Subfamily III. COPIPHORINÆ.

The Cone-Headed Grasshoppers.

"Happy insect! what can be
In happiness compared to thee?
Fed with nourishment divine,
The dewy morning's gentle wine,
Nature waits upon thee still,
And thy verdant cup does fill;
'Tis filled wherever thou dost tread,
Nature's self thy Ganymede."—*Cowley.*

Species of medium or large size, having the vertex projected forward in the form of a cone, sometimes blunt, more often prolonged and pointed, this usually bearing on its lower surface a small basal tooth; face long, very oblique; eyes small; pronotum with not more than one transverse sulcus; prosternum with two slender spines; tegmina seldom expanded at middle, both they and the wings fully developed (except in *Belocephalus*); shrilling organ of male well developed, its cross-vein prominent; hearing organs present near base of front tibiæ; front coxæ with a spine on outer side; fore tibiæ without apical spines; hind femora slender, much thickened at base; hind tibiæ armed beneath with two rows of short spines and above with three pairs of apical spurs; tarsi depressed, their first two joints sulcate lengthwise on the outer side.

Karney (1912) recognized 43 genera as belonging to this subfamily, only four of which occur with us. The principal literature dealing especially with the American species is as follows: Redtenbacher, 1891; Blatchley, 1893, 1903; Saussure & Pictet, 1897—1899; Karney, 1907, 1912; Davis, 1912a, 1914, 1915; Rehn & Hebard, 1915, 1916.

KEY TO EASTERN GENERA OF COPIPHORINÆ.

a. Tegmina lobiform, covering less than half the abdomen; wings wanting or very rudimentary. I. Belocephalus.

aa. Tegmina and wings well developed.

b. Fastigium triquetrous or three-sided, flat, very rugose above and ending in a short, strongly decurved spine. II. Pyrgocorypha.

bb. Fastigium not triquetrous, usually conical, convex and nearly smooth above, the tip not ending in a decurved spine.

c. Fastigium with a tooth beneath, its lower face on a slightly higher plane and well separated from the median facial ridge; tegmina much surpassing hind femora, their tips broadly rounded. III. Neoconocephalus.

cc. Fastigium without a tooth beneath, its lower face on the same plane and scarcely separated from the median facial ridge; tegmina usually surpassed by hind femora, their tips then acute or narrowly rounded. IV. Homorocoryphus.

1. BELOCEPHALUS Scudder, 1875, 458. (Gr., "sharp" + "head.")

THE WINGLESS CONE-HEADED GRASSHOPPERS.

Medium sized Tettigoniids of rather robust form, having the vertex usually strongly produced in the form of a stout, sharply pointed cone bearing on its lower face a small basal tooth; eyes small, not prominent; pronotum subcylindrical, front and hind margins subtruncate or rounded, transverse sulcus at apical third very faint, lateral lobes longer than deep, their lower margin nearly straight, its angles obtusely rounded; tegmina of males shorter than pronotum, with shrilling organ well developed, partly transparent, those of females very small, widely separated lateral pads reaching only to second dorsal abdominal segment; front and middle femora subequal in length, armed beneath on outer margin with two to five minute teeth; hind femora slender, their lower outer margins with eight to ten, and inner with three to five rather stout teeth, lower lobe of knees ending in a small, acute spine. Male with supra-anal plate very broad, triangular, deeply emarginate at apex; cerci very stout, strongly incurved and deeply forked at apex, the upper prong of fork the more slender (Fig. 166, c, x); subgenital plate broad, feebly emarginate and bearing

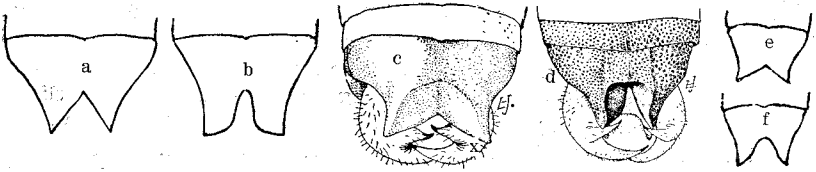

Fig. 166. Supra-anal plates of males of *Belocephalus*, showing the form of the notch, a, of *sabalis*; b, *sleighti*; c, *subapterus*; d, *excavatus*; e, *rehni*; f, *micanopy*; x, male cerci of *subapterus*. (After Davis.)

each side of the notch a very small, one-jointed style set in a shallow socket. Ovipositor rather stout, nearly straight, half or more the length of body.

The species are usually dimorphic in color, either a nearly uniform pale green or pale brown, the males being more often of the former hue. Since they cannot fly and are not active walkers, each colony is confined closely to its original environment, thus causing minor modifications of structure in isolated areas.

The genus was founded on a single Florida species and up to 1912 was considered monotypic. Since that date seven additional nominal species have been described by Davis and R. & H., all from the southern States. As only one of the eight has been taken by me, Mr. Davis kindly prepared the following key to the species. This is based largely upon the males, the females being very diffi-

cult of separation. As will be noted farther on, I consider some of the forms treated in the key as only varieties of the older named species.

KEY TO SPECIES OF NORTH AMERICAN BELOCEPHALUS.

a. Vertex of head produced as a stout subcylindrical thorn, tapering apically.

b. Outer extremities of subgenital plate not bent upward and inward, nor produced into points.

c. Antennæ unicolorous; body of male about 40 mm. in length.

d. Supra-anal plate with inner sides of V-shaped notch nearly straight (Fig. 166, *a*); hind femora about 20 mm. in length. 228. SABALIS.

dd. Supra-anal plate with inner sides of V-shaped notch curved (Fig. 166, *b*); hind femora about 18 mm. in length. 228a. SLEIGHTI.

cc. Antennæ spotted or annulated; body of male usually less than 40 mm. in length.

e. Length of body more than 30 mm.

f. Supra-anal plate with V-shaped notch broadly open, and with sides straight (Fig. 166, *c*); length of body about 34 mm.; a more slender species than *davisi*. 229. SUBAPTERUS.

ff. Supra-anal plate with V-shaped notch not broadly open; sides of notch curved; length of body about 35 mm. 229a. DAVISI.

ee. Length of body about 24 mm.; supra-anal plate with V-shaped notch narrow, its inner sides a little curved, the excavated part surrounding the notch with sides declivitous (Fig. 166, *d*.) 230. EXCAVATUS.

bb. Outer extremities of subgenital plate bent upward and inward and produced into sharp points; antennæ spotted; length of body about 34 mm. 229b. HEBARDI.

aa. Vertex of head rounded, not produced as a sharp pointed thorn.

g. Outer extremities of subgenital plate not bent upward and inward into points; supra-anal plate with V-shaped notch very broad, its inner sides straight (Fig. 166, e); length of body of male about 25 mm. 231. REHNI.

gg. Outer extremities of subgenital plate bent upward and inward and produced into points; supra-anal plate with V-shaped notch not very broadly open, its inner sides curved (Fig. 166, f); length of body of male about 30 mm. 232. MICANOPY.

228. BELOCEPHALUS SABALIS Davis, 1912a, 123. Palmetto Cone-head.

Male.—Size large for the genus, form robust. Color usually uniform green, mandibles and often the clypeal suture black. Fastigium nearly as long as head behind the eyes, sharply pointed, its tip and that of the lower basal tooth black. Antennæ about as long as body, uniform pale yellow. Disk of pronotum feebly rugose, lateral lobes more strongly so. Tegmina less than two-thirds the length of pronotum, their tips broadly obliquely rounded. V-shaped notch of supra-anal plate about as wide as deep,

reaching one-third to middle of plate. Female.—Usually pale brown with two very narrow fuscous stripes extending from near tip of fastigium back to middle third of abdomen or beyond (these also present in the brown males), the space between them darker on head and pronotum. Tegmina very small, oblong pads, their inner edges not reaching the darker stripes on abdomen. Ovipositor strongly tapering to an acute apex, its apical half feebly upcurved. Length of body, ♂, 40—41, ♀, 45; of fastigium beyond base of antennæ, ♂, 3.5, ♀, 4.5; of pronotum, ♂, 8.6—10.4, ♀, 9—10; of tegmina, ♂, 5.2—7.7, ♀, 2—3; of hind femora, ♂, 16—20, ♀, 21—21.8; of ovipositor, 16—18 mm. (Fig. 167.)

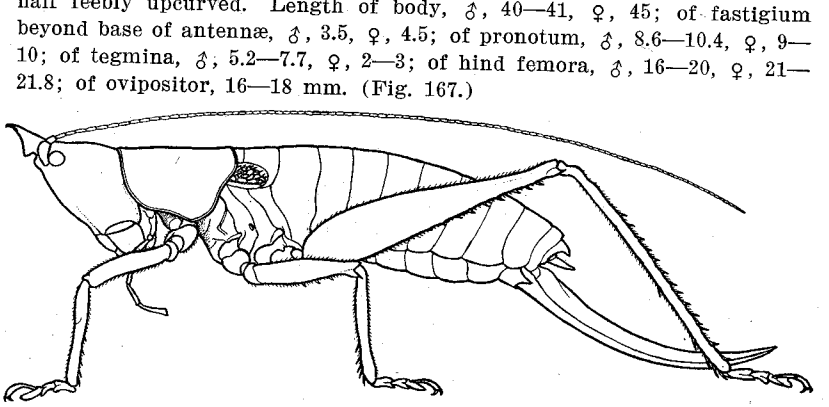

Fig. 167. Female. × 1.7. (Original, by Fox.)

Miami and Parish, Fla., Sept. 22—Oct. 17 (*Davis*). Ft. Myers, Fla., Sept. 17, one green female, Gainesville collection. Described from Punta Gorda and recorded also by R. & H. and Davis from Homestead, Marathon, Cocoanut Grove and Pineland, Fla., July —November. A subtropical species known only from the southern third of Florida. The females appear to be far less numerous than the males.

Of its habits Davis (1912a, 122) says: "At Punta Gorda in November, the males would perch on the topmost leaf of a scrub palmetto and stridulate a song hardly to be distinguished from the rapid *ik-ik-ik* of the *Conocephalus ensiger* of the northeastern United States. They fed on the palmetto, their powerful jaws enabling them to gnaw the tough leaves." At Homestead R. & H. (1914c, 401) found "the species very common on scrub palmetto, *Serenoa serrulata* (Michx.) in the pine woods, and only at night, when their stridulations permitted stalking with a flash-lamp. The song was faint, and ceased on an approach of even as much as twenty feet. However, they were easy to capture when located, as they almost invariably made no attempt to escape, but instead merely slipped down the palmetto leaf a few inches or around to the other side and there flattened themselves out with caudal limbs extended backward and cephalic limbs forward. When picked up they would violently attempt to bite their captor, and if successful could inflict a painful bite on a tender portion of

the hand. Their note is very low and consists of a succession of sounds like *zip-zip-zip-zip-zip-zip-zip-zip-zip.*" Of a specimen kept in captivity Hebard (1915b, 458) says: "Its actions show how absolutely nocturnal the species is; this specimen resting rigid in some concealed position during the day, with cephalic limbs and antennæ directed straight forward and median and caudal limbs straight backward, but at night moving actively about and extremely alert and rapid in its movements."

228a. BELOCEPHALUS SABALIS SLEIGHTI Davis, 1914, 199. Pine Key Conehead.

Size, form and color of *B. sabalis*. Differs only in having the fastigium and hind femora a little shorter and in the form of the V-shaped notch of supra-anal plate. In *sabalis* the sides of this notch are straight with the apical angle (point of the V) acute. The prongs formed by the V have their extreme tips acute and located at the middle of each prong. (Fig. 166, *a*.) In *sleighti* the notch is slightly deeper, the apical angle narrowly rounded and the inner sides of the V concave, so that the tips of the resulting prongs are more obtuse and located on their outer margins (Fig. 166, *b*.)

Big Pine Key, Fla., July 19, Sept. 19 (*Davis*). In the measurements of a series of *sabalis* given by R. & H. (1914c, 401) the length of the hind femora is shown to vary from 15.9 to 19.7 mm. and the "length of fastigium from the eyes" from 3.1 to 4.5 mm. The measurements of these parts given by Davis in his description of *sleighti* and in the key fall well within the individual variations of *sabalis* shown by R. & H. The slight difference in the form of supra-anal notch of male I consider also as well within the limits of specific variation of such organs, as it has been previously shown that the secondary genital organs of the males of Orthoptera are more subject to variation than any other part of the body. I therefore regard *sleighti* as only an incipient species or variety of *sabalis*, the slight differences in structure being due to some feature of environment or inherited tendency, as yet unexplained. *B. sleighti* was described from Big Pine Key and has not been recorded elsewhere. It was also found on saw palmetto and, says Davis, had a "song much like that of *B. sabalis*," its habits and note thus being additional evidence of its specific identity with that species.

229. BELOCEPHALUS SUBAPTERUS Scudder, 1875, 459. Half-winged Conehead.

Male.—Size medium for the genus; form moderately robust. Color usually pale green tinged with yellow, with two narrow dark stripes extending from middle of fastigium to hind margin of pronotum; tip of fastigium, basal tooth of same, clypeal suture and mandibles shining

black; basal halves of antennæ spotted or ringed with dark brown; fore femora often with a row of small brown dots on outer face. Fastigium as long as the occiput, strongly tapering to a sharp decurved point. Disk of pronotum twice as long as wide, slightly rugose, the lateral lobes much more so. Tegmina as long as pronotum, their tips narrowly obliquely rounded. Notch of supra-anal plate distinctly wider than deep (Fig. 166, *c.*) Female.—Usually brown, with the interval between the narrow fuscous stripes on head and pronotum darker. Tegmina as in *sabalis*. Ovipositor slightly longer than hind femora, less tapering and with tip more obtuse than in *sabalis*. Length of body, ♂, 28—34, ♀, 30—38; of fastigium beyond the eye, ♂, 2.6—3.2, ♀, 3.5—4; of pronotum, ♂, 6.2—8, ♀, 8—8.5; of tegmina, ♂, 8—8.5, ♀, 3—3.5; of hind femora, ♂, 14—17, ♀, 17—19; of ovipositor, 19—21 mm. (Fig. 168.)

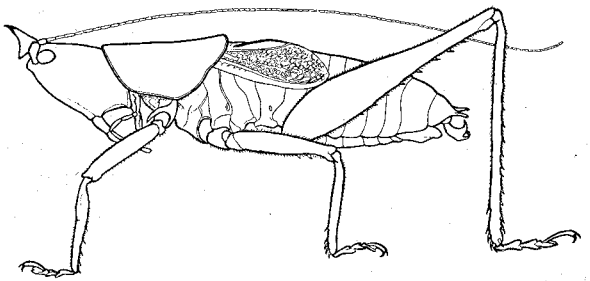

Fig. 168. Male × 2. (Original by Fox.)

Gainesville, Sanford and Dunedin, Fla., Oct. 14—Jan. 13 (*W. S. B.*). Three specimens were taken at Sanford Jan. 11 and 12, from between boards of a lumber pile and two at Dunedin, Jan. 13, from beneath a board near the border of a pond, thus showing that the adults in central Florida sometimes hibernate. Scudder's types were females from N. E. Florida, and the species has been recorded from many points in the northern half of that State. It has also been taken by R. & H. (1916, 258) at Florence, Ashley Junction and Yemassee, S. Car., and at numerous stations in Georgia. They state that it is most abundant in Georgia in early December, and is then found mostly amongst the shrubbery and other undergrowth of open pine woods and palmetto hammocks.

229a. BELOCEPHALUS SUBAPTERUS DAVISI Rehn & Hebard, 1916, 259. Davis's Cone-head.

Somewhat larger and more robust than *subapterus*. Color and black markings on head, antennæ and pronotum as there. Differs in the form of the emargination of the supra-anal plate of male, the notch being more rounded than in typical *subapterus*. "It is not quite as deep as in *sleighti*, and has the sides convex and angle very broadly rounded. The lateral productions formed by this emargination have evenly converging sides with blunt and sharply rounded apex situated mesad." (*R. & H.*) Length of body, ♂, 33—40, ♀, 36; of vertex, 3.7—4.5; of pronotum, ♂,

7.9—8.9, ♀, 8.1; of tegmina, ♂, 5.6—8.1, ♀, 2.3; of hind femora, ♂, 16.4—18.8, ♀, 18.4; of ovipositor, 19.2 mm.

An examination of the type, and also of a pair of this form in the U. S. National Museum from Chuluota, Fla., shows it to be intermediate in size between *sabalis* and *subapterus,* with the supra-anal notch also intermediate in form. It has not only the black markings of *subapterus* but the relative length and form of the male tegmina are exactly as in that species and not as in *sabalis* and *sleighti* as stated by R. & H. In *subapterus, davisi, hebardi* and *rehni* the tegmina are one-fourth longer than broad, as long as or slightly longer than pronotum and with tips narrowly obliquely rounded, while in *sabalis* and *sleighti* they are as broad or slightly broader than long, less than two-thirds the length of pronotum, the tips broadly obliquely rounded. As R. & H. admit (1916, 261) that there is a "considerable amount of size variation" and a "decided amount of variation in the shape of the supra-anal notch" in their type series, I can only regard *davisi* as a variety of *subapterus,* it being apparently an intermediate form between that species and *sabalis.*

The types of *davisi* were from Billy's Island, Okefenoke Swamp, Ga., where *subapterus* also occurs. The males were taken at night when they were found in numbers stridulating in the undergrowth of the pine woods.

229b. BELOCEPHALUS SUBAPTERUS HEBARDI Davis, 1912a, 123. Hebard's Cone-head.

Differs from *subapterus* only in having the extremities of the subgenital plate, near the insertion of the styles, bent upward and inward and slightly produced into sharp points. The form, size, color, dark markings of antennæ, head and thorax, length and form of tegmina and supra-anal notch of male are precisely as in *subapterus.* The females of the two forms are very similar, the ovipositor of *hebardi* being slightly longer, straighter and more slender than in typical *subapterus.*

Parish, Fla., July 26, Sept. 21 (*Davis*). Described from Punta Gorda, Fla., where it occurred in November on the same clumps of palmetto as *B. sabalis.* In the Philadelphia collections also from Ft. Myers. Davis states that it was "more retiring in habits than *sabalis* and sang a slow *zeek-zeek-zeek.*" I regard it as only a variety of *subapterus.*

230. BELOCEPHALUS EXCAVATUS Davis, 1915, 98.

Smaller than *subapterus,* color and black markings on antennæ, head and pronotum as in that species. Fastigium sharp-pointed, slightly bent downward and tipped with black. Antennæ longer than body. Abdomen with a well defined interrupted carina. Femora and tibiæ of all legs

blotched with brown and tips of spines black. Notch of supra-anal plate narrow with inner sides but little curved, the excavated part surrounding the notch with sides more declivitous than in any other known species of the genus (Fig. 166, *d.*) Length of body, ♂, 24; of fastigium beyond base of antennæ, 2.5; of pronotum, 7; of tegmina, 7; of hind femora, 13.5 mm.

Not seen by me. The above are the salient points of the original description. Known definitely only by the unique brown male type taken at Gainesville, Fla., Oct. 2, and now in the American Museum of Natural History.

231. BELOCEPHALUS REHNI Davis, 1912a, 124. Rehn's Cone-head.

Agrees with *subapterus* in color and general markings. Differs in its smaller size and in having the fastigium shorter and blunt pointed. Femora and tibiæ of all the legs blotched with brown; abdomen finely flecked with the same color. Styles about four times as long as broad. Length of body, ♂, 24, ♀, 29; of fastigium beyond base of antennæ, ♂, 1.5, ♀, 2; of pronotum, ♂ and ♀, 6.5; of tegmina, ♂, 7—7.5, ♀, 2; of hind femora, ♂, 13, ♀, 17; of ovipositor, 21 mm.

Described from five specimens taken from beneath loose bark of pine and between boards at Newberry, Fla., in November. Known also from Ocala, Orlando and Dunellon, Fla. The small size and blunt fastigium are probably sufficient to separate it specifically from *subapterus* which it otherwise very closely resembles.

232. BELOCEPHALUS MICANOPY Davis, 1914, 200.

Size and form of a small *subapterus*. Mandibles, lower edge of front, base of antennæ beneath, tip and lower tooth of fastigium, black; upper surface of head and pronotum with a faint yellowish line on either side, bordered within by blackish, these extending backward to base of thorax, male, onto abdomen, female; in the latter sex the entire area between the lines dark brown. Antennæ longer than body, male, slightly shorter, female, the joints of basal third or more in both sexes spotted or annulate with black. Femora and tibiæ of all legs blotched with brown at knees, with tips of spines black. Fastigium short, blunt pointed, somewhat intermediate in form between *subapterus* and *hebardi*. Male with notch of supra-anal plate and outer extremities of subgenital plate as described in key. Styles about three times as long as broad. Length of body, ♂ and ♀, 30; of fastigium beyond base of antennæ, 2; of pronotum, ♂ and ♀, 9; of tegmina, ♂, 7, ♀, 3; of hind femora, ♂ and ♀, 16; of ovipositor, 19 mm.

Big Pine Key, Fla., Sept. 19 (*Davis*). Recorded only from that island, where it was taken in September and October from "among the leaves of the silver palm, *Coccothrinax argentea* Lodd. The song is slow and readily distinguished from that of *B. sleighti.*" (*Davis.*)

* * *

From the key and descriptions it will be noted that we have three groups or types of *Belocephalus* in Florida, viz.: (*a*). The

sabalis group—large bulky forms with antennæ unicolorous, fastigium very long and sharply pointed, and male with short broad tegmina and supra-anal notch deep. (*b*). The *subapterus* group—species of medium size with antennæ spotted, fastigium of moderate size and sharply pointed and male with longer, narrower tegmina and supra-anal notch broadly and shallowly concave. (*c*). The *rehni* group—species of small or medium size, with antennæ spotted and tegmina as in (*b*), fastigium short and blunt, and supra-anal notch of moderate width and depth. A careful study of a large series of specimens from all parts of the State would perhaps show that only three forms, *sabalis, subapterus* and *rehni* are sufficiently differentiated to be regarded as valid species; the other nominal forms being only offshoots, intermediate subspecies or varieties, based upon slight modifications of the very plastic secondary genital organs of the males.

II. PYRGOCORYPHA Stål, 1873a, 50. (Gr., "tower" + "head.")

Rather robust species of medium size, having the fastigium prolonged, triquetrous, acute, flat above and with a prominent basal tooth on the lower side; eyes small, prominent; antennae very slender, about as long as body; pronotum with disk flat, front and hind margins subtruncate; lateral carinæ obtuse; lateral lobes perpendicular, longer than deep, their front margin broadly obliquely rounded into the lower one, this short, oblique, its posterior angle obtuse, hind margin broadly rounded; humeral sinus broad and deep; tegmina elongate, their tips rounded; front and middle femora armed beneath with three to five spines on outer margin; hind femora slender with numerous spines on both lower margins; all the tibiæ armed beneath with numerous slender spines; meso- and metasternal lobes triangular, acute. Cerci of male stout, subcylindrical, curved, each ending in two claw-like appendages, these flattened, strongly incurved and ending in a sharp spine. Ovipositor slender, straight, acute, of nearly equal width throughout, not reaching tips of tegmina.

Kirby (1906, 239) recognized nine species, distributed throughout the world, only one of which inhabits the United States.

233. PYRGOCORYPHA UNCINATA (Harris), 1841, 132. Hook-faced Cone-head.

Green or pale reddish-brown; mandibles black; tegmina with numerous widely scattered, minute black dots. Fastigium elongate-triangular, about as long as occiput, flat and very rugose above, its tip ending in a minute, sharp decurved spine. Disk and lateral lobes of pronotum strongly rugose-punctate. Hind femora short, reaching slightly beyond

middle of tegmina. Other characters as given under the generic heading. Length of body, ♂, 32—34, ♀, 35—42; of fastigium beyond eye, ♂, 3.5—4; ♀, 4—4.5; of pronotum, ♂, 9.5, ♀, 10; of tegmina, ♂, 37—42, ♀, 42—46; of hind femora, ♂, 18, ♀, 20; of ovipositor, 19—21.5 mm.

Gainesville, Miami, and Cape Sable, Fla., Sept. 24—Feb. 23. The Miami specimens from the Davis collection are labelled: "This and eight or ten others eating grass at night." It does not appear to be widely distributed in Florida, having been recorded only from Miami, Marco, Chokoloskee, Everglade and Charlotte Harbor, all in the southern third of the State. Davis states that their song resembles *azik, azik, azik, azik,* and that they are very shy when singing and difficult to capture. At Charlotte Harbor Hebard says (1916, 20) "They were heard on May 19 and 20 everywhere after dark on Useppa Island, singing in the tops of the cabbage palmettoes, where they were usually located in the berry clusters. A few were also heard in the undergrowth of the heavier tangles and in mangroves on the edge of the swamp. While singing the males were very wary when approached, usually ceasing their song at a distance of 15 or more feet. The insect is slow in movements, clinging tenaciously to its support and easily seized if approached cautiously." The Cape Sable specimen, taken on Feb. 23, was a nymph of the third instar.

The wariness of *P. uncinata* mentioned by Davis and Hebard was not noted by Allard who captured a single male in stridulation at Thompson's Mills, Ga., in October. He says (1911b) "The insect was traced by its note to the low grass and weeds on a bank almost in the midst of the settlement. By the strong light of a bull's eye lantern the writer approached within a foot or two of the insect which continued to stridulate vigorously for some time, even though in the full glare of a strong light. After its notes had ceased, the insect at intervals jerked its body and wings spasmodically without producing any sound. This peculiar behavior is characteristic of a number of species of *Conocephalus* when disturbed during stridulation. On the grass and weeds very near where this male was taken, the writer a night or two before heard several locusts in stridulation, presumably individuals of *P. uncinata.* As the notes of these insects were heard but one or two nights, it is possible that their stridulation period is very brief. The note is a loud, penetrating, prolonged *z-z-z-z-z-z-z-z-z-z-z-z-z-z-z* quite like that of a *Conocephalus.*"

The type of Harris was from Alabama and the species is known to range from Clarksville, Tenn., and Raleigh, N. Car., west

and south to Arkansas, Texas, Cuba, Mexico and Central America, though very few records of its occurrence in the United States have been made.

III. NEOCONOCEPHALUS Karney, 1907, 22. (Gr., "near" + Conocephalus.)

This generic name takes the place of *Conocephalus* of my Orthoptera of Indiana (1903, 363). The members of the genus are readily known by having the fastigium of vertex prolonged forward and more or less upward into a cone which much exceeds in length the first segment of the antennæ, and bears a pointed basal tooth beneath. This cone is never hooked downward at tip as in *Pyrgocorypha* and is much less rugose above than there. In addition they have the eyes small, subrotund, rather prominent; spines of prosternum long and slender; pronotum with disk usually nearly twice as long as wide, its sides feebly diverging from apex to base; front margin subtruncate, hind one broadly rounded, lateral carinæ distinct but obtuse, humeral sinus usually broad, shallow, rounded; lateral lobes as deep or slightly deeper than long, their front margin broadly obliquely rounded into the lower one which is short and also rounded into the hind one, the posterior angle usually obsolete; tegmina long, narrow, rounded at end, much surpassing the abdomen and slightly exceeding the wings; stridulating organ on left tegmen of male opaque and of a coarse texture, on right or lower one, transparent at the center; front and middle femora rather short, usually armed beneath with a few very short spines; hind femora long, slender, usually with both lower margins armed beneath with numerous fine spines. Male with supra-anal plate broadly emarginate at apex, the lobes each side of notch ending in a spine; cerci much as in *Pyrgocorypha,* the appendages at end not flattened, but incurved and spinose as there; subgenital plate emarginate, the styles very short and set in sockets on the extreme tips of the projections each side of notch. Ovipositor rather narrow, nearly straight, oftentimes of excessive length; the eggs of those species in which the oviposition has been noted, being deposited between the stems and root leaves of grasses, reeds and sedges.

Although these larger cone-heads are said to be rather common by those writers who have prepard lists of Orthoptera from other states, they appear to be, in Indiana, the least abundant of all the winged Tettigoniidae, 20 years collecting having yielded fewer than 30 specimens. They appear to be more common in

the northern than in the southern half of the State. As in *Belocephalus* the color is dimorphic, green and brown forms of most of the species being known, the former largely predominating.

Of the habits of the species as found in Illinois, McNeill (1891) has written: "All the species of *Conocephalus* seem to possess more intelligence than is usual among the Orthoptera, and they are about the most difficult of the order to approach. In escaping they usually slip or fall into the grass instead of jumping or flying; but they seem to fully understand that they are very well protected by their color and form. If approached very cautiously they often remain quite still upon the stem of grass upon which you have surprised them with the usually well founded expectation that you will not be able to distinguish them from the green herbage around. If they think it worth while to make some active movement to escape they will frequently slip around on the other side of the stem and walk down the stem to the ground or off upon another plant. Unlike most Orthoptera they do not use their front legs in holding to the mouth the thing upon which they feed. Instead of biting they seem to wrench or tear away pieces from the stems or leaves."

Allard (1910c) says: "The stridulations of the species of *Neoconocephalus,* like the notes of all the Locustidae, entirely lack any musical tone or trill so characteristic of the crickets. Their notes are always loud, buzzing and penetrating, and differ not so much in sound-quality as in the manner of delivery. The notes of all species may be definitely classed as intermittent or prolonged. These insects are almost strictly terrestrial, are persistent singers, and most species stridulate most actively at night."

Redtenbacher, in his monograph (1891), recognized 101 species of *Conocephalus* from all parts of the world. Scudder (1900, 72) listed 16 from the United States. Under the generic name *Conocephaloides* Kirby (1906, 241) recognized 143 species of the insects. Karney (1907, 22) proposed a number of subgenera for this aggregation and in 1912 elevated his name *Neoconocephalus* to generic rank, the older names *Conocephalus* and *Conocephaloides* having been shown to belong rightfully to other groups of Tettigoniidae. Rehn & Hebard, in their Synopsis (1915) recognized only 11 species and one variety from America north of Mexico, all of which occur in the territory covered by this work.

KEY TO AMERICAN SPECIES OF NEOCONOCEPHALUS.

a. Fastigium or cone of vertex distinctly longer than wide, its apex not broadly and evenly rounded.

b. Fastigium narrowing rapidly from near base or middle to apex,

much longer than its basal width, its tip (except in *melanorhinus*) narrowly rounded (Fig. 169, *a*—*e*.)

c. Lower surface of fastigium in part or wholly black.

d. Both lower margins of hind femora armed with spines; under surface of fastigium almost wholly shining black (Fig. 169, *a*—*d*.)

e. Larger and more robust, length of body, female, 38 or more mm.; of fastigium of female in front of eyes, 5.3 or more mm. 234. EXILISCANORUS.

ee. Smaller and more slender; length of body, female, less than 36 mm.; of fastigium rarely more than 4.5 mm.

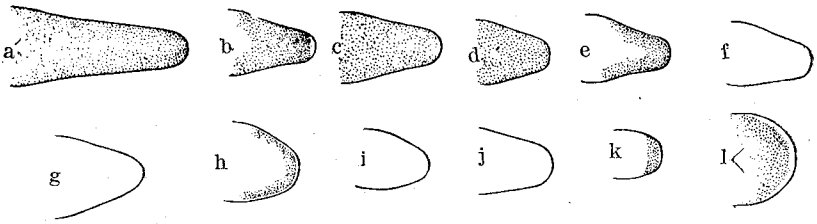

Fig. 169. Ventral views of fastigium of males of *Neoconocephalus*. × 6. a, *exiliscanorus*; b, *nebrascensis*; c, *lyristes*; d, *melanorhinus*; e, *ensiger*; f, *robustus*; g, *crepitans*; h, *caudellianus*; i, *palustris*; j, *velox*; k, *retusus*; l, *triops*. (After R. & H.)

f. Ovipositor distinctly longer than hind femora; tip of fastigium narrowly rounded (Fig. 169, *b*, *c*.)

g. Ovipositor surpassing tips of tegmina 5—7 mm.; form of male slightly more robust; fastigium usually slightly depressed above. 235. NEBRASCENSIS.

gg. Ovipositor not surpassing tips of tegmina; form of male more slender; fastigium subcylindrical, usually slightly longer, more attenuate. 235a. LYRISTES.

ff. Ovipositor shorter than hind femora; fastigium about twice as long as its basal width, its tip subtruncate (Fig. 169, *d*.) 236. MELANORHINUS.

dd. Under surface of fastigium with only the sides and tip black (Fig. 169, *e*); usually the inner lower carina of hind femora alone armed with spines; ovipositor longer than hind femora. 237. ENSIGER.

cc. Lower surface of fastigium without black markings; form robust; both lower margins of hind femora usually spinose; ovipositor about as long as hind femora. 238. ROBUSTUS.

bb. Fastigium narrowing but little if at all from near base to apex, its tip rounded or subtruncate (Fig. 169, *g*—*l*.)

h. Ovipositor but little if any shorter than hind femora; form robust.

i. Lower surface of fastigium immaculate. 238a. CREPITANS.

ii. Lower surface of fastigium with black margins (Fig. 169, *h*.) 239. CAUDELLIANUS.

hh. Ovipositor distinctly shorter than hind femora; form more slender; under surface of fastigium immaculate (Fig. 169, *i*, *j*.)

j. Length of hind femora, male, 15.2—19.4 mm.; male smaller, less slender; tip of vertex less broadly rounded; lower carinæ of hind femora darker near bases of spines. 240. PALUSTRIS.

jj. Length of hind femora 22.5—25.7 mm.; male larger, form very slender; tip of vertex more broadly rounded; lower carinæ of hind femora immaculate. 241. VELOX.

aa. Fastigium of vertex not or but very slightly longer than wide, its apex broadly, evenly rounded, and lower surface with a black mark near tip (Fig. 169, *k*, *l*.)

k. Ovipositor much longer than hind femora; form slender; vertex slightly longer than wide, convex above (Fig. 169, *k*); tegmina surpassing hind femora less than 11 mm. 242. RETUSUS.

kk. Ovipositor but slightly if any longer than hind femora; form more robust; vertex usually wider than long, almost flat above (Fig. 169, *l*); tegmina surpassing hind femora 15 or more mm. 243. TRIOPS.

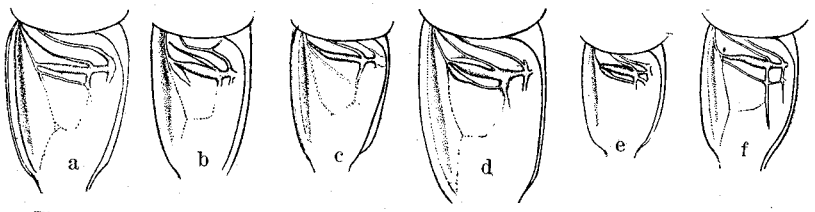

Fig. 170. Stridulating fields of male tegmen of *Neoconocephalus*. × 3. a, *exiliscanorus*; b, *lyristes*; c, *ensiger*; d, *caudellianus*; e, *palustris*; f, *retusus*. (After R. & H.)

234. NEOCONOCEPHALUS EXILISCANORUS (Davis), 1887, 57. Slightly Musical Cone-head.

Size large for the genus, form moderately robust. Pea-green tinged with yellowish on head, pronotum and fore femora, or brown with tegmina irregularly dotted with fuscous spots; the green individuals with a narrow yellowish line along the lateral carinæ of pronotum, this absent on occiput but present on lateral margins of fastigium; also often with a short and very narrow oblique yellowish line behind each eye; mandibles yellow; tarsi and apical joints of palpi more or less infuscated. Fastigium very prominent, extending 5—7.5 mm. in front of eyes, subdepressed and with a slight median furrow on basal half, gradually tapering from base forward, its apical half curved slightly upward, the apex narrowly rounded; lower basal tooth small, blunt. Pronotum subequal in length to fore femora, of more than average breadth; lateral carinæ evident but dull, hind margin broadly rounded; lateral lobes flaring noticeably outward rather than perpendicular as in most of the other species, their surface slightly rugose. Tegmina reaching slightly beyond middle of ovipositor, their basal third rather broad, apical two-thirds tapering very gradually to the rounded apex. Stridulating organ of male large, very broad, the main vein long, moderately swollen (Fig. 170, *a*.) Wings equalling the tegmina in length. Fore and middle femora short, stout, usually armed beneath on front carina with a few very short spines. Hind femora rather short, slender, armed beneath on each carina with 5 to 9 small but sharp spines. Hind tibiæ slightly shorter than the femora. Ovipositor

slender, of more than average length and nearly equal width throughout. Length of body, ♂, 33—37, ♀, 38—44; of fastigium, ♂, 4.2—6.1, ♀, 5.3—7.5; of pronotum, ♂, 7.6—9; ♀, 7.9—9; of tegmina, ♂, 33.5—46.4, ♀, 40—53; of hind femora, ♂, 19.3—24.8, ♀, 24—32; of ovipositor, 35—47 mm. (Fig. 171.)

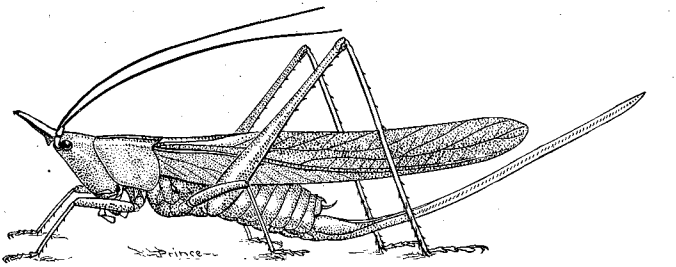

Fig. 171. Female. Natural size. (Original.)

New Harmony, Ind., September. Staten and Long Islands, N. Y., August, (*Davis.*) The only known Indiana specimen of this large, long-headed Tettigoniid is the female type of my *Conocephalus bruneri* (1903, 367) taken at New Harmony, Posey Co., by the late Arthur Dransfield. Not being able to identify it by the literature available, it was sent to Prof. Lawrence Bruner, who wrote me that it was evidently an undescribed form. Karney (1907, 30) first placed it as a synonym of *exiliscanorus* and comparison with State Island females of that species shows that he is probably correct, though the Indiana specimen is distinctly larger and with longer fastigium than any of those received from Davis.

The types of Davis were found amongst the cat-tails that grew on the salt marshes of Staten Island, and it ranges along the Atlantic coast from New Haven, Conn., to Raleigh, N. Car., and Mississippi, and inland to Clarksville, Tenn., Thompson's Mills, Ga., and Dallas, Texas. Of its habits Davis (1887) says: "This insect keeps very close to the ground, hiding well in the vegetation, and is not easily discovered. The sound produced when stridulating is very faint, not louder than that made by *Gryllus abbreviatus* and I was much surprised to hear such a faint song from so large an insect. I have in consequence named it the 'slightly musical Conocephalus.'" Later (1889) he adds that "*exiliscanorus* devours the heads of the meadow grass (*Spartina*) and is such a slow singer that one can easily estimate the number of times one wing is drawn over the other, which is about 115 times a minute." Again (1911) he says that the song varies considerably in loudness according to the age of the singer, while its volume is also to some extent dependent upon the temperature.

About Tappahannock, Va., Fox found it "frequent between August 9 and September 10 in tidal marshes occurring most commonly in tall reeds, *Spartina cynosuroides* (L.) but spreading in small numbers through the briery thickets and corn fields of the adjoining dry land."

R. & H. (1915, 374) state that the song of *N. exiliscanorus*

"Is a *ziit-ziit-ziit-ziit*—a vibrant rattling note, rising and falling in intensity, often ceasing as if from exhaustion. The song is rapid, the sounds being emitted on warm evenings about three to the second. When near a colony of this species on favorable evenings after dark the air is vibrant with the sound; as several singers cease others take up the constantly rising and falling song, but at no very great distance the sound is inaudible. The insects were found not to begin to sing until nearly sunset and before dark often ceased their song upon any attempt to approach the spot. After dark the singing was much more vigorous and the singers could then even be approached with a light, cautiously seized while singing and moving about in the bushy weeds and heavy grasses into which they climbed while stridulating. Toward midnight, after the air is chilled, the singers become audibly fewer and their stridulations less intense. The species is found very local but often in large numbers in the heavier tangles of weeds, low bushy plants or heavy reeds in both fresh and salt water marshes. The females were found often in grasses near the singers; one was taken ovipositing in a grass blade at dusk."

235. NEOCONOCEPHALUS NEBRASCENSIS (Bruner), 1891, 72. Nebraska Cone-head.

Size median, form slender. General color either bright grass green or a yellowish brown or tan with usually narrow yellowish lines along lateral carinæ of pronotum; antennæ in the brown individuals often tinged with pinkish; hind tibiæ together with all the tarsi more or less infuscated. Fastigium slender, as long as occiput, male, distinctly longer, female, projected upward, moderately tapering, its tip narrowly rounded, under surface shining black. Pronotum with disk narrow, lateral carinæ almost parallel, hind margin rounded, surface rugose-punctate, humeral sinus rather deep and narrow. Stridulating field of male tegmen large, broad, very similar to that of *N. r. crepitans*. Femora armed beneath as in *exiliscanorus*. Anal cerci of male stout, with strong internal hooks. Ovipositor long, slender, lanceolate, a little curved upward and extending 5—7 mm. beyond the closed tegmina. Length of body, ♂, 27—30, ♀, 32—33; of fastigium, ♂, 3.2—3.5, ♀, 3.7—4; of pronotum, ♂, 7.6—8, ♀, 7.2—8; of tegmina, ♂, 36—38, ♀, 40—42; of hind femora, ♂, 20—23, ♀, 23—24.7; of ovipositor, 29—32.5 mm.

Putnam, Vigo, Fulton and Lake Counties, Ind. (*W. S. B.*); Moline, Homer, Savanna and Normal, Ill. (*Urbana* coll.) In central and northern Indiana this is the most common of the three species of *Neoconocephalus* there occurring. It frequents the same haunts as *C. ensiger* and when approached often attempts to escape by burrowing beneath the fallen grass. In Nebraska

Bruner (1891) says it is found throughout the eastern part of the state, occurring more frequently in the natural groves growing along the principal streams.

The known range of typical *nebrascensis* extends from Sarnia, Ont., and Ohio west to Minnesota, eastern Nebraska and northeastern Kansas and south and west to Clarksville, Tenn., and St. Louis, Mo.

Walker (1904a, 338) states that at Sarnia, Ont., by tracing their song to its source, he found four males on August 12 in a large stretch of open grassy marshland bordering the St. Clair River. "The song was a loud penetrating continuous whirr, quite suggestive of the dog-day cicada, but less clear and very unlike that of *N. ensiger*. It was heard only in the morning during bright sunlight."

235a. NEOCONOCEPHALUS NEBRASCENSIS LYRISTES (Rehn & Hebard), 1905, 45.

Differs from typical *nebrascensis* by the characters given in key, the males separable only by their slightly less robust form, and in having the stridulating field more narrow and elongate, the secondary veins heavy only at junction with the primary one (Fig. 170, *b*.) Fastigium variable both in length and breadth, in extremes in females extending 5 mm. beyond the eyes. Ovipositor ranging in length from 23 to 30 mm. but not surpassing the tegmina in any of the specimens seen; in New Jersey females somewhat stouter with apical fourth usually more tapering than in typical *nebrascensis* from Indiana. Length of body, ♂ and ♀, 28—35; of fastigium, 3.7—5; of pronotum, 7.2—8.8; of tegmina, ♂, 35.7—42.4, ♀, 44—52; of hind femora, ♂, 20—24, ♀, 23—26; of ovipositor, 23.3—30.7 mm.

After studying at Philadelphia the types of both forms and comparing with them Indiana specimens of what Bruner named for me as *nebrascensis* and New Jersey, Virginia and Florida specimens of what is known as *lyristes*, I have placed the latter as the eastern and southern representative or race of *nebrascensis*. No fixed character of specific importance has been given separating the two. Rehn (1906b) says the males differ in that *nebrascensis* "is of a more robust build, with broader tegmina, wider and more arcuate tympanum, more expanded caudal section of pronotum and deeper lateral lobes of the same;" all of which characters are comparative only and fall within the limits of individual variation as shown by the specimens examined. R. & H. in their key (1915, 369) separate the two only by the terms "form robust, vertex slender," *nebrascensis* and "form slender, vertex heavy," *lyristes*. In their later treatment they do not compare *lyristes* with *nebrascensis*, but only with *melanorhinus*, a species with much shorter fastigium and ovipositor. Davis (Ms.) states that

he was unable to separate the males from Indiana and New Jersey except by the labels they bore, and Fox (Ms.) says that the only differences he could find in both sexes was the slight one afforded by the fastigium.

The type of *lyristes* was a male labelled "Chokoloskee, Fla.," a locality which R. & H. (1915, 384) seriously question, but which is borne out by a Palm Beach female at hand, which agrees in all particulars with the type and New Jersey specimens except in color, it being a nearly uniform purplish-brown instead of green and in its having a slightly longer and more slender fastigium.

The known range of the race *lyristes* extends from Long Island, N. Y., and various points in New Jersey, southwest to Tappahannock, Va. It is also known from the type locality and Palm Beach, Fla., but not from intervening points from Virginia southward. R. & H. (1915, 381) state that *lyristes* is "locally common in New Jersey in bogs, fresh water marshes and in the coastal salt water-marshes in areas of *Scirpus* and high marsh plants near the mainland, but never out on the tidal flats where *melanorhinus* occurs. It has nowhere been found more than a few miles from the seacoast. * * The song is a high-pitched continuous buzzing, very much like that of *N. retusus*, but distinctly longer."

236. NEOCONOCEPHALUS MELANORHINUS (Rehn & Hebard), 1907, 304. Black-nosed Cone-head.

Size small for the genus; form rather robust. Green or smoky brown with sides of fastigium and lateral carinæ of pronotum yellowish, sides of tarsi brown; dark form often with a narrow shining purplish-brown stripe on upper fourth of lateral lobes, this extending back along the principal veins of tegmina. Fastigium as described in key, narrowed

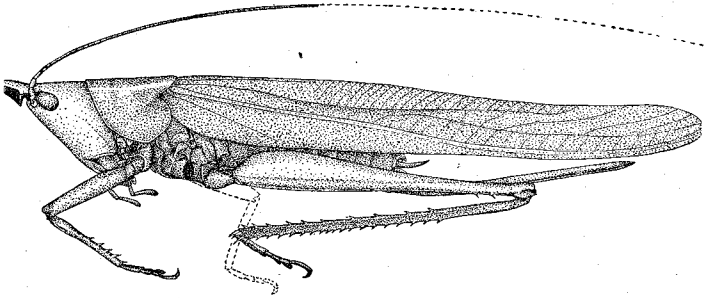

Fig. 172. Female type. × 1.5. (After R. & H.)

from the middle forward, its upper surface sparsely punctate and with a fine median groove. Antennæ but little longer than the hind femora. Pronotum with lateral carinæ distinctly but feebly divergent backward, surface coarsely and closely punctate; lateral lobes slightly longer than deep, their lower margin oblique, its angle obtuse. Tegmina surpassing the hind femora about one-third their length, cross-veinlets prominent,

tips narrowly rounded. Front and middle femora unarmed beneath. Hind femora rather short, inner lower carina armed beneath with three to eight slender spines, outer one usually unarmed. Median notch of subgenital plate of male, broad, the styles hirsute, longer and stouter than in allied species. Ovipositor rather wide, almost straight. Length of body, ♂, 28, ♀, 32—35; of fastigium, ♂, 2.6—2.8, ♀, 2.9—3.1; of pronotum, ♂, 6.9—8.5, ♀, 6.7—8; of tegmina, ♂ 29.3—37.5, ♀, 35—47.5; of hind femora, ♂, 17.5—21.5, ♀, 19.3—27; of ovipositor, 16.3—22.8 mm. (Fig. 172.)

Tuckerton and Cape May, N. Jer., Aug. 21—Sept. 1 (*Davis*); Ocean View, N. Jer. (*Fox*). A submaritime species described from a single female taken at Cedar Keys, Fla., but not elsewhere recorded from that State. Ranges from New Jersey along the Atlantic coast to Virginia and probably to Florida. Davis (1913, 177) took the first known male Sept. 1, 1907, at Tuckerton, N. Jer. R. & H. (1915, 378) give an account of the habits of *melanorhinus* as follows:

"This species was found in large numbers on the salt marsh tidal flats of New Jersey in areas of the salt meadow-grass, *Spartina patens* (Ait.), growing near one foot in height, but it was also found there rather abundant in areas of the low marsh spike-grass, *Distichlis spicata* (L.). When first met with in the summer of 1914, the males of a large colony were stridulating vigorously early on a somewhat cloudy afternoon; the song was a weak, high-pitched continuous buzzing, giving much the same vibrating resonance as a bit of rubber stretched in the wind. The note was very much weaker, richer in quality and less harsh than that of *N. robustus*. During daylight the singers invariably seemed further away than was the case, and time and again specimens were passed over until this fact was realized. At night the song was somewhat louder and very similar to that of *N. lyristes*, almost inappreciably higher pitched and more strident. When an individual was alarmed while singing the note ceased abruptly, the singer dropping or leaping to the ground and there remaining motionless, perfectly concealed. * * * The abundant green color-phase of this insect blends perfectly with the broader green leaves of *Spartina patens*, while the brown individuals of pale to very dark shades blend as perfectly with the brown and yellowish bases of the same plant and the bare dark muck beneath. The insects were seen to fly but short distances while singing individuals were observed to be resting motionless on the grass or climbing nervously about."

237. NEOCONOCEPHALUS ENSIGER (Harris), 1841, 131. The Sword-bearer.

A species of small size and slender form. Green, rarely brown, often fading to dull yellow in drying; margins and tip of lower face of fastigium black, the tooth green; lateral carinæ of pronotum often yellow; tarsi, hind tibiæ and tip of ovipositor sometimes darker. Fastigium slender, slightly constricted in front of eyes, narrowed from the middle forward (Fig. 169, *e.*) Pronotum with lateral carinæ feebly divergent, disk finely punctate; humeral sinus shallow, very broadly rounded. Tegmina long and narrow. Stridulating vein of male long, feebly swollen (Fig. 170, *c.*) Front and middle femora usually unarmed. Length of body, ♂, 24—26,

♀, 28—30; of fastigium, ♂, 3, ♀, 3.2—3.5; of pronotum, ♂ and ♀, 7—7.5; of tegmina, ♂, 37—42, ♀, 44—48; of hind femora, ♂, 20—21, ♀, 22—23; of ovipositor, 27.5—33 mm. (Figs. 173, 174 and Pl. V.)

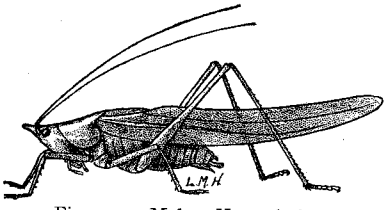

Fig. 173. Male. Natural size. (After Lugger.)

This is a rather common cone-head in northern Indiana, where it frequents the tall grasses along ditches and the borders of damp prairies. In the central and southern counties it is more scarce. Its known range extends from Norway, Me., west and north across southern Ontario to Bismark, N. Dak., and Julesburg, Col., and south and southwest to N. Carolina, Tennessee, Kansas and New Mexico. It is therefore the most widely distributed species of the genus in the United States. The female of *ensiger* has been recorded as depositing her eggs between the stem and the root leaves of *Andropogon,* a genus of tall coarse grasses which grow in dry, sandy localities. The young, hatched in May, reach maturity in central Indiana about July 10, though an adult male was taken in Vigo Co. on June 8.

Scudder, who has set the note to music, says of the song (1874, 368): "This insect has but a single song and stridulates only by night, or during cloudy weather. It begins its song as soon as the sky is obscured or the sun is near the horizon. It commences with a note like *brw,* then pauses an instant and immedi-

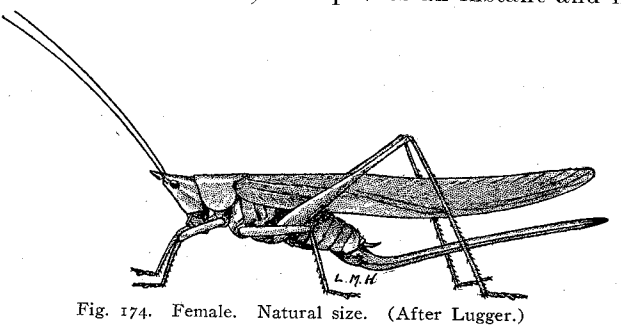

Fig. 174. Female. Natural size. (After Lugger.)

ately emits a rapid succession of sounds like *chwi* at the rate of about five per second, and continues them for an unlimited time. Davis (1887) likens its note to the syllable *'ik-ik-ik,'* as if sharpening a saw, enlivening the low bushes, and particularly the corn-patch, as it seems to especially delight in perching near the top of a cornstalk and there giving forth its rather impulsive song."

Walker (1904a, 337) mentions *ensiger* as "a very common in-

sect in Ontario, ranging northward about as far as Muskoka and the Bruce Peninsula. It frequents fields, vacant lots and roadsides, which resound at night with the incessant monotonous song. During the summer and autumn * * * I have occasionally heard it stridulating in bright sunshine in the afternoon. It is the most easily approached of all our locustarians while thus engaged and is in fact difficult to find in any other way, hence the females are but seldom seen. Although it usually perches upon tall weeds, I have occasionally traced its song to a tree or vine, the insect being sometimes stationed at a considerable height."

Allard (1911) says that in September near Oxford, Mass., *ensiger* is a very common species in all upland localities where it "prefers the fresh herbage of cultivated fields and is especially to be looked for in fields of corn. One oftentimes finds a noisy singer perched six or seven feet from the ground on a corn stalk or tassel. One also sometimes meets with it in large colonies among the luxuriant weeds and grasses of the lowlands. Its call notes are intermittent and follow each other rather briskly—*tsip-tsip-tsip-tsip*. They are rather soft and lisping, recalling to mind the staccato lisps of an *Orchelimum*."

R. & H. (1915, 385) have placed the *Conocephalus attenuatus* Scudder (1872, 249) as a synonym of *N. ensiger*.

238. NEOCONOCEPHALUS ROBUSTUS (Scudder), 1862, 449. Robust Conehead.

Size large, form robust. Pale green, rarely brown; fore and middle legs, hind tibiæ and tarsi and under surface greenish-yellow; sides of fastigium and lateral carinæ of pronotum yellowish; antennæ pale reddish-yellow. Fastigium with under surface immaculate,[66] about as long as occiput, distinctly narrowed from middle to apex, its upper surface convex, tip narrowly rounded (Fig. 169, *f*.) Pronotum with lateral carinæ distinctly divergent, more strongly so in male, hind margins broadly rounded, surface finely punctate; lateral lobes almost as deep as long their lower margin oblique, obtusely angulate; humeral sinus shallow, broadly rounded. Tegmina broader than in allied species, surpassing hind femora about 13 mm. Stridulating field of male large, its main vein heavy. Fore and middle femora either unarmed beneath or with a few small spines. Hind femora long, slender, armed beneath with three to 12 rather short spines on each carina. Length of body, ♂, 30, ♀, 31—37; of fastigium, ♂, 2.7—3.6, ♀, 3.1—3.7; of pronotum, ♂, 8—9.9, ♀, 7.3—8.3; of tegmina, ♂, 40—48, ♀, 43—54; of hind femora, ♂, 23—28, ♀, 24—28; of ovipositor, 25—31 mm. (Fig. 175.)

[66]This is true of all the specimens at hand and R. & H. (1915, 387) say that the vertex is always immaculate, but Scudder, in his original description, loc. cit., says of the type: "tubercle of the vertex tipped with black, not extending or but very faintly and narrowly, down the sides."

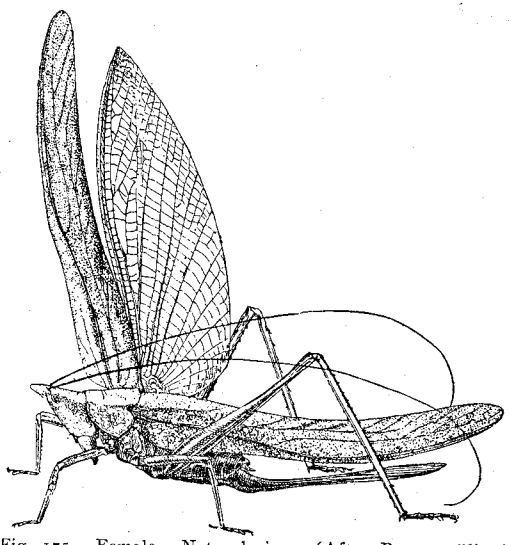

Fig. 175. Female. Natural size. (After Beutenmüller.)

Laporte Co., Ind., Oct. 15. Woodhaven, Long Island, N. Y., August (*Davis*). This is a xerophytic species, inhabiting sandy districts and is known only from along the Atlantic sea coast from Cape Cod, Mass., to Charlottesville, Va., and along the shores of the larger inland lakes. In Indiana it is known definitely only from Laporte county where it occurs quite frequently along the shores of Lake Michigan. R. & H. (1915, 390) state that typical *robustus* has not been taken over 60 miles from the coast, and without seeing the Laporte Co. specimens have assigned them to *N. robustus crepitans;* but they are identical in form of fastigium, size and all other characters with Scudder's type at Cambridge and with specimens from Long Island sent me by Davis as typical *robustus*. They also fully agree with the key and description of R. & H. of that form.

Scudder (1874, 376) describes the note of *robustus* as heard in New England thus: "This insect is exceedingly noisy and sings equally, and I believe similarly, by day and night. The song resembles that of the harvest fly, *Cicada canicularis*. It often lasts for many minutes, and seems, at a distance, to be quite uniform. On a nearer approach one can hear it swelling and decreasing in volume * * * and it is accompanied by a buzzing sound, quite audible near at hand, which resembles the humming of a bee or the droning of a bag-pipe."

Davis (1887, 57) says that on Staten Island *N. robustus* "resides for the most part mid the grass on sandy ground near the sea shore, though an occasional individual finds its way inland. Along the sea beach they stridulate in early afternoon, especially if slightly cloudy, and when approached they have a curious fashion of dropping to the ground. I have often found them on such occasions actually standing on their heads in the soft sand, leaning against the grass stems which grow so close together

without in any way holding on to them. Whether this position is intentional or not, I cannot say, but certain it is that when looked for from above they offer the smallest extent of their bodies to view and may thus escape many enemies."

Hart (1907) records *robustus* as occurring on waste sandy land in central and southern Illinois, and has observed them resting, head downward, on a green stem, thus closely resembling a grass leaf. At Tappahannock and Charlottesville, Va., Fox (1917) found *robustus* frequent on dry land or at the borders of tidal marshes, occurring on tall grasses and herbage in fields, pastures and roadsides.

238a. NEOCONOCEPHALUS ROBUSTUS CREPITANS (Scudder), 1862, 450. Crepitating Cone-head.

Size very large for the genus; form very robust. Color of *robustus*, the brown form more often found than there. Differs mainly in the shape of the fastigium which is distinctly broader, but feebly narrowed on apical third, and with tip bluntly rounded (Fig. 169, g.) Disk of pronotum broader, that of female with lateral carinæ parallel or nearly so—not feebly divergent as in *robustus*. Hind femora proportionally longer, with spines of lower carinæ longer and more slender. Length of body, ♂, 38, ♀, 40; of fastigium, ♂, 2.7—3.6, ♀, 3—3.8; of pronotum, ♂, 8.2—10.8, ♀, 8.3—9.3; of tegmina, ♂, 39—53, ♀, 49.4—58.4; of hind femora, ♂, 22.8—31, ♀, 28.8—35.1; of ovipositor, 27—36.9 mm.

Vigo Co., Ind., Aug. 8, one male; St. Louis, Mo.; Sedgewick Co., Kansas, August, taken at electric light by E. S. Tucker. In addition to the single Vigo Co. male this form is known from Indiana only from Lake Maxinkuckee (R. & H., 1915, 394) and from Tippecanoe County, where Fox (1915) took two specimens in the corn plats of Purdue University farm on August 26.

In Florida it has been recorded from Warchard, Levy Co., Atlantic Beach, Hastings and Fort Barrancas. Scudder's types of *crepitans* were from Texas and Nebraska and its range is given by R. & H. (1915, 392) as extending from "extreme southern New Jersey over the entire coastal plain of the southeastern United States as far south as Hastings, Fla. Westward it is widely distributed over the entire Mississippi Valley region as far as White Bear Lake, Minn.; Garden City, Kan.; Clarendon and Cisco, Texas, and Nugent, Miss." They state (1915, 389) that in the vicinity of Ocean View, N. Jer., and on the Delaware River near Philadelphia intergrading specimens between *N. robustus* and *N. crepitans* occur and on the basis of this intergradation they place *crepitans* as a race of *robustus*.

Davis (1913, 178) states that at Erma, N. Jer. the song of *crepitans* (so-called by R. & H.) "while it consisted of the same

continuous whirr as in *robustus,* was not nearly so ear-splitting." Commenting on this R. & H. (1915, 390) attribute the difference to possible climatic conditions and state that "in the west, in the center of its typical distribution, we have heard it singing with the full burring, buzzing whirr which is characteristic of and fully as loud as, the song of typical *robustus.*"

239. NEOCONOCEPHALUS CAUDELLIANUS (Davis), 1905, 289. Caudell's Cone-head.

"A robust species, either green or brown, the tegmina often flecked with black. Fastigium obtuse, its sides with a faint yellow line, beneath which there is a black line extending from the base to the base of the antennæ, or nearly so; lower basal tooth blunt but distinct. Anterior and middle femora unarmed beneath; posterior femora armed beneath on both carinæ with numerous spines." (*Davis.*) "Closely resembles *N. robustus* but the vertex very decidedly shorter with the sides usually very weakly convergent distad and apex rotundato-truncate, more so than in typical *robustus crepitans.* Stridulating field of male slightly more elongate with veins heavier than in *robustus* (Fig. 170, *d.*) Green color distinctly richer than in that species." (*R. & H.* 1915, 395.) Length of body, ♂, 33; of fastigium, ♂, 2.4—3.3, ♀, 3.1—3.2; of pronotum, ♂ and ♀, 8—8.9; of tegmina, ♂, 42—47.9, ♀, 54.5; of hind femora, ♂, 23.6—28.9, ♀, 28—31.5; of ovipositor, 33—35.4 mm.

Jamesburg, Cold Spring and Erma, N. Jer., Aug. 16—Sept. 18 (*Davis.*) The known range of this species extends from New Jersey to Atmore, Ala., but it appears to be nowhere very common. The three male types were found in a cranberry bog at Lakehurst, N Jer., and of them Davis says: "The song is a slow *zip-zip-zip,* repeated many times and much resembling that of *Conocephalus exiliscanorus* of the salt meadows." No females were found until 1910, when two were taken by Davis (1911) at Cold Spring, N. Jer. Of males taken near Tuckerton he wrote: "They were in a dry field and some of them, when disturbed, flew several hundred feet and lit in cedar trees. This was an unusual proceeding for they generally seek safety by dropping to the ground and hiding among the thick vegetation."

R. & H. (1915, 396) say: "The present insect is very widely distributed not only along the coastal strip in truck gardens, waste fields, and marshy fresh water areas, but also in boggy portions of the adjacent pine barrens and in fields there located. Usually no more than three or four widely scattered individuals are to be heard at one time. The song is loud, resonant and constant—*dzeeeet-dzeeeet-dzeeeet,* always the same, not rising and falling, the notes given deliberately, counted as averaging twelve to ten seconds. The males would continue their loud song fear-

lessly until approached to within about eight feet, then ceasing abruptly they would fly into the darkness with a swift powerful zigzagging flight. In alert swiftness this species and *N. velox* are distinctive."

Aside from the black margined under surface of the fastigium this insect is an exact replica of a small *N. robustus crepitans*, the form of the cones being identical. That species is said to sometimes have the fastigium "very briefly and narrowly darkened ventrad." I would consider *caudellianus* to be only a form of *crepitans* were it not for the difference in song as noted by Davis and R. & H.

240. NEOCONOCEPHALUS PALUSTRIS (Blatchley), 1893c, 89. Marsh Conehead.

Males small for the genus, form rather slender; females larger, more robust and with abdomen distinctly enlarged. General color of females usually a bright grass green; of males more often brown varying in shade; fastigium of green form tipped with dull yellow, which extends half way down the sides; labrum and apical segments of all the palpi rose red tinged with violet; antennæ and apical third of ovipositor reddish-brown; tarsi somewhat infuscated. Fastigium short, stout, apical third feebly narrowed, tip bluntly rounded (Fig. 169, *i*); under surface with a low obtuse carina, the usual basal tooth represented by a small blunt tubercle. Pronotum with lateral carinæ feebly divergent, hind margin very broadly rounded; lateral lobes longer than deep, their lower margin oblique, its

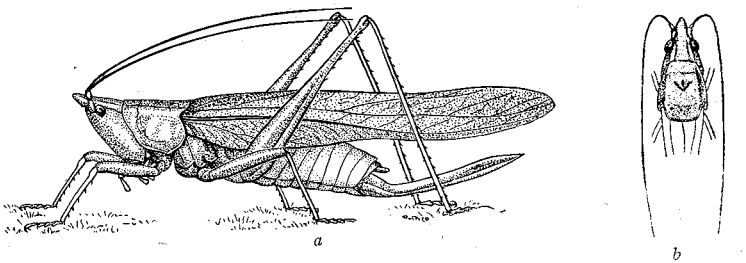

Fig. 176. *a*, Female. × 1.3; *b*, head of same from above. (Original.)

hind angle obtuse; humeral sinus very shallow. Tegmina very slender, tapering but little to the narrowly rounded tips. Stridulating field of male small, broad, basal three-fourths of stridulating vein coarse, apical fourth very weak (Fig. 170, *e*.) Fore and middle femora usually with 1—3 short, stout spines on apical third of lower outer carina. Hind legs short, tibiæ but little more than half as long as closed tegmina; femora with 3—9 spines on each of the lower carinæ. Ovipositor slightly shorter than hind tibiæ, broadest at a point about two-thirds the distance from base, thence tapering regularly to a sharp apex. Length of body, ♂, 24—26, ♀, 27—35; of fastigium, ♂, 2.3—3, ♀, 2.6—4; of pronotum, ♂, 6.3—8, ♀, 5.6—8.7; of tegmina, ♂, 28—34, ♀, 29—45; of hind femora, ♂, 16—19, ♀, 16—25; of ovipositor, 16—21 mm. (Fig. 176.)

Vigo Co., Ind., Oct. 24, type female (*W. S. B.*); Alexandria,

Va., Sept. 2 and Raleigh, N. Car., Aug. 4 (*Davis*). This trim-bodied cone-head was described from a single female taken Oct. 2, 1891, from the fallen grasses on the margins of a large low-land pond in Vigo County. This pond, now extinct, was surrounded on all sides by heavy timber, and its margins yielded a number of interesting Orthoptera found nowhere else in the county. Among them were *Leptysma marginicollis* (Serv.), *Paroxya hoosieri* (Bl.), *Anaxipha exigua* (Say), *Phylloscirtus pulchellus* (Uhler) and *Conocephalus nigropleurus* (Bruner). The first four mentioned are insects of a southern range, and *N. palustris*, as predicted at the time, has been found to be more common southward. Elsewhere in Indiana *N. palustris* is known only from Tippecanoe County, where Fox (1915, 30) found it in August and September of regular occurrence but not especially frequent in the open bogs of the rice cut-grass, *Homalocenchrus oryzoides* (L.).

Outside of Indiana *N. palustris* has been taken at various stations in Pennsylvania and New Jersey, near Columbus and Castalia, Ohio, Washington, D. C., Tappahannock, Va., Raleigh, N. Car., Clarksville, Tenn., and New Orleans, La. Of its habits in New Jersey and Pennsylvania R. & H. (1915, 400) have written: "The males were found to be at night very alert and shy, much the most difficult of the species to take excepting *N. caudellianus*. The method of escape is, however, to hide with agility in the tangles of vegetation in which the species is usually found, rather than to seek safety in flight. The song is a continuous *dzeeeeeeeeeee*, very high pitched and very weak."

"The series taken at Cornwells, Pa., was captured during the day by beating the tangled vegetation, and particularly a small area of *Panicularia septentrionalis* in a marshy spot. In the latter plant the females were exceedingly numerous, nearly all being taken there. In the daytime individuals are sluggish, moving but slowly about, but the clinging powers were found to be remarkable and the use of the spines on the limbs for this purpose was quickly apparent."

About Tappahannock, Va., Fox (1917) found *N. palustris* common in tidal marsh on the tall marsh-grass, *Spartina cynosuroides* (L.), less frequent on the three-square rush, *Scirpus americanus* (Pers.); also on cat-tails and in moist depressions filled with succulent grasses at the heads of gulleys."

241. NEOCONOCEPHALUS VELOX Rehn & Hebard, 1914c, 402. Swift Cone-head.

Size medium for the genus; form compressed, slender, elongate. Pale brown or tawny olive; head with a median stripe of darker brown, this

dividing and extending back along the lateral carinæ; tegmina with numerous very small, scattered brown spots; spines of the femora and tibiæ tipped with brown. Fastigium constricted at base, widest at middle, then feebly narrowed to the rounded apex. Pronotum with lateral carinæ very obtuse, feebly divergent, both its disk and the occiput finely rugose-punctate; lateral lobes much longer than deep, their lower margin broadly rounded into the front and hind ones; humeral sinus broad, very shallow, male, much deeper, female. Tegmina elongate, surpassing the hind femora about 16 mm, tip of ovipositor, 5 mm.; stridulating field of male rather small and broad, its main vein heavy, the others very weak. Front and middle femora armed beneath on the outer carina with two or three small spines. Hind femora very slender, armed beneath with six to eight slender spines on each carina. Subgenital plate of male with median notch narrow, the styles stouter and broader than in any other species, their tips bluntly rounded. Length of body, ♂, 33—40; of fastigium 2.6—3; of pronotum, 8.7—9; of tegmina, 40—42; of hind femora, 23—25 mm. (Fig. 177.)

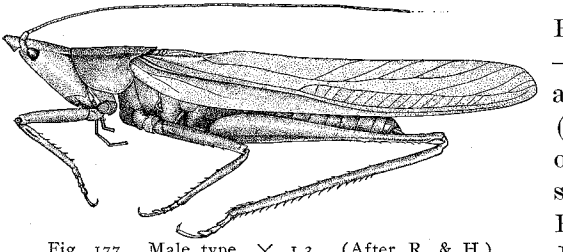

Fig. 177. Male type. × 1.3. (After R. & H.)

LaGrange and Parish, Fla., June—July 31; Logtown and Ratliff, Miss. (*Davis.*) Recorded only from Homestead, Fla., and Billy's Island, Ga., June—July, the former being the type locality. R. & H. (1915, 399) state that: "The song of this very shy and vigorous species is a loud and continuous buzzing. It is apparently a native of the undergrowth of the pine forests of the extreme southeastern United States."

242. NEOCONOCEPHALUS RETUSUS (Scudder), 1879a, 93. Round-tipped Cone-head.

Size small for the genus; form slender. Color usually green, often pale brown with tegmina faintly maculate; fastigium with margins yellowish, its apex only with a curved black line on under surface; lateral carinæ of pronotum often yellowish; tibiæ, tarsi and apical half of ovipositor usually more or less fuscous. Fastigium shorter than the interocular width, convex above, its sides subparallel, (Fig. 169, *k*,) basal tooth obtuse. Pronotum coarsely and thickly punctate, transverse sulcus distinct, metazona three times as long as prozona, hind margin very broadly rounded, lateral carinæ feebly divergent, female, rather strongly so, male; lateral lobes with lower margin oblique, its hind angle obsolete, hind margin broadly rounded; humeral sinus broad, shallow. Tegmina relatively short, surpassing the hind femora only 8—10 mm., their tips rather broadly rounded. Front and middle femora usually unarmed beneath, rarely with a single small spine. Hind femora with 2—6 small spines on each of the lower carinæ. Notch of subgenital plate of male broad, the styles slender,

acute. Ovipositor much surpassing the tegmina. Length of body, ♂, 26—28, ♀, 29—31; of fastigium, ♂ and ♀, 1.8—2.2; of pronotum, ♂, 6.8—7.5, ♀, 5.3—7.8; of tegmina, ♂, 29—34, ♀, 30—42; of hind femora, ♂, 18.5—21, ♀, 21—27; of ovipositor, 27—39 mm.

Putnam Co., Ind., Aug. 27—Sept. 18; Washington, D. C., Aug. 23; Norfolk and Tappahannock, Va., Aug. 23—Oct. 8; Staten Island, N. Y., Sept. 3. The Indiana specimens were taken from a marshy spot in a blue-grass pasture, the first one in 1914, and only females are so far known from that State. In Florida it is recorded only from Jacksonville, St. Augustine, Daytona and Gainesville and probably inhabits only the northern third of the State. Scudder's type was a female from Georgia and the known range of the species extends from Connecticut west to central Indiana and St. Louis, Mo., and southwest to northern Florida and Nugent, Miss.

R. & H. (1915, 403) describe the song and habits of *retusus* as follows: "The present insect is an inhabitant of the grasses in waste fields, along the borders of marshes and in the drier portions of the marshes proper, and is usually to be found in large numbers. The song is of the exact pitch of that of *N. lyristes* but weaker, a continuous *zeeeeeeeeee.* In New Jersey the species is the last of the genus to appear, reaching the adult condition toward the end of August." R. & H. (1915, 401) have placed the *Conocephalus atlanticus* Bruner (1899, 38) as a synonym. They state that the *Conocephalus triops* and *C. dissimilis* of many American authors also refer rightfully to *retusus, triops* being a larger, more robust form with shorter ovipositor and shorter, flatter, broader fastigium.

243. NEOCONOCEPHALUS TRIOPS (Linnæus), 1758, 430. Broad-tipped Conehead.

Size rather large; form robust. Green or brown; tip of fastigium beneath and often the tips of mandibles black; lateral carinæ of pronotum and margins of fastigium rarely yellowish; brown form often with a purplish stripe along the upper third of lateral lobes and humeral vein of tegmina; under surface of hind femora and tibiæ very dark in some individuals. Fastigium as described in key. Pronotum broader and smoother than in *retusus;* humeral sinus broader; lateral lobes deeper in proportion to their length. Front and middle femora unarmed or with a few small spines. Hind femora with six to ten very small spines on each lower carina. Ovipositor but slightly surpassing the tips of tegmina, its apical third feebly decurved. Length of body, ♂, 27.5—32, ♀, 32—36; of fastigium, ♂ and ♀, 2.1—2.6; of pronotum, ♂ and ♀, 8.7—9.7; of tegmina, ♂, 40—44, ♀, 43—53; of hind femora, ♂, 22—24, ♀, 23—26; of ovipositor, 21—25 mm.

Ormond, Gainesville, West Palm Beach, Lake Istokpoga, Cape Sable and Dunedin, Fla. (*W. S. B.*); Mobile, Ala. (*Loding*); Agricultural College, Miss. (*Weed*); October—March. Recorded from numerous places in Florida, and occurs everywhere throughout the State and on the southern keys. These records have been made under different names, viz., *Conocephalus triops* (Linn.), *C. fusco-striatus* Redt., *C. mexicanus* Sauss. and *C. nietoi* Sauss., the second and third being synonyms of *triops* and the fourth belonging rightfully to an extralimital species of *Homorocoryphus*.

My first field acquaintance with *C. triops* was made at Ormond on March 16, 1899. These I determined as *C. nietoi* Sauss. by comparison with Mississippi specimens which I had received under that name from H. C. Weed and they were so recorded by me (1902, 70). About Dunedin *N. triops* occurs in small numbers throughout the winter, frequenting for the most part the dense masses of fallen grasses about the borders of marshes and ponds, but sometimes noted amidst the wire-grass of open pine woods. There as elsewhere the males are mostly brown and the females green, there being but one brown female and one green male among the 24 specimens at hand. I have never seen it fly when disturbed, but it is an adept at burrowing and also at remaining perfectly motionless by the side of or on some object with whose hue its own color blends. On the other hand, Hebard states (*R. & H.*, 1904) that at Thomasville, Ga., the brown *fusco-striatus* phase of this species "appeared early in March and was soon plentiful in the woods, especially in the broom sedge in damp locations. The specimens, when pursued, always took to wing and made off with a strong but zigzag flight, never alighting until quite a distance had been traversed."

N. triops is found, say R. & H. (1915, 408) "almost everywhere in the southern United States, inhabiting the forest undergrowth, fields and semi-marsh situations. Over most of its range it is one of the earliest Tettigoniids to appear, the adults being found in south Georgia in late March." Its known range extends from the vicinity of Washington, D. C., south and west to Stillwater, Oklahoma, Central Texas, Arizona and Los Angeles, Cal. Redtenbacher (1891, 399) gives also for his *fusco-striatus*, Missouri, Cuba, Port Au Prince and Quita.

Allard (1910a) has given an excellent account of the habits and song of the brown color phase of *N. triops* which is, in part, as follows:

"The careful observer of insect stridulations who visits the upper

Piedmont region of Georgia in March or April, will hear, during warm evenings, a loud, continuous, noisy buzz, sometimes in the tallest pines and oaks, or again in the weeds and low herbage of fields. This is the stridulation of a cone-headed grasshopper known as *Conocephalus fusco-striatus* Redt. In this region the notes of this interesting locust together with the familiar trillings of the ubiquitous field cricket, *Gryllus pennsylvanicus* Burm., are among the earliest insect stridulations to be heard in spring. Here it is the only *Conocephalus* to be heard in early spring, and, judging from the individuals in song during warm evenings, it is a fairly common species.

"This cone-head is strictly a nocturnal insect and stridulates most freely during warm, moonlight evenings. The note is a loud, harsh, snappy *z-z-z-z-z-z* continued for many minutes at a time. Within a few feet of the stridulating insect a strong, penetrating buzzing hum is noticeable, attended by almost continuous harsh, snappy, unmusical creptitations which are audible for long distances, and constitute the notes usually heard by the distant observer. It is somewhat difficult, especially for those who have not studied insect-stridulations, to locate one of these insects in a big field. Its powerful, penetrating notes seem to permeate the herbage on every hand, frequently causing no little bewilderment in the mind of one who attempts to locate the musician too carelessly. It is a very shy insect and cannot readily be captured unless approached with considerable care. It takes to wing readily, and flies long distances in the fields or from tree to tree."

Of the two synonyms of *N. triops* above noted, the name *mexicanus* Sauss. (1859, 208) has usually been given by American authors to the green form, and *fusco-striatus* Redt. (1891, 399) to the brown one. R. & H. (1914c, 402) first placed the latter as a synonym of *mexicanus* and in 1915 referred both names to *triops*. Other synonyms of *triops* as stated by them are *Conocephalus obtusus* Burm. (1838, 705), *C. dissimilis* Serv., (1839, 518), *C. dissimilis* Harris (1862, 164), *C. hebes* Scudd. (1879a, 92), and *Neoconocephalus mexicanus* var. *tibialis* Karney (1907, 33).

IV. Homorocoryphus Karney, 1912, 36. (Gr., "contiguous" + "vertex")

Species of large size and robust form, very similar in structure and general facies to those of *Neoconocephalus*, with which they were formerly grouped. Fastigium slightly shorter than width of interocular space, its apical half convex, swollen, bluntly rounded; antennæ longer than body, very slender; pronotum with posterior lobe very short, lateral carinæ subobsolete, hind margin truncate, lateral lobes longer than deep, humeral sinus distinct but shallow; tegmina variable in length; wings shorter than or equal to tegmina; fore and middle femora short, subequal, armed with only one or two short spines on lower, outer carinæ; hind

femora short, but slightly surpassing the abdomen, female, their lower carinæ armed with three to seven short, stout spines. Male with apex of supra-anal plate very broadly concave or emarginate, the projection each side acute; cerci much as in *Neoconocephalus;* subgenital plate with a narrow median notch; styles short, broad, concave above, their tips bluntly rounded. Ovipositor more than one-half longer than hind femora, slightly widened and feebly decurved beyond the middle, its apex very acute. Other characters as in *Neoconocephalus.*

But one species of the genus occurs in the United States.

244. HOMOROCORYPHUS MALIVOLANS (Scudder), 1879a, 90.

Pale brown, the female darker; disk of pronotum with a narrow dark brown stripe each side, sometimes almost wholly blackish-brown; tarsi and hind tibiæ often in great part infuscated. Occiput and sides of head rather coarsely and very irregularly punctate. Disk and sides of pronotum rugosely punctate, more strongly so in female. Tegmina dimorphic in length, in the more common brachypterous form not reaching tips of hind femora, slightly longer than abdomen, male, shorter than abdomen, female, their tips acute or narrowly rounded; in macropterous form surpassing hind femora 12—15 mm. and extending far beyond tip of abdomen in both sexes, their apices rounded; wings usually shorter than tegmina, equal to latter in macropterous individuals. Other characters as given under the generic heading. Length of body, ♂, 27—29, ♀, 39—43; of fastigium, ♂, 2; ♀, 2.7; of pronotum, ♂, 7, ♀, 9—10; of tegmina, short-winged, ♂, 19—20, ♀, 23—24; long-winged, ♂, 40, ♀, 47—50; of hind femora, ♂, 17, ♀, 22.5—24; of ovipositor, 37—38.5 mm. (Fig. 178.)

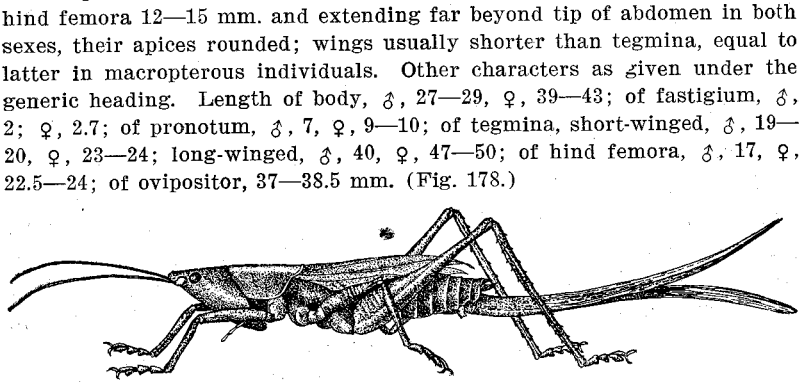

Fig. 178. Short-winged female. Natural size. (After R. & H.)

Tappahannock, Va., July 14 (*Fox*); Citrus Center, Fla. (*Davis*). Scudder's type was a unique male taken at Cedar Keys, Fla., June 4 by E. A. Schwarz. This was the only specimen known until 1905, when R. & H. described a single female from Chokoloskee, Fla., under the name of *Conocephalus hoplomachus.* A second male was taken by them July 12, 1912 "from saw-grass growing in knee-high water on the edge of the everglades" at Detroit, Fla., and was properly placed (1914c, 405) under Scudder's name. The only other Florida locality recorded is Citrus Center, where Davis secured two males on May 2, but he has a male taken at Parish, August 25, in which the tegmina are 40 mm. in length.

Outside of Florida the species is recorded only from Wilming-

ton, N. Car., Tappahannock, Va. and Victoria, Texas. At Tappahannock Fox (1917) took 29 males and 12 females, July 13—Aug. 18, which he found mostly "in dense stands of the tall marsh-grass, *Spartina cynosuroides* (L.), in tidal marshes, a few occurring in briery thickets on nearby knolls. Observed ovipositing in the *Spartina.*" It probably occurs sparingly over the areas of the marshes covered by this and allied grasses and reeds all along the Atlantic coast from Virginia to extreme southern Florida and also along the gulf coast of Florida on which the type was taken. As Scudder has noted, the male, on account of its short tegmina and blunt rounded fastigium, resembles somewhat a large *Orchelimum.*

Caudell (1918a) records a macropterous female of *H. malivolans* from Victoria, Texas, in which both tegmina and wings are 50 mm. in length, thus giving the "insect an appearance of being larger and more bulky than its brachypterous relatives."

Subfamily IV. CONOCEPHALINÆ.

The Meadow Grasshoppers.

"The poetry of earth is never dead:
When all the birds are faint with the hot sun,
And hide in cooling trees, a voice will run
From hedge to hedge about the new mown mead:
That is the grasshopper's—he takes the lead
In summer luxury—he has never done
With his delights; for when tired out with fun
He rests at ease beneath some pleasant weed."—*Keats.*

Species of small or medium size, having the vertex projected upward and forward in the form of a blunt rounded tubercle, concave on each side to accommodate the basal joint of antennæ; eyes rather large, subglobose; antennæ very slender, tapering, often of excessive length; pronotum with not more than one transverse sulcus; prosternum toothed or with two slender spines, rarely unarmed; tegmina usually well developed but often dimorphic in the same species, sometimes reduced to mere pads, or even wanting, their color usually green, rarely pale brown; wings usually present and fully developed, absent or very minute in *Odontoxiphidium* and much aborted in some species of *Conocephalus.* Other characters much as in the Copiphorinæ.

To this sub-family belong those slender-bodied green grass-