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(Orthoptera)

by

James A. G. Rehn and Morgan Hebard

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CONOCEPHALUS FOUND IN NORTH AMERICA,  
NORTH OF MEXICO

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From the Transactions of the American Entomological Society, xli, 155-224  
Issued June 19, 1915

No. 720

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STUDIES IN AMERICAN TETTIGONIIDAE  
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BY JAMES A. G. REHN AND MORGAN HEBARD

A SYNOPSIS OF THE SPECIES OF THE GENUS  
CONOCEPHALUS (XIPHIDIUM OF AUTHORS)  
FOUND IN NORTH AMERICA NORTH OF  
MEXICO<sup>1</sup>

**CONOCEPHALUS** Thunberg

1815. *Conocephalus* Thunberg, Mém. Acad. Imp. Sci. St. Petersbourg, v, p. 271.  
1829. *Anisoptera* Latreille, Règne Anim., Ed. 2, v. p. 184.  
1831. *Xiphidion* Serville, Ann. Sci. Nat., xxii, p. 159.  
1838. *Xiphidium* Burmeister, Handb. Entom., ii, abth. ii, pt. i, p. 707.  
1869. *Palotta* F. Walker, Cat. Dermapt. Salt. Brit. Mus., ii, p. 249.  
1912. *Conocephalus* Karny, Gen. Ins., Orth., Subf. Conocephalinae, p. 8.

GENOTYPE (by tautonymy).—*Conocephalus hemipterus* Thunberg = *Conocephalus conocephalus* [*Locusta conocephalus*] (Fabricius).

This genus is a member of the Tettigoniidae and of the subfamily Conocephalinae, and has been placed by Karny at the end of his restricted subfamily Conocephalinae, after the very closely allied genus *Orchelimum*. It is evident, however, that the North American genus *Odontoxiphidium* should be placed at the end of this group, following the present genus.

It is extremely important to note that the many subgenera of *Conocephalus* are readily separable one from the other by one or more striking characters in every instance, while the genus *Orchelimum*, though forming a distinct unit which is readily recognizable in the vast majority of specimens examined, affords no single constant character for its ready separation from the present genus.

<sup>1</sup> Published with the aid of the Orthoptera Fund.

*Differential Generic Characters.*—The genus *Conocephalus* is separated with great difficulty from the genus *Orchelimum*. The present genus includes diminutive forms; but the smallest individuals of several species of *Orchelimum*, the majority of these found only in the extreme northern part of the range of the respective species, are not as large as the largest specimens of *Conocephalus* before us. In the present genus the stridulating field of the male tegmen is normally smaller, narrower and less extensive than in *Orchelimum*, the vicinity of the arcuate vein not strongly produced or overhanging<sup>2</sup> and, when looking from the dorsum, the humeral trunk is never hidden.<sup>3</sup> The male cerci, though showing many different types, do not in any of the North American species exhibit the type found in the majority of the species of *Orchelimum*, in which the tooth is placed in a more or less decided socket-like depression; all of the American species of the genus have the cerci unispinose. Further usual differences are found in the male subgenital plate which is truncate distad in the great majority of American species.<sup>4</sup> The females of all the North American species do not have the ovipositor decidedly arcuate, though distinctly arcuate in *C. nemoralis*, occasionally of this type in *C. nigropleuroides*, and such a condition even more weakly indicated in other species.<sup>5</sup> Material of the two genera is easily separated by a decidedly different general appearance, but when the characters of the two are compared, the variation in each of the genera leaves us unable to state a single absolute difference.

*History.*—In 1815, Thunberg erected the genus *Conocephalus*, including in it twenty-four species; under one of these, *C. hemipterus* (p. 272), he placed as a synonym *Locusta conocephalus* of Fabricius, which citation forms, under the International Nomenclature rules, type designation by tautonymy, and in consequence

<sup>2</sup>The opposite of this is true for the majority of, but not all, the species of *Orchelimum*.

<sup>3</sup>This is the normal condition in the species of *Orchelimum*, excepting in *O. volantum* and *O. bradleyi*, and to a less degree in *O. gladiator*.

<sup>4</sup>This is not true of *C. allardi*, which has a distinctive and remarkable male subgenital plate.

<sup>5</sup>In *Orchelimum, militare* is the only species having a straight ovipositor; several other species have the ovipositor with dorsal margin straight but with ventral margin curved.

the species becomes type of the genus *Conocephalus*. This unfortunate condition has been remarked by certain authors in recent years, and requires the abandonment of the name *Conocephalus* for the large cone-headed katydids to which it has generally been applied, and its use for the present genus, which appears in most literature under *Xiphidion* or *Xiphidium*.

The name *Anisoptera* of Latreille, 1829, was based on two species, *dorsalis* and *brachypterus*; the former has been selected as the type of *Anisoptera* by Kirby,<sup>6</sup> the latter is a member of the Decticinae. Karny<sup>7</sup> takes exception to the use of *Anisoptera* for the present genus by Kirby; the latter's non-use of *Conocephalus* is apparently incomprehensible to him, but is probably due to Kirby's personal objection to the use of tautonymic names, which objection has been shared by numerous workers.

Walker's genus *Palotta*, 1869, includes the single species *inornata*, which has been synonymized by Kirby under *Xiphidium iris* of Stal.

*Classification*.—Karny has recently divided the present genus into five subgenera.<sup>8</sup> His new *Neoxiphidion* includes thirty-two species and in the absence of a designated genotype we select *C. (N.) fasciatus* (DeGeer). The subgenus *Xiphidion* Serville has the type fixed by Kirby<sup>9</sup> as *fuscum* (Fabricius). Karny's new *Thecoxiphidion* includes six species and, in the absence of a designated genotype, we select *C. (T.) strictus* (Scudder). The subgenus *Palotta* F. Walker has *inornata (iris* Serville) type by monotypy, while the type of the subgenus *Conocephalus* is *C. (C.) conocephalus* by tautonymy, as discussed above. Of these subgenera we find *Xiphidion*, *Palotta* and *Conocephalus* possessing sufficient and distinguishable characters, but under *Xiphidion* we must place *Neoxiphidion* and *Thecoxiphidion*. The first of these is separated by Karny by the male cerci being heavy, depressed and short distad, the majority of species American, in contrast to *Xiphidion* having the male cerci slender, acuminate, not or but little depressed distad, the majority of species from the Eastern Hemisphere. Study of the genotypes and the numerous species of the

<sup>6</sup> Syn. Cat. Orth., ii, p. 274, (1906).

<sup>7</sup> Verh. k.-k. zool.-botan. Gesell. Wien, lix, p. 27, (1909).

<sup>8</sup> Gen. Ins., Orth., Subf. Conocephalinae, p. 8, (1912).

<sup>9</sup> Syn. Cat. Orth., ii, p. 274, (1906).

genus before us convinces us that the above characters are insufficient. Moreover we are certain that the type species of these subgenera, *fasciatus* and *fuscus*, possess no other differential characters of sufficient importance to warrant the erection of subgenera. The North American species which we place under the subgenus *Xiphidion* are naturally separated into three groups, but it would be necessary to erect countless subgenera for the genus were these considered subgenerically distinct. The Old World species having no teeth, or two, instead of the usual one on each male cercus, are certainly more distinctive than these and may constitute valid subgenera, while the variation, within the genus, of the male subgenital plate affords even more decided genital characters, being acutely produced distad without styles in some, acutely produced distad with styles in others and not produced but bearing styles in the majority of species.

The very long ovipositor and very brief tegmina are used to separate *Thecoxiphidion* from *Xiphidion*. The variation in the ovipositor, not only in the type of this subgenus but in the majority of the species which we have studied, convinces us that this character is insufficient for subgeneric use, and the tegminal length is not to be considered of even specific value, as the genotype itself, normally decidedly brachypterous, develops a macrop-terous form.

*Key to the Subgenera of the Genus Conocephalus*

A. Prosternum bispinose. (Caudal tibiae armed at distal extremity with three pairs of spurs.)

B. Ventral margins of cephalic and median tibiae armed with five to seven<sup>10</sup> well spaced spines.

C. Male subgenital plate very strongly produced meso-distad in two sharp straight spikes, styles absent.

**Dicellura** new subgenus

CC. Male subgenital plate with distal margin more or less decidedly truncate, with no decided emargination or production; small, slender, filiform styles present laterad.

**Xiphidion** Serville

BB. Ventral margins of cephalic and median tibiae armed with nine to ten closely set spines.

**Palotta** F. Walker

AA. Prosternum unarmed. (Ventral margins of cephalic and median tibiae armed with five to seven<sup>10</sup> well spaced spines.)

<sup>10</sup> In all of the North American species of the genus, the cephalic and median tibiae have both ventro-cephalic and ventro-caudal margins armed uniformly with six well spaced spines.

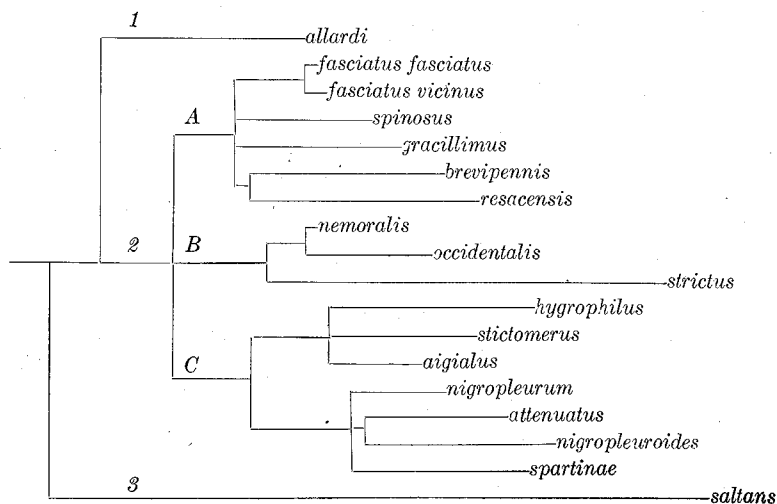
B. Caudal tibiae armed at distal extremity with three pairs of spurs.

**Conocephalus** Thunberg

BB. Caudal tibiae armed at distal extremity with a single pair of spurs  
(dorsal and ventral pairs absent. Male subgenital plate as in *Xiphidion*.)

**Anarthropus** new subgenus

The following diagram illustrates the relationship of the forms here considered.



The numbers given above designate the three subgenera known from North America; the letters indicate the natural groups of the very large subgenus *Xiphidion*, each of which includes species showing a greater or less degree of affinity, as given in the above diagram. Of the species of group A, *resacensis* shows much the greatest affinity to the species of group C. Group B is distinctive and forms a decided unit, not a transition, between groups A and C. Group C divides into two portions, the species forming the first of these showing somewhat greater affinity to those of Group A.

In certain respects otherwise very different species show decided similarity, thus *allardi* and *nemoralis* both have unusually broad tegmina with apices very broadly rounded and tympana of males in proportion decidedly wider than is usual; *brevipennis*

and *spartinae* are so similar in general appearance that they long remained unrecognized in collections as very distinct species.

*Distribution* (over the region under consideration).—The present genus is found everywhere in Canada as far north as adequate collecting has been done and probably extends in distribution northward at least as far as the spruce belt. It is also found everywhere in the United States; but in the semi-desert and desert regions of the west it is confined to mountains, rivers, streams, lakes and irrigated tracts where a more constant water supply is to be found. The genus is found in the greatest numbers in the Mississippi Valley region and in the central Atlantic states.

*Material Examined*.—In addition to a series of over 1000 specimens already correctly recorded, we have examined and recorded in the present paper 2907 specimens, of which 1924 are in the Hebard Collection and that of the Academy of Natural Sciences of Philadelphia. For the privilege of studying the additional material we wish to express our deep appreciation to Mr. A. N. Caudell, of the United States National Museum and to Dr. Samuel Henshaw, of the Museum of Comparative Zoology, who have enabled us to study all of the material in the collections of those institutions, to Prof. A. P. Morse who has generously requested us to study and record the interesting series in his collection taken by him outside of New England, and to Mr. Wm. T. Davis and Dr. J. Chester Bradley whose careful work in the field and kind cooperation has greatly assisted us in this and other studies. The privilege of studying and recording the material belonging to the Pennsylvania State Department of Zoology has also aided us in the present work.

In the preparation of the present paper the following types have been before us:

*Conocephalus allardi* (Caudell)

*Conocephalus fasciatus vicinus* (Morse)

(*Xiphidium vicinum* var. *productum* Morse, synonym of *Conocephalus fasciatus vicinus* (Morse).)

*Conocephalus spinosus* (Morse)

*Conocephalus gracillimus* (Morse)

*Conocephalus brevipennis* (Scudder)

(*Xiphidium ensifer* Scudder, synonym of *Conocephalus brevipennis* (Scudder).)

(*Xiphidium gossypii* Scudder, synonym of *Conocephalus brevipennis* (Scudder).)

*Conocephalus resacensis* new species

*Conocephalus nemoralis* (Scudder)

*Conocephalus occidentalis* (Morse)

(*Xiphidium occidentale* var. *camurum* Morse, synonym of *Conocephalus occidentalis* (Morse).)

(*Xiphidium occidentale* var. *caudatum* Morse, synonym of *Conocephalus occidentalis* (Morse).)

*Conocephalus strictus* (Scudder)

*Conocephalus hygrophilus* new species

*Conocephalus stictomerus* new species

*Conocephalus aigialus* new species

*Conocephalus nigropleurum* (Bruner)

*Conocephalus attenuatus* (Scudder)

*Conocephalus nigropleuroides* (H. Fox)

*Conocephalus spartinae* (H. Fox)

*Conocephalus saltans* (Scudder)

(*Xiphidium modestum* Bruner, synonym of *Conocephalus saltans* (Scudder).)

*Key to Males of the North American Species of the Genus  
Conocephalus found north of Mexico*

A. Prosternum bispinose. Caudal tibiae armed at distal extremity with three pairs of spurs.

B. Subgenital plate very strongly produced meso-distad in two sharp straight spikes which are weakly divergent, styles absent, distal margin of plate between productions obtuse-angulate emarginate.

(Subgenus **Dicellura**)

(Size medium, form robust. Vertex very weakly ascending, sides moderately divergent, greatest width two-thirds that of proximal antennal joint. Eyes normal. Convex callosity of lateral lobes very broad. Tegmina broad at apex, tympanum of same unusually large. Dorsum of abdomen, including cerci, dark brown. Cerci heavy, with mesal portion not contrastingly swollen, armed with a heavy mesal (vertical) tooth which is flat and broad at the base, situated interno-mesad. Ventral margins of caudal femora unarmed.)

**allardi** (Caudell)

BB. Subgenital plate not produced distad, disto-lateral styles small and filiform, distal margin of plate nearly or quite transverse.

(Subgenus **Xiphidion**)

C. Cerci armed with a heavy mesal (vertical) tooth, so that its base is visible from above, this tooth situated interno-mesad.



D. Cerci with mesal portion not contrastingly swollen.

E. Cerci with distal portion weakly to very decidedly depressed and with apex broad and rounded. (Size small to medium.)

F. Tympanum of tegmina not unusually elongate. Convex callosity of lateral lobes not very broad. Vertex moderately produced, (weakly to very weakly ascending).

G. Cerci with distal portion moderately produced, the depression of the same being general and not more decided on the internal side.

H. Vertex with sides moderately divergent, greatest width about two-thirds that of proximal antennal point. Eyes decidedly small. Convex callosity of lateral lobes moderately but not decidedly broad. Dorsum of abdomen trifasciate, with median line broad. Cerci not decidedly heavy or elongate, with distal portion weakly depressed. Ventral margins of caudal femora normally unarmed.

I. Form slender. Abdominal fasciae moderately distinct, colors not brilliant. **fasciatus fasciatus** (DeGeer)

II. Form moderately slender. Abdominal fasciae very distinct, colors brilliant (particularly so in life).

**fasciatus vicinus** (Morse)

HH. Vertex with sides decidedly divergent, greatest width equalling that of proximal antennal joint. Eyes normal. Convex callosity of lateral lobes very narrow. Abdomen immaculate, with distal portion, including cerci, pale yellow. Cerci heavy, elongate, with distal portion very decidedly depressed. Ventro-external margins of caudal femora bearing normally four to five spines. (Form moderately robust.)

**spinus** (Morse)

GG. Cerci with distal portion more decidedly produced and very strongly depressed, particularly on the internal side. (Form moderately slender. Vertex with sides moderately divergent, greatest width two-thirds that of proximal antennal joint. Eyes normal. Convex callosity of lateral lobes moderately but not decidedly broad. Dorsum of abdomen dark brown, in pale examples yellowish. Ventral margins of caudal femora normally unarmed.)

**brevipennis** (Scudder)

FF. Tympanum of tegmina unusually elongate. Convex callosity of lateral lobes very broad. Vertex distinctly produced. (Form very slender. Vertex weakly ascending, sides moderately divergent, greatest width about two-thirds that of proximal antennal joint. Eyes normal. Dorsum of abdomen narrowly but usually strikingly trifasciate. Cerci of similar type to those of *fasciatus* but distinctly more elongate and attenuate, with distal portion very strongly depressed. Ventral margins of caudal femora unarmed.)

**gracillimus** (Morse)

EE. Cerci with distal portion not at all or very weakly depressed, with apex narrow, acuminate. (Eyes normal. Ventral margins of caudal femora unarmed.)

F. Vertex broad and blunt, very weakly ascending, sides strongly divergent. Size medium to slightly smaller.

G. Form distinctly robust. Vertex with greatest width slightly greater than that of proximal antennal joint.<sup>11</sup> Convex callosity of lateral lobes moderately broad. General color dark brown, occasionally washed with green, veins and veinlets of tegmina pale and conspicuous. Tegmina broad at apex, tympanum of same unusually large. Cerci short, distal portion short, conical, with blunt apex not at all depressed. **nemoralis** (Scudder)

GG. Form moderately robust. Vertex with greatest width averaging about one and three-fourths times that of proximal antennal joint which is unusually small. Convex callosity of lateral lobes very broad. General color dark brown or bright green, abdomen uniformly dark or very dark meso-dorsad with a dark line on each side, veins of tegmina not conspicuous. Tegmina not broad at apex, tympanum of same unusually small. Cerci similar to those of *nemoralis* but with distal portion more produced, elongate, attenuate, almost imperceptibly or not at all depressed, with apex more acuminate.

**occidentalis** (Morse)

FF. Vertex very broad and exceedingly blunt, not at all ascending, sides very strongly divergent, (greatest width about one and one-half times that of proximal antennal joint). Size large to very large. (Form robust. Convex callosity of lateral lobes very broad. Dorsum of abdomen infuscated except in very pale examples. Tegmina broad at apex. Cerci of same general type as those of *nemoralis* but with distal portion very greatly produced, very elongate and attenuate, very weakly depressed distad, with apex strongly acuminate.) **strictus** (Scudder)

DD. Cerci with mesal portion very contrastingly swollen, (this portion elongate ovate, distal portion moderately produced and very weakly depressed, apex sharply rounded. Size rather large, form distinctly attenuate. Vertex not ascending, sides strongly divergent, greatest width slightly greater than that of proximal antennal joint. Eyes normal. Lateral lobes of pronotum very broad, convex callosity of same very broad. Abdomen immaculate, with distal portion, including cerci, pale yellow. Ventral margins of caudal femora unarmed.)

**resacensis** new species

<sup>11</sup> One male of *C. nemoralis* is before us having the vertex unusually narrow, not as wide as the basal antennal joint. Though this character is of decided importance in the species of the present genus, the above instance shows that, no matter how constant a single character may appear to be, occasional specimens are sure to be found in which the variation from the normal is decided.

CC. Cerci armed with a more delicate (ventral) tooth, so that but little of this tooth is visible from above, (mesal portion of cercus very contrastingly swollen), tooth situated at proximal base of this swelling, (distal portion of cercus greatly depressed. Vertex distinctly ascending).

D. Cerci with swollen mesal portion not attenuate elongate. (Eyes unusually protuberant. Abdomen immaculate, with distal portion, including cerci, a bright and striking yellow in life.)

E. Swollen mesal portion of cerci with that portion above tooth produced in an overhanging knob-like protuberance, distal portion strongly produced with sides very weakly converging to broadly rounded apex.

F. Vertex with sides strongly divergent, greatest width equalling that of proximal antennal joint. Convex callosity of lateral lobes of pronotum broad. Cerci with swollen mesal portion bulbous, ovate. Coloration not unusual. Size large, form robust and rather elongate. Eyes large. Ventro-external margins of caudal femora bearing two to four spines. **hygrophilus** new species

FF. Vertex with sides very weakly divergent, greatest width little more than half that of proximal antennal joint. Convex callosity of lateral lobes of pronotum very narrow. Cerci with swollen mesal portion brief, so that entire distal half of cercus is flattened. Coloration unusual.<sup>12</sup> Size rather large, form rather slender, Eyes normal. Ventro-external margins of caudal femora bearing normally three and three spines. **stictomerus** new species

EE. Cerci with swollen mesal portion not produced above tooth, (this portion nearly circular), distal portion less strongly produced with margins strongly converging to sharply rounded apex. (Vertex with sides moderately divergent, greatest width about two-thirds that of proximal antennal joint. Convex callosity of lateral lobes broad. Size medium, form robust and rather truncate. Eyes large. Ventro-external margins of caudal femora bearing normally four and five spines.) **aigialus** new species

DD. Cerci with swollen mesal portion attenuate, elongate ovate, (distal portion with margins subparallel to broadly rounded apex.)

E. Vertex with greatest width very little over one-half that of proximal antennal joint. Eyes of normal size but unusually protuberant.

F. Coloration solid, distinctive and vivid, abdomen solid shining black, with meso-dorsal portion occasionally very dark brown. (Cerci heavy, with swollen mesal portion broadly elongate ovate. Size medium, form moderately robust. Convex callosity of lateral lobes very narrow but distinct. Ventro-external margins of caudal femora bearing normally three and three spines.)

**nigropleurum** (Bruner)

FF. Coloration of head and pronotum trifasciate, abdomen not solid shining black. (Size small to medium, form distinctly slender.)

<sup>12</sup> The caudal femora are in life strikingly marked with spots and dots of coral red.

G. Coloration not as brilliant. Convex callosity of lateral lobes very narrow and subobsolete. Cerci of similar type to those of *nigropleurum* but longer though but little more slender, with distal portion curved outward. Ventro-external margins of caudal femora bearing normally two and two spines.

**attenuatus** (Scudder)

GG. Coloration very brilliant. Convex callosity of lateral lobes moderately but not decidedly broad. Cerci of similar type to those of *nigropleurum* but much more slender, with enlarged portion and distal portion both more attenuate, slightly irregular in outline. Ventro-external margins of caudal femora in much more than half of the examples unarmed, when spines are present these range from one to two.

**nigropleuroides** (H. Fox)

EE. Vertex with greatest width two-thirds that of proximal antennal joint. Eyes normal. (Coloration not striking, resembling that of *aigialus* but with the yellow less extensive and decidedly paler. Convex callosity of lateral lobes moderately but not decidedly broad. Size small, form moderately slender. Male cerci similar to those of *nigropleuroides* but not irregular in outline. Ventro-external margins of caudal femora bearing normally one and two spines.)

**spartinae** (H. Fox)

AA. Prosternum unarmed. Caudal tibiae armed at distal extremity with one pair of spurs.

(Subgenus **Anarthropus**)

(Size medium to very small, form rather slender. Vertex moderately ascending, sides decidedly divergent, greatest width nearly one and one-half times that of proximal antennal joint. Eyes normal. Convex callosity of lateral lobes very broad. Abdomen with dorsum dark, bordered laterad with a narrow pale line, sides infuscated. Cerci very slender, with a long, slender, median (vertical) tooth situated interno-mesad, the diameter of which at its base is nearly that of diameter there of shaft of cercus. Ventral margins of caudal femora unarmed.)

**saltans** (Scudder)

It must be remembered in using the above key that single characters are seldom if ever absolutely constant and that variation exists in all species, the characters given above, when taken singly, being only correct for the great majority and not for every example of the species considered.

In every group we have carefully studied, the absolute necessity of determining material not from one or two apparently striking differences but from the sum total of characters, has convinced us that, for correct conceptions and accurate determinations, the latter method is the only safe one to follow. In consequence a brief key for the species treated here would in our opinion only lead to confusion, and in the use of the present key we feel that

success depends upon following each species out in each character and basing conclusions upon the net result. Should single characters be taken as all important, confusion is an almost certain result.

We give below in tabular form the extremes, found in the species in tegminal and ovipositor length (in millimeters), and have also included the general form of the ovipositor and the results obtained from counting the spines of the ventro-external margins of the caudal femora. The ventro-internal margins of the caudal femora are furnished with one to two spines in but five specimens, two of *C. fasciatus fasciatus* and three of *C. attenuatus*, in the very large series examined.

	Tegmina		Ovipositor	Spines of ventro-external margins of caudal femora
	Macropterous	Brachypterous		
<i>allardi</i> *	♂ .....	6.7-6.8	straight.	none.
	♀ .....	5.3-5.4	15.3-16.8	.....
<i>f. fasciatus</i>	♂ 11.7-19.3	.....	straight.	normally 0.
	♀ 10-21.1	.....	7-9.9	12.5% 1 to 3.
<i>f. vicinus</i>	♂ 16.4-18.7	9.9-13.1	straight.	normally 0.
	♀ 15.6-18.5	10.6-13.9	7.5-13	4% 1 to 2.
<i>spinus</i> *	♂ 14.3-15.1	.....	very weakly curved, broader.	normally 4 and 5. extremes 4 to 6.
	♀ 16.2	.....	7-8.8	.....
<i>gracillimus</i>	♂ 14.4-19.1	.....	straight.	none.
	♀ 15.3-20.7	.....	7.8-10.9	.....
<i>brevipennis</i>	♂ 13.9-16.3	6-10.3	straight or nearly straight.	normally 0.
	♀ 14.9-18.1	5.4-9.3	8.9-14.7	23% 1 to 5.
<i>resacensis</i> *	♂ .....	7.1-8.8	straight.	none.
	♀ .....	5.6-6	15.2-15.6	.....
<i>nemoralis</i>	♂ .....	7.2-9.2	distinctly curved.	none.
	♀ 15.7-16.7	4.3-7.7	7.8-9.8	.....
<i>occidentalis</i>	♂ .....	7-9.4	very weakly curved to nearly straight.	none.
	♀ 16.4	4.3-6.9	8-15.7	.....
<i>strictus</i>	♂ 15.7-17.8	5.1-7.3	nearly straight.	none.
	♀ 15.4-22 <sup>13</sup>	2.8-5.8	17.7-32.3	.....
<i>hygrophilus</i>	♂ .....	10.3	weakly sigmoid, broader.	normally 2 and 3. extremes 2 to 4.
	♀ 18.6	.....	10.4	.....

<sup>13</sup> A single female from Appomattox, Virginia, exhibits an intermediate condition between the brachypterous and macropterous forms of the present species; tegminal length 10.5 mm.

		Tegmina	Brachypterous	Ovipositor	Spines of ventro-external margins of caudal femora
		Macropterous			
<i>stictomerus</i>	♂	18.3-18.4	8-11.6	very weakly sigmoid, broader.	normally 3 and 4. extremes 0 to 7.
	♀	18.3-18.8	6.9-9.8	13.7-19.8	
<i>agialis</i>	♂	16-17.7	6.8-9.6	straight to weakly sigmoid, broader.	normally 4 and 5. extremes 1 to 7.
	♀	18.1-19.7	7.1-10.6	10.6-13.7	
<i>nigropleurum</i>	♂	.....	5.7-9.4	straight, broader.	normally 3 and 3. extremes 0 to 6.
	♀	16-18.6	6.6-9.3	13.4-18.7	
<i>attenuatus</i>	♂	18.1	10.1-10.6	very weakly curved.	normally 2 and 2. extremes 0 to 5.
	♀	19.4-20.9	8.7-10.6	19.9-27.8	
<i>nigropleuroides</i>	♂	.....	5.7-8.7	weakly sigmoid or distinctly curved.	considerably over half 0. extremes 0 to 2.
	♀	15.5-17.8	5.3-8.2	5.9-9.3	
<i>spartinae</i>	♂	15.3-18.2	5.9-9.3	very weakly curved.	normally 1 and 2. extremes 0 to 5.
	♀	16.2-18.9	5.2-9.3	7.1-9.9	
<i>saltans</i>	♂	14.3-17.1	3.1-6.3	very weakly curved to nearly straight.	none.
	♀	16.2-20.3	1.6-3.8	9.7-16.4	.....

In the species marked with an asterisk greater extremes doubtless exist, as adequate material for such determination is not as yet contained in collections. The macropterous forms have the wings decidedly surpassing the tegmina, the brachypterous forms have the tegmina as long as, or longer, than the wings. Such macropterism and brachypterism is found in twelve of the seventeen species here considered. No such brachypterous form is developed in *fasciatus vicinus*; a semi-brachypterous form being the normal condition in this race, and macropterism appearing in the southernmost portions of its distribution. Three species—not including the above mentioned geographic race of one of these—show only a macropterous condition, while two species are known from only brachypterous material. So little material is known of one of the only macropterous and both of the only brachypterous species, that both conditions will very probably be found in one or possibly all of these species when larger series have been gathered. Of the twelve species showing

both conditions, the normal type is brachypterous in all of which we have sufficient material to reach any conclusion; two of these, *stictomerus* and *spartinae*, alone show a macropterous type apparently in preponderance in portions of their southernmost distribution.

The ovipositor length is taken from the base of the basal plica to the apex of the ovipositor, it has been a general practice to take this length from the juncture of the subgenital plate to the apex of the ovipositor, but due to the mobility of the subgenital plate this method can not be as accurate. In consequence our measurements average about .4 mm. less than they would if taken the other way.

The spines of the ventro-external margins of the caudal femora, when present in *fasciatus fasciatus*, *fasciatus vicinus* and *brevipennis*, are almost invariably decidedly smaller than in the species in which such spines are normally present.

The genicular lobes of the caudal femora are always unispinose in *occidentalis*, *strictus* and *saltans*, normally so in *nemoralis* and apparently so in *allardi* and *resacensis*; in all of the other species they are normally bispinose. A single abnormal specimen of *spartinae* has one of these genicular lobes trispinose. The variability of this character in the majority of species causes it to be of little diagnostic importance.

The abdominal coloration is important, particularly in the males of the species of this genus. Some forms are distinctive in coloration and these factors are discussed in the specific treatment. Many species are similar in having head, pronotum, thorax and limbs green, with a dark medio-dorsal stripe on head and pronotum usually narrowly bordered by buff. In the specific treatment of such species, it has not been considered necessary to discuss these features unless specific variations occur.

As the present work is considered by no means monographic, we have thought it best to omit detailed descriptions under the treatment of all but the new species. The most important characters are given in the keys and tables of the introduction. In the following treatment of the known species, we have more fully discussed these characters where further details of interest exist, and have also considered other less important characters which have been omitted from the keys and tables of the intro-

duction. As a result, in determining material with the present paper, we would advise the use primarily of the keys, tables and figures; the specific treatment of known species being here employed mainly to set forth the variation in each species and its distribution.

Subgenus **Dicellura**<sup>14</sup> new subgenus

The subgenus includes a single species, from the Appalachian region of the southeastern United States.

*Type of Subgenus.*—*Conocephalus allardi* [*Xiphidion allardi*] (Caudell).

*Subgeneric Description.*—Prosternum bispinose. Subgenital plate of male very strongly produced meso-distad in two sharp straight spikes which are weakly divergent, styles absent; between the productions the distal margin of the plate is obtuse-angulate emarginate at an angle of slightly over ninety degrees. Ventral margins of cephalic and median femora armed with six well spaced spines. Caudal tibiae armed at distal extremities with three pairs of spurs. Size medium for the genus, form robust.

**Conocephalus allardi** (Caudell) (Pls. XV-XVII, fig. 1; XVIII, 1 and 2; XIX, 9; XX, 1.)

1910. *Xiphidion allardi* Caudell,<sup>15</sup> Ent. News, xxi, p. 58. [Tray and Blue Mountains, Towns County, Georgia.]

The present insect is widely separated from any other known species of the genus by the characters given in the subgeneric description. The species bears a slight superficial resemblance to *C. brevipennis* but differs greatly in the characters mentioned above, in the very broad tegmina of which the male tympanum is unusually large for the species of the genus, and in the ovipositor which is rigidly straight and exceeds in length the maximum found in *brevipennis*. The anomalous male subgenital plate brings to mind that of the South American species, *C. vitticollis* and *C. longipes*, but this plate is found upon examination to be an entirely different development in the present insect.

<sup>14</sup> From *δικελλα*=fork and *οὐρά*=tail, in allusion to the exceptional form of the male subgenital plate.

<sup>15</sup> Single type designated by Caudell and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 164, (1912).



Lateral lobes of pronotum decidedly broad, cephalic margin moderately oblique and nearly straight to the broadly obtuse-angulate ventro-cephalic angle, thence nearly straight and decidedly more horizontal than is usual to the rather sharply rounded ventro-caudal angle which is rectangulate, caudal margin weakly sinuate but nearly straight, humeral sinus obsolete, convex callosity very broad. Tegmina broadly rounded at apex. Genicular lobes of caudal femora normally unispinose, sometimes supplied with a small supplementary spine; genicular areas of same darkened; ventral margins of caudal femora unarmed.

In addition to the type series (the type and allotype in the United States National Museum and a paratypic pair in the Hebard Collection), we have examined but two unrecorded specimens. The species is further known only from specimens taken by Allard at Indian Grave Gap, Towns County, Georgia.

Wytheville, Virginia, IX, 5, 1903, (Morse), 1 ♂, [Morse Cln.].

Rabun County, Georgia, VII, 1910, (W. T. Davis), 1 juv. ♀, [Davis Cln.].

Subgenus **Xiphidion** Serville<sup>16</sup>

1912. *Xiphidion* Karny, Gen. Ins., Fasc. 135, Subf. Conocephalinae, p. 8.

1912. *Neoxiphidion* Karny, *ibid.*

1912. *Thecoxiphidion* Karny, *ibid.*

**Conocephalus fasciatus** (DeGeer)<sup>17</sup> (Pl. XV, figs. 2, 3 and 5; XVI and XVII, 2; XVIII, 3 and 4; XIX, 10; XX, 2.)

1773. *Locusta fasciata* DeGeer, Mém. Hist. Ins., iii, p. 458, pl. 40, fig. 4. [Pen(n)sylvania.]

1841. *Orchelimum gracile* Harris, Ins. Inj. Veget., p. 131. [Massachusetts.]

Harris' description of his *gracile*, giving a nearly straight ovipositor and other characters, shows unquestionably the present synonymy; the figure of a female accompanying the same description in the Flint edition<sup>18</sup> belongs, however, to an *Orchelimum*, probably *concinnum* Scudder, the curved ovipositor showing at once that the specimen selected for the figure by Dr. Agassiz was not the species described by Harris.

The present species is not, as has been generally supposed, found far south of the borders of the United States, and the only exotic material of the species now before us is from Bermuda.

<sup>16</sup> See page 157 for the type of this subgenus and the synonymy.

<sup>17</sup> For a more descriptive discussion of the present species see following study by Rehn and Hebard, Trans. Am. Ent. Soc., xli, (1915).

<sup>18</sup> Harris, Ins. Inj. Veget., Flint Ed., p. 163, fig. 78, (1862).

The Antillean records and those from Panama apply to a closely allied but distinct species *C. cinereus*, while those from Mexico may be in part correct, as the present species certainly inhabits the northern portion of that country; the South American records, however, belong either to the above mentioned or still another species.

The tegmina normally surpass the tips of the caudal femora when in repose; no brachypterous condition exists in this insect and only very occasional specimens have the tegmina barely reaching the extremities of the caudal femora. This latter condition is found only in rare specimens from northern localities and in western series approaching *C. f. vicinus*.

The male cerci in the present species are usually bright green; in drying some specimens, as in the other species of the genus, lose all of their normal green general coloration, becoming a uniform straw color. The genicular areas of the caudal femora are not darkened; the genicular lobes of the same are normally bispinose; the ventro-external margins of the caudal femora are normally unarmed, very small (usually microscopic) spines are present in two hundred and eight perfect specimens examined as follows:

Number of spines,	0-0	0-1	1-1	1-2	2-2
Number of specimens,	182	19	5	1	1

This shows 12.5 % of the material to have these margins armed, geographic distribution apparently having no effect on this condition in the present species. In the specimen having the ventro-external margins of the caudal femora armed with 2 and 2 spines, one of the ventro-internal margins is also furnished with a single minute spine, this is also found in a single specimen having the ventro-external margins unarmed.

The ovipositor length is as follows: Bothwell, Prince Edward Island, 8-9.2; Northeast Harbor, Maine, 7-7.8; Fredericksburg, Virginia, 8-9.3; Jacksonville, Florida, 7.3-8.3; West Point, Nebraska, 9.2-9.6; Pinebluff, Wyoming, 8.3-9.9; Carrizo Springs, Texas, 8.6-9.7; Jemez Hot Springs, New Mexico,<sup>19</sup> 8.6-9.4 mm.

The present species is found in the United States from the Atlantic to the Pacific, the typical form being supplanted by a

<sup>19</sup> These specimens are intermediate between the eastern and western races of this species.

geographic race in the region of Pacific drainage. The insect will probably be found to occur in Canada far north of its present known range (Prince Edward Island to North Bay and White-mouth, Ontario, to Aweme, Manitoba) as it is a hardy species even more abundant in the meadows of northern Maine and Michigan than in the south and E. M. Walker states that it is "one of the few common locustids in northern Ontario." Southward it is found to the extremity of southern Florida and along the gulf coast to Mexico.

*Specimens Examined:* Previously recorded, over 300. Here recorded, 698; 339 males, 355 females and 4 immature females. Intermediates, 20; 7 males, 11 females and 2 immature females.

Bothwell, Prince Edward Island, VIII, 24, 1912, (B. Long), 4 ♂, 7 ♀, [A. N. S. P.].

St. Andrews, Prince Edward Island, VIII, 26, 1912, (B. Long), 1 ♂, 2 ♀, [A. N. S. P.].

Dundee, Prince Edward Island, VIII, 26, 1912, (B. Long; in black spruce swamp), 1 ♀, [A. N. S. P.].

Charlottetown, Prince Edward Island, IX, 1912, (B. Long), 1 ♀, [A. N. S. P.].

Bunbury, Prince Edward Island, VIII, 28, 1912, (B. Long; in marsh), 5 ♀, [A. N. S. P.].

Cape Aylesbury, Prince Edward Island, VIII, 27, 1912, (B. Long; among sand dunes), 2 ♀, [A. N. S. P.].

Great Cranberry Island, Maine, VIII, 24, 1913, (H.; occasional in short grasses), 1 ♀.

Northeast Harbor, Maine, VIII, 16 and 21, 1913, (H.; common in short grasses), 5 ♀.

Baileys Island, Casco Bay, Maine, VIII, 25, 1907, (B. Long), 3 ♀, [A. N. S. P.].

Rye Beach, New Hampshire, IX, 1 and 2, 1913, (H.), 1 ♂.

Marion, Massachusetts, VIII, 1905, (H.), 1 ♂.

Amherst, Massachusetts, X, 1907, (J. A. Hyslop), 1 ♀, [U. S. N. M.].

Wesquage Beach, Rhode Island, IX, 8 and 10, 1913, (H.; grasses near salt marsh), 4 ♂, 2 ♀.

Chateaugay Lake, New York, VIII, 20 to IX, 11, 1878, (Scudder), 1 ♂, 3 ♀, [M. C. Z.].

Clifton Springs, New York, 5 ♂, 7 ♀, [Cornell Univ.].

Ithaca, New York, VIII, I to X, 4, 1885 to 1894, 13 ♂, 5 ♀, [Cornell Univ.].

Cattaraugus, New York, IX, 11, 1894, 1 ♀, [Cornell Univ.].

Tobyhanna, Pennsylvania, IX, 1903, (H.), 2 ♂.

Stroudsburg, Pennsylvania, IX, 1903, (H.), 1 ♂.

Cornwells, Pennsylvania, IX, 11, 1906, (R. & H.), 1 ♀.

Tinicum Island, Pennsylvania, IX, 9 and 29, 1903 and 1904, (R. & H.), 1 ♂, 1 ♀.

Swarthmore, Pennsylvania, X, 13, 1906, (E. T. Cresson Jr.), 2 ♀, [A. N. S. P.].

Pink Hill, Delaware County, Pennsylvania, VII, 9, 1908, (R. & H.; grasses on serpentine outcrop), 1 ♂.

Harrisburg, Pennsylvania, VII, 20 to VIII, 30, 5 ♂, 3 ♀, [Pa. St. Dept. Zool.].

Rockville, Pennsylvania, VII, 4 to 29, 8 ♂, 11 ♀, [Pa. St. Dept. Zool.].

Camphill, Cumberland County, Pennsylvania, VII, 31, 1 ♂, [Pa. St. Dept. Zool.].

Beatty, Pennsylvania, (C. Brugger), 2 ♂, 2 ♀, [A. N. S. P.].

Mullica River flats, Burlington County, New Jersey, VIII, 24, 1914, (H.; border of marsh), 1 ♂, 1 ♀.

Chestnut Neck, Atlantic County, New Jersey, VII, 16, 1911, (R. & H.; grasses near salt marsh), 1 ♂.

Ventnor, New Jersey, VIII, 5, 1914, (H.; among weeds in marshy spots on barrier beach), 2 ♂, 2 ♀, 1 juv. ♀.

Margate City, New Jersey, VII, 24, 1914, (H.), 1 juv. ♀; VIII, 17, 1914, (H.; salt marsh border), 1 ♀.

Ocean City, New Jersey, VIII, 14, 1914, (H.; grasses beside road, in middle of salt marsh), 1 ♂.

Cedar Springs, New Jersey, VIII, 14, 1914, (H.; common in grasses near fresh marsh), 1 ♂.

Cape May, New Jersey, VII, 22, 1910, (H.), 1 ♂, 2 ♀.

Chestertown, Maryland, VIII, 10 to 30, 1899 to 1904, (E. G. Vanatta), 3 ♂, 3 ♀, [A. N. S. P.].

Island Creek, Maryland, VII, 20, 1912, (C. R. Shoemaker), 1 ♂, [U. S. N. M.].

Washington, District of Columbia, 1 ♀, [U. S. N. M.]

Fredericksburg, Virginia, VII, 20, 1913, (R. & H.; common in meadowland), 9 ♂, 7 ♀.

Virginia Beach, Virginia, VII, 4, 1903, (Morse), 1 ♂, [Morse Cln.].

Norfolk, Virginia, IX, 8, 1903, (Morse), 2 ♂, 5 ♀, [Morse Cln.].

Hickory, Virginia, VII, 3, 1903, (Morse), 9 ♂, 10 ♀, [Morse Cln.].

Appomattox, Virginia, IX, 6, 1903, (Morse), 1 ♂, 3 ♀, [Morse Cln.].

Wytheville, Virginia, IX, 5, 1903, (Morse), 1 ♂, [Morse Cln.].

Eure, North Carolina, VII, 5, 1903, (Morse), 2 ♂, 2 ♀, [Morse Cln.].

Selma, North Carolina, VII, 7, 1903, (Morse), 1 ♂, 1 ♀, [Morse Cln.].

Winter Park, North Carolina, IX, 7, 1911, (R. & H.; occasional in weeds and undergrowth), 1 ♀.

Lake Waccamaw, North Carolina, IX, 8, 1911, (R. & H.; occasional in high weeds), 2 ♂.

Greensboro, North Carolina, VII, 10, 1903, (Morse), 3 ♂, 1 ♀, [Morse Cln.].

Salisbury, North Carolina, VII, 11, 1903, (Morse), 7 ♂, 4 ♀, [Morse Cln.].

Roan Mountain, North Carolina, VIII, 31, 1903, (Morse), 3 ♂, 3 ♀, [Morse Cln.].

Linville, North Carolina, VIII, 30, 1903, (Morse), 8 ♂, 12 ♀, [Morse Cln.].

Morganton, North Carolina, VII, 12, 1903, (Morse), 3 ♂, 3 ♀, [Morse Cln.].

Balsam, North Carolina, VIII, 20, 1903, (Morse), 1 ♂, [Morse Cln.].

Governors Island, North Carolina, VIII, 20, 1903, (Morse), 1 ♂, [Morse Cln.].

- Topton, North Carolina, VIII, 21, 1903, (Morse), 1 ♂, [Morse Cln.].  
 Denmark, South Carolina, VIII, 14, 1903, (Morse), 1 ♂, [Morse Cln.].  
 Yemassee, South Carolina, IX, 4, 1911, (R. & H.), 2 ♂.  
 Trenton, Georgia, VII, 10, 1905, (Morse), 4 ♂, [Morse Cln.].  
 Marietta, Georgia, VII, 27, 1903, (Morse), 8 ♂, 2 ♀, [Morse Cln.].  
 Atlanta, Georgia, VII, 26, 1910, 1 ♀, [Ga. State Cln.]; VIII, 2, 1913, (R. & H.), 1 ♂, 2 ♀.  
 Augusta, Georgia, VII, 29, 1913, (R. & H.), 1 ♀.  
 Savannah, Georgia, VIII, 13, 1903, (Morse), 1 ♀, [Morse Cln.].  
 Tybee Island, Georgia, VIII, 12, 1903, (Morse), 3 ♂, [Morse Cln.].  
 Isle of Hope, Georgia, IX, 3, 1911, (R. & H.), 1 ♂.  
 Jesup, Georgia, IX, 1, 1911, (R. & H.), 1 ♂.  
 St. Simon's Island, Georgia, VIII, 30, 1911, (R. & H.), 1 ♀.  
 Brunswick, Georgia, VIII, 30, 1911, (H.), 1 ♀.  
 Cumberland Island, Georgia, VIII, 31, 1911, (R. & H.), 3 ♂.  
 Waycross, Georgia, VIII, 11, 1903, (Morse), 2 ♂, 1 ♀, [Morse Cln.].  
 Billy's Island, Okefenokee Swamp, Georgia, VI and VII, 1912, (J. C. Bradley), 2 ♂, 6 ♀, [Cornell Univ.].  
 Macon, Georgia, VII, 30 and 31, 1913, (R. & H.; in high grasses on edge of forest), 1 ♂, 3 ♀; IX, 18, 1878, (in pasture), 2 ♀, [U. S. N. M.].  
 Westpoint, Georgia, VII, 30, 1903, (Morse), 1 ♀, [Morse Cln.].  
 Columbus, Georgia, VII, 16, 1913, (J. C. Bradley), 1 ♂, 3 ♀, [Ga. State Cln.].  
 Albany, Georgia, VIII, 1, 1913, (R. & H.; very few in wet grass), 1 ♂.  
 Bainbridge, Georgia, IX and X, 1910, (J. C. Bradley), 1 ♂, 2 ♀, [Ga. State Cln.].  
 Jacksonville, Florida, XI, 3, 1911, (W. T. Davis), 2 ♂, 3 ♀, [Davis Cln.].  
 South Jacksonville, Florida, IX, 27 and 28, 1911, (W. T. Davis), 1 ♂, 2 ♀, [Davis Cln.].  
 Atlantic Beach, Florida, VIII, 24, 1911, (R. & H.; in sandy field of low grass.), 2 ♀.  
 Pablo Beach, Florida, IX, 27, 1913, XI, 4, 1911, (W. T. Davis), 1 ♂, 1 ♀, [Davis Cln.].  
 Live Oak, Florida, VIII, 10, 1903, (Morse), 1 ♂, [Morse Cln.]; VIII, 26, 1911, (R. & H.), 1 ♂.  
 Tallahassee, Florida, VIII, 8, 1903, (Morse), 9 ♂, 2 ♀, [Morse Cln.].  
 Marianna, Florida, VIII, 7, 1903, (Morse), 1 ♂, 2 ♀, [Morse Cln.].  
 Cedar Keys, Florida, VI, 3, 1 ♀, [U. S. N. M.].  
 Tampa, Florida, XI, 23, 1911, (G. P. Englehardt), 1 ♀, [Bklyn. Inst. A. & S.].  
 Little River, Florida, XI, 25, 1912, (F. Knab), 1 ♀, [U. S. N. M.].  
 Lemon City, Florida, (E. J. Brown), 1 ♀, [U. S. N. M.].  
 Miami, Florida, XI, 26, 1912, (F. Knab), 1 ♀, [U. S. N. M.].  
 North Bay, Ontario, IX, 1 to 8, 1906, (G. S. Miller Jr.), 3 ♂, 6 ♀, [M. C. Z.].  
 Cuyahoga Falls, Ohio, VIII, 14, 1904, (W. V. Werner), 1 ♂, [U. S. N. M.].  
 Salineville, Ohio, IX, 10, 1892, 1 ♂, [Cornell Univ.].  
 Brulé, Wisconsin, VIII, 16 and 17, 1912, (Witmer Stone), 1 ♂, 2 ♀, [A. N. S. P.].

- Cranmoor, Wisconsin, X, 17, 1910, (C. W. Hooker), 2 ♀, [U. S. N. M.].  
 Chicago, Illinois, IX, 9, 1903, (H.; in waste field), 1 ♂, 1 ♀.  
 Waldo, Minnesota, VIII, 1906, (Witmer Stone), 1 ♀, [A. N. S. P.].  
 Duluth, Minnesota, VIII, 1906 and 1912, (Witmer Stone), 3 ♂, 7 ♀, [A. N. S. P.].  
 Staples, Minnesota, VII, 21, 1909, (H.), 3 ♂, 1 ♀, 1 juv. ♀.  
 St. Peter, Minnesota, 1880, 1 ♀, [U. S. N. M.].  
 Johnson City, Tennessee, VIII, 27, 1903, (Morse), 1 ♀, [Morse Cln.].  
 Chattanooga, Tennessee, X, 19, 1888, (F. G. Martin), 1 ♂, 1 ♀, [U. S. N. M.];  
 2 ♂, [Hebard Cln.].  
 Columbia, Tennessee, 1 ♂, [Hebard Cln.].  
 Anniston, Alabama, VII, 12, 1905, (Morse), 3 ♂, 2 ♀, [Morse Cln.].  
 Tuscaloosa, Alabama, VII, 15, 1905, (Morse), 3 ♂, 1 ♀, [Morse Cln.].  
 Greenville, Alabama, VII, 31, 1903, (Morse), 6 ♂, 3 ♀, [Morse Cln.].  
 Flomaton, Alabama, VIII, 2, 1903, (Morse), 2 ♂, 3 ♀, [Morse Cln.].  
 Agricultural College, Mississippi, 1 ♂, [Hebard Cln.].  
 Meridian, Mississippi, VII, 16, 1905, (Morse), 1 ♀, [Morse Cln.].  
 Hattiesburg, Mississippi, VII, 17, 1905, (Morse), 1 ♂, [Morse Cln.].  
 Gulfport, Mississippi, VII, 21, 1905, (Morse), 3 ♂, [Morse Cln.].  
 Natchez, Mississippi, V, 14, 1909, (E. S. Tucker), 1 ♂, [U. S. N. M.].  
 Fort Dodge, Iowa, VIII, 27, 1910, (M. P. Somes), 1 ♀, [Hebard Cln.].  
 Iowa City, Iowa, VIII, 5, 1910, (M. P. Somes), 1 ♀, [Hebard Cln.].  
 St. Louis, Missouri, VII, 24, 1877, 1 ♂, [U. S. N. M.].  
 Kirkwood, Missouri, X, 1877, 1 ♂, 3 ♀, [U. S. N. M.].  
 Fayetteville, Arkansas, IX, 5, 1905, (Morse), 3 ♂, 1 ♀, [Morse Cln.].  
 Van Buren, Arkansas, IX, 1, 1905, (Morse), 5 ♂, 6 ♀, [Morse Cln.].  
 Dardanelle, Arkansas, VIII, 31, 1905, (Morse), 1 ♂, [Morse Cln.].  
 Magazine Mountain, Arkansas, VIII, 29, 1905, (Morse), 1 ♂, [Morse Cln.].  
 Mena, Arkansas, VIII, 31, 1905, (Morse), 1 ♂, [Morse Cln.].  
 De Queen, Arkansas, VII, 29, 1905, (Morse), 1 ♀, [Morse Cln.].  
 Ashdown, Arkansas, VII, 27, 1905, (Morse), 3 ♂, 1 ♀, [Morse Cln.].  
 Bayou Sara, Louisiana, I, 20, 1879, 1 ♂, [U. S. N. M.].  
 Milneburg, Louisiana, VII, 22, 1905, (Morse), 3 ♂, 4 ♀, [Morse Cln.].  
 New Orleans, Louisiana, VI, 1883, (Shufeld), 3 ♂, 1 ♀; VI, 7, 1902, (at light), 2 ♀; X to XI, 15, 1882, 1 ♂, 1 ♀, [all U. S. N. M.].  
 Crowley, Louisiana, IX, 28 and 30, 1911, (E. S. Tucker; in rice field), 14 ♂, 11 ♀, [U. S. N. M.].  
 Winnipeg, Manitoba, VIII, 22, 1877, 1 ♂, [U. S. N. M.].  
 Harney's Peak, Black Hills, South Dakota, 7000 to 8000 ft. (Bruner), 1 ♀, [U. S. N. M.].  
 West Point, Nebraska, VIII to IX, 6 ♂, 5 ♀, [Hebard Cln.].  
 Lincoln, Nebraska, VII to IX, 3 ♂, 3 ♀, 1 juv. ♀, [Hebard Cln.].  
 North Platte, Nebraska, VII, 28, 1910, (R. & H.; swampy areas on river plain), 2 ♂, 3 ♀.  
 Fort Robinson, Nebraska, VII, 1888, 1 ♀, [Hebard Cln.].  
 Glen, Nebraska, VIII, 1903, (L. Bruner), 4 ♂, 5 ♀, [Hebard Cln.].

Sidney, Nebraska, VII, 30, 1910, (R. & H.), 1 ♂; VIII, 25, 1893, 1 ♀, [Hebard Cln.].

Belpre, Kansas, IX, 13, 1909, (H.; in field of short grass), 1 ♀.

Independence, Kansas, (A. Birckfield), 1 ♂, [U. S. N. M.].

Howe, Oklahoma, VIII, 4, 1905, (Morse), 5 ♂, [Morse Cln.].

Wilburton, Oklahoma, VIII, 27, 1905, (Morse), 2 ♂, 4 ♀, [Morse Cln.].

Haileyville, Oklahoma, VIII, 6, 1905, (Morse), 1 ♂, [Morse Cln.].

Okmulgee, Oklahoma, VI, 24, (J. D. Mitchell; at light), 1 ♀, [U. S. N. M.].

Shawnee, Oklahoma, VIII, 26, 1905; (Morse), 1 ♂, [Morse Cln.].

Bonita, Texas, VIII, 14, 1905, (Morse), 1 ♂, 1 ♀, [Morse Cln.].

Pittsburg, Texas, IX, 9, 1904, (F. C. Bishopp), 2 ♂, [U. S. N. M.].

Terrell, Texas, VI, 9, 1904, (F. C. Bishopp), 1 ♂, [U. S. N. M.].

Dallas, Texas, IX, 25 and 26, 1912, (R. & H.; common in field of high grass), 5 ♂, 8 ♀.

Sagamore Hill, Tarrant County, Texas, IX, 27, 1912, (R. & H.; areas of low grass in open), 2 ♂.

Doucette, Texas, VII, 24, 1912, (H.), 1 ♂.

Beaumont, Texas, VII, 23, 1912, (H.; not common on grassy swampy ground), 3 ♂, 5 ♀.

Calvert, Texas, VIII, 1903, (A. W. Morrill), 1 ♂, [U. S. N. M.].

Shovel Mount, Texas, VI, 30, 1901, (F. G. Schaupp), 1 ♀, [A. N. S. P.].

Paige, Texas, VIII, 3, 1904, (C. R. Jones; on cotton), 1 ♂, [U. S. N. M.].

Kerrville, Texas, VIII, 17 and 18, 1912, (R. & H.), 1 ♂.

San Antonio, Texas, VIII, 15 and 16, 1912, (R. & H.; common in high grass), 3 ♀.

Galveston, Texas, VII, 19 to 21, 1912, (H.); 8 ♂, 1 ♀.

La Marque, Texas, VII, 22, 1912, (H.), 1 ♀.

Webster, Texas, VII, 19, 1912, (H.; common on grass prairie), 1 ♂, 3 ♀.

Virginia Point, Texas, VII, 21, 1912, (H.), 1 ♂, 3 ♀.

Rosenberg, Texas, VII, 25 and 26, 1912, (H.), 2 ♂.

Wharton, Texas, VII, 12, 1904, (C. R. Jones; on cotton), 1 ♀, [U. S. N. M.].

Victoria, Texas, VII, 26 and 27, 1912, (H.; common in stream bottom), 2 ♂, 1 ♀.

Corpus Christi, Texas, VII, 29, 1912, (H.), 1 ♂.

Gregory, Texas, VII, 30, 1912, (H.), 1 ♂, 1 ♀.

Lyford, Texas, VIII, 6 and 7, 1912, (R. & H.), 1 ♂, 1 ♀.

Mission, Texas, VIII, 5 and 6, 1912, (H.), 1 ♂, 1 ♀.

Brownsville, Texas, VII, 31 to VIII, 5, 1912, (H.), 1 ♂, 2 ♀.

Piper Plantation, near Brownsville, Texas, VIII, 3, 1912, (R. & H.; grassy spots in heavy river bottom tangle), 3 ♂, 2 ♀.

Uvalde, Texas, VIII, 21 and 22, 1912, (R. & H.), 1 ♂.

Del Rio, Texas, VIII, 22 and 23, 1912, (R. & H.; common in grasses of river bottom), 2 ♂, 1 ♀.

Carrizo Springs, Texas, X, 1884, (A. Wadgymer), 4 ♂, 9 ♀, [Hebard Cln.].

Benavides, Texas, VIII, 9 and 10, 1912, (R. & H.), 1 ♂.

Glendive, Montana, VII, 26, 1909, (H.; on river bottoms), 3 ♂, 3 ♀.

Forsyth, Montana, VII, 27, 1909, (H.), 1 ♂.

- Billings, Montana, VII, 28, 1909, (R. & H.; on grassy river plain), 16 ♂, 9 ♀.  
 Worland, Wyoming, VIII, 1911, 1 ♀, [Hebard Cln.].  
 Pinebluff, Wyoming, 9 ♂, 27 ♀, [Hebard Cln.].  
 Julesburg, Colorado, VII, 29, 1910, (R. & H.), 1 ♂, 1 ♀.  
 Livermore, Colorado, X, 4, 1898, 2 ♂, [U. S. N. M.].  
 Boulder, Colorado, 1 ♀, [U. S. N. M.].  
 Pueblo, Colorado, VIII, 30 and 31, 1877, (Scudder), 1 ♀, [M. C. Z.].  
 Garland, Colorado, VIII, 28 and 29, 1877, (Scudder), 1 ♂, 3 ♀, [M. C. Z.].  
 Springer, New Mexico, IX, 15, (C. N. Ainslie), 1 ♂, [U. S. N. M.].  
 Rociada, New Mexico, VIII, 8, (Cockerell), 2 ♀, [U. S. N. M.].

Intermediate material between typical *C. fasciatus* and *C. fasciatus vicinus*.

Jemez Mountains, New Mexico, VIII, 1909, 1 ♀, [Hebard Cln.].

Jemez Hot Springs, New Mexico, VIII, 1 to 29, 1912 and 1913, (J. Woodgate),  
 7 ♂, 11 ♀, 2 juv. ♀, [Hebard Cln.].

**Conocephalus fasciatus vicinus** (Morse) (Pls. XVI, XVII and XX, fig. 3;  
 XVII, figs. 5 and 6.)

1881. *Xiphidium ensiferum* Scudder (not of 1862), Second Rept. U. S. Ent.  
 Comm., 1880, App. ii, p. 23. [Glenbrook and Reno, Nevada.]

1881. *Xiphidium brevipenne* Scudder (not of 1862), Second Rept. U. S. Ent.  
 Comm., 1880, App. ii, p. 23. [Sisson and Strawberry Valley, California.]

1881. *Xiphidium fasciatum* Scudder, Second Rept. U. S. Ent. Comm., 1880,  
 App. ii, p. 23. [Portland, Oregon.]

1901. *Xiphidium vicinum* Morse,<sup>20</sup> Can. Ent., xxxiii, p. 203. [Palm Springs,  
 San Bernardino, Colton, Los Angeles, Kern City, Lathrop, West Berkeley,  
 Mill Valley, Sisson and Gazelle, California; Ashland, Glendale, Drain and  
 Divide, Oregon; Tenino, Washington.]

1901. *Xiphidium vicinum* variety *productum* Morse,<sup>21</sup> Can. Ent., xxxiii, p.  
 204. (Macropterous material in above series.)

This insect has been adequately described by Morse; the distinctive characters given, when compared with typical *fasciatus*, being, in the female, a normally longer ovipositor both actually and in proportion to the caudal femora, and in the male, cerci which are slightly broader just distad of the tooth with the external margins less sinuous. The present series shows further that in this race the form is normally somewhat more robust and the lateral lobes of the pronotum are broader, with cephalic margin more broadly convex and ventro-caudal angle even more broadly

<sup>20</sup> Single type designated: ♂; Palm Springs, California, VII, 10, 1897, (Morse), [Morse Cln.]. (Morse and Hebard, Proc. Acad. Nat. Sci. Phila., 1915, p. 106, (1915).)

<sup>21</sup> Single type designated: ♀; San Bernardino, California, VII, 15, 1897, (Morse), [Morse Cln.]. (Morse and Hebard, Proc. Acad. Nat. Sci. Phila., 1915, p. 106, (1915).)



rounded. The great majority of individuals of this race differ from the average of *fasciatus fasciatus* in having the tegmina just reaching the tips of the caudal femora or falling short of these as much as 3 mm. Examples occur, however, having as long tegmina as are found in *fasciatus* s.s., which condition is more frequently met with in the southern portion of the range of the insect and has been given the name *productum* by Morse. As further differences are wanting to distinguish such material, we are obliged to place this name in the synonymy of the present form. The phase having very long tegmina and wings is represented by the following material before us: 2 ♂, Mountain Home, Idaho; 1 ♂, 2 ♀, Shoshone, Idaho; 1 ♂, Milford, Utah; 1 ♂, Reno, Nevada; 2 ♂, Alamitos Bay, California, and 1 ♂, Los Angeles, California. An almost intermediate condition is shown in a number of individuals from Council Crest and Divide, Oregon, and in two ♂ from Milford, Utah.

In life the present race is normally quite as green in general coloration with abdominal markings brighter than in typical *fasciatus*; the following field note taken from fresh material at Shoshone and Mountain Home, Idaho, demonstrates this very clearly—"Abdomen with a medio-dorsal band of vandyke brown, wider cephalad, narrowing gradually caudad, bordered by lemon yellow bands about half as wide. In the males the rest of the abdomen is grass green, in the females these lemon yellow bands are in turn bordered on each side by very narrow bands of vandyke brown." The large series before us, though otherwise in excellent condition, is almost without exception much discolored and faded, the cerci of the males retaining a green coloration in only a few cases.

The genicular areas of the caudal femora are not darkened; the genicular lobes of the same are normally bispinose; the ventro-external margins of the caudal femora are normally unarmed, very small (usually microscopic) spines are present in one hundred and fifty-two specimens examined as follows:

Number of spines,	0-0	0-1	0-2
Number of specimens,	146	5	1

This shows 3.9% of the material to have these margins armed with such adventitious spines.

The ovipositor length is as follows: Mountain Home, Idaho, 11.2-12.6; Soda Springs, Idaho, 9.2-10.7; Council Crest, Oregon,

9-10.7; Sisson, California, 9.8-11.2; Los Angeles, California, 12; Reno, Nevada, 10.3-11.7; Milford, Utah, 10.7-11.7 mm. Morse, in his excellent series of measurements given with the original description, shows the extremes of ovipositor length to be 7.5 to 13 mm. in the present insect.

The present geographic race is distributed over the region of Pacific drainage in the United States, having been found from Soda Springs, Idaho, and Milford, Utah, as far north as Tenino, Washington, and Agassiz, British Columbia,<sup>22</sup> and south to Alamos Bay and Palm Springs, California. In the desert regions of this area, the species is to be found often very numerous in green vegetation in irrigated areas or where other constant sources of water supply exist.

*Specimens Examined:* Previously recorded, 122. Here recorded, 201; 104 males, 92 females and 5 immature females.

Soda Springs, Idaho, 7 ♂, 7 ♀, [Hebard Cln.].

Shoshone, Idaho, VIII, 8, 1910, (R. & H.; occasional in an irrigated area), 4 ♂, 4 ♀.

Mountain Home, Idaho, VIII, 9, 1910, (R. & H.; scarce in an irrigated area),

1 ♂, 2 ♀.

Nampa, Idaho, VIII, 9, 1910, (R. & H.; in a marshy meadow), 5 ♂, 1 ♀.

Reno, Nevada, IX, 2, 1910, (R. & H.; in grassy irrigated tract), 14 ♂, 6 ♀.

Wabuska, Nevada, IX, 5, 1910, (H.; common in grasses about water tank),

1 ♂, 3 ♀.

Salt Lake Valley, Utah, VIII, 1 to 4, 1877, (Scudder), 18 ♂, 11 ♀, [M. C. Z.].

Provo, Utah, VIII, 23 and 24, 1877, (Scudder), 2 ♂, 4 ♀, [M. C. Z.].

Milford, Utah, IX, 5, 1909, (R. & H.; very common in grasses along river), 28 ♂, 39 ♀.

Longmire's Springs, Mount Rainier, Washington, 2700 ft., VIII, 23, 1910, [H.; grasses about springs], 1 ♂.

Pullman, Washington, VIII, 19, 1909, (J. A. Hyslop), 1 ♂, [U. S. N. M.].

Newaukum, Washington, VIII, 8, 1909, (H.; in bulrushes and bracken), 1 juv. ♀.

Mount Tabor, Oregon, VIII, 9, 1909, (R.; high grasses in open), 1 ♀.

Council Crest, Oregon, VIII, 9, 1909, (H.; not common in field of high dry grass), 8 ♂, 8 ♀, 2 juv. ♀.

Clackamas, Oregon, VIII, 9, 1909, (H.; in high grasses), 1 ♀.

West Albany, Oregon, VIII, 10, 1909, (R. & H.), 1 ♂, 1 ♀.

Divide, Oregon, VIII, 11, 1909, (R. & H.; occasional in dry meadow grasses) 5 ♂, 1 ♀.

<sup>22</sup> This record of F. Walker as *fasciatus* we have been unable to verify, but there is little doubt that the material will be found to belong to the present race.

Sacramento, California, VIII, 18, 1907, (E. S. G. Titus), 1 ♂, 1 ♀, [U. S. N. M.]

Bakersfield, California, IX, 14, 1910, (R. & H.; grasses along irrigating ditch), 3 ♂, 1 ♀.

Los Angeles, California, 1889, (Coquillett), 4 ♂, 1 ♀, 2 juv. ♀, [Hebard Cln.]

**Conocephalus spinosus** (Morse)<sup>23</sup> (Pls. XVI, XVII and XX, fig. 4; XVIII, figs. 7 and 8.)

1901. *Xiphidium spinosum* Morse,<sup>24</sup> Can. Ent., xxxiii, p. 201. [Coronado, California.]

As the author of this species has given a really excellent description, it is rather irritating to find it synonymized by Karny<sup>25</sup> under *C. saltator*, where, without material for comparison, that author briefly states that it is a smaller variation.

The species is known only from the salt marshes about San Diego Bay, California; the type series of three males, two females and one immature female in the Morse Collection and Museum of Comparative Zoology, and in addition three males and one female in Philadelphia, have been examined.

**Conocephalus gracillimus** (Morse) (Pl. XV, fig. 8; XVI, XVII and XX, 5; XVIII, 9 and 10; XIX, 11.)

1877. *Xiphidium ensiferum* Scudder, (not *ensifer* of Scudder, 1862), Proc. Bost., Soc. Nat. Hist., xix, p. 83. [Fort Reed, Florida.]

1901. *Xiphidium gracillimum* Morse,<sup>26</sup> Can. Ent., xxxiii, p. 236. [Capron [Viking] and Biscayne Bay [Miami], Florida.]

The present species belongs to a small group, the other species of which are Antillean and tropical American, which is in the main distinguished from the forms more nearly related to *C. fasciatus* by the majority of the characters given in the key for the present insect. When compared with *fasciatus*, the more produced vertex and broader convex callosities of the lateral lobes of *gracillimus* are found to be characters which are somewhat less conspicuous than might be expected; the present species is more

<sup>23</sup> For a full discussion of the present species see following study by Rehn and Hebard, Trans. Am. Ent. Soc., xli, (1915).

<sup>24</sup> Single type designated: ♂; Coronado, California, VII, 24, 1897, (Morse; on salt marsh), [Morse Cln.]. (Morse and Hebard, Proc. Acad. Nat. Sci. Phila., 1915, p. 105, (1915).)

<sup>25</sup> Abh. k.-k. zool.-botan. Gesell. Wien, iv, p. 94, (1907).

<sup>26</sup> Single type here designated: ♂; [Miami] Biscayne Bay, Florida, (Mrs. A. T. Slosson), [M. C. Z.]. (Morse and Hebard, Proc. Acad. Nat. Sci., Phila., 1915, p. 105, (1915).)

readily distinguished by the decidedly more slender form, differently shaped lateral lobes of the pronotum, narrower tegmina with male tympanum decidedly more elongate, different coloration, and different male cerci.

Lateral lobes of pronotum broad, cephalic margin moderately oblique and nearly straight to the very broadly obtuse-angulate ventro-cephalic angle, thence very weakly concave and slightly more horizontal than usual to the sharply rounded ventro-caudal angle which is slightly less than  $90^\circ$ , caudal margin convex to the broad and distinct humeral sinus, convex callosity very broad. These lobes are often more or less distinctly marked mesad with a diffused dark postocular stripe. The abdomen is marked in dark individuals with three narrow dark bands, one meso-dorsal, the others lateral, the two intervening spaces forming usually bright yellow bands. The pronotal markings, combined with the narrowness of the abdominal bands, give individuals showing the intensive color pattern a much more striped appearance than is ever found in *fasciatus*. The cerci are bright green or dark brown;<sup>27</sup> the greater production, especially of the distal portion, causing the internal tooth to be situated in relative position just proximad of the point which it occupies in *fasciatus*. Though the genicular lobes of the caudal femora are normally bispinose, fifteen of the series of sixty-six specimens examined for this character have one of these lobes unispinose, two have two of the same showing this condition, while two have three of the genicular lobes unispinose. In this species the genicular areas of the caudal femora are not darkened; the ventral margins of the caudal femora are unarmed. Immature examples of *gracillimus* are very slender and very strongly tristriate.<sup>28</sup>

The present species is confined in distribution to the Florida Keys and the mainland of southern Florida as far north as Fort

<sup>27</sup> In life the male cerci are probably always green or greenish, this color is one of the most likely to disappear in dried material.

<sup>28</sup> Of the immature specimens recorded as this species by the present authors, Proc. Acad. Nat. Sci. Phila., 1912, p. 268, (1912), those from Miami and Homestead, Florida, are immature examples of *Orchelimum concinnum*, while the two immature individuals from Key Vaca and Key West, Florida, are specimens of *Odontoxiphidium apterum*. These errors were due to our then very limited knowledge of the early stages of these species, which exhibit indeed a general (though not detailed) similarity to *gracillimus*.

Reed and Tampa, in which region the authors have taken a series of eighty-three specimens.

*Specimens Examined:* Previously correctly recorded, 95. Here recorded, 1 male, 1 female and 1 immature female.

Fort Reed, Florida, IV, 21, 1876, (J. H. Comstock), 1 juv. ♀, [Cornell Univ.].

Lemon City, Florida, (E. J. Brown), 1 ♂, [U. S. N. M.].

Biscayne, Florida, V, 23, 1 ♀, [U. S. N. M.].

**Conocephalus brevipennis** (Scudder) (Pls. XVI and XVII, fig. 6; XVIII, 11 and 12; XX, 6 and 7.

1862. *Xiphidium brevipennis* Scudder,<sup>29</sup> Can. Nat. and Geol., vii, p. 285.<sup>30</sup>  
[New England.]

1862. *X[iphidium] ensifer* Scudder, Bost. Journ. Nat. Hist., vii, p. 451.  
[Lawn Ridge, Illinois.] (In part.)

1869. *Xiphidium ensiferum* F. Walker, Cat. Dermapt. Salt. Br. Mus., ii, p. 270. [United States.]

1875. *Xiphidium gossypii* Scudder,<sup>31</sup> Proc. Bost. Soc. Nat. Hist., xvii, p. 462.  
[Texas; Mississippi.]

Scudder's *ensifer*, emended *ensiferum* by F. Walker, is based upon two females from Lawn Ridge, Illinois, now in the Museum of Comparative Zoology; one of these, which we here select as single type, is a brachypterous example of *Conocephalus brevipennis*; in this specimen the caudal femur is 13.1, the ovipositor 13.7 mm. in length. The other specimen is a brachypterous example of *C. strictus*. At that time the latter species was undescribed, but the confusion of two so very distinct species is almost incredible.

Scudder's *gossypii* is also a synonym of the present species, based upon material from Texas and Mississippi, which agrees throughout with typical *brevipennis* from New England, except in the somewhat greater size.

The present species and *C. spartinae*, though distantly related, are very similar in general appearance and have been fully

<sup>29</sup> Single type here designated: ♀; Massachusetts, [M. C. Z.]. Measurements; length of body 13.2, of tegmen 9, of caudal femur 11, of ovipositor 9.4 mm.

<sup>30</sup> Scudder's description of *X [iphidium] brevipennis*, in the Bost. Journ. Nat. Hist., vii, p. 451, was published in November 1862, while this, the original description, appeared in August and September of the same year; to it was added a record from the Red River Settlements, Manitoba, properly assigned to *C. saltans* here.

<sup>31</sup> Single type here designated: ♀; Texas, (Belfrage), [M. C. Z.]. Measurements; length of body 14.1, of tegmen 8.4, of caudal femur 16.8, of ovipositor 13.1 mm.

compared under the latter species. Females of the two species are difficult to separate, but, in addition to a somewhat different facies, this sex of *brevipennis* is found to have the ovipositor averaging distinctly longer and straighter.

Lateral lobes of pronotum moderately broad, cephalic margin straight to the broadly obtuse-angulate ventro-cephalic angle, thence straight to the rather broadly rounded ventro-caudal angle which is slightly less than  $90^\circ$ , caudal margin weakly convex to the distinct humeral sinus, convex callosity moderately broad.

Though the distinctive male cerci of this species usually show little or no variation, a single specimen in the series from Cornwells, Pennsylvania, has the apex of these organs acute and very narrowly rounded, an abnormality found in no other male of the species before us.

The tegmina in the males usually just reach the bases of the brown cerci, in the females they are shorter, covering usually about two-thirds of the dorsum of the abdomen; somewhat greater tegminal abbreviation sometimes occurs, however, and macropterism very rarely takes place, this condition being represented in 3.2% of the examples in the series here recorded, 7 males and 11 females.

The genicular areas of the caudal femora are usually weakly infuscated in the present species; the genicular lobes of the same are normally bispinose but frequent examples are met with which have one, two or three of these lobes unispinose, examples are very rare in which all of the genicular lobes of the caudal femora are unispinose. The ventro-external margins of the caudal femora are normally unarmed, small spines are present in three hundred and forty-one perfect specimens examined as follows:

Number of spines,	0-0	0-1	0-2	0-3	1-1	1-2	1-3	2-2	2-3	2-5
Number of specimens,	267	43	6	1	11	6	1	4	1	1

This shows 21.7% of the material to have these margins armed; as in *fasciatus*, geographic distribution apparently does not influence this condition, but in the present species the spines when present are usually heavier than in that insect.

The ovipositor length is as follows: Saunderstown, Rhode Island, 9.1-10.8; Diamond Valley, Pennsylvania, 11.6-12.7; Cornwells, Pennsylvania, 10.3-13.4; Chestnut Hill, Pennsylvania,

11.4-14.7; Tinicum, Pennsylvania, 8.9-11.8; Castle Rock, Pennsylvania, 11.4-13.6; Cedar Springs, New Jersey, 9.3-10.8; Fayetteville, North Carolina, 9.7-10.8; Wilmington, North Carolina, 9.2-9.6; Florence, South Carolina, 10.6-11.9; Yemassee, South Carolina, 9.3-9.6; Atlantic Beach, Florida, 9.4; Moline, Illinois, 11.4-13.7; West Point, Nebraska, 10.5-14.7 mm. The ovipositor varies slightly from the normal perfectly straight type to one in which an extremely weak upward curvature is appreciable, suggesting the type found in *spartinae*, and one in which an open sigmoid curvature is barely indicated, to the weakest appreciable degree. The specimens from West Point, Nebraska, have the ovipositor slightly heavier and averaging longer than in any eastern series. Of the eastern material, that from drier upland situations (Diamond Valley, Cornwells (back from the river), Chestnut Hill, Castle Rock, Pennsylvania; Fayetteville, North Carolina; Florence, South Carolina, and a number of other localities) has the ovipositor frequently showing a suggestion of an open-sigmoid curvature and averaging longer than in material from marsh or swamp lands (Tinicum, Pennsylvania; Wilmington, North Carolina; Yemassee, South Carolina; Atlantic Beach, Florida, and other localities), and we believe the differences discussed above probably to be due wholly to environmental conditions,<sup>32</sup> particularly those governing oviposition, which in situations of different character would indicate that different plants are selected as the receptacles for the eggs.

The present species is known from Eastport, Maine; Montreal, Quebec, and Algonquin Park, Ontario to Atlantic Beach, Florida,<sup>33</sup> and the Gulf coast as far as Beaumont, Texas. The

<sup>32</sup> Different variations are found in occasional species, primarily due it would seem to immediate environmental conditions and not sufficient to warrant trinomial recognition. See under *C. nigropleuroides* in the present paper and under *C. cinereus* and *saltator* in the next paper of the present series. Also under *Orchelimum concinnum*, Trans. Am. Ent. Soc., xli, pp. 15 and 62, (1915), and under *Nemobius fasciatus fasciatus* and its geographic race *socius*, Proc. Acad. Nat. Sci. Phila., 1913, pp. 410 and 424, (1913).

<sup>33</sup> Further south in Florida this species has not been found. Scudder's 1877 record, with a query, of an immature individual from Fort Reed as his *ensiferum*, applies to *Conocephalus gracillimus*; while the present authors' record from Chokoloskee we now know to be based upon material incorrectly labelled and probably taken in the vicinity of New York, New York.

westernmost records are Minnesota<sup>34</sup>; North Platte, Nebraska, and Texas (probably Dallas), the species apparently not reaching far beyond the limits of the naturally well watered regions.<sup>35</sup> The insect is numerous and widely distributed over the Upper Austral Zone of the central Atlantic and upper Mississippi Valley regions of the United States, but is found local and usually quite scarce in the lowlands of the southeastern states.

*Specimens Examined:* Previously recorded, over 100. Here recorded, 555; 257 males, 286 females, 2 immature males and 10 immature females.

Montreal, Quebec, VIII, 30, 1902, (C. Stevenson), 1 ♀, [U. S. N. M.].

Seabrook, New Hampshire, (A. A. Eaton), 1 ♀, [U. S. N. M.].

Jaffrey, New Hampshire, IX, 23, 1896, (S. Henshaw), 6 ♂, 16 ♀, [M. C. Z.].

Marion, Massachusetts, VIII, 1905, (H.; grasses in woods), 4 ♂, 5 ♀.

Saunderstown, Rhode Island, IX, 3 to 7, 1913, (H.; common in upland grasses and vines near woods), 7 ♂, 11 ♀.

Wesquage Beach, Rhode Island, IX, 8 and 10, 1913, (H.; in grasses and vines near woods and on edge of salt marsh), 2 ♂, 6 ♀.

Niverville, New York, VIII, 24, 1904, (Morse), 3 ♂, [Morse Cln.].

Chatham, New York, VIII, 9, 1904, (Morse), 4 ♂, 2 ♀, [Morse Cln.].

Clifton Springs, New York, 1 ♂, 1 ♀, [Cornell Univ.], (macropterous).

Ithaca, New York, VIII, 4 to X, 12, 1885 to 1894, 22 ♂, 24 ♀, [Cornell Univ.], (1 ♂ macropterous).

Tobyhanna, Pennsylvania, IX, 1903, (H.), 1 ♂, 5 ♀.

Stroudsburg, Pennsylvania, IX, 1903, (H.; in high grasses), 2 ♂, 1 ♀.

Dauphin, Pennsylvania, IX, 15, 1 ♂, [Pa. State Dept. Zool.].

Harrisburg, Pennsylvania, VIII, 16, 1 ♀, [Pa. State Dept. Zool.].

Progress, Pennsylvania, X, 10, 1 ♀, [Pa. State Dept. Zool.].

Marysville, Pennsylvania, X, 6 and 7, 4 ♂, 1 ♀, [Pa. State Dept. Zool.].

Bristol, Pennsylvania, IX, 1912, (H. W. Fowler), 1 ♀, [A. N. S. P.].

Woodlands Cemetery, Philadelphia, Pennsylvania, X, 7, 1906, (B. Long), 1 ♂, 1 ♀, [A. N. S. P.].

Cornwells, Pennsylvania, IX, 7, 1914, (H.; everywhere in low shrubbery and grasses along river and on edge of woods), 10 ♂, 3 ♀, 2 juv. ♀; IX, 11, 1906, (R. & H.), 1 ♂, 6 ♀.

Ashbourne, Pennsylvania, X, 27, 1906, (B. Long), 2 ♂, 5 ♀, [A. N. S. P.].

<sup>34</sup> Though not so stated by Luggler, it is virtually certain that the species is common in Minnesota only as far north as the border of the Canadian Zone. Scudder's record of this species from the Red River Settlements, Manitoba, applies to *C. saltans*.

<sup>35</sup> Scudder's records of *brevipennis* from California and *ensifer* from Nevada apply to *C. fasciatus vicinus*, to which insect the present species shows decided similarity in many respects, but may be readily separated by the differences of coloration and genitalia.



Chestnut Hill, Pennsylvania, VIII, 5, to X, 4, 1903 to 1911, (H.; in grasses near woods), 3 ♂, 7 ♀.

Wissahickon Creek, Chestnut Hill, Pennsylvania, IX, 9, 1914, (H.; grasses in openings of forest), 2 ♂, 1 ♀.

Swarthmore, Pennsylvania, X, 13, 1906, (E. T. Cresson Jr.), 1 ♀, [A. N. S. P.].

Castle Rock, Delaware County, Pennsylvania, IX, 19, 1909, (R. & H.; common in luxuriant undergrowth of heavy deciduous forest), 5 ♂, 14 ♀, (2 ♀ macropterous).

Devon, Pennsylvania, IX, 14, 1905, 1 ♀, [A. N. S. P.].

Tinicum Island, Pennsylvania, VIII, 13 to IX, 29, 1903 to 1911, (R. & H.; very abundant near marsh in rank grass), 38 ♂, 42 ♀.

Fern Hill, Chester County, Pennsylvania, IX, 19, 1909, (R. & H.; grasses on serpentine outcrop), 3 ♂, 7 ♀.

Shady Nook, Sullivan County, Pennsylvania, VIII, 6 and 7, 1908, (Witmer Stone), 1 ♂, [A. N. S. P.].

Diamond Valley, Huntingdon County, Pennsylvania, IX, 10, 1905, (R.), 3 ♂, 4 ♀.

Emporium, Pennsylvania, X, 1905, (H. W. Fowler), 2 ♀, [A. N. S. P.].

Beatty, Pennsylvania, (O. Brugger), 2 ♂, 2 ♀, [A. N. S. P.].

Lindenwold, New Jersey, X, 31, 1914, (B. Long), 2 ♂, [A. N. S. P.].

Woodbury, New Jersey, X, 2, 1907, (C. B. Hardenberg), 1 ♂, 1 ♀, [A. N. S. P.].

Stafford's Forge, New Jersey, VIII, 12 to IX, 16, 1905 to 1908, (R. & H.), 6 ♂, 5 ♀.

Mays Landing, New Jersey, VIII, 29, 1914, (H.; in boggy pine barrens), 1 ♀.

Reega, New Jersey, VIII, 29, 1914, (H.; scarce in undergrowth of pine barrens), 1 ♂, 1 ♀.

Margate City, New Jersey, VIII, 17, 1914, (H.; grasses on dry ground on edge of salt marsh), 1 ♂, 2 ♀.

Cedar Springs, New Jersey, VIII, 14 and 26, 1914, (H.; tall grasses on border of fresh marsh), 38 ♂, 9 ♀, 2 juv. ♀, (1 ♂ macropterous).

Plummers Island, Maryland, VIII, 6 and 29, 1901 and 1904, (Currie, Barber), 1 ♂, 1 ♀, [U. S. N. M.].

Cabin John, Maryland, IX, 23, 1911, 1 ♂, 2 ♀, [U. S. N. M.].

Washington, District of Columbia, IX, 1883, 1 ♀, [Hebard Cln.].

Anolostan Island, District of Columbia, IX, 6, 1912, (Caudell), 1 ♀, [U. S. N. M.].

Marshall Hall, Maryland, VIII, 9, 1883, 1 juv. ♀, [Hebard Cln.].

Rossllyn, Virginia, IX, (Caudell), 1 ♂, [U. S. N. M.].

Falls Church, Virginia, IX, 4 and 28, 1906, 3 ♂, 2 ♀, [U. S. N. M.].

Appomattox, Virginia, IX, 6, 1903, (Morse), 2 ♂, 3 ♀, [Morse Cln.].

Wytheville, Virginia, IX, 4, 1903, (Morse), 1 ♀, [Morse Cln.].

Cape Henry, Virginia, IX, 7, 1903, (Morse), 1 ♀, [Morse Cln.].

Norfolk, Virginia, IX, 8, 1903, (Morse), 2 ♀, 1 juv. ♀, [Morse Cln.].

- Virginia Beach, Virginia, IX, 7, 1903, (Morse), 1 ♂, 2 ♀, [Morse Cln.]; X, 6, (F. Knab), 1 ♀, [U. S. N. M.].
- Fayetteville, North Carolina, IX, 9, 1911, (R. & H.), 4 ♂, 4 ♀.
- Roan Mountain, North Carolina, VIII, 31, 1903, (Morse), 3 ♂, 2 ♀, [Morse Cln.].
- Linville, North Carolina, VIII, 30, 1903, (Morse), 7 ♂, 3 ♀, 2 juv. ♀, [Morse Cln.].
- Saluda, North Carolina, VIII, 17, 1903, (Morse), 2 ♂, [Morse Cln.].
- Governors Island, North Carolina, VIII, 20, 1903, (Morse), 1 ♂, 3 juv. ♀, [Morse Cln.].
- Wilmington, North Carolina, IX, 8, 1911, (R. & H.), 4 ♂, 3 ♀.
- Lake Waccamaw, North Carolina, IX, 8, 1911, (R. & H.: in high weeds on lake shore), 3 ♂, 3 ♀.
- Spartanburg, South Carolina, VIII, 6, 1913, (H.), 1 juv. ♂.
- Florence, South Carolina, IX, 6, 1911, (R. & H.; in green undergrowth of deep forest and in grasses on its edge), 7 ♂, 5 ♀.
- Yemassee, South Carolina, IX, 4, 1911, (R. & H.; grasses on edge of forest), 3 ♂, 2 ♀, 1 juv. ♀.
- Atlanta, Georgia, VIII, 2, 1913, (R. & H.), 1 juv. ♂.
- Savannah, Georgia, VIII, 14, 1903, (Morse), 1 ♂, [Morse Cln.].
- Sandfly, Georgia, IX, 3, 1911, (R. & H.), 1 ♂, 1 ♀.
- Homerville, Georgia, VIII, 27, 1911, (R. & H.), 1 ♂.
- Billy's Island, Okefenokee Swamp, Georgia, IX, 1 to 5, 1913, (J. C. Bradley), 1 ♀, [Cornell Univ.].
- Atlantic Beach, Florida, VIII, 24, 1911, (R. & H.), 2 ♂, 1 ♀.
- South Jacksonville, Florida, IX, 7, 1913, (W. T. Davis), 1 ♀, [Davis Cln.].
- Windsor, Ontario, IX, 1894, 2 ♂, [Cornell Univ.].
- Cuyahoga Falls, Ohio, VIII, 14, 1904, (W. V. Warner), 1 ♂, [U. S. N. M.].
- Salineville, Ohio, IX, 10, 1892, 1 ♀, [Cornell Univ.], (macropterous).
- Roan Mountain Station, Tennessee, IX, 3, 1903, (Morse), 3 ♀, [Morse Cln.].
- Johnson City, Tennessee, VIII, 27, 1903, (Morse), 1 ♂, 1 ♀, [Morse Cln.].
- Chattanooga, Tennessee, VIII, 24, 1903, (Morse), 4 ♂, 5 ♀, [Morse Cln.].
- Flomaton, Alabama, VIII, 2, 1903, (Morse), 1 ♂, [Morse Cln.].
- Chicago, Illinois, IX, 9, 1904, (H.; in waste field), 1 ♀.
- Moline, Illinois, IX, (McNeill), 1 ♂, 2 ♀, [Hebard Cln.].
- West Point, Nebraska, IX and X, 1884 and 1885, (L. Bruner), 19 ♂, 33 ♀, [Hebard Cln.], (4 ♂, 6 ♀ macropterous).
- Weeping Water, Nebraska, IX, 24, 1909, (L. Bruner), 1 ♀, [Hebard Cln.].
- Lincoln, Nebraska, VIII (taken at light), 1 ♀, [Hebard Cln.], (macropterous).
- Table Rock, Nebraska, VIII, 25, 1904, (H.; in high grass), 1 ♀.
- North Platte, Nebraska, VIII, 28, 1910, (R. & H.; swampy areas on river plain), 1 ♂.
- Hopkins, Arkansas, IX, 12, 1904, (C. R. Jones), 1 ♂, [U. S. N. M.].
- Beaumont, Texas, VIII, 23, 1912, (H.; grasses on swampy ground), 1 ♂.

**Conocephalus resacensis**<sup>36</sup> new species (Pl. XV, fig. 6; XVI, 7; XVII, 7; XVIII, 13 and 14; XX, 8.)

The present species somewhat resembles *C. allardi* and *C. brevipennis* but differs from both in the attenuate form, wider vertex, smoother pronotum with lateral lobes even more elongate than in *allardi*, different and paler coloration, much more elongate caudal femora with genicular areas not darkened, (genicular lobes normally unispinose as in *allardi*), and very different male genitalia, though with subgenital plate of the normal type of the subgenus *Xiphidion*, as found in *brevipennis*.

*Type*.—♂; Piper Plantation near Brownsville, Texas. August 3, 1912. (Rehn and Hebard.) [Hebard Collection, Type No. 171.]

*Description of Type*.—Size rather large for the genus, form slender and surface very smooth. Head with dorsum of vertex, when seen from the lateral aspect, scarcely at all depressed proximad, in same plane as the occiput; fastigium of vertex nearly as wide as basal antennal joint, narrowing with a decided concavity to facial suture; eyes normal. Pronotum elongate, rounding smoothly into the lateral lobes which are considerably longer than deep with surface very smooth, cephalic margin of lateral lobes broadly and evenly arcuate to the ventro-caudal angle which is moderately rounded and rectangular, caudal margin of same very weakly convex to the very shallow and scarcely appreciable humeral sinus, convex callosity very broad, somewhat broader than in *allardi* and decidedly broader than in *brevipennis*. Tegmina slightly more than half the length of the caudal femora, structure very delicate with veins weaker than in *brevipennis*; stridulating area similar but smaller in proportion with stridulating vein and veins of the speculum decidedly heavier than in that species, in this latter respect more as in *allardi*; wings slightly shorter than tegmina. Abdomen and cerci unicolorous. Cerci elongate; the median half quite evenly and decidedly swollen and bearing on the internal margin at the point of greatest diameter a rather long tooth, which is broad at its base and is situated slightly lower than mesad (in vertical sense) but entirely visible from above, this tooth directed meso-ventrad with apex sharp and decurved; external margin of cercus very weakly concave, nearly straight; distad the cercus narrows evenly from the swollen portion to the narrow blunted apex, which portion of the cercus is very weakly depressed. Subgenital plate bearing disto-laterad styles .7 mm. in length, the sockets of which are produced beyond the transverse distal margin of the plate. Cephalic and median femora much as in *brevipennis*, caudal femora very long and more attenuate than in *brevipennis*, with enlarged proximal portion tapering much more gently and with ventral margins unarmed, genicular lobes unispinose.<sup>37</sup>

<sup>36</sup> In reference to the "resacas" or ancient and now cut off and dried out curves of the Rio Grande, in the grasses of which, surrounded by the low heavy jungle of the river plain, the present species makes its home.

<sup>37</sup> The immature male before us shows this character to be variable, as this specimen has the genicular lobes bispinose.

*Allotype*.—♀; data same as the type.

*Description of Allotype*.—Similar to type, very slightly larger. Lateral lobes of pronotum longer with caudal margin straight and humeral sinus obsolete. Tegmina lanceolate with rather sharply rounded apex, half as long as abdomen; wings very slightly longer. Ovipositor longer than caudal femur, straight. The subgenital plate embraces the base of the ovipositor and has the distal margin broadly arcuate.

	Measurements (in millimeters)					
	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur	Length of cercus	Length of ovipositor
<i>Type</i> , ♂.	17.2	3.7	7.1	13.4	2.1	—
<i>Paratype</i> , ♂.	16.7	3.9	8.8	14.2	2.1	—
<i>Allotype</i> , ♀.	16.7	4.1	6	14.4	—	15.2
<i>Paratype</i> , ♀.	16.8	4.1	5.6	14.9	—	15.6

In the paratypic female before us the ovipositor shows a very slight curvature.

*Coloration*.—Dorsum of head and pronotum with a very broad median band of cinnamon brown, margined laterad with light buff. Eyes tawny. Tegmina and wings transparent and pale buff. Abdomen (of male) uniform ochraceous tawny including cerci, (of female) dorso-proximal and entire distal portion including ovipositor cinnamon brown tinged with tawny. The remaining portions of head, body and limbs, including the genicular areas of the caudal femora, Vanderpoel's green (Ridgeway). The allotype has alone retained in large measure the original coloration.

The present material was taken among luxuriant grasses growing in the openings of the almost impenetrable jungles of palm, huisache, ebony and many other trees, which occupy the low country along the Rio Grande below Brownsville.

*Specimens Examined*: 6; 2 males, 2 females, 1 immature male and 1 immature female.

Piper Plantation near Brownsville, Texas, VIII, 3, 1912, (R. & H.), 2 ♂, 2 ♀, *type*, *allotype* and *paratypes*, 1 juv. ♂, 1 juv. ♀.

**Conocephalus nemoralis** (Scudder) (Pl. XVI, figs. 8 and 9; XVII, 8; XVIII, 15 and 16; XIX, 12; XX, 9.)

1875. *Xiphidium nemorale* Scudder,<sup>38</sup> Proc. Bost. Soc. Nat. Hist., xvii, p. 462. [Dallas County, Iowa.]

1891. *Xiphidium curtipenne* Redtenbacher, Verh. Zool.-botan. Gesell. Wien, xli, pp. 498, 522. [Missouri.]

<sup>38</sup> Single type here designated: ♂; Dallas County, Iowa, IX, 3, (J. A. Allen), [M. C. Z.]. Measurements; length of body 10.8, of tegmen 8, of caudal femur 12.2 mm.

Scudder has properly synonymized Redtenbacher's *curtipenne* with the present species.<sup>39</sup>

The present insect is very striking in form, coloration and ovipositor, which latter, though not strongly, is more decidedly curved than in any other North American species of the genus. The species is dark brown in general coloration, often strongly tinged with burnt lake and sometimes with green; the dorsum of the pronotum, particularly in paler individuals, is bordered by very narrow lateral lines of the same pale color which make the tegminal veins and veinlets so conspicuous in the present species, these lateral lines are continued on the head, converging to the vertex which they border.

Lateral lobes of pronotum with cephalic margin moderately convex to the ventro-caudal angle with the ventro-cephalic angle weakly indicated, ventro-caudal angle rather broadly rounded, rectangulate, caudal margin exceedingly weakly convex to the subobsolete humeral sinus, convex callosity moderately broad.

Macropterism is very rare, we have but two examples of this condition before us, females from Plummer's Island, Maryland, and Asheville, North Carolina.

The genicular areas of the caudal femora are always infuscated; the genicular lobes of the same are each furnished with a single rather heavy spine or very occasionally bispinose; the ventral margins of the caudal femora are unarmed.

The ovipositor length is as follows: Beatty, Pennsylvania, 9.2; Asheville, North Carolina, 8.6-9.5; Marion County, Indiana, 8.8-9; Moline, Illinois, 8.6; West Point, Nebraska,<sup>40</sup> 7.8-8.7 mm. Though normally distinctly but not very strongly curved, the ovipositor is found to vary occasionally in the degree of this curvature as well as in length and heaviness.

The present species is widely distributed over the upper Mississippi valley region as far north as West Spring Green, Wisconsin, and is known eastward as far as the Hudson Palisades in New Jersey; Harrisburg, Pennsylvania; Washington, D. C., and Asheville, North Carolina, and westward as far as West Point and Lincoln, Nebraska, and Wichita, Kansas.

<sup>39</sup> Can. Ent., xxx, p. 184, (1898).

<sup>40</sup> One female from West Point, Nebraska, has the ovipositor only 6.7 mm. in length, but the whole organ appears to be somewhat abnormal and we have consequently omitted reference to this individual elsewhere.

*Specimens Examined:* Previously recorded, over 70. Here recorded 77; 23 males, 44 females, 4 immature males and 6 immature females.

Dauphin, Pennsylvania, IX, 15, 1 ♀, [Pa. State Dept. Zool.].

Harrisburg, Pennsylvania, VIII, 18, 1 ♂, 2 ♀, 2 juv. ♀, [Pa. State Dept. Zool.].

Highspire, Pennsylvania, IX, 20, 1 ♀, [Pa. State Dept. Zool.].

Middletown, Pennsylvania, IX, 5, 2 ♀, [Pa. State Dept. Zool.].

Beatty, Pennsylvania, (O. Brugger), 1 ♂, 1 ♀, [A. N. S. P.].

Sharpsburg, Maryland, IX, 18, 1903, (Caudell), 1 ♂, [U. S. N. M.].

Plummer's Island, Maryland, VIII, 25 to X, 25, (Caudell, Barber, Fisher, McAtee, Clemons), 9 ♂, 7 ♀, [U. S. N. M.], (1 ♀ macropterous).

Washington, District of Columbia, VIII, 1883, (A. Koebele), 1 ♀, [Hebard Cln.].

Luray, Virginia, IX, 2, 1906, (F. Knab), 1 ♀, [U. S. N. M.].

Roan Mountain Station, Tennessee, IX, 3, 1903, (Morse), 4 ♂, 4 ♀, 4 juv. ♂, 3 juv. ♀, [Morse Cln.].

Clarksville, Tennessee, IX, 24 and 25, 1913, (S. E. Crumb; on tobacco), 2 ♂, [U. S. N. M.].

Springvale, Tennessee, VIII, 30, 1900, 1 ♀, [Morse Cln.].

West Spring Green, Wisconsin, VIII, 26, 1906, (J. D. Hood), 1 ♀, [Pa. State Dept. Zool.].

West Point, Nebraska, IX, 1, (Bruner), 4 ♀, [Hebard Cln.].

Omaha, Nebraska, 1 ♂, 1 ♀, [A. N. S. P.].

Ashland, Nebraska, 1 ♀, [A. N. S. P.].

Weeping Water, Nebraska, IX, 24, 1909, (Bruner), 2 ♂, 8 ♀, [Hebard Cln.].

Lincoln, Nebraska, IX, 15, (Bruner), 1 ♂, 1 ♀, [Hebard Cln.].

Des Moines, Iowa, VIII, 26, 1903, (Caudell), 1 ♀, (U. S. N. M.).

St. Louis, Missouri, IX, 25 to X, 27, 1875 and 1876, 1 ♂, 4 ♀, [U. S. N. M.].

Kirkwood, Missouri, IX, 6, 1873 and X, 7, 1877, 2 ♀, [U. S. N. M.].

Dardanelle, Arkansas, VIII, 31, 1905, (Morse), 1 juv. ♀, [Morse Cln.].

***Conocephalus occidentalis*** (Morse) (Pl. XVI, fig. 10; XVII, 9; XVIII, 17 and 18; XIX, 13; XX, 10.)

1901. *Xiphidium occidentale* Morse,<sup>41</sup> Can. Ent., xxxiii, p. 202. [Tehachapi, Ahwa(h)nee, Wawona, Yosemite Valley, Berkeley, Sisson[s] and Gazelle, California; Ashland, Grant's Pass, Roseburg and Corvallis, Oregon.]

1901. *Xiphidium occidentale* variety *camurum* Morse, Can. Ent., xxxiii, p. 202. [Ashland, Oregon.]

1901. *Xiphidium occidentale* variety *caudatum* Morse,<sup>42</sup> Can. Ent., xxxiii, p. 203. [Mt. Shasta district, California.]

The use of such varietal names as given above appears wholly inadvisable. The one, *camurum*, is based solely upon a macrop-

<sup>41</sup> Single type designated: ♂; Tehachapi, California, VIII, 3, 1897, (Morse), [Morse Cln.]. (Morse and Hebard, Proc. Acad. Nat. Sci. Phila., 1915, p. 105, (1915).)

<sup>42</sup> Single type designated: ♀; Mount Shasta district, California, VII, (H. Edwards), [M. C. Z.]. (Morse and Hebard, Proc. Nat. Sci. Phila., 1915, p. 105, (1915).)

terous specimen of the present insect; the other, *caudatum*, on three specimens exhibiting a maximum of ovipositor length. When we consider the prevalence of macropterism and brachypterism in the species of this and many other genera, and know that such forms are often if not always the offspring of the same parent, we feel satisfied that such names are absolute synonyms, the use of which can only lead to confusion and misconception of the importance of trinomials designating valid and constant geographic races. Morse's very large series and our own specimens show considerable variation in length of ovipositor and caudal femur; the material showing the caudal femora rather short and the ovipositor rather long, named *caudatum* by Morse, is not worthy of name designation as there is no geographic correlation and such variations are frequent in the species of the genus.

The present species, although differing very decidedly in many important characters, shows much the nearest affinity to *C. nemoralis*, to which insect it also bears a closer general resemblance than to any other American species.

The great majority of specimens before us have the limbs and sides of head, pronotum and abdomen, brown; a very few examples have these portions green. The females have the abdomen usually rather distinctly marked dorso-mesad with a double row of dark markings, while on each side is situated a narrow band, usually of even darker coloration.

The lateral lobes of the pronotum are rather similar to those of *nemoralis*, but are somewhat broader, with angles more broadly rounded and humeral sinus slightly more appreciable.

Macropterism is very rare, we have examined the unique female in the Morse collection which exhibits this condition.

The genicular areas of the caudal femora are weakly or not at all infuscated; the genicular lobes of the same are unispinose in all of the specimens we have examined; the ventral margins of the caudal femora are unarmed.

The ovipositor length is as follows: Sisson, California, 14.2-15.7; Shasta County, California, 11.1; Sentinel, California, 10.3-12.6; Mariposa Grove, California, 10.1-11; Mill Valley, California, 8.7 mm. The ovipositor is usually very weakly curved but in some specimens it is almost absolutely straight.

The present species is peculiar to the Pacific coast and has been found there from Corvallis, Oregon, southward through the mountains as far as Tehachapi, California, and on the coast in the vicinity of San Francisco.

*Specimens Examined:* Previously recorded 156. Here recorded, 19; 7 males, 10 females and 2 immature females.

Mount Shasta, California, IX, 1885, (J. Behrens), 1 ♂, [Hebard Cln.].

Shasta County, California, VII, 1885, (J. Behrens), 1 juv. ♀; VIII to IX, 1885, (J. Behrens), 1 ♂, 1 ♀, [all Hebard Cln.].

Sisson, California, VIII, 15, 1909, (R. & H.; in grasses of marshy meadow), 4 ♂, 9 ♀, 1 juv. ♀.

Sacramento, California, VIII, 20, 1904, (M. Nawa), 1 ♂, [U. S. N. M.].

**Conocephalus strictus** (Scudder) (Pl. XVI, fig. 11; XVII, 10; XVIII, 19 and 20; XX, 11.)

1862. *X[iphidium] ensifer* Scudder, Bost. Journ. Nat. Hist., vii, p. 451. [Lawn Ridge, Illinois.] (In part.)

1875. *Xiphidium strictum* Scudder,<sup>43</sup> Proc. Bost. Soc. Nat. Hist., xvii, p. 460. [Dallas, Texas.]

This species averages larger and has the ovipositor averaging longer than in any other species found in the United States. Though differing very decidedly from *C. nemoralis* and *occidentalis*, the present insect shows unquestionably an extreme development from a common ancestor with these species.

In coloration the dorsum of the abdomen, the cerci and the ovipositor are dark brown, the remaining portions of the insect are green excepting the usual medio-dorsal dark stripe on the head and pronotum which is narrowly bordered with buff, in the females these narrow dorso-lateral buff lines are continued on the abdomen to the base of the ovipositor. Material from the arid southwest usually shows a decidedly paler type of coloration in which the dorsum of the abdomen is often very weakly infuscated or greenish yellow; frequently in pale females from this region the color pattern described above is strongly defined, the abdomen showing a very broad medio-dorsal fuscous band bordered by a narrow buffy band on each side, the sides of the abdomen below this infuscated, this coloration heaviest dorsad along the borders of the pale dorso-lateral bands, thus making them very pronounced.

<sup>43</sup> Single type here designated: ♀; Dallas, Texas, (Boll), [M. C. Z.]. Measurements; length of body 16.6, of tegmen 4.2, of caudal femur 16.4, of ovipositor 24.7 mm.



Lateral lobes of pronotum large, cephalic margins straight to the distinct but broadly obtuse-angulate ventro-cephalic angle, thence straight to the broadly rounded ventro-caudal angle which is approximately rectangulate, caudal margin distinctly convex to the distinct humeral sinus, convex callosity very broad.

Macropterism is very rare in the present species, 11 of over 500 adult specimens at present before us represent this condition.

The genicular areas of the caudal femora are not infuscated; the genicular lobes of the same are unispinose; the ventral margins of the caudal femora are unarmed.

The ovipositor length is as follows: Mount Airy, Pennsylvania, 17.7-23.1; Fern Hill, Pennsylvania, 19.4-28.1; Marshall County, Indiana, 20.1-21.8; St. Louis, Missouri, 20.9-21.3; West Point, Nebraska, 17.7-22.8; Dodge City, Kansas, 17.9-22.6; Dickinson, Texas, 21.2-25; Beeville, Texas, 25.2-32.3; Sycamore Cañon, Baboquivari Mts., Arizona, 19.7-24.4 mm. The ovipositor usually shows a very weak curvature but in occasional specimens it is almost absolutely straight. Nowhere in the series of the present genus before us is the variability in ovipositor length more strikingly illustrated, for the range in length is from 17.7 to 32.3, showing a variation of 14.6 mm. The material before us shows that in some localities the species develops an ovipositor averaging longer or shorter than in others, but the fact is also proven by this material that nowhere in the wide distribution of the species does a recognizable geographic race occur, or even a form which might usually be distinguishable, in spite of the wide range of ovipositor length.

On the Atlantic coast the species is known from Staten Island, New York, south to Newbern, North Carolina; westward it has been taken as far north as southwestern Minnesota, other westernmost records being Hot Springs, South Dakota; Kearney, Nebraska; Syracuse, Kansas, and Cisco, Texas, while on the Rio Grande it has been taken at Brownsville and Del Rio, Texas. In the mountain regions of the arid southwest the species is again found (Marathon, Texas; Mesilla, New Mexico, and the Baboquivari Mountains, Arizona), and it will almost certainly be found to have a wide range over the highest portions of northern Mexico and for some distance along the Gulf coast of that country.

*Specimens Examined:* Previously recorded, over 50. Here recorded, 505; 217 males, 249 females, 4 immature males and 35 immature females.

Cornwells, Pennsylvania, IX, 7, 1914 (H.; pasture, in area of *Andropogon*), 3 ♂, 1 ♀; IX, 11, 1906, (R. & H.), 1 ♀.

Ashbourne, Pennsylvania, X, 27, 1906, (B. Long), 1 ♂, 4 ♀, [A. N. S. P.], (1 ♀ macropterous).

Mount Airy, Pennsylvania, IX, 12, 1903, (H.), 1 ♂; IX, 24, 1914, (H.; upland pasture, very abundant in *Andropogon virginicus*), 6 ♂, 10 ♀.

Tinicum Island, Pennsylvania, IX, 9, 1904, (R. & H.), 1 ♂, 1 ♀, 1 juv. ♀.

Addingham, Pennsylvania, VIII, 13, 1914, (D. Culver), 1 ♂, 2 juv. ♀, [A. N. S. P.].

Castle Rock, Delaware County, Pennsylvania, IX, 19, 1909, (R. & H.; luxuriant vegetation in deciduous forest), 4 ♂, 7 ♀, (1 ♀ macropterous).

Fern Hill, Chester County, Pennsylvania, IX, 19, 1908, (R. & H.; grasses on serpentine outcrop), 11 ♂, 13 ♀, (1 ♂ and 1 ♀ macropterous).

Marcus Hook, Pennsylvania, VIII, 11, 1905, (P. Lorrilliere), 1 juv. ♀, [A. N. S. P.].

Harrisburg, Pennsylvania, Wetzel's swamp, IX, 30, 1 ♀, [Pa. State Dept. Zool.], (macropterous).

Rockville, Pennsylvania, VII, 29, 1 juv. ♀, [Pa. State Dept. Zool.].

Ocean View, New Jersey, VII, 27, 1914, (H; upland field), 1 juv. ♂, 3 juv. ♀; IX, 8 to X, 9, 1909 to 1911, (H. Fox), 2 ♂, 3 ♀, [A. N. S. P.].

Wildwood Junction, New Jersey, VIII, 27 to VIII, 8, 1914, (H.; in waste field particularly about bayberry bushes), 3 juv. ♂, 5 juv. ♀.

Washington, District of Columbia, VIII and IX, 1883, 2 ♂, 2 ♀, [Hebard Cln.], (1 ♀ macropterous; VIII, 18 to XI, 14, (Caudell, Allard), 3 ♂, 7 ♀, [U. S. N. M.], 3 ♀ (macropterous).

Arlington, Virginia, X, 10, 1912, (Allard), 1 ♂, 2 ♀, [U. S. N. M.].

Falls Church, Virginia, IX, 4, 1906, (Caudell), 1 juv. ♀, [U. S. N. M.].

Norfolk, Virginia, IX, 8, 1903, (Morse), 2 ♂, 2 ♀, [Morse Cln.].

Virginia Beach, Virginia, IX, 7, 1903, (Morse), 1 ♀, [Morse Cln.].

Appomattox, Virginia, IX, 6, 1903, (Morse), 15 ♂, 15 ♀, 2 juv. ♀, [Morse Cln.].

Utica, Mississippi, VIII, 1 juv. ♀, [U. S. N. M.].

Lawn Ridge, Illinois, 1 ♀, one of the types of *Xiphidium ensifer* Scudder, [M. C. Z.].

Urbana, Illinois, X, 15, 1905, (C. A. Hart), 1 ♂, 1 ♀, [Hebard Cln.].

Iowa City, Iowa, VIII, 1889, (B. Shimek), 1 ♂, 1 juv. ♀, [Hebard Cln.].

Des Moines, Iowa, VIII, 26, 1903, (Caudell), 1 ♂, 1 ♀, [U. S. N. M.].

St. Louis, Missouri, IX, 25 to X, 27, 1875 and 1876, 1 ♂, 7 ♀, [U. S. N. M.]; X, 9, 1904, (C. L. Heink), 4 ♀, [Hebard Cln.].

Kirkwood, Missouri, X, 1877, 1 ♂, 3 ♀, [U. S. N. M.].

Fayetteville, Arkansas, IX, 5, 1905, (Morse), 9 ♂, 6 ♀, [Morse Cln.].

Hot Springs, South Dakota, X, 1888, 1 ♀, [Hebard, Cln.].

West Point, Nebraska, VIII to X, 1884, (L. Bruner), 3 ♂, 9 ♀, [Hebard Cln.].

South Bend, Nebraska, X, 15, 1910, (L. Bruner), 1 ♀, [Hebard Cln.].

- Weeping Water, Nebraska, IX, 29, 1909, (L. Bruner), 3 ♀, [Hebard Cln.].  
 Lincoln, Nebraska, IX, 3 and 15, 1909, (L. Bruner), 3 ♂, 6 ♀, [Hebard Cln.], (1 ♀ macropterous).
- Kearney, Nebraska, VII, 27, 1910, (R. & H.; in patches of higher grasses on river bottoms), 9 ♂, 9 ♀, 2 juv. ♀.
- Howe, Oklahoma, VIII, 4, 1905, (Morse), 3 ♂, 2 juv. ♀, [Morse Cln.].  
 Wilburton, Oklahoma, VIII, 27, 1905, (Morse), 7 ♂, 4 ♀, [Morse Cln.].  
 South McAlester, Oklahoma, VIII, 7, 1905, (Morse), 11 ♂, 6 juv. ♀, [Morse Cln.].
- Caddo, Oklahoma, VIII, 8, 1905, (Morse), 1 ♂, 1 ♀, 1 juv. ♀, [Morse Cln.].  
 Shawnee, Oklahoma, VIII, 26, 1905, (Morse), 4 ♂, 2 ♀, [Morse Cln.].  
 Base of Mount Sheridan, Oklahoma, VIII, 24, 1905, (Morse), 2 ♀, [Morse Cln.].
- Cache, Oklahoma, VIII, 23, 1905, (Morse), 5 ♂, 6 ♀, [Morse Cln.].  
 Mountain Park, Oklahoma, VIII, 22, 1905, (Morse), 2 ♂, 3 ♀, [Morse Cln.].  
 Denison, Texas, VIII, 12, 1905, (Morse), 4 ♂, 3 ♀, [Morse Cln.].  
 Wichita Falls, Texas, VIII, 15, 1905, (Morse), 4 ♂, 11 ♀, [Morse Cln.].  
 Dodge City, Kansas, IX, 13, 1909, (H.; higher grasses in prairie depressions), 14 ♂, 15 ♀, (1 ♂ macropterous).
- Syracuse, Kansas, IX, 12, 1909, (R. & H.; higher grasses in prairie depressions), 1 ♂, 9 ♀.
- Plano, Texas, VIII, 1907, (E. S. Tucker), 1 ♂, [U. S. N. M.].  
 Sagamore Hill, Tarrant County, Texas, IX, 27, 1912, (R. & H.), 1 juv. ♀.  
 Cisco, Texas, IX, 21 and 22, 1912 (R. & H.; scarce in high meadow grasses), 2 ♂, 2 ♀.
- Flatonía, Texas, VIII, 19 and 20, 1912, (R. & H.; in bunch grass, immature specimens occasional), 1 ♀.
- Galveston, Texas, VII, 19 to 21, 1912, (H.), 3 ♂, 3 ♀.
- Virginia Point, Texas, VII, 21, 1912, (H.; in moderate numbers in weeds and tall grass growing at a level slightly higher than tidal marsh), 3 ♂, 3 ♀.
- La Marque, Texas, VIII, 22, 1912, (H.), 10 ♂, 3 ♀.
- Dickinson, Texas, VII, 20, 1912, (H.; nowhere common but widely distributed in low green plants in pine woods), 3 ♂, 8 ♀.
- Webster, Texas, VII, 19, 1912, (H.; occasional in plant clumps on prairie), 1 ♂.
- Rosenberg, Texas, VII, 25 and 26, 1912, (H.; common and widely distributed in weeds and grasses), 4 ♂, 3 ♀.
- Victoria, Texas, VII, 26 and 27, 1912, (H.; occasional in weeds), 2 ♂, 3 ♀.  
 Beeville, Texas, VII, 28, 1912, (H.), 3 ♂, 3 ♀.  
 Gregory, Texas, VII, 30, 1912, (H.), 2 ♂, 2 ♀.  
 Robstown, Texas, VIII, 9, 1912, (H.), 1 ♂, 2 ♀.  
 Lyford, Texas, VIII, 6 and 7, 1912, (R. & H.), 2 ♂, 2 ♀, 1 juv. ♀.  
 Brownsville, Texas, VII, 30 to VIII, 5, 1912, (H.), 2 ♂, 2 ♀.  
 Clarendon, Texas, VIII, 18, 1905, (Morse), 9 ♂, 6 ♀, [Morse Cln.], (1 ♀ macropterous).
- Amarillo, Texas, VIII, 19, 1905, (Morse), 1 ♂, [Morse Cln.].  
 Del Rio, Texas, VIII, 22 and 23, 1912, (H.; area of heavy grass with clumps of cat-tails in river bottoms), 1 ♂.

Marathon, Texas, VIII, 26 and IX, 13, 1912, (R. & H.; scarce in high green grass in wet spots), 5 ♂, 3 ♀.

Boulder, Colorado, VIII, 9, 1905, (T. A. D. Cockerell), 4 ♂, 1 ♀, 4 juv. ♀, [U. S. N. M.].

Sycamore Cañon, Baboquivari Mountains, Arizona, X, 8, 1910, c. 4700 ft., (H.; common in dry grasses on cañon slopes at upper forks), 21 ♂, 23 ♀.

**Conocephalus hygrophilus**<sup>44</sup> new species (Pl. XV, fig. 9, XVI, 12; XVII, 11; XVIII, 21 and 22; XX, 12.)

This insect shows nearest relationship to *C. stictomerus*, and some affinity to *C. aigialus*, differing from the latter species in the larger size, much broader but otherwise similar vertex, deeper lateral lobes of the pronotum with the ventro-caudal angle more acute, not strikingly truncate distal extremity of the male abdomen, different male cerci and longer caudal femora. The male cerci are distinctive, the nearest development in this respect being found in *C. stictomerus*.

The species probably will be found in numerous localities in the heavier vegetation along the margins of salt marshes and about brackish and fresh water swamps on the Gulf coast, little work has as yet been done there in such environment.

*Type*.—♀; Virginia Point, Galveston County, Texas. July 21, 1912. (Hebard.) [Hebard Collection, Type No. 172.]

*Description of Type*.—Size large for the genus, form robust and rather elongate. Head with dorsum of vertex when seen from the lateral aspect not strongly but distinctly ascending above the plane of the occiput (slightly more so than in *C. aigialus* and much as in *C. stictomerus*), fastigium of vertex almost as wide as basal antennal joint, narrowing with a distinct concavity to the facial suture, when seen from front about half again as deep as wide. Eyes large for the genus and unusually protruding. When seen from above the lateral lobes of pronotum diverge rather strongly ventro-laterad; cephalic margin of lateral lobes with the ventro-cephalic angle very weakly indicated, broadly arcuate to the ventro-caudal angle which is very sharply rounded and weakly acute-angulate, caudal margin very weakly convex to the very shallow humeral sinus, convex callosity broad. Tegmina delicate in structure, elongate, reaching a little beyond tips of caudal femora; wings decidedly longer, extending beyond apex of ovipositor. Ovipositor decidedly shorter than caudal femur, broad, approximately straight in direction but showing a very evident open-sigmoid curve. Subgenital plate flat, with lateral margins convex and turned upward sharply, thus embracing the base of the ovipositor, meso-caudal portion of margin transverse. Cephalic and median limbs much as in *aigialus*, caudal limbs decidedly longer, caudal femora with ventro-external margins armed with a few small stout spines (2 and 2), genicular lobes strongly bi-spinose.

<sup>44</sup> From *ὕγρα* and *φίλος*, a lover of the watery ways.

*Allotype*.—♂; Milneburg, Orleans Parish, Louisiana. July 22, 1905. (A. P. Morse.) [Morse Collection.]

*Description of Allotype*.—Very similar to type, size slightly smaller. Tegmina very similar to those of *aigialus*, delicate in structure, abbreviate, reaching to base of penultimate dorsal abdominal segment, tympanum short and broad, veins and veinlets very delicate; wings slightly shorter than tegmina. Distal portion of abdomen, including cerci, raw sienna. Cerci elongate, mesal portion ovate, bulbous and swollen with that portion above ventro-proximal tooth produced in an overhanging knob-like protuberance, at the proximal base of this swelling is situated interno-ventrad a slender deurved tooth, directed mesad and nearly perpendicular to the shaft of the cercus, the external margin of which is weakly concave, beyond the mesal swelling the cercus is greatly depressed and flattened, this distal portion strongly produced with sides very weakly converging to the broadly rounded apex. Subgenital plate bearing disto-laterad short styles, the distal margin of the plate is weakly convex.

*Measurements (in millimeters)*

	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur	Length of cercus	Length of ovipositor
♂						
Milneburg, La., <i>Allotype</i> .	16.8	3.7	10.3	13.8	2	—
♀						
Virginia Point, Tex., <i>Type</i> .	17.2	3.8	18.6	13.9	—	10.4

*Coloration*.—General color pale green (bright green in life). Eyes cinnamon brown. Dorsum of head and pronotum with a weakly indicated band of pale brown. Tegmina and wings transparent, warm buff. Distal half of male abdomen, including cerci, raw sienna; in life probably much more brilliant and approaching orange more closely in shade. In the female the abdomen at the base of the ovipositor is washed weakly with this color. Genicular areas of caudal femora yellowish.

The unique female of the present species before us is macrop-terous, while the unique male is brachypterous.

The ventro-external margins of the caudal femora are armed with small but heavy spines; in the female 2-2, and in the male 3-4.

The present species is only known from the localities given below.

*Specimens Examined*: 2; 1 male and 1 female.

Milneburg, Louisiana, VII, 22, 1905, (Morse), 1 ♂, *allotype*, [Morse Chn.], (brachypterous).

Virginia Point, Texas, VII, 21, 1912, (H.; in heavy grasses on edge of salt marsh), 1 ♀, *type*, (macrop-terous).

***Conocephalus stictomerus***<sup>45</sup> new species (Pl. XV, fig. 10; XVI, 13; XVII, 12; XVIII, 23 and 24; XX, 13.)

1911. *Conocephalus ensiferus* Rehn and Hebard (not *Xiphidium ensifer* Scudder, 1862), Proc. Acad. Nat. Sci. Phila., 1910, p. 643. (In part.) [Macropterous pair; Raleigh, North Carolina.]

The above error was a result of the specimens being in a very bad state of preservation, combined with the fact that at the time many of the characters of the greatest importance in distinguishing the North American species of the genus remained unstudied.

This species shows a development almost intermediate between *C. hygrophilus* and *C. aigialus*, but differs from both of these species in the very much narrower vertex, in the male cerci which are similar to those of *hygrophilus* but distinctly less specialized, and in the ovipositor which is very decidedly longer than the maximum found in either of the above mentioned forms. The coloration is very distinctive, no approach to it being found in any of the known species of the genus.

The present insect inhabits the middle Atlantic coastal plain, where it is to be found in the luxuriant grasses growing about the borders of marshes near fresh and brackish water.

*Type*.—♂; Cedar Springs, Cape May County, New Jersey. August 26, 1914. (Hebard.) [Hebard Collection, Type No. 173.]

*Description of Type*.—Size rather large for the genus, form rather slender. Head with dorsum of vertex when seen from the lateral aspect distinctly ascending above the plane of the occiput (much as in *C. hygrophilus* and more so than in *C. aigialus*), fastigium of vertex narrow, very little more than half as wide as the basal antennal joint, narrowing with a scarcely appreciable concavity to the facial suture, when seen from front over twice as deep as the greatest width. Eyes normal in size but unusually protruding. Pronotum moderately constricted, with lateral lobes narrower than in *C. hygrophilus* and *C. aigialus*, similar in this respect to *C. brevipennis*, cephalic margin nearly straight, ventrocephalic angle very broadly rounded obtuse-angulate, ventral margin very weakly concave to the broadly rounded but acute-angulate ventro-caudal angle, caudal margin weakly convex to the very shallow humeral sinus, convex callosity very narrow. Tegmina delicate in structure, abbreviate, reaching to middle of penultimate dorsal abdominal segment, tympanum much as in *brevipennis*; wings slightly shorter than tegmina. Cerci elongate, mesal portion with proximal section enlarged and produced above ventro-proximal tooth in an overhanging heavy knob-like protuberance, at the base of this swelling is

<sup>45</sup> From *στικτός*=spotted and *μηρός*=thigh, in allusion to the remarkable spots and dots of coral red found on the thighs of individuals of this species during life.

situated a slender decurved tooth which is, however, broad at its base, this tooth directed mesad and nearly perpendicular to the shaft of the cercus, the external margin of which is weakly angulato-concave, beyond the proximo-mesal swelling the cercus is greatly depressed and flattened particularly on the inner side, this distal half strongly produced with sides very weakly converging to the broadly rounded apex. Subgenital plate bearing disto-laterad very short styles, distal margin of the plate very weakly convex, nearly transverse. Cephalic and median limbs much as in *brevipennis*, caudal limbs decidedly longer, caudal femora with ventro-external margins armed with a number of small stout teeth (3 and 3), genicular lobes strongly bispinose. Coloration of insect distinctive and striking.

*Allotype*.—♀; data same as the type.

*Description of Allotype*.—Similar to type, very slightly larger. Tegmina lanceolate with rather sharply rounded apex, half as long as abdomen; wings slightly shorter. Ovipositor distinctly but not decidedly longer than caudal femur, broad, approximately straight in direction but showing a very evident open-sigmoid curve. Subgenital plate similar to that of *hygrophilus*. Coloration distinctive and striking as in type.

♂	<i>Measurements (in millimeters)</i>				
	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur	Length of cercus
Cedar Springs, N. J., <i>Type</i> .....	14.4	3.2	8.7	12.4	2
Cedar Springs, N. J., <i>Paratypes</i> .....	13.4-14.4	3-3.3	8-9.2	12.3-13.7	1.9-2.1
Chestertown, Md.....	12.4-13.6	2.9-3	8.7-11.6	13-13.8	2-2.2
Raleigh, N. C.....	14.9-15	3.4-3.5	18.3-18.4	14-15.1	2.1-2.2
♀					Length of ovipositor
Cedar Springs, N. J., <i>Allotype</i> .....	15.3	3.3	9.8	14.7	15
Cedar Springs, N. J., <i>Paratypes</i> .....	11.1-16	2.9-3.4	6.9-9.8	12.6-14.7	13.7-15.1
Chestertown, Md.....	13.4	3.7	7.8	15.3	18.1
Churchland, Va.....	14.5	3.7	9.2	15.6	19.8
Raleigh, N. C.....	14.3-15.5	3.4-3.6	18.3-18.8	14.3-15.2	16.1-16.7

*Coloration*.<sup>46</sup>—Lower portions of lateral lobes of pronotum, all of thorax, proximal two-fifths of male abdomen and all femora lettuce green. In life the swollen portions of the caudal femora

<sup>46</sup> The material upon which these color notes are based was, when fresh, kept in a 3% solution of formaldehyde for about ten hours. This treatment has preserved the green coloration almost in its entirety, but the other delicate colors are not as brilliant as in life and the coral red spots of the caudal femora have wholly disappeared. Still weaker solutions of formaldehyde, applied for a longer time, may be found to hold these evanescent colors. At present our experiments are preliminary but have shown a definite improvement over simply drying the material.

are strikingly marked with irregularly placed spots and dots of coral red; these in the immature condition are much darker, reddish brown in color, and are still evident in dried material. Tibiae green, much suffused with brown. Face capucine orange with a median vertical stripe of mahogany red extending from the vertex to the base of the clypeus, genae clouded with mahogany red. Dorsum of head and pronotum with a broad median band of mahogany red, the remaining lateral portions of the occiput and pronotum including the upper portions of the lateral lobes capucine buff, the area between this and the green portion of the lateral lobes clouded with mahogany red. Eyes very deep mahogany red. Tegmina and wings transparent, salmon buff. Distal three-fifths of male abdomen, including cerci, orange rufous. Abdomen and ovipositor of female sudan brown, shaft of latter washed with green. Genicular areas of caudal femora suffused with reddish brown.

The material before us shows little local size variability; in southward distribution there is a slight increase in size.

All of the specimens before us from New Jersey and Maryland are brachypterous, while those from North Carolina are all macropterous.

The ventro-external margins of the caudal femora are armed with small but heavy spines, (approximate average, three and four); these are found in the thirty-two perfect specimens before us as follows:

Number of spines,	0-0	0-1	1-2	2-2	2-3	2-4	2-5	3-3
Number of specimens,	1	1	1	3	1	1	2	7
Number of spines,	3-4	3-5	3-6	3-7	4-4	4-5	5-5	6-6
Number of specimens,	3	2	1	1	3	3	1	1

The series from which the present species is described was taken in a heavy growth of panic grass (*Panicum virgatum*), one to one and one-half feet high, interspersed with various marsh plants in a limited marshy area on the border of a brackish stream. Two hours strenuous and continuous beating was necessary to secure the series, as the species was very scarce. Though not unusually active in their movements, the insects proved to possess extreme facility in concealing themselves. The species is known to range from Cedar Springs, New Jersey, to Raleigh, North Carolina.



*Specimens Examined:* 42; 17 males, 23 females and 2 immature females.

Cedar Springs, New Jersey, VIII, 14, 1914, (H.; in high marsh grass), 1 juv. ♀; VIII, 26, 1914, (H.; in high marsh grass), 12 ♂, 13 ♀, 1 juv. ♀, *type, allotype and paratypes*, [Hebard Cln.].

Chestertown, Maryland, VIII, 19 and 23, 1899, (E. G. Vanatta), 2 ♂, 1 ♀, [A. N. S. P.].

Churchland, Virginia, VIII, 8 and IX, 15, 1914, (H. Fox; in brackish marsh, one in *Spartina glabra*), 2 ♀, [Fox Cln.].

Raleigh, North Carolina, VIII, 6 and 16, 1904, (C. S. Brimley; light at night), 1 ♂, 1 ♀, [Hebard Cln.]; IX, 9 and 16, 1905, (C. S. Brimley), 2 ♂, 6 ♀, [U. S. N. M.], (all macropterous).

**Conocephalus aigialus**<sup>47</sup> new species (Pl. XV, fig. 7; XVI, 14; XVII, 13; XVIII, 25 and 26; XX, 14.)

1907. *Xiphidion nigropleurum* (?) Rehn and Hebard (not *Xiphidium nigropleurum* Bruner, 1891), Proc. Acad. Nat. Sci. Phila., 1907, p. 313. (In part.) [1 ♀; Pablo Beach, Florida.]

1911. *Conocephalus brevipennis* Rehn and Hebard (not *Xiphidium brevipennis* Scudder, 1862), Proc. Acad. Nat. Sci. Phila., 1910, p. 643. (In part.) [1 ♂; Cape Henry, Virginia.]

As noted above the present authors have twice failed to recognize single specimens of the present species as distinct from the then known species. This was chiefly due to the fact that scarcely any material from the salt marshes of the Atlantic coast was then available, and, in a genus showing such great variability as the present, no definite knowledge of the forms already described and the number of species really present could be gleaned from the inadequate series at that time in hand.

The present species bears a slight superficial resemblance to *C. brevipennis* and *C. spartinae*, but may at once be separated from these by the decidedly more robust and compact structure, unusually prominent eyes, heavy truncate distal portion of the male abdomen, which in life is a bright and striking yellow and bears concolorous cerci which are distinctive (but plainly a development of the type found in *C. stictomerus* and *C. hygrophilus*), broad and weakly sigmoid ovipositor, and short, heavy limbs with the ventro-external margins of the caudal femora bearing normally a number of heavy spines.

Along the coast of Georgia and Florida, where *spartinae* is also found in the salt marshes, the present insect averages decidedly larger in size than that species.

<sup>47</sup> From *αιγιαλος*=the sea shore.

As its name implies the present insect inhabits salt marsh vegetation, on the beaches and along the tidal rivers of the Atlantic coast, where its habits are very similar to those of *spartinae*; in the present case, however, the insect is found not out on the marshes but in the halophytic vegetation along their borders and in similar vegetation on the beaches.

*Type*.—♂; Wrightsville, New Hanover County, North Carolina. September 7, 1911. (Rehn and Hebard.) [Hebard Collection, Type No. 174.].

*Description of Type*.—Size medium, form robust and compact. Head with dorsum of vertex when seen from the lateral aspect distinctly though slightly ascending above the plane of the occiput, fastigium of vertex narrow, little more than half as wide as the basal antennal joint, narrowing with a scarcely appreciable concavity to the facial suture, when seen from front over twice as deep as the greatest width. Eyes large for the genus and unusually protruding. Pronotum short with lateral lobes diverging rather strongly ventro-laterad, lateral lobes with cephalic margin broadly and evenly arcuate to the ventro-caudal angle which is rather sharply rounded and nearly rectangulate, caudal margin very weakly convex to the very shallow humeral sinus, convex callosity broad. Tegmina delicate in structure, abbreviate, reaching to base of penultimate dorsal abdominal segment; tympanum small, short and broad; veins and veinlets very delicate, more so than in *brevipennis*. Wings slightly shorter than tegmina. Abdomen with distal extremity enlarged and truncate, distal half including cerci bright and striking yellow in life. Cerci short, bulbous and swollen mesad in a large and nearly circular area at the proximal base of which is situated a slender ventro-internal tooth directed mesad and nearly perpendicular to the shaft of the cercus, the external margin of which is very weakly concave, beyond the mesal swelling the cercus is greatly depressed, this distal portion with sides rapidly and evenly converging to the rather sharply rounded apex. Subgenital plate bearing disto-laterad very short styles, the distal margin of the plate is very weakly convex, nearly transverse. Limbs shorter and heavier than in *spartinae* or *brevipennis*, caudal femora with ventro-external margins armed with a number of small stout teeth (5 and 5); genicular lobes strongly bispinose.

*Allotype*.—♀; data same as the type.

*Description of Allotype*.—Very similar to type, size somewhat larger. Tegmina lanceolate, tapering to the very sharply rounded apex, reaching to distal third of abdomen. Ovipositor distinctly but not decidedly shorter than caudal femur, broad, approximately straight in direction but showing a very evident open-sigmoid curve. Subgenital plate flat, with lateral margins turned upward sharply and embracing the base of the ovipositor, distal margin of flat surface transverse.

## 204. STUDIES IN AMERICAN TETTIGONIIDAE (ORTHOPTERA)

	<i>Measurements (in millimeters)</i>				
	Length of body	Length of pronotum	Length of tegmen	Length of caudal femur	Length of cercus
♂					
Cape Henry, Va. . . . .	12.6	3.1	8.6	11.9	1.8
Wrightsville, N. C., Type . . . . .	12.9	3.1	7.3	10.9	1.8
Wrightsville, N. C., Paratypes . . . . .	11.9-13.7	3.1-3.4	6.8-8.3	10.7-12.3	1.6-1.9
Tybee Island, Ga. South Jacksonville, Fla. . . . .	14.2-15.2	3.3-3.8	8.2-9.6	12.2-13.3	1.8-2
	13.6-14.9	3.7-3.8	16-17.7	12.6-13	1.9-2
♀					Length of ovipositor
Wrightsville, N. C., Allotype . . . . .	13.7	3.4	7.8	12.2	10.7
Wrightsville, N. C., Paratypes . . . . .	11.6-15.8	3.2-3.8	7.1-7.4	12.1-13.2	10.6-10.8
Tybee Island, Ga. South Jacksonville, Fla. . . . .	14-15.9	3.7-4.3	7.2-9.3	12.7-15	10.7-11.7
	15.3-17.2	3.8-4.3	18.1-19.7	14-14.4	11.9-13.7
South Jacksonville, Fla. . . . .	16.3	4.1	9.7	15	12.8
Pablo Beach, Fla.	15.2	4.1	10.6	15.3	13.4

*Coloration.*—General color pale green (bright green in life). Dorsum of head and pronotum with a broad median band of cinnamon brown. Eyes natal brown to ecru drab (in life sometimes orange buff). Tegmina and wings transparent, light buff. Distal half of male abdomen, including cerci, orange buff (brighter and very striking in life), in living females the abdomen at the base of the russet ovipositor is usually washed with this color. Genicular areas of caudal femora frequently very weakly suffused with brown.

A distinct increase in size in the southward distribution of the species is noted, but each large series shows a decided amount of local size variability as well.

Macropterism is found in two males and three females from the vicinity of Jacksonville, Florida, out of the thirty-four specimens before us.

The degree of production of the distal portion of the male cerci is found to be occasionally variable.

The ventro-external margins of the caudal femora are armed with small but heavy spines, in number averaging four and five;

these are present in the twenty-nine perfect specimens before us as follows:

Number of spines,	1-4	2-2	3-4	3-5	3-6	4-4
Number of specimens,	1	1	2	2	2	2
Number of spines,		4-5	4-6	5-5	5-6	5-7
Number of specimens,		9	1	5	3	1

The present species is found in salt marsh vegetation on the beaches and along the tidal rivers of the Atlantic coast from Cape Henry, Virginia, to Pablo Beach, Florida.

*Specimens Examined:* 34; 14 males and 20 females.

Cape Henry, Virginia, VIII, 18, 1908, (R.; in dune vegetation on beach), 1 ♂.  
Oceanview, Virginia, VIII, 9, 1904, (Caudell), 1 ♀, [U. S. N. M.].

Wrightsville, North Carolina, IX, 7, 1911, (R. & H.; in undergrowth near beach and under live oaks in grass on edge of marsh), 5 ♂, 8 ♀, *type, allotype* and *paratypes*.

Tybee Island, Georgia, VIII, 12 and 13, 1903, (Morse), 3 ♂, 6 ♀; IX, 2, 1911, (H.; occasional along edge and in borders of salt marsh in high grasses), 6 ♂, 6 ♀.

Jacksonville, Florida, (T. J. Priddey), 1 ♀, [Hebard Cln.], (macropterous).

South Jacksonville, Florida, IX, 6 and 7, 1913, (W. T. Davis), 2 ♂, 3 ♀, [Davis Cln.], (2 ♂, 2 ♀ macropterous).

Pablo Beach, Florida, VIII, 11, 1905, (R. & H.), 1 ♀.

**Conocephalus nigropleurum** (Bruner) (Pl. XVI, fig. 15; XVII, 14; XVIII, 27 and 28; XIX, 14; XX, 15.)

1891. *Xiphidium nigropleurum* Bruner,<sup>48</sup> Can. Ent., xxiii, p. 58. [Eastern Nebraska to Antelope County.]

1898. *Xiphidium nigropleura* Scudder, Can. Ent., xxx, p. 184. (Emendation, in key to species.)

The coloration of the present insect makes it the most beautiful, and one of the most distinctive in appearance, of the North American forms. The margins of the lateral lobes and of the dorsum of the pronotum, the limbs, tegmina and cerci are a rich and vivid green; the face and genae, sides of body just below proximal portion of the tegmina and median areas of the lateral lobes and the dorsum of the pronotum, are dark brown; the dorsal surface of the head is marked with a median black line, the portions between this and the eyes are yellowish brown. The abdomen is shining black, the dorsum of the same sometimes dark brown, particularly in females.

<sup>48</sup> Single type selected by Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1912, p. 124, (1912).

Lateral lobes of pronotum ample (larger than in *C. attenuatus*), cephalic margin straight to the distinct but broadly obtuse-angulate ventro-cephalic angle, thence straight to the rather narrowly rounded ventro-caudal angle which is less than 90° (not as narrow as in *attenuatus*), caudal margin nearly straight, almost imperceptibly convex to the very weakly defined humeral sinus, convex callosity narrow but distinct.

Three females are macropterous in the series of ninety-two specimens of the present species which we have examined.

When compared with those of *attenuatus*, the male cerci are found to be of similar general type but decidedly straighter and less attenuate; the swollen portion is shorter and larger and the distal portion is shorter; moderately but distinctly depressed and not directed outward, the tooth is in the same position but has its base broader and more flattened.

The caudal femora are rather long but with the proximal portion well developed; the genicular areas of the same are occasionally infuscated, while the genicular lobes are bispinose.

The ventro-external margins of the caudal femora are armed as follows in forty-seven perfect specimens examined:

Number of spines,	0-3	1-2	1-3	1-4	2-2	2-3	2-4
Number of specimens,	1	3	4	1	5	8	2
Number of spines,	3-3	3-4	4-4	4-5	4-6	5-5	
Number of specimens,	8	10	1	2	1	1	

The present species is found in the upper Mississippi valley region and northward to Ithaca, New York; extreme southwestern Ontario; Gun Lake, Michigan, and Lone Rock, Wisconsin: in western distribution it will probably not be found to occur far west of the well watered portions of eastern Nebraska (Halsey being the westernmost record) and in eastward distribution it is probably limited by the Appalachians.

*Specimens Examined:* Previously definitely recorded, 16. Here recorded, 76; 34 males, 29 females, 6 immature males and 7 immature females.

Ithaca, New York, VIII, 22 and 25, 1891, (Morse), 15 ♂, 12 ♀, 2 juv. ♀, [Morse Cln.]; VIII, 4 to X, 12, 1885 to 1912, 13 ♂, 11 ♀, [Cornell Univ.], (1 ♀ macropterous); VI, 28 to VIII, 4, 1885 and 1887, 6 juv. ♂, 3 juv. ♀, [Cornell Univ.].

Gun Lake, Michigan, VIII, 13 to 26, 1912, (M. A. Carriker, Jr.), 1 ♂, 1 ♀, Hebard Cln.]

Lone Rock, Wisconsin, VIII, 12, 1906, (J. D. Hood), 1 ♀, [Pa. State Dept. Zool.].

Denison, Iowa, VII, 20, (J. A. Allen), 1 ♀, [M. C. Z.].

West Point, Nebraska, VIII and IX, 1884 and 1887, (Bruner), 5 ♂, *type* and *paratypes*, [Hebard Cln. and A. N. S. P.].

Lincoln, Nebraska, VIII and IX, 1888, (Bruner), 2 ♀, *allotype* and *paratype*, [Hebard Cln.], (1 macropterous).

Halsey, Nebraska, VII, 12, 1909, (R.; in grasses on river plain), 2 juv. ♀.

Watertown, Illinois, VIII, 9, (McNeill), 1 ♀, [M. C. Z.].

**Conocephalus attenuatus** (Scudder) (Pl. XVI, fig. 16; XVII, 15; XVIII, 29 and 30; XX, 16.)

1869. *Xiphidium attenuatum* Scudder,<sup>49</sup> Trans. Am. Ent. Soc., ii, p. 305. [Illinois.]

1891. *Xiphidium* sp.? McNeill, Psyche, vi, p. 24. [Illinois.]

1891. [*Xiphidium*] *lanceolatum* Bruner, Can. Ent., xxiii, p. 59. (Nomen nudum.)

1892. *Xiphidium scudderi* Blatchley, Can. Ent., xxiv, p. 26. [Vigo County, Indiana.]

1892. [*Xiphidium*] *lanceolatum* Bruner, Ent. News, iii, p. 265. (Explanation of nomen nudum.)

Blatchley states, in 1903, that his *scudderi* was based upon the brachypterous condition of the present species.<sup>50</sup> This is true, and the name is consequently placed in the synonymy here without reservation.

The position of the present species is in group C of the subgenus *Xiphidion*, between *C. nigropleurum* and *C. nigropleuroides*. The form and length of the ovipositor in the female, and cercal characters in the male, afford features by which the species can be readily distinguished. The coloration and color pattern is also distinctive; the color pattern, however, showing a closer similarity to that of *nigropleuroides* than to any other form.

The face is warm buff with median portion mahogany red, radiating below to form a dark suffusion on the genae and extending upward on the sides, thus enveloping the postocular region; the lateral lobes of the pronotum, excepting the dorsal margin, are of the same color, while the medio-dorsal stripe of head and pronotum is somewhat darker. The remaining portions of the head, broad margins of the medio-dorsal stripe of head and pronotum, and the limbs, are warm buff, the femora very finely speckled with mahogany red. In the male, the abdo-

<sup>49</sup> The type of this species has been destroyed.

<sup>50</sup> Orth. of Indiana, p. 379.

men is amber brown with cerci slightly paler and more buffy; in the female, the abdomen is mahogany red with narrow and much interrupted dorso-lateral paler bands weakly suggested while the ovipositor is cinnamon brown.

Lateral lobes of pronotum moderately large with ventral margin and particularly ventro-caudal angle distinctly curved outward; cephalic margin broadly convex, with ventro-cephalic angle subobsolete, to the very sharply rounded ventro-caudal angle which is distinctly less than  $90^\circ$ , caudal margin nearly straight, almost imperceptibly convex, to the very weakly defined humeral sinus, convex callosity very narrow, subobsolete.

But seven of the series of sixty-five specimens here recorded are macropterous.

The male cerci are of a type almost intermediate between those of *C. nigropleurum* and *C. spartinae*; when compared with those of the latter species they are seen to be decidedly more ample and somewhat heavier, with tooth slightly heavier and directed proximad at a sharper angle; the externo-lateral margin is more concave than in either of the above species. An abnormality, which we have never before seen, is found in a single male from Cornwells, Pennsylvania; this specimen is adult, but the cerci have remained as in the instar preceding maturity.

The ovipositor is very gently curved upward, tapering very gently distad to the sharp apex, with greater portion of dorsal margin and distal portion of ventral margin supplied with widely spaced microscopic serrulations, a condition not found in any other species of the present genus here considered, but the normal condition in the genus *Orchelimum*. The ovipositor length is as follows: Cornwells, Pennsylvania, 24.6–27.5; Vigo County, Indiana, 23.4–26.2; West Point, Nebraska, 19.9–26.3; Lincoln, Nebraska, 25.4–27.8 mm.

The genicular areas of the caudal femora are not darkened and the genicular lobes of the same are normally strongly bispinose, occasionally unispinose. The caudal femora are long and slender and have the ventro-external margins armed as follows in 54 perfect specimens examined:

Number of spines,	0-0	0-1	0-2	1-1	1-2	1-3	1-4	2-2
Number of specimens,	3	2	2	4	10	4	1	5

Number of spines,	2-3	2-4	3-3	3-4	3-5	4-4	4-5
Number of specimens,	9	1	4	5	1	1	2

Two examples have the ventro-internal margins of these femora armed with 0-1 and one with 1-2 spines, this is a very unusual condition found elsewhere in the North American species even more rarely in *C. fasciatus* alone.

On a special excursion to Cornwells, Pennsylvania, undertaken to secure a series of this species, it was found very scarce in high grasses, (*Panicum virgatum*), and plants along the shore of the Delaware river, and in moderate numbers in a small marshy area, particularly in a restricted growth of low marsh grass, (*Panicularia septentrionalis*). The males were usually found in the grass or perched on nearby plant leaves, whence they sprang away with alacrity. The females were never as conspicuous and sprang away with great swift leaps, then, hiding on the opposite sides of grass stems and leaves in the deepest tangles of vegetation, they proved very difficult to locate. The species may be said to be easily the most alert and active of the genus found about Philadelphia. Over its wide distribution it is doubtless restricted to damp spots and marsh areas.

The present species is known from Ithaca, New York, and the vicinity of Philadelphia, Pennsylvania, westward to eastern Nebraska and Kansas; it apparently enjoys the most general distribution in the region south of the Great Lakes, and is probably very local and usually scarce everywhere east of the Appalachians. The most northern records are extreme southwestern Ontario (Rondeau and Point Pelee) and Minnesota.

*Specimens Examined:* Previously recorded, 15. Here recorded, 65; 28 males, 34 females, 1 immature male and 2 immature females.

The Cove, Ithaca, New York, X, 27, 1912, 2 ♂, 3 ♀, [Cornell Univ.].

Cornwells, Bucks County, Pennsylvania, IX, 7, 1914, (H.), 25 ♂, 14 ♀, 1 juv. ♂, 1 juv. ♀; X, 11, 1906, (R. & H.), 1 ♀.

Philadelphia, Pennsylvania, 1897, (C. W. Johnson), 1 ♀, [Morse Cln.], (macropterous).

Harrisburg, Pennsylvania, VIII, 19, 1 juv. ♀, [Pa. State Dept. Zool.].

Watertown, Illinois, VIII, 23, (McNeill), 1 ♀, [M. C. Z.].

West Point, Nebraska, IX, 1885, (Bruner), 11 ♀, [Hebard Cln.], (4 macropterous).

Lincoln, Nebraska, VIII, (1 ♀ macropterous collected at light), 1 ♂, 3 ♀, [Hebard Cln.], (1 ♂, 1 ♀ macropterous).



**Conocephalus nigropleuroides** (H. Fox) (Pl. XVI, fig. 17; XVII, 16; XIX, 1 and 2; XX, 17.)

1907. *Xiphidium nigropleurum* (?) Rehn and Hebard (not *Xiphidium nigropleurum* Bruner, 1891), Proc. Acad. Nat. Sci. Phila., 1907, p. 313. (In part.) [Cedar Keys, Florida.<sup>51</sup>]

1912. *Xiphidium nigropleuroides* H. Fox,<sup>52</sup> Ent. News, xxiii, p. 116, Pl. IX, figs. 1 to 5. [Cape May County, New Jersey.]

The present insect resembles *C. spartinae* more closely than any other species in the form of the male cerci. The color pattern, though distinctive, shows the nearest similarity to that of *C. attenuatus*. The shades of color in this insect, particularly striking and brilliant in life, are not found in any other North American species. The species, though decidedly smaller and more slender than *spartinae* in New Jersey, increases southward in size and robustness to a very decided degree, as does *spartinae* in size to a considerably less extent; so that in material of the two species from Florida, the present insect is distinctly the larger and more robust of the two. The variation in shape of the ovipositor is far greater in *nigropleuroides* than in any other American species of the genus.

The medio-dorsal stripe of head and pronotum is blackish-brown; the face, postocular portion of genae and lateral lobes of pronotum very dark brown, these markings giving the insect a trifasciate appearance. This is greatly intensified by the pale coloration of the intervening portions of head and pronotum, which are cream color. In fresh material the tegmina, limbs and male cerci are very bright sea green, or grass green in some series, while the distal portion of the male abdomen is brilliantly marked with orange. In the female this latter color is weaker and occupies a decidedly lesser area. The brightest colors in this insect are unusually hard to preserve, only traces of the same remaining in the majority of dried specimens before us.

Lateral lobes of pronotum with cephalic margin broadly convex to the ventro-caudal angle, with ventro-cephalic angle weakly defined and ventral margin often irregular and slightly concave before the ventro-caudal angle which is broadly rounded, angu-

<sup>51</sup> The authors' record of a single specimen of this species from Gainesville, Florida, is here corrected as it is due to a mistake in labelling, the specimen having been taken at Cedar Keys, Florida, the day previous.

<sup>52</sup> Single type selected by H. Fox, Ent. News, xxiii, p. 232, (1912).

lation of same a little less than  $90^\circ$ , caudal margin rather irregularly convex to the rather weak humeral sinus, convex callosity moderately but not decidedly broad. As in *attenuatus*, the ventral margin and particularly the ventro-caudal angle is sharply but narrowly curved outward.

Macropterism is found in but four females, all from Cumberland Island, Georgia, in the series of over one hundred and sixty-eight specimens before us.

When compared with *spartinae*, the male cerci are found to be very similar but more attenuate and slightly irregular in outline, this irregularity giving the organs the appearance of being a little malformed.

The ovipositor is normally rather broad and approximately straight in direction with a weak open-sigmoid curvature. In the series of eight specimens from Cedar Keys, Florida, we find this type in three, and a distinctly thought not strongly upward curved type in five, the ovipositor in these being broader and showing an even greater curvature than is normal in *spartinae*. The development of two distinct types of ovipositor in the same species at one locality is a problem which we have also encountered in *Orchelimum concinnum*. The females here considered belong without the slightest doubt to the same species and the cause of this varied development is yet highly problematical. Elsewhere in the species of the genus some individual variation naturally occurs in degree of curvature and heaviness of the ovipositor, but the appearance here of two distinct types, elsewhere of decided importance and value as specific characters, is very surprising. Differentiation in method of oviposition and selection of certain different plants for this purpose has probably been a major factor in the development of the different types of ovipositor now to be found in various species of the genus, but when two distinct types are found in the same species it would lead one to suppose them to be the result of these same factors. The difficulty is that with such development the different forms have as a rule developed into distinct species, which in the present instance is not the case. The ovipositor length is as follows: Ventnor, New Jersey, 10.7-12; Ocean View, New Jersey, 11.1-12.8; Ocean View, Virginia, 12.7-13.8; Wrightsville, North Carolina, 11.4-12; Cumberland Island,

Georgia, 13.9–15.9; Cedar Keys, Florida, open-sigmoid, 13.2–14.1, arcuate, 12.4–14.6 mm.

The genicular areas of the caudal femora are not darkened, the genicular lobes are normally bispinose but occasionally unispinose; the caudal femora are elongate but with the proximal portion more swollen than in *spartinae*, the ventro-external margins are unarmed in all but two of the ninety specimens from New Jersey before us, in the more southern material these margins are armed as follows in forty-one perfect specimens examined:

Number of spines,	0-0	0-1	0-2	1-1	1-2	2-2
Number of specimens,	24	6	5	3	1	2

The present insect appears to be absolutely limited in distribution to the salt-marsh tidal flats. It is known from Ventnor, New Jersey, to Cumberland Island, Georgia, on the Atlantic Coast, and from Cedar Keys, Florida, on the Gulf coast.

*Specimens Examined:* Previously recorded, over 30. Here recorded, 138; 67 males, 54 females, 5 immature males and 12 immature females.

Ventnor, New Jersey, VIII, 5, 1914, (H.; very abundant in high *Spartina stricta* and in nearby *Spartina patens*, many immature individuals but few adults), 40 ♂, 22 ♀, 5 juv. ♂, 12 juv. ♀.

Ocean City, New Jersey, VIII, 14, 1914, (H.; occasional in *Spartina stricta* far out on tidal marsh), 5 ♂, 4 ♀.

Cape May Court House, New Jersey, VIII, 14, 1914, (H.; scarce in *Spartina stricta* far out on tidal marsh), 2 ♂.

Oceanview, Virginia, VIII, 9, 1904, (Caudell), 2 ♀, [U. S. N. M.].

Wrightsville, North Carolina, IX, 7, 1911, (H.; along tidal channels on salt marsh), 1 ♂, 4 ♀.

Cumberland Island, Georgia, VIII, 31, 1911, (H.; in fringing tidal salt marsh), 12 ♂, 14 ♀, (4 ♀ macropterous).

Cedar Keys, Florida, VIII, 15, 1905, (H.; in tidal salt marsh), 7 ♂, 8 ♀.

***Conocephalus spartinae*** (H. Fox) (Pl. XVI, fig. 19; XVII, 17; XIX, 3 and 4; XX, 18.)

1862. *Xiphidium brevipennis* Scudder (not *Xiphidium brevipennis* Scudder, August and September, 1862), Bost. Journ. Nat. Hist., vii, p. 451. November, 1862. (In part.) [Cape Cod, Massachusetts.]

1902. *Xiphidion nemorale* Rehn (not *Xiphidium nemorale* Scudder, 1875), Ent. News, xiii, p. 315. [Atlantic City, New Jersey.]

1904. *Xiphidion brevipenne* Rehn (not *Xiphidium brevipennis* Scudder, 1862), Ent. News, xv, p. 330. (In part.) [Atlantic City and Cape May, New Jersey.]

1912. *Xiphidium spartinae* H. Fox,<sup>53</sup> Ent. News, xxiii, p. 111, pl. VIII, figs. 1 to 6. [Wood's Hole, Massachusetts; salt marshes of southern New Jersey.]

<sup>53</sup> Single type selected by H. Fox, Ent. News, xxiii, p. 232, (1912).

The descriptions by Fox of this species and *C. nigropleuroides* are complete, thorough and very different from the usual careless and insufficient descriptions of the species of the present genus.

The present species bears a very decided general resemblance to *C. brevipennis*, so close that, until studied by Fox, virtually all of the material in collections had been confused with that species. When compared with *brevipennis*, we find that *spartinae* differs signally in the male cerci, while females may usually be separated by the ovipositor which normally shows a very weak but appreciable curvature, this appendage in *brevipennis* being normally straight. In addition, material of the present species from the North Atlantic coast is small and more slender than *brevipennis*, but in southward distribution it attains a size quite as great as the largest examples of that species. The pronotum is much as in *brevipennis* but has the lateral lobes not quite as deep with the ventro-caudal angle rather sharply rounded, the tegmina are more delicate (not quite as delicate as in *C. aigialus*), with the male tympanum having the stridulating vein distinctly longer, this area being slightly more transverse in proportion to the length than in *brevipennis*—this is true of *aigialus* which, however, has the tympanal area appreciably smaller. The distinctive male cerci show at once that the position of the species is in group C, while *brevipennis* belongs to group A. These cerci are slender and symmetrical, an elongate bulbous swelling occupies the mesal half, at the base of which is situated interno-ventrad a small slender tooth directed mesad with a very weak inclination proximad, the external margin of the cercus is moderately concave, beyond the bulbous area the cercus is weakly depressed, this distal portion with sides subparallel to the broadly rounded apex. These cerci differ from those of *brevipennis* not only in shape but in coloration as well, being bright green except in the darkest individuals in which they are pale olive.

In coloration, material from New Jersey often shows an intensive condition, in this the medio-dorsal stripe of the head and particularly the pronotum is very broadly margined by pale buff, and below this the lateral lobes of the pronotum are marked

with a postocular reddish brown suffusion; no examples of such coloration are found in southern material. In *brevipennis*, when the lateral lobes of the pronotum are suffused with a darker color, this color usually extends upward nearly to the medio-dorsal stripe of the dorsum, as the pale margins of this stripe are normally very narrow in that species, and as a result the intensive types of coloration in the two species are normally distinctly different in appearance. In general coloration, with the exception of the differences mentioned above and the green male cerci, this species agrees with *brevipennis*.

The genicular areas of the caudal femora are normally not darkened, in occasional specimens they are weakly infuscated; the genicular lobes of the same are normally bispinose, rarely they are found to be unispinose, while a single female (Wesquage Beach, Rhode Island) has one genicular lobe trispinose; the ventro-external margins of the caudal femora are armed in one hundred and eighty-one perfect specimens examined as follows:

Number of spines,	0-0	0-1	0-2	0-3	1-1	1-2	1-3	1-4
Number of specimens,	15	32	12	2	20	40	10	2
Number of spines,	2-2	2-3	2-4	2-5	3-3	3-4	4-4	
Number of specimens,	20	16	4	1	3	3	1	

Macropterism is very rare in material from the Atlantic coast, but appears to be of frequent occurrence on the Gulf coast. As there is a gradual but not decided increase in size southward in the distribution of the species, we find such macropterous examples from the Gulf coast to be, in general appearance only, very similar to *C. fasciatus*.

The ovipositor is very weakly curved upward but varies to an almost straight condition; specimens showing the extreme of this variation are often frequently difficult to separate from females of *brevipennis*, which have the ovipositor approaching the minimum length found in that species. The ovipositor length<sup>54</sup> is as follows: Wesquage Beach, Rhode Island, 9; Chestnut

<sup>54</sup> Our ovipositor length measurements are, as elsewhere in the present series of papers, taken from the base of the basal plica to the apex of the ovipositor; this explains the measurements of other authors exceeding ours by about .4 mm. where the length has been taken from the juncture of ovipositor and subgenital plate to apex of ovipositor. We have not used this dimension as it is not sufficiently accurate, the position of the movable subgenital plate affecting it.

Neck, New Jersey, 7.2-8.3; Atlantic City, New Jersey, 7.1-8.8; Ventnor, New Jersey, 7.6-8.7; Ocean City, New Jersey, 8-9.7; Oceanview, Virginia, 9; Wrightsville, North Carolina, 9.1; Tybee Island, Georgia, 8.1-9.8; Virginia Point, Texas, 8.2-9.9 mm.

This species has almost without exception been found in salt marshes, usually in *Spartina patens*, covering the tidal flats. The chiefly macropterous series taken at Virginia Point, Texas, was, however, in high and heavy grasses, where the following field note was made, "A difficult species to capture as individuals are very restless and immediately seek shelter by jumping down low in the bunches of grass where they are very hard to follow." On the coast of New Jersey the species is frequently to be found in great numbers on the salt marshes, both in *Spartina patens* and *Panicularia fluitans*, where large series could be taken with ease. The present insect is now known from Cape Cod, Massachusetts, to Miami, Florida on the Atlantic coast, and on the Gulf coast from Virginia Point, Texas, to Everglade, Florida.

*Specimens Examined:* Previously correctly recorded, over 30. Here recorded, 253; 123 males, 106 females, 8 immature males and 16 immature females.

Cape Cod, Massachusetts, (Scudder), 8 ♂, 15 ♀, [M. C. Z.].

Saunderstown, Rhode Island, IX, 9, 1913, (H.; in marsh grasses), 1 ♂.

Wesquage Beach, Rhode Island, IX, 10, 1913, (H.; salt marsh), 1 ♀.

New Haven, Connecticut, VIII, 27, 1904, (B. H. Walden), 1 ♂, [Hebard Cln.].

Mullica River flats, Burlington County, New Jersey, VIII, 24, 1914, (H.; occasional in short grasses, *Panicularia fluitans*, on salt marsh), 2 ♂, 1 ♀.

Chestnut Neck, Atlantic County, New Jersey, VIII, 16, 1911, (R. & H.; very common on tidal flats in *Spartina patens*), 15 ♂, 6 ♀.

Atlantic City, New Jersey, IX, 11, 1902, (R.; tidal flats), 3 ♀.

Ventnor, New Jersey, VIII, 5, 1914, (H.; 1 ♀ in marshy depression on barrier beach, and moderately numerous but adults few on tidal flats in *Spartina patens*), 10 ♂, 5 ♀, 9 juv. ♀.

Margate City, New Jersey, VII, 24, 1914, (H.; in great numbers but adults occasional in salt marsh particularly in areas of *Panicularia fluitans*), 9 ♂, 11 ♀, 5 juv. ♂, 4 juv. ♀.

Ocean City, New Jersey, VIII, 14, 1914, (H.; adults in moderate numbers on tidal flats in *Spartina patens*), 4 ♂, 7 ♀, 1 juv. ♂, (1 ♂ macropterous).

Cedar Springs, New Jersey, VIII, 26, 1914, (H.; very scarce in fresh marsh), 1 ♂.

Cape May Court House, New Jersey, VII, 20, 1914, (H.; exceedingly abundant but adults very scarce on tidal flats in *Spartina patens*), 2 ♂, 1 juv. ♂, 2 juv. ♀; VIII, 14, 1914, (H.; adults only, moderately numerous in same locality), 13 ♂, 12 ♀, (1 ♂ macropterous).

Cold Spring, New Jersey, IX, 4, 1907, (B. Long), 1 ♀, [A. N. S. P.].

Cape May, New Jersey, VIII, 7, 1903, (H. L. Viereck), 2♂, 1♀, [A. N. S. P.].

Oceanview, Virginia, VIII, 8, 1904, (Caudell), 1♂, 1♀, [U. S. N. M.].

Virginia Beach, Virginia, VII, 2, 1903, (Morse), 1♂, 1♀, [Morse Cln.], (macropterous).

Wrightsville, North Carolina, IX, 7, 1911, (H.; very scarce in grasses fringing barrier beach tidal lagoon), 1♂, 1♀.

Tybee Island, Georgia, VIII, 12 and 13, 1903, (Morse), 7♂, 5♀, [Morse Cln.]; IX, 2, 1911, (H.; common and found far out on tidal flats in low grass), 25♂, 18♀, 1 juv. ♂, 1 juv. ♀, (1♀ macropterous).

Miami, Florida, (Mrs. A. T. Slosson), 1♂, [Morse Cln.].

Buras, Louisiana, VII, 25, 1905, (Morse), 8♂, 5♀, [Morse Cln.], (1♂ macropterous).

Virginia Point, Texas, VII, 21, 1912, (H.; common in heavy grasses in salt marsh), 11♂, 12♀, (9♂, 12♀ macropterous).

#### Subgenus *Anarthropus*<sup>55</sup> new subgenus

The subgenus is known to include two species; of these one, *C. (A.) saltans* (Scudder), is North American and the other, *C. (A.) javanicus* (Redtenbacher),<sup>56</sup> is Javan.

*Type of subgenus.*—*Conocephalus saltans* [*Xiphidium saltans*] (Scudder).

*Subgeneric Description.*—Prosternum unarmed. Subgenital plate of male of the normal type found in the genus; distal margin transverse, bearing minute styles laterad. Ventral margins of cephalic and median femora armed with six well spaced spines. Caudal tibiae with dorsal and ventral pairs of distal spurs absent, armed at the distal extremities with a single pair of well-developed median spurs. Size small to very small for the genus, form rather slender.

***Conocephalus saltans*** (Scudder) (Pl. XVI, fig. 19; XVII, 18; XIX, 7, 8 and 15; XX, 19.)

1862. *Xiphidium brevipenne* Scudder, Can. Nat. and Geol., vii, p. 285. (In part.) [Red River Settlements, Manitoba.]

1872. *Xiphidium saltans* Scudder,<sup>57</sup> Fin. Rept. U. S. Geol. Surv. Nebr., p. 249. [Banks of the Platte River, Nebraska.]

<sup>55</sup> From *ἀναρπος*=weak and *πῶς*=foot, in allusion to the missing dorsal and ventral pairs of spurs of the caudal tibiae.

<sup>56</sup> Abh. k.-k. zool.-botan. Gesell. Wien, xli, p. 526, (1891). The male of this species has the cercus similar to that of *saltans*, but with tooth exceedingly long, evenly and decidedly curved downward.

<sup>57</sup> Single type here designated: ♀; Platte [River, Nebraska], (Hayden), [M. C. Z.]. Measurements; length of body 12.8, of tegmen 2.7, (caudal femora missing), of ovipositor 13.7 mm.

1891. *Xiphidium modestum* Bruner, Can. Ent., xxiii, p. 56. [Eastern and middle Nebraska.]

1891. *Xiphidium taeniatum* Redtenbacher, Verh. Zool.-botan. Gesell. Wien, xli, pp. 498, 520. [Texas.]

Scudder has properly placed *modestum* and *taeniatum* in the synonymy under the present species.<sup>58</sup>

Typical *saltans* is normally small to very small, and both slender and delicate in structure. A brown phase of coloration is frequently met with, particularly in the southeastern states, but a green color form is also not unusual elsewhere, and in this phase the insect very closely resembles a small example of *C. strictus*.

Pronotum with cephalic margin convex and ventro-cephalic angle weakly indicated to the broadly rounded ventro-caudal angle which is almost 90°, caudal margin weakly convex to the very broad and distinct humeral sinus, convex callosity very broad.

An extremely brachypterous type is normal, and it is consequently rather surprising to find twelve of the two hundred and six specimens recorded strongly macropterous, all of these being from the western portions of the insect's distribution.

The caudal femora have the ventral margins unarmed, the genicular areas not darkened and the genicular lobes unispinose.

The male cerci are of a wholly different type from that of any other North American species, being very slender with a very long slender tooth situated interno-mesad and slightly beyond the middle of the shaft; the distal portion of the cercus tapers evenly to the narrowly rounded apex and is very weakly indented above.

The ovipositor is normally weakly curved and in length measures as follows: Atsion, New Jersey, 10.5-10.7; Fern Hill, Pennsylvania, 12.6-12.9; Asheville, North Carolina, 10.9-13; Thomasville, Georgia, 13.8-15.8; West Point, Nebraska, 9.7-13.8; Sidney, Nebraska, 10.8-13.2; southwestern Nebraska, 15; Dodge City, Kansas, 15.2; Colorado Springs, Colorado, 14.1-15.3; Dallas, Texas, 15.9.

The present insect is one of the latest species to appear in the southeastern United States, the great majority were found on

<sup>58</sup> Can. Ent., xxx, p. 184, (1898).



the coast of the Carolinas to be immature as late as early September. Among the nearly adult females taken there, the ovipositor ranges from 13.7 to 14.9 mm., which, with our adult series from Thomasville, Georgia, shows that over the lowlands of the southeastern United States the ovipositor averages very long. Males from this region also show the cerci averaging slightly longer and more slender than elsewhere in the distribution of the insect, but, when the variation in almost every large series is noted, the above results, though showing very possibly an incipient geographic differentiation, are by no means sufficient to warrant the recognition of a geographic race. Individuals from Texas and Oklahoma average much the largest of any specimens before us.

The species is widely and generally distributed over the prairies of the middle west, east of this its distribution appears to be more or less discontinuous, the insect preferring sandy or other areas of poor soil such as the serpentine outcrops in Pennsylvania.

The present species is known on the Atlantic coast from the East Plains and Brown's Mills, New Jersey, southward to Yemassee, South Carolina and Thomasville, Georgia, and is probably distributed, except in the northern portion of this region, westward to the base of the Appalachians. The northernmost points of distribution are Toronto, Ontario; the Red River, Aweme and the Souris River, Manitoba, and Moose Jaw, Saskatchewan. In western distribution it has been found along the Yellowstone River as far as Livingston, Montana, and has been taken in Colorado at Fort Collins and Manitou. The most southwestern records are Springer, New Mexico, and Amarillo and Dallas, Texas.

*Specimens Examined:* Previously recorded, over 30. Here recorded, 208; 73 males, 87 females, 17 immature males and 31 immature females.

Fern Hill, Chester County, Pennsylvania, IX, 19, 1908, (R. & H.; in grasses on serpentine outcrop), 6 ♂, 6 ♀.

Whitings, New Jersey, IX, 28, 1906, (B. Long), 1 ♂, [A. N. S. P.].

East Plains, Ocean County, New Jersey, VIII, 24, 1914, (H.; in glade of tall grass and also among dwarf pine and oak), 1 ♂, 3 juv. ♀.

Reega, New Jersey, VIII, 29 and 31, 1914, (H.; undergrowth of pine barren) 1 juv. ♂, 2 juv. ♀.

Petersburg, New Jersey, X, 1, 1910, (H. Fox; dry poor land among red cedars), 1 ♀, [A. N. S. P.].

- Somerset Heights, Maryland, V, 24, 1905, (E. S. G. Titus), 1 ♂, [U. S. N. M.].  
 Cabin John Run, Maryland, X, 1907, (W. Palmer), 1 ♀, [U. S. N. M.].  
 Washington, District of Columbia, VIII, 22 and IX, 6, 1878, 1 ♂, 1 ♀,  
 [U. S. N. M.].  
 Fayetteville, North Carolina, IX, 9, 1911, (R. & H.; immature specimens  
 abundant), 7 juv. ♂.  
 Wilmington, North Carolina, IX, 9, 1911, (R. & H.; immature individuals  
 common through undergrowth of pine woods, particularly in clumps of scrub  
 oak shoots), 4 ♂, 2 juv. ♂, 3 juv. ♀.  
 Winter Park, North Carolina, IX, 7, 1911, (R. & H.; as at Wilmington), 3 ♂,  
 4 juv. ♀.  
 Wrightsville, North Carolina, IX, 7, 1911, (R. & H.; in sandy pine woods),  
 1 juv. ♀.  
 Lake Waccamaw, North Carolina, IX, 8, 1911, (R. & H.), 1 juv. ♂.  
 Florence, South Carolina, IX, 6, 1911, (R. & H.; immature specimens common  
 in open grassy glade and in undergrowth of pine woods), 5 juv. ♂, 3 juv. ♀.  
 Yemassee, South Carolina, IX, 4, 1911, (R. & H.; in clumps of scrub oak  
 shoots in pine woods), 4 juv. ♂, 2 juv. ♀.  
 Atlanta, Georgia, VIII, 2, 1913, (R. & H.), 1 juv. ♂.  
 Stone Mountain, Georgia, VIII, 3, 1913, (R. & H.; immature specimens  
 moderately numerous in bunch grass areas in pine woods on mountain), 1  
 juv. ♂.  
 Spring Creek, Decatur County, Georgia, VII, 16 to 29, 1912, (J. C. Bradley),  
 1 very small juv., [Ga. State Cln.].  
 Pine, Indiana, IX, 3, 1906, (J. D. Hood), 1 ♀, [Pa. State Dept. Zool.].  
 Chicago, Illinois, IX, 9, 1903, (H.; in waste field), 1 ♀.  
 Staples, Minnesota, VII, 21, 1909, (H.; in sandy spot among wild strawberry  
 and other low plants), 7 ♂, 4 ♀, 1 juv. ♀.  
 Jefferson County, Iowa, VII, 20 to 24, (J. A. Allen), 3 juv. ♀, [M. C. Z.].  
 Dallas County, Iowa, VIII, 20 to 23, (J. A. Allen), 4 ♀, [M. C. Z.].  
 Hillsboro, North Dakota, VII, 24, 1891, 1 ♂, [Hebard Cln.].  
 Bismarck, North Dakota, VIII, 9, 1889, (Bruner), 2 ♂, 2 ♀, [Hebard Cln.].  
 Mandan, North Dakota, VII, 25, 1909, (H.; along streamlet on prairie in  
 grasses), 1 ♂, 1 juv. ♀.  
 Dickinson, North Dakota, VII, 25, 1909, (H.), 1 juv. ♀.  
 West Point, Nebraska, IX to X, 1882 to 1885, (Bruner), 4 ♂, 21 ♀, [Hebard  
 Cln.], (1 ♂, 2 ♀ macropterous).  
 Badger, Nebraska, 1 ♂, [Hebard Cln.].  
 Valentine, Nebraska, VIII, 10, 1888, 2 ♂, 1 ♀, [Hebard Cln.]; 1 ♂, 3 ♀,  
 [U. S. N. M.], (1 ♀ macropterous).  
 Gordon, Nebraska, (Bruner), 1 ♀, [U. S. N. M.].  
 Fort Robinson, Nebraska, VIII, 21, 1888, (Bruner), 2 ♀, [U. S. N. M.].  
 Glen, Nebraska, VIII, 6 to 20, 1903, 1 ♂, 3 ♀, [Hebard Cln.], (1 ♀ macrop-  
 terous).  
 Kearney, Nebraska, VII, 27, 1910, (R. & H.; river bottom grassland), 2 ♂,  
 2 ♀.

- North Platte, Nebraska, VII, 28, 1910, (R. & H.; river bottom grassland), 5 ♂, 5 ♀, (1 ♂ macropterous).
- Sidney, Nebraska, VII, 30, 1910, (R. & H.; river bottom grassland), 15 ♂, 13 ♀, (1 ♂, 1 ♀ macropterous).
- Wichita, Kansas, IX, 7, 1904, (F. B. Isely), 2 ♀, [U. S. N. M.], (1 macropterous).
- Dodge City, Kansas, IX, 13, 1909, (H.; in depressions of prairie), 2 ♂, 1 ♀.
- Waurika, Oklahoma, X, 14, 1909, (F. C. Bishopp), 1 ♀, [U. S. N. M.].
- Summit of Mount Sheridan, Oklahoma, VIII, 24, 1905, (Morse), 1 ♀, [Morse Cln.].
- Dallas, Texas, 1 ♂, 3 ♀, [M. C. Z.], (1 ♂, 2 ♀ macropterous).
- Clarendon, Texas, VIII, 18, 1905, (Morse), 1 ♂, [Morse Cln.].
- Amarillo, Texas, VIII, 19, 1905, (Morse), 3 ♂, [Morse Cln.].
- Moose Jaw, Saskatchewan, VIII, 24, 1903, (Caudell), 1 ♀, [U. S. N. M.].
- Glendive, Montana, VII, 26, 1909, (H.; river bottom area of grass and sagebrush), 1 juv. ♀.
- Forsythe, Montana, VII, 27, 1909, (H.; in cañon and in grassy depressions above bluffs), 2 ♂, 4 ♀.
- Billings, Montana, VII, 28, 1909, (R. & H.), 2 ♂.
- Livingston, Montana, VII, 29, 1909, (R. & H.; in field of dry grass), 1 ♂.
- Julesburg, Colorado, VII, 29, 1910, (R. & H.; river bottom grassland), 2 ♂, 1 ♀.
- Manitou, Colorado, VIII, 1889, 1 ♀, [Hebard Cln.].
- Springer, New Mexico, IX, 15, 1909, (C. N. Ainslie), 1 ♂, [U. S. N. M.].

## EXPLANATION OF PLATES

## Plate XV

- Fig. 1.—*Conocephalus allardi* (Caudell). Tray Mountain, Georgia. Subgenital plate of male (*paratype*). ( $\times 5\frac{1}{2}$ )
- Fig. 2.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba. Subgenital plate of male. ( $\times 5\frac{1}{2}$ )
- Fig. 3.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba. Male. Distal extremity of caudal tibia. ( $\times 20$ )
- Fig. 4.—*Conocephalus saltans* (Scudder). Fern Hill, Pennsylvania. Male. Distal extremity of caudal tibia. ( $\times 20$ )
- Fig. 5.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba. Male. Lateral outline of head. ( $\times 10$ )
- Fig. 6.—*Conocephalus resacensis* new species. Piper Plantation, Brownsville, Texas. Male (*type*). Lateral outline. ( $\times 3\frac{1}{2}$ )
- Fig. 7.—*Conocephalus aigialis* new species. Wrightsville, North Carolina. Male (*type*). Lateral outline. ( $\times 3\frac{1}{2}$ ) [Figure number omitted on plate.]
- Fig. 8.—*Conocephalus gracillimus* (Morse). Homestead, Florida. Male. Lateral outline of head. ( $\times 10$ )
- Fig. 9.—*Conocephalus hygrophilus* new species. Milneburg, Louisiana. Male (*allotype*). Lateral outline. ( $\times 4$ )
- Fig. 10.—*Conocephalus strictomerus* new species. Cedar Springs, New Jersey. Male (*type*). Lateral outline. ( $\times 4$ )

## Plate XVI

Outline of cephalic view of fastigium. ( $\times 25$ )

- Fig. 1.—*Conocephalus allardi* (Caudell). Tray Mountain, Georgia. Male (*paratype*).
- Fig. 2.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba. Male.
- Fig. 3.—*Conocephalus fasciatus vicinus* (Morse). Sisson, California. Male.
- Fig. 4.—*Conocephalus spinosus* (Morse). Coronado Beach, California. Female.
- Fig. 5.—*Conocephalus gracillimus* (Morse). Homestead, Florida. Male.
- Fig. 6.—*Conocephalus brevipennis* (Scudder). Tincum, Pennsylvania. Male.
- Fig. 7.—*Conocephalus resacensis* new species. Piper Plantation, Brownsville, Texas. Male (*type*).
- Fig. 8.—*Conocephalus nemoralis* (Scudder). Asheville, North Carolina. Male.
- Fig. 9.—*Conocephalus nemoralis* (Scudder). Asheville, North Carolina. Male. Unusually narrow condition.
- Fig. 10.—*Conocephalus occidentalis* (Morse). Sentinel, California. Male.
- Fig. 11.—*Conocephalus strictus* (Scudder). Mt. Airy, Pennsylvania. Male.

- Fig. 12.—*Conocephalus hygrophilus* new species. Milneburg, Louisiana. Male (*allotype*).
- Fig. 13.—*Conocephalus stictomerus* new species. Cedar Springs, New Jersey. Male (*type*).
- Fig. 14.—*Conocephalus aigialus* new species. Wrightsville, North Carolina. Male (*type*).
- Fig. 15.—*Conocephalus nigropleurum* (Bruner). West Point, Nebraska. Male (*type*).
- Fig. 16.—*Conocephalus attenuatus* (Scudder). Vigo County, Indiana. Male.
- Fig. 17.—*Conocephalus nigropleuroides* (Fox). Wrightsville, North Carolina. Male.
- Fig. 18.—*Conocephalus spartinae* (Fox). Chestnut Neck, New Jersey. Male.
- Fig. 19.—*Conocephalus saltans* (Scudder). Fern Hill, Pennsylvania. Male.

## Plate XVII

Outline of lateral lobe of pronotum. ( $\times 6$ )

- Fig. 1.—*Conocephalus allardi* (Caudell). Tray Mountain, Georgia. Male (*paratype*).
- Fig. 2.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba. Male.
- Fig. 3.—*Conocephalus fasciatus vicinus* (Morse). Sisson, California. Male.
- Fig. 4.—*Conocephalus spinosus* (Morse). Coronado Beach, California. Male.
- Fig. 5.—*Conocephalus gracillimus* (Morse). Homestead, Florida. Male.
- Fig. 6.—*Conocephalus brevipennis* (Scudder). Tincum, Pennsylvania. Male.
- Fig. 7.—*Conocephalus resacensis* new species. Piper Plantation, Brownsville, Texas. Male (*type*).
- Fig. 8.—*Conocephalus nemoralis* (Scudder). Asheville, North Carolina. Male.
- Fig. 9.—*Conocephalus occidentalis* (Morse). Sentinel, California. Male.
- Fig. 10.—*Conocephalus strictus* (Scudder). Mt. Airy, Pennsylvania. Male.
- Fig. 11.—*Conocephalus hygrophilus* new species. Milneburg, Louisiana. Male (*allotype*).
- Fig. 12.—*Conocephalus stictomerus* new species. Cedar Springs, New Jersey. Male (*type*).
- Fig. 13.—*Conocephalus aigialus* new species, Wrightsville, North Carolina. Male (*type*).
- Fig. 14.—*Conocephalus nigropleurum* (Bruner). West Point, Nebraska. Male (*type*).
- Fig. 15.—*Conocephalus attenuatus* (Scudder). Vigo County, Indiana. Male.
- Fig. 16.—*Conocephalus nigropleuroides* (Fox). Wrightsville, North Carolina. Male.
- Fig. 17.—*Conocephalus spartinae* (Fox). Chestnut Neck, New Jersey. Male.
- Fig. 18.—*Conocephalus saltans* (Scudder). Fern Hill, Pennsylvania. Male.

## Plate XVIII

Dorsal (shaded) and lateral outlines of male cercus. ( $\times 10$ )

- Figs. 1 and 2.—*Conocephalus allardi* (Caudell). Tray Mountain, Georgia. (Paratype.)
- Figs. 3 and 4.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba.
- Figs. 5 and 6.—*Conocephalus fasciatus vicinus* (Morse). Sisson, California.
- Figs. 7 and 8.—*Conocephalus spinosus* (Morse). Coronado Beach, California.
- Figs. 9 and 10.—*Conocephalus gracillimus* (Morse). Homestead, Florida.
- Figs. 11 and 12.—*Conocephalus brevipennis* (Scudder). Tinicum Island, Pennsylvania.
- Figs. 13 and 14.—*Conocephalus resacensis* new species. Piper Plantation, Brownsville, Texas. (Type.)
- Figs. 15 and 16.—*Conocephalus nemoralis* (Scudder). Asheville, North Carolina.
- Figs. 17 and 18.—*Conocephalus occidentalis* (Morse). Sentinel, California.
- Figs. 19 and 20.—*Conocephalus strictus* (Scudder). Mt. Airy, Pennsylvania.
- Figs. 21 and 22.—*Conocephalus hygrophilus* new species. Milneburg, Louisiana. (Allotype.)
- Figs. 23 and 24.—*Conocephalus stictomerus* new species. Cedar Springs, New Jersey. (Type.)
- Figs. 25 and 26.—*Conocephalus aigialis* new species. Wrightsville, North Carolina. (Type.)
- Figs. 27 and 28.—*Conocephalus nigropleurum* (Bruner). West Point, Nebraska. (Type.)
- Figs. 29 and 30.—*Conocephalus attenuatus* (Scudder). Vigo County, Indiana.

## Plate XIX

Dorsal (shaded) and lateral outlines of male cercus. ( $\times 10$ )

- Figs. 1 and 2.—*Conocephalus nigropleuroides* (Fox). Wrightsville, North Carolina.
- Figs. 3 and 4.—*Conocephalus spartinae* (Fox). Chestnut Neck, New Jersey.
- Figs. 5 and 6.—*Conocephalus saltans* (Scudder). Fern Hill, Pennsylvania.
- Figs. 7 and 8.—*Conocephalus saltans* (Scudder). Wilmington, North Carolina.

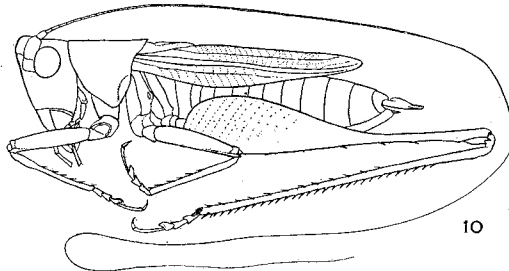
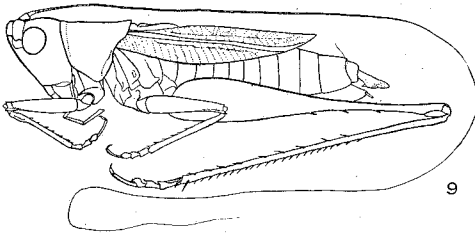
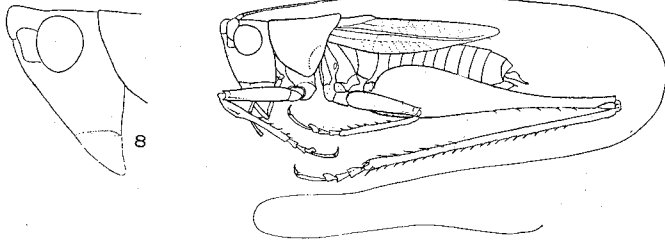
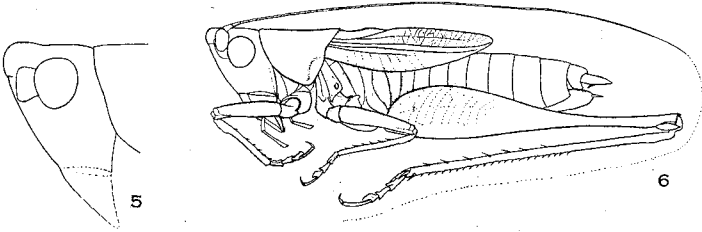
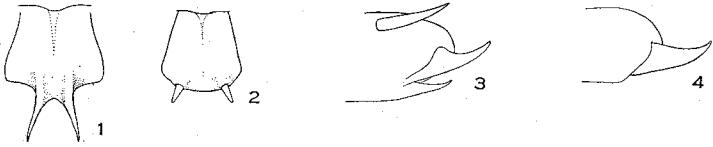
Stridulating field of male tegmen. ( $\times 7\frac{1}{2}$ )

- Fig. 9.—*Conocephalus allardi* (Caudell). Tray Mountain, Georgia. (Paratype.)
- Fig. 10.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba.
- Fig. 11.—*Conocephalus gracillimus* (Morse). Homestead, Florida.
- Fig. 12.—*Conocephalus nemoralis* (Scudder). Asheville, North Carolina.
- Fig. 13.—*Conocephalus occidentalis* (Morse). Sentinel, California.
- Fig. 14.—*Conocephalus nigropleurum* (Bruner). West Point, Nebraska. (Type.)
- Fig. 15.—*Conocephalus saltans* (Scudder). Fern Hill, Pennsylvania.

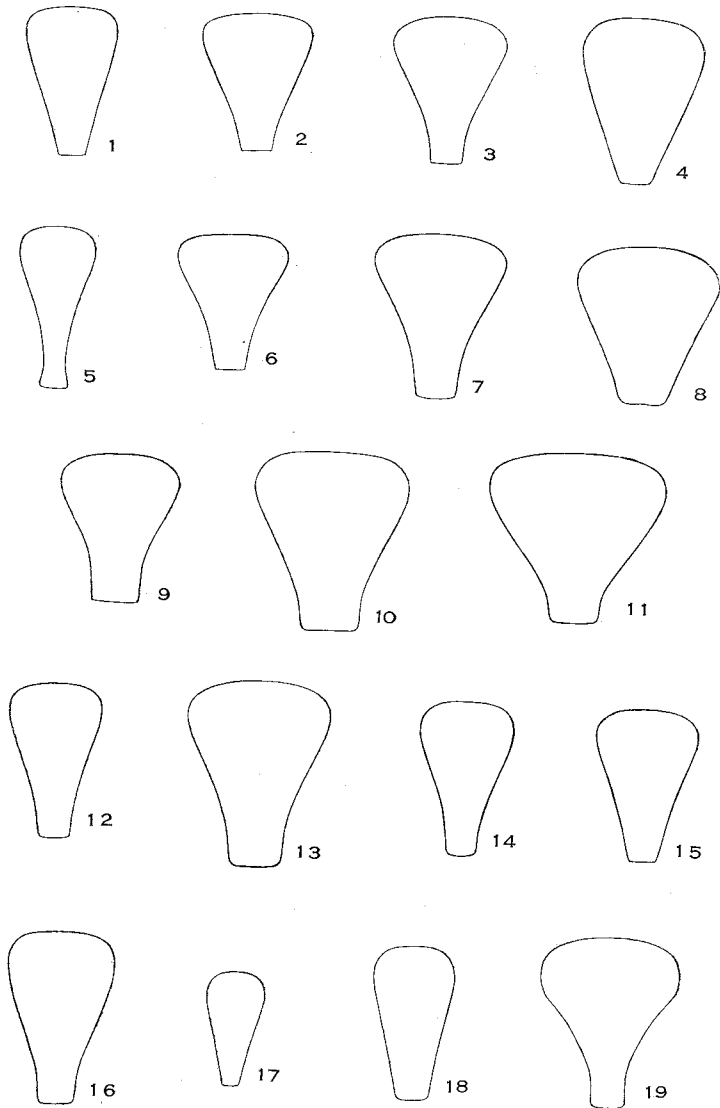
## Plate XX

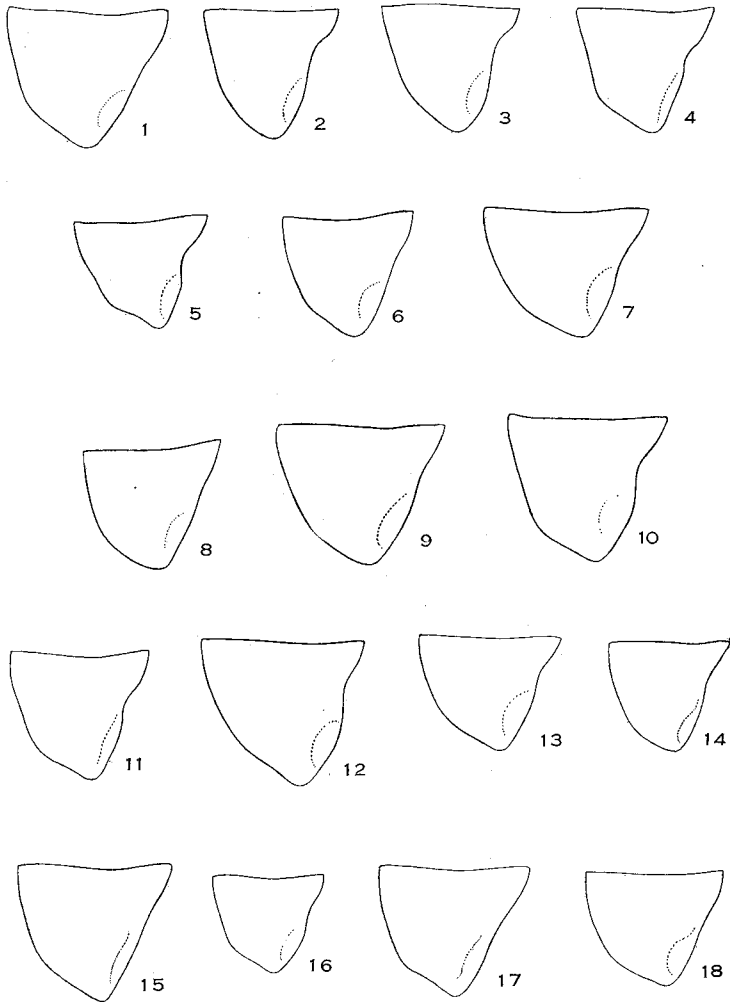
Outline of ovipositor. ( $\times 2$ )

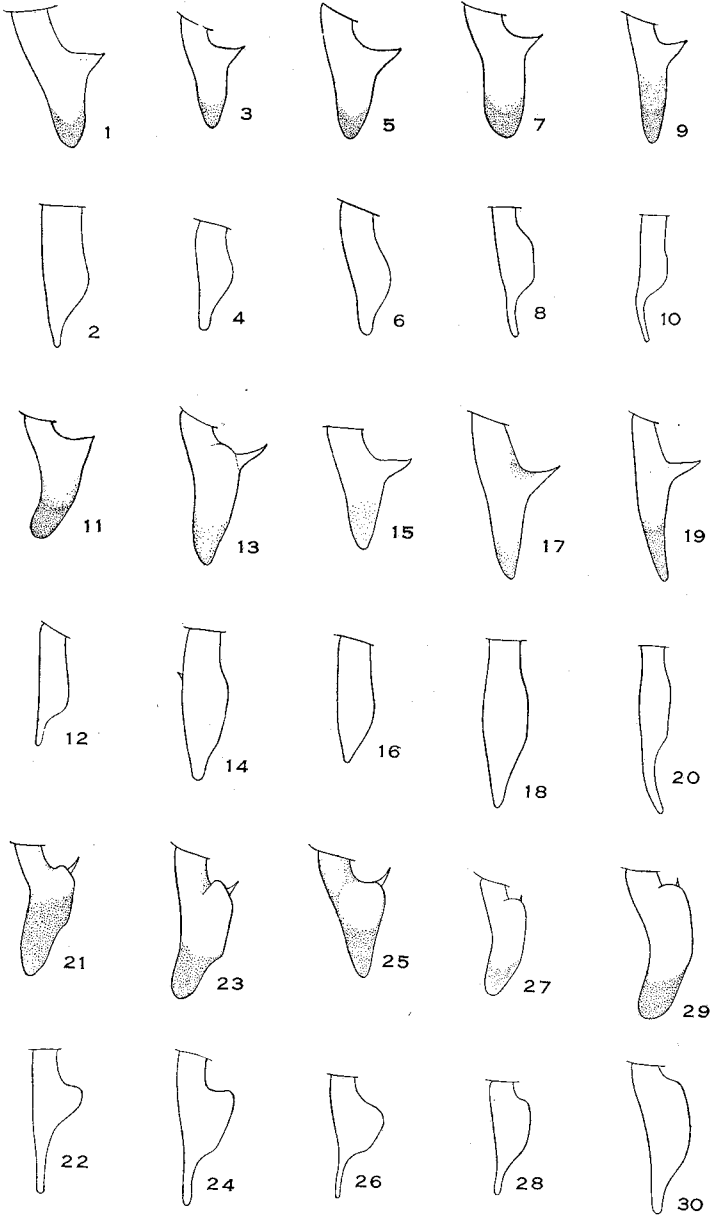
- Fig. 1.—*Conocephalus allardi* (Caudell). Tray Mountain, Georgia. (*Paratype*.)
- Fig. 2.—*Conocephalus fasciatus fasciatus* (DeGeer). Aweme, Manitoba.
- Fig. 3.—*Conocephalus fasciatus vicinus* (Morse). Sisson, California.
- Fig. 4.—*Conocephalus spinosus* (Morse). Coronado Beach, California.
- Fig. 5.—*Conocephalus gracillimus* (Morse). Homestead, Florida.
- Fig. 6.—*Conocephalus brevipennis* (Scudder). Tinicum, Pennsylvania.
- Fig. 7.—*Conocephalus brevipennis* (Scudder). Asheville, North Carolina.
- Fig. 8.—*Conocephalus resacensis* new species. Piper Plantation, Brownsville, Texas. (*Allotype*.)
- Fig. 9.—*Conocephalus nemoralis* (Scudder). Asheville, North Carolina.
- Fig. 10.—*Conocephalus occidentalis* (Morse). Sisson, California.
- Fig. 11.—*Conocephalus strictus* (Scudder). Raleigh, North Carolina.
- Fig. 12.—*Conocephalus hygrophilus* new species. Virginia Point, Texas. (*Type*.)
- Fig. 13.—*Conocephalus strictomerus* new species. Cedar Springs, New Jersey. (*Allotype*.)
- Fig. 14.—*Conocephalus aigialus* new species. Wrightsville, North Carolina. (*Allotype*.)
- Fig. 15.—*Conocephalus nigropleurum* (Bruner). Lincoln, Nebraska. (*Paratype*.)
- Fig. 16.—*Conocephalus attenuatus* (Scudder). West Point, Nebraska.
- Fig. 17.—*Conocephalus nigropleuroides* (Fox). Wrightsville, North Carolina.
- Fig. 18.—*Conocephalus spartinae* (Fox). Chestnut Neck, New Jersey.
- Fig. 19.—*Conocephalus saltans* (Scudder). Fern Hill, Pennsylvania.

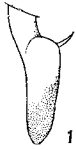












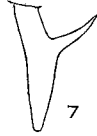
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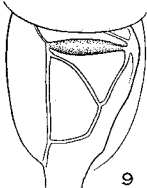
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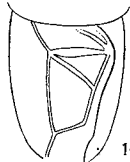
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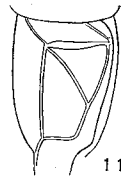
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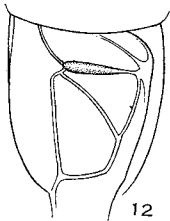
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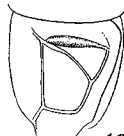
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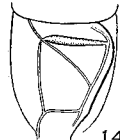
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