (Scudder)

(*Conocephalus atlanticus* Bruner, synonym of *Neoconocephalus retusus* (Scudder).)

The total of specimens examined in the preparation of the present paper is about 1400. Of the 1248 here recorded, 989 are in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia.⁴ We wish to express our heartiest thanks to Mr. Wm. T. Davis for the privilege of examining his types and several large and interesting series in his collection, to Mr. A. N. Caudell and Dr. Samuel Henshaw for the privilege of studying all of the material in the United States National Museum and Museum of Comparative Zoology respectively, to Prof. A. P. Morse who has most generously requested us to include in this study all of the previously unrecorded material in his collection excepting that from New England, and to Dr. J. Chester Bradley whose work in Georgia has helped our distributional studies decidedly in this and other genera.

Neoconocephalus exiliscanorus (Davis) (Pl. XV, figs. 1B to 1E.)

1887. *Conocephalus exiliscanorus* Davis, Can. Ent., xix, p. 57. [Staten Island, New York.]

1902. *Conocephalus bruneri* Blatchley, Orth. of Indiana, p. 267, fig. 90. [New Harmony, Indiana.]

In 1907,⁵ Karny first placed *bruneri* correctly in the synonymy here. Blatchley apparently wholly overlooked Davis' *exiliscanorus* when he described *bruneri* (his specimen was apparently pronounced to belong to an undescribed species by Bruner to whom it had been sent for determination).

As is shown by the figure, the vertex of the present species is more produced and specialized in this insect than in any other

⁴ Material collected by either or both of the authors is in these collections and for such material recorded in the present paper we have, as has been our custom, not designated the collection.

⁵ Abh. k. k. zool.-bot. Ges. Wien, IV, p. 30.

treated in the present paper; the latero-caudal projections of the supra-anal plate of the male are also most decided. The stridulating field of the male tegmen is large and very broad; the stridulating vein is very long and evenly but not strongly swollen, with accompanying veins well marked; the veinlets of this field are rather decided. The ovipositor is somewhat broader than usual and more noticeably curved upward.⁶

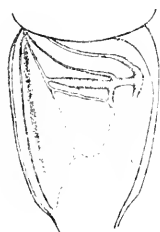


FIG. 1 A—*Neocoenoccephalus exilis canorus* (Davis). Staten Island, New York. *Type*. Stridulating field of male tegmen. ($\times 3\frac{1}{2}$.)

This species agrees with *nebrascensis* in having the ventrocephalic margins of the cephalic and median femora usually but not always armed with a few small spines, and the ventral margins of the caudal femora with a number of irregularly spaced short delicate spines.

Types.—Described from two males from a single locality.

Single Type here Designated: ♂; Staten Island, New York. (Wm. T. Davis; in cat-tails on salt marsh.) [Davis Collection.]

The material before us shows that there is a great amount of individual variation in the species, what geographic variation exists can not be definitely ascertained as the species is yet known only from single records over apparently the greater part of its range.

The spines of the cephalic and median tibiae are rather short and heavy; the ventral margins of the caudal femora are armed with numerous short delicate spines, normally internal 5-9, external 4-8, often specimens may be found with several more extremes before us; internal 5-11, external 4-10.

The green color phase is the more abundant, but very frequently specimens are brown in general coloration.

For measurements see page 373.

⁶ Immature females of the present species have the ovipositor curving weakly downward. In the early stages apparently no trace of black marking on the vertex or margins of caudal femora is ever present; in species having the vertex decidedly produced, such production is decidedly less.

NEOCONOCEPHALUS EXLISCANORUS (Davis)
Measurements (in millimeters) of extremes

	Number of specimens	Length of vertex ⁷	Length of vertex of vertex	Length of pronotum	Length of tegumen	Length of caudal femur	Length of ovipositor ⁸
♂	(29)	4.2-5.2	3.2-4.1	7.7-9	34.8-44.5	19.8-24.8	
	(1)	6.1	4.9	9.1	46.4	23.8	
	(63)	5.6-6	3.2-4.3	7.6-8.8	33.1-41.7	19.3-22.9	
♀	(10)	5.3-6.2	4.3-5.3	7.7-8.8	41.3-46.8	25.4-28.8	40.8-45.7
	(1)	7.2	6.2	9.6	49.1	30.4	18.1
	(6)	5.6-6	4.8-5.2	7.9-9	40.1	23.9	31.1-38.9
	(1)	6.6	5.3	9	50.7		17.3
	(1)	4.4	3.1	9.2	53.3	32.7	12.6

⁷ This measurement is taken from the cephalic margin of the eye to the apex of the vertex.

⁸ Throughout the present paper this measurement is taken from the ventral apex of the basal plicia to the apex of the ovipositor.

Song rather loud (louder than that of *N. melanorhinus* and *lyristes*, not as loud as *caudellianus* and not nearly as loud as *robustus*), "ziit-ziit-ziit-ziit"—a vibrant rattling note rising and falling in intensity, often ceasing as if from exhaustion. The number of consecutive times without pause that this sound was produced were on one occasion counted, 26-14-20-20-17; usually on a warm evening an undisturbed singer would average about as above before ceasing for a few seconds. The song is rapid, the sounds being emitted on warm evenings about 3 to the second. Weather conditions probably have some effect upon the song of the species, but elaborate and protracted field study would be necessary to determine the degree of such.⁹ When near a colony of this species on favorable evenings after dark the air is vibrant with the sound, as several singers cease others take up the constantly rising and falling song, but at no very great distance the sound is inaudible. The insects were found not to begin to sing until nearly sunset and before dark often ceased their song upon any attempt to approach the spot,¹⁰ after dark the singing was much more vigorous and the singers could then often be approached with a light and cautiously seized while singing and moving about in the bushy weeds and heavy grasses into which they climbed while stridulating. After the air is chilled toward midnight the singers become audibly fewer and their stridulations less intense. The species is found very local but often in large numbers in the heavier tangles of weeds, low bushy plants or heavy reeds in both fresh and salt water marshes. Females were found often in grasses near the singers; one was taken ovipositing in a grass blade at dusk.

The present species is known on the Atlantic coast from New Haven, Connecticut, to Raleigh, North Carolina. Elsewhere it is known from but single specimens taken at widely separated

⁹ Such differences have probably misled Allard, who describes the song of a single male of this species (as *bruneri*) from Thompson's Mills, Georgia, as being stronger and sharper than that of *exiliscanorus* heard at Washington, District of Columbia. Proc. Ent. Soc. Wash., XII, p. 122 (1910).

¹⁰ These observations are from experience at numerous localities on the New Jersey coast; on Tinicum Island, Pennsylvania, the large series was, however, taken with ease at dusk, on which occasion the males were singularly fearless even at that hour.

localities, Thompson's Mills, Georgia, New Harmony, Indiana, and Dallas, Texas.

Specimens Examined: Previously recorded, 3. Here recorded, 174; 141 males, 30 females and 3 immature females.

Woodhaven, Long Island, New York, VIII, 1912, (W. T. Davis), 7 ♂, 1 ♀, [Davis Cln.].

Utrecht, Brooklyn, New York, VIII, 8, 1908, (W. T. Davis), 3 ♂, [Davis Cln.].

Tysens Lane, New Dorp, Staten Island, New York, VIII, 19 to 28, 1911, (W. T. Davis), 3 ♂, [Davis Cln.].

Richmond, Staten Island, New York, VIII, 22, 1909, (W. T. Davis), 7 ♂, [Davis Cln.].

Rumyon, New Jersey, X, 8, 1909, (W. T. Davis), 2 ♂, [Davis and U. S. N. M. Clns.].

Washington Park, New Jersey, VIII, 1, 1911, (H. Fox; border of bog), 1 ♂,¹¹ [A. N. S. P.].

Mullica River flats, Burlington County, New Jersey, VIII, 24, 1914, (H.; in high salt marsh grass, bushes and everywhere in exceptionally heavy cover), 2 ♂.

Pleasantville, New Jersey, VIII, 16 and 17, 1914, (H.; in heavy weeds and grasses along shore margin of salt marsh and 1 ♂ in heavy weeds on high ground west of town); 29 ♂, 10 ♀.

Mays Landing, New Jersey, VIII, 29, 1914, (H.; in low bushy weeds in marshy area), 2 ♂.

Tuckahoe, New Jersey, VIII, 26, 1914, (H.; in heavy marsh grasses, reeds and bushes in fresh water marsh), 2 ♂, 1 ♀.

Ocean City, New Jersey, VIII, 21, 1914, (H.; fresh water marshy area of heavy grasses on barrier beach), 1 ♂.

Swainton, New Jersey, VIII, 21, 1914, (H.; in fresh water marshy meadow among grasses, ferns and low bushes), 1 ♂.

Cape May Court House, New Jersey, VIII, 21, 1914, (H.; in heavy weeds and reedy tangles on shore margin of salt marsh), 6 ♂, 1 ♀.

Erma, New Jersey, VIII, 14, 1912, (W. T. Davis), 1 ♀, [Davis Cln.].

Cold Spring, New Jersey, VIII, 1910, (W. T. Davis), 1 ♂, [Davis Cln.].

Cape May Point, New Jersey, IX, 9, 1911, (H. Fox; shore margin of salt marsh), 1 ♀,¹¹ [A. N. S. P.].

Cornwells, Pennsylvania, IX, 7, 1914, (H.; heavy vegetation in bog), 1 ♂.

Philadelphia, Pennsylvania, VII, 25, 1911, (E. R. Casey), 1 ♀, [Casey Cln.].

Philadelphia Neck, Pennsylvania, IX, 29, 1913, (H.; in low plants in marshy spot), 1 ♂.

¹¹ These specimens have unfortunately been recently recorded as *Conocephalus nebrascensis* by Fox, Proc. Acad. Nat. Sci. Phila. 1914, p. 524 (1914).

Gibson Point, Elmwood, Pennsylvania, VII, 9 and 20, 1911, (H. Fox; cling-grass area in semi-marsh), 2 ♂, 1 ♀,¹¹ [A. N. S. P.].

Tinicum Island, Pennsylvania, VIII, 13, 1911, (R. & H.), 4 ♂; IX, 9, 1904, (H.), 1 ♀; IX, 29, 1913, (E. R. Casey, R. & H.); in bushy weeds in semi-marsh area), 59 ♂, 5 ♀.

Essington, Pennsylvania, VII, 27, 1911, (H. Fox), 1 juv. ♀, [A. N. S. P.].

Washington, District of Columbia, VI, 19, 1911, (W. T. Davis), 2 juv. ♀, [Davis Cln.]; VIII, 5, 1910, (O. Swezey; in restaurant at night), 1 ♀, [U. S. N. M.]; IX, 10 and 14, 1909, (A. N. Caudell; in marsh grasses and weeds), 3 ♂, [U. S. N. M.].

Rossllyn, Virginia, VII, 28, 1900, (A. N. Caudell), 1 ♂, [U. S. N. M.].

Clarendon, Virginia, VIII, 1913, (H. A. Allard), 2 ♂, [U. S. N. M.].

Raleigh, North Carolina, VIII, 5, 1903, (Mrs. C. S. Brimley; in garden), 1 ♀,¹² [U. S. N. M.].

Thompson's Mills, Georgia, VII, 1909, (H. A. Allard; grasses and weeds in wet spot), 1 ♂,¹³ [U. S. N. M.].

Dallas, Texas, (Boll), 1 ♀, [M. C. Z.].

Neoconocephalus nebrascensis (Bruner) (Pl. XV, figs. 2B to 2E.)

1891. *Conocephalus nebrascensis* Bruner, Can. Ent., xxiii, p. 72. [Eastern Nebraska; Illinois; Iowa.]

The present insect, though nearest *N. exiliscanorus*, differs from that species very decidedly. In general form only, the species suggests small individuals of *N. robustus*. The vertex when compared with that of *N. ensiger* is found to be differently marked and projects upward more strongly, with distal half more tapering and basal tooth more prominent. The stridulating field of the male tegmen is large and broad, in general form and texture more similar to that of *robustus* than to that of *exiliscanorus*; the stridulating vein is of moderate length and strongly swollen, with accompanying veins weakly developed.

Bruner's measurements are not exact; we give below the measurements of the type¹⁴ and allotype:—length of vertex, lateral, 3.2 and 3.7; of vertex, ventral, 2.2 and 2.7; of pronotum, 8 and 7.5; of tegmen, 36.7 and 41.8; of caudal femur, 20.6 and 24.7; of ovipositor of allotype, 32.6 mm. The length of the ovipositor of the St. Louis female is 34.8 mm.

¹² Recorded as *Conocephalus bruneri* by Brimley, Ent. News, XIX, p. 20 (1908).

¹³ Recorded as *Conocephalus bruneri* by Allard, Proc. Ent. Soc. Wash., XII, p. 122 (1910).

¹⁴ Selected by Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 125 (1912).

The armament of the limbs is rather similar to that of *exilis-canorus*; the ventral margins of the caudal femora are armed with short delicate spines, the extremes in the few specimens before us are, internal 7-12, external 4-6.

All of the material before us is of the green color phase.

McNeill states that the song of this species is continuous and that the insect begins singing earlier in the evening than does *ensiger*.

The species is known from Ohio and Sarنيا, Ontario, west to Minnesota, extreme eastern Nebraska and northeastern Kansas, south to St. Louis, Missouri.

In addition to one specimen examined by us but previously correctly recorded, we here record the following 7 specimens: 5 males and 2 females, of which the typical material has been previously recorded as from "eastern Nebraska and Illinois."

West Point, Nebraska, VIII, 1887, (L. Bruner), 2 ♂, *type* [Hebard Chn.], *paratype* [M. C. Z.].

Omaha, Nebraska, IX, (L. Bruner), 1 ♀, *allotype* [Hebard Chn.].

Lincoln, Nebraska, IX, (L. Bruner), 1 ♂, *paratype* [Hebard Chn.].

Moline, Illinois, VIII, 26 and IX, 12, (McNeill), 2 ♂, *paratypes* [M. C. Z. and Hebard Chn.].

St. Louis, Missouri, IX, 15, 1876, 1 ♀, [U. S. N. M.].

Neoconocephalus melanorhinus (Rehn and Hebard) (Pl. XV, figs. 3B to 3E.)

1907. *Conocephalus melanorhinus* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1907, p. 304, figs. 1, 2. [Cedar Keys, Florida.]

The present insect is more nearly related to *N. lyristes* than to any other known species, differing, however, in the much shorter vertex, decidedly less elongate form, proportionately shorter caudal femora, and notably in the female sex in the similarly rather wide but much shorter ovipositor which is very weakly curved downward. The stridulating field of the male tegmen is similar to that of *lyristes* but somewhat broader, with veinlets of this field slightly more pronounced.

This species is now known to be very abundant and widely distributed in the areas of *Spartina patens* on the tidal marshes of the New Jersey coast. The large series before us agrees perfectly with the type except in size, which is decidedly less in these northern examples. The type has the ventral surface of the

vertex black as far as, and not including, the basal tooth; the majority of the specimens before us have the entire ventral surface of the vertex black (this is true of all in the dark brown color phase), but in occasional specimens this coloration covers only the distal half, while a number are marked as in the type.

In both this species and *lyristes* the spines of the ventral margins of the caudal femora are delicate and rather long, distinctly longer than in *N. exiliscaenorus*.

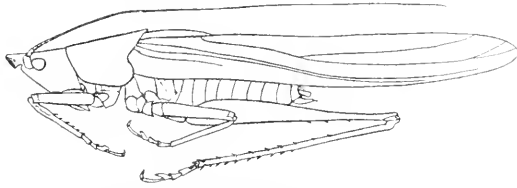


FIG. 3.—*Neocoenoccephalus melanorhinus* (R. & H.). Cape May Court House, New Jersey. Male. (Natural size.)

There are no specimens in the large series before us having the ventro-cephalic margins of the cephalic and median femora armed. The caudal femora have the number of spines of the ventral margins decidedly fewer than in *lyristes*, the external margins are usually unarmed, sometimes supplied from one to several spines, in the material before us the extremes are, internal 3-8, external 0-3.

For measurements see page 379.

This species was found in large numbers on the salt marsh tidal flats of New Jersey in areas of *Spartina patens* growing near one foot in height, but it was also found there rather abundant in areas of low *Distichlis spicata*. When first met with in the summer of 1914, the males of a large colony were stridulating vigorously early on a somewhat cloudy afternoon; the song was a weak, high-pitched continuous buzzing, giving much the same vibrating resonance as a bit of rubber stretched in the wind. The note was very much weaker, richer in quality and less harsh than that of *N. robustus*. During daylight the singers invariably seemed further away than was the case, and time and again specimens were passed over until this fact was realized. At night the song is somewhat louder and very similar to that of *N. lyristes*, almost inappreciably higher pitched and more strident.

NEOONOCEPHALUS MELANORHINUS (R. and H.)
Measurements (in millimeters) of extremes

♂	Number of specimens	Lateral length of vertex	Ventral length of vertex	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
Mullica River, New Jersey.....	(55)	2.3-2.8	1.6-2.1	6.4-8.5	29.3-37.5	17.5-21.3	
Cape May Court House, New Jersey.....	(71)	2.6-2.8	1.8-2.1	6.9-8.1	25.4-35.4	17.4-20.3	
Ocean City, Maryland.....	(1) ¹⁵			8.1	36.2	21.5	
♀							
Mullica River, New Jersey.....	(1)	2.8	1.8	6.2	34	18	16.3
Cape May Court House, New Jersey.....	(15)	2.9-3.1	1.9-2.1	6.7-7.2	34.7-39.3	19.3-21.2	17-18.3
Ocean City, Maryland.....	(1)	3.3	2.2	7.3	43	22	19.1
Cedar Keys, Florida. <i>Type</i>	(1)	3.7	2.7	8	47.5	27	22.8

¹⁵ This specimen has the vertex damaged.

When an individual was alarmed while singing the note ceased abruptly, the singer dropping or leaping down to the ground and remaining motionless there, perfectly concealed. One specimen was noticed to have fallen on its back, in which position it remained motionless several seconds, then turning over quickly it sought the nearest grass stem. The abundant green color phase of this insect blends perfectly with the broader green leaves of *Spartina patens*, while the brown individuals of pale to very dark shades blend as perfectly with the brown and yellowish bases of the same plant and the bare dark muck beneath.¹⁶ The insects were seen to fly but short distances. While singing, individuals were observed to be resting motionless on the grass or climbing nervously about.

The species is confined to the salt marsh; we have never found it even on the borders of the salt marsh near the mainland in areas of *Juncus* and high marsh grasses, one of the localities in which *lyristes* is often abundant.

The present species is known only from the type locality and Tuckerton, New Jersey, besides the localities listed below. In addition to the two specimens mentioned above we have examined the following series of 169 specimens; 149 males, 19 females and 1 immature female.

Mullica River flats, Burlington County and Atlantic County, New Jersey, VIII, 24, 1914, (H.; in low grasses of salt marsh flats), 55 ♂, 1 ♀.

Ocean City, New Jersey, VIII, 21, 1914, (H.; rare in *Spartina patens* on tidal flats), 1 ♂.

Ocean View, New Jersey, VII, 23 to VIII, 30, 1911, (H. Fox; in *Spartina* and *Iva frutescens*), 7 ♂, 1 ♀,¹⁷ [A. N. S. P.].

Van Gilder's Landing, New Jersey, VII, 13 and 24, 1910 and 1911. (H. Fox; in *Spartina*), 5 ♂,¹⁷ [A. N. S. P.].

Sea Isle Turnpike, New Jersey, VIII, 20, 1910, (H. Fox; salt marsh), 4 ♂,¹⁷ [A. N. S. P.].

Goshen Landing, New Jersey, VIII, 22, 1910, (H. Fox; in *Spartina*), 5 ♂, 1 ♀,¹⁷ [A. N. S. P.].

Cape May Court House, New Jersey, VIII, 14 and 21, 1914, (H.; in *Spartina patens* and *Distichlis spicata* on tidal marsh flats), 71 ♂, 15 ♀, 1 juv. ♀.

¹⁶ In the entire series of 171 specimens, 26 are dark brown, 16 pale brown while the remaining 129 are green.

¹⁷ Recorded by Fox as *Conocephalus lyristes*, Proc. Acad. Nat. Sci. Phila., 1914, p. 524 (1911).

Ocean City, Maryland, VII, 21, 1905, (E. Daecke). 1 ♂. 1 ♀,¹⁸ [Hebard and Daecke (Ins.).]

Neoconocephalus lyristes (Rehn and Hebard) (Pl. XV, figs. 4B and 4C.)

1905. *Conocephalus lyristes* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1905, p. 45, pl. I, figs. 8, 9. [Chokoloskee, Florida.¹⁹ (Unique male.)]

The present species is nearest to *N. melanorhinus*, under which species the two are compared. The stridulating field of the male tegmen is moderately large, rather narrow and elongate, in texture normal and similar to that of *N. robustus*; the stridulating vein is heavy and of medium length, with accompanying veins rather heavy only where they join this vein. The ovipositor of *lyristes* is rather wide, long, and distinctly curved downward.

Under *melanorhinus* are recorded the specimens previously misidentified as *lyristes* by Rehn and Fox. The present species has been misidentified as *N. nebrascensis* from Lakehurst, New Jersey, by Davis,²⁰ and again by Smith from that locality, Sea Isle City and Cold Spring, New Jersey.²¹ Fox has recently added to the confusion by quoting again the latter two records as *nebrascensis*, and adding to them under the same name several records which apply correctly to *N. exiliscanorus*.²²

The present insect is locally common in New Jersey in bogs, fresh water marshes and in the coastal salt water marshes in areas of *Scirpus* and high marsh plants near

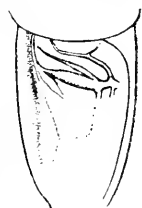


FIG. 4 A—*Neoconocephalus lyristes* (R. & H.). Chokoloskee, Florida (?). Type. Stridulating field of male tegmen. ($\times 3\frac{1}{2}$.)

¹⁸ Recorded by Rehn as *Conocephalus lyristes*, Ent. News, XVII, p. 366 (1909).

¹⁹ We are not certain that the type locality is authentic as the dealer from whom the specimen was purchased is now known by us to be unreliable.

²⁰ Can. Ent., XXXVII, p. 289 (1905).

²¹ Ins. of New Jersey, Orth., p. 189 (1910).

²² Proc. Acad. Nat. Sci. Phila., 1914, p. 524 (1914). It is unfortunate that Fox has included a portion of the Tettigoniidae (Locustidae of authors) in this paper; elsewhere it is correct, instructive and in the main complete, but in this family the confusion of species, misidentifications and lack of material, makes this portion of the work largely valueless.

the mainland, but never out on the tidal flats where *melanorhinus* is found.

The ventral surface of the long heavy vertex is almost always jet black, very rarely pale green individuals have the portion about the proximal tooth less darkened, and in one specimen before us the dark coloration extends only to the base of the tooth, leaving the tooth and brief proximal portion green.

The present species usually has the ventro-cephalic margins of the cephalic and median femora unarmed, occasionally bearing single spines; the ventral margins of the caudal femora are supplied with a number (though averaging somewhat fewer than in *exiliscanorus*) of irregularly spaced delicate spines which are similar to those of *melanorhinus* and longer than those of *exiliscanorus*, extremes in number here studied, internal 7-12, external 3-6.

For measurements see page 383.

This insect varies from very dark brown to a rich and brilliant green in general coloration, several specimens from Tuckahoe, New Jersey, were when fresh and still are absolutely intermediate between the two extremes, being a pale greenish-yellow in general coloration; every other gradation is to be found in the series before us.

On several occasions during the summer of 1914, the junior author was during the late afternoon in localities where this species was abundant, but at no time were males heard stridulating until after dark. Mr. Davis, however, writes that he has found the males stridulating on an afternoon during the summer of 1914 on Staten Island; we are of the opinion that at favorable times all of the species at present under consideration stridulate during the day time, but probably never as vigorously as they do on similar occasions at night. This insect's song is a weak and high-pitched continuous buzzing, very much like that of *N. retusus*, but, though weak, distinctly stronger than in that species. In this way during night collecting at Tuckahoe, New Jersey, where both species were plentiful and stridulating constantly on all sides, it was usually possible to determine individuals of this species and of *retusus* before approaching closely. This song is compared with the very similar stridulation of *melanorhinus* under that species. Individuals were easily taken after dark by aid of

NEOOSOCEPHALUS LYRISTES (R. and H.)
 Measurements (in millimeters) of extremes²³

♂	Number of specimens	Lateral length of vertex	Ventral length of vertex	Length of pronotum	Length of tegm.en	Length of caudal femur	Length of ovipositor
Tuckahoe, New Jersey.....	(41)	3.7-4.3	2.8-3.3	7.6-8.8	35.9-42.4	19.9-23.2	
Cape May Court House, New Jersey.....	(7)	3.7-4.5	2.7-3.6	7.7-8.4	35.7-42.4	20.3-24.8	
♀							
Tuckahoe, New Jersey.....	(1)	5.1	3.9	8	52.1	26.7	30.7
Cape May Court House, New Jersey.....	(5)	4.3-5.1	3.3-4	7.2-8.4	44.1-51.7	23-25.6	23.3-29

²³ For further measurements see Rehn, Ent. News, XVII, p. 367 (1906). As we have remarked, the material from Maryland there measured represents *melanobius* and not the present species.

a flash-lamp, the males while stridulating, and both sexes while feeding on the seeds of *Scirpus* and tall marsh grasses.

The species is known from Long Island, New York, to the extremity of southern New Jersey; nowhere has it been found more than a few miles from the sea coast. As we have stated, the type locality for the species is extremely questionable, the type having been taken very possibly in the vicinity of New York City and incorrectly labelled.

Specimens Examined: Previously recorded, 10. Here recorded, 84; 59 males, 22 females, 2 immature males and 1 immature female.

Long Island, New York, IX, 1 ♀, [Morse Chn.].

White's Bog, New Jersey, IX, 28 to X, 12, 1914, (H. K. Plank), 1 ♂, 1 ♀, [U. S. N. M.].

Mullica River flats, Burlington County, New Jersey, VIII, 24, 1914, (H.; in *Scirpus* on border of marsh), 1 ♀.

Pleasantville, New Jersey, VIII, 17, 1914, (H.; ♀ on edge of salt marsh in high reeds, ♂ stridulating in low oak in pine barrens two miles west of town), 1 ♂, 2 ♀.

Ocean City, New Jersey, VIII, 21, 1914, (H.; small colony in heavier grasses on salt marsh near mainland, few in fresh water marshy areas on barrier beach), 6 ♂, 2 ♀.

Tuckahoe, New Jersey, VIII, 26, 1914, (H.; common and widely distributed through cat-tails and high grass in fresh water marsh), 41 ♂, 1 ♀.

Cedar Springs, New Jersey, VIII, 26, 1914, (H.; in high grass, *Panicum virgatum*, on border of fresh water marsh), 1 ♂, 3 ♀.

Ocean View, New Jersey, VIII, 29 and 30, 1910 and 1912, (H. Fox), 2 ♀, [A. N. S. P.].

Swainton, New Jersey, VIII, 21, 1914, (H.; in marshy meadow of grass, ferns and reeds), 1 ♂.

Cape May Court House, New Jersey, VIII, 14, 1914, (H.; border of salt marsh), 1 ♀ juv.; VIII, 21, 1914, (H.; occasional in bordering *Scirpus* area of salt marsh), 7 ♂, 5 ♀, 2 ♂ juv.

Erma, New Jersey, VIII, 18, 1912, (W. T. Davis), 1 ♂, 2 ♀, [Davis Chn.].

Cold Spring, New Jersey, VIII, 1910, (W. T. Davis), 1 ♀, [Davis Chn.]; IX, 4, 1907, (B. Long), 1 ♀,²⁴ [A. N. S. P.].

***Neoconocephalus ensiger* (Harris)** (Pl. XV, figs. 5B to 5E.)

1841. *Conocephalus ensiger* Harris, Rept. Ins. Mass. Inj. Veget., p. 131. [Massachusetts.]

²⁴ Recorded as *Conocephalus nebrascensis* by Smith, Ins. of New Jersey, Orth, p. 189 (1910).

1872. *Conocephalus attenuatus* Scudder, Final Rept. U. S. Geol. Surv. Nebr., p. 249. [Banks of Platte River, Nebraska.]

Comparison of series of New England and Nebraskan material and study of the original descriptions of *ensiger* and *attenuatus* show that the latter name is an absolute synonym of the former. All of the references for *attenuatus* in the literature belong under the present species.

The peculiar markings of the vertex in this distinctive species are found in the large series before us to be extremely constant, varying but little in intensity. The stridulating field of the male tegmen is of similar proportions to that of *N. exiliscanorus* but relatively decidedly smaller, in texture normal; the stridulating vein is very long and rather weakly swollen, with accompanying veins weakly defined. The length of the ovipositor in material from the Atlantic coast ranges from 27.3 to 33.3 mm., in that from Nebraska from 29.3 to 37.1 mm.

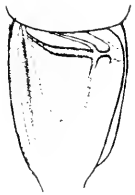


FIG. 5 A—*Neoconocephalus ensiger* (HARRIS). SAUNDERSTOWN, RHODE ISLAND. Stridulating field of male tegmen. ($\times 3\frac{1}{2}$.)

The ventral margins of the femora are usually unarmed; the ventro-cephalic margins of the cephalic and median femora are very rarely found to bear single spines, while of the ventral margins of the caudal femora the internal is more frequently found to bear a few small spines.

The green color form is usually strongly predominant, only occasional brown individuals being encountered.

At night the incessant song of this species was everywhere heard at Saunderstown, Rhode Island, excepting in the marsh areas. It is well described by Allard as, "tzip-tzip-tzip-tzip-tzip, rapidly repeated for indefinite periods." The note is not loud, in volume more similar to that of *N. retusus* than to that of *N. exiliscanorus*.

The present species is known from Norway, Maine, southward to the vicinity of Philadelphia, Pennsylvania, while in the southeastern United States the species is known from the Appalachians in North Carolina and Tennessee. Westward its distribution extends across southern Ontario as far northwest as the Red

River of the North, Minnesota, the westernmost records being Bismarck, North Dakota; Colorado, and the Rio Grande River in (probably northern) New Mexico. Little is known of the southern limits of the species' range, south of the latitude of Wichita, Kansas, it is probably distributed only at relatively high elevations.

Specimens Examined: In addition to a large series previously recorded, we here record 74 specimens; 49 males, 23 females and 2 immature females.

Rye Beach, New Hampshire, IX, 2, 1913, (H.; near salt marsh in high grasses), 1 ♂.

Seabrook, New Hampshire, (A. A. Eaton), 1 ♂, [U. S. N. M.].

Nantucket, Massachusetts, VIII, 29, 1911, (H. Fox), 1 ♂, [A. N. S. P.].

Saunderstown, Rhode Island, IX, 3 to 9, 1913, (H.; common in open overgrown with bayberry bushes and interspersed with high grasses), 11 ♂, 2 ♀.

Wesquage Beach, Rhode Island, IX, 10, 1913, (H.; in grasses on beach dunes), 1 ♂.

Hthaea, New York, VIII, 6 and 8, 1890, (A. P. Morse), 1 ♂, 1 ♀, [Morse Cln.].

Oxford, New York, (S. S. Hale), 1 ♀. [U. S. N. M.].

Honesdale, Pennsylvania, VII, 22, 1 ♀, [Pa. St. Dept. Zool.].

Philadelphia, Pennsylvania, (Westcott), 2 ♂, [Hebard Cln.]; 1910, (E. R. Casey), 1 ♂, [Casey Cln.].

Devon, Pennsylvania, IX, 13, 1905, 1 ♂, [A. N. S. P.].

Blairsville, Pennsylvania, VIII, 27, 1 ♂, [Pa. St. Dept. Zool.].

Beatty, Pennsylvania, (Brugger), 3 ♂, 1 ♀, 1 juv. ♀, [A. N. S. P.].

Beaver, Pennsylvania, VIII, 1, 1 ♂, [Pa. St. Dept. Zool.].

Roan Mountain Station, Tennessee, IX, 3, 1903, (A. P. Moise), 1 ♂, [Morse Cln.].

Roan Mountain, Tennessee, VIII, 31, 1903, (A. P. Morse), 1 ♂, [Morse Cln.].

Grand Rapids, Michigan, VIII, 27, 1899, 1 ♂, [Hebard Cln.].

West Spring Green, Wisconsin, VIII, 21, 1906, 1 ♂, [Pa. St. Dept. Zool.].

Watertown, Illinois, VIII, 9, (McNeill), 1 ♂, 1 ♀, [M. C. Z.].

Dallas County, Iowa, VIII, (Allen), 1 ♂, [Hebard Cln.].

Bismarck, North Dakota, VIII, 9, 1885, (L. Bruner), 1 ♂, [Hebard Cln.].

Glen, Nebraska, VIII, 6 to 20, 1903, (L. Bruner), 1 ♀. [Hebard Cln.].

Valentine, Nebraska, 1 ♀, [U. S. N. M.].

West Point, Nebraska, VII to IX, 1884 to 1887, 3 ♂, 5 ♀, [Hebard Cln.].

Lincoln, Nebraska, VIII to IX, 3, (L. Bruner; majority attracted to light), 4 ♂, 7 ♀.

North Platte, Nebraska, 2800 ft., VII, 28, 1910, (R. & H.; in river-bottom grass land), 3 ♂.

Kearney, Nebraska, 2146 ft., VII, 27, 1910, (R. & H.; in river-bottom grass land), 5 ♂, 2 ♀, 1 juv. ♀.

Haigler, Nebraska, VIII, 5, 1904, 1 ♂, [Hebard Cln.].

Julesburg, Colorado, 3460 ft., VII, 29, 1910, (R. & H.; in river-bottom grass land), 1 ♂.

Neoconocephalus robustus robustus (Scudder) (Pl. XV, figs. 6B to 6E, 7B and 7C.)

1813. [*Gryllus* (*Tettigonia*)] *acuminata* Stoll (not *Gryllus acuminatus* Linnaeus, 1758), *Natuur. Afbeeld. Besch.* der Spook., Zabelspr., p. 18, pl. Sa, figs. 27, 28. [Pennsylvania.]

1862. *Conocephalus robustus* Scudder, *Bost. Journ. Nat. Hist.*, vii, p. 449. [Cape Cod, Massachusetts.]

Stoll's name *acuminata*, based unquestionably upon material of this species, is preoccupied; the name which has been in general use, *robustus* of Scudder, in consequence fortunately stands. Other species have never been recorded as this insect, but all southern and western records of *robustus* are properly referred to *robustus crepitans*.

A considerable amount of variation in size and shape of the vertex is to be found in the present race; this is also true of the southern and western race *robustus crepitans*, but in the latter normally larger and more robust insect, the vertex is always broader and more truncate at the apex. In the northeastern race, *robustus robustus*, the vertex is always immaculate. The stridulating field of the male tegmen is very large and rather broad, more ample than in *N. nebrascensis*, in texture normal; the stridulating vein is heavy, though not quite as heavy as in *nebrascensis*, and moderately long, with accompanying veins weakly developed.

Types.—An unspecified series of both sexes from one locality.

Single Type here Designated: ♂: Cape Cod, Massachusetts. (Samuel H. Scudder; by the sea-beach.) [Museum of Comparative Zoology.]

The ventro-cephalic margins of the cephalic and median femora are either smooth or bear single or a few small spines; the ventral margins of the caudal femora bear usually a few small spines, in the series before us the extremes in number being internal 5-12, external 0-5.

For measurements see page 388.

The green color phase is greatly predominant, brown individuals are rarely found.

NEOONOCEPHALUS ROBUSTUS ROBUSTUS (Seudder)
Measurements (in millimeters) of extremes

	♂	Number of specimens	Lateral length of vertex	Ventral length of vertex	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
Cape Cod, Massachusetts. <i>Type</i>		(1)	2.8	1.9	8.3	40.7	23	
Penzance, Massachusetts.....		(2)	2.7-2.8	1.8-1.9	8.8-9.1	41.2-43.1	23.9-24	
Wesque Beach, Rhode Island		(8)	2.8-3.3	1.8-2.3	8.1-9.2	40.8-44.6	22.7-24.2	
Chatsworth, New Jersey.....		(4)	2.8-3	1.8-2	8.5-8.9	41.6-44.6	23.3-24.2	
Ventnor, New Jersey.....		(89)	2.7-3.6	1.9-2.4	7.9-9.9	40.2-48.6	22.6-28.4	
	♀							
Wesque Beach, Rhode Island		(1)	3.3	2.2	7.7	49.6	26.4	26.7
Staten Island, New York.....		(1)	3.4	2.3	8.2	52.8	28.1	30.4
East Plains, New Jersey.....		(4)	3.1-3.2	2.2-2.3	7.3-7.9	42.5-47	24-26.3	25-26
Ventnor, New Jersey.....		(21)	3.4-3.7	2.2-2.6	7.8-8.3	48.3-54.7	26.2-28.3	27.6-31.6

The song of this insect is a very loud and continuous buzzing which is very penetrating and usually audible to a distance of at least 600 feet. This song is given loudly and persistently after dark, rarely lone individuals will be heard singing lustily even on clear days as early as four o'clock. During the day males sometimes at long intervals give a short hesitating and irregularly harsh note which would not be readily associated with their song. Study of material in the field and in captivity as well, was necessary to determine the author of this sound, which could often be heard on summer days in the sand grass areas of the New Jersey barrier beaches. This day song, or what might well be termed sleep-song, is in reality a brief and drowsy impulse giving just sufficient energy to the act of stridulation to demonstrate the sound produced when the vibrations are not at full speed, the irregularity of the sound resulting from the same cause. A species of the genus carefully studied in Jamaica was found to have an even more distinctive note during the day, but due apparently to the identical cause. Other species of the genus will doubtless be found to have similar habits and this, combined with the established fact that in certain species of Orthoptera the speed of the normal stridulation varies with the atmospheric warmth, must be remembered in studying the song of various species in different places if confusion is to be avoided. In the sand grass areas of the New Jersey barrier beaches the sound produced at night by myriads of this insect is often astoundingly loud. While stridulating the males frequently rest head downward, occasionally moving nervously about without ceasing their song.

The area of intergradation between typical *robustus* and *robustus crepitans* is very unusually narrow. Large collections of the insect made on the Atlantic coast show that the intergradation takes place in the vicinity of Ocean View, New Jersey, and on the Delaware River in the vicinity of Philadelphia, Pennsylvania. On the fall line occasional specimens of such intermediate material is before us from as far south as Washington, District of Columbia. In the large series from elsewhere in the range of *robustus robustus*, the vertex, though showing some variation, is never as blunt as in material from the range of *robustus crepitans*. There appears to be little or no geographic variation in the range of the present race, though such variation is marked in the very extensive distribution of *robustus crepitans*.

Davis has noted an apparent difference in the song of the two forms which have been long considered distinct species; those from Erma, New Jersey (*crepitans*), appeared to sing less loudly than those from Chatsworth, New Jersey (*robustus*), heard on consecutive evenings. We have noted climatic conditions to have a decided effect on the song of the species under consideration and this may be the explanation of the above, or *robustus crepitans* from the northeastern portion of its distribution may sing less loudly than *robustus robustus*, but in the west, in the center of its typical distribution, we have heard it singing with the full burring, buzzing whirr which is characteristic of, and fully as loud as, the song of typical *robustus*.

The present geographic race is known from Cape Cod, Massachusetts, to Philadelphia, Pennsylvania and Ocean View, New Jersey, in which latitude the intergradation with *robustus crepitans* is found. The species has not yet been taken over sixty miles from the coast.

In addition to a number of specimens examined but previously recorded we here record the following series of 159 specimens, 120 males, 32 females, 1 immature male and 6 immature females, and of racial intermediates, 63 specimens, 58 males, 4 females and 1 immature male.

Penzance, Massachusetts, VIII, 20 and 21, 1911, (H. Fox), 2 ♂, [A. N. S. P.].

Saundersdown, Rhode Island, IX, 7, 1913, (H.; stridulating after dark on trunk of haw), 1 ♂.

Wesquage Beach, Rhode Island, IX, 8 and 9, 1913, (H.; widely scattered and plentiful over extensive open grassy areas along coast), 15 ♂, 1 ♀.

Woodhaven, Long Island, New York, VIII, 1912, (W. T. Davis), 1 ♀ [Davis Ch.].

Coney Island, New York, (W. T. Davis), 1 ♂, [Hebard Ch.].

Staten Island, New York, VIII, 4, 1906, (W. T. Davis; in salt meadow), 1 ♀, [Davis Ch.].

Atsion, New Jersey, VII, 30, 1911, (R. & H.), 1 ♂, 1 ♀.

East Plains, New Jersey, VIII, 24, 1914, (H.; in glade of tall grass out on plains), 4 ♀.

Stafford's Forge, Ocean County, New Jersey, VIII, 24, 1914, (R.; in huckleberry and sweet fern undergrowth of pine barrens), 1 ♀.

Spray Beach, Long Beach Island, New Jersey, IX, 24, 1907, (B. Long), 1 ♀, [A. N. S. P.].

Mullica River flats, Atlantic County, New Jersey, VIII, 24, 1914, (H.; high grasses on edge of marsh), 1 ♂.

Reega, New Jersey, VII, 31 to VIII, 29, 1914, (H.; rare in grasses of fields in pine barrens), 3 ♂, 1 ♀.

Pleasantville, New Jersey, VIII, 17, 1914, (H.; fields), 4 ♂.

Ventnor, New Jersey, VII, 31 to VIII, 23, 1914, (H.; in great numbers in sand grass areas), 89 ♂, 21 ♀, 1 juv. ♂, 5 juv. ♀.

Margate City, New Jersey, VII, 24, 1914, (H.; grasses on edge of salt marsh), 1 juv. ♀.

Sea Isle Junction, New Jersey, IX, 5, 1908, (H. Fox; in shrubby fields), 3 ♂, [A. N. S. P.].

Intermediate material between *N. robustus robustus* and *N. robustus crepitans*.

Ocean View, New Jersey, VII, 30 to VIII, 29, 1908 to 1912, (H. Fox; lowlands near salt marsh, in bunch grass, in house), 9 ♂, 1 ♀, [A. N. S. P.].

Van Gilder's Landing, New Jersey, VII, 29, 1911, (H. Fox; grassy upland), 11 ♂, [A. N. S. P.].

Sea Isle City, New Jersey, 3 ♂, [A. N. S. P. and Hebard Ch.].

Swainton, New Jersey, VIII, 8, 1914, (H.; in grassy field stridulating* in bright sunshine), 1 ♂, 1 juv. ♂.

Anglesea, New Jersey, VIII, 8, 1901, (H. L. Viereck), 1 ♂, 1 ♀, [A. N. S. P.].

Manumuskin, New Jersey, VIII, 14, 1912, (H. Fox), 2 ♂, [A. N. S. P.].

North Cramer Hill, Camden County, New Jersey, X, 1910, (Connor), 1 ♀, [A. N. S. P.].

Washington Park, New Jersey, VIII, 1 and 8, 1911, (H. Fox; uplands), 14 ♂, 1 ♀, [A. N. S. P.].

Philadelphia Neck, Pennsylvania, IX, 25, 4 ♂, [A. N. S. P.]; IX, 29, 1913, (H.; very scarce in tall dry weeds), 3 ♂.

Gibson Point, Pennsylvania, VIII, 2 to 11, 1912, (H. Fox; tall grass and weeds), 5 ♂, [A. N. S. P.].

Essington, Pennsylvania, VII, 27, 1911, (H. Fox; upland grasses), 5 ♂, [A. N. S. P.].

Neoconocephalus robustus crepitans (Seudder) (Pl. XVI, figs. 8B to 8G.)

1862. [*onocephalus*] *crepitans* Seudder, Bost. Journ. Nat. Hist., vii, p. 450. [Texas; Nebraska.]

The sudden intergradation between this widely distributed race and typical *robustus* is discussed under that insect. In the south and middle west the race attains proportions distinctly greater and more robust than are ever found in typical *robustus*, and in the northernmost portions of the insect's range the smallest individuals are found. Though showing some variation, the vertex is, in the present race, distinctly broader and more truncate at the apex and in western material is occasionally there very

briefly and narrowly darkened ventrad.²⁵ The stridulating field of the male tegmen is similar to that of *robustus robustus*, in very large individuals of proportionately greater size. In other respects we find the two races inseparable.

Types.—Two females from Texas and Nebraska.

Single Type here Designated: ♀; Texas. (Alexander Agassiz.) [Museum of Comparative Zoology.]

The armament of the limbs is generally similar to that of typical *robustus*; the ventral margins of the caudal femora bear likewise usually a few small spines, in the series before us the extremes being, internal 1–12, external 0–7.

For measurements see page 393.

The green color phase is predominant.

The present geographic race is distributed from extreme southern New Jersey, over the entire coastal plain of the southeastern United States, as far south as Hastings, Florida, but on the Piedmont plateau is only known from Georgia. Westward it is widely distributed over the entire Mississippi Valley region, the limits of distribution being La Porte County, Indiana; White Bear Lake, Minnesota; Garden City, Kansas, and Clarendon and Cisco, Texas. It is apparently not found in southeastern Texas, and we have no records from Louisiana where much field work remains to be done; Nugent, Mississippi, is as yet the only record for that state.

In addition to a series of 14 specimens examined by us but previously recorded we have had before us 93 specimens; 45 males, 38 females, 5 immature males and 5 immature females.

Cold Spring, New Jersey, VIII, 1910, (W. T. Davis), 2 ♂, [Davis Cln.].²⁶

Cape May, New Jersey, VIII, 11, 1903, (H. L. Viereck), 1 ♂; IX, 9, 1911, (H. Fox, dune grass areas), 1 ♀, [all A. N. S. P.].

Newcastle, Delaware, VIII, 6, 1911, (H. Fox), 1 ♂, [A. N. S. P.].

Chesapeake Beach, Maryland, VIII, 2, 1912, (Wm. Palmer), 1 ♂, [U. S. N. M.].

²⁵ Bruner separated his Nebraskan material with weakly marked vertex from that with unmarked vertex, including a supposed but not really constant difference in the width of the same, naming one *crepitans* and the other *robustus*. This is unwarranted, all of this material belonging under *robustus crepitans*.

²⁶ In addition to this southern New Jersey material, Mr. Davis has kindly sent us the series of 21 males and 1 female from Erma, New Jersey, which he has recorded as *crepitans*, and which does belong to this race showing no variation whatever toward *robustus robustus*.

NEOONOCEPHALUS ROBUSTUS CREPITANS (Seudder)
*Measurements (in millimeters) of extremes*²⁷

♂	Number of specimens	Lateral length of vertex	Ventral length of vertex	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
	(21)	2.7-3	1.7-2	8.2-9	39.2-44.2	22.8-26.6	
Erma, New Jersey.....	(1)	3	2	9.9	46.7	28.9	
Virginia Beach, Virginia.....	(1)	3.3	2.1	10.1	50.1	31.1	
Atlanta, Georgia.....	(1)	3.6	2.7	10.8	53.8	31	
Tybee Island, Georgia.....	(1)	3.2	2.1	10	50.2	29.8	
Clarendon, Texas.....	(4)	2.8-3	1.8-1.9	9.6-9.7	48-49.2	25.6-28.2	
Lincoln, Nebraska.....	(1)	2.7	1.8	8	38	20.1	
Lake Maxinkuckee, Indiana.....							
♀							
Erma, New Jersey.....	(1)	3	1.9	8.3	49.8	29.7	36.9
Wrightsville, North Carolina.....	(1)						
Albany, Georgia.....	(2)	3.2-3.8	2.1-2.5	8.3-9.3	49.1-55.3	29.3-32	27-33.5
Wareham, Florida.....	(1)	3.7	2.5	9	57.8	35.1	31.2
Texas, <i>Type</i>	(1)	3.3	2.3	9.2	58.1	33.8	31.1
Cisco, Texas.....	(1)	3.3	2.2	8.8	57.7	28.8	31.7
Lincoln, Nebraska.....	(6)	3.2-3.3	2.1-2.2	8.9-9.1	57.7-58.2	29.7-30.9	32-32.7

²⁷ These length measurements, when compared with those of typical *robustus*, would lead one to suppose that the two races are closer than is the reality, for typical *robustus crepitans* is distinctly heavier in every respect, with broader pronotum and wings and heavy blunt vertex.

- Somerset Heights, Maryland, IX, 24, 1905, (E. S. G. Titus), 1 ♀, [U. S. N. M.].
- Plummer's Island, Maryland, VIII, 27, 1913, (W. L. McAtee), 2 ♂, [U. S. N. M.].
- Washington, District of Columbia, VII, 29 to X, 2, 1883 to 1910, (Per-gande; Caudell, 1 ♂ at light), 6 ♂, 3 ♀, [U. S. N. M. and Hebard Cln.].
- Herndon, Virginia, VIII, 1911, (W. T. Davis), 1 ♂, [Davis Cln.].
- Clarendon, Virginia, VIII, 1913, (H. A. Allard), 2 ♂, [U. S. N. M.].
- Ocean View, Virginia, VIII, 9, 1904, (Caudell), 1 ♀, [U. S. N. M.].
- Virginia Beach, Virginia, VII, 20 and X, 6, (latter F. Knab), 1 ♂, 1 ♀, [U. S. N. M. and Davis Cln.].
- Tarboro, North Carolina, VII, 6, 1903, (A. P. Morse), 1 juv. ♀, [Morse Cln.].
- Raleigh, North Carolina, VII, 9, 1903, (A. P. Morse), 1 juv. ♂, [Morse Cln.].
- Salisbury, North Carolina, VII, 11, 1903, (A. P. Morse), 1 juv. ♂, [Morse Cln.].
- Southern Pines, North Carolina, IX, 20 and X, 30, 1912, 2 ♀, [Davis Cln.].
- Wrightsville, North Carolina, IX, 7, 1911, (R. & H.; high grass on edge of dry ground near swamp), 2 ♂, 1 ♀.
- Columbia, South Carolina, VIII, 28, 1913, (R. & H.), 1 juv. ♂.
- Denmark, South Carolina, VIII, 15, 1913, (A. P. Morse), 1 juv. ♀, [Morse Cln.].
- Atlanta, Georgia, VIII, 1 ♂, [Ga. St. Cln.].
- Augusta, Georgia, VII, 29, 1913, (R. & H.), 1 juv. ♂.
- Tybee Island, Georgia, VIII, 12 and 13, 1903, (A. P. Morse), 1 ♂, 2 ♀, 1 juv. ♂, 1 juv. ♀, [Morse Cln.]; IX, 2, 1911, (H.: in high grass on edge of salt marsh), 2 ♂.
- Albany, Georgia, VIII, 1, 1913, (R. & H.; somewhat swampy under-growth in pine woods), 2 ♀.
- Atlantic Beach, Florida, VIII, 24, 1911, (R. & H.; in tangle of vines in "hammock"), 1 ♀.
- Hastings, Florida, (A. J. Brown), 1 ♀, [Morse Cln.].
- Fort Barrancas, Florida, VIII, 3, 1903, (A. P. Morse), 1 ♀, [Morse Cln.].
- Nugent, Mississippi, VII, 20, 1905, (A. P. Morse), 1 ♀, 1 juv. ♀, [Morse Cln.].
- Lake Maxinkuckee, Indiana, IX, 1906, (B. W. Evermann), 1 ♂, [U. S. N. M.], dried alcoholic.
- St. Louis, Missouri, VIII, 15 to IX, 25, 1909, (C. L. Heink; 1 at light), 2 ♂, 3 ♀, [Hebard Cln.]; IX, 14 and 26, 1876 and 1889, (S. S. Case; E. J. Longeman), 2 ♀, [U. S. N. M.].
- Kirkwood, Missouri, IX, 20, 1877, 1 ♂, [U. S. N. M.].
- West Point, Nebraska, IX, 1887, (L. Bruner), 2 ♂, [Hebard Cln.].
- Lincoln, Nebraska, VIII to IX, (L. Bruner; several at light at night), 4 ♂, 6 ♀, [Hebard Cln.].
- Emporia, Kansas, IX, 13, 1909, (H.; many about are light after shower at dark), 1 ♂.

- Dodge City, Kansas, IX, 13, 1909, (H.; grass prairie), 1 ♂.
- Wilburton, Oklahoma, VIII, 27, 1905, (A. P. Morse), 1 ♀, [Morse Cln.].
- Shawnee, Oklahoma, VIII, 26, 1905, (A. P. Morse), 1 ♂, [Morse Cln.].
- Caddo, Oklahoma, VIII, 9, 1905, (A. P. Morse), 1 ♂, [Morse Cln.].
- Summit of Mt. Sheridan, Wichita Mountains, Oklahoma, = 2600 ft., VIII, 24, 1905, (A. P. Morse), 1 ♂, [Morse Cln.].
- Cache, Oklahoma, VIII, 23, 1905, (A. P. Morse), 1 ♂, 1 ♀, [Morse Cln.].
- Dallas, Texas, IX, 8, 1904, 1 ♀; XII, 17, 1908. (E. S. Tucker: at light), 1 ♀, 1 ♂, [all U. S. N. M.].
- Wichita Falls, Texas, VIII, 15, 1905, (A. P. Morse), 2 ♂, 2 ♀, 1 juv. ♀, [Morse Cln.].
- Cisco, Texas, IX, 21 and 22, 1912, (R. & H.; high grasses in meadow), 1 ♀.
- Clarendon, Texas, VIII, 11 and 18, 1905, (C. R. Jones and A. P. Morse), 3 ♂, 2 ♀, [Morse Cln. and U. S. N. M.].

Neconocephalus caudellianus (Davis) (Pl. XVI, figs. 9B and 9C.)

1905. *Conocephalus caudellianus* Davis. Can. Ent., xxxvii, p. 289. [Lakehurst, New Jersey.]

The present insect closely resembles *N. robustus robustus*, but the vertex is very decidedly shorter with sides usually very weakly convergent distad and apex rotundato-truncate, more so than in typical *robustus crepitans*, and with ventral surface rather heavily outlined in black, this marking showing but little variation in the series before us. The stridulating field of the male tegmen is very similar to that of *robustus robustus* but very slightly more elongate; the stridulating vein is somewhat more decidedly swollen in proximal two-thirds with accompanying veins distinctly heavier where they join this vein.

The green color phase appears to greatly outnumber the brown, and in such individuals the green is distinctly richer than in *robustus*. With species showing such close relationship, it is surprising to find *caudellianus* differing greatly in both habits and song.

The females here listed from Yemassee, South Carolina, are the first of this sex to be recorded.

They differ from females of *robustus* in the characters mentioned above and also have the pronotum proportionately slightly shorter.

Types.—Described from three males from a single locality.



FIG. 9 A—*Neconocephalus caudellianus* (Davis). Tuckerton, New Jersey. Stridulating field of male tegmen. ($\times 3\frac{1}{2}$.)

Single Type here Designated: ♂; Lakehurst, New Jersey. September 1903. (Wm. T. Davis.) [Davis Collection.]

The armament of the limbs is generally similar to that of *robustus*; the ventral margins of the caudal femora likewise bear a few small spines, in the series before us the extremes in number being, internal 8-13, external 0-8.

For measurements see page 397.

Of the twenty specimens now before us, but three males are of the brown color phase.

The present insect is not only the least plentiful of the species of the genus found in New Jersey, but is also much the most wary and difficult to capture. It is very widely distributed not only along the coastal strip in truck gardens, waste fields and marshy fresh water areas, but also in boggy portions of the adjacent pine barrens and in fields there located. The insect was to be heard at intervals everywhere during two evening's collecting between Cape May Court House, and Port Republic, New Jersey, but at no locality were more than three or four widely scattered individuals to be heard at one time. In the pine barrens it was much less often heard, but in one boggy area near Mays Landing, New Jersey, numerous widely scattered individuals were encountered. The song of this species is loud, resonant and constant, dzeeet-dzeeet-dzeeet, always the same, not rising and falling, the notes given deliberately, counted as averaging 12 to 10 seconds. The males would continue their loud song fearlessly until approached to within about eight feet, then ceasing abruptly they would almost at once fly into the darkness with a swift powerful zigzagging flight. In alert swiftness this species and *N. velox* are distinctive.

The present species is known only from the type locality, Jamesburg and Tuckerton, New Jersey, in addition to these given below.

Specimens Examined: Previously recorded 6. Here recorded 19, 17 males, 2 females.

Atsion, New Jersey, VIII, 30, 1911, (R. & H.), 1 ♂.

Port Republic, New Jersey, VIII, 24, 1914, (H.; in waste field in pine barrens), 1 ♂.

Mays Landing, New Jersey, VIII, 26 and 29, 1914, (H.; in boggy pine barrens), 6 ♂.

Pleasantville, New Jersey, VIII, 16, 1914, (H.; in truck garden stridulating after dark on corn stalk five feet from ground), 1 ♂.

NEOONOCEPHALUS CAUDELLIANUS (DAVIS)
Measurements (in millimeters)

♂	Number of specimens	Lateral length of vertex	Ventral length of vertex	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
	(6)	2.4-2.8	1.7-2	8-8.9	42-45.6	23.6-26.6	
	(2)	3-3	2-2.1	8.7-8.8	45.8-47.9	28.3-28.9	
♀							
	(2)	3.1-3.2	2.1-2.2	8-8.1	54.5-54.7	31.3-31.9	35.1-35.7

NEOONOCEPHALUS PALUSPIS (BLATCHLEY)
Measurements (in millimeters) of extremes

♂	Number of specimens	Lateral length of vertex	Ventral length of vertex	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
	(1)	2.3-2.8	1.3-1.8	6.3-7.8	28.6-32.2	15.2-18.7	
	(19)	2.8-3	1.8-2	7.1-8.1	28.3-31.2	17.8-18.8	
	(1)	2.6	1.6	7	31.4	19.1	
♀							
	(19)	2.6-3.2	1.6-2.1	5.6-7	28.1-35.9	15.9-21.8	15.4-20.4
	(7)	3.1-3.8	2.2-2.7	7.3-8.7	35-41.9	20.2-24.6	18.2-21.7
	(2)	3-2	2-2	8-3	45.3	27.3	21.6
	(1)	1	2.6	8.6	43.4	26.7	22

Swanton, New Jersey, VIII, 21, 1914, (H.; in fresh water marshy meadow choked with ferns, grasses and rushes), 3 ♂.

Cold Spring, New Jersey, VIII, 1910, (W. T. Davis), 2 ♂, [A. N. S. P.].

Yemassee, South Carolina, IX, 4, 1911, (R. & H.; in swampy undergrowth of low short-leaf pine woods), 2 ♀.

Billy's Island, Okcefenokee Swamp, Georgia, VII and IX, 1 to 5, 1912 and 1913, (J. C. Bradley), 2 ♂, [Cornell Univ.].

Atmore, Alabama, VI, 21, 1897, (A. P. Morse), 1 ♂, [Morse Cln.].

Neoconocephalus velox Rehn and Hebard (Pl. XVI, figs. 11B and 11C.)

1914. *Neoconocephalus velox* Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1914, p. 402. [Homestead, Florida.] (Unique male.)

The present insect shows nearest relationship to *N. palustris*, but differs decidedly in the considerably larger size and much more elongate form; vertex which tapers more gradually and evenly to the somewhat more broadly rounded apex; tegmina which are decidedly longer but even proportionately decidedly broader, with stridulating field of male more evenly coriaceous and stridulating vein alone prominent and broader; caudal femora with proximal portion less contrastingly swollen and areas adjacent to teeth of ventral margins not darkened.

The stridulating field of the male tegmen is proportionately small and broad, of the same size and form approximately as in small northern males of *N. melanorhinus*; the stridulating vein is heavy and of medium length with accompanying veins very weakly defined; veinlets of this field very weak.

Measurements (in millimeters)

♂	Lateral length of vertex	Ventral length of vertex	Length of pronotum	Length of tegmen	Length of caudal femur
Billy's Island, Georgia...	2.6	1.7	8.7	41.5	24
Homestead, Florida. <i>Type</i>	3	1.9	9	42	25.2

One of the caudal limbs of the specimen here recorded is aborted, no longer than the median limb, with only the median pair of the distal tibial spurs present. The ventral margins of the caudal femora are armed with small spines, internal 6-7, external 6-8 in number.

Both specimens before us are rather pale tawny olive in general coloration.

The song of this very shy and vigorous species is a loud and continuous buzzing. The species is known from but two specimens, though others were observed at Homestead, Florida; it is apparently a native of the undergrowth of the pine forests of the extreme southeastern United States.

Specimens Examined: Previously recorded 1. Here recorded, 1; 1 male.

Billy's Island, Okefenokee Swamp, Georgia, VI, 1912, (J. C. Bradley), 1 ♂, [A. N. S. P.].

Neoconocephalus palustris (Blatchley) (Pl. XVI, figs. 10B to 10E.)

1893. *Conocephalus palustris* Blatchley, Can. Ent., xxv, p. 89. [Vigo County, Indiana.] (Unique female.)

The present species is one of the most distinctive of the genus known from North America, showing nearer relationship to the peculiar *N. velox* than to any other species. The size of the males is small and the form slender; the females average distinctly larger and more robust, with abdomen unusually enlarged and ovipositor short and broad, distinctly broadest meso-distad. The insect has a generally more coriaceous appearance than the other species here considered, and the ventral margins of the caudal femora are distinctly darkened beneath each of the spines a distance equal to the length of the spine. The present species, unlike the others here treated, has the external of the ventral margins of the caudal femora bearing on an average more (but smaller as in the other species) spines than the internal.

The stridulating field of male tegmina is small and broad; the proximal three-fourths of stridulating vein is very heavy, the distal fourth is very weak, no heavier than weakly defined accompanying veins; the veinlets of this area are exceedingly weak.

The ventro-cephalic margins of the cephalic and median femora are armed with 0-3 small stout spines, normally 1-2; the ventral margins of the caudal femora are in the series before us armed normally with 7-8 small, short and only moderately slender spines which have their apices darkened, extremes—internal 3-9, external 5-8 in number.

For measurements see page 397.



FIG. 10 A
Neoconocephalus palustris
(Blatchley).
Raleigh,
North Carolina. Stridulating field of male tegmen. ($\times 3\frac{1}{2}$.)

In the female sex the green color form is strongly predominant, but in the series of males before us brown individuals are somewhat the more numerous. In the brown phase the variation is decided, extreme individuals are; of pale general coloration, Naples yellow; of dark general coloration, mummy brown.

The males of the present species were found to be at night very alert and shy, in New Jersey much the most difficult of the species to take excepting *N. caudellianus*. The method of escape is, however, to hide with agility in the tangles of vegetation in which the species is usually found, not to seek safety in flight. The song is a continuous dzēēēēēēēēēēēē, very high pitched (higher than that of *N. lyristes* or *N. retusus*) and very weak (as weak as that of *retusus*).

The series taken at Cornwells, Pennsylvania, was captured during the day by beating the tangled vegetation and particularly a small area of *Panicularia septentrionalis* in a marshy spot. In the latter plant the females were exceedingly numerous, nearly all being taken there. These specimens showed that in the daytime individuals are sluggish, moving but slowly about, but the clinging powers were found to be remarkable and the use of the spines on the limbs for this purpose was quickly apparent.

Probably owing to the very local distribution of the species, it is known from a number of widely separated localities; on the Atlantic coast from New Brunswick, New Jersey, south to Raleigh, North Carolina and westward from Vigo County, Indiana, south to New Orleans, Louisiana.

Specimens Examined: Previously recorded 1. Here recorded, 112; 36 males, 65 females and 11 immature females.

Cornwells, Bucks County, Pennsylvania, IX, 7, 1914, (H.; in marshy area), 11 ♂, 49 ♀, 6 juv. ♀.

Philadelphia Neck, Pennsylvania, IX, 21, 1904, (H. W. Wenzel), 1 ♀, [A. N. S. P.].

Gibson Point, Pennsylvania, VIII, 9, 1911, (H. Fox), 1 ♂, 4 juv. ♀; IX, 17, 1911, (H. Fox), 1 ♀, 1 juv. ♀, [A. N. S. P.].

Tinicum Island, Pennsylvania, IX, 29, 1913, (R.; in tall marsh vegetation), 1 ♀.

Reega, New Jersey, VIII, 16, 1914, (H.; stridulating at night on low oak in pine barrens), 1 ♂.

Tuckahoe, New Jersey, VIII, 26, 1914, (H.; in cat-tails and grasses in wet spots in fresh marsh), 19 ♂, 7 ♀.

Plummer's Island, Maryland, VIII, 27, 1909, (H. A. Allard), 1 ♂, 1 ♀; X, 1908, (Wm. Palmer), 1 ♂, [all U. S. N. M.].

Washington, District of Columbia, VIII to IX, 17, 1907, (H. A. Allard), 2 ♂, 2 ♀, [U. S. N. M.].

Raleigh, North Carolina, VIII, 22, 1906 and IX, 18, 1905, 2 ♀, [U. S. N. M.].

New Orleans, Louisiana, XI, 14, 1882, (Shufeldt), 1 ♀, [U. S. N. M.].

Neoconocephalus retusus (Scudder) (Pl. XVI, figs. 12B to 12L.)

1879. *Conocephalus retusus* Scudder, Proc. Bost. Soc. Nat. Hist., xx, p. 93. [Georgia.] (Unique female.)

Conocephalus dissimilis of American authors (except Harris).

Conocephalus triops of numerous recent American authors.

1899. *Conocephalus atlanticus* Bruner, Ent. News, x, p. 38. [Philadelphia Neck, Pennsylvania; New Jersey; Maryland; Virginia.]

It is surprising that recent American authors have generally considered this species *dissimilis* or *triops*, which names apply to the very different species which is last studied in the present paper.²⁵ The confusion surrounding the proper name for this species, doubtless, was at least partially the cause of Bruner's considering material before him undescribed, and erecting the synonymic *atlanticus*. We have his type series before us, the only material of the present species which he had, and, excepting a gradual but pronounced increase in size southward accompanied by a general proportionate elongation of the members, this smaller material is inseparable from Scudder's larger type of *retusus* from Georgia. Countless species of Orthoptera vary geographically in similar fashion, and we are convinced that such size variation without other difference is insufficient to constitute a geographic race; when other differences do occur geographically, or where certain organs are diminished while others increase in size, these characters being constant over certain areas of distribution (as in *Nemobius fasciatus* and *N. fasciatus socius*),²⁶ it is equally certain that geographic races do exist.

²⁵ This may in part have occurred through the various records of *retusus*, *atlanticus*, *triops*, *dissimilis* and *gladiator* in the New Jersey lists, which all apply to the present species. This really amazing confusion was due to the fact that J. B. Smith himself compiled these lists from a list compiled by the present senior author, adding other records from past literature and determinations of various other individuals, republishing the final results without consulting any authority on the subject.

²⁶ See Hebard, Proc. Acad. Nat. Sci. Phila., 1913, p. 422 (1913).

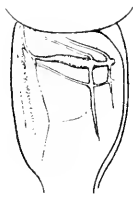


FIG. 12 A—*Neoconocephalus retusus* (Scudder), Chestnut Hill, Pennsylvania. Stridulating field of male tegmen. (3½.)

This species and *N. triops* are distinctive in the form of the vertex when compared with other North American species. From that insect, *retusus* is easily distinguished by the much smaller size, more attenuate form and proportionately very much longer ovipositor.

The stridulating field of the male tegmen is small and rather broad; the stridulating vein is of moderate length and rather weakly swollen, with accompanying veins not decided but well defined throughout their length; the veinlets of this area are weakly defined.

A minor difference is apparent in the male cercus of the present species, the longer (ventral) of the distal arms being distinctly compressed dorsad along the caudal margin.

Measurements (in millimeters)

♀	Number of specimens	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
Philadelphia Neck, Pennsylvania.....	(6)	6.5-7.3	29.8-40.7	20.8-23.7	31.4-37
Tinicum Island, Pennsylvania.....	(19)	5.3-7.1	23.5-32	16.9-23	27.7-34.3
Plummer's Island, Maryland.....	(1)	5.3	25.9	17.8	23.9
Washington, District of Columbia.....	(4)	6.9-7.1	32-36.4	22.8-24.4	33.3-36
Falls Church, Virginia.....	(3)	6.4-6.6	30.6-36.8	22-22.7	31.9-33.2
Asheville, North Carolina ..	(1)	6.8	33.5	21.8	32.5
Fayetteville, North Carolina	(4)	6-6.7	30.5-30.7	22-23.2	35.2-37
Florence, South Carolina. ...	(2)	6.9-7	33.7-37.4	24.2-25.1	36.5-37.4
Georgia. <i>Type</i>	(1)	6.9	37.7	28.1	31.3
Albany, Georgia.....	(1)	7.7	40.6	27.2	39.2
Thomasville, Georgia.....	(1)	7.8	42.7	27.4	39.7
Bainbridge, Georgia.....	(2)	7.1-7.8	36-41.1	24.4-28.9	36-38.2
St. Augustine, Florida.....	(2)	7.3-8	35.1-37.9	27.7-29.1	35-36.7
St. Louis, Missouri	(1)	7	35.8	22.7	33.9

The type measures in length of vertex, lateral 2.1, ventral 1.2; the males before us give the following extremes of these dimensions, lateral 1.8-2.2, ventral, 1.-1.4 mm. We have not given a table of measurements for the male sex, for, though averaging

slightly smaller, the male proportions are quite similar to those of the female.

The ventral margins of the cephalic and median femora are almost always unarmed, bearing rarely a single very small spine; the ventral margins of the caudal femora are armed with very small spines with the adjacent areas of the femora sometimes very weakly darkened; in the series before us the number of spines is: internal 2-8, external 2-5.

The green color phase is usually decidedly more numerous than the brown.

The present insect is an inhabitant of the grasses in waste fields, along the borders of marshes and in the drier portions of the marshes proper, and is usually to be found in large numbers. The song is of the exact pitch of that of *N. lyristes* but weaker (as in *N. palustris*), a continuous zčččččččččč. In New Jersey the species is the last of the genus to appear, reaching the adult condition toward the end of August.

The present species is known from Westville, Connecticut, southward to Daytona, Florida (the authors' Chokoloskee, Florida, record of this species is based on material the labelling of which we have subsequently found cause to question, and the record is therefore discredited). Westward in the Mississippi Valley region it is known from as far as Nugent, Mississippi, and northward to St. Louis, Missouri, and Morristown, Tennessee.

Specimens Examined: In addition to a large series previously recorded, we here record 184 specimens; 110 males, 58 females, 6 immature males and 10 immature females.

Yonkers, New York, X, 20, 1914, (H. A. Allard), 4 ♂, [U. S. N. M.].

Rockville Center, Long Island, New York, IX, 5, 1904, (B. H. Walden), 1 ♂, [Morse Cln.].

Staten Island, New York, IX, 19, (W. T. Davis), 1 ♂, [Hebard Cln.].

Middlesex County, New Jersey, X, 5, 1 ♂, [Hebard Cln.].

Riverton, New Jersey, IX, 8, 1901, (H. L. Viereck), 1 ♂, [A. N. S. P.].

Mullica River flats, Burlington County, New Jersey, VIII, 24, 1914, (H.; border of salt marsh), 1 juv. ♂.

Mays Landing, New Jersey, VIII, 29, 1914, (H.; in low herbage of marshy area), 1 ♂.

Reega, New Jersey, VIII, 29, 1914, (H.; occasional in undergrowth of pine barrens), 1 ♂, 1 juv. ♀.

Pleasantville, New Jersey, VIII, 17, 1914, (H.; grasses on edge of salt marsh), 1 juv. ♀.

- Ventnor, New Jersey, VIII, 26, 1914, (II.; marshy depression in sand area), 1 ♀, 1 juv. ♂, 1 juv. ♀.
- Margate City, New Jersey, VIII, 17, 1914, (II.; grasses on edge of marsh), 1 juv. ♂, 1 juv. ♀.
- Tuckahoe, New Jersey, VIII, 26, 1914, (II.; very common in fresh water marsh grasses), 22 ♂, 8 ♀.
- Cedar Springs, New Jersey, VIII, 26, 1914, (II.; adults occasional, immature examples numerous in areas of high grass near marsh), 6 ♂, 3 ♀, 1 juv. ♂, 1 juv. ♀.
- Petersburg, New Jersey, VIII, 31, 1910, (H. Fox; in boggy field), 1 ♂, 1 ♀, [A. N. S. P.].
- Cornwells, Pennsylvania, IX, 7, 1914, (II.; in marsh vegetation), 3 ♂, 3 ♀.
- Roslyn, Pennsylvania, X, 18, 1914, (B. Long), 1 ♂, [A. N. S. P.].
- Bluebell, Pennsylvania, X, 23, 1914, (H.; few stridulating in field on clear but chilly afternoon), 1 ♂.
- Ardley, Pennsylvania, VIII, 26, 1906, (B. Long), 3 ♂, [A. N. S. P.].
- Elkins Park, Pennsylvania, IX, 6, 1912, (B. Long; under electric light), 1 ♀, [A. N. S. P.].
- Chestnut Hill, Pennsylvania, IX, 6 to 19, 1903 to 1914, (II.; grassy uplands), 11 ♂, 1 ♀.
- Philadelphia Neck, Pennsylvania, IX, 29, 1913, (H.; grassy lowlands), 2 ♂.
- Gibson Point, Pennsylvania, IX, 17, 1911, (H. Fox), 1 ♀, [A. N. S. P.].
- Tinicum Island, Pennsylvania, IX, 9 to 29, 1903 to 1913, (R. & H.; grasses near marsh), 19 ♂, 19 ♀.
- Laurel, Maryland, (E. S. G. Titus), 1 ♂, [U. S. N. M.].
- Plummer's Island, Maryland, IX, 2 to 29, 1904 to 1907, (Caudell, W. L. McAtee), 3 ♂, 1 ♀, [U. S. N. M.].
- Washington, District of Columbia, X, 29, 1883, (L. Bruner), 1 ♂, [Hebard Cln.]; VIII, 24 to IX, 20, 1904 to 1906, (Caudell), 5 ♂, 4 ♀, [U. S. N. M.].
- Analostan Island, District of Columbia, IX, 6, 1912, (Caudell), 1 ♂, [U. S. N. M.].
- Rossllyn, Virginia, IX, 9, 1906, (F. Knab), 1 ♂, [U. S. N. M.].
- Falls Church, Virginia, IX, 4, 1906, (Caudell), 1 ♂, 3 ♀, [U. S. N. M.].
- Roanoke, Virginia, IX, 6, 1903, (A. P. Morse), 1 ♂, [Morse Cln.].
- Fayetteville, North Carolina, IX, 9, 1911, (R. & H.), 2 ♂, 4 ♀, 1 juv. ♀.
- Wrightsville, North Carolina, IX, 7, 1911, (R. & H.), 2 ♂.
- Winter Park, North Carolina, IX, 7, 1911, (R. & H.), 1 juv. ♂.
- Florence, South Carolina, IX, 6, 1911, (R. & H.), 3 ♂, 2 ♀, 3 juv. ♀.
- Atlanta, Georgia, VIII, 27, 1 ♂, [Ga. St. Cln.].
- Albany, Georgia, VIII, 1, 1913, (R. & H.), 1 juv. ♂; IX, 1, 1910, (J. C. Bradley), 1 ♀, [Ga. St. Cln.].
- Bainbridge, Georgia, IX, 3 to 7, 1913, (J. C. Bradley), 6 ♂, 2 ♀, [Ga. St. Cln.].
- Fargo, Georgia, VIII, 31, 1913, (J. C. Bradley), 1 juv. ♀, [Cornell Univ.].

South Jacksonville, Florida, IX, 28, 1913, (W. T. Davis), 1 ♂. [Davis Cln.]

Daytona, Florida, XI, 11, 1911, (G. P. Englehardt), 1 ♀. [Bklyn. Inst. A. & S.]

St. Louis, Missouri, IX, 5, 1876, 1 ♀, [U. S. N. M.]

Morristown, Tennessee, VIII, 27, 1903, (A. P. Morse), 1 ♂. [Morse Cln.]

Chehawhaw Mountain, Alabama, 2400 ft., VII, 13, 1905, (A. P. Morse), 1 ♂. [Morse Cln.]

Nugent, Mississippi, VII, 20, 1905, (A. P. Morse), 1 ♀. [Morse Cln.]

Neoconocephalus triops (Linnaeus) (Pl. XVI, figs. 13B to 13E.)

1758. [*Gryllus* (*Tettigonia*)] *triops* Linnaeus, Syst. Nat., Ed. IX, i, p. 130. ["Indiis," probably the West Indies.]

1838. [*conocephalus*] *obtusus* Burmeister, Handb. Ent., ii, Abth. ii, pt. i, p. 705. [Unknown locality.]

1839. *Conocephalus dissimilis* Serville, Hist. Nat. Ins., Orth., p. 518. [North America; Latreille's collection, very possibly from Louisiana.]

1859. *Conocephalus mexicanus* Saussure, Rev. et Mag. Zool., 2e Ser., xi, p. 208. [Mexico.]

1862. *Conocephalus dissimilis* Harris, Ins. Inj. Veg., Flint Ed., p. 164. [South Carolina.]

1874. *Conocephalus triops* Stål, Recens. Orth., ii, p. 110.

1878. *Conocephalus hebes* Scudder, Proc. Post. Soc. Nat. Hist., xx, p. 92. (In part.) [New Orleans, Louisiana.]

1891. *Conocephalus fusco-striatus* Redtenbacher, Verh. zool.-bot. Ges. Wien, xli, p. 399. [Georgia; Missouri; Carolina; Texas; Mexico; Cuba; Hayti; Quita; Antilles.]

1907. *Neoconocephalus mexicanus* var. *tibialis* Karny, Abh. k. k. zool.-bot. Ges. Wien, iv, p. 33. [North Carolina.]

(Recent authors in America have generally considered the green form *mexicanus* and the brown form *fusco-striatus*.)

The synonymy of *triops*, *obtusus* and *dissimilis* has long been established. The descriptions originally given under each of these names are wholly uncertain, but Stål, in 1874, having examined the type of *triops* and studied Harris' adequate description of 1862 of *dissimilis* of Serville, stated these two to be the same. Serville's species is unquestionably that which we have been calling *mexicanus* (green color phase), and *fusco-striatus* (brown color phase), as all other recent American authors have done, but, unlike the majority of these, we have not applied the name *triops* to the form properly designated as *retusus*. It is not surprising that Saussure, in 1859, described *mexicanus*, thereby erecting another

synonym for *triops*, for at that time the descriptions then extant of the species were all very inadequate; but the inclusion of material of the present species in the series of *hebes* described by Scudder, in 1878, can only be attributed to carelessness, and Redtenbacher's evident naming of the brown color phase, in 1891, as *fusco-striatus* should have been avoidable to one whose knowledge of the genus was so extensive. Karny's variety *tibialis* is even less deserving of name recognition, based solely on dark examples of the brown color phase.

In recording material from the United States, the names *niëtoi* and *obscurellus* have been used, the former a number of times and the latter once;³⁰ the majority of these records we know apply to the present insect and we feel certain that the others do likewise, these species (of which Saussure's type of *Conocephalus niëti* is apparently a member of the genus *Homorocoryphus*) being found south of the region at present under consideration.

The present insect is easily recognized, and as it is the only large and robust species of the genus having a very short broad vertex which is found in the region under consideration.

The stridulating field of the male tegmen is of medium size and rather broad; the stridulating vein is heavy and rather long, with accompanying veins heavy where they join this vein, which, at its distal extremity, has two very small but conspicuous pits, one on each side; the veinlets of this area are exceedingly numerous and extremely weakly defined.

The male cerci of the present species are slightly different from those of the other forms here considered, having a more or less decided knoblike production at the base of the distal arms.

The ovipositor is distinctly compressed beyond the enlarged basal portion; distad the shaft has a distinct but very weak downward curvature.

The moderate amount of size variation which occurs in this species has no geographic significance, as is shown by the large series before us.

³⁰ It is this record of Saussure and Pictet, Biol. Cent. Amer., Orth., I, p. 392 (1898), which unfortunately causes the name *obscurellus* to appear in Scudder's Catalogue of the Described Orthoptera of the United States and Canada. See foot note No. 35.

Measurements (in millimeters)

♀	Lateral length of vertex	Ventral length of vertex	Width of vertex beyond eye	Length of pronotum	Length of tegmen	Length of caudal femur	Length of ovipositor
Atlanta, Georgia	2.1	1.6	1.9	9.1	48.4	26.1	24.6
Thomasville, Georgia	2.3	1.7	1.9	9	48.7	25.9	25.3
Bainbridge, Georgia	2.3	1.8	2	9	50.8	26.6	26
Homestead, Florida	2.3	1.7	1.9	7.7	42.5	23.1	23.8
Hot Springs, Arkansas	2.4	1.9	2	9.2	49.9	25.8	26.1
Hot Springs, Arkansas	2.3	1.7	1.9	8.3	47.8	25.4	25.6
Tiger Mills, Texas	2.8	2	2.1	9.7	53.2	28.2	27.1
Beaumont, Texas	2.3	1.7	1.8	8.1	43.3	24.4	20.9
Gregory, Texas	2.3	1.8	1.8	8.1	43.4	22.9	22.3
Brownsville, Texas	2.4	1.7	2	9.2	51.7	27.7	25.1
Yuma, Arizona	2.6	1.6	1.9	8.2	45.7	24.9	23.8

We have not given a table of measurements for the male sex, for, though averaging slightly smaller, the male proportions are quite similar to those of the female.

The cephalic and median femora are unarmed or supplied with very small, moderately heavy spines on the cephalic margins, in the series before us the range being 0-3; the caudal femora have the ventral margins armed with very small spines (smallest on the external margins), the extremes in the series before us are, internal 6-11, external 6-10 in number. Occasionally in individuals of both green and brown color phases the areas beneath each of these very small spines are darkened, but seldom as noticeably as in *N. palustris*.

In the brown color phase variation exists with degree of intensity of general coloration. Very pale examples often have the femora and tibiae of the general coloration (such material having been recorded occasionally as *obscurellus*), darker specimens have the ventral margins of the femora very dark (these appearing in the literature frequently as *fusco-striatus*) while the extreme intensity of coloration found in the darkest specimens have such markings still more decided, the tibiae correspondingly infuscated, the jaws more yellow, and the lateral stripes of the pronotum more distinct, (unfortunately described by Karny as var. *tibialis*). The types of *triops*, *obtusus*, *dissimilis* and *mexicanus* are of the green color phase; the latter name has been

generally used to designate green individuals of the present species by recent American authors.

The green color phase is somewhat more frequently encountered than the brown.

The present species is found almost everywhere in the southern United States; it inhabits the forest undergrowth, fields and semi-marsh situations. Over much of its range it is one of the earliest Tettigonids to appear, adults being found in south Georgia in late March. The few midsummer records, accompanied by numerous early winter captures and the finding of specimens in midwinter apparently hibernating, suggest that the species may be double brooded, or that appearing adult very late in the fall it is one of the few species of the family in that latitude to pass the winter in the adult condition. The song is a very loud, sharp, z-z-z-z-z-z-z-z-z-z-z-z-z-z, indefinitely prolonged; when closely approached a constantly recurring impulse gives an audible krzzzzkrzzzzkrzzzz with no break, though a recurrent clicking is to be heard, as described by us recently.³¹ It was heard frequently at twilight in the spring of 1904 at Thomasville, Georgia, the song of brown males being at that time of day not as intense as that of green males previously captured at night; this leading the junior author to think that the supposed *fusco-striatus* was a less loud singer than the supposed *mexicanus*.³² Such mistakes are likely to occur in field observations unless extreme care is exercised.³³

The species is widely and generally distributed from Washington, District of Columbia, southward over the entire southeastern United States and thence westward to central Texas, the westernmost record in this region being Carrizo Springs, Texas, and the northernmost definite record Stillwater, Oklahoma. In the Pacific drainage of the southwest, the species is known on the Mexican border from Benson, Arizona, to San Diego and Los Angeles, California.

Specimens Examined: Previously recorded as *mexicanus* and *fusco-striatus*, 36. Here recorded, 109; 43 males, 59 females, 1 immature male and 6 immature females.

³¹ Proc. Acad. Nat. Sci. Phila., 1914, p. 402 (1914).

³² Proc. Acad. Nat. Sci. Phila., 1904, p. 795 (1905).

³³ See foot note No. 9.

- Town Bank, Cape May County, New Jersey, X, 24, 1909, (H. W. Fowler; dead on strand, very possibly washed ashore in drift), 1 ♀,³⁴ [A. N. S. P.].
- Washington, District of Columbia, II, 1914, (B. A. McKinney; in market), 1 ♀; IX, 10, 1908, (E. L. Walter), 1 ♂; X, 2, 1910, (A. N. Caudell; at light), 1 ♂, [all U. S. N. M.].
- Hampton, Virginia, II, 4, 1892, 1 ♀, [U. S. N. M.].
- Virginia Beach, Virginia, 1907, (Hopkins), 1 ♂, 1 ♀, [U. S. N. M.].
- Fayetteville, North Carolina, IX, 9, 1911, (R. & H.), 1 juv. ♂.
- Florence, South Carolina, IX, 6, 1911, (R. & H.), 1 juv. ♀.
- Yemassee, South Carolina, IX, 4, 1911, (R. & H.), 1 juv. ♀.
- Atlanta, Georgia, VIII, 30, 1913, (J. C. Bradley), 1 ♀, [Ga. St. Cln.].
- Jesup, Georgia, IX, 1, 1911, (R. & H.); bull rushes in sink in pine forest, 1 ♀.
- St. Simon's Island, Georgia, VIII, 30, 1911, (R.); IX, 22, 1910, (J. C. Bradley), 1 ♂, [Ga. St. Cln.].
- Cumberland Island, Georgia, VIII, 31, 1911, (H.); in beach plants), 1 juv. ♀.
- Billy's Island, Okefenokee Swamp, Georgia, VI, 1912, (J. C. Bradley), 3 ♀, [Cornell Univ.].
- Thomasville, Georgia, III, 1906, (H.); undergrowth in long-leaf pine woods), 2 ♂.
- Bainbridge, Georgia, IX, 17 to X, 19, 1910, (J. C. Bradley), 2 ♂, [Ga. St. Cln.].
- Jacksonville, Florida, IX, 28, 1913, (W. T. Davis), 1 ♂, [Davis Cln.].
- Daytona, Florida, XI, 11, 1911, (G. P. Englehardt), 3 ♂, [Bklyn. Inst. A. & S.].
- Hastings, Florida, IV to IX, 1900 and 1901, (A. J. Brown), 1 ♂, 4 ♀, [Morse Cln.].
- Brooksville, Florida, VIII, 5, 1913, (E. R. Sasser), 1 ♂, [U. S. N. M.].
- Miami, Florida, III, 5, 1905, (H. G. Dyar), 1 ♂,³⁵ [U. S. N. M.].
- Key Largo, Florida, III, 1898, (G. N. Collins), 1 ♀, [U. S. N. M.].
- Agricultural College, Mississippi, 1892, (C. M. Weed), 1 ♂, [Hebard Cln.].
- Hattiesburg, Mississippi, VII, 17, 1905, (A. P. Morse), 1 ♂, [Morse Cln.].

³⁴ This specimen may very possibly have been washed ashore in drift; this record and also that of a specimen found in the winter in a bunch of spinach at West Newton, Massachusetts and in the Morse Collection, we do not advise using in mapping the species' distribution, as one is very possibly and the other undoubtedly an accidental occurrence.

³⁵ Redtenbacher has, we feel certain, recorded specimens of *Triops* as *Conoccephalus nittoi* from Texas and Louisiana, Verh. k. k. zool.-bot. Ges. Wien, XLI, p. 405 (1891), which has unfortunately caused Scudder to include this name in his Catalogue of the described Orthoptera of the United States and Canada. Caudell has, as a result, recorded this specimen as *nittoi*, Ent. News, XVI, p. 219 (1905).

- Biloxi, Mississippi, (Alice Tracy), 1 ♀, [Hebard Cln.].
 Gulfport, Mississippi, VII, 21, 1905, (A. P. Morse), 1 ♀, [Morse Cln.].
 Milneburg, Louisiana, VII, 22, 1905, (A. P. Morse), 1 ♀, [Morse Cln.].
 New Orleans, Louisiana, (Shufeldt), 1 ♂, 1 ♀, [U. S. N. M.].
 Daleville, Arkansas, IX, 13, 1904, (C. R. Jones), 1 ♂, [U. S. N. M.].
 Hot Springs, Arkansas, IV, 23 to 26, 1906, (C. S. Hebard; in hotel at night), 4 ♀. [Hebard Cln.].
 Fort Towson, Red River, Arkansas, (L. A. Edwards), 1 ♀, [M. C. Z.].
 Paris, Texas, III, 14 to IX, 23, 1904, (F. C. Bishopp, A. A. Girault, W. D. Hooker; 1 ♀ at sugar), 2 ♂, 5 ♀, [U. S. N. M.].
 Denison, Texas, VIII, 11, 1905, (A. P. Morse), 1 juv. ♀, [Morse Cln.].
 Dallas, Texas, XI, 10, 1903, (at light), 1 ♂; XII, 17, 1908, (E. S. Tucker; at light), 1 ♀; 4 ♂, 1 ♀, [U. S. N. M. and Hebard Cln.].
 Tiger Mills, Texas, (F. G. Schaupp), 2 ♀, [Hebard Cln.].
 Shovel Mountain, Burnet County, Texas, XI, 16, 1901, (F. G. Schaupp), 1 ♂, [A. N. S. P.].
 Beaumont, Texas, VII, 23, 1912, (H.; swampy spots in pine woods), 1 ♂, 2 ♂, 1 juv. ♀; X, 11, 1904, (E. S. G. Titus), 1 ♂, 3 ♀, [U. S. N. M.].
 Virginia Point, Texas, VII, 21, 1912, (H.; near salt marsh), 1 ♀.
 Washington County, Texas, IV, 1886, 6 ♀, [Hebard Cln.].
 Rosenberg, Texas, VII, 25 and 26, 1912, (H.; in high grasses along streams), 2 ♂, 2 ♀.
 Victoria, Texas, VII, 26 and 27, 1912, (H.; scarce in grassy field), 1 ♂; XII, 27, 1910, (J. D. Mitchell; apparently hibernating in rotten log), 2 ♂, 1 ♀, [U. S. N. M.].
 Goliad, Texas, IX, (J. D. Mitchell), 1 ♀, [U. S. N. M.].
 Beeville, Texas, VII, 28, 1912, (H.), 1 ♀.
 Corpus Christi, Texas, II, 2, 1904, (A. A. Girault), 1 ♂, [U. S. N. M.]; VII, 29, 1912, (H.), 1 ♂.
 Gregory, Texas, VII, 30, 1912, (H.; very common in marshy area of high grass, males very noisy after dark), 5 ♂, 2 ♀.
 Lyford, Texas, VIII, 6 and 7, 1912, (R. & H.), 1 ♂.
 Brownsville, Texas, VII, 31 to VIII, 5, 1912, (H.), 1 ♀.
 Piper Plantation, Brownsville, Texas, VIII, 3, 1912, (H.; high green grasses in opening of jungle), 1 ♂.
 San Antonio, Texas, VIII, 15 and 16, 1912, (H.), 1 juv. ♀.
 Carrizo Springs, Texas, IX, 1884, (A. Wadgymer), 1 ♀, [Hebard Cln.].
 Benson, Arizona, X, 13, 1910, (R. & H.; high weeds in San Pedro River valley), 1 ♀.
 Yuma, Arizona, X, 1, 1910, (H.; night at light in town), 1 ♂, 1 ♀.
 Los Angeles, California, (Coquillett), 1 ♀, [Hebard Cln.].
 San Diego, California, (A. L. Babcock), 1 ♀, [Morse Cln.].

EXPLANATION OF PLATES

All the figures on these plates are six times the size of nature.

Plate XV

FIG. 1 B—*Neoconocephalus exiliscanorus* (Davis). Staten Island, New York. *Type*. Male. Lateral view of fastigium.

FIG. 1 C—*Neoconocephalus exiliscanorus* (Davis). Staten Island, New York. *Type*. Male. Ventral view of fastigium.

FIG. 1 D—*Neoconocephalus exiliscanorus* (Davis). Washington, District of Columbia. Female. Lateral view of fastigium.

FIG. 1 E—*Neoconocephalus exiliscanorus* (Davis). Washington, District of Columbia. Female. Ventral view of fastigium.

FIG. 2 B—*Neoconocephalus nebrascensis* (Bruner). West Point, Nebraska. *Type*. Male. Lateral view of fastigium.

FIG. 2 C—*Neoconocephalus nebrascensis* (Bruner). West Point, Nebraska. *Type*. Male. Ventral view of fastigium.

FIG. 2 D—*Neoconocephalus nebrascensis* (Bruner). Omaha, Nebraska. *Allotype*. Female. Lateral view of fastigium.

FIG. 2 E—*Neoconocephalus nebrascensis* (Bruner). Omaha, Nebraska. *Allotype*. Female. Ventral view of fastigium.

FIG. 3 B—*Neoconocephalus melanorhinus* (R. & H.). Cape May Court House, New Jersey. Male. Lateral view of fastigium.

FIG. 3 C—*Neoconocephalus melanorhinus* (R. & H.). Cape May Court House, New Jersey. Male. Ventral view of fastigium.

FIG. 3 D—*Neoconocephalus melanorhinus* (R. & H.). Cedar Keys, Florida. *Type*. Female. Lateral view of fastigium.

FIG. 3 E—*Neoconocephalus melanorhinus* (R. & H.). Cedar Keys, Florida. *Type*. Female. Ventral view of fastigium.

FIG. 4 B—*Neoconocephalus lyristes* (R. & H.). Chokoloskee, Florida (?). *Type*. Male. Lateral view of fastigium.

FIG. 4 C—*Neoconocephalus lyristes* (R. & H.). Chokoloskee, Florida (?). *Type*. Male. Ventral view of fastigium.

FIG. 5 B—*Neoconocephalus ensiger* (Harris). Saunderstown, Rhode Island. Male. Lateral view of fastigium.

FIG. 5 C—*Neoconocephalus ensiger* (Harris). Saunderstown, Rhode Island. Male. Ventral view of fastigium.

FIG. 5 D—*Neoconocephalus ensiger* (Harris). Saunderstown, Rhode Island. Female. Lateral view of fastigium.

FIG. 5 E—*Neoconocephalus ensiger* (Harris). Saunderstown, Rhode Island. Female. Ventral view of fastigium.

FIG. 6 B—*Neoconocephalus robustus robustus* (Scudder). Wesquage Beach, Rhode Island. Male. Lateral view of fastigium.

FIG. 6 C—*Neoconocephalus robustus robustus* (Scudder). Wesquage Beach, Rhode Island. Male. Lateral view of fastigium.

FIG. 6 D—*Neoconocephalus robustus robustus* (Scudder). Atsion, New Jersey. Female. Lateral view of fastigium.

FIG. 6 E—*Neoconocephalus robustus robustus* (Scudder). Atsion, New Jersey. Female. Ventral view of fastigium.

FIG. 7 B—Intermediate between *Neoconocephalus robustus robustus* and *N. r. crepitans*. Sea Isle City, New Jersey. Male. Lateral view of fastigium.

FIG. 7 C—Intermediate between *Neoconocephalus robustus robustus* and *N. r. crepitans*. Sea Isle City, New Jersey. Male. Ventral view of fastigium.

Plate XVI

FIG. 8 B—*Neoconocephalus robustus crepitans* (Scudder). Lincoln, Nebraska. Male. Lateral view of fastigium.

FIG. 8 C—*Neoconocephalus robustus crepitans* (Scudder). Lincoln, Nebraska. Male. Ventral view of fastigium.

FIG. 8 D—*Neoconocephalus robustus crepitans* (Scudder). Lincoln, Nebraska. Female. Lateral view of fastigium.

FIG. 8 E—*Neoconocephalus robustus crepitans* (Scudder). Lincoln, Nebraska. Female. Ventral view of fastigium.

FIG. 8 F—*Neoconocephalus robustus crepitans* (Scudder). St. Louis, Missouri. Female. Lateral view of fastigium.

FIG. 8 G—*Neoconocephalus robustus crepitans* (Scudder). St. Louis, Missouri. Female. Ventral view of fastigium.

FIG. 9 B—*Neoconocephalus caudellianus* (Davis). Tuckerton, New Jersey. Male. Lateral view of fastigium.

FIG. 9 C—*Neoconocephalus caudellianus* (Davis). Tuckerton, New Jersey. Male. Ventral view of fastigium.

FIG. 10 B—*Neoconocephalus palustris* (Blatchley). Raleigh, North Carolina. Male. Lateral view of fastigium.

FIG. 10 C—*Neoconocephalus palustris* (Blatchley). Raleigh, North Carolina. Male. Ventral view of fastigium.

FIG. 10 D—*Neoconocephalus palustris* (Blatchley). Cornwells, Pennsylvania. Female. Lateral view of fastigium.

FIG. 10 E—*Neoconocephalus palustris* (Blatchley). Cornwells, Pennsylvania. Female. Ventral view of fastigium.

FIG. 11 B—*Neoconocephalus velox* (R. & H.). Homestead, Florida. *Type*. Male. Lateral view of fastigium.

FIG. 11 C—*Neoconocephalus velox* (R. & H.). Homestead, Florida. *Type*. Male. Ventral view of fastigium.

FIG. 12 B—*Neoconocephalus retusus* (Scudder). Chestnut Hill, Pennsylvania. Male. Lateral view of fastigium.

FIG. 12 C—*Neoconocephalus retusus* (Scudder). Chestnut Hill, Pennsylvania. Male. Ventral view of fastigium.

FIG. 12 D—*Neoconocephalus retusus* (Scudder). St. Augustine, Florida. Male. Lateral view of fastigium.

FIG. 12 E—*Neoconocephalus retusus* (Scudder). St. Augustine, Florida. Male. Ventral view of fastigium.

FIG. 12 F—*Neoconocephalus retusus* (Scudder). Chestnut Hill, Pennsylvania. Male. Lateral view of fastigium.

FIG. 12 G—*Neoconocephalus retusus* (Scudder). Chestnut Hill, Pennsylvania. Male. Ventral view of fastigium.

FIG. 12 H—*Neoconocephalus retusus* (Scudder). New Brunswick, New Jersey. Female. Lateral view of fastigium.

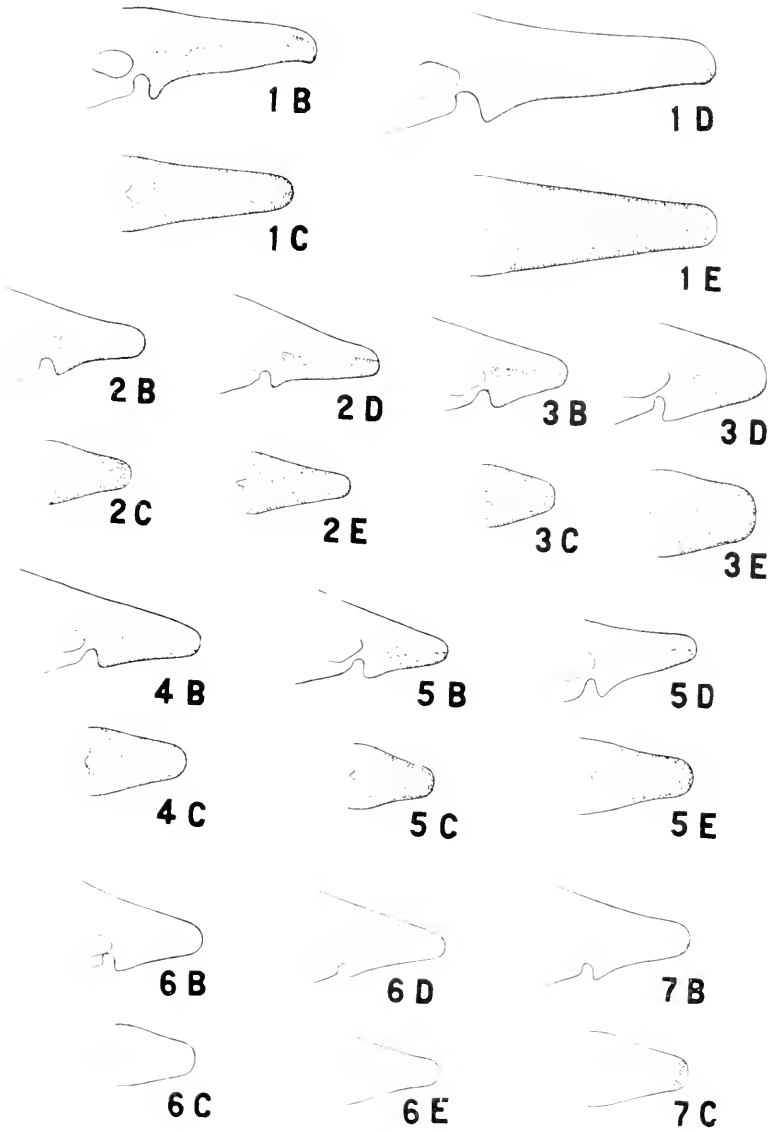
FIG. 12 I—*Neoconocephalus retusus* (Scudder). New Brunswick, New Jersey. Female. Ventral view of fastigium.

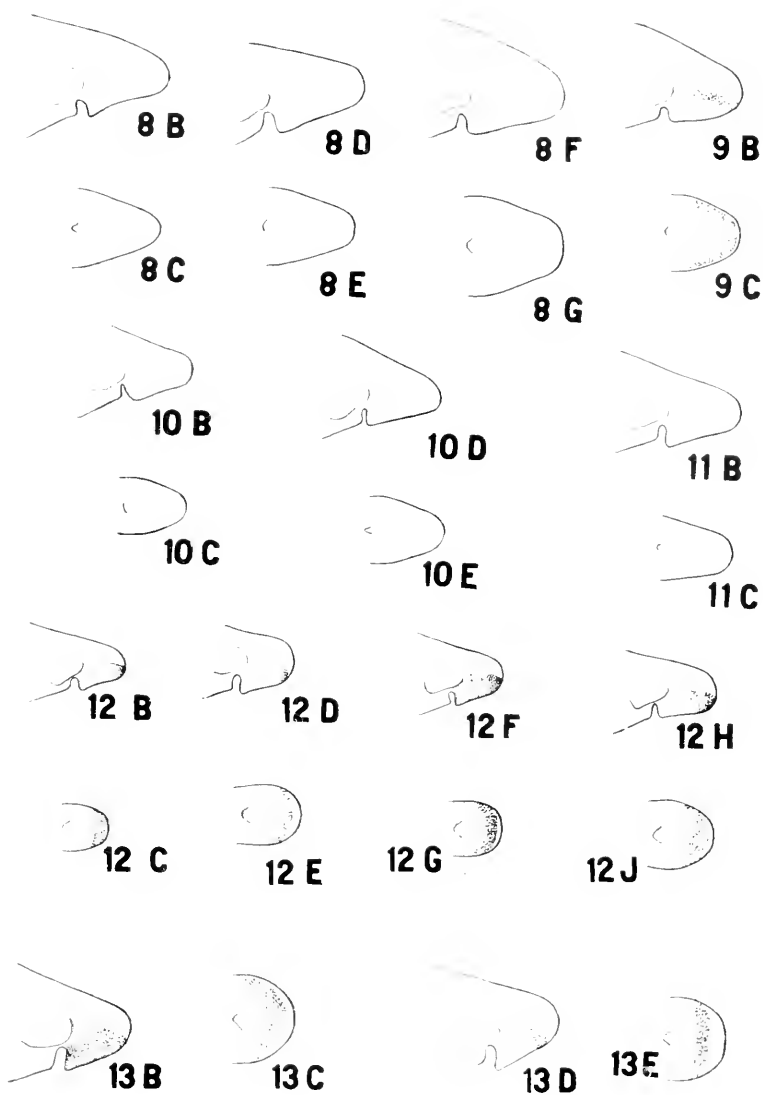
FIG. 13 B—*Neoconocephalus triops* (Linnaeus). Thomasville, Georgia. Male. Lateral view of fastigium.

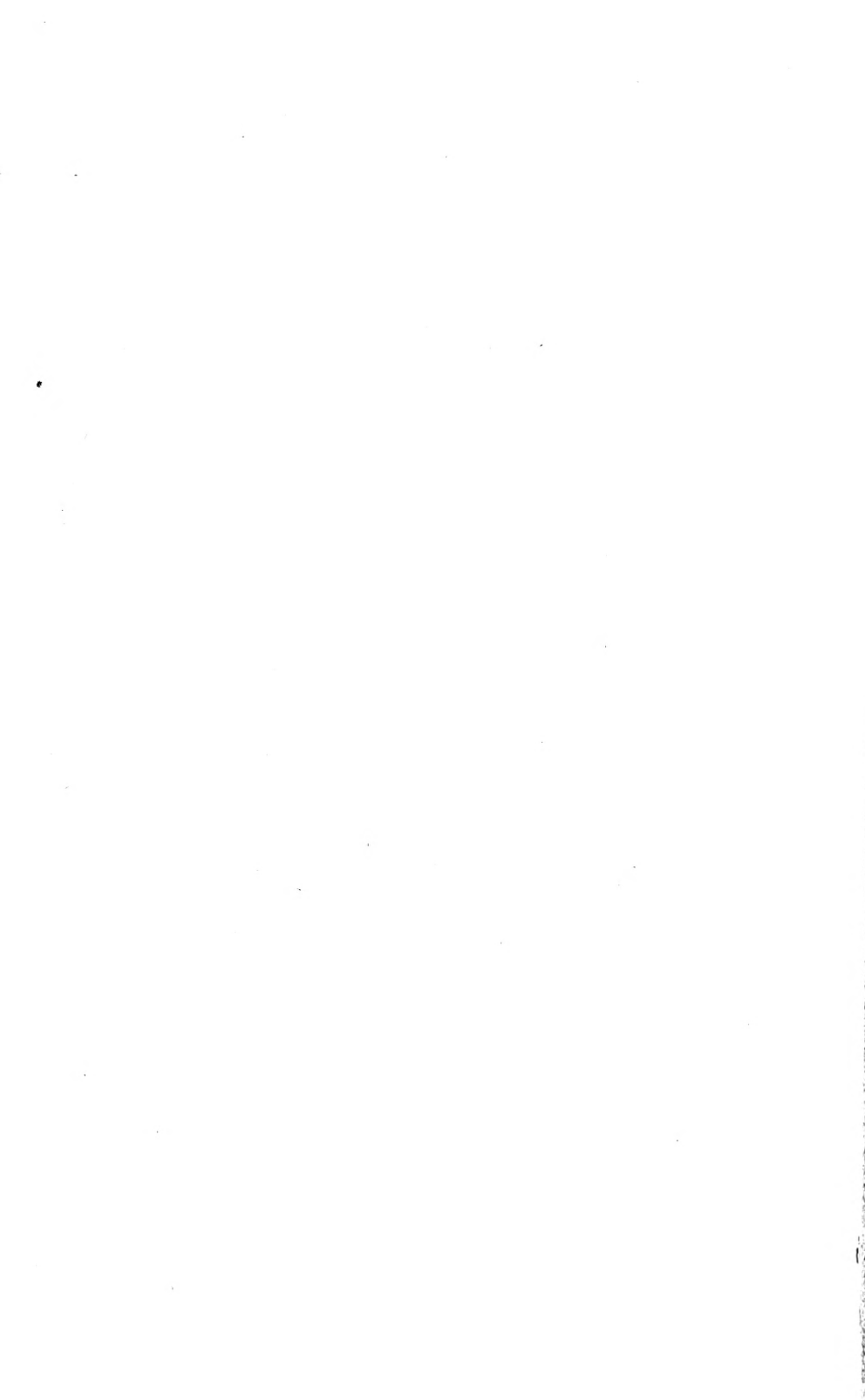
FIG. 13 C—*Neoconocephalus triops* (Linnaeus). Thomasville, Georgia. Male. Ventral view of fastigium.

FIG. 13 D—*Neoconocephalus triops* (Linnaeus). Thomasville, Georgia. Female. Lateral view of fastigium.

FIG. 13 E—*Neoconocephalus triops* (Linnaeus). Thomasville, Georgia. Female. Ventral view of fastigium.

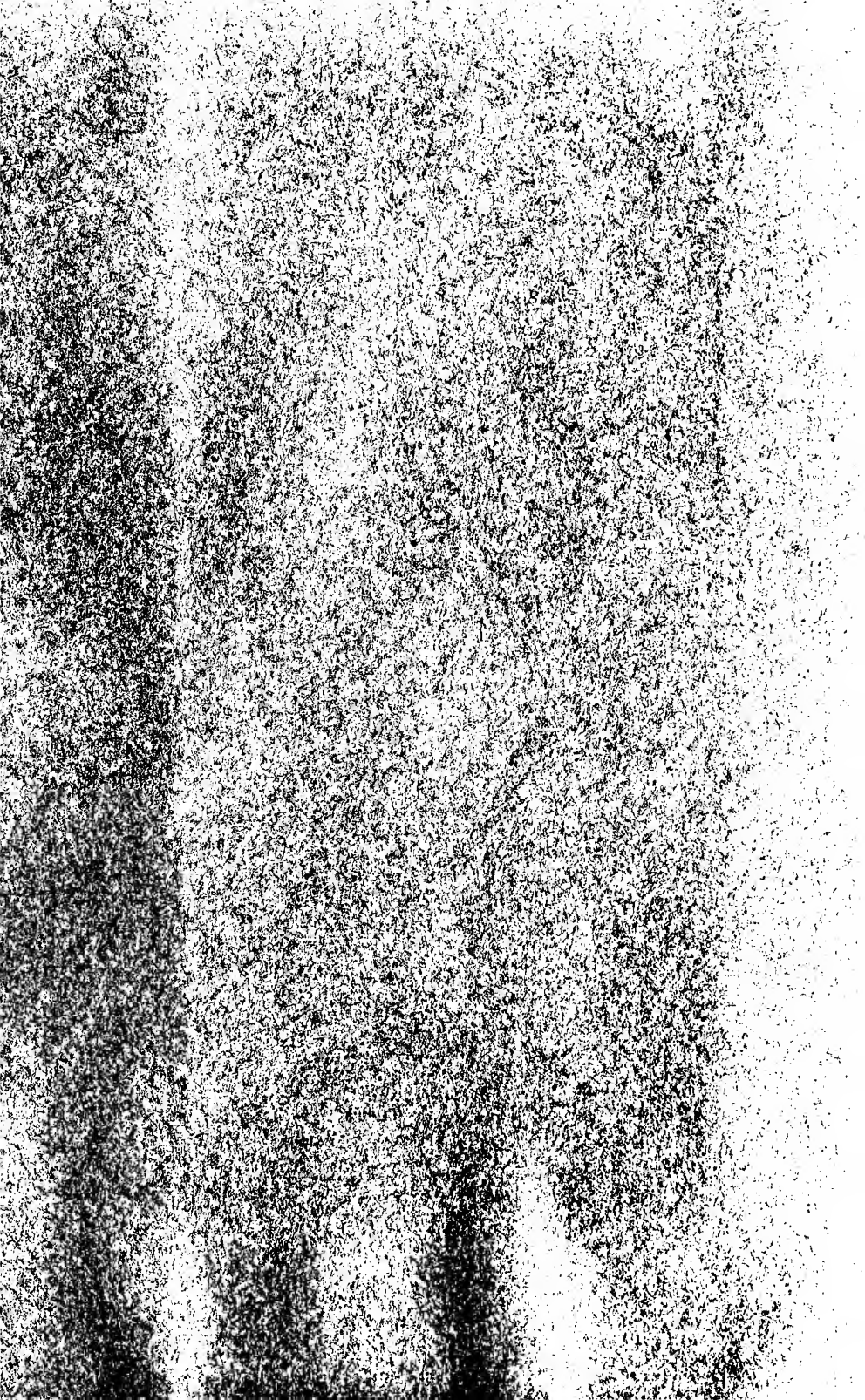






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