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Regards of
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THE AMERICAN SPECIES OF THE GENUS
MIOGRYLLUS (ORTHOPTERA, GRYLLIDÆ).

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Recent studies in the group Gryllites, of which the present genus is a member and in which, in our opinion, it stands after *Grylloides* and before *Gryllus*, have demonstrated that in the past the true value and significance of many morphological features of the present group have been wholly miscalculated. There is no question but that in this group various species exhibit the greatest plasticity found in the Orthoptera and enjoy as wide a distribution as any American forms, excepting those which have been spread by the agency of man. Unless we consider that these great plastic units have always been treated systematically without the following features being realized, the amount of synonymic names for many species would be incomprehensible.

Variations found in the Group Gryllites.—Many species vary greatly in size, as in the Orthoptera generally, this variation often being geographic but frequently due to local environmental conditions.

A megacephalic condition is met with in occasional individuals, particularly of the male sex; in some of these males the head is frequently not only disproportionately swollen, but the face at the clypeal suture suddenly sunken in, thus affording an unusual and distinctive appearance. In such specimens the pronotum is, as a result, more enlarged cephalad than is normal.

The wings are often fully developed as organs of flight or very greatly aborted in the same species irrespective of sex, and the tegmina also vary from an elongate condition to one of decided abbreviation. It is true that some species with extremely abbreviate tegmina apparently never develop a form having long tegmina or wings, but these are rare and, as in many other groups of Orthoptera, the majority of the species exhibit both macropterous and brachypterous or micropterous forms. Throughout the present paper we have referred to the macropterous and micropterous condition, using these terms in application to the wings only and not to the tegmina.

The length of the ovipositor varies greatly in the majority of the species and has been proven by experiment to be chiefly influenced by local soil conditions.¹

The foramen on the inner face of the cephalic tibia is always membranous and distinct in macropterous specimens, but in the brachypterous condition of the same species this opening varies individually from that type to one in which it has completely disappeared. In all forms of the present group the foramen on the outer face of the cephalic tibia is always the largest, membranous and distinct. This organ appears only when the adult condition is reached.

The number of spines on the dorsal margins of the caudal tibia is never absolutely constant in material of a single species, nor is the relative length of the six distal spurs. In these respects, however, different species do show different averages.

In a great number of species the general coloration is very dark and the color pattern almost obliterated. In such species, the color pattern appears fully only in specimens of recessive coloration, which gives such material a distinctive appearance.

¹ See Lutz, *The Variation and Correlations of Certain Taxonomic Characters of Gryllus*, pp. 1-63 (1908).

MIOGRYLLUS Saussure.

1877. *Gryllus*, 2d Section *Miogryllus* Saussure, Mélang. Orthopt., II, p. 362.
 1897. *Miogryllus* Saussure, Biol. Cent.-Amer., Orth. I, p. 227.
 1901. *Miogryllus* Scudder, Psyche, IX, p. 256.

The genus included five species. GENOTYPE.—*Miogryllus pusillus* [*Gr[yllus] pusillus*] (Burmeister) = *Miogryllus convolutus* [*Gryllus convolutus*] (Johannson), selected by Kirby, 1906.

This genus includes a number of species which are closely related to the genus *Gryllus* and for which no definite single differential characters exist, excepting the form of the titillatores (a portion of the male genitalia concealed within the subgenital plate), and in the proportions of the wings; in the long-winged condition, wings which are proportionately much longer than the tegmina (in *Miogryllus*, $2\frac{1}{2}$ to $3\frac{1}{2}$ times the tegminal length, in *Gryllus*, in the majority of species normally $1\frac{1}{2}$ times this length but in a few species 2 or slightly more than 2 times the tegminal length), while in material having the wings greatly reduced and hidden by the tegmina, these organs are perfect though greatly reduced in *Gryllus*, but small pad-like appendages in the present genus. All of the species average smaller than do the American forms of *Gryllus* and have the spines of the dorsal margins of the caudal tibiae, in the great majority of specimens, 4 or 5 in number (this being fewer than is normal in *Gryllus*), less heavy and not as rigidly fixed in their sockets as in that genus. The male tegmina have normally 2, but occasionally 1 or 3, transverse veins (in *Gryllus* the number is normally 4 or 5, rarely 3 or 6). The male titillatores are formed by two dark chitinous perpendicular plates which are uncinatè dorsad, between the dorsal margins of which are two small acicular projections of equal length. In the American forms of *Gryllus* the medio-dorsal portion of this organ is produced in a large horizontal triangular plate with apex curved upward. The species agree with those of *Gryllus* in having a large membranous foramen on the outer face of the cephalic tibiae and also a smaller but distinct membranous foramen on the inner face of the same, excepting in micropterous individuals where this inner foramen is frequently greatly reduced or absent on one limb or both.

History.—No species have been incorrectly referred to the present

genus. As will be seen by consideration of the nomenclature, the species have been variously described as members of *Nemobius*, *Gryllus*, *Miogryllus* and *Gryllodes*. The use of the generic name *Nemobius* in this connection was inexcusable, for the group Nemo-biites, to which that genus belongs, is separable by the unarmed dorsal margins of the caudal metatarsus and other adequate and constant characters. The three other genera are, however, very closely associated and are based on characters which are elusive and (excepting one sexual character) variable, though each genus properly considered includes forms which constitute recognizable units and are in our opinion worthy of retention. A number of the smallest Old World species, which are placed in *Gryllus*, show a decided tendency toward the present genus.

Distribution of Genus.—In America: from Staten Island, New York; Knox County, Indiana; South Bend, Nebraska; Alamogordo, New Mexico; Las Vegas, Nevada, and San Diego, California, southward to Buenos Aires and Mendoza, Argentina. In South America the genus is apparently absent on the west coast, west of the Andes.

Specimens Examined.—In the preparation of the present paper the following types have been before us.

(*Nemobius distinguendus* Scudder, synonym of *Miogryllus convolutus* (Johannson).)

(*Nemobius delicatus* Scudder, synonym of *Miogryllus convolutus* (Johannson).)

Miogryllus ensifer (Scudder).

Miogryllus lineatus (Scudder).

(*Nemobius pictus* Scudder, synonym of *Miogryllus lineatus* (Scudder).)

(*Miogryllus capitatus* Scudder, synonym of *Miogryllus lineatus* (Scudder).)

(*Miogryllus sicarius* Scudder, synonym of *Miogryllus lineatus* (Scudder).)

(*Gryllus saussurei* Scudder, synonym of *Miogryllus verticalis* (Serville).)

(*Miogryllus oklahomæ* Caudell, synonym of *Miogryllus verticalis* (Serville).)

The total number of specimens examined in the preparation of the present paper is 391, of these 301 are in the Hebard Collection

and that of the Academy of Natural Sciences of Philadelphia. The collections of the United States National Museum, Museums of Comparative Zoölogy and Brooklyn Institute of Arts and Sciences have been examined through the kindness of their curators and we have been further assisted by Professor A. P. Morse, Mr. Wm. T. Davis and Dr. J. Chester Bradley. For this kind coöperation we wish to express our deepest gratitude.

Miogryllus convolutus (Johannson).

1763. *Gryllus convolutus* Johannson, Amoen. Acad., VI, p. 399. [Surinam.] (Macropterous ♀.)
1773. *Gryllus ater* De Geer, Mém. l'hist. Ins., III, p. 520. [Surinam.] (Macropterous ♀.)
1838. *Gr[yllus] pusillus* Burmeister, Handb. Entom. II, 2 Abth., pt. 1, p. 733. [Brazil.] (Macropterous.)
1858. *Gryllus nitidulus* Stål, Kongl. Svensk. Freg. Eug. Resa, II, p. 315. [Buenos Aires, Argentina.] (Micropterous ♀.)
1874. *Grylloides micromegas* Saussure, Miss. Sci. Mex., Rech. Zool., VI, p. 418. [Mexico.] (Micropterous ♀.)
1874. *Grylloides brevipennis* Saussure, Miss. Sci. Mex., Rech. Zool., VI, p. 418. [Peru.] (Micropterous ♀.)
1874. *Grylloides parvipennis* Saussure, Miss. Sci. Mex., Rech. Zool., VI, p. 419. [Santa Catarina, Brazil.] (Micropterous ♀.)
1896. *Nemboius distinguendus* Scudder, Jour. N. Y. Ent. Soc., IV, p. 101. [Orizaba, Mexico.] (Micropterous ♀.)
1896. *N [emobius] delicatus* Scudder, Psyche, VII, p. 433. [San Rafael, Vera Cruz, Mexico.] (Macropterous ♂ and ♀.)

No other species of Orthoptera in the large collections from the Guianas before us fits Johannson's brief description of *convolutus*, with which large series of macropterous examples of the present insect agree perfectly. De Geer's *ater* is evidently a slightly amplified description of the same insect. Burmeister's *pusillus* from Brazil agrees also in every detail, and he further describes the normally striking coloration of the caudal femora; his description is of the macropterous condition also, but with tegmina more abbreviate. Stål's *nitidulus* represents the larger and somewhat paler condition found in Argentina as demonstrated by material before us; these differences are by no means sufficient to warrant the retention of the name as a geographic race. His specimen is micropterous but with long tegmina, a condition also represented in material before us,

though usually in such material the tegmina are distinctly shorter. That author gives five spines for the dorsal margin of the caudal femora, this is unusual for the species and found in but few specimens before us; it is very possible that he included the dorso-external spur, which equals in size the marginal spines. Saussure's *micro-megas* is based on a small micropterous specimen with ovipositor of minimum length; *brevipennis* a larger pale micropterous individual showing nearly the maximum of tegminal abbreviation, and *parvipennis* similar but with tegmina somewhat less abbreviate. The presence (*brevipennis*) or absence (*parvipennis*) of a foramen on the inner face of the cephalic tibia has caused these two names to be placed in different genera: this is a condition now known to be variable within the species. In addition to the variants referred to above, we find in the present species some slight variation in the size and convexity of the head, form of maxillary palpi (varying in the oblique truncation of the distal segment, which reaches to a point from slightly less than to a little beyond the middle of the ventral margin) and proportions of the caudal femora, which would be expected in a plastic species enjoying so extensive a distribution and which, accompanied by the varied appearance mentioned above, apparently led Saussure to describe the three specimens before him as distinct.

The types before us of Scudder's *Nemobius distinguendus* and *delicatus* leave no room for doubt. That author, evidently through sheer carelessness, forgot the character which so definitely separates the Nemobiites from the Gryllites. Absence or presence of elongate wings are the additional factors principally responsible for the two names.

This small, usually dark species, which has generally been determined as *pusillus* by authors, is one of the most variable and widely ranging of the American Gryllidæ. The features most worthy of remark are as follows: Head little broader than pronotum, slanting and scarcely convex from summit of occiput to the large but not strongly produced interantennal protuberance; strikingly buffy, narrow, divergent lines run back from lateral ocelli. Maxillary palpi rather heavy, distal segment obliquely truncate; palpi blackish except fourth and proximal portion of fifth (distal) segment, which portions are

whitish.² Pronotum subequal in width. Cephalic tibiae with very large nearly elliptical foramen on outer face and smaller ovoid foramen, also membranous, on inner face, except in wingless individuals in which inner tympanum is frequently absent on one limb and occasionally on both. Caudal femora with ventro-proximal portion strikingly paler than other portions of limb.³ Dorsal margins of caudal tibiae normally armed with four and four spines;⁴ dorso- and medio-

MEASUREMENTS (IN MILLIMETERS) OF EXTREMES.

Male.	Length of Body.	Length of Pronotum.	Length of Tegmen.	Length of Wing.	Length of Caudal Femur.
San Rafael, V. C., Mexico...	8.5-9	1.7-1.9	4.0-4.2	11.9-12.6	5.4-5.8
Medellin, V. C., Mexico.....	9.0-10.3	1.8-2	3.7-4.4	12.2-14.9	6.0-6.9
Benque Viejo, Br. Honduras..	8.6	1.7	3.9	11.7	5.6
Tabernilla, Panama.....	8.7- 9.7	1.7-1.8	4.0-4.3	12.6-13.7	5.6-6.1
Ancon, Panama.....	7.4- 8.2	1.5-1.9	3.0-3.3	—	5.7-5.8
Bartica, Br. Guiana.....	8.0-10.5	1.6-2.2	3.4-4.6	11.2-14.1	5.1-6.7
Kaitour, Br. Guiana.....	6.7	1.3	2.8	—	4.8
Igarapé Assu, Brazil.....	9.6-10.5	1.7-2.1	4.1-4.2	12.1-13.3	5.7-6.3
Manáos, Brazil.....	9.0- 9.7	1.9-2	4.2-4.7	12.3-12.7	6
Carcaraña, Argentina.....	10.2	2.4	5.2	14.4	7
Extremes of series.....	6.7-10.5	1.3-2.4	2.8-5.2	11.2-14.9	4.8-7

Female.	Length of Pronotum.	Length of Tegmen.	Length of Wing.	Length of Caudal Femur.	Length of Ovipositor.
San Rafael, V. C., Mexico.....	2.0-2.2	3.7-4.3	12.3-12.9	6.4-6.9	7.2-7.3
Medellin, V. C., Mexico.....	1.9-2.2	3.7-4.1	12.3-14	6.1-7.3	6.5-7.4
Medellin, V. C., Mexico.....	1.9	3.9	—	6.8	6.8
Orizaba, V. C., Mexico.....	2.2	5.1	—	7.3	7.4
Benque Viejo, Br. Honduras.....	2.2	4.1	—	7.2	7
Pózo Azul, Costa Rica.....	1.9-2.2	4.7-4.9	13.7-14	6.6-6.9	7.8-7.9
Tabernilla, Panama.....	2.1	3.8	13.7	6.7	7
Ancon, Panama.....	2.3	2.8	—	6.9	6
Bartica, Br. Guiana.....	1.9-2.3	4.4-5.7	13.0-16.4	5.9-8	6.2-9.7
Kaitour, Br. Guiana.....	1.9-2	2.3-2.7	—	5.7-6	5.6-6.2
Igarapé Assu, Brazil.....	1.8-2.1	4.3-4.6	13.7-14	6.7-6.9	7.2-8.2
Contamano, Peru.....	2.3	4.6	—	7.8	8.3
Chanchamayo, Peru.....	2.1	4.7	14.6	7	8
Carcaraña, Argentina.....	2.4	5.4	15.8	7.2	8.6
Extremes of series.....	1.8-2.4	2.3-5.7	12.3-16.4	5.7-8	5.6-9.7

² In occasional paler specimens, the dark portion is brownish and confined to the three proximal segments and distal portion of the fifth, while in a few very dark examples the palpi, excepting the median portion of the fourth segment, are blackish.

³ In pale examples, this difference of coloration is appreciable but by no means as decidedly pronounced.

⁴ Rarely five are found, as discussed above.

internal spurs longest and subequal in length. The ovipositor is long and very slender with smooth apex but little enlarged; it is extremely variable in length and varies from rigidly straight to rather strongly curved, this latter condition apparently frequently accentuated in drying.

In this series of females the extremes of body length are 8.4-12.7 mm., those extremes found in the series from Kaitour and Bartica, British Guiana, respectively. The very large series before us from the latter locality shows that a very great amount of variation exists, irrespective of geographic distribution. As in numerous other groups which we have studied, material is evidently greatly influenced by local environmental conditions.

The great majority of specimens before us are blackish and shining in general coloration, with wings, when present, contrastingly whitish. Some examples, however, are dark brown with lateral margins of dorsum of pronotum outlined in a paler shade and limbs brown, the ventro-proximal pale portion of the caudal femora in consequence not as contrastingly colored. The lateral lobes of the pronotum are always dark and uniform in color. The head is often narrowly and briefly bistriate on the occiput between the two distinctive lateral lines discussed above, which are present in every specimen before us. These latter lines, in rare specimens, widen distad and overspread the entire interantennal protuberance and adjacent portion of the occiput, giving such individuals an unusual facial aspect.

The known distribution of this species is defined by the material before us and that quoted in the synonymy when we add to this the record of *brevipennis* by Giglio-Tos from Gualaquiza, Ecuador, that by Caudell of *pusillus* from Sapucay, Paraguay, those of *pusillus* and *brevipennis* by Chopard from various localities in French Guiana and that of *nitidulus* by Berg from Cerro de Sotoya, Argentina.

Specimens Examined.—200; 59 males, 136 females and 5 immature females.

Jalapa, Vera Cruz, Mexico, 1 ♀ [A. N. S. P.] (micr., l. teg.).⁵

⁵ The following abbreviations are used:— dk. = dark; micr. = microp-terous; macr. = macropterous; l. = long; med. = medium; pl. = pale; mod. = moderately; megac. = megacephalic; sh. = short; v. = very; teg. = tegmina.

Orizaba, V. C., Mex., I, 1892, 1 ♀, type *Nemobius distinguendus* Scudder [Hebard Cln.; type no. 398] (micr., v. l. teg.).

Medellin, V. C., Mex. (Rev. T. Heyde), 4 ♂, 6 ♀, 1 juv. ♀ [Hebard Cln.] (1 ♀ micr., med. teg.).

San Rafael, V. C., Mex. (C. H. T. Townsend), 5 ♂, 5 ♀, including type series *Nemobius delicatus* Scudder [Hebard Cln.; type no. 400] (macr.).

Benque Viejo, British Honduras, VII, 1906 (W. A. Stanton), 1 ♂, 1 ♀ [U. S. N. M.] (macr.).

San José, Costa Rica, V and VI, 1902 and 1906 (P. Biolley; 1 at light), 2 ♀ [Hebard Cln. and A. N. S. P.] (macr.).

Pózo Azúl de Pirris, C. R., V, 10 to 20 (M. A. Carriker Jr.), 3 ♀ [Hebard Cln.] (macr.).

Tabernilla, Canal Zone, Panama, V, 4 and 9, 1907 (A. Busk), 2 ♂, 1 ♀ [U. S. N. M.] (macr.).

Ancon, C. Z., Panama, XI, 16, 1913 (M. Hebard; in heavy marsh grass), 4 ♂, 1 ♀ (Hebard Cln.) (macr., v. sh. teg.).

Caparo, Trinidad, VI to VII, 1913 (S. M. Klages), 2 ♂, 9 ♀ [A. N. S. P. and Hebard Cln.] (1 ♂, 7 ♀ micr., v. sh. teg.).

Kaiteur, British Guiana, VII, 31 to VIII, 12, 1911 (F. E. Lutz), 1 ♂, 3 ♀ [A. M. N. H.] (micr., v. sh. teg.).

Rockstone, B. G., VII, 9, 1911 (Crampton and Lutz), 1 ♀, 1 juv. ♀ [A. M. N. H.] (micr., med. teg.).

Bartica, B. G., XII, 31, 1912 to IV, 14, 1913 (S. M. Klages), 28 ♂, 82 ♀ [A. N. S. P.] (macr., but 1 ♀ micr., l. teg.); V. 21, 1901 (R. G. Crew), 1 ♀ [A. N. S. P.] (macr.).

Paramaribo, Dutch Guiana (K. Mayo), 1 ♀ [A. N. S. P.] (micr., med. teg.).

Ceará, Ceará, Brazil (F. Rocha), 1 ♀ [U. S. N. M.] (macr.), dried alcoholic.

Bonito, Pernambuco, Brazil (A. Koebele), 4 ♂, 1 ♀ [U. S. N. M.] (2 ♂ macr.).

Pará, Pará, Brazil (C. F. Baker), 2 ♀ [A. N. S. P.] (macr.).

Igarapé Assu, Pará, Brazil, I, 17 to II, 6, 1912 (H. S. Parish), 4 ♂, 9 ♀ [A. N. S. P.] (macr.).

Manáos, Amazonas, Brazil (Mann and Baker), 2 ♂ [A. N. S. P. and Stanford Univ.] (macr.).

Porto Velho, Rio Madeira, Brazil (Mann and Baker), 1 ♂ [A. N. S. P.] (macr.).

Contamano, Rio Ucayali, Peru, X to XI, 1912, 3 ♀, 3 juv. ♀ [A. N. S. P.] (1 micr., v. l. teg.), alcoholic.

Chanchamayo, Peru, 1 ♀ [A. N. S. P.] (macr.).

Carcaraña, Santa Fé, Argentina, 1 ♂, 1 ♀ [A. N. S. P.] (macr.).

Miogryllus ensifer (Scudder).

1896. *Nemobius ensifer* Scudder, Jour. N. Y. Ent. Soc., IV, p. 101.
[Central America.] (Macropterous ♀.)

This species shows near relationship to *M. convolutus*, differing in the average larger size, normal chestnut general coloration, longer and wholly pale maxillary palpi with apex of distal segment less strongly truncate (this occupying but distal third of ventral margin), head with longitudinal lines when present only faintly indicated on occiput and the lateral pair never continued beyond this point, lateral lobes of pronotum which often show traces of a dark stripe dorsad, wings always distinctly tinged with chestnut, caudal femora which are not distinctively marked and ovipositor which averages decidedly longer.

The two species agree in the armament of the caudal tibiae and in the form of the male titillatores. The other species of the genus are larger, heavier forms, with caudal femora bearing an average of five spines on the dorsal margins, instead of the average of four found in *convolutus* and *ensifer*.

MEASUREMENTS (IN MILLIMETERS) OF EXTREMES.

Male.	Length of Pronotum.	Length of Tegmen.	Length of Wing.	Length of Caudal Femur.	Length of Ovipositor.
Tabernilla, Panama.....	2.3-2.4	5.8-6	15.1-16.1	7.2-7.7	—
Female.					
Central America. Type.....	2.6	5.8	15.2	7.7	8.6
Tabernilla, Panama.....	2.5-3.2	5.3-6.7	15.6-19.3	7.7-9.7	8.8-11
Georgetown, Br. Guiana.....	2.7	4.8	16.3	8.2	—

The extremes of body length are: males, 11-12.1, females 11.1-14 mm. Though the series before us is not large enough for definite conclusions, it would appear that the present species is by no means as variable as *convolutus*.

In this species the median ocellus is usually strongly defined by a pale yellowish spot, in *convolutus* no such marking surrounds this organ. The limbs are slightly paler than the chestnut general coloration of the body, but are speckled and suffused with that shade. In numerous specimens the ventro-caudal portion of the dorsum of the pronotum is marked with pale yellowish brown, which color is continued on the tegmina occupying the intermediate channel. In one male before us the right tegmen has but one instead of the normal two transverse veins. All of the specimens in the present series are macropterous.

This species is known only from the material here studied.

Specimens Examined.—23; 7 males and 16 females.

Central America (Rev. T. Heyde), 2 ♀ [Hebard Cln.; type no. 397].

Tabernilla, Canal Zone, Panama, V, 1 to VI, 16, 1907 (A. Busk), 7 ♂, 13 ♀ [U. S. N. M.].

Georgetown, British Guiana, 1 ♀ [A. N. S. P.].

Miogryllus lineatus (Scudder).

1876. *Gryllodes lineatus* Scudder, Ann. Rept. Chief of Engineers, 1876, part III, p. 499. [Between Virgin River and Fort Mojave, Arizona.] (Micropterous ♀.)

1896. *N[emobius] pictus* Scudder, Psyche, VII, p. 434. [Colorado, New Mexico.] (Macropterous ♀.)

1901. *Miogryllus capitatus* Scudder, Psyche, IX, p. 257. [Gulf Coast of Texas.] (Micropterous ♂, 2 juv.)

1901. *Miogryllus sicarius* Scudder, Psyche, IX, p. 258. [San Diego, California.] (Macropterous ♀.)

After study of the types of all of the above names and also the series listed below, we are able to place the last three without question in the present synonymy. The type of *lineatus* is a rather dark female with short tegmina and concealed, greatly aborted wings; *pictus* is based on a pale macropterous female; *capitatus* on a male with truncate tegmina and concealed, greatly aborted wings, particularly aberrant in showing a strongly megacephalic condition, which development is discussed below; while *sicarius* is a female, exactly like the type of *pictus*, with which specimen it was evidently not compared, this probably due to the fact that *pictus* had been described as a member of *Nemobius* in a paper in which Scudder evi-

dently wholly overlooked the most distinctive character which separates the Gryllites from the Nemobiites.

This species is closely related to *M. verticalis*, but is much less variable than that species. It may be distinguished by its less robust form; very pale general coloration; occiput and vertex which are multi-fasciate (in *verticalis* the pale median lines, if present basally, scarcely ever reach beyond the summit of the occiput); normally distinct color pattern, with lateral lobes often wholly darkened in the specimens of deepest coloration (in *verticalis* darkest individuals, excepting rarely among those which are black in general coloration, still have pale ventral margins of these lobes); decidedly more delicate tegmina and wings, with veins less pronounced and in the micropterous males with tegmina squarely truncate (normally decidedly more rounded in *verticalis*), and with armament of caudal tibiae similar, but with spines and spurs more delicate. The number of such spines is normally five on each margin, very rarely six are found.

A megacephalic condition (described as *capitatus*) is occasionally found in males of this species.⁶ In such specimens the head is swollen out of all proportion to the rest of the insect, this causing the pronotum to expand somewhat cephalad. In such specimens a sudden and very marked flattening at the base of the clypeus often occurs, giving a further distinctive appearance to these individuals. The causes of this abnormality are unknown. We find it strikingly pronounced in occasional males of *verticalis* also, and it is known to occur in other species of Gryllidæ, while in certain genera of Stenopelmatinæ, such as *Deinacrida*, *Anostostoma*, *Carcinopsis*, etc.,⁷ where the head is tremendously enlarged and the mandibles specialized, particularly in the males, such specialization is known to exhibit the greatest variability within each species. When we consider that this development is nearly always much less pronounced in the female sex and that the males of the Gryllidæ are known to be extremely pugnacious, it would appear probable that this megacephalism is a development intimately associated with the struggle for supremacy between individuals of the stronger sex. The apparently rare occur-

⁶ This condition appears to be frequently developed on the Gulf coast of Texas, we have no other examples of megacephalism from elsewhere in the distribution of the species.

⁷ See Brunner, Verh. k.-k. zool.-bot. Gesellsch. Wien, XXXVIII, p. 251 (1888).

rence, but pronounced degree when present, of this specialization in this and other species, is a feature the solution of which will probably require both extensive field studies and breeding experiments.

In the present species a large ovoid membranous foramen is present on the internal face of the cephalic tibia in all macropterous specimens, but in the micropterous examples before us this place is indicated merely by a slight unmodified depression of the chitin. As in the other species of the genus, opposite this point on the outer face, a larger, nearly elliptical, membranous foramen is always present in the adult condition.

MEASUREMENTS (IN MILLIMETERS) OF EXTREMES.

Male.	Length of Pronotum.	Length of Tegmen.	Length of Wing.	Length of Caudal Femur.	Length of Ovipositor.
Las Vegas, Nevada.....	2.5-2.8	4.4-5.1	—	7.8-8.3	—
Yuma, Arizona.....	2.1-2.7	5.6-5.8	15.5-16.8	7.3-8.2	—
Brownsville, Texas.....	2.3	6.9	17	8.2	—
Brownsville, Texas.....	2.7	5	—	9.3	—
Gulf coast, Texas (Type, <i>capitatus</i>)..	3	5.8	—	9.7	—
Female.					
Yuma, Arizona.....	2.6-2.8	5.1-6.5	15.9-18.3	7.6-8.3	9.8-11
Brownsville, Texas.....	2.4-2.7	7.0-7.1	17.1-18.3	8.7-9.2	8.0-8.7

The extremes of body length are; males, 12.8-16, females 12.7-14.2 mm. In the series from Brownsville, the caudal femora average somewhat longer and in the females the ovipositor averages shorter than in material from the southwestern United States, but, considering the known variability within the species, it appears wholly unlikely that further material will exhibit sufficient constant geographic variation to warrant the recognition of an eastern race.

The general coloration of the present insect is pale yellowish brown, marked with a darker shade. The abdomen is dark, with two meso-lateral bands of paler brown which vary from decidedly wide to moderately narrow in different individuals.

Of the material here studied probably nearly all the macropterous individuals were taken when attracted to lights at night. It is a difficult matter to capture this very active insect in its native environment under rocks, stones or various rubbish, and this undoubtedly accounts for the scarcity in collections of micropterous material.

This also probably explains the great gaps in the known distribution of the insect, which we believe will be found to be widely and generally distributed over the desert and semi-desert regions of the southwestern United States and northern Mexico. It constitutes the only known desert adaptation of the genus.

In addition to the localities quoted in the synonymy and those given below, the present species has been correctly recorded by Rehn from Tucson, Arizona. The two records of immature individuals of the same species by that author from Florence, Arizona, and Alamogordo, New Mexico, are properly referable to *Gryllus assimilis* of the *personatus* variant.

Beside the types mentioned above we have had before us the following series of 42 specimens, 20 males and 22 females.

Las Vegas, Nevada, VIII, 9, 1907 (Hebard; in ore pile) 2 ♂;⁸ IX, 2, 1909 (Hebard; among rocks) 1 ♂ [all Hebard Cln.] (all micropterous).

Yuma, Arizona, VII, 27 and 28, 1907 (Rehn and Hebard; attracted to light), 14 ♂, 16 ♀⁹ [A. N. S. P. and Hebard Cln.] (macropterous).

Esperanza Ranch, Brownsville, Texas, V to VIII, 1, 1903 and 1904 (C. Schaeffer), 3 ♂, 6 ♀¹⁰ [Mus. Bkln. Inst. A. & S. and U. S. N. M.] (2 ♂ micropterous and megac.).

Miogryllus bohlsii (Giglio-Tos).

1895. *G[ryllodes] bohlsii* Giglio-Tos, Zool. Jahrb., Abth. Syst., VIII, p. 817. [Paraguay.]

We have been unable to obtain material of this insect described from a single wingless male. It is described as closely related to *saussurei* = (*verticalis*), differing in the smaller and less swollen head, pronotum which narrows cephalad, tegmina which have the apical area equal the remaining portion in length and spines of dorsal margins of caudal tibiae which number 7 and 6.

⁸ Recorded by Rehn and Hebard, Proc. Acad. Nat. Sci. Phila., 1909, p. 483 (1910).

⁹ Recorded by Rehn and Hebard as *M. pictus*, Proc. Acad. Nat. Sci. Phila., 1908, p. 401 (1908).

¹⁰ Caudell recorded 1 ♀ as *M. pictus* and 2 ♂ as *M. capitatus* from this series, Bklyn. Inst. Mus., Sci. Bull., I, p. 115 (1904).

So much variation is to be found in *verticalis*, that this insect may prove to be a mere aberration, but, in the absence of material agreeing with the description in several of the features mentioned above, we await further information.

Miogryllus verticalis (Serville).

1839. *Gryllus verticalis* Serville, Hist. Nat. Ins., Orth., p. 343. [Cayenne, French Guiana.] (Macropterous ♀.)
 1874. *Gryllus la platae* Saussure, Miss. Sci. Mex., Rech. Zool., VI, p. 408. [Buenos Aires, Argentina.] (Micropterous ♂ and ♀.)
 1877. *Gryllodes guyennensis* Saussure, Mélang. Orthopt., II, p. 384. [Surinam.] (Micropterous ♀.)
 1877. *Gryllus saussurei* Scudder, Proc. Bost. Soc. Nat. Hist., XIX, p. 35. [Georgia.] (Micropterous ♂♂.)
 1902. *Miogryllus oklahomæ* Caudell, Trans. Am. Ent. Soc., XXVIII, p. 90. [Perkins, Oklahoma.] (Micropterous ♂.)

Although Serville's description of *verticalis* is very brief and based on a single female, then in poor condition, there is no doubt that the specimen described represents the rare macropterous condition of the present species. No other species of American Gryllidæ agrees with Serville's measurements; body about 16 mm., wings surpassing tegmina by about 12 mm. This great wing length is found in the three macropterous specimens of the species before us and precludes the possibility of the name being a synonym of *Gryllus assimilis* as placed by Saussure in 1874.¹¹ In other features of Serville's description there are no discrepancies with our material.

Saussure's *laplatae* is based upon micropterous material of both sexes of this species. After examination of the types of Scudder's *saussurei* and Caudell's *oklahomæ* and large series of the species before us, there remains no doubt of the synonymy of these names. The former is based on material inseparable from the synonymous *laplatae* in every respect except size, while the latter represents only the maximum degree of coloration found in this plastic species. Saussure's *guyennensis* is based solely on a female with shorter ovipositor (9.7 mm. in length) than that of the female type of the synonymous *laplatae* (13 mm. in length), and tegmina showing nearly the maximum of abbreviation and in consequence not meeting dorsad.

¹¹ Miss. Sci. Mex., Rech. Zool., VI, p. 397.

Such differences are mere individual variations, as found frequently in the series before us.

So very wide a distribution is very unusual, but such has been found to occur likewise in *Gryllotalpa hexadactyla*, and evidence is at hand of still other species which range from temperate North America through the tropics to temperate South America.

It is of interest to note that the present species is probably found in largest numbers in temperate regions, where no macropterous individuals have been found, but that among the limited series before us from tropical America three are macropterous and in these the internal face of the cephalic tibiae bear a large membranous tympanum, this place being not defined or merely indicated by a slight unmodified depression in the great majority of the large series of micropterous individuals before us. The exceptions among the micropterous series which exhibit a small membranous foramen in this position appear to be found chiefly among megacephalic individuals.

This, the heaviest species in the genus, which shows the nearest approach to the type found in *Gryllus*, is the most widely distributed and also the most plastic of the species of the genus. The features most worthy of remark are as follows: average size large for the genus, rather small when compared with *Gryllus*; form robust and compact. Head large with occiput rounded and but little flattened to the broad inter-antennal protuberance, frequently marked proximad with narrow parallel lines, supra-ocular pair often extending to the lateral ocelli, lines between these with but rare exceptions very brief, terminating at crest of occiput. In intensive condition of coloration all trace of cephalic marking is lost, entire head being shining black. Maxillary palpi rather heavy, with distal joint obliquely truncate, this truncation extending over two-thirds to three-fifths of ventral margin; palpi vary in color from a pale yellowish type (in palest specimens) through one in which distal segment is darkened (normal) to one in which they are entirely darkened (extreme of intensive coloration). Tegmina in both macropterous and micropterous males narrowing more gradually distad than in *lineatus*, with texture less delicate and veins heavy and well defined in both sexes. Number of transverse veins in male normally two, very rarely one or three. Micropterous females have tegmina decidedly aborted and broadly rounded, normally attinent mesodorsad but occasionally overlapping or separated

by a brief space. Pronotum broad, transverse, with lateral margins subparallel or very slightly expanding cephalad (whenever the cephalic size increase is indicated); lateral lobes normally broadly and heavily barred above with dark brown with ventral portion pale; even in the majority of darkest specimens traces of this pale ventral marking are evident. Abdomen normally brown with dark maculations and a narrow median line of darker shade. Limbs rather uniform in coloration tinged with reddish except in dark individuals. Caudal femora very heavy, heavier than in *lineatus*; spines of dorsal margins

MEASUREMENTS (IN MILLIMETERS) OF EXTREMES.

Male.	Length of Body.	Length of Pronotum.	Length of Tegmen.	Length of Caudal Femur.
Lakehurst, New Jersey.....	15	2.9	7.6	10.3
Cardiff, New Jersey.....	12	2.4	6.9	9.3
Goldsboro, North Carolina.....	10.8-11.2	2.0-2.3	3.6-4	7.1-7.8
Georgia. Type, <i>saussurei</i>	11.9	1.9	5.6	7.5
Clayton, Georgia.....	14	2.7	5.2	9.2
Billy's Island, Georgia.....	12.7	2.6	5.3	9.1
Crawford Co., Indiana.....	11.1	2	4.9	7.2
Wichita, Kansas.....	11.8-13.2	2.3-2.7	6.0-6.2	8.0-8.2
Washington Co., Texas.....	11.7-13.5	2.4-2.8	4.3-4.9	8.2-8.9
Beaumont, Texas.....	10.0-11.6	2.1-2.7	4.0-4.8	8.0-8.6
Vera Cruz, Mexico.....	11	2.1	3.9	6.8
Orizaba, Mexico.....	11.2	2	4.3	7.4
Independencia, Brazil.....	16	3.1	6.1	10.4
Igarapé Assu, Brazil.....	15.5	2.7	7.8	9.2
Carcaraña, Argentina.....	13.1-14	2.8-3	6.2-6.8	9.2-9.8
Mendoza, Argentina.....	14	2.9	5	9.1
Extremes of series.....	10.0-16	1.9-3.1	3.6-7.6	6.8-10.4

Female.	Length of Body.	Length of Pronotum.	Length of Tegmen.	Length of Caudal Femur.	Length of Ovipositor.
Washington, District of Columbia	15.	2.9	3.4	10.3	10
Falls Church, Virginia.....	12.5	2.7	3	9	8.8
Goldsboro, North Carolina.....	11.7-13.4	2.4-2.8	2.2-3.7	8.3-9.5	7.8- 8.6
Augusta, Georgia.....	15.1	2.9	3.1	9.9	10
Jacksonville, Florida.....	13.0-17.5	2.8-3.1	2.7-3.3	8.6-11	8.3-11.2
Crawford Co, Indiana.....	12.0-14.2	2.7-3	3.0-3.7	8.7-10	8.3-10.8
Washington Co., Texas.....	14	2.9	2.7	9	8.2
Beaumont, Texas.....	11.7-14.2	2.4-2.7	2.6-3.7	8.3- 9.4	8.5- 9.3
Cordoba, Mexico.....	12.7-13	2.4-2.6	7.1-7.2	8.9- 9.1	8.8- 9
Jalapa, Mexico.....	11	2.2	3	7.7	7.2
Vera Cruz, Mexico.....	11.2	2.1	2.3	7.4	7.2
Independencia, Brazil.....	15.3	3	2.9	10.1	9.7
Carcaraña, Argentina.....	12.5-16.2	2.9-3	3.1-3.9	10.0-10.6	10.2-10.8
Mendoza, Argentina.....	16.4	3.2	4	10.6	12
Extremes of series.....	11.0-17.5	2.1-3.2	2.2-4	7.4-11	7.2-12

of caudal tibiae five in number, rarely six (in apparent rigidity, more closely approaching *Gryllus* than any other species of the present genus); the six distal spurs are also heavy.

A megacephalic condition similar to that found in *lineatus*, under which species we have discussed this feature, is also found in *verticalis*.

Of the material discussed above, the male from Igarapé Assu, Brazil, is macropterous, length of wing 19.9 mm., and also the females also from Cordoba, Mexico, length of wing 18.1-19.4 mm.

These series show a decided individual size variability with, however, little variation in proportions. A great amount of size variation appears to be due chiefly to local environmental conditions, but from our material the species does appear to average distinctly larger in temperate South America than in the United States; in the latter country no geographic size variation appears to exist, extremes being found almost indiscriminately.

From Nebraska to the Gulf coast of Texas, the extreme intensive type of coloration, in which particularly the males are almost uniform black (described as *oklahomæ*), is very frequently encountered; this type of coloration also appears occasionally in Georgia and Florida, but further north on the Atlantic coast this condition has not been found. Every conceivable intergradation between this and the normal type of coloration is found over the entire range of the species.

The most northern point at which the species has been found is Staten Island, New York. The material before us defines the further known distribution of the species, with the exception of a record from Paraguay by Giglio-Tos as "*G[ryllodes] saussurei*," and specimens recorded by that author as both *La Platae* and *guyennensis* from Colonia Riso, Rio Apa, Paraguay, and under the last name from Villa Rica, Paraguay.

Specimens Examined.—122; 47 males, 60 females, 7 immature males and 8 immature females.

Lakehurst, New Jersey, VII, 12, 1908 (W. T. Davis), 1 ♂¹² [A. N. S. P.] (dk. megac.).¹³

Cardiff, N. J., VII, 28 to 31, 1914 (Hebard; trapped in molasses jar, in pine barrens), 1 ♂ [Hebard Cln.] (dk., mod. megac.).

Cape May, N. J., VII, 22, 1910 (Hebard), 1 juv. ♀ [Hebard Cln.]. Philadelphia, Pennsylvania, 1 juv. ♀ [A. N. S. P.].

College Park, Maryland, IX, 17, 1904 (A. N. Caudell), 1 ♀ [U. S. N. M.] (pl.).

Plummer's Island, Md., IV, 6, 1905 (W. L. McAtee), 1 ♀ [U. S. N. M.] (pl.).

Washington, District of Columbia, VI, 12, 1908, 1 ♀ [U. S. N. M.] (pl.).

Falls Church, Virginia, 1 ♂, 1 ♀ [U. S. N. M.] (♂ mod. dk., ♀ med. color).

Raleigh, North Carolina, VII, 8, 1903 (A. P. Morse), 1 ♂ [Morse Cln.].

Goldsboro, N. C., VII, 25, 1913 (Rehn and Hebard; undergrowth of pine woods), 3 ♂, 5 ♀, 1 juv. ♂, 1 juv. ♀ [Hebard Cln. and A. N. S. P.] (♂ dk., ♀ mod. dk.).

Columbia, South Carolina, VII, 28, 1913 (Hebard; edge of woods), 1 ♀ [Hebard Cln.] (mod. pl.).

Georgia, 2 ♂, type and paratype *saussurei* Scudder [M. C. Z.] (dk.).

Clayton, Ga., 2000-3700 ft., VI, 1909 (W. T. Davis), 1 ♂ [Davis Cln.] (dk. mod. megac.).

Sand Mountain, Ga., VII, 8, 1905 (A. P. Morse), 1 ♂, 2 ♀ [Morse Cln.].

Trenton, Ga., VII, 10, 1905 (A. P. Morse), 3 ♀, 1 juv. ♂ [Morse Cln.].

Augusta, Ga., VII, 29, 1913 (Hebard; undergrowth of short-leaf pine woods), 1 ♀ [Hebard Cln.] (med. color.).

Tybee Island, Ga., VIII, 13, 1903 (A. P. Morse), 1 ♂, 1 ♀ [Morse Cln.].

Macon, Ga., VII, 30 and 31, 1913 (Rehn and Hebard; undergrowth of short-leaf pine woods), 1 ♀ [Hebard Cln.] (mod. pl.).

Mixon's Hammock, Okefenokee Swamp, Ga., VI, 16, 1912 (J. C. Bradley), 1 ♂ [Cornell Univ.] (v. dk.).

Billy's Island, Okefenokee Swamp, Ga., VI and VII, 1912 (J. C. Bradley), 1 ♂, 3 ♀ [Cornell Univ.] (♂ v. dk., megac., ♀ mod. dk.).

Jacksonville, Florida (T. J. Priddey), 2 ♀, 1 juv. ♀ [Hebard Cln.].

Atlantic Beach, Fla., VIII, 24 and 25, 1911 (R. & H.; in sandy fields and 1 in "hammock tangle"), 1 ♂, 3 ♀ [Hebard Cln. and A. N. S. P.] (pl.).

Marianna, Fla., VIII, 7, 1903 (A. P. Morse), 2 ♂, 4 ♀ [Morse Cln.] (♂ v. dk., ♀ med. dk.).

Homestead, Fla., III, 17 to 19, 1910 (Hebard; rubbish about pot-hole), 1 juv. ♂, 1 juv. ♀;¹² VII, 10 to 12, 1912 (Rehn and Hebard; undergrowth in pine woods), 2 ♀, 1 juv. ♂ [all Hebard Cln. and A. N. S. P.] (med. color to mod. dk.).

Deep Lake, Fla., IV, 13, 1912 (W. T. Davis), 2 ♂¹² [Davis Cln. and A. N. S. P.] (v. dk.).

Key West, Fla., III, 15 and 16, 1910 (Hebard; under coquina boulders), 1 ♂, 1 ♀, 1 juv. ♂, 1 juv. ♀¹² [Hebard Cln.] (pl.).

Crawford County, Indiana, VI, 27 to VII, 7, 1899 to 1902 (W. S. Blatchley), 1 ♂, 5 ♀¹² [A. N. S. P. and Hebard Cln.] (♂ dk., ♀ pl. to med. color).

South Bend, Nebraska, VIII, 11, 1910 (L. Bruner), 1 ♂ [Hebard Cln.] (v. dk.).

Wichita, Kansas, VI, 4, 1904 (F. B. Isely), 3 ♂, 2 ♀¹³ [U. S. N. M. and Hebard Cln.] (♂ v. dk., megac.).

Perkins, Oklahoma, V, 16, 1901 (Mrs. Nellie Caudell), 1 ♂, type *M. oklahomæ* Caudell [U. S. N. M.] (v. dk.).

Washington County, Texas, IV (L. Bruner), 4 ♂, 1 ♀ [Hebard Cln.] (♂ dk., megac., ♀ mod. dk.).

Tiger Mills, Tex., II, 1885 (F. G. Schaupp), 1 juv. ♀ [Hebard Cln.].

Beaumont, Tex., VII, 23, 1912 (Hebard; in wet grasses of pine forest), 7 ♂, 11 ♀ [Hebard Cln.] (♂ mod. dk., ♀ med. color to mod. dk.).

La Marque, Tex., VII, 22, 1912 (Hebard; under cow dung on prairie), 1 ♂ [Hebard Cln.] (mod. dk., mod. megac.).

Victoria, Tex., IV, 20, 1902 (W. E. Hinds), 1 juv. ♂ [U. S. N. M.].

Orizaba, Vera Cruz, Mexico, 1 ♂, 1 juv. ♂ [Hebard Cln.] (med. color).

Jalapa, V. C., Mex., VI, 1, 1894 (L. Bruner), 1 ♀ [Hebard Cln.] (mod. dk.).

Cordoba, V. C., Mex., IV, 24, 1908 (F. Knab), 2 ♀ [U. S. N. M.] (mod. dk., macropterous).

Vera Cruz, V. C., Mex., I, 1892, ♂, 1 ♀ [Hebard Cln.] (pl.).

¹² This material has been previously recorded as *M. saussurei*.

¹³ Recorded by Isely as *M. oklahomæ*, Trans. Kansas Acad. Sci., XIX, p. 248 (1905). Paler examples of his series were then recorded as *M. saussurei*. Interesting data as to appearance and habits are given.

Baturite Mountains, Ceará, Brazil (W. M. Mann), 1 ♂ [Stanford Univ.] (megac.).

Maranguape Mountains, Ceará, Brazil (W. M. Mann), 1 ♂ [A. N. S. P.] (megac.).

Independencia, Parahyba, Brazil (Mann and Heath), 1 ♂, 1 ♀ [A. N. S. P.] (♂ megac.).

Igarapé Assu, Pará, Brazil (H. S. Parish), 1 ♂ (med. color, macropterous).

Buenos Aires, Argentina (C. Lizer), 1 juv. ♀ [A. N. S. P.].

Carcaraña, Santa Fé, Argentina, 2 ♂, 2 ♀ [A. N. S. P.] (med. color.).

Mendoza, Argentina, II, 20, 1907 (Haarup), 1 ♂, 1 ♀ [Hebard Cln.] (♂ mod. pl., ♀ pl.).