THE DECTICINÆ (A GROUP OF ORTHOPTERA) OF NORTH AMERICA

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The Decticinæ are a group of locustians which are readily differentiated by their appearance from all other Orthoptera, except certain Stenopelmatinæ. The presence of wings will usually serve to distinguish them from the Stenopelmatinæ,[a] though they are generally small, especially in the female, where they are sometimes even absent. The presence of two long-winged genera breaks into the otherwise compactness of the group, making its exact definition more difficult.

The members of this group are widely distributed over the country, but are more numerous in the South and West. As a rule the species are local or very rare, but the members of two genera, *Anabrus* and *Peranabrus*, especially the former, occur in incalculable numbers, doing immense damage to cultivated crops. While most of our Decticinæ are probably primarily herbivorous, there is little doubt that many, very likely most, of them are at times carnivorous. The cannibalism of *Anabrus* and *Peranabrus* is well authenticated, and members of other genera are known to eat other insects as well as individuals of their own kind.

The life histories of the members of this interesting group are not well known. Such facts as are known regarding the habits and development of the species are given under the discussion of the various forms in this paper. Many of the species are probably nocturnal or crepuscular in habit, though certain species of some genera, *Anabrus*, *Atlanticus*, etc., are active during the day.

The natural haunts of most of the forms seem to be in grassy fields or in open woods, where they hop about in exposed positions, in striking contrast to the habits of *Ceuthophilus* and other stenopelmatid forms, which live secluded lives in caves, hollow trees, etc.

[a] *Cyphoderris* is the only winged genus of the Stenopelmatinæ found in our United States fauna, though in other regions a number of winged genera occur.

While most of the Decticinæ are winged, two genera, *Capnobotes* and *Anoplodusa*, have organs of flight sufficiently developed for flying. In most cases the wings are aborted, and the elytra, while usually larger than the wings, are useless for purposes of flight, though in the case of the males of some species they are admirably adapted to the production of sound, the tympanum being extremely well developed.

Aside from the species of *Anabrus* and *Peranabrus*, which have been variously called western cricket, mormon-cricket, coulee-cricket, etc., the members of this group have received few popular names. In a broad sense they have been called Jerusalem crickets. The name camel cricket, so far as known to the writer, is not applied to members of this group, being used only for the wingless stenopelmatid genus *Ceuthophilus*. In northern Europe certain common species of Decticinæ are known as "wart-eaters" by the peasants, who cause them to bite off warts, the belief being that warts thus injured will return no more.

In the preparation of this paper I have studied specimens of all the species. Besides the material of the U. S. National Museum I have examined that in the Scudder collection, the collections of the Academy of Natural Science of Philadelphia, of the American Museum of Natural History in New York, of the Museum of the Institute of Arts and Sciences in Brooklyn, New York, and the material in the collections of the agricultural experiment stations of Colorado and Washington. In addition to the foregoing material the private collections of Profs. Laurence Bruner, A. P. Morse, and W. S. Blatchley were examined. Probably the most valuable collection studied was that of Dr. S. H. Scudder, in Cambridge, Massachusetts. Several weeks were spent examining this famous collection, access to it and facilities for its study having been accorded me by Mr. Samuel Henshaw, curator in the Museum of Comparative Zoology. Without access to this collection a satisfactory revision of the Decticinæ would scarcely have been possible, and for the privilege of examining it I am grateful to those concerned. Especial thanks are due Professor Bruner, who, in addition to allowing me free and unrestricted access to his rich collection, presented the National Museum with many desirable specimens, some rare, others unique.

The Decticinæ, as represented in North America, are defined as follows:

Tarsi more or less depressed, the first two segments longitudinally sulcate laterally; anterior tibiæ with a slit-like foramina near the base on each side and with an apical spine on the outer side above; anterior coxæ spined. Antennæ inserted between the eyes, nearer the summit of the occiput than the upper margin of the labrum. Posterior tarsus with a free plantula at the base of the first joint. Organs of flight,

except in *Capnobotes* and *Anoplodusa*, aborted or shorter than the abdomen.

The possession of a free plantula below the base of the posterior tarsus is usually a conspicuous character (fig. 1 *p*.), but in some forms it is not so obvious, though always distinct. In many genera there is visible between the cerci of the male, below or by the side of the supraanal plate, two paired organs, usually more or less compressed. These are called supragenital-or infracercal-plates. They are generally obscure or wholly invisible, being hidden beneath the last abdominal segment, but sometimes they are more prominent than the cerci, as in *Aglaothoraæ* and *Neduba*.

The cerci of the male are usually of various shapes and usually furnished with teeth, furnishing good synoptic characters, but in a few genera they are simple, like those of the females. The last abdominal segment of the males is often of various shapes. As used here the last abdominal segment means the apical portion only, not the whole segment.

We have twenty genera of Decticinæ in North America. Most of the described species have been characterized by Dr. Scudder, and the genera put in tabular form by the same author.[a] His classification is based partially upon the armature of the anterior tibiæ, a character which I find most unreliable. This character is less used in the classifications of Herman[b] and Brunner.[c]

FIG. 1.—SIDE VIEW OF A FOOT SHOWING THE PLANTULA (*p*) BELOW THE FIRST TARSAL SEGMENT.

In the definition of species I find that the cerci of the male furnish valuable characters. For the differentiation of the genera I have constructed a table based on somewhat artificial characters. Many writers maintain that a table must represent the natural sequence of the subjects treated and sacrifice the question of function ability to that end. I believe, however, that the primary use of a table is to enable one to correctly place the genera or species discussed, and that the natural sequence should be otherwise indicated. The following generic key is therefore recognitional rather than natural, but I hope will serve the practical purpose intended, that of making easy the identification of the genera.

KEY TO THE GENERA OF NORTH AMERICAN DECTICINÆ.

1. Wings short, rarely longer than the pronotum and often, especially in the female, rudimentary or wanting 3
   Wings fully developed, extending far beyond the tip of the abdomen in both sexes 2
2. Prosternum armed with a pair of spines; posterior femora armed below on apical half with several distinct spines ..... *Capnobotes*, p. 310
   Prosternum unarmed; posterior femora unarmed below ..... *Anoplodusa*, p. 318

[a] Guide Orth. N. A. (1897). [b] Die Decticiden, 1874. [c] Rev. Syst. Orth., 1893.

3. Prosternum armed with a pair of spines 4
   Prosternum unarmed 12
4. Lateral carinæ of pronotum present, sharp and distinct 5
   Lateral carinæ of pronotum not indicated or very blunt and obscure 7
5. Posterior tibiæ armed below with two apical spines; ovipositor curved upward .. 6
   Posterior tibiæ armed below with four apical spines; ovipositor straight, except rarely in *A. pachymerus* ..... *Atlanticus*, p. 320
6. Lateral carinæ of the pronotum behind the point of convergence nearly straight or but little bowed outward, causing the disk of the metazone to be trapeziform, the widest part far behind the middle ..... *Neduba*, p. 295
   Lateral carinæ of the pronotum behind the point of convergence strongly bowed outward, causing the disk of the metazona to be of a more or less elongate oval form, the widest part not so far behind the middle .... *Aglaothorax*, p. 290
7. Posterior femora long, much more than twice as long as the pronotum, extending much beyond the tip of the abdomen; pronotum without indications of lateral carinæ; ovipositor of female, where known, curved upward 8
   Posterior femora short, no more than twice as long as the pronotum, not or scarcely extending beyond the tip of the abdomen; pronotum with obscure, blunt lateral carinæ on the posterior third; ovipositor curved downward. *Apote*, p. 327
8. Pronotum posteriorly more or less elevated, saddle shaped; elytra of the male longer than the pronotum 9
   Pronotum straight above, not saddle shaped; elytra of the male less than one-half the length of the pronotum 11
9. Posterior tibiæ armed below with two apical spines; elytra of the male much swollen, apically broadly rounded ..... *Neobarrettia*, p. 302
   Posterior tibiæ armed below with four apical spines; elytra of the male but little swollen, apically narrowly rounded 10
10. Elytra of the male with the tympanum occupying more than one-half the length of the elytra beyond the pronotum; lateral lobes of the pronotum about as long as high; vertex greatly compressed ..... *Rhenia*, p. 305
    Elytra of the male with the tympanum occupying less than one-half the length of the elytra beyond the pronotum; lateral lobes of the pronotum about twice as long as high; vertex but little compressed ..... *Zacycloptera*, p. 308
11. Prosternal spines distinct; pronotum, except in *S. stevensoni*, *ateloploides*, and *bruneri*, more than 8 mm. in length ..... *Stipator*, p. 339
    Prosternal spines indistinct or wholly obsolete, rarely sharply triangular; pronotum 8½ mm. or less in length ..... *Eremopedes*, p. 330
12. Pronotum without indications of lateral carinæ on the anterior half or indicated only by color 13
    Pronotum with persistent lateral carinæ except sometimes on the anterior fourth[a] 18
13. Posterior femora, except of young specimens, less than twice as long as the pronotum 14
    Posterior femora more, usually much more, than twice as long as the pronotum 15
14. Pronotal disk smooth; anterior tibiæ armed above on both margins; cerci of the male apically furcate, the lower branch long and sharp, fig. 47 .. *Anabrus*, p. 351
    Pronotal disk rough, scabrous; anterior tibiæ armed above on the outer margin only; cerci of the male apically expanded but not furcate, the inner corner short, fig. 51 ..... *Peranabrus*, p. 362

[a] The Mexican *Idiontatus subcarinatus* has the lateral carinæ dull but distinct.

15. Lateral lobes of the pronotum not well developed (figs. 54, 56); anterior tibiæ of the female rarely with more than one dorsal spine ..... *Ateloplus*, p. 368
Lateral lobes of the pronotum well developed (fig. 60, etc.); anterior tibiæ of both sexes with more than one dorsal spine 16
16. Elytra of the female not projecting beyond the pronotum, of the male rarely projecting one-half the length of the pronotum 17
Elytra of the female projecting somewhat beyond the pronotum, of the male projecting one-half or more than one-half the length of the pronotum.
Idiostatus, p. 373
17. Size large, pronotum 12 mm. or more in length; pronotum with distinct lateral and median carinæ on the posterior half; posterior femora less than two and one-half times as long as the pronotum; ovipositor curved lightly upward.
Anabrus, p. 351
Size smaller, pronotum 8 mm. or less in length; pronotum without carinæ on the posterior half; posterior femora more than two and one-half times as long as the pronotum; ovipositor usually more noticeably curved upward.
Eremopedes, p. 330
18. Posterior femora short, less than twice as long as the pronotum 19
Posterior femora long, twice or more, usually much more than twice as long as the pronotum 21
19. Pronotum posteriorly truncate, the lateral carinæ dull, straight, posteriorly somewhat divergent ..... *Peranabris*, p. 362
Pronotum posteriorly rounded, the lateral carinæ sharp, curved outward mesially 20
20. Posterior tibiæ with two apical spines beneath; pronotum with low but persistent median carina; posterior femora much swollen basally, there more than twice as broad as apically ..... *Aglaothorax*, p. 290
Posterior tibiæ with four apical spines below; pronotum with the median carina distinct only posteriorly; posterior femora less swollen basally, there less than twice as broad as apically ..... *Plagiostira gillettei;* p. 392
21. Posterior tibiæ with two apical spines below; pronotum as in figs. 2 and 4.
Aglaothorax diabolicus, p. 294
Posterior tibiæ with four apical spines below; pronotum not as in figs. 2 and 4 .. 22
22. Lateral lobes of the pronotum declivent, slightly so in *Steiroxys;* posterior femora three or more times as long as the pronotum, much swollen in the basal half; ovipositor curved upwards or straight 24
Lateral lobes of the prothorax perpendicular, or almost so; posterior femora little if any more than twice as long as the pronotum 23
23. Posterior femora very little swollen in the basal half; ovipositor curved downwards ..... *Plagiostira*, p. 388
Posterior femoræ conspicuously swollen in the basal half; ovipositor curved upwards ..... *Platycleis*, p. 403
24. Lateral carinæ of the pronotum bowed inward in the anterior half, posteriorly divergent, the disk of the pronotum considerably broader behind than at the middle of the anterior half (fig. 79); median carina scarcely indicated even posteriorly ..... *Idionotus*, p. 394
Lateral carinæ of the pronotum parallel, or nearly so, sometime slightly convergent in the anterior fifth (fig. 83), the disk little broader behind than elsewhere; median carina distinct and percurrent 25
25. Elytra well developed, overlapping above and projecting about one-half the length of the pronotum in both sexes 26
Elytra of the female forming slightly projecting lateral pads, widely separated above ..... *Steiroxys*, p. 404

26. Pronotal disk narrow, the lateral lobes strongly declivent; lateral carinæ distinctly convergent anteriorly (fig. 83) ..... *Clinopleura*, p. 398
Pronotal disk broad, the lateral lobes less declivent; lateral carinæ subparallel. *Platycleis*, p. 403

In the following treatment I have made little attempt at arranging the genera in a natural order, contenting myself with keeping *Neobarrettia*, *Neduba*, and *Aglaothorax* together, by reason of their group affinities, and having the genera with the prosternum unarmed following those with the prosternum armed.

AGLAOTHORAX, new genus.

Tropizaspis SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 83, 87 (part).—KIRBY, Syn. Cat. Orth., II, 1906, p. 191 (part).

Description.—Head moderate in size; eyes rounded, small, not very prominent; vertex scarcely a third as broad as the interocular space. Prosternum armed with moderately long spines, with very short spines or wholly unarmed. Pronotum nearly flat above, being but a little higher in the middle, and with low but persistent median carina; lateral carinæ scarcely indicated on the anterior fifth, from that point backwards distinct and roundly bowed outwards, making the pronotal disk broadly ovate (fig. 2), behind semicircularly rounded, the anterior margin truncate; lateral lobes well developed, nearly perpendicular, much longer than high, the posterior margin scarcely sinuate. Organs of flight aborted in the female, developed but not, or scarcely, projecting beyond the pronotum in the male. Legs short and stout, posterior femora less than twice as long as the pronotum, except in one species, and much swollen in the basal half; anterior tibiæ armed above on the outer margin with an apical spine and dorsally, opposite the end of the hearing organ, with another small spine, the latter sometimes absent; inner margin of the anterior tibiæ unarmed or with a single apical spine; posterior tibiæ with but two apical spurs beneath, the plantula moderately large and well developed. Supraanal plate concealed in both sexes, being covered by the unusually expanded and extended anal segment; subgenital plate broad, apically more narrowly rounded in the female, that of the male furnished with a pair of small apical styles, usually very inconspicuous; the male has a pair of more or less flattened organs lying between the supraanal and subgenital plates, which are termed supragenital or infracercal plates; cerci of both sexes simple, conical; ovipositor shorter than the posterior femora, curved strongly upwards.

Type.—*Tropizaspis ovata* Scudder.

This genus, known as yet only in the western part of the United States, is distinguished from *Neduba*, to which it is allied, by the broad oval thorax and the short posterior femoræ of most of the species. The general appearance of the members of the two genera are very differ-

ent and little difficulty will be found in their separation. *A. diabolica* Scudder has the long posterior femora of *Neduba*, but the form of the pronotum and the general appearance serve to locate it in this genus.

The armature of the prosternum in this genus is very variable, individuals of the same species varying from unarmed to quite noticeably spined, the spines always, however, short and blunt. Most of the specimens studied have the prosternum unarmed, very few being noticeably spined.

Three species of this genus are known. They may be separated by the following table:

KEY TO THE SPECIES OF AGLAOTHORAX.

A.—Posterior femora of female less than two times as long as the pronotum, of male little more than one and one-half times as long; ovipositor more pointed, apically armed with several, about two dozen, acute teeth. [Adult female of *A. ovatus* unknown.]

B.—Last abdominal segment of the male triangular, apically rounded; cerci scarcely longer than the basal width; infracercal plates large, together broader than the last abdominal segment, the portion beyond that segment two or more times as long as broad ..... *ovatus*, p. 291

B′.—Last abdominal segment of the male quadangular, apically truncate; cerci two or more times as long as the basal width; infracercal plates smaller, together not as broad as the last abdominal segment, the portion beyond that segment about as long as broad ..... *castaneus*, p. 293

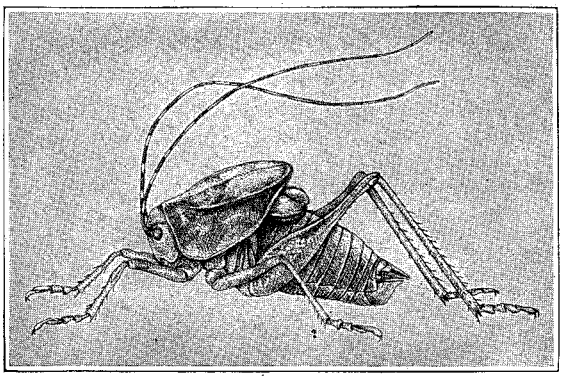
A′.—Posterior femora of female, male unknown, more than twice as long as the pronotum; ovipositor less pointed, armed at the tip with a few, about one dozen, blunt serrations ..... *diabolicus*, p. 294

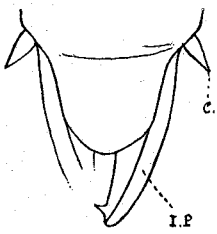
AGLAOTHORAX OVATUS Scudder.

Tropizaspis ovata SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 83, 84; Cat. Orth. U. S., 1900, p. 77—WOODWORTH, Bull. No. 142, Calif. Exp. Station, 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191.

Description.—Male, adult female unknown. Head of medium size, well inserted into the pronotum; vertex about one-fourth as broad as the interocular space, apically shallowly cleft; front flat, very little convex. Eyes small, round, moderately prominent, and dark brown in color. Antennæ much longer than the body, the basal segment about as broad as one of the eyes. Pronotum excessively large and posteriorly produced far over the base of the abdomen, covering the wings; lateral lobes well developed, nearly vertical, twice as long as high, the posterior border scarcely sinuate; lateral carinæ sharp, except near the anterior border, from which point they curve gradually outward, making the disk an oblong oval, semicircularly rounded behind and truncate before, the disk very gently convex with very obscure but persistent median carina. Prosternum unarmed or armed with moderately distinct spines, rarely at all sharp or conspicuous. Abdomen scarcely longer than the pronotum and much narrower, except in young

specimens, strongly compressed and carinate above; cerci of both sexes simple, conical, apically pointed, about as long as the basal width; last abdominal segment of the male apically broadly rounded; subgenital plate apically subtruncate, the styles very small and generally scarcely noticeable; infracercal plates large and long (fig. 3), extending half their length beyond the last abdominal segment, deeply and broadly sulcate on the inner side and armed at the apex on the lower margin with a short, hard, sharp tooth, rarely visible from above. Ovipositor, of a half-grown nymph, the only one seen, about two-thirds as broad as the interocular space and curved gently upward, scarcely longer than the pronotum and apically unarmed. Elytra developed as broad bulbous, strongly convex pads, not projecting beyond the pronotum, but plainly visible, forming a large tympanum. Legs short and moderately stout; anterior coxal spines sharp; fore and middle femora moderately long,





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FIGS. 2-3.—AGLAOTHORAX OVATUS. 2, ADULT MALE. 3, TIP OF ABDOMEN; *c*, CERCUS; *i. p.*, INFRACERCAL PLATE.

nearly as long or somewhat longer than the greatest width of the pronotal disk, below unarmed or armed with a few minute spines; posterior femora short, less than two times as long as the pronotum and the basal half, or a little more, strongly swollen, being three or more times as broad there as the apical portion, armed on both margins below with a few small stout spines; all the femora armed above on the basal portion with a few small apically directed spines or sharp tubercles. Anterior tibiæ armed above on both sides with an apical spine, sometimes absent on the inner side, and on the dorsal surface usually with another spine as described under the genus, below armed on both margins with several spines; middle and hind tibiæ longer than their respective femora and armed above and below on both margins, the former with several on both sides and the latter with many above and a very few weak ones below, confined to the apical half.

Color brownish yellow with the borders of the pronotum and middle portions of the posterior femora above mottled with black. Antennæ with the second segment, brown, the rest fuscous, with every fifth or sixth segment light, toward the apex the light-colored ones becoming more remote from each other and more or less obscured, in some specimens the whole antenna being nearly uniformly fuscous. The anterior and intermediate femora are sometimes more or less distinctly banded on the apical half with fuscous. Some specimens are brown, but even here the black markings are easily seen.

Measurements.—Length, adult male, female in that stage unknown, pronotum, 12–13 mm.; posterior femora, 17–19; posterior tibiæ, 18–20; cerci, .75; greatest width, pronotal disk, 7–8.5; posterior femora, basal portion, 3.75–4.25; apical portion, 1.25–1.5.

Type.—In the Museum of Comparative Zoology, Cambridge, Massachusetts.

Specimens examined.—Two adult males, Los Angeles County, California, July, and one immature male, same place, June; one immature female, San Bernardino Mountains, June (Coquillett).

This species was described from a single male (fig. 2) from which the greater part of the antennæ was missing; this specimen, now in the Scudder collection in Cambridge, Massachusetts, was taken by D. A. Saunders in California, no definite locality given. I have examined the type.

The two immature specimens, male and female, in the National Museum collection are darker, especially the male, than the adults, and the pronotal disk even more rounded, the part posterior of the anterior constriction being nearly or quite as broad as long.

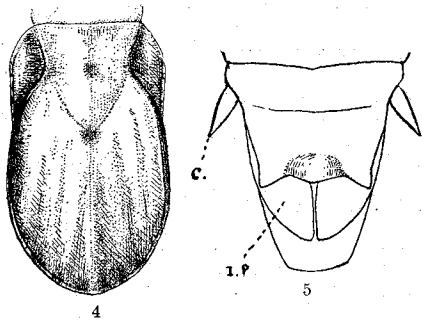
Nothing is known of the habits of this species. Mr. Coquillett thinks he took his specimens among rocks in a canyon.

AGLAOTHORAX CASTANEUS Scudder.

Tropizaspis castanea SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 83, 84; Cat. Orth. U. S., 1900, p. 77.—WOODWORTH, Bull. No. 142, Calif. Exp. Station, 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191.

Description.—In general appearance this species is very like the preceding one, being colored practically the same, some dark brown and others brownish yellow, as in *ovatus*. The pronotal disk, however, has the anterior constriction slightly more remote from the anterior margin (fig. 4). The most striking difference lies in the male genitalia. Here the last abdominal segment is almost truncate, the lateral angles sharp; cerci more elongate, being at least two times as long as the basal width. Infracercal plates more depressed, together scarcely broader than the last abdominal segment and the portion beyond that segment but little longer than wide (fig. 5.) Subgenital plate nearly like that of *A. ova* the styles usually even more inconspicuous.

The fastigium of this species, as represented by a mature pair before me, is deeply sulcate, but with the sulcus anteriorly closed, forming a round pit, while in *ovatus* it is open to the end, making the vertex narrowly cleft. The prosternum is unarmed in the two specimens before me. Ovipositor of the adult quite strongly curved upward, nearly as long as the posterior femora and apically armed both above and below with about two dozen acute teeth.



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FIGS. 4–5.—AGLAOTHORAX CASTANUS. 4, PRONATUM OF MALE FROM ABOVE. 5, TIP OF THE ABDOMEN FROM ABOVE; *c*, CERCUS; *i. p*, INFRACERCAL PLATE.

The measurements of an adult pair in the U. S. National Museum are as follows:

Measurements.—Length, pronotum, male, 13 mm.; female, 12.5; posterior femora, male, 19; female, 23; posterior tibia, male, 19; female, 23; cerci, male, 1; female, 1; ovipositor, 20 mm. Greatest width, pronotum, male, 8; female, 8; posterior femora, basal part, male, 4.5; females, 5; apical part, male, 1.25; female, 1.5.

Type.—In the Museum of Comparative Zoology; paratype, No. 10247, U. S. National Museum.

Specimens examined.—The U. S. National Museum contains a single pair of this species, taken by Mr. Coquillett of Los Angeles County, California, in July. The type was also examined.

AGLAOTHORAX DIABOLICUS Scudder.

Tropizaspis diabolica SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 84, 86; Cat. Orth. U. S., 1900, p. 77.—WOODWORTH, Bull. No. 142, Cal. Exp. Station, 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191.

The original description of this species, of which only the female sex is known, is here quoted in full.

Head moderately large, castaneo-testaceous, the fastigium slightly broader than the basal joints of the antennæ. Pronotum with rather feebly clepsydral disk, which is considerably more than half as long again as broad, broadest but little behind the middle of the metazona, and of nearly equal breadth throughout the posterior half of the pronotum, the lateral carinæ not elevated on the prozona, on the metazona a little elevated but blunt; hind border margined, broadly rounded; median carina feeble, subequal, percurrent; the whole disk uniform castaneous, transversely pectinate, feebly rugose posteriorly, the lateral lobes fusco-fuliginous on upper half, castaneo-testaceous below. Legs luteo-testaceous, the fore and midle femora twice banded with blackish fuscous, the hind femora coarsely and a little transversely spotted above with blackish fuscous, much more than twice as long as the pronotum, the basal portion unusually stout. Abdomen dull luteo-testaceous, faintly infuscated in blotches laterally; ovipositor rather strongly curved, not narrowed in the middle

more than beyond, luteo-testaceous, a little infuscated in the apical half, nearly two-thirds as long as the hind femora, the denticulations blunt, oblique, separated by more than their own height.

Measurements.—Length of body, 25 mm.; pronotum, 10.5; breadth of same, 6; length of hind femora, 25.5; ovipositor, 16.

One female. Monte Diablo, California, August, 1872.

Type.—In the Museum of Comparative Zoology.

In length of posterior femora this species is allied to the members of the following genus, but in general appearance it is like *Aglaothorax ovatus*. Its nearest ally is probably *A. castaneus*. From that species, however, it is readily separated by the long posterior femora and the shorter and blunter ovipositor with its fewer and duller serrations. The pronotum has a distinct transverse sulcus cutting off about one-fifth of the anterior portion of the disk, not cutting the median carinæ however. The fastigium is very narrowly sulcate, being cleft as in *ovatus*. The cerci are seemingly a little more elongate than those of the female of *castaneus*.

Specimens examined.—This species is not represented in the collection of the U. S. National Museum, but I examined the type at Cambridge. The posterior femora of the type specimen measured 5.5 mm. across the basal part.

Genus NEDUBA Walker.

Neduba WALKER, Cat. Derm. Salt. Brit. Mus., II, 1869, p. 250.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Arytropteris HERMANN, Verh. Zool.-Bot. Ges. Wien, XXIV, 1874, p. 204 (part).

Tropizaspis BRUNNER, Ann. Mus. Civ. Stor. Nat. Genova, XXXIII (2d ser., XIII), 1893, p. 187 (invalid, no species included).—SCUDDER, Can. Ent., XXVI, 1894, pp. 178, 180.—WOODWORTH, Bull. No. 142, Cal. Exp. Station, 1902, p. 14.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Eyes moderate, not prominent; vertex prominent, narrow, one-third or less as broad as the interocular space. Prosternum generally armed with two long sharp spines, but sometimes the spines are short and blunt and some specimens may eventually be found to have the prosternum wholly unarmed. Pronotum moderately large, dorsally very little tectiform, the median carina percurrent, more or less distinct; lateral carinæ sharp, percurrent, convergent in the anterior third or fourth. Behind the point of convergence they are nearly straight and strongly divergent, the disk posteriorly about twice as broad as anteriorly and strongly produced, the hind border semicircularly rounded, the anterior border truncate; vertical lobes well developed, narrow below, very moderately inclined, the posterior border moderately sinuate. Organs of flight aborted in the female; in the male developed, but not projecting beyond the pronotal disk. Legs long and stout; posterior femora more than twice as long as the pronotum in both sexes and strongly swollen in the basal half; anterior tibiæ

spined above on the outer margin with from one to three spines, usually two, and on the inner margin with a single apical spine; posterior tibiæ armed below with two apical spurs; plantula large and distinct, as in the preceding genus. Supraanal plate concealed beneath the last abdominal segment, which is broad in both sexes, larger in the male; subgenital plate long and broad, more narrowly rounded apically in the female; in the male furnished on each side with a short apical style; cerci of both sexes simple, conical; ovipositor noticeably shorter than the posterior femora and curved quite strongly upward.

Type.—Neduba carinata Walker.

The males of this genus, like those of the preceding one, has a pair of infracercal plates, figs. 7, 10, 11 IP. The last abdominal segment is considerably distorted in many cabinet specimens.

We have three species of this genus—the type species and two new ones herein described. These species and a varietal form of *carinata* may be separated as follows:

KEY TO THE SPECIES OF NEDUBA.

A. Last abdominal segment of the male with the outer apical corners angular; infracercal plates very broad, the portion beyond the last abdominal segment not or scarcely longer than broad and apically unarmed (figs. 7, 10).

B. Infracercal plates of the male together scarcely as broad as, or but little broader than, the last abdominal segment (fig. 7); lateral carinæ of the pronotum in the female not, or less noticeably, bowed outward behind the point of constriction (fig. 6); pronotal disk of neither sex longitudinally convex.

C. Pronotal disk unicolorous or longitudinally marked with black.

carinata, p. 296.

C′. Pronotal disk irregularly mottled with black.

carinata var. *picturata*, p. 299.

B′. Infracercal plates of the male together broader than the last abdominal segment (fig. 10); lateral carinæ of the pronotum in the female distinctly bowed outward behind the point of constriction (fig. 9); pronotal disk of both sexes, especially the female, longitudinally quite noticeably convex.

carinata var. *convexa*, p. 300.

A′. Last abdominal segment of the male with the outer apical corners rounded; infracercal plates long and slender, the portion beyond the last abdominal segment nearly three times as long as broad and armed on the inner side near the apex with a small sharp tooth (fig. 11).....*morsei*, p. 301.

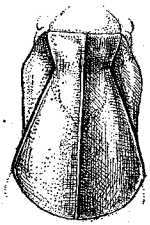
NEDUBA CARINATA Walker.

Neduba carinata Walker, Cat. Derm. Salt. Brit. Mus., II, 1869, p. 251.—Kirby, Syn. Cat. Orth., II, 1906, p. 194.

Arytropteris steindachneri Hermann, Verh. Zool.-Bot. Ges. Wien, XXIV, 1874, p. 204, pl. VI, figs. 98–102.

Tropizaspis steindachneri Scudder, Can. Ent., XXVI, 1894, pp. 180, 183; Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 84, 86; Cat. Orth. U. S., 1900, p. 77.—Woodworth, Bull. No. 142, Cal. Exp. Station, 1902, p. 15.—Kirby, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head small, not prominent, no broader than the front of the pronotum into which it is inserted moderately deep; fastigium about one-fourth as broad as the interocular space, quite prominent, oval above, not sulcate, or very broadly and shallowy so. Eyes small, nearly round, not prominent. Antennæ long and slender, three times or more longer than the body, the basal segment large, about as broad as long and almost as large as one of the eyes. Pronotum (fig. 6) large and posteriorly much produced over the base of the abdomen, covering the wings; lateral lobes shallow, rarely half as deep as long, posteriorly distinctly sinuate; lateral carinæ sharp and distinct, converging in the anterior fifth and then diverging posteriorly, usually straight behind the point of convergence but sometimes a little, or rarely considerably, bowed outwards; median carina distinct and persistent but very slightly elevated; pronotal disk inconspicuously ruggose, more distinctly so in the male, transversely a little concave or, more usually, flat and slightly tectiform, marked at the narrowest point with a faint transverse sulcus, not however severing the median carina; posterior margin broadly rounded; front margin truncate. Prosternum armed with two spines, usually long and distinct but sometimes short and blunt. Wings aborted in the female, in the male the elytra form well developed, strongly convex tympani, easily seen but not projecting beyond the pronotal disk. Legs long and slender, the posterior femora more than two times as long as the pronotum; all the femora unarmed below but above there are a number of sharp, backwardly directed spines, more numerous on the posterior femora; anterior tibiæ armed above on the outer carina with two spines, one basal and one terminal, probably sometimes with a median spine also; on the inner margin the anterior tibiæ generally bears a single apical spine and armed below on both sides with seven or eight spines; intermediate tibiæ armed on both margins above and below; posterior tibiæ also armed on both margins above and below, above with about a dozen stout ones on each margin and below with a few weak slender ones. Abdomen usually somewhat compressed, normally about as wide as the pronotum, distinctly but slightly carinate above. Cerci of both sexes simple, round and tapering to a sharp tip, about four times as long as the basal breadth, often, at least in the female, five times as long; subgenital plate apically narrowly rounded and unarmed in the female, in the male apically truncate and armed with a pair of distinct but short apical styles, the styles usually about two times as long as broad; last



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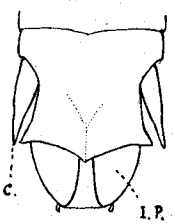

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FIGS. 6–7.—NEDUBA CARINATA. 6, PRONOTUM OF MALE FROM ABOVE. 7, TIP OF ABDOMEN OF THE MALE FROM ABOVE; *c*, CERCUS. *i. p*, INFRACERCAL PLATE.

abdominal segment and infracercal plate of male shaped as shown in fig. 7, the projecting portion of the latter scarcely longer than broad and their combined width scarcely as great as that of the former. Ovipositor short, rarely more than two-thirds as long as the posterior femora, about as broad or considerably broader than the fastigium and gently curved upward, the tip armed with a dozen or more sharp elongate teeth on the upper margin and a lesser number below.

General color, light brownish, with darker mottlings, sometimes uniformly yellowish; lateral lobes of the pronotum usually infuscated, the disk unicolorous or marked with longitudinal dusky stripes; anterior and intermediate tibiæ and femora usually with one or two more or less conspicuous broad black bands, besides other smaller mottlings; posterior femora longitudinally infuscated on the outer face, sometimes with the color broken by three or four light spots; abdomen almost always with a pair of broad dark-colored subdorsal stripes extending from the pronotum back across the basal half of the abdomen and then deflexing toward the sides, where they meet an indefinite area of infuscation that envelopes the sides of the apical portion of the abdomen. Ovipositor brownish, usually about the same shade as the ground color of the body.

Measurements.—Length, pronotum, male, 9 mm.; female, 8.5–9.5; posterior femora, male, 19, female, 20–22; ovipositor, 13–17; width at widest point, pronotum, male, 6.5, female, 6.5; posterior femora, basal part, male, 3.5, female, 4–4.25; apical part, male, 1, female, 1.12; ovipositor, at middle point, 1.5–1.75 mm.

Type.—In the British museum in London.

Specimens examined.—The National Museum contains three adult males, four females, and several nymphs. These are from Seattle, Washington, Palo Alto, California, and Humboldt and Siskiyou counties, California. Also four females from Wellington, British Columbia (Toylore). The Palo Alto specimen, one male, was taken in November; an adult from Seattle was taken in August. The nymphs were taken in March at Seattle and in June in Humboldt county, California. I have also specimens taken at Eureka, California, and nymphs taken at Sierra Madre, California, on May 30, 1906.

I am indebted to Messrs. Kirby and Waterhouse for notes on and drawings of the type of *carinata*. From a rough sketch sent the pronotum is seen to be more bowed out posteriorly than usual, something as in *N. morsei*.

This Pacific coast species is said to extend east to Texas. Scudder mentions a specimen labeled as having been taken in Nebraska by Suckley, but he thinks it wrongly labeled, as it is not elsewhere recorded from that region, and Suckley also collected in the Northwest.

Carinata is the commonest species of the genus. The Scudder col-

lection contains nine males and seven females, some marked types, but erroneously so.

Prof. A. P. Morse, who has taken this species in the west, says it is found in deciduous woodlands and shrubbery, hopping about on the carpet of fallen leaves, with which its coloration agrees. This is probably true of the other members of the genus. Some nymphs referred with doubt to this species have the lateral carinæ of the pronotum nearly parallel.

At Eureka, California, July 5, 1906, I took three adult males and one female nymph. They were in just such a locality as described by Morse. The males were stridulating and were quite numerous, being heard in the grass along the road in open ground well removed from woodland, even in the edge of town. The male commences to stridulate about dusk, or a little before, and the sound is similar to that made by a person gritting the teeth together, but in a higher key. The chirp is repeated from a few, three or more, to as many as about thirty times, the largest number noted by me being twenty-nine, while the fewest, when the insect was seemingly undisturbed, was three. The rapidity of the beats was at the rate of about one hundred a minute. The singer was usually found among dead leaves beneath briars or shrubs. They do not leap readily, seeming to depend for protection on their surroundings rather than by their activity. So well do they harmonize with their surroundings that it is almost impossible to discover them as long as they remain quiet. When their retreat is beneath a bunch of briars, as is often the case, they are practically safe from capture. I took the typical form and the var. *picturata* singing within a few yards of each other.

NEDUBA CARINATA var. PICTURATA Scudder.

Tropizaspis picturata SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 83, 85; Cat. Orth. U. S., 1900, p. 77.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191.

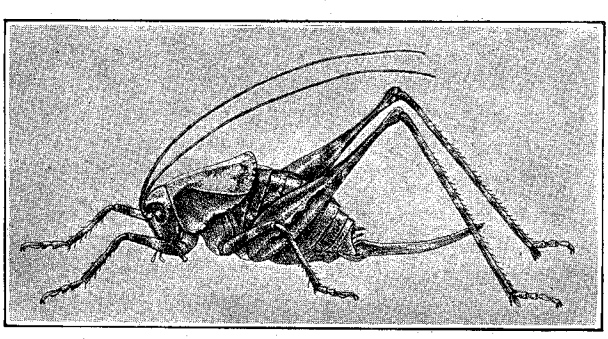


FIG. 8.—NEDUBA CARINATA VAR. PICTURATA. ADULT FEMALE.

Description.—This is a mere color variety of *carinata*, differing from the typical species only by having the pronotum irregularly mottled above instead of unicolorous or longitudinally striped. Scudder

characterized it as having the ovipositor narrowed mesially and narrower than the fastigium. The types were examined and the characters are, in my opinion, not specific. The thoracic mottling and the slight mesial narrowing of the ovipositor are not correlated, and the male genitalia, while somewhat shrunken, seem to be just as in typical *carinata*.

Type.—In the Museum of Comparative Zoology.

Specimens examined.—The National Museum contains two adult males, one female (fig. 8) and a nymph from Seattle, Washington; one adult on September 20, the others without dates, and one female, nymph from Humboldt County, California, June 9; also a male from Eureka, California, July 5, 1906.

NEDUBA CARINATA var. CONVEXA, new variety.

Description.—Differing from typical *carinata* in several particulars. The size is somewhat greater as represented by the three specimens before me and the color seems lighter. The pronotum of the only female seen (fig. 9) is more convex on the disk and is longitudinally

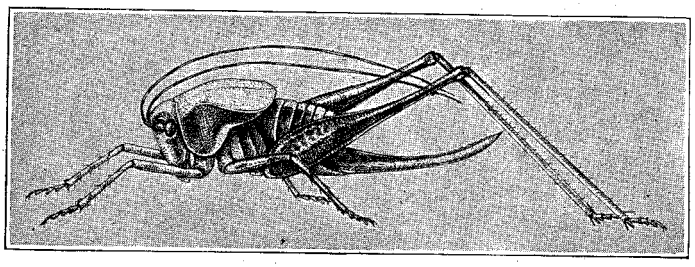


FIG. 9.—NEDUBA CARINATA VAR. CONVEXA. ADULT FEMALE.

more convex than in any other specimens seen, that of the male seemingly more distinctly rugose than common in *carinata*. The lateral carinæ of the pronotum of the female are more bowed outward than in allied species, giving it a slight superficial resemblance to members of the preceding genus. The median carina is about the same as in *carinata*. Prosternum armed with moderately long spines, rather short in the male specimens. The ovipositor is longer than usual in allied forms, but when a number of specimens are examined it will probably be found to vary as it does in typical *carinata*. The infracercal plates of the male, while shaped essentially as those of the typical form, are apparently broader, their combined width being generally greater than that of the last abdominal segment, probably due, however, to the greater relaxation of the genital organs of the specimens examined rather than to the actual width. Last abdominal segment of the male with the posteriolateral corners more produced than in typical *carinata* and the apical styles of the subgenital plate

of the male are usually shorter, being no longer than broad (fig. 10). The anterior tibiæ are armed above on the outer margin with two spines and on the inner margin with one apical spine. The color of the male is a light yellowish brown, the sides of the pronotum and portions of the posterior femora more or less infuscated and all the legs rather obscurely banded as in the typical form. The female has the disk of the pronotum a uniformly yellowish brown, the lateral lobes black with the lower and hinder margins narrowly emarginate with yellowish brown. The abdomen is colored as in typical *carinata* and the antennæ of both sexes are banded as describe dunder that form.

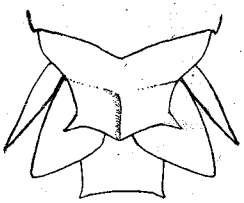


FIG. 10.—NEDUBA CABINATA VAR. CONVEXA. TIP OF ABDOMEN OF ADULT MALE FROM ABOVE.

Measurements.—Length, pronotum, male 9.5 mm., female 10.5; posterior femora, male 20, female 23; ovipositor, 20; width pronotum at widest point, male 7–7.5, female 7; posterior femora, basal part, male 3.75, female 5; apical part, male 1, female 1.5; ovipositor at middle, 1.5.

Types.—Cat. No. 10160 (male) U. S. National Museum and (female) American Museum of Natural History, New York.

Specimens examined.—One male, Mount Shasta, California (Behrens, collector), and one male, one female, Napa County, California (Edwards, collector).

This variety, of which the pair from Napa County, California, were loaned me for study by William Beutenmüller, of the American Museum of Natural History, of New York, is quite distinctive in general appearance. I have hesitated to call it a distinct species, though it may eventually prove to be such.

NEDUBA MORSEI, new species.

Description.—In general appearance, both as to form and color, this species is very similar to *carinata*. The pronotum is somewhat mottled, as in *carinata picturata*, and the lateral carinæ are slightly bowed outward behind the point of greatest constriction. The most important characters, however, that serve to separate it from its ally, *carinata*, lie in the male abdominal characters. Here the last abdominal segment is apically rounded, instead of truncately sinuate as in *carinata*, and the infracercal plates are long, slender, and internally armed near the tip with a short spine or tooth; that part of the infracercal plate projecting beyond the last abdominal segment is three times as long as broad, instead of scarcely longer, as in the other forms (fig. 11). The cerci are about two times as long as the basal width, instead of three or four times as long. The anterior tibiæ are armed above on the outer margin with three spines.

Measurements.—Length, pronotum, 9 mm.; posterior femora, 16; width of pronotum at widest point, 6.5; posterior femora on basal half, 3.5.

Type.—Collection of A. P. Morse, Wellesley, Massachusetts.

Specimens examined.—One male, the type, Mount Wilson, Altadena, California, July 27, A. P. Morse.

I take pleasure in naming this structurally distinct species in honor of the collector, Prof. A. P. Morse, of Wellesley, Massachusetts.

FIG. 11.—NEDUBA MORSEI. TIP OF ABDOMEN OF ADULT MALE FROM ABOVE.

This is the specimen mentioned by Doctor Scudder.[a] While museum pests have done much damage to the specimen, the most important characters are fortunately intact or not materially injured.

The three following genera are based on the male sex only, the females of none of the species being known.

NEOBARRETTIA Rehn.

Neobarrettia REHN, Ent. News, XII (1901), p. 16.—KIRBY, Syn. Cat. Orth., II, 1906, p. 182.

Description.—Head medium; eyes small. Thorax saddle-shaped, posteriorly abruptly elevated, much more so than anteriorly, subtruncate both before and behind and scarcely produced posteriorly. Lateral lobes of the pronotum vertical, posterior border scarcely sinuate; lateral and median carinæ not indicated except on the elevated posterior portion where they are present but very rounded. Prosternum armed with a pair of long, sharp spines. Mesosternum also armed with a stouter pair of spines. Wings apparently aborted, or scarcely developed, the elytra almost twice as longs as the pronotum, very broad and somewhat swollen, apically rounded, the transverse vein of the tympanum very stout. Posterior femora more than three times as long as the pronotum and much swollen on the basal half; anterior tibiæ armed above on the outer side only with three spines; posterior tibiæ armed below with but two spurs. Plantula very short, not prominent. Supraanal plate scarcely visible beneath the last abdominal segment, which is short and broad, mesially emarginate; ceri broad and stout, about twice as broad as the basal width and apically abruptly bent inwards, the tips forming a blunt, back tooth; subgenital plate short and broad, with two triangular, pointed apical styles.

Type.—*Capnobotes imperfecta* Rehn.

This genus, like the two preceding ones, is a member of Brunner's division Rhacoclees, distinguished by having but two apical spurs below on the posterior tibiæ. Unlike *Aglaothorax* and *Neduba* how-

[a] Proc. Amer. Acad. Arts Sci., XXXV, 1899, p. 87.

ever, the males are not furnished with conspicuous infra-cercal plates. The elongate and somewhat swollen elytra and saddle-shaped thorax easily distinguish this Mexican genus from its allies. There is but one species, as follows:

NEOBARRETTIA IMPERFECTA (Rehn).

Capnobotes imperfectus REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 89.—KIRBY, Syn. Cat. Orth., II, 1906, p. 182.
Neobarrettia imperfectus REHN, Ent. News, XII, 1901, p. 16.

Description.—Head scarcely broader than the anterior part of the pronotum, into which it is quite deeply inserted; fastigium extremely narrow, scarcely a fourth as broad as one of the eyes, no more than a tenth as broad as the interocular space, above narrowly sulcate; occiput smooth and roundly tumid, not elevated above the anterior edge of the pronotum. Eyes small, nearly round, quite prominent. Antennæ long and slender, the basal segments very large and broad,

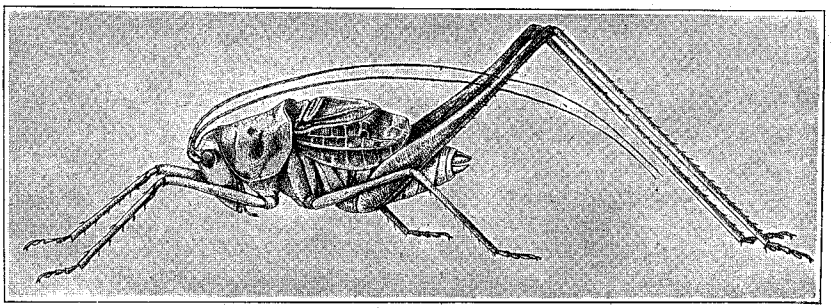


FIG. 12.—NEOBARRETTIA IMPERFECTA. ADULT MALE.

irregular in shape, the fastigium crowded between them. Pronotum saddle-shaped but not constricted at any point, scarcely noticeably broadened behind; pronotal disk crossed at the middle of the anterior and posterior halves by transverse sulci, the anterior one slight and meeting the edge of the pronotum halfway down the lateral lobe and the posterior one very broad and meeting the posterior margin of the lateral lobes just before the humeral angle, which is broadly rounded. The pronotum behind this posterior sulcus is abruptly and conspicuously elevated and here furnished with rounded lateral and median carinæ which are not present on the anterior part of the pronotum; lateral lobes well developed, less than twice as long as deep and scarcely sinuous behind; pronotal disk slightly emarginate both before and behind. Prosternal spines long and sharp, mesosternal spines thicker. Anterior coxal spines somewhat recurved, sharp and strongly compressed basally; posterior femora long and slender, strongly swollen on the basal half, armed on both margins, beneath with short spines; anterior and intermediate femora long, considerably longer than the

pronotum, armed as the posterior femora; anterior tibia armed on the outer margin above with three spines, unarmed on the inner margin; all the tibiæ armed below on both margins with long spines, the middle ones armed above with three or four spines on each margin and the posterior ones armed above on the apical two-thirds with several spines on each margin. Wings not visible beneath the elytra, which are very broad, nearly twice as long as the thorax and considerably swollen in the middle, the lateral fields nearly vertical, the main oblique vein of the tympanum very large and stout, the whole transparent and reticulated with very stout veins. Abdomen plump, cylindrical, not carinate above, extending well beyond the tips of the elytra except in dried specimens where it is much contracted. Cerci (fig. 13) about two times as long as the basal breadth, tapering to the apex, which is abruptly curved inwards, forming a slightly recurved smooth, hard, black tooth; subgenital plate short and broad, mesially notched and with a distinct median carina below; apical styles distinct in the specimens examined, but are said to be sometimes absent. The color is described by Rehn as follows:

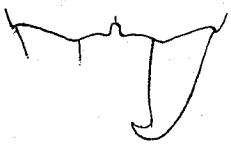


FIG. 13.—NEOBARRETTIA IMPERFECTA. TIP OF ABDOMEN OF MALE FROM ABOVE.

Head and pronotum dull lemon-yellow, washed above with wood-brown (faintly in one individual), lightest below. Antennæ wood-brown. A dull, dark brownish line is continued back of the eye on the superior portion of the lateral lobes of the pronotum. Central portion of the pronotum marked with four rather regular blotches of blackish; the sloping lateral margin with a broad band of white. Elytra green, external border lightest, darkest centrally. Abdomen rich wood-brown, scrumbled with dull ochre, beneath pale yellowish. Femora pale yellowish green, the posterior part infuscated in several specimens; extremities black in the posterior pair. Tibiæ the same, washed above with a dull purplish brown. Tarsi blackish.

Measurements.—Length, pronotum, 5 mm.; elytra, 8.5; posterior femora, 19; posterior tibia, 20; width, pronotum, in front, 4.5, behind, 5; posterior femora, basally, 3; apically, 1.

Type.—In the Academy of Natural Sciences, Philadelphia; paratype, No. 10161, U. S. National Museum.

Specimens examined.—The type, shown in fig. 12, a single male taken by O. W. Barrett at Rio Cocula, Guerrero, Mexico, in December, 1898, was loaned to me for study by Rehn. Bruner has three males, also taken by Barrett in Mexico, at Cocula and Igula in Guerrero. One of these specimens, a paratype, has been presented to the National Museum by Bruner.

The following facts relative to the life and habits of this interesting insect are quoted from notes by the collector.[a]

[a] Trans. Amer. Ent. Soc., XXVII, 1901, p. 229.

The locality where the specimens were taken is the least known corner of Mexico—hilly, with dried up vegetation during about one-half of the year. The species seems to be cupuscular in habits. It was almost impossible to find a specimen during the daytime, and I do not believe the males stridulate long after dark, for I slept several nights in a tent in the "Chaparral" among them, and do not remember hearing them after dark. The shrubs which they inhabit are a compact growing species, affording a place of concealment by day, while their thick tops offer unusual advantages for the roof-garden concerts of the stridulators at twilight. The stridulation is feeble and not continued beyond a few seconds with a period of rest. When captured they offer little or no defense, and their saltatory powers are small and not willingly used.

REHNIA, new genus.

Description.—Male, female unknown. Head medium, slightly broader than the anterior portion of the pronotum; eyes large and prominent; vertex extending between the basal segments of the antennæ as a much compressed projection, distinctly separated from the face. Pronotum of medium size, moderately produced posteriorly and the disk abruptly elevated behind as in the preceding genus; the anterior and posterior margins of the pronotum are truncate or broadly rounded; lateral lobes deep, nearly vertical, margins nearly straight, humeral angle scarcely indicated; lateral carinæ not indicated except very slightly so on the posterior margin; median carina not indicated. Prosternum armed with a pair of long sharp spines. Organs of flight fairly well developed, nearly or quite two times as long as the pronotum, the elytra apically narrowly rounded, tympanum well developed, occupying one-half the length of the elytra. Legs long and stout, the posterior femora about three and one-half times as long as the pronotum and considerably but gradually swollen on the basal half, the genicular spines sharp and prominent; posterior tibiæ a little longer than the corresponding femora and armed below with four terminal spurs; plantula short; anterior tibiæ armed above on the outer carina only with five spines. Subgenital plate moderately broad and long, apically triangularly incised and with a pair of short stout apical styles; supraanal plate triangular, nearly hidden; last abdominal segment broad and short, roundly incised mesially; cerci basally flattened, inwardly concave, the apex slender and incurved, the upper portion of the flattened base slightly produced in the form of an inner tooth.

Type.—Rehnia victoriæ, new species.

Superficially this genus bears some resemblance to *Neobarrettia* Rehn, but structurally it is very different, in a natural classification falling into a different section, the former genus belonging to the section Rhacoclees and *Rehnia* to the section Gampsoclees.

There are two species of this genus before me, the type from Mexico and a second very distinct species supposedly from the United States. These two species may be separated as follows:

KEY TO THE SPECIES OF REHNIA.

A. Spines of the legs inconspicuous, those of the posterior femora colored similarly to the femora themselves; size smaller ..... *victoriæ*, p. 306

A′. Spines of the legs large and conspicuous, those of the posterior femora piceous, strongly contrasted with the color of the femora themselves; size large ..... *spinosa*, p. 307

REHNIA VICTORIÆ, new species.

Description.—Male, female unknown.—Head deeply inserted into the pronotum which is slightly flared anteriorly to receive it; interocular space three times as broad as one of the eyes; face broad and flat, not strongly convex; eyes round and very prominent; antennæ long and slender, the basal two segments much enlarged. Pronotum smooth and dorsally evenly rounded, the posterior margin very slightly but abruptly elevated, where the lateral carinæ are very obscurely indicated; anterior and posterior margins of the pronotal

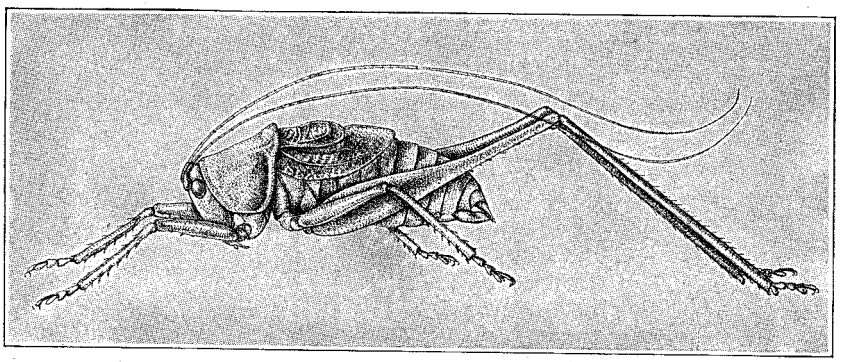


FIG. 14.—REHNIA VICTORIÆ. ADULT MALE.

disk subtruncate or very gently rounded; prosternal spines moderately long, slender, and very sharp. Elytra a little longer than the wings, not quite two times as long as the pronotum. Legs long and quite stout, all the femora armed below on both margins for nearly the entire length with stout triangular spines; posterior and intermediate tibiæ spined above and below on both margins, those of the former shorter than the tibial depth, those of the latter equal to or greater than the tibial depth; anterior tibiæ armed below on both margins with spines longer than the tibial depth, above on the outer margin only with five spines about as long as the tibial depth. Abdomen plump, rounded, without dorsal carina; cerci but little longer than the last abdominal segment (fig. 15), the slender apical portion produced as a long incurved tooth; terminal styles of the subgenital plate about three times as long as the basal breadth.

General color green; head paler on the face, the two first segments of the antennæ pale green, the rest reddish brown; eyes reddish brown;

pronotum tinged with reddish brown dorsally and the posterior border of the lateral lobes quite conspicuously margined with creamy white; elytra tinged above, especially along the lateral margins of the tympanum, with brown; abdomen shaded with light brown; spines of the legs tipped with black.

FIG. 15.—REHNIA VICTORIÆ. TIP OF ABDOMEN OF MALE FROM ABOVE.

Measurements.—Length, pronotum, 7.25 mm.; elytra, 12.5; posterior femora, 26; width, pronotum on the hinder portion of the disk, 4; posterior femora at broadest point, 3.5.

Type.—Cat. No. 10162 U. S. National Museum.

Specimens examined.—One male, the type (fig. 14), Victoria, Guerrero, Mexico. O. W. Barrett, collector.

This interesting insect bears quite an obvious resemblance to the *Neobarrettia imperfecta* of Rehn, but the larger and more pointed elytra and larger size will readily serve to distinguish it from that species.

REHNIA SPINOSA, new species.

Description.—Male, female unknown. Structurally very closely allied to *victoriæ*, but bears scarcely any resemblance to that species.

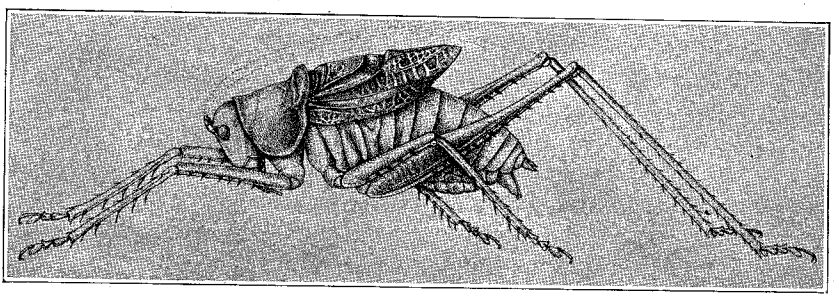


FIG. 16.—REHNIA SPINOSA. ADULT MALE.

The eyes are even more prominent than in *victoriæ* and the head is proportionately broader, being broader than the anteriorly flared pronotum, which is shaped as described under the preceding species, but considerably more elevated posteriorly and anteriorly. Prosternal spines slightly longer than in *victoriæ*, but the armature of the legs and the formation of the wings and abdomen are as described under that species. The cerci are, however, longer and less incurved apically (fig. 17).

General color uniformly yellow; eyes brownish yellow; tympanum of the elytra dark brown, and the spines of all the femora are wholly black, and those of the tibiæ are black at the base and apex, the middle part yellowish; pronotum margined anteriorly with a fine line of black and on the anterior border and along the posterior margin of

the lateral lobes with creamy white; meso-and metapleura each with an elongate white spot.

Measurements.—Length, pronotum, 10 mm.; elytra, 21; posterior femora, 36; width, pronotum at the hinder part of the disk, 6.5; posterior femora at widest point, 5.

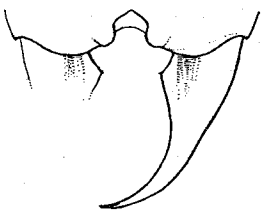


FIG. 17.—REHNIA SPINOSA. TIP OF ABDOMEN OF THE MALE FROM ABOVE.

Type.—Cat. No. 10163, U. S. National Museum.

Specimens examined.—One male, the type (fig. 16), Texas.

This large yellow species with the conspicuous black spines is a very noticeable insect. The piceous spines on the yellow femora serve to impart to it a very spinose appearance, quite different from any other of our native forms. Bruner, who kindly presented this curious creature to the National Museum, is authority for the above habitat, the specimen itself being without label of any sort. But he expresses himself as being very positive of the locality. It is very surely an introduced species, probably coming from Mexico or Central America.

ZACYCLOPTERA, new genus.

Description.—Male, female unknown. Head moderate; eyes medium in size, prominent; vertex not prominent, narrow, scarcely as broad as the basal segment of the antennæ, about one-fifth as broad as the interocular space. Pronotum large, produced posteriorly over the base of the abdomen; lateral lobes considerably inclined, about twice as long as high, rounded below, posteriorly broadly sinuate; disk rounded, slightly elevated on the posterior fourth, anteriorly truncate, posteriorly broadly rounded; lateral carinæ indicated on the posterior fourth by rounded shoulders, anteriorly represented only by a light-colored stripe; median carina not indicated. Prosternum armed with a pair of short spines. Wings and elytra of equal length, projecting beyond the pronotum a little more than the pronotal length; wings exceedingly broad, decidedly broader than long and uniformly piceous; elytra apically narrowly rounded, the tympanum occupying about one-third the length of the elytra beyond the pronotum. Legs long and slender; posterior femora more than twice as long as the pronotum and very little swollen on the basal half, armed below on both margins with a few very small sharp spines; posterior tibiæ armed below with four apical spurs; anterior tibiæ armed above on the outer carina only with three spines. Tip of the abdomen much shrivelled in the only specimen seen, but the supraanal plate seems obscure and the last abdominal segment is long and deeply and narrowly cleft; cerci short, about twice as long as the basal width and apically depressed and formed into two teeth, directed inward and a little downward.

Type.—Zacycloptera atripennis, new species.

This is a very distinct genus. It is apparently the most nearly related to the preceding one, but does not resemble that genus in any way. The legs are longer and more slender than common in this group.

But one species is known, the type from Nevada. It is described as follows:

ZACYCLOPTERA ATRIPENNIS, new species.

Description.—Male, female unknown. Head slightly broader than the anterior portion of the pronotum, into which it is moderately well inserted; vertex very short and narrow, but not compressed, scarcely

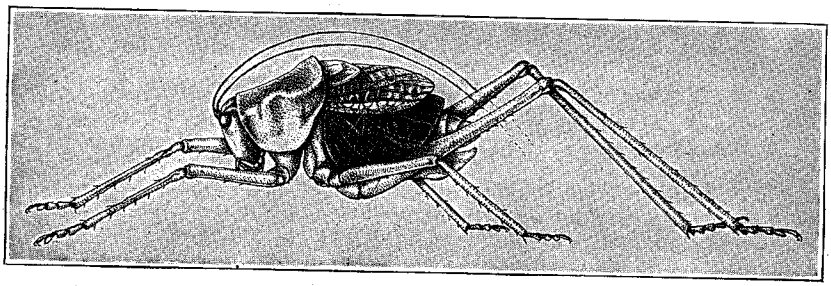


FIG. 18.—ZACYCLOPTERA ATRIPENNIS. ADULT MALE.

half as broad as one of the eyes; eyes rounded, moderate in size, and very prominent, being semiglobular. Antennæ slender, the basal segment about half as broad as one of the eyes, being a little broader than the vertex as viewed from in front. Pronotum and wings as described under the genus. Legs long, the posterior femora but little swollen basally, shaped as in the genus *Plagiostira*. All the femora are sparsely spinose below on both margins, the spines usually little more than acute tubercles. Abdomen mostly, at least in dried specimens; nearly concealed beneath the ample wings; cerci short and broad, the depressed tip formed into two acute inwardly directed teeth, the tips slightly decurved (fig. 19).

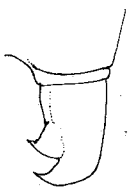


FIG. 19.—ZACYCLOPTERA ATRIPENNIS. TIP OF ABDOMEN OF MALE FROM ABOVE.

General color a very light brown, nearly white, except the elytra and top of the pronotum, which are brown, and the wings, which are uniformly piceous. The upper portion of the lateral lobes of the pronotum is brown, and separated from the brownish disk by a moderately broad pallid streak, less distinct posteriorly. These pallid streaks approach slightly in the middle, giving the pronotum somewhat the appearance of possessing lateral carinæ. The eyes are brown and the top of the head and the tibiæ are slightly embrowned, the tarsi and abdomen more so.

Measurements.—Length, pronotum, 9 mm.; elytra, 11; posterior femora, 21; width, pronotum, across metazone, 6; posterior femora, at widest point, 3; at narrowest point, 1.5.

Type.—Cat. No. 10164, U. S. National Museum.

Specimens examined—One male, the type (fig. 18), Hawthorne, Nevada, June (Wickham).

This interesting insect, donated to the National Museum by Professor Bruner, is very peculiar in the posterior femora being but comparatively little swollen basally and by the round, coal-black wings. In both these respects it is allied to the members of the genus *Plagiostira*, but the armed prosternum and non-carinate pronotum prove it to be not at all allied to that genus.

CAPNOBOTES Scudder.

Capnobotes SCUDDER, Can. Ent., XXIX, 1897, pp. 73, 74; Guide N. A. Orth., 1897, p. 55; Cat. Orth, U. S., 1900, p. 76.—COCKERELL, The Ent., XXXVII, 1904, pp. 178–181.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

Description.—Head moderately large, eyes of medium size, hemispherical; vertex prominent, narrow, about one-half as broad as one eye. Prosternum armed with a pair of sharp spines; mesosternum and metasternum with the angles spinelike, those of the mesosternum especially often forming well-developed spines, though blunter than those of the prosternum. Pronotum of moderate size, considerably produced backward over the base of the wings; disk flat behind, in front convex, posterior margin rounded, anterior margin truncate; lateral carinæ subparallel, distinct only on the hinder portion; median carina absent; lateral lobes well developed, nearly as deep as long, almost vertical, the posterior margin sinuate, the humeral angle distinct; lower border straight, slightly oblique. Wings and elytra both present and well developed, longer than the body in both sexes; elytra long and slender, those of the male furnished with an oval transparent spot on the right tympanum, the corresponding spot of the left tympanum opaque; wings long and broad, rapidly tapering apically. Legs moderately slender; posterior femora about four times as long as the pronotum, considerably swollen on the basal half and armed below with a number of small spines; tibiæ of approximately the same length as the corresponding femora, the anterior ones armed above on both margins or only on the outer, the number of spines variable, below armed on both margins, sometimes scarcely so on the outer margin. Subgenital plate apically triangularly forked, the branches carinate below and terminating in the male with a pair of cylindrical styles; supraanal plate concealed beneath the last abdominal segment, which projects backward as two long processes, being furcate nearly to the base; cerci long, subcylindrical, simple in the female, in the male toothed on the inner

side near the tip; ovipositor somewhat shorter than, or about as long as, the posterior femora, curved slightly downward.

Type.—*Locusta fuliginosa* Thomas.

This genus is closely allied to the long-winged forms of the old world genus *Dyrmadusa*, but the more slender posterior femora, narrower tegmina, more slender form, and the presence of distinct lateral carinæ on the posterior portion of the pronotum will serve to separate it from that genus.

The species of *Capnobotes* are probably all nocturnal, living among low, stunted vegetation. The notes given under *C. occidentalis* will probably be found to be true of all the species of the genus.

Three species and two varieties of *Capnobotes* are recognized and may be separated by the following table:

KEY TO THE SPECIES OF CAPNOBOTES.

A. Elytra marked along the disk with oblique light-colored spots and apically broad, 5 mm. from the tip being distinctly more than one-half as broad as at the broadest point (fig. 20).
  B. Larger. Wings deeply fuliginous. Cerci of the male six or seven times as long as the basal breadth and armed on the inner side with an apical and a subapical tooth, subequal in size (fig. 22) ..... *fuliginosus*, p. 311
  B′. Smaller. Wings hyaline, or slightly fuliginous in the costal area. Cerci of the male about four times as long as the basal breadth and armed on the inner side with a short, blunt apical tooth, sometimes reduced to a mere shoulder, and a longer subapical tooth (fig. 23).
    C. Color brown or fawn colored ..... *occidentalis*, p. 315
    C′. Color green or greenish.
      D. Elytra uniformally green ..... *occidentalis* var. *uniformis*, p. 317
      D′. Elytra green, with a row of light-colored discal spots. *occidentalis* var. *viridis*, p. 316
A′. Elytra nearly uniformly brown and apically very narrow, 5 mm. from the tip being considerably less than one-half as broad as at the broadest point (fig. 24) ..... *bruneri*, p. 317

CAPNOBOTES FULIGINOSUS Thomas.

Locusta fuliginosa THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V, 1872, pp. 443–444, pl. I, fig. 9; Rept. U. S. Geol. Surv. W. 100 Mer., V, 1875, p. 906.—GLOVER, Ill. N. A. Ent., Orth., 1872, pl. IX, fig. 9.—RILEY, Stand. Nat. Hist., II, 1884, p. 191.—HOWARD, Ins. Book, 1901, pl. XXXV, fig. 6.

Capnobotus fuliginosus SCUDDER, Can. Ent., XXIX, 1897, p. 74; Cat. Orth. U. S., 1900, p. 76.—CAUDELL, Proc. U. S. Nat. Mus., XXVI, 1903, p. 806.—REHN, Proc. Acad. Nat. Sci. Philad., 1904, p. 573.—COCKERELL, The Ent., XXXVII, 1904, p. 180.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

Description.—Head moderate, scarcely broader than the anterior portion of the pronotum into which it is inserted quite deeply; fastigium narrow, about as broad as the basal joint of the antenna, moderately prominent and very shallowly sulcate above; eyes moderately large and quite prominent, a little longer than broad; antennæ long and slender, the basal segment large, subquadrate. Pronotum

of medium size, posteriorly produced well over the base of the abdomen; lateral lobes well developed, nearly as deep as long not including the backward prolongation of the disk, quite strongly declivent, behind strongly sinuate, the humeral angle deep; lateral carinæ scarcely indicated on the anterior half and distinct and moderately sharp on the posterior half where they are slightly divergent; median carina scarcely indicated; disk transversely rounded in front but flat be-

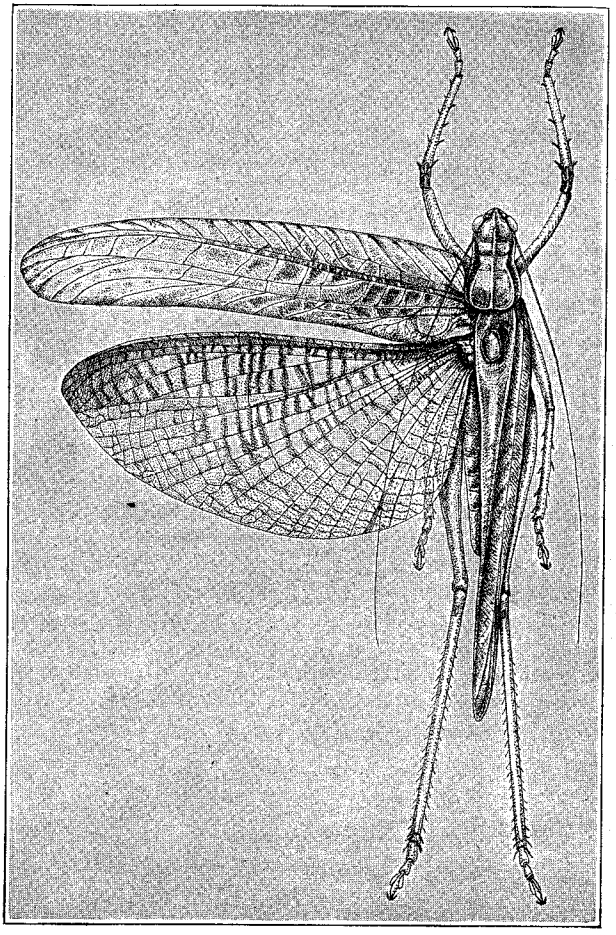
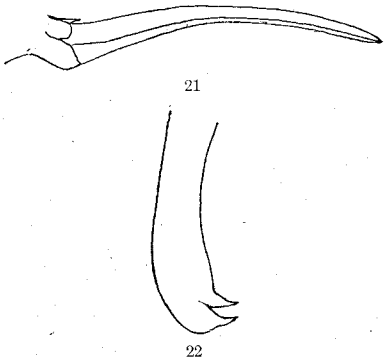


FIG. 20.—CAPNOBOTES FULIGINOSUS, ADULT MALE.

hind, longitudinally nearly straight or gradually and slightly elevated posteriorly and anteriorly, being subhastate, usually cut across the anterior fifth by a distinct sulcus, curving forward below, meeting the anterior margin about halfway down the side; anterior margin truncate, posterior margin broadly rounded. Prosternal spines slender, long, and sharp. Elytra fully developed (fig. 20), extending about one-fourth their length beyond the tips of the posterior

femora, the right one in the male with an oval transparent membrane at the base on the tympanum, a similar oval area on the left elytron but there coraceous like the rest of the surface; wings about as long as the elytra, the anal field not produced beyond the general outline; veins quite heavy and the space next the costal vein somewhat thickened. Legs moderately long and slender; anterior coxal spines long and sharp, slightly curved; anterior femora longer than the pronotum and rounded, unarmed above, broadly sulcate below, with several spines on the inner margin and on the outer margin with a few very obscure blunt spines or usually with black tubercles or dots representing them; middle femora like the anterior ones except the spines are distinct on both margins below; posterior femora about four times as long as the pronotum, swollen in the basal half where they are about three times as broad as apically, rounded and unarmed above, below broadly sulcate and armed on both margins in apical three-fourths with about half a dozen short distinct and sharp spines; anterior femora armed below with several distinct spines on the inner margin, the outer margin unarmed or with a few acute tubercles, rarely, if ever, with distinct spines; anterior tibiæ armed below on both margins and above on the outer margin with three to five spines and on the inner margin above with none to two spines; middle and hind tibiæ armed above and below on both margins with several long spines, those of the posterior tibiæ below, except near the tip, alternate and quite remote from each other; plantula short, not quite one-half as long as the basal segment of the tarsus. Abdomen large and generally fairly plump, slightly carinate above, the last segment in both sexes long and furcate, each branch at least five or six times as long as the basal width; subgenital plate in both sexes moderately long and broad and apically notched, in the male furnished with a pair of apical styles about four or five times as long as the basal width; cerci long and slender, slightly exceeding the anal prolongation of the last abdominal segment in both sexes, simple and uniformly tapering to a sharp point in the female and in the male apically depressed and incurved, the apex divided into two short, stout, inwardly directed teeth with sharp naked points (fig. 22); ovipositor somewhat shorter than the posterior femora and curved moderately downward (fig. 21).



FIGS. 21, 22.—CAPNOBOTES FULIGINOSUS. 21, OVIPOSITOR. 22, CERCUS OF THE MALE.

General color brown variegated with lighter shades; head light brown with obscure postocular and occipital bands; pronotum light brown with

the upper part of the lateral lobes more or less infuscated and generally with dusky markings on the disk, the lateral carinæ on the metazone generally black. Elytra light brown with ashy markings, the disk with a series of more or less distinct light diagonal spots; wings deeply fuliginous with translucent spaces between the cross veins over the greater part of the discal area. Legs yellowish brown with obscure darker mottlings on the femora, the posterior femora without scaliform markings on the outer face, sometimes longitudinally marked with a broken blackish line.

Measurements.—Length, pronotum, male, 7.5–8.5 mm., female, 7–9; posterior femora, male, 32–36, female, 32–38; elytra, male, 50–60, female, 56–68; cerci, male, 4–5, female, 3–4; ovipositor, 28–34; width pronotum across matazona, male, 5–6.25, female, 6–6.5; posterior femora, at widest point, male, 3.75–4.5, female, 3.75–4.75; elytra, across basal fourth, male, 9–11.5, female, 10–11; elytra 5 from apex, male, 7–10, female, 7–8; ovipositor at the middle, 1.75–2.25.

Type.—Cat. No. 1102, U. S. National Museum.

Specimens examined.—The type, a male collected in northern Arizona by Doctor Palmer, four males and four females from Arizona, Nevada, and California, one male taken by Townsend, probably in New Mexico, and a female from Lower California. Besides these, all of which are in the U. S. National Museum collection, I have seen specimens from Arizona and California in the collections of Scudder, Bruner, and Morse.

This species was described by Thomas in the genus *Locusta* from a single male which was figured.[a] Three years after the description of the male, Thomas described the female from a specimen collected by the Wheeler expedition. In 1897 Doctor Scudder erected the genus *Capnobotes* for this species and its allies. Being the first species described as well as the first to appear, both in table and discussion, in Scudder's article establishing the genus *Capnobotes*, it is logically the type of that genus.

This species seems to occur as adults in July and August, and probably later. The series studied, including material from the Scudder and Morse collections, exhibits considerable variation in the slenderness of the elytra, length of the ovipositor, and amount of the posterior elevation of the pronotum. But the different phases of development in these characters seem to extend throughout the range of the species and probably do not indicate specific differences. No specific differences were found to separate the Lower Californian specimen from those of California or Arizona.

Aside from Riley's statement in the Standard Natural History that they live in low and somber-colored vegetation, there is nothing

[a] Glover's Ill. North Amer. Ent., Orth., pl. IX, fig. 9.

recorded regarding the habits of this species. The habits are probably similar to those of *occidentalis* as discussed under the treatment of that species.

CAPNOBOTES OCCIDENTALIS Thomas.

Locusta occidentalis THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V. 1872, p. 444, pl. II, fig. 16.—GLOVER, Ill. N. A. Ent., Orth., 1872, pl. XI, fig. 16.—RILEY, Stand. Nat. Hist., II, 1884, p. 191.

Capnobotes occidentalis SCUDDER, Can. Ent., XXIX, 1897, p. 74; Cat. Orth. U. S., 1900, p. 76.—WOODWORTH, Bull. No. 142, Calif. Exp. Station, 1902, p. 15.—COCKERELL, The Ent., XXXVII, 1904, p. 179.—KIRBY, Syn. Cat. Orth., II, 1906, p. 182.

Description.—Much smaller than *fuliginosa* and very distinct from that species. Head and pronotum essentially as in *fuliginosa*, except that the pronotum is scarcely at all elevated posteriorly, while this is only true of some specimens of *fuliginosa*. Legs as in *fuliginosa*, the anterior femora with a few short spines on the inner inferior carina, the outer margin unarmed or sometimes with infuscated spots representing spines, in the nymphs with more distinct spines. Elytra generally more slender than common in *fuliginosa*, but with the same general color pattern, the oblique discal spots seemingly a little less elongate; wings shaped as in *fuliginosa*, but differing radically from those of that species in being transparent instead of fuliginous, the costal border only subopaque. Last abdominal segment with the anal prolongations not quite as elongate as in *fuliginosa*, at least in the male; cerci of the male much shorter than those of *fuliginosa*, being about four times as long as the basal breadth and apically armed on the inner side with a very short blunt spur, often a mere shoulder, and subapically with a long well-developed tooth or spur (fig. 23). Ovipositor curved gently downward and somewhat variable in length.

FIG. 23.—CAPNOBOTES OCCIDENTALIS. CERCUS OF THE MALE.

Color similar to that of *fuliginosa*, but usually more bleached in cabinet specimens, being of a fawn color. The wings are nearly transparant, not fuliginous as in *fuliginosa*. There are two color varieties, both green.

Measurements.—Length, pronotum, male, 6.5–7 mm., female, 7–7.5; elytra, male, 41, female, 45–55; wing, male, 37, female, 42–47; posterior femora, male, 26, female, 26–31; ovipositor, 22–27; width, pronotum across metazona, male, 4, female, 4.5–5; elytra at widest part, male, 7.5, female, 8; elytra 5 from apex, male, 4.5, female, 5.25; wing at widest point, male, 17, female, 20; ovipositor at middle, 1.5.

Type.—Cat. No. 1103, U. S. National Museum.

Specimens examined.—The type, a female from California taken by Mr. Taylor, two females from Salmon Falls, Idaho (Evermann), and a

male from Reno, Nevada (Wickham), taken in July. This male and also an immature male from Arizona (Dunn) were presented by Professor Bruner.

The nymph mentioned above has the characters of the adult, the wings, however, being short and reversed, and the spines on the outer carina of the lower side of the anterior femora are distinct. Bruner has a pair from Garfield Beach, Utah, and the Scudder collection contains a single female from Nevada, an unusually large specimen, from which I secured the above maximum measurements.

The following notes on the habits of this species are extracted from an article by Cockerell.[a]

This species, also the variety *viridis*, was taken near Pecos, New Mexico, on dry hillocks covered with *Pinus edulis* and *Sabina sp.* The males commence to stridulate at dusk, and the note is so high pitched as to be inaudible to some persons. The insects were present in some numbers, but were very difficult to capture, jumping off into the darkness at the least disturbance.

CAPNOBOTES OCCIDENTALIS var. VIRIDIS Cockerell.

Capnobotes occidentalis var. *viridis* COCKERELL, The Entom., XXXVII, 1904, p. 180.—KIRBY, Syn. Cat. Orth., II, 1906, p. 182.

Description.—Similar to typical *occidentalis* except that the color is greenish instead of brown or fawn colored. The elytra have the row of light oblique discal spots as found in the typical form. The cerci of the only male seen, the type, has the apical inner tooth wholly aborted. The costal margin of the wings is greenish, the rest hyaline. The ovipositor of the only female examined, one received from Professor Bruner, is shaped as usual in the genus, and is as long as the posterior femora.

Measurements.—Length, pronotum, male, 6.5 mm., female, 7.5; elytra, male, 39, female, 49; posterior femora, male, 23, female, 30; ovipositor, 29; width, pronotum across the metazona, male, 4.5, female, 5; elytra at widest part, male, 7, female, 9; elytra 5 from apex, male, 4, female, 5; posterior femora at widest part, male, 3.25, female, 3.75; ovipositor in the middle, 1.75.

Type.—Cat. No. 10165, U. S. National Museum.

Specimens examined.—Two specimens, the type, a male from Pecos, New Mexico, presented by Cockerell, who took it on Pine, August 24, and a female without label from the Bruner collection.

This is probably the insect mentioned by Riley in the Standard Natural History as a green form of *C. fuliginosa* occurring in Utah. But the cerci of the male and the hyaline wings of both sexes at once separate this insect from *fuliginosa*. Besides, it is found associated with typical *occidentalis* as stated under that species.

[a] The Entomologist, XXXVII, 1904, pp. 178–181.

CAPNOBOTES OCCIDENTALIS var. UNIFORMIS, new variety.

Description.—Male, female unknown—very like the preceding form, but the color is uniformly greenish, the elytra without the usual row of oblique spots along the disk. The elytra are also considerably less elongate than in var. *viridis*, giving the insect quite a different appearance. The cerci are essentially like those of *viridis*.

Measurements.—Length, pronotum, 6.75 mm.; posterior femora, 26; elytra, 42; width, pronotum across the metazona, 4.5; elytra at widest part, 7.5; elytra 5 from apex, 5.25: posterior femora at widest point, 3.25.

Type.—Cat. No. 10166, U. S. National Museum.

Specimens examined.—One male, Los Angeles County, California, July. (Coquillett.)

This insect is described as a variety of *occidentalis* with considerable doubt. The uniform color and less slender elytra give it a very distinctive appearance and when more material from the west is studied it may prove to be a distinct species. The form of the elytra is very like that of *Anoplodusa arizonensis* Rehn.

CAPNOBOTES BRUNERI Scudder.

Capnobotes bruneri SCUDDER, Can. Ent., XXIX, 1897, p. 74; Cat. Orth. U. S., 1900, p. 76.—WOODWORTH, Bull. No. 142, Exp. Sta. California, 1902, p. 15.—COCKERELL, The Ent., XXXVII, 1904, p. 181.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

Description.—Female, male unknown. Most closely allied to *fuliginosa*. General color a uniform wood brown; head and pronotum as in *fuliginosa*. Elytra unique in the genus, being more than twice as broad across the basal fourth than the apical fourth and nearly uniformly brown, the row of oblique discal spots scarcely noticable (fig. 24); wings fuliginous in heavy reticulations, not so opaque as in *fuliginosa* nor so transparent as in *occidentalis*, comparatively broader than in *fuliginosa*. All the femora spined beneath on both sides for the greater part of the length with short stout spines; anterior tibiæ armed above on the outer side only with three or four spines, the type having three on one tibia and four on the other. Ovipositor long and slender, longer than the posterior femora and curved downward as in the other species of the genus.

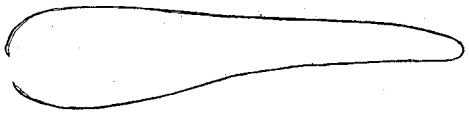


FIG. 24.—CAPNOBATES BRUNERI. OUTLINE OF ELYTRON OF THE FEMALE. [TYPE-SPECIMEN.]

Measurements.—Length, pronotum, 8.5 mm.; elytra, 47; wing, 41; posterior femora, 33; ovipositor, 37; width, pronotum across metazone, 5.5; elytra, at widest part, 10 mm.; elytra 5 from apex, 3.75; wing at broadest point, 20.5.

Type.—Cat. No. 10167, U. S. National Museum.

Specimens examined.—One female, Tepusquet Peak, Santa Barbara County, California. This specimen, Scudder's original type, is in the collection of the National Museum through the courtesy of Bruner. The very unusual shape of the elytra (fig. 24) and the coloration make this species easy of identification.

ANOPLODUSA, new genus.

Description.—Male, female unknown. Head of moderate size; eyes nearly round, quite prominent; vertex flat, not prominent, about the size of the basal segment of the antennæ. Pronotum posteriorly produced over the base of the wings as in *Capnobotes* and in shape agreeing with that of *C. fuliginosa;* prosternum unarmed, no sign of spines being present. Wings and elytra fully developed, extending beyond the tips of the posterior femora and shaped as in *Capnobotes fuliginosa*, the right elytron with transparent speculum, that of the left elytron opaque. Legs long, anterior and intermediate femora as long or a little longer than the pronotum; posterior femora about four times as long as the pronotum, abruptly and considerably swollen on the basal half and unarmed; anterior femora armed below with a few fine teeth on the inner margin, the outer margin unarmed; anterior tibiæ armed above on the outer margin only with three spines; otherwise the legs are essentially the same as in *Capnobotes*. Genitalia as in *Capnobotes*, the cerci of the only species known with two preapical teeth on the inner side.

Type.—Drymadusa arizonensis Rehn.

This genus bears a very striking resemblance to *Capnobotes*, having long wings and the same general appearance of the members of that genus. But the unarmed prosternum and the posterior femora being without ventral spines will readily separate it from that genus. *Anoplodusa*, lacking as it does prosternal spines, is not as nearly allied to *Drymadusa* as is *Capnobotes*.

There is but one species of this interesting genus.

ANOPLODUSA ARIZONESIS Rehn.

Drymadusa arizonesis REHN, Proc. Acad. Nat. Sc., Philad., 1904, p. 573.—KIRBY, Syn. Cat. Orth., II, 1906, p. 180.

Mr. Rehn's original description is here given in full:

Description.—Male, female unknown. Size rather large; form considerably elongate. Head with the occiput rounded transversly, not elevated, sloping gradually to the rather narrow, partially sulcate fastigium, which latter is deflected and touches the frontal process, width of the fastigium less than that of the first antennal joint; eyes wide apart, prominent, subglobose; antennæ as long as the tegmina. Pronotum selliform; anterior margin shallowly emarginate, posterior margin broadly and evenly rotundate; lateral lobes with the inferior margin rather narrowly rounded; posterior sinus very slight. Tegmina elongate, exceeding the apex of the abdomen by half their length, the greatest width is contained six and one-half times in the length, apex obliquely truncato-rotundate, costal expansion regular but not marked, greatest

basally and narrowing gradually toward the apex; wings equal to the tegmina in length. Abdomen somewhat compressed; supra-anal plate triangular, deeply and very narrowly divided into two elongate acute lobes; cerci rather short, the apical portion with two distinct hooks on the internal face; subgenital plate compressed, deep, inferiorly carinate, apical margin triangularly incised. Anterior femora longer than the pronotum, internal inferior margin with three to four very distinct spines; tibiæ with two spines on the external superior margin. Median femora slightly longer than the anterior, external inferior margin with one or two spines; tibiæ with two spines on the external superior margin and three internal superior margin. Posterior femora slightly shorter than the head and body, apical half slender and subequal, basal half moderately expanded; tibiæ slightly longer than the femora, compressed quadrate in section, regularly spined above, except basally, where the spines are fewer, inferior face with seven pairs of spines and several odd ones, upper inner calcar much exceeding the external in size; posterior tarsi of the type usual in the genus (*Drymadusa*).

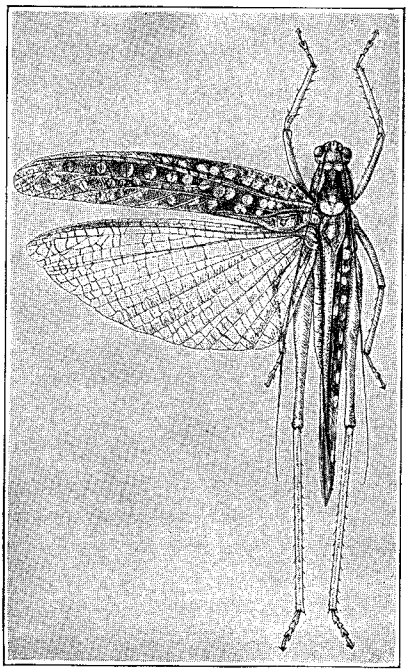


FIG. 25.—ANOPLODUSA ARIZONENSIS. ADULT MALE.

General color ochraceous buff (probably greenish in life), washed with apple-green on the tegmina. Head darker above than below; eyes hazel. Pronotum with an hourglass-shaped figure on the median portion of the disk, and a line along the posterior portion of the lateral lobes approximately parallel to the margin blackish-brown; posterior margin of the disk of the pronotum basally bone-white. Tegmina with a distinct median longitudinal series of subcircular opaque whitish spots, flanked above by a short series not so distinct, a few poorly defined blotches along the anal margin, and an irregular jumbled series in the costal field.

Measurements.—Length, body, 29 mm.; pronotum, 6.8; tegmina, 41; posterior femora, 24.5; width, pronotum at widest point 5; tegmina at widest point, 6.5.

Type.—In the Academy of Natural Sciences, of Philadelphia.

Specimens examined.—The type (fig. 25), a male from Florence, Pinal County, Arizona, 1903 (C. R. Beiderman).

Mr. Rehn's statement that the anterior tibiæ have but two dorsal spines on the outer margin is wrong, there being three of them. In the above description the name supraanal plate is used for what I call the last abdominal segment.

The cerci of this species are shaped essentially like those of *Capnobotes fuliginosa* (fig. 22), and extend to the tip of the last abdominal segment.

In the Scudder collection is an immature dectician without label, neither date nor locality, but presumably from the United States as it is associated with other material belonging to our fauna. It is a female, and by the development of reversed and elongately pointed wing pads is obviously the young of some long-winged species. The prosternum is unarmed, and the ovipositor is distinctly curved upwards. These characters prohibit its reference to *Capnobotes*, and so, unless it is some foreign species mixed in with the native forms, it is probably a nymph of the present species. If so, the ovipositor of *Anoplodusa* is seen to be curved upwards instead of downwards as in *Capnobotes*.

ATLANTICUS Scudder.

Engoniaspis BRUNNER, Ann. Mus. Civ. Stor. Nat. Genova, XXXIII (2d ser., XIII), 1893, p. 185 (invalid, no species included).—SCUDDER, Can. Ent., XXVI, 1894, pp. 177, 179 (invalid, no species included).—Guide N. A. Orth., 1897, p. 56 (invalid, no species included).—Cat. Orth U. S., 1900, pp. 75, 96.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

Atlanticus SCUDDER, Can. Ent., XXVI, 1894, pp. 177, 179.—Guide N. A. Orth., 1897, p. 55; Cat. Orth. U. S., 1900, p. 75.—BLATCHLEY, Orth. Ind., 1903, p. 392.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

Description—Head of medium size, not prominent; eyes nearly round, moderately prominent; vertex moderately prominent, about one-third as broad as the interocular space. Pronotum large, posteriorly much produced over the base of the abdomen; disk broadly rounded, posterior margin rounded or subtruncate, anterior border truncate; lateral lobes well developed, but not so deep as long, separated from the disk by sharp and persistent lateral carinæ, in one species less sharp but still distinct; median carina absent or bluntly indicated on the posterior margin. Prosternum armed with two spines, usually long and sharp, but sometimes shorter and less acute. Elytra rudimentary and wholly concealed beneath the pronotum in the female; in the male strongly convex and projecting somewhat beyond the pronotum and overlapping above. Legs moderately stout; posterior femora variable in length, varying according to species, much and abruptly swollen on the basal half and unarmed, or armed below on the inner carina with a few short spines; anterior tibiæ armed above on the outer carina only with three spines; posterior tibiæ furnished below with four apical spurs. Subgenital plate apically deeply cleft in the female, in the male very shallowly cleft and terminated by a pair of oblong rounded styles; supraanal plate small, triangular and apically more or less broadly rounded in both sexes, usually inconspicuous; cerci rounded in both sexes, simple in the female, in the male armed on the inner side with a tooth; ovipositor straight or, in one species, sometimes curved gently upwards.

Type.—*Decticus pachymerus* Burmeister.

This genus bears a striking superficial resemblance to the European genus *Thyreonotus*, but is not systematically related to it, having four instead of two apical spurs beneath the posterior tibia. That the genus *Engoniaspis* of Brunner is a synonym of *Atlanticus* is very certain, a figure of the type of the former genus, a female, having been sent to me by Brunner. This figure (fig. 29) shows very clearly that it is an *Atlanticus* and quite certainly *A. pachymerus*.

Engoniaspis Brunner would invalidate the later described *Atlanticus* of Scudder had it been based on a named species, but it remained invalid until the establishing of *Atlanticus* in 1894.

The species of *Atlanticus* occur east of the great plains from Canada to the southern States in the South, probably extending westward to California. So far as known they inhabit open woodlands or dry hillsides, sometimes however being found in marshy meadows. They are sometimes called "shield-back grasshoppers" and occur from early spring, when the young nymphs issue and hop about in the woods and along hillsides, till late in September in the Middle States, when the last of the slowly moving adults are seen. Blatchley says that in Indiana they reach maturity in June.

In confinement these insects will eat animal as well as vegetable food, and in nature probably do not confine themselves to a vegetable diet. The young are active all day, and many fall a prey to insectiverous birds and reptiles. The adults also hop about during the day, and the males stridulate by day as well as by night.

There are three described species of this genus. These are separable as follows:

KEY TO THE SPECIES OF ATLANTICUS.

A. Lateral carinæ of the pronotum sharp. Cerci of the male with a short stout tooth situated about or beyond the middle on the inner side.

B. Posterior femora long, more than two times as long as the pronotum. Elytra in the male projecting beyond the pronotum a distance less than the width of the pronotal disk at the anterior margin. Cerci of the male with that portion beyond the inner tooth three times as long as the basal width..... *dorsalis*, p. 321.

B′. Posterior femora shorter, less than or scarcly two times as long as the pronotum. Elytra of the male projecting beyond the pronotum a distance equal to or greater than the width of the pronotal disk at the anterior margin. Cerci of the male with that portion beyond the inner tooth about two times as long as wide ..... *pachymerus*, p. 323.

A′. Lateral carinæ of the pronotum distinct but not sharp. Cerci of the male with a long slender tooth situated much before the middle on the inner side..... *gibbosus*, p. 326.

ATLANTICUS DORSALIS Burmeister.

Decticus dorsalis BURMEISTER, Handb. Ent., II, 1838, p. 713.

Locusta (Ephippigera) dorsalis DE HAAN, Bijdr. Kenn. Orth., 1842, p. 178.

Thyreonotus dorsalis SCUDDER, Bost. Journ. Nat. Hist., VII, 1862, p. 454.—HITCHCOCK, Rept. Geol. N. H., I, 1874, p. 370; Proc. Bost. Soc. Nat. Hist., XIX,

1877, p. 83; Ent. Notes, VI, 1878, p. 24.—WALKER, Cat. Derm. Salt. Orth. Brit. Mus., II, 1869, p. 246.—SMITH, Rep. Conn. Bd. Agric., 1872, (1872) p. 380; Cat. Ins. N. J., 1890, p. 411.—COMSTOCK, Intr. Ent., 1888, p. 118.—FERNALD, Ann. Rept. Mass. Agric. Coll., XXV, 1888, p. 110.—Orth. N. E., 1888, p. 26.—DAVIS, Ent. Amer., V, 1889, p. 80.—BLATCHLEY, Proc. Ind. Acad. Sci., 1892, (1894) pp. 151–152.

Atlanticus dorsalis SCUDDER, Can. Ent., XXVI, 1894, pp. 179, 180, 183.—Cat. Orth. U. S., 1900, p. 75.—PSYCHE, IX, 1900, p. 104.—BEUTENMULLER, Bull. Amer. Mus. Nat. Hist., VI, 1894, p. 285, pl. VI, fig. 8.—BLATCHLEY, Orth. Ind., 1897, p. 23.—SMITH, Ins. N. J., 1900, p. 162.—KIRBY, SYN. Cat. Orth., II, 1906, p. 181.

Description.—Head of moderate size, not swollen, quite deeply set into the pronotum; fastigium broader than the basal segment of the antenna, about one-third as broad as the interocular space; front transversely convex; eyes moderate, nearly round and moderately prominent; antennæ long and slender, basal segment large, broad and strongly depressed. Pronotum large, posteriorly much produced, in the female entirely covering the wings; lateral lobes well developed but scarcely as deep as long, slanting moderately outward, the posterior margin distinctly sinuous; lateral carinæ sharp and distinct, converging very moderately in the anterior fifth and then considerably expanding to the posterior margin of the pronotum; median carina absent or very dimly present posteriorly; pronotal disk slightly convex, the anterior margin truncate, posterior margin broadly rounded, marked just behind the middle with a broad, shallow, transverse sulcus, sometimes scarcely visible; behind this transverse sulcus the surface is not so smooth as anteriorly. Prosternal spines of variable lengths but always present and well developed. Legs stout; anterior coxal spines sharp, slightly recurved and basally flattened; posterior femora more than two times as long as the pronotum, much swollen on the basal half and usually armed below on the inner carina with a few small spines, sometimes unarmed; posterior and intermediate tibiæ armed above and below on both margins; anterior tibiæ armed above on the outer margin only with three spines and on both margins below with several spines. Organs of flight completely concealed beneath the pronotum in the female, in the male overlapping above and projecting beyond the pronotum a distance usually less than the anterior width of the pronotum, the tympanum well developed but mostly concealed beneath the posterior portion of the pronotum. Supraanal and subgenital plates and the cerci of the female as described under the genus; cerci of the male armed about the middle on the inner side with a short stout spine, that portion of the cercus beyond the tooth about three times as long as the basal width; ovipositor straight, shorter, or rarely as long or a little longer, than the posterior femora, the lower margin straight, the upper margin obliquely cut off apically, bringing the organ to a moderately sharp point (fig. 26).

General color quite uniformly brownish, the posterior margin of the lateral lobes of the pronotum sometimes, but not always, yellowish

white and the posterior portion next the lateral carinæ sometimes darkened. The tips and outer face of the posterior femora are sometimes infuscated and the whole insect is often more or less blotched with blackish, but never conspicuously so.

Measurements.—Length, pronotum, male, 8–10 mm., female, 10.5–12; posterior femora, male, 19–22, female, 26–30; ovipositor, 22–30; width, pronotum at widest point, female, 6.5–7.5; ovipositor in middle, 1.5–1.75.

Specimens examined.—Immature specimens of what I believe to be this species are in the National Museum from Arizona, Florida, Virginia, and Maryland, and adults from Maryland, Virginia, District of Columbia, Mississippi, and Florida. This species has been recorded from New England to Florida and westward to Indiana. It has not been recorded from west of the Mississippi River. In my notebook, however, is mention of a female nymph in the Morse collection from California. On March 4, 1904, Dyar took a nearly full-grown male nymph at Jacksonville, Florida, in which the disk of the pronotum has the lateral carinæ nearly parallel. It was found in a damp woods and jumped into a pool of water, thus facilitating its capture. I have taken nearly full-grown nymphs in Maryland on July 7, sitting on a low bush at dusk. The young are locally quite common in the vicinity of Washington during April, but the adults are, as a rule, quite rare. The young nymphs have the prosternal spine but little developed.

FIG. 26.—ATLANTICUS DORSALIS. TIP OF THE OVIPOSITOR.

Mr. Lutz took a female on Long Island, New York, on October 16, which he considered as approaching quite closely the allied *A. pachymerus*, and questions the distinctness of these two species. But the measurements given in his notes[a] fall within the range presented by *dorsalis*.

ATLANTICUS PACHYMERUS Burmeister.

Decticus pachymerus BURMEISTER, Handb. Ent., II, 1838, p. 712.

Locusta (Ephippigera) pachymerus DE HAAN, Bijdr. Kenn. Orth., 1842, p. 178.

Thyreonotus pachymerus SCUDDER, Bost. Journ. Nat. Hist., VII, 1862, p. 453.—WALKER, Cat. Derm. Salt. Orth. Brit. Mus., II, 1869, p. 246.—SMITH, Rept. Conn. Bd. Agric., 1872 (1872), p. 380; Cat. Ins. N. J., 1890, p. 411.—COMSTOCK, Intr. Ent., 1888, p. 118, fig. 106.—FERNALD, Ann. Rept. Mass. Agric. Coll., XXV, 1888, p. 110; Orth. N. E., 1888, p. 26.—DAVIS, Ent. Amer., V, 1889, p. 80; Can. Ent., XXV, 1893, pp. 108–109.—MCNEILL, Psyche, VI, 1891, p. 24.—OSBORN, Proc. Iowa Acad. Sci., I, Pt. 2, 1892, p. 119.—BLATCHLEY, Proc. Ind. Acad. Sci., 1892 (1894), pp. 150–151.—GARMAN, Orth. Ky., 1894, p. 7.

Atlanticus pachymerus SCUDDER, Can. Ent., XXVI, 1894, pp. 179, 180, 183; Cat. Orth. U. S., 1900, p. 76; Psyche, IX, 1900, p. 104.—BEUTENMÜLLER, Bull. Mus. Amer. Nat. Hist., VI, 1894, p. 285, pl. VII, fig. 7.—DAVIS, Journ. N. Y. Ent. Soc., III, 1895, p. 142.—BLATCHLEY, Orth. Ind., 1897, p. 23.—LUGGER, Orth. Minn., 1898, p. 245, fig. 160.—SMITH, Ins. N. J., 1900, p. 162.—HENSHAW, Psyche, IX, 1900, p. 119.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

[a] Ent. News, XVI, 1900, pp. 201–202.

Pterolepis pachymerus BALL, Proc. Iowa Acad. Sci., IV, 1897, p. 237.
Decticus derogatus WALKER, Cat. Derm. Salt. Orth. Brit. Mus., II, 1869, p. 260.
Engoniaspis testacea SCUDDER, Cat. Orth. U. S., Append., 1900, p. 96.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

Description.—Of the same general color and appearance as *A. dorsalis*, but the posterior femora are usually less than two times as long as the pronotum, rarely twice as long, or a little more (fig. 27), and the ovipositor is generally longer than the posterior femora rather than shorter, as in *dorsalis*. The posterior margin of the pronotum is usually less rounded than in *dorsalis*, sometimes subtruncate. The elytra of the males are better developed, as a rule, than those of *dorsalis*, projecting beyond the pronotum a distance equal to or greater than the anterior width of the pronotal disk. The cerci of the male are similar to those of *dorsalis*, except that the inner tooth is less remote from the apex, that portion of the circus beyond the tooth being scarcely more than two times as long as the basal breadth. (See fig. 30.)

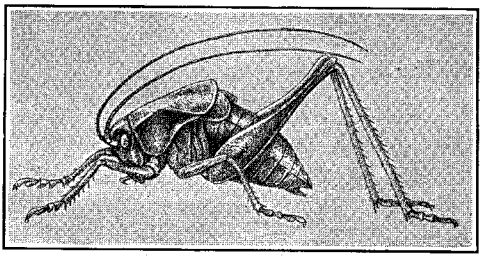


FIG. 27.—ATLANTICUS PACHYMERUS. ADULT MALE.

Measurements.—Length, pronotum, male, 8.5–11 mm., female, 8–10; posterior femora, male, 15–18, female, 16–22; ovipositor, 17–22; width, pronotum across anterior portion, male, 3.25–3.75, female, 3.75; pronotum across posterior portion, male, 6–8, female, 6.5–6.75.

Type.—Cat. No. 5734, U. S. National Museum.

Specimens examined.—National Museum material from Ohio, District of Columbia, Virginia, Maryland, North Carolina, Indiana, and the type of *Engoniaspis testacea* presumably from Missouri; also material from various localities in the collections of Scudder, Brunner, and Morse.

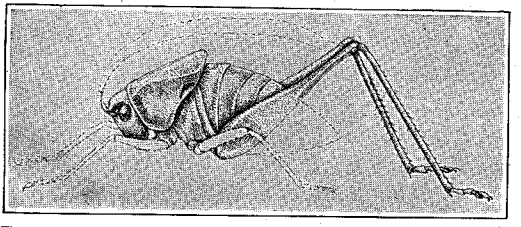


FIG. 28.—ENGONIASPIS TESTACEA. TYPE SPECIMENS (DOTTED PORTIONS RESTORED).

This species does not usually extend as far south as *dorsalis*, the southern limit, so far as recorded, being North Carolina, but is found as far north as Canada.[a] It has been recorded from the Mammoth Cave in Kentucky, but probably erroneously so, as it is not a cave species.

The type of *Engoniaspis testacea*, as stated in Scudder's original

[a] Blatchley, in A Nature Wooing by the Sea, records it from Florida, the record being based upon nymphs. These immature specimens may belong to another species.

description, is without the tip of the abdomen, but it is certainly a female, as shown by the absence of wings, fig. 28. It agrees in every particular, including the prosternal spines, with female specimens of authentic *A. pachymerus*, and I feel perfectly safe in establishing its synonomy with that species. Being the type of *Engoniaspis*, the only described species, it makes that genus a synonym of *Atlanticus*. Fig. 29 shows the insect upon which Brunner established the genus *Engoniaspis*. In his letter inclosing this drawing Brunner writes:

Of *Engoniaspis* I possess but two females. I send you a drawing. The thorns of the prosternum are pointed. The color of the animal is brown.

The figure shows the straight ovipositor and general appearance of *pachymerus*. The imperfect type of Scudder's *E. testacea* is shown in fig. 28.

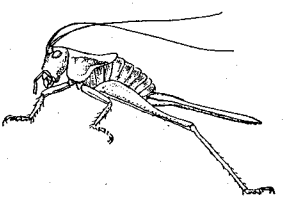


FIG. 29.—ENGONIASPIS, SPECIES. FIGURE OF TYPE FROM DRAWING SENT TO ME BY BRUNNER. (REDUCED ONE-HALF.)

Like its congener this species is active by day as well as by night. I have taken the adult male in early September on Plummer's Island, Maryland, hopping about in open woods in the early afternoon. The young hatch early in the spring, in March or early April in the vicinity of Washington, and, like the young of *dorsalis*, are more active leapers than when matured. William Davis has an interesting account of this species in the Canadian Entomologist for 1893. He found the males stridulating in some numbers in a swampy meadow on Staten Island, New York. It was June 26, on a sunny afternoon. One male specimen was captured, sitting unconcealed on a dry dead leaf of swamp grass, and placed in a cage in Mr. Davis's room. Here it sang with unabated zeal until the first of August, when his song grew less in volume until finally he died on the tenth or eleventh of September. The song is described as resembling somewhat that of *Orchelimum vulgare* with the preliminary "zip, zip" omitted. "It was," says Mr. Davis, "a continuous 'zeee,' with an occasional short 'ik,' caused by the insect getting its wing-covers ready for action after a period of silence." This specimen grew quite tame, following the hand for fruit, with which it was liberally supplied, but at times took unnecessary fright and bumped its head against its prison walls in a most insane fashion. He did not usually hide at all but sat on a leaf in his prison, waving his long antennæ.

FIG. 30.—ATLANTICUS PACHYMERUS. CERCUS OF ADULT MALE.

Beutenmüller records this species as occurring in New York in dry places, especially along hillsides, from the middle of June to late September. The adults are unable to leap more than a few inches, especially the males, which usually have the posterior legs very short, often scarcely a third longer than the pronotum.

Future investigations may prove *pachymerus* to be a variety of *dorsalis*, but at the present state of our knowledge it can scarcely be considered other than as a distinct species. There is much variation in the development of the elytra and some in the relative length of the posterior femora. Rarely some females have the ovipositor distinctly curved upward, but usually it is straight or even slightly curved downward.

ATLANTICUS GIBBOSUS Scudder.

Atlanticus gibbosus SCUDDER, Can. Ent., XXVI, 1894, p. 180; Cat. Orth. U. S., 1900, p. 75.—REHN, Proc. Acad. Nat. Sci. Philad., 1904, (1905), p. 797.—KIRBY, Syn. Cat. Orth., II, 1906, p. 181.

Description.—Head moderately large, not swollen nor deeply inserted into the pronotum; fastigium broad, rounded, not sulcate, broader than the first segment of the antenna. Eyes moderate, not prominent; antennæ slender, basally enlarged. Pronotum large and produced posteriorly over the base of the wings more than usual in the other members of the genus, completely covering the wings in both sexes, lateral lobes but moderately deep, almost vertical, posteriorly broadly sinuate; lateral carinæ prominent but less acute than in the other species of the genus, converging on the anterior fourth and from there backward diverging and rounded outward, making the disk of the metazona very elongate-ovate, posteriorly well rounded, nearly semicircular; median carina absent or barely indicated on the posterior margin of the disk; pronotal disk broadly convex, without transverse sulci, the anterior margin truncate; prosternal spines elongate and moderately acute. Abdomen heavy, not or very slightly carinate above. Elytra and wings of both sexes concealed beneath the pronotum. Legs moderately stout; posterior femora much swollen on the basal half or a little more, genicular lobes well developed, forming close-lying laminæ, or flattened spines; anterior tibiæ armed above on the outer margin only with three spines; intermediate tibiæ spined above on both margins and the posterior ones armed with a double row of small equal closely set spines above on the apical two-thirds and below with a few small scattered spines on the median line only. Cerci of the female simple, conical, about four times as long as the basal width, of the male long and moderately stout, apically slender, curved inward and then upward quite strongly, near the base on the inner side armed with a long incurved tooth two times as long as the width of the cerci at that point (fig. 31); last abdominal segment rectangularly incised; ovipositor about one-fifth shorter than the posterior femora and straight.

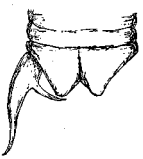


FIG. 31.—ATLANTICUS GIBBOSUS. TIP OF ABDOMEN OF MALE FROM ABOVE.

General color a light yellowish, quite uniform except the lateral lobes of the pronotum, which are black on the upper half for the entire length.

Measurements.—Length, pronotum, male and female, 14 mm.; posterior femora, male, 32, female, 30; ovipositor, 24; cerci, male, 3.5–4.5, female, 2.5: width, pronotum at widest point, male and female, 8; posterior femora at widest point, male and female, 7, at narrowest point, male and female, 1.5.

Type.—In the Museum of Comparative Zoology, Cambridge, Massachusetts.

Specimens examined.—Four adult and two immature specimens from Florida and one male and two females from North Carolina.

The Scudder collection contains five specimens, two male nymphs from Florida and one male and two female adults from North Carolina. The above description was drawn up from the adults from North Carolina. The U. S. National Museum is indebted to the liberality of Professor Bruner for an adult male specimen of this species from Lake City, Florida.

This large southern species is a very noticeable form. The large and posteriorly rounded pronotum will serve to readily separate it from the other members of the genus. It superficially resembles the European *Thyreonotus corsicus*, but is not structurally allied to that species.

Immature individuals of this species were found by Mr. Rehn quite plentiful in southern Georgia. They were found in pine woods in March and April, probably maturing about July.

APOTE Scudder.

Drymadusa SCUDDER (not Stein), Can. Ent., XXVI, 1894, pp. 178–180.
Apote SCUDDER, Can. Ent., XXIX, 1897, p. 73.—KIRBY, Syn. Cat. Orth., II, 1906, p. 182.

Description.—Head medium in size; eyes large and moderately prominent; vertex about one-fourth as broad as the interocular space. Pronotum long and narrow, posteriorly well produced over the base of the abdomen; disk rounded anteriorly and tectate posteriorly, the anterior margin truncate, the posterior margin semicircularly rounded; lateral lobes longer than high, the posterior margin slightly sinuate; lateral and median carinæ absent on the anterior portion of the pronotum, posteriorly present, the former parallel and blunt, the latter low but fairly sharp; prosternum armed with a pair of long sharp spines. Wings short but equally developed in both sexes, convex, overlapping above and projecting beyond the pronotum a distance less than the length of the pronotum. Legs stout; posterior femora short, less than two times as long as the pronotum, abruptly and considerably swollen on the basal half, or slightly more; anterior tibiæ armed above on the outer margin only with three spines; all the femora armed beneath on

both margins with small blunt spines, usually minute and fewer in number on the inner margin. Subgenital plate apically triangularly incised in the male, terminated by a pair of short blunt unarticulate styles, of the female less distinctly incised and without terminal styles; supraanal plate short and triangular in both sexes; cerci of the female short, conical, simple; of the male longer, cylindrical in the basal three-fourths, on the inner side furnished with a pointed projection (fig. 33); ovipositor more than two times as long as the pronotum and quite strongly curved downward.

Type.—Apote notabilis Scudder.

This genus is allied to the European genus *Drymadusa*, but differs in several particulars, more especially in the short posterior femora, less distinct humeral sinus, and the less distinct carinæ on the posterior portion of the pronotum. But one species is known.

APOTE NOTABILIS Scudder.

Drymadusa sp. SCUDDER, Can. Ent., XXVI, 1894, p. 180.
Apote notabilis SCUDDER, Can. Ent., XXIX, 1897, p. 73; Cat. Orth. U. S., 1900, p. 76.—KIRBY, Syn. Cat. Orth., II, 1906, p. 182.

Description.—Head moderately large and prominent, barely broader than the anterior portion of the pronotum, into which it is inserted

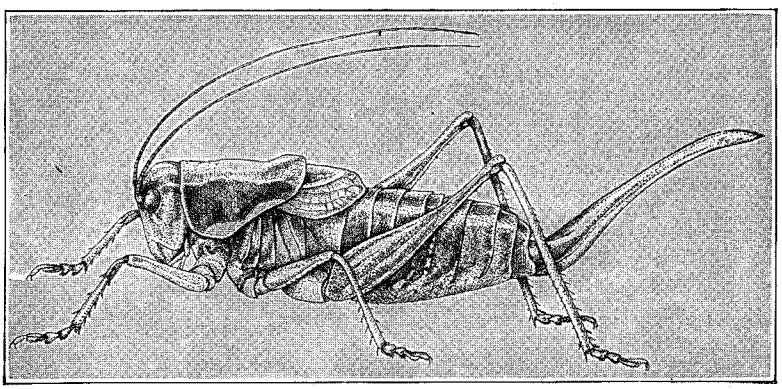


FIG. 32.—APOTE NOTABILIS. ADULT FEMALE.

quite deeply; vertex considerably broader than the basal segment of the antenna, but scarcely more than one-fourth as broad as the interocular space; front broadly rounded; eyes large and prominent, nearly round; antennæ long and slender, the basal segment broad and flattened. Pronotum large, elongate, narrow, posteriorly produced over the base of the abdomen; lateral lobes well developed, somewhat longer than high, the posterior margin nearly straight, the humeral sinus being feeble, but distinct; disk rounded and without carinæ on the anterior half or three-fourths, or very slightly indicated; behind that portion, and set off by a shallow transverse furrow, there is a

distinct and fairly sharp median carina, on each side of which the disk is flat and slanting to the distinct but very blunt lateral carinæ; the disk is no broader at one point than another, and has a second transverse sulcus near the anterior border, and just anterior of the post-median transverse furrow it is marked with a V-shaped depression, the apex directed backwards and nearly touching the transverse depression; prosternal spines long, erect, sharp. Legs and wings as described under the genus, the elytra narrowly rounded at the apex. Abdomen large and plump, sometimes obscurely carinate above. Cerci of the female simple, conical, about four times as long as the basal width, of the male more than four times as long as the basal width, and on the inner side toward the tip armed with a moderately slender sharp-pointed tooth, with the upper edge meeting the terminal part of the cercus at an angle (fig. 33), or a less slender tooth with the upper edge in a line with the tip of the cercus (fig. 34); ovipositor longer than the posterior femora, curved distinctly downward and slightly narrowed medially, the tip sharp and unarmed. (See fig. 32.)

FIG. 33.—APOTE NOTABILIS. CERCUS OF MALE.

Color, brown, marked with ash-gray; head, dark brown above, merging into yellow on the face and below; antennæ yellowish at the base, apically becoming darker; pronotum brownish above, sometimes varied with pale yellowish, the posterior margin of the lateral lobes also sometimes margined with yellow. Wings brownish, with black veins; abdomen brown, with pallid subdorsal lines and more or less mottled on the sides with the same color, below yellowish; pleura below the wings piceous with a pale border below. Legs yellowish, the outer face of the posterior femora usually more or less infuscated; ovipositor yellow with the tip margined with black.

FIG. 34.—APOTE NOTABILIS VAR. ROBUSTA. CERCUS OF MALE.

Measurements.—Length, pronotum, male, 10–13.5 mm., female, 10–13; elytra, male, 6–7, female, 5–6; posterior femora, male, 18–22, female, 19.5–22; cerci, male, 2.75–3, female, 1.75; ovipositor, 23–29; width, pronotum at posterior border, male and female, 5.5–7; posterior femora on basal half, male and female, 4–5, on apical half, male and female, 1.25–1.75.

Type.—In the Museum of Comparative Zoology.

Specimens examined: Material from North Dakota, Oregon, Washington, and Vancouver Island, British Columbia.

The National Museum contains one male and two females from the State of Washington, Rockland, July 4 (Fisher) and Pullman, June 25 (Piper), and one female from Wellington, British Columbia (Taylor). Two male and one female specimens were also sent to me for study by the Washington Experiment Station. These are from Pullman and

Washtucna, no dates given. Bruner's material, comprising five specimens, all females, from Washington, was also studied.

Besides the type, a single female from Dakota, the Museum of Comparative Zoology has a mature pair labeled as having been taken in Oregon in the month of June. This male has an intestinal worm, *Mermis sp.* protruding at least eight inches from the tip of the abdomen.

The dissimilarity of the cerci of the two males critically studied is indicative of two distinct forms. The form with cerci like fig. 34 is heavier and more robust in both sexes and the posterior femora seem broader. The lower margins of the lateral lobes of the pronotum are not pallid, as seems to be constantly the case with the other form, and the general color is apparently somewhat lighter. The habitat of the two forms are the same, however, and there are certain tendencies toward variation which make it seem best for the present to consider the two forms varietal rather than as distinct species. I therefore propose the varietal name *robusta* for the heavier form. The maximum of the above measurements are from this variety.

Type.—Cat. No. 10168 U. S. National Museum.

EREMOPEDES Cockerell.

Eremopedes SCUDDER, Can. Ent., XXVI, 1894, pp. 178, 181 (invalid, no described species included); Guide Orth. N. A., 1897, p. 56 (invalid, no described species included); Cat. Orth. U. S., 1900, pp. 78, 97; Proc. Davenp. Acad. Nat. Sci., IX, 1902, p. 55.—COCKERELL, Ann. Mag. Nat. Hist. (7), II, 1898, p. 323.—CAUDELL, Can. Ent., XXXIII, 1902, p. 100.—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Description.—Head moderate in size; vertex narrow, one-half, or less, as broad as the interocular space except in *brevicauda*, where it is nearly as wide. Pronotum moderately large and well produced posteriorly, without carinæ, or with mere indications of lateral carinæ on the posterior margin in one species, or obscure but persistent in *brevicauda*. Lateral lobes of the pronotum well developed except in a single species. Prosternum typically unarmed, but there are in some species a pair of fairly distinct spines present in some specimens. Wings wholly concealed in the female, in one species a little exposed; in the male the elytra are broad, overlap above, and project somewhat beyond the pronotum. Legs moderately slender, the posterior femora more than two times as long as the pronotum and moderately to considerably swollen on the basal two-thirds; anterior tibiæ armed above on the outer margin only with three spines. Abdomen moderately large and plump, scarcely carinate, the terminal segment deeply cleft, especially in the male (fig. 37); supraanal plate small, triangular, deeply sulcate above in the middle, the whole nearly hidden beneath the last abdominal segment; cerci simple in the female, in the male more or less sinuate and with a blunt tooth-like projection on the inner side; ovipositor

curved moderately upward and somewhat shorter or a little longer than the posterior femora, in one species short and subfalcate.

Type.—Eremopedes scudderi Cockerell.

This genus seems to naturally unite those of our genera of Decticinæ having the prosternum unarmed with those having it armed. Some specimens of even the same species have the prosternum wholly unarmed, while others have a pair of short but moderately distinct spines. This makes some species almost indistinguishable from certain members of the previous genus, *Stipator*. Especially is this true of *Eremopedes balli*, which is difficultly separable from *Stipator stevensoni*, except by the cerci of the males. The extreme superficial resemblance of these two species is the cause of a queer blunder having been made.[a]

Eremopedes is very closely allied to *Idiostatus*, but presents several points of difference. The females of *Eremopedes* generally have the ovipositor more strongly curved upward, and the elytra are usually wholly concealed beneath the pronotum, while in *Idiostatus* they are more or less extended beyond the pronotum. The elytra of the males are usually shorter in *Eremopedes* and the lateral carinæ of the pronotum of both sexes are scarcely indicated, while in *Idiostatus* they are more or less distinct, especially posteriorly. The prosternum, so far as known, is never armed in *Idiostatus*, while it is sometimes in *Eremopedes*.

Doctor Scudder proposed the genus *Eremopedes* in the year 1894, but he based it upon an undescribed species, thus giving it no standing. The first species described under the genus was Cockerell's *scudderi*, and, according to rules covering such cases, that is therefore the type of the genus. Thus the genus is credited to Cockerell. This view is the opposite of that formerly held by me, but it seems the proper one, as otherwise many changes would result, such as the replacement of *Atlanticus* Scudder by *Engoniaspis* Brunner, etc.

There are five species of *Eremopedes*. They occur mostly in the southwestern United States and seem to be nocturnal in habit, hiding by day in nooks, under bark, etc. The species are separable by characters given in the following table, given for convenience in two parts, one for the males and one for the females:

KEY TO THE SPECIES OF EREMOPEDES—MALES.

A. Cerci shaped as fig. 37, projecting almost one-half their length beyond the last abdominal segment..... *scudderi*, p. 333

A′. Cerci shaped as figs. 36 and 38, projecting but little beyond the last abdominal segment.

B. Smaller, pronotum 6 mm. or less in length; cerci shaped as fig. 38.... *balli*, p. 335

B′. Larger, pronotum more than 6 mm. in length; cerci shaped as fig. 36. *ephippiata*, p. 332

The males of *brevicauda* and *albofasciata* unknown.

KEY TO THE SPECIES OF EREMOPEDES, FEMALES.

A. Ovipositor long, more than two times as long as the pronotum.
B. Larger, the posterior femora 19 mm. or more in length, very rarely as little as 18 mm.
C. Ovipositor as long, or almost as long, as the posterior femora; lateral lobes of the pronotum not so well developed as in the alternating category, the posterior sinus less distinct.
D. Color variable but without dorso-lateral white stripes. . *scudderi*, p. 333
D′. Color green, conspicuously marked with a pair of dorso-lateral white stripes on the pronotum and abdomen ..... *albofasciata*, p. 337
C′. Ovipositor usually no more than two-thirds as long as the posterior femora; lateral lobes of the pronotum well developed, the posterior sinus distinct. *ephippiata*, p. 332
B′. Smaller, the posterior femora not over 18 mm. in length..... *balli*, p. 335
A′. Ovipositor short, no longer than the pronotum ..... *brevicauda*, p. 336

EREMOPEDES EPHIPPIATA Scudder.

Cacopteris ephippiata SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 88, 91.—KIRBY, Syn. Cat. Orth., II, 1906, p. 193.

Eremopedes unicolor SCUDDER, Cat. Orth. U. S., App., 1900, p. 97.—CAUDELL, Can. Ent., XXXIII, 1901, p. 99; Proc. U. S. Nat. Mus., XXVI, 1903, p. 807.—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Description.—Head as in *scudderi*. Pronotum about as in the preceding species, except that the lateral lobes are well developed and the

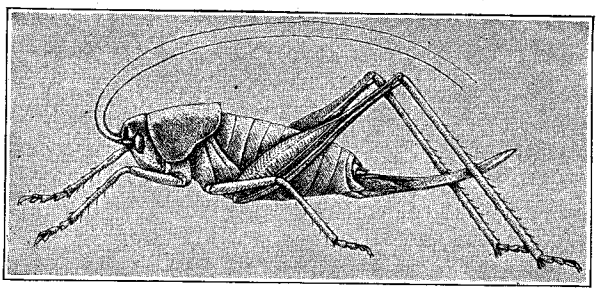


FIG. 35.—EREMOPEDES EPHIPPIATA. ADULT FEMALE.

posterior sinus distinct. Prosternum unarmed, or armed with a pair of short blunt spines rarely quite distinct and acute. Legs armed as in the type species, but the posterior femora are apparently less elongate. Abdomen moderately plump, obscurely carinate. Wings concealed in the female, in the male projecting somewhat beyond the pronotum. Ovipositor considerably shorter than the posterior femur; cerci of the female simple, pointed, of the male triangular, very stout, shaped as shown in fig. 36.

Color generally uniformly brownish, sometimes yellowish, the outer face of the posterior femur sometimes with an elongate black streak; in some specimens the lateral lobes of the pronotum are dark and the lower margins yellowish, and some specimens have the pronotal disk

yellowish, while in others it is nearly coal black. The disk of the elytra of the male is infuscated.

Measurements.—Length, pronotum, male, 6.25–7.5 mm., female, 6.5–8.5; posterior femora, male, 17–20, female, 17.5–26.5; elytra, male, 2–2.5; ovipositor, 16–19.

Type.—Cat. No. 5736, U. S. National Museum (*unicolor* Scudder).

Specimens examined.—The unique type of *unicolor* (fig. 35), a female merely labelled "Arizona," an adult female from Hot Springs, Arizona, taken by Barber on June 22; an adult male from Phoenix, Arizona (Kunze); a couple of immature females from Oracle, Arizona, in July (Schwarz); a female from Douglas, Arizona (Snow); and a female from the Huachuca Mountains, Arizona, August 18, 1903 (Oslar); and other material from Arizona and Mexico.

FIG. 36.—EREMOPEDES EPHIPPIATA. CERCUS OF MALE.

Professor Bruner has presented the National Museum with a large female nymph from Huachuca Mountains, Arizona (Kunze); and C. Schaeffer donated an adult pair from the same locality, taken by himself in August. The Academy of Natural Sciences of Philadelphia, has a series of 5 males and 8 females from the same locality taken by Doctor Skinner in August, 1905.

The unique male type of Scudder's *Cacopteris ephippiata* from Sonora, Mexico, has been examined. It is quite certainly conspecific with *unicolor*, which was described from the female. Thus it replaces the latter name.

This species is variable in size and color. Usually it is brownish, but sometimes is yellowish, and some have the pronotum yellow above with the sides brown, resembling somewhat the coloration of *E. scudderi* var. *bicolor*, and still others have the pronotal disk almost picious.

EREMOPEDES SCUDDERI Cockerell.

Eremopedes scudderi COCKERELL, Ann. Mag. Nat. Hist. (7), II, 1898, p. 323.—SCUDDER, Cat. Orth. U. S., 1900, p. 78.—CAUDELL, Can. Ent., XXXIII, 1901, p. 101.—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Eremopedes scudderi var. *viridis* COCKERELL, Ann. Mag. Nat. Hist. (7), II, 1898, p. 324.—CAUDELL, Can. Ent., XXXIII, 1901, p. 101.—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Eremopedes scudderi var. *bicolor* SCUDDER and COCKERELL, Proc. Davenp. Acad. Sci., IX, 1902, p. 54.—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Eremopedes popeana SCUDDER and COCKERELL, Proc. Davenp. Acad. Sci., IX, 1902, p. 54.—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Description.—Head moderate in size, scarcely prominent, quite deeply inserted into the pronotum; fastigium narrow, no more than one-third as broad as the interocular space, the sides concave. Eyes medium in size and rounded, moderately prominent. Antennæ slender, the basal segment as broad as the fastigium. Pronotum of

medium size, considerably produced posteriorly, the lateral lobes poorly developed, and the posterior margin very slightly sinuate; pronotal disk evenly rounded, without indication of median or lateral carinæ, truncate anteriorly, posteriorly subtruncate or very broadly rounded. Prosternum unarmed or armed with a pair of short blunt spines. Legs long and slender, the posterior femora more than three times, or about three times, as long as the pronotum, armed below in the apical half on the inner carina with a few short stout sharp spines; anterior tibiæ armed above on the outer side only with three spines. Wings lateral and wholly concealed in the female, in the male overlapping above and projecting slightly beyond the pronotum. Abdomen usually somewhat compressed and carinate above, the last dorsal segment deeply cleft in both sexes; cerci simple in the female, in the male shaped as fig. 37, projecting about half their length beyond the last abdominal segment; ovipositor long, as long or a little longer than the posterior femora.

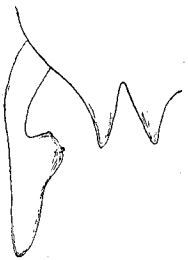


FIG. 37.—EREMOPEDES SCUDDERI. CERCUS OF MALE.

Color obscure brownish, uniformly green or brownish, with a broad ocherous band above.

Measurements.—Length, pronotum, male, 6.25–7.25 mm., female, 5.5–7.5; posterior femora, male, 20, female, 18–24; cerci, male, 3; ovipositor, 17–24.

Type.—Cat. Nos. 10173, 10174, and 10175, U. S. National Museum.

Specimens examined.—Material in various collections from Texas and New Mexico. The green form of this species has been christened var. *viridis* by Cockerell, while the varietal name *bicolor* has been applied by Scudder and Cockerell to the form with the dorsum marked with ocherous. The National Museum contains types of both these varieties as well as of the typical form; *viridis* bears the type No. 10173, while that of *bicolor* is No. 10174. The types of both varieties and the typical form are from Mesilla, New Mexico. Besides the types, the National Museum contains one male, one female, and two nymphs from the type locality, Cockerell, July and August, and one adult from El Paso, Texas (Dunn). This last was presented by Bruner. The Scudder collection has the typical form, under the name *popeana*, from Texas.

The types of *popeana* have been studied, and I entertain no doubts regarding its synonymy with the present species. Of the five specimens in the Scudder collection labeled as types of *popeana*, the specimen figured has the longest ovipositor, and none of the other four females have the ovipositor as straight as the figured specimen. No specific characters were found by direct comparison of types to satisfactorily separate *popeana* from *scudderi*, and therefore their synonymy

seems quite certain. In his original description of *popeana* Scudder states that some specimens, at least in the female and on one side, has one or two spines on the inner carina of the anterior tibia above. This statement was made by reason of an erroneous observation on the part of the describer—that of mistaking the middle leg of the right side of one of the specimens for the anterior one. These two legs were twisted across each other at the base in such a manner as to require especial care to notice the displacement.

The males of *scudderi* very much resemble those of *Idiostatus sinuata*. The types were taken in an outhouse at Mesilla Park, New Mexico, and, as stated by Cockerell, are probably nocturnal. One specimen was found killed by a centipede, *Scolopendra heros*.

EREMOPEDES BALLI Caudell.

Eremopedes balli CAUDELL, Can. Ent., XXXIII, 1901, p. 100 (part): Proc. U. S. Nat. Mus., XXVI, 1903, p. 807 (part).—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Description.—A much smaller species than either of the preceding ones. Pronotum with well developed lateral lobes, the posterior margin moderately sinuate, the disk more rounded in front than behind, posteriorly meeting the lateral lobes a little abruptly, there forming faint indications of lateral carinæ; median carina not indicated; anterior margin of the disk truncate, the posterior margin truncate or subtruncate. Prosternum unarmed or armed with a pair of tubercles or short blunt spines. Legs long, proportioned about as in the preceding species, the posterior femora unarmed below, the anterior tibiæ armed as in *scudderi*. Wings concealed in the female, in the male projecting somewhat beyond the pronotum. Abdomen scarcely or but slightly carinate, moderately plump. Cerci of the male as shown in fig. 38, projecting but little beyond the last abdominal segment. Ovipositor about as long as the posterior femora.

FIG. 38.—EREMOPEDES BALLI. CERCUS OF MALE.

General color brownish, lighter below. Head dark brown above, paler on the face and ventral and lateral surfaces; mandibles reddish distally with black teeth; pronotum dark above, pallid below, the lateral lobes usually margined below with pale yellow and behind on the upper portion, just below the obscurely indicated lateral carinæ, narrowly margined with black. Legs brownish, the posterior femora black at the apex and generally with one or two longitudinal black streaks on the outer face; the posterior tibiæ are black basally and the elytra of the males are blackish with yellowish margins and the veins also yellowish.

Measurements.—Length, pronotum, male 5–6 mm., female, 5–6.5; posterior femora, male, 15.5–17, female, 16–18; ovipositor, 13–17.

Type.—Cat. No. 6150, U. S. National Museum.

Specimens examined.—Six males and two females from Williams and Flagstaff, Arizona, all taken by Barber and Schwarz in July, 1901, and several adults from Baboquivaria Mountains, Arizona (Snow).

These Williams and Flagstaff specimens, the types, and the name *balli* is misleading, as the specimens taken by Mr. Ball and myself at Fort Collins, Colorado, were not this species but belongs to *Stipator stevensoni*. The specimens before me when the original description was drawn up comprised the specimens here described as well as those taken by Ball and myself and that accounts for the statement that the posterior femora are armed beneath when as a fact they are rarely if ever so armed. The omission of the Arizona habitat from the original description was due to inadvertence and is deplorable inasmuch as confusion is apt to exist owing to the unusual circumstances. This species superficially resembles *Stipator stevensoni* so closely as to make their confusion excusable. However, the cerci of the male will serve for their easy separation. Some of the largest females are very close to the smallest females of *ephipphiata*, but in such cases association with the males can be relied upon for a correct determination.

This insect is probably nocturnal in habits though little is known regarding it. The types were taken under bark. If it is nocturnal in habit, living under bark, etc., in the daytime, it is in this respect very different from *Stipator stevensonii* which it so resembles in appearance. Professor Snow has taken *balli* in Arizona in the Baboquivaria Mountains in which the ovipositor is several millimeters shorter than usual, measuring but 13 mm.

EREMOPEDES BREVICAUDA, new species.

Description.—Female. Head medium in size, the vertex very broad and prominent, nearly as broad as the interocular space, broader than the width of one of the eyes; front well rounded. Eyes of moderate size, not prominent, nearly round. Pronotum of medium size and posteriorly considerably produced; lateral lobes well developed, slanting, the humeral sinus broad and shallow; lateral and median carinæ very broadly rounded, scarcely noticeable, but persistent, the former parallel; pronotal disk broadly convex and longitudinally a little bowed; anteriorly subtruncate, posteriorly rounded. The pronotal disk is without transverse culci but has an obscure crescent-shaped depression in the center. Prosternum unarmed. Elytra projecting very slightly beyond the posterior margin of the pronotum. Legs moderately stout; all the femora unarmed, the posterior ones much and quite abruptly swollen on the basal three-fifths; anterior tibiæ armed above on the outer side only with three spines; intermediate tibiæ armed above on both margins. Abdomen moderately plump and dorsally somewhat carinate. Cerci round, pointed, about three times as long as the basal width. Ovipositor (fig. 39) very short and subfalcate, not as long as the pronotum.

General color reddish yellow brown. Head with a narrow obscure brownish stripe extending along each side of the vertex to the back of the head; eyes blackish. Pronotum with the lateral lobes slightly darker than the disk, narrowly bordered along the humeral sinus with light yellowish. Abdomen slightly infuscated above and on the sides, marked longitudinally with moderately broad yellowish subdorsal stripes. Ovipositor black at the tip, the sides narrowly yellowish as is also the base. Tibiæ slightly infuscated; posterior femora longitudinally marked on the outer face with a black streak.

Measurements.—Length, pronotum, 7 mm.; posterior femora, 18; ovipositor, 6; width, pronotum across metazona, 3.5; posterior femora, across widest part, 4, across narrowest point, 1; ovipositor, across middle, 1.75.

Type.—In the collection the American Museum of Natural History, New York City.

Specimens examined.—The type, one female, Napa County, California (H. Edwards).

This is a very interesting little species and is placed in this genus

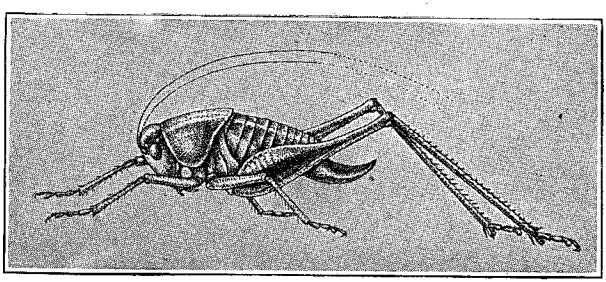


FIG. 39.—EREMOPEDES BREVICAUDA. ADULT FEMALE.

with some doubt. The persistent, but obscure, lateral carinæ of the pronotum, the broad vertex and the very short ovipositor are indicative of generic distinctness, but until the other sex is known, it is thought best to place it here. The pronotal carinæ are very obscure, but are made more apparent by reason of the pronotal disk being slightly lighter in color than that of the lateral lobes. The very short ovipositor is unique in the whole group as represented in the fauna covered by the present paper.

For the loan of this specimen for study and description I am indebted to Mr. William Beutenmuller.

EREMOPEDES ALBOFASCIATA Scudder and Cockerell.

Plagiostira albofasciata SCUDDER and COCKERELL, Proc. Davenp. Acad. Nat. Sci., IX, 1902, p. 55, pl. III, fig. 2.—KIRBY, Syn. Cat. Orth., II, 1906, p. 195.
Plagiostira gracila REHN, Publ. Kans. Acad. Sci., 1905, p. 227.

Description.—Female. Head small, not prominent, inserted deeply into the pronotum; vertex moderately broad, nearly as broad as the interocular space; front nearly straight, broadly convex. Eyes of moderate size, scarcely prominent, nearly round, slightly flattened anteriorly. Antennæ slender, more than two times as long as the body. Pronotum scarcely produced posteriorly over the basal segment of the abdomen; lateral lobes shallow, not more than one-half as deep as long, nearly vertical below, above rounded into the disk without indications of lateral carinæ at any point; humeral sinus slight, very shallow and broad; pronotal disk broadly rounded above, with a slight but distinct transverse sulcus on the anterior fifth; posterior margin broadly and shallowly concave, the anterior margin subtruncate, very slightly concave. Legs long and moderately slender; anterior coxal spines long and sharp; posterior femora moderately heavy, apically parallel for a little more than one-fourth of their length, armed below on the inner carina only with a few small stout sharp black spinules; anterior tibiæ armed above on the outer margin only with three spines. Elytra concealed beneath the pronotum, mere lateral pads, black in color with light veins. Abdomen plump, not carinate; cerci simple, conical, acute, about three times as long as the basal width; supraanal plate small, triangular, entire; last abdominal segment mesially incised apically. Ovipositor slightly curved upward, longer than the posterior femora, the tip smooth.

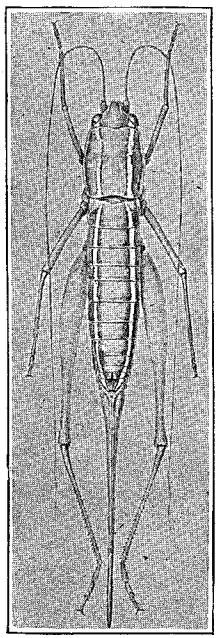


FIG. 40.—EREMOPEDES ALBOFASCIATA. ADULT FEMALE (AFTER SCUDDER).

The color is described by Scudder as follows:

Apple green, conspicuously marked with a pair of latero-dorsal white stripes, edged on both sides with dull pink, running from behind the upper edge of the eyes across the prothorax and abdomen, on the prothorax converging to the anterior sulcus and thereafter subparallel (marking the position of the lateral carinæ, were they present) on the abdomen parallel, but at first diverging feebly and then converging a little more; the lower margin of the lateral lobes of the pronotum edged as broadly with white, the white margined above with pink, and this white stripe continues forward upon the head embracing the lower margin of the eye; the vertical sides of the fastigium are white basally, edged above with pink; eyes yellow with a large dark purplish patch; antennæ with the basal joints green, beyond luteous, soon passing into testaceous. Legs green, the fore and middle femora faintly infuscated. Dorsal scutes of abdomen edged posteriorly and inferiorly with white, the white margined within with pink. Ovipositor green, becoming testaceous apically.

Measurements.—Length, pronotum, 7 mm.; anterior femora, 8; posterior femora, 27; ovipositor, 29. Width, pronotum at the posterior border, 5.5.

Type.—In the Musuem of Comparative Zoology, Cambridge, Massachusetts.

Specimens examined.—The type specimen (fig. 40), a female taken at Mesilla Park, New Mexico by Cockerell, August 12, on *Atriplex canescens*, in the Scudder collection at Cambridge, the type of Rehn's *P. gracila* from Arizona and an apparently full-grown nymph from Phoenix, Arizona (Kunze), in the National Museum.

The above-mentioned immature specimen was presented by Bruner. It is almost exactly like the type of Rehn's *P. gracila* which was kindly loaned to me for study by Professor Snow of the University of Kansas. After examining the type of Rehn's species I unhesitatingly refer it to the synonomy under the present species. Aside from being more slender, due doubtlessly to immaturity, it presents no characters of sufficient systematic value to warrant its recognition as a distinct species.

STIPATOR Rehn.

Orchesticus SAUSSURE, Rev. Mag. Zool., XI, 1859, p. 201 (not of Cabanis, 1851).—SCUDDER, Guide Orth. N. A., 1897, p. 55; Cat. Orth. U. S., 1900, p. 76.

Stipator REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 90; Proc. Acad. Nat. Sci., Philad., 1904 (1904), p. 543.—KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

Description.—Head of moderate size; vertex broad, about one-third as broad as the interocular space. Pronotum large and posteriorly moderately produced, rounded above, and without carinæ or with bare traces on the posterior portion, where the disk is sometimes slightly flattened; lateral lobes well developed; prosternum armed with a pair of spines, sometimes short, but usually long, and always distinct. Elytra of the female lateral and not, or barely, projecting beyond the pronotum, of the male overlapping above and projecting beyond the pronotum a distance equal to one-third the length of the pronotum or less. Legs moderately stout, the posterior femora more than two times as long as the pronotum and much swollen basally; anterior tibiæ armed above on the outer margin only with three spines except in *S. americanus* where both margins are sometimes armed. Supraanal plate small, rectangular in both sexes; cerci round, simple in the female, in the male armed on the inner side with a large tooth; ovipositor curved more or less upward, usually quite noticably so, and varying in length from scarcely one-fourth longer to nearly three times longer than the pronotum.

Type—Orchesticus americanus Saussure.

The variation in the armature of the anterior tibiæ is apparently confined to the type species, none others examined exhibiting this peculiarity. This is one of our largest genera, and the species is distributed quite widely over the southern and western United States and at least two species extend into Mexico. The species range in size from the largest to the smallest of our Decticinæ. As a rule they

are quite rare, though occasionally some species are not uncommon in certain localities. In food habits they are probably both herbivorous and carnivorous.

Separate tables are given for the separation of the two sexes of these insects. This was found desirable as it makes easier the determination of the species.

KEY TO THE SPECIES OF STIPATOR—MALES.

A. Cercal tooth situated much beyond the middle of the cercus, as thick, or almost as thick, and as long, or longer, than that portion of the cercus beyond it, apically rounded.
  B. Size large, pronotum 11–16 mm. in length ..... *americanus*, p. 341
  B′. Size small, pronotum 5–8 mm. in length.
    C. Posterior femora longer, armed on the inner inferior carina with several small but distinct spines; prozona nearly as convex posteriorly as anteriorly and the posterior border well rounded ..... *bruneri*, p. 343
    C′. Posterior femora relatively shorter, inconspicuously armed on the inner inferior carina with a few very minute spinules; prozona slightly flattened posteriorly and the posterior margin usually more truncate ..... *stevensonii*, p. 344
A′. Cercal tooth situated about the middle of the cercus, not as thick nor nearly as long as that portion of the cercus beyond it, apically acute.
  B. Size smaller, pronotum 8–10 mm. in length.
    C. Disk of the pronotum usually no lighter in color than the upper portions of the lateral lobes and rounded, the lateral carinæ not indicated.
      D. Antennæ usually banded. Body more robust ..... *grandis* p. 347
      D′. Antennæ uniform in color. Body more slender.
        grandis var. *insignis*, p. 349
    C′. Disk of the pronotum always lighter in color than the upper portion of the lateral lobes and slightly flattened, the lateral carinæ often indicated.
      nigromarginata, p. 346
  B′. Size large, pronotum 11–13 mm. in length ..... *grandis*, p. 347

KEY TO THE SPECIES OF STIPATOR—FEMALES.

A. Large, pronotum 11–16 mm. in length.
  B. General color yellow; pronotum usually a little flattened posteriorly and there with a trace of a median carina on each side of which is usually a broad fuscous patch, strongly contrasted with the general color; ovipositor rarely as little as 25 mm. in length ..... *americanus*, p. 341
  B′. General color brown or yellowish-brown; pronotum not flattened posteriorly and without a trace of median carina or fuscous patches; ovipositor rarely over 25 mm. in length ..... *grandis*, p. 347
A′. Smaller, pronotum 5–10 mm. in length.
  B. Dorsal surface of the pronotum and the upper half of the lateral lobes usually unicolorous; size variable.
    C. Posterior femora inconspicuously spined on the inner-inferior carina with a few very minute spinules ..... *stevensonii*, p. 344
    C′. Posterior femora more conspicuously spined on the inner-inferior carina with several small spines.
      D. Larger, pronotum 9–10 mm. in length; posterior femora scarcely infuscated apically.
        E. Stouter; antennæ usually banded ..... *grandis*, p. 347
        E′. More slender; antennæ uniform in color ..... *grandis* var. *insignis*, p. 349

D′. Smaller, pronotum 7–8 mm. in length; posterior femora deeply infuscated apically ..... *bruneri*, p. 343

B′. Pronotum dorsally light yellowish, always lighter colored than the upper half of the lateral lobes, which are infuscated; size medium, pronotum about 8 or 9 mm., rarely 10 mm. in length.

C. Posterior femora slender, more than five times as long as the basal width; lateral lobes well developed, fig. 44 ..... *nigromarginata*, p. 346

C′. Posterior femora stout, less than five times as long as the basal width; lateral lobes less developed ..... *ateloploides*, p. 350

STIPATOR AMERICANUS Saussure.

Orchesticus americanus SAUSSURE, Rev. Mag. Zool., XI, 1859, p. 201; Orth. Nova. Amer., I, 1859, p. 5.—WALKER, Cat. Derm. Salt. Orth. Brit. Mus., II, 1869, p. 248.—SCUDDER, Can. Ent., XXVI, 1894, pp. 180, 183; Cat. Orth. U. S., 1900, p. 76.

Stipator americanus REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 90.—KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

Anabrus haldemanii GIRARD, Marcy's Expl. Red River, 1853, p. 259, pl. XV, figs. 5–8; 1854, p. 248, pl. XV, figs. 5–8.—WALKER, Cat. Derm. Salt. Orth. Brit. Mus., II, 1869, p. 239.—THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., II, 1871, p. 265; Can. Ent., XII, 1880, p. 223; Rep. U. S. Ent. Comm., II, 1881, p. 259.—GLOVER, Ill. N. A. Ent., Orth., 1872, pl. VII, fig. 16.

Pterolepis haldemanii THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V, 1872, p. 441.

Thyreonotus haldemanii BRUNER, Publ. Nebr. Acad. Sci., III, 1893, p. 31.

Stipator haldemanii REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 90.—KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

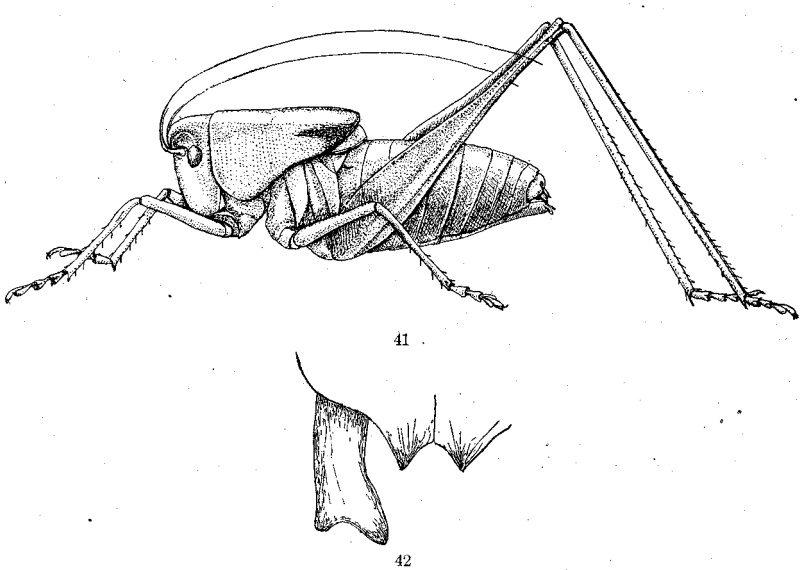
Thyreonotus cragini BRUNER, Bull. Washb. Coll., I, 1885, p. 129; 1886, p. 196; Publ. Nebr. Acad. Sci., III, 1893, p. 31.

Orchesticus cragini SCUDDER, Can. Ent., XXVI, 1894, pp. 180, 183; Cat. Orth., U. S., 1900, p. 76.

Stipator cragini REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 90.—KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

Description.—Head moderately prominent, no broader than the front of the pronotum, into which it is quite deeply set; fastigium one-third as broad as the interocular space, scarcely two times as broad as one of the eyes; front but little convex; eyes medium in size, moderately prominent, nearly round; antennæ long and slender, much longer than the body. Pronotum large and posteriorly much produced over the base of the abdomen; lateral lobes well developed, but not nearly as deep as long, nearly vertical, the posterior margin strongly sinuous; lateral and median carinæ wholly absent on the anterior portion of the pronotum, on the posterior portion indicated more or less plainly behind a transverse sulcus that crosses the disk somewhat behind the middle; pronotal disk rounded on the anterior portion, behind the transverse sulcus, usually somewhat flattened, the anterior margin truncate, posterior margin semicircularly rounded; prosternal spines moderately long and slender. Wings lateral and wholly concealed beneath the pronotum in the female, in the male much overlapping above and projecting somewhat beyond the pronotum. Legs long and stout; anterior tibiæ armed above on the outer

margin with three spines and on the inner margin with one or two spines or unarmed; posterior femora more than two times as long as the pronotum and much swollen on the basal two-thirds, usually armed on the apical half beneath, on the inner carina with a number of small sharp spinules, but sometimes very minute or wholly absent. Abdomen large and plump, scarcely carinate above; cerci of the male about four times as long as the basal breadth, bent inward on the apical third and on the curved outer margin with a blunt tooth not as long as the circal width at that point (fig. 42), of the female simple, tapering to a sharp point, about three or three and one-half times as long as the basal width; ovipositor varying from one-sixth shorter to slightly longer than the posterior femora, nearly straight in the basal two-thirds, apically very moderately curved upward.



FIGS. 41, 42.—STIPATOR AMERICANUS. 41, ADULT MALE. 42, CERCUS OF MALE.

General color yellow, the tip of the ovipositor usually infuscated, the elytra of the males blackish, with yellow outer and apical margins; the disk of the pronotum (fig. 41) has the posterior margin black and behind the transverse sulcus marked on either side of the median carina with a broad black band, usually very conspicuous, seldom obscure, and very rarely indistinct or missing. The general color is sometimes much darker than usual, but usually it is distinctly yellow.

Measurements.—Length, pronotum, male, 11–14 mm., female, 11–16; posterior femora, male, 24–32; female, 26–39; ovipositor, 25–32; cerci of male, 3.

Specimens examined.—A large number of specimens of both sexes, both adult and immature, from various regions in the middle and southern United States.

Americanus occurs throughout the middle and southern United States from Wyoming and Texas and east to Tennessee. The adults appear as early as May in Texas, and specimens in the National Museum from Kansas and Colorado are labeled as having been taken in September. The present species is peculiar in having the anterior tibiæ armed above sometimes on one margin only and sometimes on both margins. Such variability is unknown in any other member of the genus. Little difficulty will be found in the identification of this large insect. The size alone at once separates it from all other species except *grandis* and the color, markings, length of the ovipositor and the structure of the cerci of the male serve to easily separate it from that species.

The insect here described is very surely the *americanus* of Saussure. In his description of the genus *Orchesticus* he describes the pronotum as subcarinate, and this is the only species of the genus known to me of which this is true, nor has any other of our species of *Stipator* got ovipositors long enough to fit the measurements given by Saussure for *americanus*. The synonomy of *haldemanii* and *cragini* with this species has been arrived at by a careful study of descriptions and illustrations, as well as an examination of types of *cragini* and specimens of *haldemanii* in the U. S. National Museum.

In spite of the somewhat extended bibliography of *americanus* there is nothing published, so far as known to me, bearing upon the life history or habits.

STIPATOR BRUNERI, new species.

Description.—Head of moderate size, not prominent, quite deeply inserted into the pronotum; fastigium prominent, one-third as broad as the interocular space; front as in *americanus*. Eyes rounded, moderately prominent; antennæ very long and slender. Pronotum large and much produced posteriorly; lateral lobes well developed, slightly slanting outward and quite strongly sinuous behind; lateral and median carinæ not indicated at any point, the pronotal disk smooth and evenly rounded, without transverse sulce or with a very inconspicuous one; anterior margin of the pronotal disk truncate, the posterior margin semicircularly rounded; prosternal spines distinct, usually short and somewhat blunt. Wings completely concealed beneath the pronotum in the female, in the male overlapping dorsally and projecting very little beyond the pronotum; anterior tibiæ armed above on the outer margin only with three spines; posterior femora long and shaped as in *americanus*, armed below on the inner carina with several distinct but small spines. Abdomen moderately stout, scarcely carinate; cerci of the male scarcely more than three times as long as the basal width and apically forked, the outer branch blunt and nearly in a line with the main body of the cercus and the inner branch at a right angle with it and sharp pointed, a little decurved,

very similar to the figure of the cerci of the next species (fig. 43). The cerci of the female are simple, pointed, about three times as long as the basal width. Ovipositor short and heavy, usually but little more than one-half as long as the posterior femora, but sometimes three-fourths as long and curved upward.

General color brownish, sometimes yellowish brown; tip of the ovipositor, knees of the posterior femora and edge of the posterior margin of the pronotum blackish and the lower and posterior margins of the pronotum usually, but not always, yellowish, much lighter than the general color.

Measurements.—Length, pronotum, male, 7–8 mm., female, 7.5–8; posterior femora, male, 21–24, female, 24–25; cerci, male, about 1.5; ovipositor, 13–18.

Type—Cat. No. 10169, U. S. National Museum.

Material examined.—Five males, five females, Texas, Types, U. S. National Museum, and specimens from the same State in the collections of Scudder and Morse.

Described from two males and five females from Texas (Belfrage).

The Scudder collection contains one pair from the same collection, and Professor Morse took a female at Quanah, Texas, on August 21. This specimen has the ovipositor, 18 mm. long, 4 mm. more than the other females studied. Otherwise it is normal.

The longer posterior femora with the more distinct ventral spines and the usually shorter ovipositor will serve to separate this species with considerable certainty from its nearer allies.

STIPATOR STEVENSONII Thomas.

Anabrus stevensonii THOMAS, Proc. Acad. Nat. Sci. Phila., 1870, p. 75; Ann. Rept. U. S. Geol. Surv. Terr., II, 1871, pp. 265, 266.—GLOVER, Ill. N. A. Ent., Orth., 1874, pl. XVIII, fig. 19.

Pterolepis stevensonii THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V, 1872, p. 441.

Orchesticus stevensonii SCUDDER, Can. Ent., XXVI, 1894, pp. 180, 183; Cat. Orth. U. S., 1900, p. 77.

Stipator stevensonii REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 90.—KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

Anabrus minutus THOMAS, Proc. Acad. Nat. Sci., Phila., 1870, p. 75; Ann. Rept. U. S. Geol. Surv. Terr., II, 1871, pp. 265, 267.—BRUNER, Publ. Nebr. Acad. Sci., III, 1893, p. 31.

Pterolepis minutus THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V, 1872, p. 441.—GLOVER, Ill. N. A. Ent., Orth., 1872, pl. XI, fig. 17.

Orchesticus minutus SCUDDER, Can. Ent., XXVI, 1894, pp. 180, 183; Cat. Orth. U. S., 1900, pp. 76, 77.

Stipator minutus REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 90.—KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

Thyreonotus scudderi BRUNER, Bull. Washb. Coll., I, 1885, pp. 129, 130; 1886, p. 196; Publ. Nebr. Acad. Sci., III, 1893, p. 31.

Orchesticus scudderi SCUDDER, Can. Ent., XXVI, 1894, pp. 180, 183; Cat. Orth., U. S., 1900, p. 77.

Stipator scudderi REHN, Trans. Amer. Ent. Soc., XXVII, 1900, p. 90.—KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

Description.—Head, pronotum, abdomen, and wings as in the preceding species except that the posterior margin of the pronotal disk is less rounded than in *bruneri*, being sometimes almost truncate. Prosternal spines variable, sometimes short and blunt and sometimes quite long and sharp. Anterior tibiæ armed above on the outer margin only with three spines, very rarely with four; posterior femora somewhat more abruptly swollen basally than in *bruneri*, and the inner carina below is unarmed or armed with but a few very inconspicuous spinules, rarely at all prominent; cerci shaped as in *bruneri*, those of the male relatively longer, as compared with the basal width (fig. 43). Ovipositor more slender than in *bruneri* and generally considerably longer, being from about two-thirds as long to fully as long as the posterior femora.

Color as described under the preceding species and similarly variable.

Measurements.—Length, pronotum, male, 5–6.5 mm., female, 5–7; posterior femora, male, 16–18, female, 15–21; cerci of male, about 1.5; ovipositor, 14–18.

Type.—Cat. No. 1106, U. S. National Museum.

Specimens examined.—Many specimens in various collections from localities from South Dakota through Nebraska, Kansas, and Colorado to New Mexico. A male in the collection of the National Museum is labeled "Florida," but very probably erroneously so.

Superficially this species resembles very closely a species of the genus *Eremopedes.*[a] I have taken it on a stony hillside in Colorado, at the base of the mountains, actively hopping about during the middle of the day. They are adepts at eluding capture, their color harmonizing well with that of the surrounding grass and stones.

The synonymy of *minutus* and *stevensonii* seems very certain. The type of *stevensoni* seems to be lost, but the figure given by Glover shows no specific differences between that species and *minutus*. Glover's figure was made soon after the description of *stevensoni*, and as he always, when possible, drew from authentic specimens, conclusions may usually be based upon his drawings with considerable certainty. His figure agrees in size with those given by Thomas, and the original description fails to give any sufficient character for separating it from *minutus*. A careful examination of the original descriptions of both *stevensoni* and *minutus*, examination of the figures of both species by Glover and a study of the types of *minutus* and a series of additional specimens of that species leads me to the conclusion that there is but one species represented. The type of Bruner's *scudderi* has been seen and found to belong here.

FIG. 43.—STIPATOR STEVENSONII. CERCUS AND LAST ABDOMINAL SEGMENT OF MALE.

[a] See discussion under *Eremopedes balli* on p. 336.

STIPATOR NIGROMARGINATA Caudell.

Orchesticus nigromarginata CAUDELL, Trans. Amer. Ent. Soc., XXVIII, 1902, p. 89.
Stipator nigromarginatus KIRBY, Syn. Cat. Orth., II, 1906, p. 183.

Description.—Vertex moderately broad, about one-half as broad as the interocular space; eyes rounded, anteriorly truncate, scarcely prominent. Pronotum well produced prosteriorly; lateral lobes longer than deep, the posterior margin sinuate; disk very slightly flattened; lateral carinæ very slightly indicated but more noticeably located by the abrupt change in color from the usually light colored dorsum to the infuscated upper portion of the lateral lobes; median carina not indicated. Legs, wings, abdomen, cerci, and ovipositor as in *grandis* var. *insignis*. Color varying shades of brown with the upper part of the lateral lobes of the pronotum and sides of the abdomen nearly always black, conspicuously contrasted with the top of the pronotum and abdomen which are much lighter in color. This lateral infuscation of the pronotum and abdomen extends also onto the head, embracing the eyes and

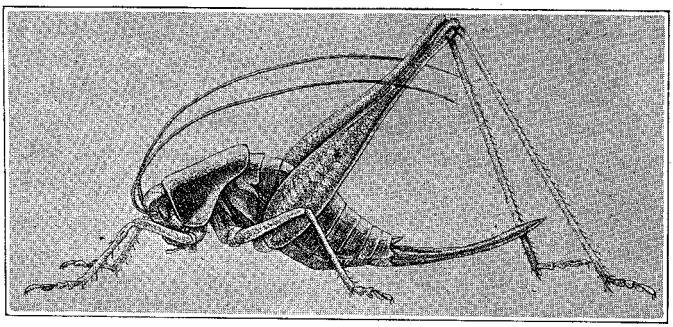


FIG. 44.—STIPATOR NIGROMARGINATUS. ADULT FEMALE.

sides of the fastigium. The antennæ are uniformly brown or, rarely, light banded. The lateral infuscation of the sides is sometimes more or less broken and the disk of the pronotum is sometimes, but rarely, dark, not so distinctly contrasted with the sides.

Measurements.—Length, pronotum, male, 7.5–8.5 mm., female, 8–10; posterior femora, male, 22.5–23, female, 26–29; ovipositor, 16–21.5; width, posterior femora at the base, male, 3.75, female, 4.5.

Type.—Cat No. 6119, U. S. National Museum.

Specimens examined.—The type, a single female, from Texas (Belfrage), and a female (fig. 44) from Perkins, Oklahoma, August 13, and material from Kansas and Texas.

In June and August, 1904, Prof. F. B. Isely, of Wichita, Kansas, sent me some nymphs from Clearwater, Kansas, and Barber took nymphs at Brownsville, Texas, in May. In the Scudder collection are two males and one female from Lakin, Kansas, 3,000 feet, September 1, and one female from Texas and one from Georgia.

In the central United States the young of *nigromarginata* probably issue in May and mature in July. Professor Isely writes me that the nymphs make no attempt to escape capture by leaping, but only by running. This seems almost incredible in view of the well-developed posterior femora, which are certainly better fitted for leaping than for running.

STIPATOR NIGROMARGINATUS var. GRISEIS, new variety.

Description.—Differing quite distinctly from the typical form in being light gray in color. The dorsum is somewhat lighter than the upper part of the lateral lobes, as in typical specimens. It is a good color form and is worthy of a varietal name.

Measurements.—Length, pronotum, male, 7.5 mm., female, 8.5; posterior femora, male, 21, female, 26; ovipositor, 20; width, posterior femora at the base, male, 3.75, female, 4.5.

Type.—Cat. No. 10171, U. S. National Museum.

Specimens examined.—One male, one female, Haigler, Nebraska (Carriker), and other specimens in the Bruner collection.

STIPATOR GRANDIS Rehn.

Stipator grandis Rehn, Proc. Acad. Nat. Sci. Phila., 1904, pp. 544, 545.—Kirby, Syn. Cat. Orth., II, 1906, p. 183.

Description.—Head quite large and prominent; fastigium prominent, about as broad as the length of one of the rounded and moderately prominent eyes; antennæ long and slender. Pronotum large, extending well back over the base of the abdomen; lateral lobes longer than high and moderately slanting, the posterior margin moderately sinuate; carinæ not indicated, neither lateral nor median, the disk uniformly rounded, usually slightly broader posteriorly; posterior margin semicircularly rounded, anterior margin truncate. Prosternal spines long and sharp. Wings wholly concealed beneath the pronotum in the female, in the male projecting slightly, as in *americanus*. Anterior tibiæ armed above on the outer margin only with three spines; posterior femora more than two times as long as the pronotum and much swollen on the basal three-fifths, armed beneath on the inner carina with several short, sharp black spines; anterior femora armed below on the inner carina with a few short stout black spines, the middle femora sometimes with one or two similar ones. Abdomen moderately heavy, usually more slender than that of *americanus* and scarcely carinate. Cerci of the male about four times as long as the basal width, and furnished on the inner side near the middle with a heavy sharp tooth as long as the cercal width at that point, like that of var. *insignis* (fig. 45). Cerci of the female simple, acute, and about the same relative length as those of the male. Ovipositor variable in

length, varying from about one-half as long to nearly as long as the posterior femora, moderately curved upward.

Color varying from dark to light brown, the antennæ ringed with brown; lateral lobes of the pronotum with the lower borders generally noticeably lighter in color than the rest; sometimes the disk of the pronotum is much lighter than the upper part of the lateral lobe, while in other cases the color is quite uniform. One specimen, a male from Texas, has yellow stripes marking the sites of the lateral carinæ of the pronotum and another, from Brownsville, Texas, has the disk green. Tibial spines usually black at the base and the short spines on the femora black.

Measurments.—Length, pronotum, male, 9–13 mm., female, 10.5–13; posterior femora, male, 26–35, female, 32–37; cercus, male, about 3, ovipositor, 15–29.

Type.—In the Academy of Natural Sciences, Philadelphia.

Specimens examined.—The type and other specimens from Mexico and a number of individuals from Texas.

The type, a single female, is from Alta Mira, Tamaulipas, Mexico, taken on June 27, by M. E. Hoag. The National Museum contains two pairs—a female from Carrizo Springs, Texas, August 28, collected by Dr. A. Wadgymar in 1885, a male from Brownsville, Texas, taken by C. H. T. Townsend, and one pair taken at Brownsville, Texas, by C. Schæffer.

Besides these I have seen specimens in the Scudder collection from Eagle Pass, Texas, Montelovey, Mexico, and from Texas without definite locality; also a number of both sexes from Texas, in the collection of the Museum of Comparative Zoology in Cambridge, Massachusetts, and Bruner has specimens from Carrizo Springs, Texas. Others are in the Museum of the Brooklyn Institute of Arts and Sciences, in Brooklyn, New York. Professor Morse has taken what he says is this species in Oklahoma. Two pairs from Brownsville, Texas, taken by Schæffer are much below the average in size, but seem to present no structural differences. The size as represented by these four specimens, one male and one female of which is in the National Museum, a gift from the collector, are as follows:

Length, pronotum, male, 9 mm., female, 10.5; posterior femora, male, 26–28, female, 33; ovipositor, 15–18.

This species attains the largest size of any other member of the genus except *S. americanus*. From *americanus* it is usually separable with but little difficulty by the characters given in the table of species. The color is quite variable, but the most striking variation is in the length of the ovipositor. A complete gradation from the shorter to the longer ovipositor exists, the following lengths represented by the series examined: 15, 18, 19, 20, 21, 22, 23, 25, 29. The cerci of young males have the inner tooth much shortened.

STIPATOR GRANDIS var. INSIGNIS, new variety.

Description.—Head medium in size, not prominent; fastigium broad, one-half or more as broad as the interocular space, very prominent. Eyes medium, not prominent, well rounded. Pronotum very narrow and slender, posteriorly much produced; lateral lobes well developed but not as deep as long, the posterior margin strongly sinuous; carinæ none; pronotal disk evenly rounded, anteriorly truncate, posteriorly semicircularly rounded, no transverse sulci noticeable. Prosternal spines well developed. Legs long, the posterior femora much but gradually swollen on the basal three-fifths, armed below on the inner carina with several short stout sharp spines, directed backwards; anterior tibiæ armed above on the outer margin only with three long spines. Wings concealed in the female, in the male the elytra overlap above and project slightly beyond the pronotum. Abdomen long and narrow, scarcely carinate above; cerci in the male round and armed on the inner side about the middle with a large sharp tooth as long as the cercal width at that point (fig. 45), in the female simple, pointed; ovipositor about two-thirds as long as the posterior femora, moderately stout and curved upwards in the apical third.

Color brown, usually darker at the tips of the posterior femora and ovipositor; disk of the pronotum and the upper portions of the lateral lobes usually unicolorous, disk of the elytra of the male black with yellowish borders; lateral lobes of the pronotum margined below with yellowish; antennæ uniformly light brown in all specimens examined.

FIG. 45.—STIPATOR GRANDIS VAR. INSIGNIS. CERCUS OF MALE.

Measurements.—Length, pronotum, male, 9–9.5 mm., female, 9–10; posterior femora, male, 25–28, female, 27–31; ovipositor, 16–20.

Type.—Cat. No. 10170, U. S. National Museum.

Specimens examined.—One male and three females, the types, from Dallas, Texas, three males and five females in the Scudder collection, all from the type locality, and one male from San Antonio, Texas, June, in Professor Bruner's collection; also one male from Kansas, one immature specimen from Brownsville, Texas (Barber), and one adult female from the same locality (Snow), in the National Museum collection.

Occasionally this variety has the sides of the pronotum black, as in *nigromarginata*, to which species this is quite closely related in many ways. But this insect is surely distinct from *nigromarginata*, though the differences are more easily seen than described. The more broadly rounded pronotum of *nigromarginata*, together with the more often blackened lateral lobes of the pronotum, will usually serve to separate it from this insect.

STIPATOR ATELOPLOIDES, new species.

Description.—Female, head moderately large and well inserted into the pronotum; vertex prominent and narrow, scarcely one-half as broad as one of the eyes; interocular space as broad as one of the eyes; eyes moderate in size and prominence, slightly longer than broad. Pronotum large and posteriorly well produced, but the lateral lobes are poorly developed, being so shallow as to give the insect a distinct resemblance to members of the genus *Ateloplus*. The posterior margins of the lateral lobes are scarcely sinuous and the lateral and median carinæ are not indicated. Pronotal disk regularly rounded, subtruncate both anteriorly and posteriorly, not much broader behind than in front, marked across the middle of the anterior half by a slight transverse sulcus. Prosternum armed with a pair of short erect spines. Legs stout; posterior femora much swollen on the basal two-thirds, armed below on each margin with a few short, stout, black spines; anterior tibiæ armed above on the outer side with three spines; middle tibiæ armed above on both margins; anterior and intermediate femora armed below on one side only with two or three short, stout spinules. Elytra and wings wholly aborted. Abdomen plump, obscurely carinate above; cerci short and stout, about two and one-half times as long as the basal width and tapering to a point. Ovipositor two-thirds as long as the posterior femora and curved moderately upward. General color pale yellowish with the spinules of the femora black, those of the tibiæ black at the base and at the tip; abdomen sprinkled with nearly microscopic round, black spots, the posterior margin of each segment with a row of the largest ones, and marked on the side at the base with an elongate fuscous patch which extends back to about the middle of the abdomen. This fuscous patch is the continuation of a lateral thoracic band which bends upward on the middle of the pronotum, leaving the lower margin of the lateral lobes yellow and giving the pronotal disk a clepsydrate appearance. The anterior and intermediate femora and tibiæ are splotched with fuscous, the former apically, the latter basally.

Measurements.—Length, pronotum, 7 mm.; posterior femora, 20; ovipositor, 13; width, posterior femora at widest point, 4.5, at narrowest point, 1.5.

Type.—Cat. No. 10172, U. S. National Museum.

Specimens examined.—One female, the type, San Jose del Cabo, Mexico. Presented by Professor Bruner.

This species is in general appearance an aberrent member of the genus, though in general structure it is unmistakably a *Stipator*. The less slender posterior femora, and especially the shallow lateral lobes of the pronotum, give it much the appearance of an *Ateloplus*, but the armed prosternum prohibits its reference to that genus.

ANABRUS Haldeman.

Anabrus HALDEMAN, Stansb. Expl. Utah, 1852, p. 371.—HERMAN, Verhandl. der k. k. zool.-bot. Gesellsch. Wien, XXIV, 1874, pp. 200, 209.—THOMAS, 2d Rept. U. S. Ent. Comm., 1880, p. 169.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191.

Description.—Head moderately large and prominent, quite deeply inserted into the pronotum; eyes rounded and moderately prominent; vertex quite prominent, about one-third as broad as the interocular space. Pronotum large and much produced posteriorly; lateral carinæ not indicated on the anterior half, posteriorly present but blunt or obscure; median carina present on the posterior portion only and there very obscure, sometimes scarcely discernible; disk smooth, evenly rounded transversely on the anterior half, posteriorly somewhat flattened, a slight transverse sulcus across the anterior portion, usually scarcely noticeable and never conspicuous, and marked near the middle with a V-shaped sulcus or depression, usually quite noticable; anterior margin of the disk truncate, the posterior margin subtruncate or broadly rounded; lateral lobes well developed, posteriorly sinuate. Prosternum unarmed. Wings of female broad, nearly but not quite meeting on the dorsal line but wholly concealed beneath the pronotum; of male overlapping, strongly convex and projecting slightly beyond the pronotal disk. Legs short and stout, the posterior femora less than two times as long as the pronotum, except in *A. longipes*, and armed below on both margins with from one to several small spines; anterior tibiæ variable in armature, the outer side armed with from three to five, usually four or five, spines and the inner side unarmed or, usually, armed with from one to three spines, the usual number being one or two. Abdomen plump, not carinate. Cerci simple and conical in the female, in the male apically flattened and furcate, the branches forming two sharp incurved claws; subgenital plate apically broadly notched in both sexes, in the female with acute angles and at the base on each side with an apically rounded lobe which may be designated as the subgenital lobes; supraanal plate triangular, usually almost hidden, especially in the male; ovipositor varying in length from a little shorter to considerably longer than the posterior femora and curved slightly and quite uniformly upward, rarely straight.

Type.—Anabrus simplex Haldeman.

The members of this genus and the one following comprise the only injurious members of our Decticinæ. Hordes of *Anabrus* at times invade cultivated areas in the western United States and do immense damage. They are known by several common names, among which are great plains cricket, western cricket, war cricket, army cricket, mormon cricket, Idaho cricket, coulee cricket, and Idaho devil. This

latter name, however, is more often applied to members of the stenopelmatid genus *Stenopelmatus*.

There has been recognized three distinct species of *Anabrus*, ranging from the plains east of the Rocky Mountains to the Pacific, and some orthopterists believe there are really many more species. In my study of the genus I have examined several hundred specimens from localities ranging from Kansas to California, north to Washington and British Columbia, and from altitudes varying from the plains of Kansas to the treeless heights of mountain peaks. Much time has been spent in search for stable characters for the separation of the various described species. So great is the range of variation in both structure and coloration and so apparently distinct are the extremes that the multiplicity of forms seemed at first certain, but such seems now scarcely probable of proof. With but a few specimens from different localities before him a worker will find the recognition of two or more forms easy, but the examination of a long series usually merges the supposedly distinct species into one. In 1897 Scudder[a] separates the species apparently to his satisfaction. There he considers the form occurring in Washington and recorded as *purpurascens* to be not that species, but *simplex*. But two years later, in his Catalogue of the Orthoptera of the United States, he includes Washington in the habitat of *purpurascens*, thus showing a reversal of opinion. An examination of the Scudder collection shows no satisfactory division of this genus into species, a fact expressive of the difficulty of the task. In the course of my investigation and studies I found some promising characters, but upon trial their value as stable means of separating the mass of material into species proved unreliable.

Professor Gillette suggested, and for a time strenuously maintained, that the relative lengths of the posterior and intermediate tibiæ were of specific value for the separation of *simplex* and *purpurascens*, in *simplex* the posterior tibiæ being less than two times as long as the intermediate ones, while in *purpurascens* the hind tibiæ are twice or more than twice as long as the middle ones. But when determined by this character both *simplex* and *purpurascens* were found in nearly every State and Territory where either species is known to occur, and material, obviously of one catch, yielded both species. The subgenital lobes of the females also presented promising possibilities, but upon trial were also found wanting. Their extending to or beyond the apex of the subgenital plate seemed very suggestive of a differentiating character, but the examination of a large number of specimens resulted in the rejection of this as a specific character. Color is also useless, as individuals of all shades are said to be found among living swarms. Putnam says that scarcely any two of the many specimens seen in Middle Park, Colorado, were colored alike. Length and shape of ovipos-

[a] Psyche, VIII, p. 95.

itor were considered as were also size and habitat, but none proved serviceable for the separation of the specimens before me into species.

That *Anabrus coloradus* is but a form of *A. simplex* is strongly indicated by the fact that the author himself probably failed to properly differentiate his own species since he mentions specimens occurring in high altitudes in Colorado as *purpurascens*, while *coloradus* is certainly the typically alpine form, and Scudder has pointed out that the high altitude species mentioned by Thomas was not *purpurascens*, but *coloradus*. Again, specimens which are very probably *coloradus*, from Middle Park, Colorado, were treated of by Putnam and Thomas as *A. simplex*. This all goes to show that the separation of these species was not satisfactory, and my reduction of them to varieties of one species seems to me amply justified.

My studies have been confined almost entirely to cabinet specimens, and future examination of living or fresh material may justify the restoration of the varietal names here employed to specific rank and the recognition of additional species. But for the present I am unable to consider our described forms as representing more than one species, recognizing, however, a number of named varieties. The habits of all being essentially the same I consider indicative of their being conspecific. This complex species and two new ones herein characterized may be separated by the following table:

KEY TO THE SPECIES OF ANABRUS.

A. Posterior femora less than two times as long as the pronotum.
  B. Cerci of the male with the apical branches not widely divergent (fig. 47). Smaller, pronotum of both sexes under 15 mm. in length.....*simplex*, p. 353
  B′. Cerci of the male with the apical branches widely divergent (fig. 48). Larger, pronotum of both sexes more than 15 mm. in length.....*cerciata*, p. 361
A′. Posterior femora more than two times as long as the pronotum...*longipes*, p. 361

ANABRUS SIMPLEX Haldeman.

Anabrus simplex HALDEMAN, Stansb. Expl. Utah, 1852, p. 372, pl. x, fig. 4.—ALDRICH, Bull. no. 41, Exp. Stat., Idaho, 1904, p. 302, fig.—DOTEN, Bull. no. 56, Exp. Stat., Nevada, 1904, p. 10. pl.—GILLETTE, Ent. News, XV, 1904, p. 321, pl. XIX.—GILLETTE and JOHNSON, Bull. no. 101, Exp. Stat., Colorado, 1905, pp. 1–16, pl. I.—REHN, Ent. News, XVII, 1906, p. 288.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191. [Additional references in Scudder's Index of Orthoptera (1901).]

Anabrus purpurascens UHLER, Proc. Ent. Soc. Philad., II, 1864, p. 550.—HOLLIS, Bull. no. 38, U. S. Dept. Agric., Bur. Ent., 1904, p. 107.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191. [Additional references in Scudder's Index of Orthoptera (1901).]

Acheta nigra LORD, Nat. in Vanc., I, 1866, pp. 264–6.

Thamnotrizon purpurascens THOMAS, Proc. Acad. Nat. Sci. Philad., 1870, p. 76; Ann. Rept. U. S. Geol. Surv. Terr., II, 1871, pp. 265, 268.

Anabrus similis SCUDDER, Rept. U. S. Geol. Surv. Nebr., 1872, p. 249; Can. Ent. XXVI, 1894, pp. 181, 183.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191.

Anabrus coloradus THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V, 1872, p. 440.—KIRBY, Syn. Cat. Orth., II, 1906, p. 191. [Bibliography in Scudder's Index of Orthoptera (1901).]

Anabrus sp. SCUDDER, Psyche, VIII, 1897, p. 95.

Description.—Head as described under the genus, the front moderately full and broadly rounded; antennæ long and slender, the basal segment broad, about one-half as large as one of the eyes. Pronotum with the lateral carinæ on the posterior portion moderately sharp and distinct to very rounded and obscure, the median carina often almost absent, sometimes quite distinct but always low; sulci of the disk as described under the genus, variable in distinctness; posterior margin of the disk varying in contour, often subtruncate but sometimes quite rounded. Legs short, the posterior femora never quite twice as long as the pronotum; anterior tibiæ armed above on the outer side with from three to five spines, usually four or five, and on the inner side with one or two, sometimes with as many as three and sometimes unarmed. Cerci of the male as shown at fig. 47; the branches are nearly parallel,

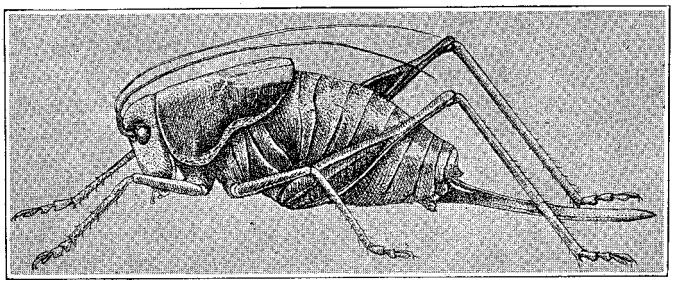


FIG. 46.—ANABRUS SIMPLEX. ADULT FEMALE.

the interspace being U-shaped, both branches curved strongly inwards, the lower being acute and considerably the longer, the upper sometimes blunt, scarcely pointed. Subgenital lobes of the female varying in length, sometimes extending just to the end of the subgenital plate and again reaching distinctly beyond it. Ovipositor varying from shorter to considerably longer than the posterior femora and in shape from nearly straight (fig. 46) to moderately curved upwards, usually distinctly curved.

Color varying from light yellow to shiny black, often, especially in life, grass green. The body is sometimes uniform in color and sometimes evenly mottled or varyingly marked.

Measurements.—Length, pronotum, male, 7–14.5 mm., female 9–15; posterior femora, male, 12–23, female, 14–26; posterior tibia, male, 11–22, female, 13–26; intermediate tibia, male, 5–13, female, 6.5–14; ovipositor, 15–28.

Specimens examined.—Numerous specimens from almost the whole of the United States west of the States bordering the Mississippi river.

Four forms of this species are here recognized and named. *Coloradus* is probably worthy of varietal distinction, but the others are given names only as a matter of convenience, not being considered as of more than mere color-variational distinctness. These forms may be separated by the following key.

KEY TO THE VARIETIES OF ANABRUS SIMPLEX.

A. Larger pronotum generally more than 11 mm. in length.
  B. Color variable but not shining black.
    C. Abdomen uniform in color ..... *simplex*, p. 355
    C′. Abdomen mottled uniformly with gray ..... *maculatus*, p. 356
  B′. Color shining black, the lower margin of the pronotum, the posterior legs and the middle portion of the ovipositor sometimes lighter in color .. *nigra*, p. 355
A′. Smaller pronotum generally no more than 11 mm. in length.
  B. Usual color brown or green, the abdomen not marked with gray. *coloradus*, p. 356
  B′. Usual color varying shades of brown, the abdomen mottled with gray. *maculatus*, p. 356

The typical form, has for synonyms *purpurascens* Uhler and *similis* Scudder. Specimens taken at one locality, Fort Collins, Colorado, exhibit ovipositors nearly straight and scarcely longer than the posterior femora to quite strongly curved upward and considerably longer than the posterior femora. These specimens also vary in color from yellowish to dark shiny brown.

FIG. 47.—ANABRUS SIMPLEX. CERCUS OF MALE.

This form, as here considered, seldom has the pronotum less than 12 mm. long, rarely but 11.5. It ranges from the plains of Nebraska to California and occurs from a few hundred feet altitude to several thousands, in the mountainous districts of considerable elevation merging into the stunted form known as *coloradus*. The specimens occurring in Nebraska and other eastern localities are usually lighter in color than ones from the west, and the posterior femora seem to be somewhat less robust and a little shorter.

ANABRUS SIMPLEX var. NIGRA, new variety.

Description.—This is a form distinguished by its shiny black color. The lower margins of the lateral lobes of the thorax are sometimes yellowish and the posterior legs and the middle portion of the ovipositor of the females are often lighter in color. The subgenital lobes of the females reach the apex of the subgenital plate and the ovipositor is moderately upcurved and considerably longer than the posterior femora. A longer series would probably show variation in these respects as there is in the typical form.

Measurements.—Length, pronotum male 12.5–14 mm., female 11.5–14; posterior femora, male 20–21, female 20–24; ovipositor 23–26.

Type.—Cat. No. 10176, U. S. National Museum.

Specimens examined.—Two male, four females, Idaho; one female, Blue Lake, Idaho; one female, Plush, Oregon; two females, four males, Eddy, Route County, Colorado.

This is merely a color variety, and grades quite imperceptibly into the typical form.

ANABRUS SIMPLEX var. MACULATUS, new variety.

Description.—Averaging smaller than the typical form. The color varies from yellowish brown to dark brown, the abdomen mottled regularly with gray. The lower margins of the lateral lobes of the thorax is sometimes yellowish. The subgenital lobes of the female in all specimens examined extend to the apex of the subgenital plate; ovipositor but little or no longer than the posterior femora and usually considerably curved upwards.

Measurements.—Length, pronotum, male, 10–11 mm., female, 9.5–12; posterior femora, male, 17–17.5, female, 17–20; ovipositor, 17–20.

Type.—Cat. No. 10177, U. S. National Museum.

Specimens examined.—Two males, five females, Fort Walsh, British Columbia, September; eight males, six females, Mount Rainier, Washington, August 25; one female, Bismarck, North Dakota, July; one female, New Mexico; one male, one female, Nebraska, labeled Lincoln, but probably taken one hundred miles or more northwest of there in the sand hills.

The maculation of the abdomen of this form gives it somewhat the appearance of being hairy. The female from Bismarck, North Dakota, is labeled by Thomas as *purpurascens*. It is the one figured in Howard's Insect Book. The unusual color, especially of fresh specimens, gives this form quite a characteristic appearance. Intermediate forms, however, lead from it to typical *simplex*. The series taken on Mount Rainier by Mr. Burke was examined when quite fresh and the specimens were found to be quite uniform in size and coloration. The grayish mottling of the abdomen has a tendency to fade out in dried specimens. These Mount Rainier specimens were found singing in the sun about noon.

ANABRUS SIMPLEX var. COLORADUS Thomas.

Description.—A small subalpine or alpine form. The color of living specimens seems to be usually grass green, but there is variation in color here as in the typical form. The subgenital lobes of the female vary in backward extension, some reaching the apex of the subgenital plate and others falling somewhat short of it. The ovipositor is more or less upcurved and varies in length from slightly longer to much longer than the posterior femora.

Cabinet specimens of this form exhibit all shades of coloration. The type-specimens, which were preserved in spirits and probably

much discolored, are now in the National Museum. They are nearly yellow with the posterior portion of the upper part of the lateral lobes of the pronotum, just below the lateral carinæ, black, as are also the margins of the abdominal segments. Some specimens, probably ones killed soon after transformation, are wholly yellow, while others are nearly black.

Measurements.—Length, pronotum, male, 7–11.5 mm., female, 9–11.5; posterior femora, male, 12.5–19, female, 14–21; ovipositor, 16–24.

Type.—Cat. No. 1107, U. S. National Museum.

Specimens examined.—The types, two discolored alcoholic specimens, male and female, from "eastern Colorado," and specimens from Colorado—Pikes Peak, Manitou, Longs Peak, Palmer Lake, Colorado Springs, Lakespur, South Park, Ward, Livermore, and summit of Vega Pass; from Cumbres, New Mexico, southern Idaho, northern Utah, and Fort McLeod, British America. Also specimens referable to this form from Wallace County, Kansas, and Lincoln, Nebraska. These specimens represent the merging of this ordinarily higher altitude form with the ordinary prairie form. Specimens of *coloradus* from high altitudes are invariably smaller than those from places of less elevation. Thus the specimens from Livermore and Colorado Springs are decidedly larger than ones taken high up in the mountains. These larger specimens inhabiting the lower altitudes merge quite imperceptibly into typical *simplex*. *Coloradus* seldom occurs below 6,000 ft. altitude.

Anabrus simplex, with its several races, is, economically, our most important member of the subfamily Decticinæ. Great bodies at times march from their breeding places in neighboring hills into the surrounding cultivated fields, causing great damage. Such swarms are often several miles in extent, and usually, I believe, consist of the typical form with some of the variety *nigra*. Such an invasion occurred in Route County, Colorado, in 1904, and is thoroughly discussed by Gillette and Johnson in Bulletin No. 101 of the Colorado Experiment Station, where the habits and life history are ably described. Doten,[a] discusses the question of remedies, while a short summary of the subject is given by Aldrich in Bulletin No. 41 of the University of Idaho. The breeding habits are treated of by Gillette.[b] For a thorough study of this interesting species the above-mentioned articles, as well as other older ones, should be consulted.

This insect generally breeds in hilly places where vegetation is scarce, preferring clay soils containing surface cracks which facilitates the insertion of the ovipositor. In ovipositing, the female brings the tip of her ovipositor forward beneath the abdomen and forces it nearly perpendicularly into the ground. The eggs are chocolate

[a] Bulletin No. 56, Nevada Experiment Station.

[b] Entomological News, xv, pp. 321–324.

brown when first deposited, but soon dry to a grayish color. They are about one-fourth of an inch in length by one-sixteenth wide and are nearly straight. So numerous are the eggs, which are laid loose in the soil, the upper ones sometimes sticking partially above the surface, that as many as three thousand have been counted in a square foot of soil. A single female may lay over one hundred eggs, but the egg-laying period probably extends over a considerable period of time, as ovæ of various stages of development are found in the ovaries at one time. The copulation of this insect presents interesting features. The position of the male in copulation is curled beneath the female or lying on his back beneath her, being dragged about as she walks. The transference of seminal fluid inclosed in a sac is recorded as follows by Gillette in his article in Entomological News, from which many of the facts here stated were taken:

> While studying the habits of this wingless grasshopper, near Eddy, my attention was attracted by the large white masses of jelly-like material that were attached to the abdomens of the females just beneath the ovipositors. They had also been noticed by the ranchmen, who spoke of them as "white sacs" and "blubber." I concluded the phenomenon must be associated in some way with the process of fertilization, and began an investigation. By pinching the abdomens of several females having the white masses attached I found they could be removed without breaking or tearing any organ, and that they were held in place by the vulva, which grasped a small portion or lobe. Several examples of both sexes were then taken at random from the swarm, and their abdomens were opened in search of this body, but it was not found. I noticed, however, that the seminiferous tubules of the males were filled with a milky white fluid before copulation, and that after copulation they were empty and yellow in color. A male and female in copula were then separated, just before the close of the process and before the sperm mass had made its appearance. The male abdomen was then pinched, so as to crowd the contents toward the end, and a sperm mass, exactly like those taken from the females, was obtained. I therefore concluded that during copulation the males fill these sacs with seminal fluid and then transfer them bodily to the females, who seize them by two small lobes. The females carry these conspicuous white objects about for a time, extracting a portion, at least, of their contents for the fertilization of the ova. After two or three hours these masses disappear entirely, but whether the contents are largely taken in by the female or whether she rejects the greater portion after extracting the spermatozoa I did not determine.

Cabinet specimens occasionally retain the sacs mentioned in the above extract, such being true of a specimen of the variety *coloradus* from Larkspur, Colorado. The angular corners of the subgenital plate seem to aid the subgenital lobes in retaining the sac. I have seen similar sacs attached to the female of *scudderia furcata* Brunner. Gillette says that mating was apparently done mostly in the early morning, as the females carrying seminal sacs were most numerous about 9 or 10 o'clock in the forenoon, scarcely any occurring after midday. The egg-laying period seems to extend through July and August and well into September, the young hatching as early as March, and are often subjected to severe temperature, which, how-

ever, they are able to endure with little fatality. The young are thus described by Gillette from living specimens.

When first hatched, the crickets are a light flesh color throughout, except the black eyes, but soon become quite black, with a broad, flesh-colored stripe the entire length of the back. Along the middle of this light dorsal stripe are two black lines separated by a narrow line of the flesh color. The hind margin of the cape, or pronotum, immediately above the front pair of legs, is very conspicuously light yellow, almost white. Antennæ somewhat longer than the body, and black.

The legs of the young nymphs are longer in proportion than in the adult forms, though Gillette does not mention this peculiarity in the above quoted description. The posterior femora of the young are more than two times as long as the pronotum, which is never the case in the adult form.

The adult males chirp in the morning hours, ceasing about 10 o'clock, except when disturbed by something, when they make a sharper note of warning, causing those in the vicinity to hop in various directions. Activity ceases at night, the insects usually retiring to rest beneath or in bushes. In 1879, Thomas stated that their activity is greater at night, but more recent observers say otherwise. I found the alpine form, *coloradus*, stridulating in the middle of the day, as I also observed the prairie form to do.

The food of this insect is varied. They will eat sage brush, but seem to prefer more succulent food, either wild or cultivated. Field grain and grasses, potatoes, and most garden truck are greedily devoured by them. Peas and timothy are said to be but little favored by them as articles of diet. They are not confined to a vegetable diet, being, in fact, rather partial to animal matter, especially disabled members of their own kind. Gruesome, indeed, are the feasts often held by these cannibals off an unfortunate brother or sister. Spent females, weakened by exertion of oviposition, often furnish a luxurious repast for other stronger individuals. Their cannibalistic habits are probably similar to those of *Peranabrus scabricollis*, a discussion of which appears under that species. Flesh of any kind is acceptable to the *Anabrus*, dead snakes being eaten as readily as cooked fish. Worms and various insects are eaten by them, and they have been observed to climb bushes to feed upon the cicadas, which they grasp by the wings. They are also fond of fresh horse manure, and also eat cow dung. In fact, they will eat nearly anything, and, as stated by Gillette, an insect with such food habits is not likely to die very soon of starvation.

While the *Anabrus* eats nearly anything that comes in its way, it is not itself exempt from being eaten. They are supposed to have at one time formed an article of diet among the Indians of the valley of the Great Salt Lake. They were eaten cooked or raw, with no other preparation than the removal of the head and legs. There are a number of natural enemies that prey on the *Anabrus*. Among animals seen eating them may be mentioned the bear and the wolf, and the

hog is said to be fond of them. Birds prey somewhat extensively upon them, the hawk, crow, ptarmigan, lark, grouse, gull, and blackbird being among those credited with eating them. A large toad has been reported as following creeks to feed upon the drowned specimens, while fish have been recorded as gorging themselves on the drowned crickets. No insect enemies are known, but specimens have been found infested internally with hair-worms. A large wasp, *Palmodes moris* Kohl, preys upon the allied *Peranabrus scabricollis* and may also attack this insect, though no record of its doing so has yet appeared. Red mites have been recorded as occurring on the *Anabrus*.

When vast hordes of *Anabrus* appear, laying waste large areas of cultivated fields, they form a scourge not easily combatted. Everything in their line of march falls before their ravenous appetites. Bodies of water of considerable size are bridged by the thousands of the drowned and across march the millions. Armies of the advancing hordes often extend over a mile, the ground over which they move being literally covered by the slowly moving mass. The rate of travel is probably little more than one-half mile a day, though it has been recorded as twice that much. Since the earliest settlements the ranches of the arid west have suffered from the ravages of these insects, and portions of Idaho and neighboring States seem to suffer more or less nearly every year.

A number of remedies against this pest have been tried and recommended. The papers of Doten, Aldrich, and Gillette, above mentioned, should be read for information regarding various remedies. Herding the army off cultivated fields, fencing them out by means of vertical walls of tin, wood, oil-cloth or other material, killing the insects by poisons, trampling by sheep, crushing with rollers, trapping in vertical-sided trenches, and killing with oil have all been considered. The effectiveness of oil in killing the pests is a matter of some dispute. It seems as if the insects are able to resist quite thorough applications of even pure kerosene, recovering, according to Professor Gillette, after a moderate spraying, but dying when immersed in it. Poisons act too slowly to be of practical value in times of invasion. Herding and fencing are probably the best methods of warding off their attacks. The suggestion has been made of innoculating migrating hordes with fungus disease, but the dryness of the climate of the infested regions would scarcely favor the success of such experiments.

The insect figured by Woodworth in Bulletin No. 149 of the California Experiment Station, fig. 8*b*, as *A. simplex* is certainly not this species, but some long-legged dectician, probably a species of the genus *Cacopteris*.

ANABRUS CERCIATA, new species.

Description.—Pronotum with the lateral carinæ rounded; median carina scarcely indicated; disk with the posterior margin evenly rounded. Anterior tibiæ armed above with five spines on the outer carina and two or three on the inner. Cerci of the male as in fig. 48, the branches widely divergent, the lower branch the longer and curving perpendicularly downward, the tip inclined somewhat inward; the shorter branch directed inward at nearly right angles to the main body of the cercus and the tip curving downward; (fig. 48) cerci of the female long, basally swollen and apically attenuate, very sharply pointed. Subgenital lobes of the female slightly exceeding the subgenital plate. Ovipositor as long as the posterior femora, very slightly curved upwards.

Color brownish with obscure yellowish mottlings; lateral lobes of the pronotum not margined; ovipositor reddish-brown, darker at the tip.

Measurements.—Length, pronotum, male, 16–16.5 mm., female, 18; posterior femora, male, 27–29, female, 30; intermediate femora, male and female, 11; posterior tibia, male, 26–30, female, 29; intermediate tibia, male, 14, female, 12.5; ovipositor, 30.

FIG. 48.—ANABRUS CERCIATA. CERCUS OF MALE.

Types.—Cat. No. 10178, U. S. National Museum (male) and in the Academy of Natural Sciences of Philadelphia (female).

Specimens examined.—One male, Washington (Morrison); a second male from the same locality is in the Bruner collection, the source of the type, and a female in the collection of the Philadelphia Academy of Natural Sciences from the Le Conte collection taken on the Columbia River in Oregon.

This species is distinguishable at a glance from any of the other described species of the genus by the unusually large size, and the males are even more readily distinguished by the structure of the cerci.

ANABRUS LONGIPES, new species.

Description.—Head scarcely prominent, no broader than the anterior portion of the pronotum, into which it is quite deeply inserted; vertex moderately prominent, convex, not sulcate; first segment of the antenna scarcely half as large as the vertex as viewed from the front; eyes rounded, not prominent. Pronotum smooth, almost shiny; disk marked on the middle with two short posteriorly convergent sulci, sometimes united to form a U-shaped sulcus; posterior margin of the disk broadly rounded. Legs long, the posterior femora (fig. 49) more than twice as long as the pronotum and armed below with a few short stout spinules on each side; anterior tibiæ armed above on both margins, the outer margin with four or five spines, the inner with from one to three. Wings barely meeting above and not extending beyond

the pronotum in the female, in the male overlapping, strongly convex and extending a very little beyond the pronotum. Abdomen stout and plump, very inconspicuously carinate; supraanal plate of both sexes subtriangular, centrally depressed; subgenital plate of female broadly concave apically with the side angles sharp, elongate and bent inwards, of the male elongate and apically triangularly incised, the apical stylets missing from the only specimen seen; subgenital lobes of the female elongate, apically narrowly rounded, about two times as long as broad and reaching to the tip of the subgenital plate; cerci of the female simple, cylindrical, about two times as long as the basal width and apically pointed, of the male shaped as in *simplex*. Ovipositor very moderately curved upwards, about as long as the posterior femora.

Color dark brown with the top of the pronotum, at least the posterior half, generally yellowish and the posterior femora are

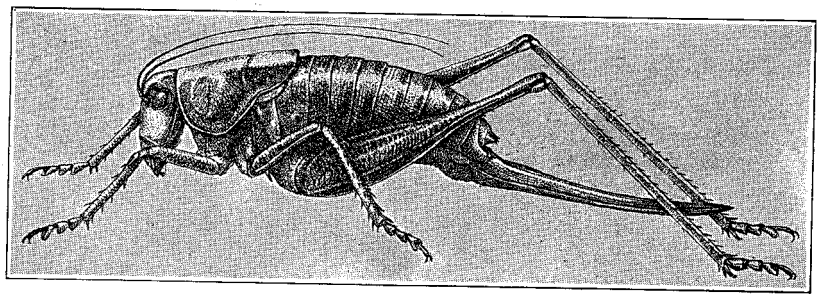


FIG. 49.—ANABRUS LONGIPES. ADULT FEMALE.

usually, but not always, yellowish, especially towards the apex; the face is yellowish brown and the abdomen is sometimes lighter on the basal half of each segment.

Measurements.—Length, pronotum, male, 12.25 mm., female, 12.5–13; posterior femora, male, 26,[a] female, 27–29; ovipositor, 26–28.

Type.—Cat. No. 10179, U. S. National Museum.

Specimens examined.—One male, two females, Pullman, Washington, August, taken by C. V. Piper.

The general structure of this long-legged species is so similar to *A. simplex* that the breeding habits are very probably as described under that species. The female quite likely carries the seminal sac of the male as described under *simplex*, as the structure of the subgenital lobes and plate seems fitted for the purpose of holding the sac as it is in that species.

PERANABRUS Scudder.

Peranabrus SCUDDER, Can. Ent., XXVI, 1894, pp. 178, 181; Guide N. A. Orth., 1897, p. 56; Cat. Orth. U. S., 1900, p. 77.—KIRBY, Syn. Cat. Orth., II, 1906, p. 192.

Description.—Head large and broad, slightly broader than the pronotum and quite prominent, vertex moderately prominent one-third as broad as the interocular space; eyes rounded, scarcely prominent. Pronotum large, posteriorly moderately produced, lateral lobes well developed, moderately declined and posteriorly sinuate; lateral and median carinæ present, dull but persistent, the former converging somewhat near the middle of the anterior fourth; disk scabrous, without distinct transverse sulci, truncate both in front and behind, sometimes slightly rounded or angulate behind. Abdomen plump, distinctly carinate dorsally. Legs short, the posterior femora less than two times as long as the pronotum, unarmed below or, rarely, with one or two very obscure short spines; anterior tibiæ armed above on the outer side only with from three to five spines. Wings as in *Anabrus*. Cerci of the female somewhat compressed basally, spically acute; of the male large, stout, apically somewhat depressed and broadened, the inner apical angle forming a short tooth with a sharp naked point (fig. 53); subgenital plate of the male apically triangularly incised, of the female with the apical incision somewhat broader with the lateral angles acute, somewhat as in *Anabrus*, and like that genus furnished at the base with a pair of subgenital lobes which, however, are here sharply angulate instead of rounded; supra-anal plate as in *Anabrus*. Ovipositor curved moderately upwards and considerably longer than the posterior femora.

Type.—*Thamnotrizon scabricollis* Thomas.

This genus very much resembles in general form the genus *Anabrus*. The scabrous pronotal disk, the shape of the male cerci, and the armature of the anterior tibiæ will serve to easily separate it from that genus. We have but one known species.

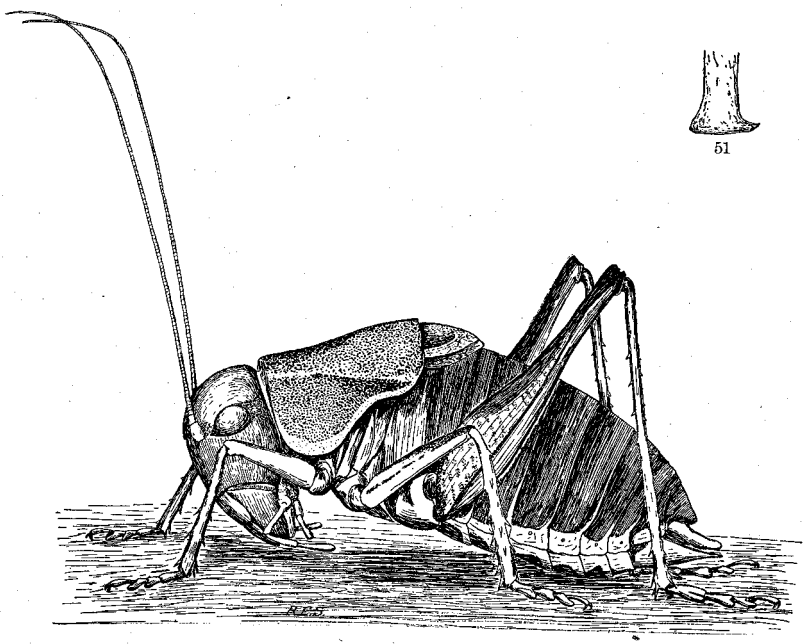
PERANABRUS SCABRICOLLIS Thomas.

Thamnotrizon scabricollis Thomas, Ann. Rept. U. S. Geol. Surv. Terr., V, 1872, p. 441.—Glover, Ill. N. A. Ent., Orth., 1872, pl. xiii, fig. 6.

Peranabrus scabricollis Scudder, Can. Ent., XXVI, 1894, pp. 181, 183; Cat. Orth. U. S., 1900, p. 77.—Piper, Bull. No. 46, Div. Ent., U. S. Dept. Agric., 1904, pp. 60-61.—Snodgrass, Journ. N. Y. Ent. Soc., XI, 1903, pp. 183-188, pls. xii, xiii; XII, 1905, pp. 74-82, pls. i, ii.—Kirby, Syn. Cat. Orth., II, 1906, p. 192.

Description.—Head slightly broader than the anterior margin of the pronotum into which it is well indented; vertex moderately prominent; front broadly rounded, moderately full; eyes small, scarcely prominent; antennæ slender, the basal segment broad. Pronotum moderately large and considerably extended posteriorly, the lateral lobes well developed but not as deep as long, slanting very moderately, and the posterior margin quite strongly sinuate; lateral carinæ moderately prominent but dull, nearly straight, diverging from in front backwards; pronotal disk scabrous, subtectiform, broader behind

than in front, anteriorly and posteriorly truncate, without transverse sulci; median carina persistent but low and dull. Prosternum unarmed. Legs short, the posterior femora (fig. 50) much swollen on the basal three-fourths, less, or no more, than twice as long as the pronotum, rarely armed beneath and then with but one or two minute spines; anterior tibiæ armed above on the outer side only with from three to five spines. Wings as in *Anabrus*, except that those of the male are apically more pointed. Abdomen plump, carinate dorsally. Cerci of the female simple, pointed, rapidly tapering; of the male heavy, depressed at the tip and broadened, the inner angle forming a short, sharp incurved spine (fig. 51); subgenital plate triangularly



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FIGS. 50, 51.—PERANABRUS SCABRICOLLIS. 50, ADULT MALE (AFTER SNODGRASS). 51, CERCUS OF MALE.

incised in the male, the terminal styles about four times as long as broad; subgenital plate of the female broadly incised; subgenital lobes of the female elongate triangular, more than twice as long as the basal breadth and tapering regularly to a point, often, in cabinet specimens, lying very close to, or apically curved under, the edge of the subgenital plate, the end of which it just reaches. Ovipositor moderately curving upwards, considerably longer than the posterior femora and apically pointed and unarmed. (Fig. 52).

Color dark brown or dark reddish brown, in cabinet specimens often discolored, being yellowish brown; the lateral lobes of the pronotum are margined below and behind with yellowish, and the elyta of the

males are bordered behind and on the sides with the same color. The under side of the body is light in color and the legs are often yellowish brown, the outer face of the posterior femora often spotted or mottled with black and yellowish brown.

Measurements.—Length, pronotum, male, 7.5–9.5 mm., female, 7.5–10.5; posterior femora, male, 14.5–18, female, 15–19; ovipositor, 20–24.

Type.—Cat. No. 1108, U. S. National Museum.

Specimens examined.—The male and female types from Montana, and specimens from the following localities in Washington: Baird (May), Coulee City, May 30 (Piper), and Blue Mountain, July 15.

This species is very nearly allied in general appearance as well as habits to *Anabrus simplex*. Like that species it often occurs in vast numbers, devastating cultivated crops. Such occurrences, however,

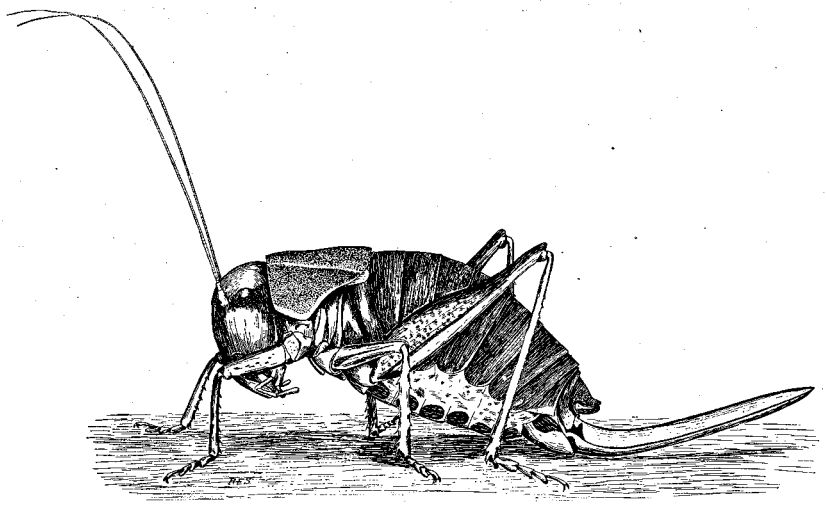


FIG. 52.—PERANABRUS SCABRICOLLIS. ADULT FEMALE (AFTER SNODGRASS).

have so far been reported only in the State of Washington. The same remedies apply to it as in the case of invasions by *Anabrus*. The internal anatomy of this insect is given by Mr. Snodgrass, as is also the habits and life history. The following notes are mostly taken from the articles of this writer:

The common name of "Coulee cricket" is often applied to this insect, suggested by the insect's partiality to regions in or about canyons known by that name. They seem to breed in desert lands, but often migrate into cultivated areas, there doing much damage. By the first of June most have reached the adult stage. When not migrating they move about or sit motionless under bushes. Their usual gait is a slow walk, but when frightened they will jump. They ordinarily walk at a rate of about ten feet a minute. When they leap they cover a distance of from three to four inches at a jump. They

seem perfectly void of fear, climbing all over one's person unless persistently brushed off. The usual chirps of the male are uttered in regular and rather slow succession, averaging between 90 and 100 beats a minute; when disturbed they stridulate sharply and more rapidly, with a decided angry tone. Like *Anabrus* this insect is omnivorous and shows the same decided cannibalistic tendencies, seeming especially fond of its own kind as an article of diet. Crops from specimens having fed on vegetable matter were filled with a green pasty mass, quite readily distinguished from the brown pulpy mass resulting from cannibalistic feasting.

Migrating bands seem to begin moving late in the afternoon, the fore part of the day being occupied in sitting still or walking aimlessly about. When traveling they move closely massed, a cricket to nearly every square inch of space, about fifteen crossing a given point every minute.

The mating habits are thus described by Snodgrass:

> From about 10 o'clock until noon mating takes place between the males and females. During this act the male is beneath the female. The former while courting the female chirps continually with his wings, and, advancing backwards and obliquely sideways towards the female from in front, tries to push his abdomen beneath hers. Sometimes the female makes no resentment, but often the male has his patience sorely tried. One was observed for twenty minutes attempting to make a female accept him before she finally did so.
>
> Although the male is the active party during courtship the fertilization of the female depends on an act of her own. The ovipositor is directed downward, or its tip braced against the ground; the opening of the bursa copulatrix behind the eighth sternum is then brought against the tip of the male's abdomen. After about five minutes a large white mass of tough albuminous matter is ejected by the male into the bursa copulatrix of the female. The pair then separate, but the white mass hangs from the abdomen of the female as a large bilobed appendage, and apparently causes her much annoyance.
>
> It is not evident what the function of this albuminous mass is, but it looks like simply a plug to close the bursa copulatrix. In the male a great mass of tubular accessory glands open into the ejaculatory duct, and it must be these glands that secrete the albuminous mass. The female often keeps the tip of her abdomen elevated to prevent the mass from dragging on the ground, for, being sticky when fresh, it becomes covered with bits of leaves and grains of sand. She attempts to rid herself of it by bending her head beneath the abdomen and chewing it off. Others assist her by eating at it until, after a short time, it is gone. Seldom is one seen in the afternoon with the mass adhering, while it is commonly present on females in the morning between 10 and 12 o'clock. No cases of mating were ever observed in the afternoon.

It will be noted that the seminal sac as described by Gillette under *Anabrus simplex* and the albuminous mass as described above by Snodgrass are analogous, and the mating habits of the two insects are very similar. The egg laying seems to be principally carried on in the late afternoon. It is thus described by Snodgrass:

> At about 5 o'clock the females begin laying eggs, and continue to do so until late in the evening. While ovipositing the female most commonly assumes an upright

position, standing upon her hind legs beside a small bunch of grass and grasping the blades with the other legs for support. The ovipositor is carefully forced down into the ground to its base. Strong peristaltic constrictions of the abdomen now take

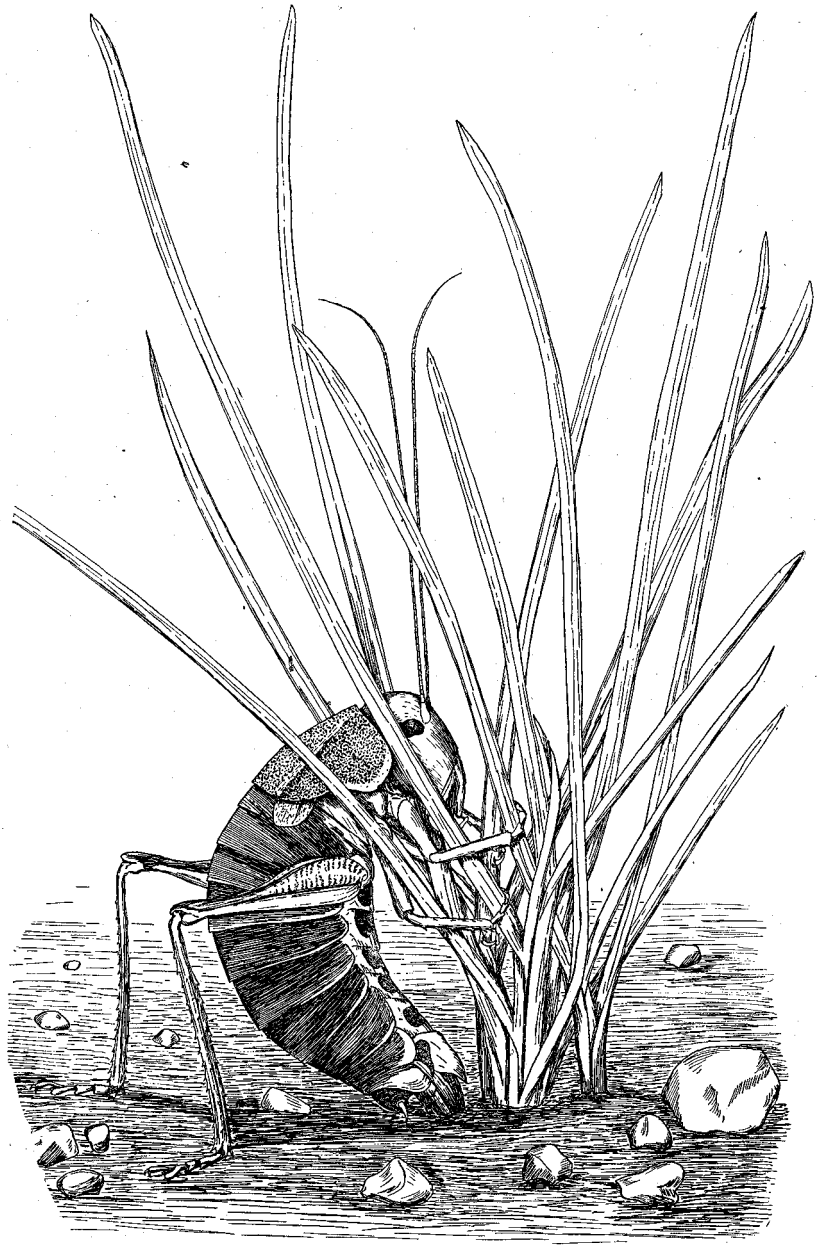


FIG. 53.—PERANABRUS SCABRICOLLIS. FEMALE OVIPOSITING (AFTER SNODGRASS).

place for a minute or so, and then the ovipositor is withdrawn. Immediately, however, it is either poked down again into the same hole or thrust into a new place

beside the first one. Thus the female continues, placing a few eggs in one hole, a few in another and so on, until a great many are laid about the roots of the same clump of grass (fig. 53.) Often she quits one place and goes off some distance to another. In the migrating bands the females have much difficulty in depositing their eggs on account of the jostling and pushing of those moving past. Sometimes a female, while ovipositing, rests on the ground in the natural position and inserts the ovipositor by drawing the tip forward beneath her and then thrusting it downward into the ground.

The eggs are not inclosed in a case, each being entirely free and separate from the others. They are discharged from the tip of the ovipositor, passing slowly along its entire length, one at a time, by a slight movement of the blades upon one another. The latter spread apart at the tip as the egg passes out.

After laying her eggs the female apparently weakens and dies during the day following.

By the middle of July the insects are said to be mostly dead. Toward the last the males are more numerous than the females by reason of many of the latter having been eaten by their fellows when weakened from ovipositing.

A large Pompilid wasp, *Palmodes moris* Kohl, was observed to store its burrow with *Peranabrus*. Animals, birds, and reptiles will probably be found to feed upon this insect, as they are known to do on *Anabrus*.

Prof. C. V. Piper tells of statements made by Washington farmers to the effect that hogs are sometimes killed by eating this insect, the stomach walls being punctured by the sharp ovipositors of the females.

ATELOPLUS Scudder.

Ateloplus SCUDDER, Can. Ent., XXVI, 1894, pp. 179, 182 (invalid; no described species mentioned); Guide Orth. N. A., 1897, p. 57 (invalid; no described species mentioned); Cat. Orth. U. S., 1900, pp. 79, 98.—KIRBY, Syn. Cat. Orth., II, 1906, p. 195.

Description.—Head moderately small, not prominent; vertex narrow, about one-fourth as broad as the interocular space; eyes moderately prominent, rounded; antenna slender, the basal segment broad, broader than the vertex. Pronotum small and very moderately produced posteriorly; lateral lobes very poorly developed, uniformly rounded into the disk, no trace of lateral or median carinæ; posterior margins of the lateral lobes scarcely sinuate; pronotal disk rounded, smooth, with a more or less distinct transverse sulcus across the middle of the anterior half, often not, or scarcely, visible; anterior and posterior margins of the disk subtruncate or very broadly rounded. Prosternum unarmed. Legs moderately stout, posterior femora more than two times as long as the pronotum, much swollen in the basal three-fourths and armed below with a few stout spines on both margins; anterior tibia armed above on the outer side only, usually with a single apical spine, sometimes with two or three spines. Wings concealed beneath the pronotum in the female, the elytra in the male projecting one-half their length beyond the pronotum. Cerci simple

and straight in the female, in the male armed on the inner side with a tooth or projection, or curved inwards apically. Supraanal plate triangular in both sexes; last dorsal segment of the abdomen of both sexes triangularly or roundly incised; subgenital plate of the male longer than broad, obtuse triangularly incised apically and ventrolaterally carinate, the carinæ terminating at the base of the apical styles; subgenital plate of the female proportionately shorter than that of the male, apically less angularly incised and without apical styles. Ovipositor about as long as the posterior femora or considerably shorter, more or less curved upward.

Type.—*Ateloplus notatus* Scudder.

The armature of the anterior tibiæ in this genus, like those of *Idiostatus* and a few others, is variable, as will be seen from the discussion of the following species. A sufficiently large number of specimens of any of the species for study might show the number of dorsal spines on the outer margin of the anterior tibiæ to vary in number from one to three, though none have been seen with two spines. Color is somewhat variable, but fortunately the male cerci form an excellent synoptic character, separating the genus into three unquestionably distinct species, which, together with one species erected on the female only, may be separated by the following key:

KEY TO THE SPECIES OF ATELOPLUS.

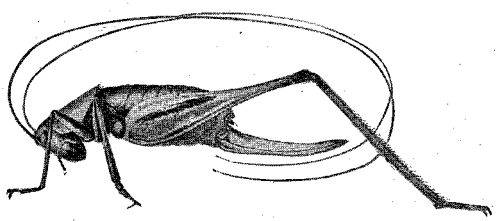
A. Larger; cerci of the male not shaped as fig. 59; ovipositor but little more than three-fourths as long as the posterior femora.
  B. Cerci of the male about four times as long as broad, armed on the inner side with a stout preapical spine (fig. 55); posterior femora of both sexes tipped with black ..... *notatus*, p. 369
  B′. Cerci of the male no longer than broad, armed on the inner side at the apex with a very small, fine tooth (fig. 58); posterior femora of neither sex tipped with black ..... *schwarzi*, p. 372
A′. Smaller; cerci of the male, that of *minor* unknown, apically curved inwards, a slight shoulder on the outer side (fig. 59); ovipositor nearly as long as the posterior femora, decidedly more than three-fourths as long.
  B. Color yellowish brown, ovipositor more strongly curved upwards.. *luteus*, p. 373
  B′. Color dark brown, ovipositor less strongly curved upwards ..... *minor*, p. 371

ATELOPLUS NOTATUS Scudder.

Ateloplus notatus SCUDDER, Cat. Orth. U. S., 1900, pp. 79, 98, pl. II, fig. 3.—KIRBY, Syn. Cat. Orth., II, 1906, p. 195.

Description.—Head not prominent, deeply inserted into the pronotum, the anterior border of which projects slightly over the base of the head; vertex broad, the interocular space as broad as twice the width of one of the eyes; front not greatly convex; eyes moderate in size, moderately prominent; antennæ long and slender, more than twice as long as the body. Pronotum moderately produced posteriorly, the lateral lobes shallow, not more than one-half as deep as the pro-

zonal width, slanting, posteriorly scarcely or but very slightly sinuous; lateral and median carinæ absent; prozona broad, broadly convex, cut at the middle of the anterior half by a T-shaped transverse sulcus, anterior margin broadly rounded, the posterior margin truncate. Prosternum unarmed. Abdomen rounded, not carinate dorsally; ovipositor short, scarcely more than three-fourths as long as the posterior femora, curved gently upwards and apically smooth, without serrations; cerci simple, about three times as long as the basal width, rapidly and quite gradually tapering to a sharp point in the female, in the male about four times as long as the basal width, cylindrical, blunt apically and furnished in the inner side with a large, naked-pointed, preapical tooth (fig. 55); supraanal plate triangular in both sexes, nearly concealed in the male, more conspicuous in the female, dorsally sulcate; last dorsal segment roundly sulcate apically in the female and triangularly notched in the male, the projections acute in both sexes; subgenital plate of the male longer than broad, obtuse angularly incised apically and ventro-laterally carinate, the carinæ terminating on either side of the apical incision and from their extremity arise the short and bluntly terminated apical styles; of the female proportionately much shorter, apically less angularly incised and without lateral carination or apical styles. Wings of both sexes and the elytra in the female aborted, in the male the elytra project beyond the pronotum a distance equal to one-half their width. Legs moderately short and stout, anterior coxal spines long and sharp; femora ventrally armed with a few short spines, the anterior and intermediate ones with two or three, usually on the posterior margin only, rarely unarmed; posterior femora parallel on the apical third and armed with a few spines on both margins below, the geniculations blunt, laminate and curved inwards; tibiæ armed above and below, the anterior ones with a single preapical spine above on the outer margin in the female but in the male there are sometimes three; the intermediate tibiæ generally have four spines on the posterior border above and one or two on the anterior margin; posterior tibiæ armed below for three-fourths of their length with small spines placed far



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FIGS. 54, 55.—ATELOPLUS NOTATUS. 54, ADULT FEMALE (AFTER SCUDDER). 55, CERCUS OF MALE.

apart and arranged in two rows of six or eight spines each, and armed above for nearly their entire length with two rows of close set, short, stout spines.

General color light wood-brown. The top of the head is generally marked longitudinally with obscure stripes and the pronotum is ornamented above by faint clepsydrate markings and with a chestnut brown stripe down the middle and, in the female, extending along the back to the tip of the abdomen. The posterior femora are marked longitudinally on the outer face with a black line and the tip is black, as is also the base of the corresponding tibiæ. This femoral coloration is present in both sexes and will probably prove more constant than the body coloration. The ovipositor is infuscated apically.

Measurements.—Length, pronotum, male, 7 mm., female, 7; elytra, male, 1.5; posterior femora, male, 18, female, 18.5; ovipositor, 12.5; width, pronotum at posterior margin, male, 5, female, 5.

Type.—Cat. No. 5735, U. S. National Museum.

Specimens examined.—One adult female (fig. 54), the type, from San Diego, California (Orcutt), and an immature male from Indio, California, June 5 (Caudell). Through the courtesy of Prof. F. H. Snow I have been enabled to study an adult male from Bill William's Fork, Arizona (Snow).

The above-mentioned adult male agrees with the female type except as pointed out in the above description. It may eventually prove wrongly associated, in which case it will represent a new species, for it is certainly not conspecific with any of the three following forms. The immature male from Indio was taken under loose bark of a spiny tree standing alone in the desert. The cerci of this young specimen are proportioned about like those of the adult, but the inner tooth is scarcely indicated. The anterior tibiæ are armed above with a single preapical spine on the outer margin like that of the female.

The insect figured by Woodworth in Bulletin No. 142 of the California Experiment Station as *A. notatus* is either not this species or an unusually poor figure, the pronotum being figured with lateral carinæ, which is certainly not true of the insect now under discussion.

ATELOPLUS MINOR, new species.

Description.—Female, male unknown. Related structurally to the preceding species, but differs in the following particulars: The ovipositor is not so decidedly curved upward, the anterior

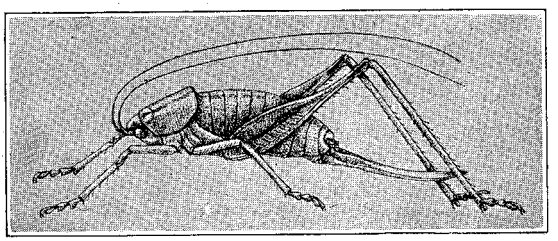


FIG. 56.—ATELOPLUS MINOR. ADULT FEMALE.

tibiæ are armed above on the outer margin with but one spine, the color is a dark brown with lighter mottlings, and the size is still smaller.

Measurements.—Length, pronotum, 5 mm.; posterior femora, 13; ovipositor, 12.5; width, pronotum at posterior margin, 3.75.

Type.—Cat. No. 10182, U. S. National Museum.

Specimens examined.—The type (fig. 56), one female, Oracle, Arizona, June 29 (Schwarz).

ATELOPLUS SCHWARZI, new species.

Ateloplus notatus CAUDELL (not Scudder), Proc. U. S. National Museum, XXVI, 1903, p. 808.—REHN (not Scudder), Proc. Acad. Nat. Sci. Philad., 1904, p. 574.

Description.—In general size and appearance resembling *A. notatus*, but differs in the following particulars: The cerci of the male are short, being about as broad as long, and are armed at the tip with a very small, inconspicuous blackish tooth (fig. 58); the cerci of the female are about the same length as in *notatus*, but taper more abruptly, being somewhat bulbous basally. The last dorsal abdominal segment of both sexes is more acutely cleft than in *notatus* and the projections more elongate. Legs armed about as in *notatus*, but the anterior tibiæ of both sexes in all specimens examined are armed above with a single subapical spine. Color like that of *notatus*, except the dorsal stripe is not present in either sex and the posterior femora are not tipped with black.

FIGS. 57, 58.—ATELOPLUS SCHWARZI. 57, CERCUS OF IMMATURE MALE. 58, CERCUS OF ADULT MALE.

Measurements.—Length,[a] pronotum, male, 6.5 mm., female, 7–7.5; posterior femora, male, 15, female, 19–20; ovipositor, 14–15; width, pronotum at posterior border, male, 4.5, female, 5.5.

Type.—Cat. No. 10180, U. S. National Museum.

Specimens examined.—One adult male, one adult female, types, and one immature female from Tinajas Altas, Arizona (McGee); one adult female, one immature male and two immature females, Hot Springs, Arizona, June 21 (Barber and Schwarz); one immature male, Santa Rita Mountains, Arizona, June 22 (Barber and Schwarz); and one immature female, Phoenix, Arizona (Cordley).

This species superficially resembles *notatus*, but the black-tipped femora of the latter and, especially, the form of the male cerci very readily serve for their separation. The cerci of immature female specimens of *schwarzi* often taper gradually as in *notatus* and variation will probably be found to exist in this respect even in mature specimens. The cerci of the immature males are essentially as in the adult specimens (fig. 57).

[a] The measurements of the female are from two adult specimens, the minimum measurements being taken from the type.

ATELOPLUS LUTEUS, new species.

Description.—A much smaller and more slender appearing insect than *A. notatus*. The anterior tibiæ of both sexes are armed above on the outer margin with three spines. The general color is yellowish brown, much lighter than in the preceding species. The female has a black dorsal line extending from the front of the pronotum to the tip of the abdomen composed of two slender lines nearly touching. This dorsal line is not present in the male. The posterior femora are not tipped with black and the outer face is not marked with a dusky line except very obscurely so in the male. The most striking peculiarities of this species, however, lie in the genitalia. The cerci of the female are similar to those of *A. notatus*, but those of the males are strikingly different, being curved inward apically and with a slight shoulder on the outer side (fig. 59). The ovipositor is very nearly as long as the posterior femora, being decidedly more than three-fourths as long, as opposed to the two previous species where it is scarcely more than three-fourths as long as the posterior femora. The ovipositor is curved very decidedly upward and is scarcely at all infuscated apically.

FIG. 59.—ATELOPLUS LUTEUS. CERCUS OF MALE.

Measurements.—Length, pronotum, male, 5 mm., female, 6; posterior femora, male, 14, female, 15.5; ovipositor, 15; width, pronotum at the posterior border, male, 3.5, female, 4.5.

Type.—Cat. No. 10181, U. S. National Museum.

Specimens examined.—The types, one male, one female, Mohave, Arizona (Wickham).

The small size, the longer ovipositor, and especially the form of the cerci of the male will serve to differentiate this species from the preceding ones.

IDIOSTATUS Pictet.

Idiostatus PICTET, Mem. Soc. Phys. Genev., XXX, 1888, p. 63.—SCUDDER, Can. Ent., XXVI, 1894, pp. 178, 181; Guide N. Amer. Orth., 1897, p. 56; Cat. Orth. U. S., 1900, p. 78.—KIRBY, Syn. Cat. Orth., II, 1906, p. 193.

Cacopteris SCUDDER, Can. Ent., XXVI, 1894, pp. 178, 181 (invalid; no species included); Guide N. Amer. Orth., 1897, p. 56 (invalid; no species included); Proc. Amer. Acad. Arts Sci., XXXV, 1899, p. 87; Cat. Orth. U. S., 1900, p. 78.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head moderate in size, inserted well into the pronotum and scarcely prominent; vertex moderately narrow, about one-third as broad as the interocular space; eyes rounded and quite prominent. Pronotum fairly large and moderately produced posteriorly; lateral lobes variously developed, in some species being well developed and in others poorly so, but never as shallow as in the genus *Ateloplus*, moderately declivent and with or without posterior sinus;

lateral carinæ dull, rarely at all developed on the anterior half and then very inconspicuous; median carina absent or obscurely indicated on the posterior portion of the pronotum; disk posteriorly somewhat flattened or uniformly rounded, anteriorly truncate, posteriorly truncate, subtruncate or somewhat rounded. Prosternum unarmed. Wings lateral and but little extended beyond the pronotum in the female, in the male overlapping above and usually extending beyond the pronotum a distance equal to one-half or more than one-half the length of the pronotum. Legs long, the posterior femora more than two, usually three and sometimes four, times as long as the pronotum, much swollen on slightly more than the basal half and armed below on both margins with a few small spines; anterior tibiæ armed above on the outer side alone with three or four spines or armed on both outer and inner margins, the inner margin, when spined, with two to three spines. Abdomen moderately full and with or without dorsal carina; cerci simple in the female, in the male of various forms, armed on the inner side with a tooth or projection; supraanal plate[a] small, triangular and usually hidden beneath the last abdominal segment, which, in the male, is apically cleft, the incision linear, V-shaped, U-shaped or broadly rounded; subgenital plate of the female narrowly cleft, of the male triangularly cleft with the lateral angles terminating in apical styles. Ovipositor of various lengths, straight or curved slightly upwards on downwards.

Type.—*Idiostatus californicus* Pictet. (=*hermanii* Thomas.)

This is an interesting genus of apparently rare insects occurring in the western and southwestern United States. Little is known of the habits of the various species and some confusion has existed regarding the status of certain forms. The synonomy of Scudder's genus *Cacopteris* with *Idiostatus* is very certain as a type of *Cacopteris*, *C. aequalis*, has been seen and compared with the type of *Idiostatus* and found to be generically similar. The pronotum of *aequalis* is as angulate posteriorly and the median carina there as distinctly indicated as in *hermanii*.

The armature of the anterior tibiæ in this genus is unusual in as much as those of the two sides of a single specimen may vary, one being armed above on both margins and the other on the outer margin only. When long series of specimens are studied nearly all the species will probably be found to exhibit more or less variation in this respect.

As a whole *Idiostatus* is a very heterogeneous genus, but the various types are apparently unworthy of generic distinction, their differences being of insufficient importance. Three types of ovipositor, straight,

[a] Scudder, Proc. Amer. Acad. Arts Sci., XXXV, 1899, p. 87, designates what I call the last abdominal segment as the supraanal plate. In this matter Scudder is very surely wrong, the true supraanal plate being always present but nearly or entirely concealed beneath the last abdominal segment.

curved upwards and curved downwards, occur, but the degree of curvature is slight and valueless as a character of more than specific value.

As stated under the discussion of *Eremopedes*, there is some relationship between that genus and *Idiostatus*.

The species of *Idiostatus* are quite numerous as compared with most of our Dectician genera, and to facilitate their easy differentiation two tables are given, one of the males and one of the females. The following tables have been prepared with considerable care, and, I trust, will be found as functionable as compatible with the classifactory difficulties of the objects treated.

KEY TO THE SPECIES OF IDIOSTATUS—MALES.

(Males unknown of *femorata* and *variegata*.)

A. Cerci round or somewhat depressed, apically very unlike that of *inermis* as tabulated under the alternate category.
  B. Cerci with an inner tooth, not like fig. 61.
    C. Cerci beyond the tooth short and triangular or swollen, not like fig. 64.
      D. Tooth of the cerci somewhat incurved apically; cerci between the tooth and the tip concave, figs. 66, 67.
        E. Cercal tooth apically sharp and slender, no more than one-fourth as thick as the apical portion of the cercus itself.
          F. Smaller, total length 20 mm., of pronotum 6–8 mm....*hermanii*, p. 381
          F′. Larger, total length 30 mm., of pronotum 9–10 mm..*bilineatus*, p. 379
        E′. Cercal tooth apically less sharp, thicker than the apical portion of the cercus itself .....*fuscopunctatus*, p. 382
      D′. Tooth of cerci not incurved; cerci between the tooth and the tip straight or convex, figs. 70, 72.
        E. Tooth of cerci triangular; cerci beyond the tooth acute triangular, fig. 70 .....*rehni*, p. 382
        E′. Tooth of cerci slender; cerci beyond the tooth swollen, fig. 72. *elegans*, p. 384
    C′. Cerci beyond the tooth long and slender, much longer than the tooth itself, fig. 64 .....*sinuata*, p. 378
  B′. Cerci with an outer tooth or shoulder, like fig. 61.
    C. Apical projections of the last abdominal segment triangular, short, separated by a V-shaped cleft, fig. 63 .....*nevadensis*, p. 378
    C′. Apical projections of the last abdominal segment slender, acuminate, separated by a U-shaped cleft, fig. 62 .....*æqualis*, p 376
A′. Cerci basally somewhat compressed and apically forming two depressed incurved teeth, fig. 73 .....*inermis*, p. 386

KEY TO THE SPECIES OF IDIOSTATUS—FEMALES.

(Females unknown of *nevadensis*, *sinuata*, and *fuscopunctata*.)

A. Ovipositor almost as long, or longer than, the posterior femora.
  B. Size smaller and more slender, the pronotum less than 9 mm. in length rarely, *rehni* and *hermanii* more than 6 mm.
    C. Ovipositor straight or curved gently upwards; pronotum, except in *hermanii*, less than 6 mm. in length.
      D. Larger, pronotum more than 7 mm. in length.....*hermanii*, p. 381

D′. Smaller, pronotum no more than 6 mm. in length, usually less.
E. Posterior femora less than four times, usually but three times, as long as the pronotum ..... *inermis*, p. 386
E′. Posterior femora four or more times as long as the pronotum. *æqualis*, p. 376
C′. Ovipositor apically curved somewhat downwards; pronotum usually more than 6 mm. in length ..... *rehni*, p. 382
B′. Size large and bulky, the pronotum 9 mm. or more in length.
C. Larger, the posterior femora more than 25 mm. in length ... *bilineatus*, p. 379
C′. Smaller, the posterior femora no more than 25 mm. in length. *elegans*, p. 384
A′. Ovipositor much less than the posterior femora in length.
B. Smaller, posterior femora more than four times as long as the pronotum. *femorata*, p. 387
B′. Larger, posterior femora less than four times as long as the pronotum. *variegata*, p. 387

IDIOSTATUS ÆQUALIS Scudder.

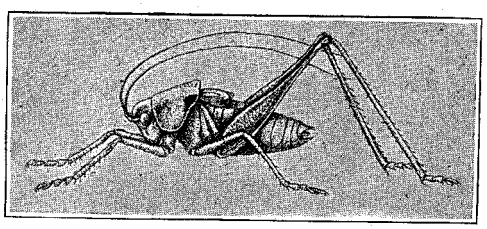
Cacopteris æqualis SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 88, 92; Cat. Orth. U. S., 1900, p. 78.—WOODWORTH, Bull. No. 142, Cal. Exp. Sta., 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head scarcely prominent, quite deeply inserted into the pronotum; vertex about one-third as broad as the interocular space and quite prominent; eyes rounded, not very large but protrudent, being decidedly prominent; basal segment of the antennæ enlarged and broad but scarcely one-half as large as the vertex as viewed from in front. Pronotum moderate in size; lateral lobes well developed, nearly as deep as long, almost vertical and very slightly sinuate posteriorly; lateral carinæ scarcely indicated except on the posterior third where they are present, usually distinct but never sharp; median carina present only on the posterior fourth of the pronotum and there very blunt and indistinct; pronotal disk rounded, scarcely perceptibly tectate, without transverse sulci or with a very obscure broad shallow one across the posterior portion, truncate anteriorly and posteriorly. Legs long, the posterior femora about four times as long as the pronotum and much swollen on a little more than the basal half, armed below with a few sharp, short, stout black spines; anterior tibiæ armed above on both margins, three spines on the outer margin and two on the inner. Elytra of the male (fig. 60) ample, projecting beyond the pronotum a distance about equal to the pronotal length, of the female forming widely separated rounded pads which project scarcely their own width beyond the pronotum. Abdomen moderately plump, scarcely carinate; subgenital plate deeply and linearly cleft in the female, in the male triangularly incised apically, the terminal styles about four times as long as broad; last dorsal abdominal segment of the male apically furcate, the angles elongate, extending to about the tip of the subgential plate, and sharp, with the incision U-shaped (fig. 62) cerci of the female about three times as long as the greatest breadth,

much swollen on the basal two-thirds, the apical third rapidly tapering in the basal portion, apically pointed; cerci of the male rounded, apically slightly depressed with the tip attenuate, bent inwards and slightly pointed, on the outer side about the middle furnished with a blunt shoulder or short projection (fig. 61). Ovipositor almost straight, very slightly curved upwards and as long, or very nearly as long, as the posterior femora.

Color dark or light yellowish brown; the sides of the pronotum just below the short blunt lateral carinæ is usually shiny black. The tegmina of the males are generally yellowish brown with a round black spot on the outer apical margin of each.

Measurements.—Length, pronotum, male, 4.5–5.5 mm., female, 5.25–6; elytra, male, 3.5–5, female, 1–1.5; posterior femora, male, 18–21, female, 20–25; ovipositor, 20–24.



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FIGS. 60, 61, 62.—IDIOSTATUS ÆQUALIS. 60, ADULT MALE. 61, CERCUS OF MALE. 62, LAST DORSAL ABDOMINAL SEGMENT OF MALE.

Types.—Cat. No. 10183, U. S. National Museum, and in the collections of S. H. Scudder and A. P. Morse.

Specimens examined.—Various specimens from California and a female from Arizona. All the types are from California. Besides a female type from Cahon Pass, California, the National Museum contains two males and two females, all from Los Angeles County, California, except one male which is labeled simply California. One adult female from Claremont, California, and two immature females from San Bernardino County, California, taken in May, are also in the National collection. Bruner has recently contributed a female specimen from Arizona (Dunn).

An immature male in the Morse collection shows the elytra not projecting beyond the pronotum but with cerci essentially as in adult individuals. The immature female often has the ovipositor considerably longer than the posterior femora, one in the Morse collection having the ovipositor 22 mm. in length while the posterior femora measures but 17.5 mm.

IDIOSTATUS NEVADENSIS Scudder.

Cacopteris nevadensis SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 88, 91 (male, not female); Cat. Orth. U. S., 1900, p. 78.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Male, female unknown. Very similar in structure and appearance to *C. æqualis*. The anterior tibiæ are armed as in *æqualis* but the posterior femora are relatively a little shorter. The lateral lobes of the pronotum are well developed but are less sinuate posteriorly than in *æqualis*, being practically without any trace of sinus. The elytra are essentially as in *æqualis* and, like those of that species, have the outer apical angles marked by a black spot. The cerci are like those of *æqualis* but the structure of the last dorsal segment of the abdomen is quite different, the apical denticulations being short, not reaching as far back as the tip of the subgenital plate, and triangular, not elongate, and the intervening sinus is V-shaped (fig. 63).

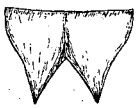


FIG. 63.—IDIOSTATUS NEVADENSIS. LAST DORSAL ABDOMINAL SEGMENT OF THE MALE.

Measurements.—Length, pronotum, 5 mm.; posterior femora, 18; elytra, 3.

Type.—In the Scudder collection.

Specimens examined.—Two males, Ruby Valley, Nevada (Ridgeway).

The female associated with these males by Scudder, but which he suggested might not belong here, is really the female of *I. inermis*, which see.

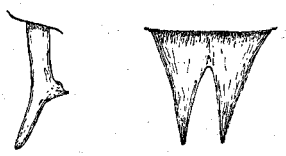
This species is very closely allied to *æqualis* and may eventually prove to be a form of that species. The structure of the last abdominal segment, however, seems to indicate quite strongly their distinctness.

IDIOSTATUS SINUATA Scudder.

Cacopteris sinuata SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 88, 90; Cat. Orth. U. S., 1900, p. 78.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Male; female unknown. Head moderately deeply inserted into the pronotum, scarcely prominent; vertex narrower than in *æqualis*, being scarcely more than one-fourth as broad as the interocular space; eyes rounded and quite prominent; basal segment of the antennæ broad and about as large as the vertex when viewed from in front. Pronotum of medium size and moderately produced posteriorly; lateral lobes not well developed, being nearly twice as long as deep, moderately declivent, posterior margin slightly sinuate; lateral and median carinæ not indicated, the position of the former faintly represented by a slight squareness of the pronotum at that point; disk broadly rounded, without transverse sulci, subtruncate in front and behind. Legs moderately long, the posterior femora absent in the

only specimens examined; anterior tibiæ armed above on the outer side only with three spines. Elytra as in *æqualis* but extending beyond the pronotum a distance scarcely more than one-half the thoracic length and without a black spot on the outer apical angle. Subgenital plate as in *æqualis* but the last abdominal segment is between that species and *nevadensis*, the apical denticulations being almost as elongate as those of *æqualis* and the intervening sulcus V-shaped as in *nevadensis* (fig. 65). The cerci are very different from those of the preceding species; here the inner tooth is short and placed about the center and the tip of the cercus is nearly in a line with the basal portion (fig. 64). The color is a yellowish brown with darker mottlings on the legs and pronotum; elytra light brown with the membraneous portion black, the outer apical angles not marked by a black spot.



64 65

FIGS. 64, 65.—IDIOSTATUS SINUATA. 64, CERCUS OF MALE. 65, LAST DORSAL ABDOMINAL SEGMENT OF THE MALE.

Measurements.—Length, pronotum, 6 mm.; posterior femora, 20; elytra, 3.5.

Type.—In the Scudder collection.

Specimens examined.—Two males, Fort Whipple, Arizona (E. Palmer).

The most striking characters of this species is the poorly developed lateral lobes of the pronotum, the absence of any lateral carinæ and the structure of the cerci. This species resembles very much the *Eremopedes scudderi* of Cockerell, and it may belong to *Eremopedes* rather than to *Idiostatus*.

IDIOSTATUS BILINEATUS Thomas.

Steiroxys bilineata THOMAS, Rep. U. S. Geol. Surv. W. 100 Mer., V. 1875, p. 905.
Idiostatus bilineatus SCUDDER, Can. Ent., XXVI, 1894, pp. 181, 183; Cat. Orth. U. S., 1900, p. 78.—WOODWORTH, Bull. No. 142, Calif. Exp. Stat., 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 193.

Description.—Head of medium size, moderately inserted into the pronotum; fastigium considerably produced, apically as broad as one of the eyes; front slightly convex. Eyes not very prominent, round. Pronotum large, posteriorly produced and inclined upward, especially in the male where they cover the base of the wings. Lateral lobes well developed, about two-thirds as deep anteriorly as long and with scarcely any sinus, almost vertical with very broadly rounded lateral carinæ, not present anteriorly; median carina merely indicated posteriorly; disk moderately transversely convex, smooth, without sulci, truncate both anteriorly and posteriorly, sometimes slightly rounded behind. Abdomen smooth, without carina, thick and heavy, somewhat as in the genus *Anabrus*. Ovipositor nearly straight, slightly curved upward, as long as the posterior femora and apically unarmed. Cerci

of the female about three times as long as the basal width, uniformly tapering, of the male (fig. 66) broad and stout, separated at the base by a space about one-half as wide as the basal breadth of one, the inner tooth slender and much less in diameter than the apical portion of the cercus; last dorsal segment of the abdomen apically concave and depressed, forming two small rounded lobes. Elytra as broad as and more than one-half as long as the pronotum, and overlapping above in the male, in the female mere lateral pads. Legs with the anterior coxal spines long and distinct; posterior femora as long as the body, about three times as long as the pronotum, stout, swollen on the basal two-thirds and without genicular spines; anterior tibiæ spined above on the outer side with three spines; intermediate tibiæ spined above on both margins; posterior femora and tibiæ armed below with a row of short, dull, black spines on both carinæ.

FIG. 66.—IDIOSTATUS BILINEATA. CERCUS AND LAST DORSAL ABDOMINAL SEGMENT OF MALE.

Color (alcoholic), after Thomas.

Dorsal portions throughout pale olive, striped with yellowish lines. Two rather narrow yellowish lines (one from each eye) extend back along the entire length to the tip of the abdomen; each abdominal segment is margined posteriorly with a quite narrow yellowish line; the lateral margins are marked with a somewhat broader line of the same color. Face and entire ventral surface pale yellow. Legs purplish externally. The olive of the abdomen and pronotum is more or less slightly tinged with rufous near the margins of the spaces.

I have seen no material fit for study with relation to coloration.

Measurements.—Length, pronotum, male, 9 mm., female, 10; posterior femora, male, 24.5–26, female, 28–31; elytra, male, 5.5–7, female, 2; ovipositor, 30–32. Width, pronotum across metazona, male, 6, female, 8.

Type.—Apparently lost.

Specimens examined.—Two pairs in the Scudder collection from Fort Reading, Shasta Valley, California, taken by Lieut. Williamson.

This species was described by Thomas from a female taken by Henshaw at San Carlos, Arizona. I have been unable to find this specimen in any of the collections studied. The specimens in Scudder's collection are moldy and much worn and probably very poorly represent the coloration of living specimens.

This large bulky insect is conspicuously distinct from the other members of the genus. The cerci of the males of this and the following three species are in some respects similar and are very different from the types represented by the preceding species. The last dorsal segment of the abdomen also differs materially from those of the preceding forms.

IDIOSTATUS HERMANII Thomas.

Steiroxys hermanii THOMAS, Rept. U. S. Geol. Surv. W. 100 Mer., V, 1875, p. 904, pl. XLIV, fig. 4.—Proc. Davenp. Acad. Nat. Sci., I, 1876, p. 263.

Idiostatus hermanii SCUDDER, Can. Ent., XXVI, 1894, pp. 181, 183; Cat. Orth. U. S., 1900, p. 78.—WOODWORTH, Bull. No. 142, Calif. Exp. Stat., 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 193.

Idiostatus californicus PICTET, Mem. Soc. Phys. Hist. Nat. Genev., XXX (6), 1888, p. 64, pl. III, figs. 35, 35 *a*, *b*.

Description.—In general characters allied to *I. bilineatus*, but is a much smaller and more slender insect. The head and thorax, also the abdomen and elytra, are essentially as in *æqualis*. The lateral carinæ of the pronotum are moderately distinct, less so anteriorly. The posterior femora are less than three times as long as the pronotum, armed on both margins below, and the anterior tibiæ are armed above on the outer side only with three spines. The elytra of the male extend beyond the posterior margin of the pronotum, a distance less than the thoracic length, the outer apical angle immaculate; of the female extending only a couple of millimeters beyond the pronotum. Genitalia similar to that of *bilineatus*, the cerci of the male, however, a little more concave between the apex and the tooth.

Color brownish yellow, the base of the last abdominal segment sometimes marked at the upper portion of the sides with black, and the lateral lobes of the pronotum are usually more or less distinctly margined with lighter color. Otherwise, the color is quite uniform in all cabinet specimens examined. In life the insects are often grass green, but, as represented by a series of over a dozen immature specimens taken by me on July 24, 1906, on a species of *Ceanothus*, a small holly-like plant forming dense mats on the ground at the base of Mount Shasta, California, the colors are often of various hues, the general color sometimes bright chocolate brownish or sometimes red. The lateral lobes of some of these immature specimens were black, but in most cases they are brownish.

Measurements.—Length, pronotum, male, 6.5–8 mm., female, 8; posterior femora, male, 17–22, female, 23; elytra, male, 5, female, 2; ovipositor, 26.

Specimens examined.—A number of specimens from the Mount Shasta district in California.

The type of *californicus* is probably in the collection of Brunner von Wattenwyl, but that of *hermanii* seems to be lost, not having been found in any of the collections studied by me. The Scudder collection contains one male specimen from Mount Shasta District, California, labeled *I. californicus*, by Scudder. Besides the specimens taken by the writer at Mount Shasta, California, in July, 1906, as mentioned above, the National Museum contains an adult pair from the same locality taken in September, 1885, by Behrens. They were presented

to the Museum by Bruner.. Besides the above-mentioned specimens, the National Museum has a single female specimen without locality, also presented by Bruner, that is referred here with some doubt. It is somewhat smaller than the adult from Shasta, and the sides of the abdomen are marked with black on the posterior margins, and the last two segments are wholly black laterally. The abdomen has also a pair of pale narrow subdorsal stripes. The anterior tibiæ are spined above on both margins. The posterior femora are missing.

IDIOSTATUS FUSCOPUNCTATUS Scudder.

Cacopteris fuscopunctata SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 88, 89; Cat. Orth. U. S., 1900, p. 78.—WOODWORTH, Bull. No. 142, Calif. Exp. Stat., 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Cacopteris punctata (error for *fuscopunctata*) CAUDELL, Proc. U. S. Nat. Mus., XXVIII, 1905, p. 477.

Description.—Male, female unknown. Head and pronotum as in *æqualis*, the lateral lobes of the latter scarcely sinuate behind. Elytra extending beyond the pronotum a distance equal to about one-half the length of the pronotum, the outer apical angles marked by a black spot. Legs moderately long, the posterior femora about three times as long as the pronotum, armed below with a few small black spinules on both margins; anterior tibiæ armed above on the outer margin only with three spines. Cerci similar to those of *I. hermanii* (fig. 67). The last abdominal segment of the male (fig. 68) is very different from that of *hermanii*, the apical lobes being triangular, sharply pointed, not extending back to the tip of the subgenital plate and separated by a deep rounded incision, in this respect somewhat allied to *I. æqualis*.

67 68

FIGS. 67, 68.—IDIOSTATUS FUSCOPUNCTATUS. 67, CERCUS OF MALE. 68, LAST DORSAL ABDOMINAL SEGMENT OF MALE.

Measurements.—Length, pronotum, 4.5 mm.; posterior femora, 14; elytra, 2.5.

Type.—In the Scudder collection.

Specimens examined.—The type, a single male from Tehachapi, California, taken by Morse on August 2, and a single immature male specimen in the National Museum taken by Oslar at Nogales, Arizona, on July 13, 1903.

IDIOSTATUS REHNI, new species.

Description.—Head moderate, scarcely prominent; vertex broad and moderately prominent, one-third, or a little more than one-third, as broad as the interocular space. Eyes rounded, of moderate size and prominence. Antennal scrobes about one-half as large as the vertex as viewed from in front. Pronotum moderately large and considerably produced posteriorly; lateral lobes well developed,

nearly as deep as long, slightly declivent and considerably sinuate posteriorly; lateral carinæ of the female very dull but nearly persistent, converging somewhat about the middle of the anterior third, at which point the disk is cut by a distinct but narrow transverse sulcus, in the male the lateral carinæ are scarcely indicated anterior of the posterior half of the pronotum and are almost parallel, the disk in this sex with the transverse sulcus scarcely noticable, forming a mere line; median carina inconspicuously present only on the posterior third of the pronotum in both sexes; disk almost flat for the entire length in the female, in the male slightly flattened on the posterior half or a little less, the anterior portion broadly rounded; anterior and posterior margins subtruncate in both sexes. Legs moderately long, the posterior femora three times, or almost three times, as long as the pronotum, parallel in the apical half, the basal half much and abruptly ampliate and armed below on both margins with several short, sharp, black spinules; anterior tibiæ armed above on the outer

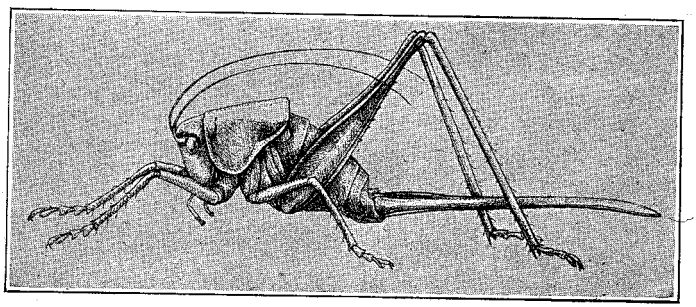


FIG. 69.—IDIOSTATUS REHNI. ADULT FEMALE.

margin only with three spines, rarely with four. Elytra of the male extending beyond the pronotum a distance equal to about one-half the length of the pronotum, uniform in color; in the female the elytra are mere lateral pads scarcely extending beyond the pronotum. Abdomen moderately plump, subcarinate, the last dorsal segment in the male broadly and roundly concave and flattened apically as in *hermanii;* cerci of the female about four times as long as the basal breadth, cylindrical and tapering nearly uniformly to an acute point, of the male cylindrical at the base, somewhat depressed apically and acutely pointed, furnished on the inner side with a triangular tooth as long as the cercal width at that point, the lower margin of the tooth perpendicular to the main body of the cercus and situated about the middle of it (fig. 70). Ovipositor considerably longer than the posterior femora and curved slightly downward (fig. 69), apically pointed, the tip granulose.

Color uniformly reddish or yellowish brown, in life probably usually green. The lateral lobes of the pronotum in living specimens are prob-

ably margined below and posteriorly with light yellow. The elytra of the males are uniformly yellowish brown, the membrane and veins unicolorous, the outer apical margins not marked by a black spot. The spines of the legs are tipped with black and the spinules on the underside of the posterior femora are black to the base.

FIG. 70.—IDIOSTATUS REHNI. CERCUS OF MALE.

Measurements.—Length, pronotum, male, 6.5 mm., female, 8; posterior femora, male, 18–19, female, 24; elytra, male, 3.5–4.5, female, about .5; ovipositor, 29.

Type.—Cat. No. 10184, U. S. National Museum.

Specimens examined.—Two males, one female, Siskiyou County, California (A. Koebele).

Superficially the males of this species resemble very much some yellowish males of *Eremopedes ephippiata*, but the cerci and superaanal plate are very different. I have named this species in honor of Mr. J. A. G. Rehn, of Philadelphia, Pennsylvania.

IDIOSTATUS ELEGANS, new species.

Description.—Head large, slightly broader than the anterior portion of the pronotum, into which it is moderately inserted; fastigium somewhat prominent, about as broad as one of the eyes, one-third as broad as the interocular space; front broadly rounded; eyes moderate in size, scarcely prominent, slightly elongate. Pronotum large, posteriorly produced over the base of the abdomen; lateral lobes well developed, nearly as deep as long and slightly sinuous posteriorly; lateral carinæ indicated only posteriorly and there very broadly rounded; median

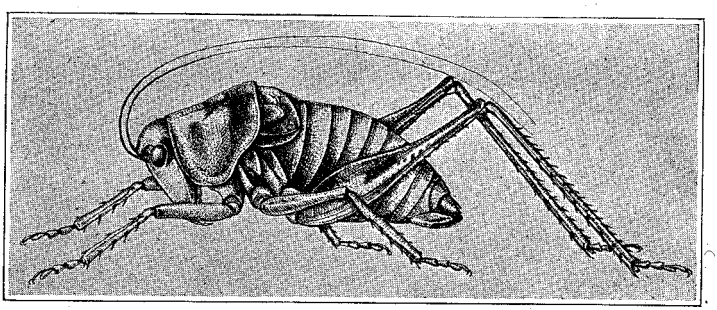


FIG. 71.—IDIOSTATUS ELEGANS. ADULT MALE.

carina very slight, subpersistent in both sexes, but very slender and obscure, especially in the female; disk broadly rounded, subtruncate anteriorly and posteriorly, anteriorly sometimes a little emarginate, cut across the anterior fifth by a slender transverse sulcus and mesially marked by a broader V-shaped sulcus, not extending to the sides. Prosternum unarmed. Legs short and stout; posterior femora about two

and one-half times as long as the pronotum, much swollen on the basal two-thirds and armed beneath with several very short, triangular, black spines; anterior tibiæ armed above on the outer side only with three spines. Elytra in the male overlapping above and extending beyond the pronotum a distance a little less than one-half the length of the pronotum, of the female broad, almost touching above and projecting beyond the pronotum a distance equal to about one-fourth the pronotal length. Abdomen plump, scarcely carinate; last abdominal segment apically depressed and mesially roundly incised; cerci of the male thick and broad, apically roundly tapering to a point and armed on the inner side with a sharp spine (fig. 72); cerci of the female short and stout, about two and one-half times as long as the basal breadth and rapidly tapering to a point. Ovipositor longer than the posterior femora and nearly straight, apically very slightly upcurved.

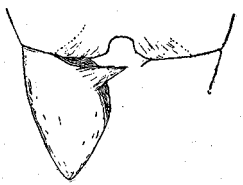


FIG. 72.—IDIOSTATUS ELEGANS. CERCUS AND LAST DORSAL ABDOMINAL SEGMENT OF MALE.

Color reddish brown, in the male lighter, marked with black. The head has a broad black postocular stripe and a black streak on the top. Pronotum mesially marked with a triangular black spot and behind with a submarginal broad black transverse stripe extending halfway down the side of the lateral lobes, more conspicuous in the male. Elytra yellow with paler veins. Abdomen with the last two segments shiny black, except the mesial emargination of the terminal one. Ovipositor black, yellowish apically and below basally. Posterior femora marked with black above at the base, on the outer face mesially and at the tip. The spines of the femora and the posterior tibiæ are black, and both femora and tibiæ of all the legs are black at the base of the spines.

Measurements.—Length, pronotum, male, 9 mm., female, 9.5; posterior femora, male, 22, female, 24; elytra, male, 4.5, female, 3; ovipositor, 26; width, pronotum across metazona, male, 6.5, female, 7; posterior femora at the narrowest point, male, 1.5, female, 1.5; at the widest point, male, 5.25, female, 5.5; ovipositor in the middle, 2.

Types.—Cat. No. 10185, U. S. National Museum.

Specimens examined.—The types, one male (fig. 71), one female, Nevada (E. H. Hillman).

This robust and prettily marked species, which was secured from the collection of Bruner, reminds one somewhat of an *Anabrus*, but it is not related to that genus.

IDIOSTATUS INERMIS Scudder.

Cacopteris inermis SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 88, 89; Cat. Orth. U. S., 1900, p. 78.—BAKER, Invert. Pacifica, I, 1903, p. 14.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Cacopteris nevadensis SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 91, 92, female, not male.

Description.—Lateral lobes of the pronotum well developed, almost as deep as long and scarcely at all sinuate posteriorly. Tegmina of the male unicolorous, the outer apical angles not marked by a black spot, extending beyond the pronotum a distance equal to more than one-half the pronotal length. Legs moderately short, the posterior femora less than, or a little more than, three times as long as the pronotum; anterior tibiæ armed above on the outer side only with three spines, very rarely the inner margin bears one spine. Cerci of the female about four times as long as the basal width, much swollen basally and tapering rapidly on the base of the apical half, the terminal portion tapering gradually to a point; in the male the cerci are very different from those of any other known species, the base being considerably compressed and the apical portion forms two sharp depressed incurved teeth, the upper one short and the lower one twice as long, both directed at right angles or less to the main body of the cercus and the tips still more incurved and black, that of the upper tooth merely sharp pointed, but that of the lower one very slender and sharp; this longer lower tooth is more than one-half as long as the main body of the cercus and the slender pointed apical portion is half as long as the body of the tooth itself (fig. 73). Last abdominal segment of the male with the apical lobes broad, short, and rounded, the intervening sinus broad and arcuate. Ovipositor almost as long or considerably longer than the posterior femora and straight.

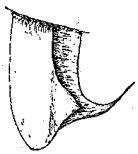


FIG. 73.—IDIOSTATUS INERMIS. CERCUS OF MALE.

Color dark brownish, the dorsum sometimes wholly testaceous and sometimes colored as the rest of the body. Pronotum with the lateral lobes usually margined below and posteriorly with luteous. Tegmina of the male fusco-testaceous, unicolorous. Legs fusco-testaceous.

Measurements.—Length, pronotum, male, 5–5.75 mm., female, 5–5.5; posterior femora, male, 14–17, female, 17–18.5; elytra, male, 3.5–4, female, 1–1.5; ovipositor, 18–20.

Types.—In the Scudder collection and in that of Professor Morse.

Specimens examined.—I have examined the types from Nevada in the collections of Scudder and Morse and an adult pair from Nevada in the latter collection taken by Baker, and a single adult male in the National Museum collection from Reno, Nevada, presented by Professor Bruner,

The female described by Scudder as that of *I. nevadensis* is really that of *inermis*, the only difference between that specimen and the female types of *inermis* being the slightly longer posterior femora and different color. But the specimens, male and female, taken by Baker in Nevada, serve to prove these features variational.

IDIOSTATUS FEMORATA Scudder.

Cacopteris femorata SCUDDER, Proc. Amer. Acad. Arts Sci., XXXV, 1899, pp. 88, 93; Cat. Orth. U. S., 1900, p. 78.—WOODWORTH, Bull. No. 142, Calif. Exp. Stat., 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Female, male unknown—Pronotum with the lateral lobes well developed and slightly sinuate posteriorly; lateral carinæ indicated only on the posterior portion of the pronotum, where they are quite distinct. Legs unusually long, the posterior femora more than four times as long as the pronotum; anterior tibiæ armed above on both margins, three spines on the outer margin, two on the inner. Cerci about as in the female of *I. inermis* but less attenuate apically. Ovipositor considerably shorter than the posterior femora and feebly curved upwards.

Color uniformly dark fusco-testaceous, the posterior femora lighter with darker stripes on the outer and inner faces.

Measurements.—Length, pronotum, 5.75 mm.; posterior femora, 25; elytra, 1; ovipositor, 18.5.

Type.—In the Scudder collection.

Specimens examined.—The unique type, a female from South Santa Monica, California (J. J. Rivers), is the only specimen of this species seen. It was taken on July 30.

IDIOSTATUS VARIEGATA, new species.

Description.—Female; male unknown. Head about as wide as the anterior part of the pronotum into which it is moderately inserted; vertex prominent and nearly one-half as broad as the interocular space; eyes medium in size, not prominent, rounded, narrowing slightly below; basal segment of the antenna no more than one-half as broad as one of the eyes. Pronotum medium in size and well produced posteriorly; lateral lobes well developed but not as deep as long, moderately declivent, and slightly sinuate posteriorly; lateral carinæ not at all indicated anteriorly, posteriorly scarcely so, being no more than well-rounded shoulders; median carina not present; disk transversely rounded, without transverse sulci, but marked on the middle by a U-shaped depression; anterior and posterior margins truncate, the former mesially a little concave. Prosternum unarmed. Legs stout, the posterior femora three times as long as the pronotum, much swollen on the basal two-thirds, and armed below on each side

with a few minute stout black spines, usually scarcely more than acute tubercles; anterior tibiæ armed above on the outer side only with three spines; anterior femora with two or three very small short spines below on the inner margin. Elytra lateral and projecting a little beyond the pronotum. Abdomen moderately stout, scarcely carinate dorsally; cerci about three times as long as the basal breadth, round, and rapidly tapering; ovipositor almost straight, just perceptible, curved upward in the apical half, considerably shorter than the posterior femora.

Color yellowish, with the upper portions of the lateral lobes of the pronotum and the abdomen, except the posterior margins of each segment and a pair of subdorsal stripes, fuscous. The disk of the pronotum is marked by a spear-shaped fuscous spot.

Measurements.—Length, pronotum, 7.25 mm.; posterior femora, 22.5; elytra, 1.5; ovipositor, 18; width, pronotum across metazona, 4.5; posterior femora at narrowest point, 1.25, at widest point, 4.5; ovipositor, at the middle, 1.5.

Type.—Cat. No. 10186, U. S. National Museum.

Specimen examined.—One female, Pocatello, Idaho. Presented by Professor Bruner.

PLAGIOSTIRA Scudder.

Plagiostira SCUDDER, Ann. Rept. Chief Eng., 1876, p. 501; Can. Ent., XXVI, 1894, pp. 179, 182; Guide Orth. N. Amer., 1897, p. 57.—KIRBY, Syn. Cat. Orth., II, 1906, p. 195.

Description.—Head small, not prominent, very deeply inserted into the pronotum; vertex very narrow, less than one-fourth as broad as the interocular space and scarcely prominent; eyes rounded, of medium size and very prominent. Thorax large, posteriorly much produced; lateral lobes very shallow, not sinuate posteriorly, perfectly vertical; lateral carinæ well developed except on the anterior fifth, where they are very obscure and rounded, straight or bowed out considerably in the middle; median carina distinct, but dull, on the posterior border only, sometimes scarcely indicated, in some specimens anteriorly replaced by a double sulcus; disk flat, rectangular or somewhat oval in form, with a broad, deep transverse sulcus occupying the middle part of the posterior half; this broad depression does not, however, interrupt the lateral carinæ; across the middle of the anterior third is a narrow but distinct and moderately deep transverse furrow or sulcus, in front of which the lateral carinæ are but poorly developed, the sulcus passing down across the lateral lobes to near the lower margin. The anterior margin of the pronotal disk is truncate, the posterior margin broadly rounded. Prosternum unarmed but sometimes furnished with a pair of very small tubercles where spines are usually situated; the mesosternal lobes are angularly developed in the sem-

blance of stout spines. Elytra, except in *gillettei*, where they are abortive, the only known specimen probably immature, overlapping above in both sexes and projecting beyond the pronotum about half its length in the male; somewhat less in the female; wings are about the same size as the elytra and coal black. Legs stout and moderately long, the posterior femora less than two times as long as the pronotum or considerably more, or much more, than two times as long, moderately or little swollen in the basal half and unarmed beneath or armed on both carinæ with a few very small blunt spinules; anterior tibiæ armed above on the outer side only with three or four spines, rarely with but two. Abdomen moderately heavy; supraanal plate elongate triangular, partially hidden beneath the last abdominal segment, which, in the male, extends backward as two projections, triangular, about as long as the basal width, the intervening sinus V-shaped; last abdominal segment of the female simple but more depressed and shorter than that of the male; subgenital plate of both sexes apically forked, the incision V-shaped, the terminal styles in the male very short and stout, subtriangular or cylindrical and more elongate. Cerci short, scarcely attaining the apex of the subgenital plate in the male (fig. 75), cylindrical in both sexes, in the female simple, conical; in the male tapering, bluntly rounded at the apex and furnished on the inner side with two short, round, blunt teeth, one just before the apex and one just beyond the middle. Ovipositor considerably longer than the posterior femora and distinctly curved downward.

Type.—*Plagiostira albonotata* Scudder.

The members of this genus may be separated as follows:

KEY TO THE SPECIES OF PLAGIOSTIRA.

A. Pronotal disk distinctly more than one and one-half times as long as its greatest width, the lateral carinæ parallel or scarcely perceptibly bowed outward, the disk rectangular. Organs of flight projecting well beyond the pronotum.

B. Posterior femora more than two times as long as the pronotum, *albonotata*, p. 389.

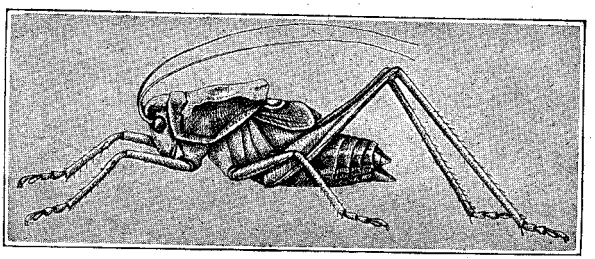
B′. Posterior femora less than two times as long as the pronotum, *albonotata* var. *brevipes*, p. 392.

A′. Pronotal disk no more than one and one-half times as long as the greatest width, the lateral carinæ distinctly bowed outward in the middle, the disk subovate. Organs of flight not projecting beyond the pronotum, at least in the only specimen seen ..... *gillettei*, p. 392.

PLAGIOSTIRA ALBONOTATA Scudder.

Plagiostira albonotata SCUDDER, Ann. Rept. Chief Eng., 1876, p. 501 (1876); Ann. Rept. U. S. Geol. Surv. W. 100 Mer., 1876, p. 281; Can. Ent., XXVI, 1904, p. 182; Cat. Orth. U. S., 1900, p. 79—SCUDDER and COCKERELL, Proc. Davenp. Acad. Nat. Sci., IX, 1902, p. 55—CAUDELL, Proc. U. S. Nat. Mus., XXVI, 1903, p. 807.—KIRBY, Syn. Cat. Orth., II, 1906, p. 195.

Description.—Head moderate, about as broad as the anterior portion of the pronotum, into which it is inserted quite deeply; vertex very narrow, barely one-fifth as broad as the interocular space and moderately prominent, longitudinally narrowly sulcate; eyes large and very prominent, semiglobular; basal segment of the antenna considerably larger than the vertex as viewed from the front. Pronotum long and moderately narrow, more than one and one-half times as long as the greatest width; lateral lobes shallow, no more than one-half as deep as long, vertical, not sinuate posteriorly; lateral carinæ sharp to the anterior transverse sulcus, thence continuing as barely discernible rounded angles, parallel or subparallel; median carina practically absent or obscurely present on the hind border posterior of the median transverse sulcus; disk flat, cut across the middle by a broad shallow sulcus as described under the genus, and across the middle of



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FIGS. 74, 75, 76.—PLAGIOSTIRA ALBONOTATA. 74, ADULT MALE. 75, CERCUS OF MALE. 76, VAR. BREVIPES, OVIPOSITOR.

the anterior third by a conspicuous transverse sulcus, which extends down across the lateral lobes nearly to the lower border; anterior margin truncate, posterior margin broadly rounded. Prosternum unarmed; mesosternal lobes acutely prolonged. Legs variable, the posterior femoræ decidedly less than twice as long as the pronotum (fig. 74) to two and one-half times as long, armed below on one or both margins with a few very minute spinules, or usually unarmed, parallel on the apical half or nearly so, the basal half very moderately swollen, no more than two times as thick as the apical portion; anterior tibiæ armed above on the outer side only, with three or four spines. Wing covers about two times as long as broad, meeting above, usually overlapping, and extending beyond the pronotum in both sexes, a distance equaling one-half the length of the pronotum in the male, sometimes less in the female, the tympanum of the male occupying about one-

half the length of the projecting portion of the elytra; wings about as long as the elytra. Genital characters as described under the genus, the ovipositor (fig. 76) curved distinctly downward and considerably longer than the posterior femora.

Color yellowish brown, in dried specimens usually quite uniform, except the wings, which are piceous, conspicuously contrasting with the brownish colored elytra, which are finely reticulate with lighter veins in both sexes. In some specimens, however, there are conspicuous chalky white markings, a transverse, faint white stripe following the lower portion of the genæ, another, broader and more conspicuous, starting below the eye and passing back along the lower margin of the lateral lobe of the pronotum. In these conspicuously marked specimens another white line runs from the upper portion of the eye to the anterior transverse sulcus of the pronotal disk, and the disk and lateral lobes bear a number of spots and dashes of white and each abdominal segment has an anteriorly directed triangular subdorsal and lateral spot, which, together, form subcontinuous subdorsal and lateral lines extending the entire length of the abdomen.

Measurements.—Length, pronotum, male, 7.5–9.5 mm., female, 8–10; posterior femora, male, 15–18, female, 16–22.5; elytra beyond the pronotum, male, 4–5, female, 2–5; ovipositor, 22–31; width, pronotum at the middle, male, 4.5–5, female, 4.75–6.5.

Type.—In the Scudder collection at Cambridge, Massachusetts.

Of this species I have recognized a variety which is separated from the typical form in the above table of species.

The typical form has the posterior femora two times or more than two times as long as the pronotum. The color of both varieties probably exhibit about the same range of variation. The measurements of this typical form are as follows:

Measurements.—Length, pronotum, male, 7.5–9 mm., female, 8–10; posterior femora, male, 15–18, female, 17.5–22.5; elytra, beyond the pronotum, male, 4–5, female, 2–4; ovipositor, 23–31; width, pronotum, male, 4.5–5, female, 4.75–6.5.

Specimens examined.—Besides the type, a single female from New Mexico, in the Scudder collection, I have studied one male, two females, Durango, Colorado, August 3, one male, Dolores, Colorado, August 2 (Gillette); one immature female, Pindale, Arizona (W. Hough), one female, Morrison, Colorado, and one female, Albuquerque, New Mexico (Cockerell).

The male specimen from Dolores, Colorado, is very small, the thoracic width being 4.5 mm. and the length of the posterior femora being but 15 mm. The female from Albuquerque, New Mexico, which is in the Scudder collection, is unusually large, the measure-

ments being as follows: Length, pronotum, 9 mm., posterior femora, 22.5, ovipositor, 31; width, pronotum, 6.5.

The very long posterior femora and ovipositor of this specimen give it a very distinctive appearance. The ovipositor is slightly more strongly curved downward apically and the pronotum is broader than usual. I refrain from giving it at least a varietal name only because of the unusual range of variation of size among the specimens of the species studied. Except in pronotal length it represents the maximum measurements made, aside from it the largest measurements made of female specimens being as follows:

Length, pronotum, 8.75–9.5 mm.; posterior femora, 21.5; ovipositor, 28; width, pronotum, 5.5.

The male of this species has never been described, though the male of the following variety has been recorded but not described.

PLAGIOSTIRA ALBONOTATA var. BREVIPES, new variety.

Description.—This variety is characterized by the short posterior femora. It is of a more robust form than the typical variety. The wings of the two specimens examined are thrust out at right angles to the elytra, their coal-black color very conspicuous against the yellowish brown background. The measurements are as follows:

Measurements.—Length, pronotum, male 8.5 mm., female 9; posterior femora, male 15, female 16; elytra, beyond the pronotum, male 4, female 3; ovipositor, 22; width, pronotum, male and female, 5.

Type.—Cat. No. 10187, U. S. National Museum.

Specimens examined.—One male, one female, Williams, Arizona, July 24, 1901, collected on sagebrush by H. Barber.

The above are the specimens recorded by me[a] some time ago as *P. albonotata*. This variety may eventually prove to be worthy of specific distinction, but in view of the extraordinary range of size of the specimens of the genius studied it is thought better to give it only varietal rank at this time.

PLAGIOSTIRA GILLETTEI, new species.

Description.—Male; female unknown. Head scarcely as broad as the anterior portion of the pronotum, into which it is deeply inserted; vertex scarcely raised out of the general contour of the head very narrow and not at all prominent; the eyes are moderately large and very prominent; basal segment of the antenna fully as large as the vertex as viewed from in front. Pronotum unusually large, distinctly broader in the middle than at either end; lateral carinæ bowed very noticeably outward, giving the pronotal disk somewhat the appearance of that of the members of the genus *Aglaothorax* (fig. 77), except it is flat

[a] Proc. U. S. Nat. Mus., XXVI, 1903, p. 897.

and roughened by rugosities and convolutions, the median transverse furrow broad; the anterior margin of the disk is truncate and the posterior margin is semicircularly rounded; median carina distinct only behind the broad transverse furrow, anteriorly replaced by a faint double longitudinal sulcus; lateral lobes longitudinally concave with a few tortuous sulci breaking the otherwise smooth surface. Organs of flight wholly concealed beneath the pronotum, the wings, like those of the typical species, coal black. Posterior femora considerably less than two times as long as the pronotum and not greatly swollen basally, the greatest width near the base no more than twice that of the narrowest part in the apical half, the swelling confined to the basal half; all the femora are armed beneath on both sides with a few very inconspicuous short, stout spinules, anterior tibiæ armed above on the outer side only with three spines. Genital organs as described under the genus.

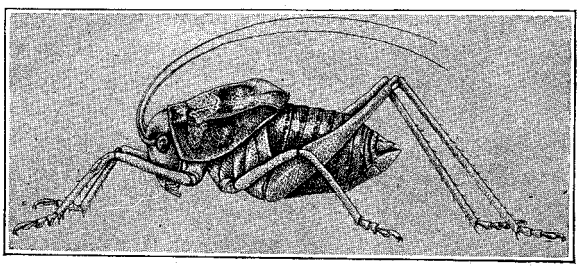


FIG. 77.—PLAGIOSTIRA GILLETTEI. MALE.

Color, yellowish, with the disk of the pronotum with fuscous mottlings, the center of the broad sulcus showing a green cast and a short longitudinal black stripe in the center of the pronotum next the anterior border, posteriorly terminating at the anterior narrow transverse sulcus. The wing pads are piceous and the abdominal segments have each a row of round black spots along the posterior margin.

Measurements.—Length, pronotum, 11.5 mm.; posterior femora, 18.5; width of pronotum across widest part, 7.5.

Type.—Cat. No. 10188, U. S. National Museum.

Specimen examined.—One male, Grand Junction, Colorado, June 20, 1905. Collected by C. P. Gillette, who presented the interesting insect to the National Museum and in whose honor I take pleasure in naming it.

This is a characteristic-appearing insect. It may be somewhat immature as suggested by the smaller wings, the outer pair of which is twisted beneath the under ones and their development propably incomplete.

IDIONOTUS Scudder.

Idionotus SCUDDER, Can. Ent., XXVI, 1894, pp. 179, 182 (invalid, no species included); Guide N. A. Orth., 1897, p. 56 (invalid, no species included); Cat. Orth., U. S., 1900, p. 79.

Description.—Head medium in size; vertex moderately or scarcely at all prominent, broad more than one-third as broad as the interocular space; eyes small, usually somewhat prominent. Pronotum medium, not greatly produced posteriorly; lateral lobes well developed, nearly as deep as long, considerably declivent and moderately sinuate posteriorly; lateral carinæ sharp, except in *subcarinata*, persistent and strongly or moderately convergent at the middle of the anterior half; median carina absent or barely indicated on the posterior third of the pronotum; disk nearly flat, marked about the middle by an inconspicuous U-shaped sulcus or a transverse sulcus, truncate before and behind or broadly rounded posteriorly. Prosternum unarmed. Legs long, the posterior femora more than two times as long as the pronotum, subparallel on the apical two-fifths, the basal portion considerably swollen, unarmed beneath or armed on both margins with a few short spines; anterior tibiæ armed above on the outer side only with three spines, rarely but two. Elytra nearly touching above and slightly projecting beyond the pronotum in the female, except in *subcarinatus*, where they are concealed; in the male, where known, the elytra overlap above and project beyond the pronotum a distance equal to one-half the length of the pronotum or more. Subgenital plate of both sexes apically notched, the apical styles of the male stout, fusiform; last abdominal segment triangular and entire in the female, in the male triangularly incised apically; cerci simple in the female, in the male armed at the extreme base with an inner spine and sometimes with a short apical spine.[a] Ovipositor short and stout, no longer than the posterior femora, abruptly tapering to a sharp point.

Type.—*Idionotus brunneus* Scudder.

The median dorsal spine of the anterior tibiæ is sometimes missing, but the normal number seems to be three.

Kirby[b] places this genus in the synonymy under the genus *Neduba* of Walker. In this he is certainly in error, the type of *Neduba* being the same as that of *Tropizaspis*.

We have three species of this genus, separable as follows:

KEY TO THE SPECIES OF IDIONOTUS.

A. Lateral carinæ of the pronotum sharp, distinct.

B. Posterior femora three or more times as long as the pronotum; cerci of the male no longer than broad and armed on the outer apical extremity with a sharp point, fig. 79½ ..... *brunneus*, p. 395

[a] This basal spine is not easily observed unless the cerci are unusually exerted.

[b] Syn. Cat. Orth., II, 1906, p. 194.

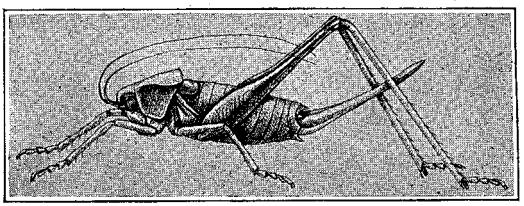
B′. Posterior femora no more than two and one-half times as long as the pronotum; cerci of the male twice as long as broad and apically unarmed, fig. 80.
brevipes, p. 396

A′. Lateral carinæ of the pronotum dull, somewhat indistinct.
subcarinatus, p. 397

IDIONOTUS BRUNNEUS Scudder.

Idionotus brunneus SCUDDER, Cat. Orth., U. S., 1900, p. 98.—WOODWORTH, Bull. No. 142, Calif. Exp. Stat., 1902, p. 15.
Neduba brunneus KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head scarcely as broad as the anterior portion of the pronotum, into which it is moderately deeply inserted; vertex broad, convex, not sulcate, one-third or more than one-third as broad as the interocular space and quite prominent; eyes rounded, moderately large and quite prominent; basal segment of the antennæ not quite as large as the vertex as viewed from in front. Pronotum very moderately produced posteriorly, the lateral lobes nearly as deep as long and declivent; lateral carinæ converging on the anterior fourth to two-thirds the distance that separates them posteriorly (fig. 79); pronotal disk rounded truncate behind and in front, marked with an obscure U-shaped sulcus near the middle. Elytra of female apically broadly rounded, nearly meeting above and projecting but little beyond the pronotum; of the male overlapping above and projecting beyond the pronotum a distance equal to about one-half the length of the pronotum. Legs long; the posterior femora more than three times as long as the pronotum and armed below on both margins with some small spines. Genitalia of female as described under the genus; the cerci of the male no longer than broad and, in addition to the short basal spine, is armed with an acute apical point (fig. 80).



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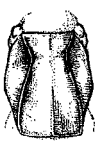

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FIGS. 78, 79, 80.—IDIONOTUS BRUNNEUS. 78, ADULT FEMALE. 79, PRONOTUM OF FEMALE FROM ABOVE. 80, CERCUS OF ADULT MALE.

Color uniformly brown, the face a little paler and the ovipositor a little more reddish brown. The pronotum of the male is sometimes briefly blackish on the extreme posterior portion, next the lateral carina.

Measurements.—Length, pronotum, male, 6 mm., female, 5.25; elytra, beyond the pronotum, male, 2.5–3, female, 1.5; posterior femora,

male, 20, female, 19.5; ovipositor, 15; width, pronotum at narrowest point, male 3, female, 2.25; posteriorly, male, 4, female, 3.5.

Type.—Cat. No. 5733, U. S. National Museum.

Specimens examined.—One female, the type (fig. 78), Folsom, California, July 7, 1885 (Koebeli), and three males, Thrall, California (Caudell).

In his original description Doctor Scudder gives the length of the pronotum as 6 mm., but I can make it no more than 5.25.

Besides the female type the National Museum contains three males taken by the writer at Thrall, California, July 28, 1906. They were taken in the evening singing in clumps of small oak shrubs. They sit a few inches above the ground and stridulate very persistently, not ceasing even when approached very closely. With a little care an observer can easily approach and study the insect songster from a distance of but a few inches. It requires a keen sight to locate the insect at first, as it is protectively colored, blending so nicely with its surroundings as to be practically invisible. When disturbed they leap to the ground among the dead leaves and such débris as usually gathers under the bushes and disappear. The note is a very low and soft, but quite high-keyed, thrill, repeated rapidly for long periods at a rate of about one hundred and fifty distinct notes per minute. Each note is made by one rasp of the short elytra.

IDIONOTUS BREVIPES, new species.

Description (Male; female unknown).—Head of moderate size, not swollen, inserted moderately into the pronotum; vertex not prominent, rounded, broad, decidedly broader than one of the eyes, which are of medium size and not prominent; antennæ slender. Pronotum of medium size, posteriorly produced well over the wings; lateral lobes deep, two-thirds as deep as long and nearly vertical, flaring a little below, posteriorly scarcely sinuate; lateral carinæ well developed, somewhat acute, nearly straight, approaching on the anterior half to one-half their posterior distance apart, and then, just before reaching the anterior edge of the pronotum, they expand slightly. Pronotal disk flat, divided about the middle by a very broad and rather deep transverse sulcus or depression; median carina present only posterior of this transverse depression, where it is rather distinct and well developed, anterior margin of the disk truncate, posterior margin broadly rounded. Wings aborted, elytra fully as long as the pronotum and very broad, overlapping more than usual in this group apically, near the costa, with a notch. Abdomen moderately slender, hardly carinate; cerci (fig. 81) cone shaped armed near the base on the inner side with a sharp black spine directed inwards and with the apical half bent upwards with a sharp curve, the whole cerci no more than twice

FIG. 81.—IDIONOTUS BREVIPES. CERCUS OF MATURE MALE.

as long as the basal width and not extending outside of the cavity formed by the subgenital plate and the last abdominal segment, the basal spine noticeable only when the cerci are removed or pushed laterally far back; subgenital plate long and triangularly incised and bears a pair of movable, club-like apical styles, two times as long as broad. Legs short, posterior femora less than two and one-half times as long as the pronotum, parallel on the apical two-fifths, unarmed; coxal spines of the anterior legs broad and sharp; anterior tibiæ armed on the outer side above with three spines, unarmed on the inner side. Posterior tibiæ with the plantulæ very poorly developed.

Color light yellowish brown; lateral lobes of the pronotum infuscated quite uniformly and heavily on the disk, the lower margin, the posterior third, and a narrow margin along the anterior edge being light yellowish. There is a row of black spots down each side of the abdomen and the outer face of the posterior femora is striately infuscated.

Measurements.—Length, pronotum, 5.5 mm.; elytra, beyond the pronotum, 6; posterior femora, 12; cerci, 1.5.

Type.—In the Scudder collection.

Specimens examined.—One male, Arctic America (Kennicott). This species was mentioned, but not described, by Doctor Scudder.[a] It is certainly a new species, as shown by the short posterior femora and other less obvious points of difference.

IDIONOTUS SUBCARINATUS, new species.

Description.—Female, male unknown. Head medium, scarcely broader than the anterior portion of the pronotum; fastigium somewhat prominent, a little broader than the basal segment of the antenna, about one-third as broad as the interocular space; eyes scarcely prominent, nearly round, very slightly flattened anteriorly; antennæ, except the basal segment, very slender. Pronotum moderately large and posteriorly produced over the base of the abdomen so as to completely conceal the organs of flight; lateral lobes well developed, declivate, posteriorly broadly sinuate; lateral carinæ dull, but distinct, made more distinct by the coloration, persistent, considerably bowed inwards in the anterior half, the posterior portion of the disk being a third broader than the narrowest portion; median carina not indicated; pronotal disk broadly convex, truncate anteriorly and posteriorly, without transverse carinæ, marked in the center with a broad obscure transverse depression. Prosternum unarmed. Organs of flight wholly concealed beneath the pronotum. Legs moderately stout, the posterior femora three times as long as the pronotum and much swollen on the basal two-thirds; all the femora unarmed; anterior tibiæ armed above on the outer side only with three spines, below on both sides; pos-

[a] Canadian Entomologist, XXVI, 1894, p. 282.

terior and intermediate tibiæ armed on both margins, both above and below. Cerci conical, simple, about three times as long as the basal breadth. Ovipositor nearly as long as the posterior femora and curved moderately and uniformly upwards.

Color wood-brown, the sides of the pronotum a little darker, the upper posterior portion shiny piceous; sides of the abdomen shiny black, strongly contrasted with the brown dorsum; posterior femora with two longitudinal black streaks on the outer face; ovipositor, legs, and face tinged with reddish brown.

Measurements.—Length, pronotum, 6 mm.; posterior femora, 18; ovipositor, 17; width, pronotum across the metazona, 3.5; posterior femora at narrowest point, 1, at widest point, 3.75; ovipositor, in the middle, 1.5.

Type.—Cat. No. 10189 U. S. National Museum.

Specimens examined.—One female, labeled "Colonia Garcia, Chihuahua, Mexico" (Townsend). The specimen was presented to the U. S. National Museum by Bruner.

The slight development of the thoracic carinæ and the absence of visible wings will readily separate this Mexican species from the United States forms.

CLINOPLEURA Scudder.

Clinopleura SCUDDER, Can. Ent., XXVI, 1894, pp. 179, 182; Guide N. A. Orth., 1897, p. 56; Cat. Orth. U. S., 1900, p. 79.—KIRBY, Syn. Cat. Orth, II, 1906, p. 194.

Description.—Head large and prominent; vertex broad, fully half as broad as the interocular space and prominent; eyes oval, scarcely prominent. Pronotum of medium size and very moderately produced posteriorly; lateral lobes well developed, about as deep as long, very declivent, and scarcely sinuate posteriorly; lateral carinæ well developed, slightly convergent in the anterior sixth and then gradually divergent to the posterior border of the pronotum, where they are as widely separated as at the anterior border (fig. 84); median carina distinct, low but persistent; disk flat, very narrow, about four times as long as the posterior breadth, no more than one-half as broad as the prothorax through the lower margins of the lateral lobes, cut at the narrowest point, the point of convergence of the lateral carinæ, by an inconspicuous transverse sulcus; pronotal disk anteriorly truncate, posteriorly rounded. Prosternum unarmed. Legs long, posterior femora over three times as long as the pronotum, subparallel in the apical half or less, slightly swollen above apically and much and abruptly swollen basally (fig. 82), armed below on the inner side only with a few stout black spines; anterior tibiæ armed above on the outer side only with four spines, rarely with five. Wings aborted; elytra broad and apically broadly rounded, overlapping above in both sexes and projecting beyond the pronotum a distance equal to nearly or quite

one-half the length of the pronotum. Subgenital plate apically notched in both sexes, the side angles rounded in the female, in the male terminating in somewhat slender styles. Last abdominal segment of the male apically deflexed and roundly concave, similar in the female; supraanal plate of both sexes triangular, often difficultly seen but in some specimens fairly prominent, often, in the male, with a central pit extending nearly through the plate; cerci simple in both sexes, quite uniformly tapering in the female, in the male with the apex attenuate and bent inwards in the form of a hard, naked, black tooth. (Figs. 83 and 86.) Ovipositor straight, not as long as the posterior femora and abruptly pointed at the apex.

Type.—*Clinopleura melanopleura* Scudder.

The members of this genus are natives of the middle Pacific States, all the known species being recorded from California or Utah. They probably inhabit open fields, as Professor Morse has taken *C. melanopleura* in some numbers traveling about in grassy fields some distance from woods.

We have three species, one apparently undescribed. They may be separated by the following table:

KEY TO THE SPECIES OF CLINOPLEURA.

A. Size larger, pronotum 6 mm. or more in length.
  B. Cerci of the male with the apical black naked portion one-third, or more, as long as the main body (fig. 83); pleura of both sexes with a light margin behind and below, generally contrasted strongly with the rest of the surface, which is black on the posterior portion and sometimes all over, *melanopleura*, p. 399
  B′. Cerci of the males with the black apical portion about one-fourth as long as the main body (fig. 86); pleura of both sexes with the colors usually but little contrasted ..... *flavomarginata*, p. 401
A′. Size smaller, pronotum 5.5 mm. or less in length; cerci of the male with the apical black portion about one-fourth as long as the main body (fig. 86), *minuta*, p. 402

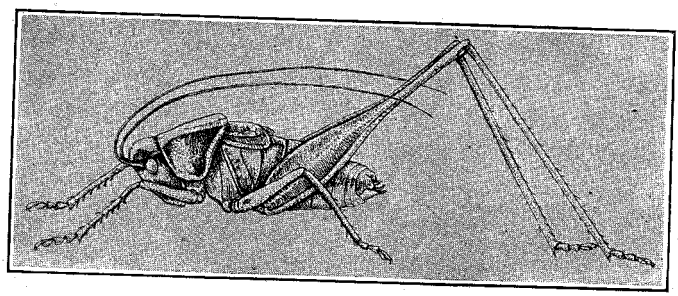
CLINOPLEURA MELANOPLEURA Scudder.

Steiroxys melanopleura SCUDDER, Ann. Rept. Chief Eng., 1876, p. 500; Ann. Rept. U. S. Geol. Surv. West 100 Merid., 1876, p. 280.

Clinopleura melanopleura SCUDDER, Can. Ent., XXVI., 1894, pp. 182, 183; Cat, Orth. U. S., 1900, p. 79; Can. Ent., XXXII., 1900, p. 332.—WOODWORTH, Bull, No. 142, Calif. Exp. Station, 1902, p. 15.—KIRBY, Syn. Cat. Orth., II. 1906, p. 194.

Description.—Head broader than the anterior portion of the pronotum, into which it is very slightly inserted; vertex prominent, one-half as broad as the interocular space, convex, not at all sulcate; eyes ovate, of medium size, not prominent; basal segment of the antenna scarcely more than one-fourth as large as the vertex as viewed from in front. Pronotum as described under the genus. Elytra of both sexes elongate, reticulated with conspicuous coarse veins. Legs very long, the posterior femora over three times as long as the pronotum

and much and abruptly ampliate on the basal three-fifths, being nearly four times as broad at the widest point as at the narrowest; anterior tibiæ armed above on the outer side only with four, or very rarely with five, spines. Cerci of the female cylindrical, about four times as long as the basal width, tapering to a point and apically curved somewhat inwards, of the male with the black naked apical portion nearly one-half as long as the main body and bent inwards at right angles with the main body and usually somewhat recurved (fig. 83), the basal portion subcylindrical, slightly tapering. Ovipositor (fig. 85) straight, considerably less than the posterior femora in length, the abruptly pointed apex smooth.



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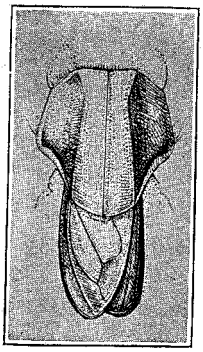

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FIGS. 82, 83, 84, 85.—CLINOPLEURA MELANOPLEURA. 82, ADULT MALE. 83, CERCUS OF MALE. 84, PRONOTUM OF MALE FROM ABOVE. 85, OVIPOSITOR FROM THE SIDE.

Color light yellowish-brown, or, by variation, dark brown. The abdomen of typical specimens is slightly darkened on the sides, as are also the outer face of the posterior femora; the lateral lobes of the pronutum are more or less deeply infuscated, except the lower and posterior margins, which are always clear yellowish. The measurements of typical specimens are as follows:

Measurements.—Length, pronotum, male, 6.5–7 mm., female, 6.5–7.5; posterior femora, male, 23–26, female, 24–28; elytra, male, 3.5–4, female, 2.5–4; ovipositor, 19–23; width of the pronotal disk at the posterior margin, male, and female, 3.25–3.5.

Type.—In the Scudder collection.

Specimens examined.—I have examined nearly half a hundred specimens of this species. Professor Morse has a fine series of six males and eighteen females taken by himself at Tehachapi, California, in 1897. They were found traveling about in a grassy field some distance from any woodlands. Besides this series in the Morse collection and the material in the Scudder collection, which includes the type, I have seen specimens from Los Angeles County, California, and from San Bernardino and Atwater in the same State. A female taken at Valley Springs, California, July 28, 1885, by H. A. Mepinge, is colored, except the lateral lobes of the pronotum, which are margined as usual, uniformly dark brown, instead of light yellowish brown, and the measurements are somewhat less, being as follows:

Length, pronotum, 6 mm.; posterior femora, 21; elytra, 2.25; ovipositor, 16; width of pronotum at the posterior border of the disk, 2.25.

This specimen seems to form a variety worthy of a name, and I call it *Clinopleura melanopleura* var. *infuscata.*

Type.—Cat. No. 10190, U. S. National Museum.

A female in the Scudder collection is somewhat more infuscated than usual, tending towards this dark variety and proving the difference separating the variety from the typical form to be varietal and not specific. This dark variety is somewhat related to the following species, *flavomarginata*, but is much smaller, and the lateral lobes of the pronotum are more distinctly margined posteriorly with yellow.

CLINOPLEURA FLAVOMARGINATA Scudder.

Clinopleura flavomarginata SCUDDER, Can. Ent., XXXII, 1900, p. 332 (part).—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Very similar to *C. melanopleura*, in structure, except that of the cerci, practically the same. The color is testaceous with the infuscation of the lateral lobes of the pronotum less distinctly contrasted with the posterior margins than in *melanopleura.* The structure of the cerci of the male is quite different from than of *melanopleura*, the black shiny apical portion being only about one-fourth as long as the main body instead of nearly one-half as long, in this respect agreeing with the cerci of the following species, *minuta.* The measurements are as follows:

Measurements.—Length, pronotum, male and female, 6.75 mm.; posterior femora, male, 25.5, female, 26.5; elytra, male and female, 2.75; ovipositor, 19.

Types.—In the Scudder collection and the collection of A. P. Morse.

Specimens examined.—Several specimens of both sexes, all from California.

The specimens recorded in the original description as from Ahwanee, Raymond, and Calaveras, California, all belong to a different species herein described as new. The true types as here eliminated are all from Ceres, California, August 17, one pair in the Scudder collection and one male in the collection of Morse. An immature female in the collection of the National Museum is referred here with some doubt. It comes from Anaheim, Orange County, California (Coquillett).

Were it not for the different cerci of the male I would rather incline to the belief that this species is but a variety of *melanopleura*.

CLINOPLEURA MINUTA, new species.

Clinopleura flavomarginata SCUDDER, Can. Ent., XXXII, 1900, p. 332 (part).

Description.—In most particulars this species is like *melanopleura* except in size, which is much less than in either *melanopleura* or *flavomarginata*. The cerci of the male are like those of *flavomarginata*, the black apical portion being about one fourth as long as the main body (fig. 86). The color is testaceous or fusco-testaceous with the lateral lobes of the pronotum infuscated and margined below and behind with yellow. The elytra are comparatively about the same length and show about the same range of variation as those of the typical species. The size, however, is the most conspicuous differentiating feature, being as follows:

FIG. 86.—CLINOPLEURA MINUTA. CERCUS OF ADULT MALE.

Measurements.—Length, pronotum, male, 4.5–5 mm., female, 4.5–5.5; posterior femora, male, 19–22, female, 19–22.5; elytra, male, 2–3, female, 1.5–2; ovipositor, 13–16; width, pronotal disk at the posterior margin, male and female, 1.75–2.5.

Type.—Cat. No. 10191, U. S. National Museum.

Specimens examined.—Several specimens of both sexes from California.

Described from two pairs from Calaveras, California. In the collections of Scudder and Morse are examples from Ahwanee, Calaveras, and Raymond, California, some of them marked as types of *C. flavomarginata*. These specimens bear *flavomarginata* type labels and are mentioned in the original description but do not appear to enter materially into the description itself as the measurements are much below those given for *flavomarginata*. I have seen a male of *minuta* from Berkeley, California.

This is the smallest species of the genus and seems very distinct.

PLATYCLEIS Fieber.

Platycleis FIEBER, Lotos, III, 1853, p. 149.
Chelidoptera[a] WESMAEL, Bull. Acad. Brux., V, 1838, p. 591.—KIRBY, Syn. Cat. Orth., II, 1906, p. 203.

Description.—Female. Head quite small, deeply inserted into the pronotum; vertex very broad, about two-thirds as broad as the interocular space, moderately prominent; eyes medium in size, moderately prominent. Pronotum small and but slightly produced posteriorly; lateral lobes well developed, about as deep as long, very nearly vertical and very slightly sinuate posteriorly; lateral carinæ distinct, moderately sharp, persistent, a little more rounded on the extreme anterior margin of the pronotum, straight, uniformly expanding a little from the front backwards; median carina present only on the posterior third, moderately sharp; disk narrow, a little broader behind than in front and flat, marked just anterior of the termination of the median carina with a tolerably distinct U-shaped sulcus; the disk is subtruncate anteriorly and posteriorly. Prosternum unarmed; mesosternal lobes prominent. Elytra squamæform, overlapping above, rounded apically and projecting beyond the pronotum a distance equal to nearly one-half the pronotal length; wings about as long as the elytra but not so broad, lateral, not meeting above. Legs moderately long, the posterior femora more than twice as long as the pronotum, swollen on the basal three-fifths and unarmed below, the plantula of the hind tarsi scarcely one-half as long as the basal segment; anterior tibiæ armed above on the outer margin only with three spines. Abdomen moderately plump and dorsally subcarinate; subgenital plate apically roundly and shallowly notched; supraanal plate small, triangular and dorsally concave, almost concealed beneath the last abdominal segment, which is broad, centrally concave and mesially incised apically for nearly its entire length by a narrow cleft; a pair of perpendicular infracercal plates embrace the supraanal plate, which they equal in length; cerci simple, conical, hairy; ovipositor curved strongly upwards and about as long as the posterior femora.

Type.—*Decticus intermedius* Serville.

This is the only old world genus represented, so far as known, in our fauna. But one species is known, the following:

PLATYCLEIS FLETCHERI, new species.

Description.—Female, male unknown. Head scarcely as broad as the anterior portion of the pronotum; vertex convex, broad and moderately prominent; eyes medium in size and prominence, rounded; basal segment of the antenna broad, almost one-half as large as the

[a] Preoccupied in ornithology by *Chelidoptera* Gould, Proc. Zool. Soc. Lond., 1836, (1837), p. 81.

vertex as viewed from in front. Pronotum narrow, structure as described under the genus. Wings narrower but about as long as the elytra, which are apically broadly rounded, overlap dorsally and project beyond the pronotum about one-half the pronotal length. Legs of moderate length and size; posterior femora more than two times as thick basally as apically, the swelling confined to about the basal three-fifths; anterior tibiæ unarmed above on the inner side, on the outer side armed with three spines. Abdomen and genital characters as described under the genus.

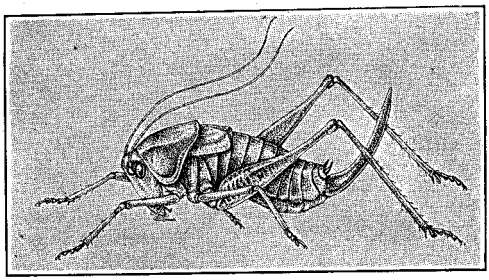


FIG. 87.—PLATYCLEIS FLETCHERI. ADULT FEMALE.

Color dark reddish brown, the posterior tarsi and the sides of the vertex black and the disk and the central portions of the lateral lobes of the pronotum nearly black, the latter bordered below and behind with yellowish.

Measurements.—Length, pronotum, 5.25 mm.; elytra, 2.5; posterior femora, 14.5; ovipositor, 14; width, pronotal disk at the posterior margin, 3.75; at the anterior margin, 2.75.

Type.—Cat. No. 10192, U. S. National Museum.

Specimens examined.—The type, one female (fig. 87), taken by Dr. James Fletcher at Calgary, Assiniboia, Canada, on July 31, 1904, and by him presented to the U. S. National Museum.

I take pleasure in naming this interesting insect in honor of its illustrious collector.

STEIROXYS Herman.

Steiroxys HERMAN, Verhandl. der k. k. Zool.-Bot. Gesellsch. Wien, XXIV, 1874, pp. 200, 207.—SCUDDER, Can. Ent., XXVI, 1894, pp. 179, 182; Guide N. A. Orth., 1897, p. 56; Cat. Orth. U. S., 1900, p. 78.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head small, not prominent, deeply inserted into the pronotum; vertex moderately prominent and exceedingly broad, almost as broad as the interocular space; eyes small, scarcely prominent; basal segment of the antenna less than one-fourth as large as the vertex as viewed from in front. Pronotum of medium size, moderately produced posteriorly; lateral lobes well developed, nearly as deep as long, slightly declivent and somewhat sinuate posteriorly; lateral and median carinæ distinct and persistent, the former subparallel, diverging slightly from in front backwards (fig. 89); disk nearly flat, subrectangular, subtruncate both in front and behind, about two or two and one times as long as broad and without conspicuous sulci, some-

times with a noticable V-shaped one near the center. Prosternum unarmed. Elytra of female short, rounded lateral pads, scarcely projecting beyond the posterior edge of the pronotum, of the male broad, overlapping dorsally and projecting beyond the pronotum a distance equal to about one-half the length of the pronotum. Legs long, the posterior femora two and one-half times to nearly four times as long as the pronotum, strongly expanded on the basal two-thirds and unarmed beneath or armed with a few small spines; anterior tibiæ armed above on the outer side only with three spines; abdomen moderately plump, scarcely carinate; subgenital plate of both sexes apically rectangularly incised, that of the male with moderately prominent styles at each side behind; supraanal plate small and apically triangular in both sexes, closely fitted between a pair of compressed infracercal plates, usually hidden beneath the last abdominal segment, which, in the male, is mesially incised; cerci of the female simple, cylindrical, pointed, of the male cylindrical with the apex sharp and tooth-like, bent inwards and furnished on the inner side with a sharp tooth; ovipositor very slightly curved upwards and of a length varying from distinctly shorter than the posterior femora to somewhat longer.

Type.—Thamnotrizon trilineatus Thomas.

The type of this genus was originally described as having the pronotum without carinæ but in the description of the genus *Steiroxys* Herman says that this was probably a clerical error. That this is probably the case is indicated by several facts. Specimens of the type species labelled in the handwriting of Thomas as type specimens are in the National Museum and they have the pronotum carinate. Glover has figured the species, presumably from authentic specimens from Thomas, and his illustration shows the pronotum to be carinate. Besides this Thomas himself practically admits the correctness of Herman's diagnosis as based on *trilineatus*.[a] Thus *trilineatus* is seen to have a carinate pronotum and the statement to the contrary in the original description is to be attributed to a clerical error.

The classification of this genus is by far the least satisfactory of any of the group here treated. The cerci of the males are either unusually variable for this group or indicate several more species than I have recognized. That the cerci of the males, which are unvarying characters of such synoptic value in other genera of the group, should be so variable as to be useless as a differentiating character in this particular genus is, to say the least, odd. It may, however, eventually result that we have several more species than here considered but at this time I am unable to recognize such to be the case. The sexes are connected only by association with localities, none, so far as I know, having been taken in copulation. Color, so far as determinable from the material studied, is of little constancy. About fifty specimens of

[a] Rept. U. S. Geol. Surv. W. 100 Mer., V, 1875, p. 906.

the genus have been studied but much more material and field observation is necessary to satisfactorily place the various forms. The genus is distinct and very well circumscribed but the species seem in a hopeless state of chaos. The females are, at the present state of our knowledge of the genus, practically inseparable. Scudder has, it is true, published a table of species based upon characters supposedly of synoptic value but a study of type material in his collection shows some of the characters used by him in his table to be inversely true. Thus the pronotal disk of *borealis* is more nearly twice as long as broad as is that of *pallidipalpis*. The length of the posterior femora varies as does the color. Therefore, I have made no attempt to synoptically separate the various forms, this being deemed impracticable at this time. The described species are as follows:

STEIROXYS TRILINEATA Thomas.

Thamnotrizon trilineatus THOMAS, Proc. Acad. Nat. Sci. Philad., 1870, p. 76; Ann. Rept. U. S. Geol. Surv. Terr., II, 1871, pp. 265, 268.—GLOVER, Ill. N. A. Ent., Orth, 1872, pl. VIII, fig. 5.—SCUDDER, Index N. A. Orth, 1901, p. 322.

Decticus trilineatus THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V, 1872, p. 443.—BRUNER, Bull. No. 27, Div. Ent. U. S. Dept. Agric., 1892, p. 31.—SCUDDER, Index N. A. Orth, 1901, p. 95.

Dectes trilineatus BRUNER, Publ. Nebr. Acad. Sci., III, 1893, p. 31.

Steiroxys trilineata HERMAN, Verhandl. der k. k. Zool.-Bot. Gesellsch. Wien., XXIV, 1874, p. 207, pl. v, figs. 64–69.—SCUDDER, Can. Ent., XXVI, 1894, pp. 182, 183; Cat. Orth. U. S., 1900, p. 79; Index N. A. Orth., 1901, p. 300.—SCUDDER and COCKERELL, Proc. Davenp. Acad. Nat. Sci., IX, 1902, p. 55.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head small and deeply inserted into the pronotum; vertex convex and moderately prominent, very broad, occupying practically all the interocular space; eyes of moderate size, rounded and not prominent. Pronotum and wings as described under the genus. Legs moderately long, the posterior femora about three times as long as the pronotum, swollen on the basal two-thirds and unarmed below; anterior tibiæ armed above on the outer side only with three spines, rarely one of them missing. Abdomen plump, dorsally subcarinate; cerci of the female round, about four times as long as the basal width and tapering to a point, tapering mostly in the apical half; cerci of the male (fig. 91) cylindrical or somewhat flattened and tapering gradually to a point, curved downward and inward at the tip, and furnished on the inside about or just beyond the middle with a slightly recurved tooth cylindrical and shaped like the end of the main body; ovipositor about as long as the posterior femora and curved somewhat upward, the tip abruptly tapering to a point and roughened by minute serrations.

Color dark brown or yellowish, usually with some lighter markings down the dorsum, sometimes lighter with a row of conspicuous V-

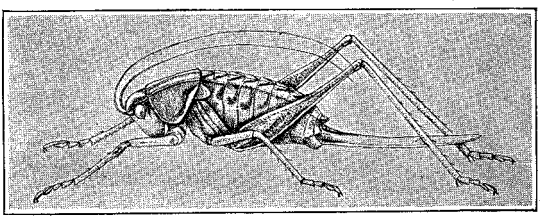
shaped black marks down the top of the abdomen and a row of oblique black dashes along the sides (fig. 88). The lateral lobes of the pronotum are generally bordered below and behind with yellowish, and next this yellow border behind is usually a piceous streak.

Measurements.—Length, pronotum, male, 5.5–6 mm., female, 4.5–6; posterior femora, male, 18–19, female, 15.5–19; elytra, male, 2–3, female, 5–1; ovipositor, 16–24; width, pronotum at posterior margin, male, 3–3.25, female, 2.5–3.

Type.—Apparently lost.

Specimens examined.—Material from Nebraska, Colorado, Montana, and Idaho.

The National Museum contains specimens labeled as types, but erroneously so, as the species was described from southeast Colorado, while these specimens are from South Pass, Wyoming; but they are doubtlessly authentic specimens, being labeled in the handwriting of Thomas. Besides these, the National Museum contains specimens, all females, from Nebraska, Colorado, Montana, and Idaho. Besides these localities the species has been recorded from Utah, Wyoming, and New Mexico.



88

89 90 91

FIGS. 88, 89, 90, 91.—STEIROXYS TRILINEATA. 88, ADULT FEMALE. 89, PRONOTUM OF FEMALE FROM ABOVE. 90, CERCUS OF ADULT MALE. 91, CERCUS OF ADULT MALE.

The figure by Glover is not a good one, failing, as it does, to properly show the thoracic carinæ.

Besides the statement that the pronotum is without carinæ the original description contains some other minor points at variance with the characters of the specimens now considered as this species. But, as stated in the discussion under the genus, Herman's construction is accepted.

There is an immense amount of variation in color and general appearance of the specimens here referred to this species. Some specimens are light, with conspicuous abdominal markings and with short legs and ovipositors, as shown in fig. 88, and others are very uniformly brownish or greenish yellow, with long posterior femora and ovipositors, while still others have the conspicuous abdominal markings, but with long posterior femora and ovipositors. The cerci of the males sometimes have the tooth situated at the middle (fig. 91),

and sometimes much beyond the middle (fig. 90); in some specimens the location of the cercal tooth is intermediate between the two figured.

There may be more than one species represented among the specimens here referred to this species, but if so, I am unable to satisfactorily separate them.

STEIROXYS PALLIDIPALPUS Thomas.

Decticus pallidipalpus THOMAS, Ann. Rept. U. S. Geol. Surv. Terr., V., 1872, p. 442; Proc. Davenp. Acad. Nat. Sci., I, 1876, p. 262.—SCUDDER, Index N. A. Orth., 1901, p. 95.

Steiroxys pallidipalpus SCUDDER, Can. Ent., XXVI, 1894, pp. 182–183; Cat. Orth. U. S. 1900, p. 78; Index N. A. Orth., 1901, p. 300.—REHN, Ent. News, XVII, 1906, p. 288.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head medium in size, inserted into the pronotum a moderate depth; vertex broad, convex, much broader than the eye, which is considerably smaller in the female than in the male. Pronotum moderate in size and in posterior prolongation, the lateral lobes deep, almost vertical, with a slight posterior sinus; lateral carinæ prominent, sharp, persistent, in both sexes diverging very slightly posteriorly. Pronotal disk nearly flat, slightly rising from the lateral carinæ to the distinct, persistent, median carina; the disk is truncate behind and in front, or very slightly rounded anteriorly, without sulci. Wings and legs as in *trilineata*, the posterior femora sometimes with a few small spines beneath. Abdomen as in *trilineata*. Cerci of the female about four times as long as the basal width, of the male heavy basally, tapering abruptly just beyond the inner tooth, which is situated at or before the middle, the apex sharp and bent inward (fig. 92). Ovipositor long, slightly curved upward and unarmed apically, curving somewhat more in the basal portion than that of the following species.

FIG. 92.—STEIROXYS PALLIDIPALPUS. CERCUS OF ADULT MALE.

Color yellowish or light brown, the posterior femora mottled more or less with fuscous; lateral lobes of the pronotum in the male slightly infuscated posteriorly and with a yellow margin above the sinus, in the female about the same, but less distinct. Ovipositor dark reddish brown.

Measurements.—Length, pronotum, male, 6.75 mm., female, 7; posterior femora, male, 18.5–24.5, female, 19–20; elytra, male, 3.5, female, 1; ovipositor, 18.5–22; width, pronotum at posterior margin, male, 4.5, female, 4.

Type.—Apparently lost.

Specimens examined.—Specimens from Nevada, Oregon, Idaho, Wyoming, Washington, and California.

The above description, except the minimum measurements, which

are taken from Thomas's original description, was drawn up from a male in the Scudder collection from Ruby Valley, Nevada (Ridgeway), and a female in the Morse collection from Mary's Peak, Benton County, Oregon, September 16, 1897. This female may be wrongly associated but the male is very certainly properly placed. The species has also been recorded from Utah and Idaho.

The cerci of the male in this species seems to represent a type derived from that of *S. trilineata*, the inner tooth having become slightly smaller and moved back toward the base (fig. 93). The two forms of cerci are, however, quite distinct.

The National Museum contains one much shrivelled female from Idaho, evidently preserved in spirits and afterwards dried, which is labeled in the handwriting of Professor Thomas as questionably *S. pallidipalpus*. Also one female from Pocatello, Idaho, one without label and a male from east Washington. This male, which is referred here with some doubt, has the cerci shaped as shown in fig. 93, and the posterior femora measure 22 mm. in length. Bruner has a number of both sexes from Washington, Idaho, Wyoming, and California. Rehn records it from Utah.

FIG. 93.—STEIROXYS PALLIDIPALPUS. CERCUS OF ADULT MALE (VARIETY).

The specimen figured by Glover[a] as this species is very surely wrongly identified, probably belonging to the genus *Eremopedes* or *Stipator*.

STEIROXYS BOREALIS Scudder.

Steiroxys borealis SCUDDER, Can. Ent., XXVI, 1894, p. 182; Index N. A. Orth., 1901, p. 300.—WOODWORTH, Bull., p. 142, Calif. Exp. Stat., 1902, p. 15.—KIRBY, Syn. Cat. Orth., II, 1906, p. 194.

Description.—Head and pronotum as in *S. trilineata*. Elytra of the male projecting scarcely one-half the length of the pronotum, broad, overlapping above, of the female slightly projecting lateral lobes. Legs moderately long; the posterior femora swollen on the basal two-thirds and unarmed beneath; anterior tibiæ armed above on the outer side only with three spines. Abdomen moderately heavy, dorsally subcarinate; cerci of the female conical, variable in length, sometimes seemingly less than four times as long as the basal width while in some specimens referred here they are fully five times as long. The cerci of the male are strikingly different from those of either of the preceeding species, being basally much compressed, no more than one-half as broad as deep and apically divided into two equal incurved hard black claws (fig. 94). Ovipositor moderately stout, scarcely as long as, or but little longer than, the posterior femora, slightly curved upward, apically pointed and unarmed.

[a] Ill. N. A. Ent., Orth., 1872, pl. IX, fig. 8.

Color brown, usually with a pair of more or less distinct narrow pale subdorsal lines on the abdomen.

Measurements.—Length, pronotum, male and female, 6–7 mm.; posterior femora, male, 18–5, female, 17.5–20; elytra, male, 3, female, 0.5–1; ovipositor, 15–21; width, pronotum at posterior margin, male, 3.25, female, 3.5.

Type.—In the Scudder collection.

Specimens examined.—The types from northern California and specimens from Oregon, Washington, Wyoming, and British America.

FIG. 94.—STEIROXYS BOREALIS. CERCUS OF ADULT MALE.

The above description, with the exception of certain measurements, was drawn up from a male from northern California, from the old Uhler collection, and a female from Oregon, no locality given. These are Scudder's types. In the collection of the Museum of Comparative Zoology at Cambridge, Massachusetts, are a number of female specimens from Oregon in which the ovipositors are almost straight. The National Museum contains several specimens, all females, which are referred here. They are from Pullman, Washington, July and August; Jackson's Hole, Wyoming, August; Fort McLeod, British America, August and one without label. These specimens are referred here by locality rather than by any noticeable differences separating them from dark forms of *trilineata*.