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With the author's regards

STUDIES IN THE
ORTHOPTERA OF ARIZONA

PART I. NEW GENERA, SPECIES AND GEOGRAPHICAL RACES

BY

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PART I. NEW GENERA, SPECIES AND GEOGRAPHIC RACES

BY MORGAN HEBARD

(Plates IV-VIII)

Last year Dr. E. D. Ball, of the University of Arizona, who is preparing a very complete study of the Orthoptera of Arizona from an economic point of view, sent me his list of the species, compiled from the literature and the large number of determinations I have made for him since 1932. I was asked to make the necessary corrections and return this list to him as soon as convenient. This at the time seemed no serious problem and a beginning was made by checking from all of our material from the State, both recorded and as yet unreported.

The obstacles encountered were soon seen to be insurmountable without far more work than was originally contemplated. As a result it was decided to undertake the present studies, in which this paper which is part one, includes the descriptions of the two new genera, eleven new species and one new geographic race which are represented in the collections before us, numbering many thousands of specimens which have been assembled over the past twenty-eight years.

The second part of these studies will shortly follow, listing the two hundred and thirty species and eighteen races now known to be native in Arizona, the nine adventive species of Blattidae found there and noting that nine new species of the genus *Ceuthophilus* will shortly be described by Hubbell in his monograph of that genus.

In addition the type locality for each species described from Arizona will be cited, synonymy established involving names found in the literature for the State, all erroneous records subsequent to 1900 will be corrected and all records of species not previously known from Arizona will be given.

BLATTIDAE

PSEUDOMOPINAE

Blattella vaga new species (Pl. IV, figs. 1 to 4.)

This insect is undoubtedly an introduction, occurring along the Gila and Colorado rivers in Arizona and California. We believe it is of Asiatic origin for we have before us a quite closely related though distinct (and unfortunately undescribed) species from southern India, whereas among the large series representing many African species at hand none show as close affinity.

Compared with the only other species established in North America, *Blattella germanica* (Linnaeus), the present insect is found to be distinguished by the slightly less reddish general coloration, particularly of the organs of flight which are faintly tinged with tawny olive instead of being faintly tinged with tawny. The male of *vaga* averages slightly smaller, this difference being more pronounced in the female, while in both sexes the tegmina are slightly broader and shorter. The heavier pair of longitudinal pronotal bars are very dark and sharply defined (in all of our series except one teneral female in which they are almost obsolete) and so are considerably more prominent than is usual in *germanica*, but the coloration of the head is particularly distinctive, being blackish brown from mesad between the eyes to the mouthparts, leaving only the latter, the cheeks, the dorsal half of the interocular space and the occiput buffy. The male has the specialization of the dorsal surface of the abdomen and of the supra-anal and subgenital plates much less intricate than in *germanica* and is best distinguished by these features, the supra-anal plate being chitinous and only moderately produced (instead of being subchitinous and very greatly produced) and the subgenital plate being almost symmetrical with small but moderately elongate styles (instead of having a highly asymmetrical subgenital plate with minute, very short styles).

Type.— ♂ ; Phoenix, Arizona. April 18, 1933. (E. D. Ball). [Hebard Collection, Type no. 1269].

Head much as in *germanica*,[1] but not as elongate; palpi and pronotum similar. Tegmina only slightly surpass cercal apices. Wings as in *germanica*, with ulnar vein (in all examined) branched only once. Dorsal

[1] Described in Mem. Amer. Ent. Soc., No. 2, p. 57, pl. 2, figs. 6 to 9, (1917).

surface of abdomen with sixth tergite more produced than those preceding, its caudal margin mesad with a small concave area above twin deep pits on the seventh tergite, which latter further has its lateral portions reflexed; eighth and ninth tergites very narrow, the latter with margin alone visible; tenth tergite (supra-anal plate) symmetrically rounded-trapezoidal, chitinous and reaching as far caudad as the subgenital plate. Subgenital plate appearing almost symmetrical but with a moderate emargination below sinistral style, thence appearing weakly rounded-triangular produced and bearing a pair of small, very delicate, straight, simple styles which are separated by a distance slightly less than the length of one of them, each about three times as long as broad.

Allotype.— ♀ ; same data as type but taken May 29, 1933. [Hebard Collection].

Very similar to male, slightly larger and more robust. Interocular space slightly wider. Dorsal surface of abdomen unspecialized. Supra-anal plate small, transverse, subchitinous, broadly rounded-triangular. Subgenital plate large, not produced, surface decidedly convex, distal margin nearly transverse.[2]

Coloration as noted above. In addition the wing veins are tinged with brown. The abdomen is margined with translucent buff, heavily suffused within these borders with dark brown and with narrow proximo-lateral dark brown markings on the tergites and broad meso-proximal suffused brown markings on the sternites, the intervening areas yellowish tawny. The limbs are buffy with femoral carinae all finely dark brown and dark brown flecks are also present at the bases of the tibial spines.

Immatures differ from those of *germanica* in coloration as do the adults, but in addition the abdomen appears transversely banded distad, the tergites being margined laterad and very narrowly distad with buffy.

♂		Length of body	Length of pronotum	Width of pronotum	Length of tegmen	Width of tegmen
Phoenix, Arizona.	*Type.*	10.2 [3]	2.8	3.8	9.	3.
Phoenix, Arizona.	*Paratype.*	9.2	2.8	3.7	8.9	2.9
Blythe, California.		9.7	2.5	3.1	8.	2.8
♀						
Phoenix, Arizona.	*Allotype.*	8.5 [4]	2.9	4.	9.9	3.1
Mesa, Arizona.		9.5 [5]	3.2	4.3	11.	3.4
Blythe, California.		9.9	2.7	3.8	10.2	3.2

[2] The female is best distinguished by the features given here in the comparison with *germanica*.

[3] Abdomen extruded. Probably about 9.3 in natural position.

[4] Abdomen retracted, bearing ootheca.

[5] A very large specimen with abdomen retracted.

Ball observed that this species occurs only in local areas of rather extreme alkali conditions, but he found it present in the Salt River valley for at least forty miles.

Specimens Examined: 25; 8 males, 15 females and 2 immature individuals.

ARIZONA: Coolidge to Mesa, VI, 29, 1933, (R. H. Beamer), 2♂, 7♀, [Univ. of Kansas and Hebard Clns.]. Phoenix, IV, 18 and V, 29, 1933, (E. D. Ball), 5♂, 4♀, *type, allotype* and *paratypes,* 1 juv. ♂, 1 juv. ♀ (the immatures taken on the first date), [Hebard and Univ. of Arizona Clns.].

CALIFORNIA: Blythe, VII, 27, 1933, (R. H. Beamer), 1♂, 4♀, [Univ. of Kansas and Hebard Clns.].

MANTIDAE

VATINAE

PSEUDOVATES Saussure

This and the four other genera referred to the Group Vates by Giglio-Tos include species showing an even greater number of distinctive assemblages, but when these are analyzed it is found that the characters which have been given major generic significance merely occur in different combinations or are different in degree only. Particularly closely related are the genera *Vates* and *Pseudovates* and Giglio-Tos' key [6] is misleading, as it is too brief and does not enumerate the exceptions which certain species show. In spite of these exceptions, however, we believe that both should be recognized as valid. They may be separated as follows:

A. Dorsal fields of tegmina of male clear, glassy, immaculate; of female opaque, without transverse suffusions. Marginal fields of tegmina of female narrow, narrowing very gradually distad. Male antennae strongly pectinate.

Vates Burmeister, 1838

Genotype; *cnemidotus* Burmeister = *lobata* (Fabricius) [7]

AA. Dorsal fields of tegmina of male greenish subhyaline, with transverse suffusions of brown; [8] of female opaque, with similar suffusions.

[6] Das Tierreich, Mantidae, p. 602, (1927).

[7] A South American species selected as genotype by Saussure and Zehntner in 1894.

[8] Except in the jamaican *cingulata* (Drury), in which these fields are clear, glassy, usually with, but sometimes lacking, transverse suffusions of brown.

Marginal fields of tegmina of female broader, showing conspicuous sudden distal narrowing.[9] Male antennae serrate-moniliform.[10]

Pseudovates Saussure, 1869

Genotype; *tolteca* (Saussure), by monotypy

These genera may be separated from the others of the group by the cephalic femora which lack a dorso-distal toothed lobe and the median and caudal limbs which bear lobes.

They are here discussed as a new species from Arizona is before us, nearest in relationship to two Mexican species, these being distinguished from all others of *Vates* and *Pseudovates* [11] in having the frontal process (a production of the inter-ocellar area) as long or longer than the width of the vertex. The lateral abdominal lobes are small but distinct in females, weaker in males. The three species may be separated by the following characters.

A. Frontal process shorter, no longer, or little longer, than width between eyes at its base.[12] Lateral fields of female tegmina much broader,[13] very suddenly and conspicuously narrowed distad.

B. Organs of flight caudate.[14] Lobation of median and caudal limbs moderately prominent.....*longicollis* (Stål)

BB. Organs of flight less caudate.[15] Lobation of median and caudal limbs very prominent.....*townsendi* (Rehn)

AA. Frontal process longer, much longer than width between eyes at its base.[16] Lateral fields of female tegmina much narrower, gradually narrowing, this becoming slightly stronger but not conspicuously so distad. (Organs of flight caudate. Lobation of median and caudal limbs moderately prominent.).....*arizonae* new species

[9] Except in *arizonae* here described, in which these fields are not as broad, with distal narrowing only weakly indicated.

[10] Except in *peruviana* (Rehn) in which they are strongly pectinate.

[11] Except *Vates amazonica* (Westwood).

[12] In specimens before us, of *longicollis* ♂ 3.8, ♀ 3.6 (type female given as 3⅓); of *townsendi* ♀ (type) 3.3 mm.

[13] In specimens before us, of *longicollis* 3.1 meso-proximad and 3.1 meso-distad, of *townsendi* 3.8 meso-proximad and 4.8 meso-distad.

[14] Length of pronotum ♂ 22.3, ♀ 25.7 (Type given as 29½); length of tegmen ♂ 45., ♀ 38.3 mm.

[15] Type female; length of pronotum 26.7, length of tegmen 35. mm.

[16] All measurements for comparison are given in the description of this species.

Saussure and Zehntner recorded a female from Guadalajara, Jalisco, and a male from Cuernavaca, Morelos, as *Vates paraensis* (Saussure) giving a color figure of the former.[17] These specimens are apparently referable to *longicollis*. They are larger than the pair of that species from Cuernavaca, Morelos, in the Academy collection and indicate that considerable individual variation occurs, the female also having a longer frontal process. Giglio-Tos suggested in 1927 that *townsendi* is probably a synonym of *longicollis*, but we believe that the differences here noted are sufficient to warrant its recognition as distinct. Very rare in collections, additional material is needed to solve the problem conclusively.

Pseudovates arizonae new species (Pl. IV, figs. 5 to 7.)

1903. *Vates* sp. Caudell, Proc. Ent. Soc., Washington, v, p. 165. [Juv.; Madera Canyon, Santa Rita Mountains, Arizona.]

1905. *Vates townsendi* Caudell (in part,[18] not of Rehn, 1904), Jour. New York Ent. Soc., XIII, p. 83, pl. 3, figs. 1 and 2. [As above and ♂ Nogales, Arizona.]

1905. *Vates townsendi* Caudell (not of Rehn, 1904), Proc. U.S. Nat. Mus., XXVIII, p. 464, figs. 2 and 3. (Same material and figures as in last reference.)

1907. *Vates paraensis* Rehn (not of Saussure, 1871), Proc. Acad. Nat. Sci. Phila., 1907, p. 68. [♀; Baboquivari Mountains, Arizona.[19]]

Type.— ♀; Baboquivari Mountains, Arizona,[20] Summer of 1906. (F. H. Snow). [Hebard Collection, Type no. 1274].

Important characters are given in the accompanying key. Size large (larger than our specimens of *longicollis*, but not as large as the type of that species or Saussure and Zehntner's female). Antennae small, very slender, joints moniliform. Frontal process very prominent, bifid, formed by two flattened attingent fingers which taper very feebly from near their bases to their rounded apices, with length decidedly greater than width

[17] Biol. Cent.-Amer., Orth., I, p. 195, pl. 6, fig. 1 and pl. 10, figs. 28 and 29.

[18] Mexican references correct.

[19] Rehn compared this specimen with the Mexican female he had recorded as *paraensis*, which we referred to *longicollis* in 1932 and have here discussed.

[20] This is the same specimen which Rehn recorded and which appears in Snow's list of that year as "*paracusis* Saussure". It was obtained by the author in an exchange of material with the University of Kansas in 1926.

between eyes there and appearing, though actually not, as long as the greatest cephalic width across the eyes. Facial scutellum with lateral margins thickly swollen and meso-dorsal spine prominent but rounded at apex. Pronotum elongate, surface (unlike the specimens before us of the very closely related species) minutely microscopically and not thickly denticulate, a medio-longitudinal carina weakly indicated on shaft and a low large bilobation at its caudal extremity, collar of subequal width, supra-coxal expansion prominent, lateral margins rather heavily denticulate throughout (more so than in the specimens before us of the very closely related species). Tegmina fully caudate, apices bluntly rounded at considerably less than a rightangle. Wings surpassing tegmina. Abdomen with latero-caudal angles of third, fourth and fifth sternites produced in small but conspicuous subfoliaceous lobes. Cephalic limbs much as in *longicollis* but surfaces more strongly though minutely denticulate, margins of coxae more strongly tuberculate and their ventral carina showing five larger darker tubercles. Median and caudal limbs with lobation similar but stronger than that of *longicollis,* much weaker than in *townsendi.* Median femora with a very broadly rounded low elongate lobe proximad on ventro-caudal carina and distad with a higher shorter rounded lobe on that carina and a similar but smaller lobe there on the two dorsal carinae; caudal femora similarly lobate but all these lobes considerably weaker, particularly the distal of the ventro-caudal carina. Median tibiae with a meso-proximal rounded lobe on the ventro-caudal carina and opposite it a longer rounded lobe on the dorso-caudal carina; on the caudal tibiae the homologous ventro-caudal lobe has almost disappeared but the dorso-caudal lobe is more prominent.

Allotype.—♂; Nogales, Arizona. June 14, 1903. (E. J. Oslar). [U.S. National Museum].

Very similar to female in ambisexual features. Size smaller, form more graceful. Antennae elongate, joints serrato-moniliform; each joint roundly produced ventro-distad, this gradually increasing and then more gradually decreasing in degree distad, greatest production making the meso-proximal joints slightly wider distad than long. Frontal process and spine of facial scutellum much as in female. Pronotum more slender with surface and margins showing even finer denticulations. Tegmina proportionately more ample, dorsal surfaces moderately glossy, marginal field moderately broad proximad but immediately narrowing more rapidly though evenly distad, tegminal apices similar. Wings surpassing tegmina. Abdominal lobes similar to those of female. Cephalic limbs with tuberculation and denticulation slightly weaker than in that sex. Median and caudal femora with lobation also similar but slightly weaker.

General coloration of female dark brown, limbs annulate with brownish buff; male decidedly paler but similarly marked. Dorsal surface of abdomen shining, tergites light orange yellow margined caudad with dark

brown, this widening mesad. Tegmina light dull green-yellow (possibly brighter and more green in life), with two large transverse blotches of dark brown on dorsal fields and flecks of the same distad in female; dorsal fields dull in female, moderately glossy in male and in that sex with the blotches lighter, more transverse and less extensive and the flecks paler and much fewer. Wings transparent, tips extensively embrowned, costal margin greenish buff, disk dark brown with transverse veinlets very finely buffy in female; clear hyaline with costal margin very pale greenish and only immediate tips embrowned in male.

Length of body ♂ 61.5, ♀ 75.; length of frontal process ♂ 5.8, ♀ 6.8; greatest width of head ♂ 5.8, ♀ 6.8; length of pronotum ♂ 22.8, ♀ 28.; width of pronotal supra-coxal expansion ♂ 4.,, ♀ 5.7; length of tegmen ♂ 40.8, ♀ 42.5; meso-proximal width of tegminal marginal field ♂ 2.1, ♀ 3.; meso-distal width of tegminal marginal field ♂ .3, ♀ 2.7; length of cephalic femur ♂ 13.4, ♀ 17.; length of caudal femur ♂ 15.2, ♀ 17.5 mm.

Specimens Examined: 4; 1 male, 1 female and 2 immature individuals.

ARIZONA: [21] Catalina Springs, 1 medium juv. ♀, [Hebard Cln.]. Ocotillo, VIII, 23, 1923, 1 medium large juv. ♀, [Hebard Cln.]. Nogales, VI, 14, 1903, (E. J. Oslar), 1♂, *allotype,* [U.S.N.M.]. Baboquivari Mountains, Summer of 1906, (F. H. Snow, 1♀, *type,* [Hebard Cln.].

ACRIDIDAE

EUMSTACINAE

The discovery of a new species from the mountains of southeastern Arizona was a distinct surprise to us, but the combination of characters which it shows is even more unexpected. In the two apparently most significant characters available for generic separation it agrees in one with *Morsea* Scudder and in the other with *Psychomastax* Rehn and Hebard.

It is possible that other yet unknown species from northwestern Mexico will clarify the generic concepts involved, but at present we feel obliged to recognize three genera, all far less distinct than we had believed the two previously recognized to be. These may be separated as follows.

[21] In 1905 C. R. Biederman wrote from the Huachuca Mountains that he had seen a very remarkable and strikingly colored insect, which he supposed to be a Mantid, which escaped capture. From his rough sketch we believe that it was almost surely an immature of the present species. During his long residence in southern Arizona he had never before seen such an insect nor did he find another.

A. Tarsal claws symmetrical. Fastigium not or but little projecting beyond eyes. Form comparatively robust. (Antennae with ninth segment toothed disto-ventrad. Caudal femora with apex armed with a medio-dorsal and dorso-lateral minute teeth, as are the genicular lobes.[22] Male cerci simple, styliform; subgenital plate lacking a linguliform process in its meso-dorsal section.)

Psychomastax Rehn and Hebard

AA. Tarsal claws highly asymmetrical. Fastigium more strongly projecting beyond eyes. Form more slender.

B. Antennae with ninth segment toothed disto-ventrad. Caudal femora with apex armed with only a medio-dorsal minute tooth and genicular lobes unarmed. Male cerci simple, styliform; subgenital plate lacking a linguliform process in its meso-dorsal section.....*Eumorsea* new genus

Genotype—*E. balli,* by monotypy

BB. Antennae with tenth segment toothed disto-ventrad. Caudal femora with apex armed with a medio-dorsal and dorso-lateral minute teeth, as are the genicular lobes. Male cerci falcate; subgenital plate with a linguliform process in its meso-dorsal section.

Morsea Scudder

Eumorsea balli[23] new genus and species (Pl. IV, figs. 8 to 11.)

The present insect is the largest of the Eumastacinae occurring in the United States and is very slender with very elongate and slender limbs. No species of the subfamily was hitherto known from east or south of the Arizona Plateau in this country.

Type.— ♂ ; Ramsey Canyon above the box, Huachuca Mountains, Arizona. Elevation 6000 feet. July 20, 1933. (E. D. Ball; on Mexican Pinyon, *Pinus cembroides* Zucc.). [Hebard Collection, Type no. 1271].

Size very large, form elongate and very slender when compared with its allies. Apterous. Dorsal surface smooth, weakly polished, with a very few subobsolete tubercles and a low percurrent medio-longitudinal carina. Head with dorsal length distinctly less than that of pronotum; broadly convex ascendant to apex of fastigium; fastigium projecting beyond eyes slightly less than half its apical width, its apex truncate; fastigio-facial angle in lateral aspect acute angulate; face strongly retreating; frontal

[22] In *Psychomastax psylla robusta* Hebard alone these teeth are sometimes absent at the externo-dorsal point and on the external genicular lobes.

[23] Named in honor of the discoverer of this insect, Dr. E. D. Ball of the University of Arizona, the results of whose field work have aided us greatly in our studies of the Orthoptera of that State.

costa narrow and deep, narrowest between laterial ocelli, thence to apex of fastigium evenly widening with surface there convex between the lateral carinae. Eyes large, prominent, in depth only slightly greater than that of infra-ocular portion of the genae. Antennae short, with twelve joints, moderately thickened and depressed distad, tooth on ventral margin of ninth joint very small and weak.[24] Pronotum expanding ventro-caudad on lateral lobes; disk very slightly broader caudad than cephalad, lateral carinae practically obsolete, medio-longitudinal carina fine and percurrent, caudal margin of disk transverse with lateral portions exceedingly faintly convex and mesad with a very weak emargination; lateral lobes with ventro-cephalic angle very broadly convex, ventro-caudal angle very sharply rounded rectangulate. Apex of abdomen distinctly thickened. Supra-anal plate small and very narrowly shield-shaped, twice as long as broad, its dorsal surface concave.[25] Cercus simple, slightly surpassing supra-anal plate, curved feebly inward, slightly and evenly tapering to the rounded apex, cylindrical except that the inner surface is flattened. Subgenital plate composed of a pair of elongate triangular plates the apices of which are fused dorso-mesad, the portion of the plate between these much less chitinous. Limbs elongate and very slender. Caudal femora with apices armed as given in the accompanying key. Caudal tibial margins armed with (21) external and (18 and 19) internal (large) spines.[26] External tarsal claw very small, internal tarsal claw elongate and projecting nearly as far as the large arolium.

Allotype.— ♀ ; same data as type. [Hebard Collection].

Very much larger than male. Frontal costa broader and not as deep. Eye in depth less than that of the infra-ocular portion of the genae. Antennae much shorter. Pronotum proportionately shorter, expanding definitely caudad both on disk and lateral lobes, the disk conspicuously broader with caudal margin transverse, its lateral portions broadly convex and mesad obtuse-angulate emarginate. Lateral lobes of pronotum with ventro-caudal angle rather broadly rounded rectangulate. Ovipositor jaws moderately prominent; dorsal pair almost straight, very faintly recurved, dorso-external margins with a few low coarse serrulations proximad; ventral pair with flange prominent and serrulate proximad and apices moderately decurved. Subgenital plate triangularly produced distad with margin convex mesad on each side and apex produced dorsad between the ovipositor valves in a spiniform process.

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[24] Practically obsolete in three male paratypes.

[25] Not as given in the original description of *Psychomastax psylla,* but the male genitalia actually agree very closely throughout with those of *Eumorsea balli.*

[26] One spine must be added to the total for the internal margin if the minute spine on the decided disto-internal rounded flange is not to be considered one of the spurs.

Sides shining blackish brown; occiput, pronotal disk and dorsal surface of abdomen clay color or light cinnamon buff to cinnamon, dark brown in one female only. Limbs in males reddish brown annulate with paler, the caudal femora with a dorso-proximal area and two annuli of the paler coloration; the females have the limbs decidedly darker, one with weakly and one with strongly annulate caudal femora. Ventral surface cinnamon buff.

The series before us shows little size variation, the type and allotype measuring as follows: length of body ♂ 11.8,[27] ♀ 21.2;[28] length of antenna ♂ 3.5, ♀ 2.7; length of pronotum ♂ 21.9, ♀ 2.7; length of cephalic femur ♂ 5, ♀ 4.7; length of median femur ♂ 4.1, ♀ 4.2; length of caudal femur ♂ 11.1, ♀ 13. mm.

Specimens Examined: 14; 7 males, 5 females and 2 immature individuals.

ARIZONA: Mount Graham, Pinaleno Mountains, VIII, 21, 1934, (E. D. Ball), 1♂. Ramsey Canyon above the box, Huachuca Mountains, 6000 feet, (E. D. Ball), VI, 11, 1933, 2 large juv. ♀; VII, 15, 1934, 2♀, *paratypes;* VII, 20, 1933, 5♂, 3♀, *type, allotype, paratypes.* Carr Canyon, Huachuca Mountains, (R. H. Beamer), 1♂, *paratype,* [Univ. of Kansas].

OEDIPODINAE

Leprus robustus new species

1900. *Leprus corpulentus* Scudder (in part not of Saussure, 1884), Psyche, IX, p. 75. [♂; Fort Whipple and forty miles east of Tucson, Arizona.]

1904. *Leprus elephas* Rehn (not of Saussure, 1861), Proc. Acad. Nat. Sci. Phila., LVI, p. 566. [♀; Reef, Arizona.]

1907. *Leprus elephas* Rehn (not of Saussure, 1861) Proc. Acad. Nat. Sci. Phila., LIX, p. 37. [♂, ♀; Carr Canyon, Huachuca Mountains, Arizona.]

This handsome insect is distinguished by its very robust form, proportionately fuller and larger head, less roughened pronotum with lateral lobes which do not widen ventrad, proportionately shorter organs of flight particularly in the female sex, tegmina not at all or very feebly maculate distad, wings with tips usually clear hyaline and disk (usually) light yellowish green varying to light greenish blue and caudal tibiae very pale glaucous, often buffy externally in females.

These features hold true only for typical material and the great amount of individual variation characteristic of all of the species of the genus, which must be reckoned with, is discussed below.

[27] Abdomen curved upward, as is normal.

[28] Estimated as the abdomen is extruded—actual length 23.2 mm.

Close relationship is shown to *L. wheeleri* (Thomas), a more regularly and boldly striped insect with wing disk clear light yellow, but large series of that species before us from eastern New Mexico and Western Texas show no intergradation. The Mexican *L. elephas* Saussure is also closely related, material before us being even stockier, with proportionately even broader caudal femora, more finely tuberculate pronotum and wing disk light yellow.[29] Series from northern Mexico must be obtained to determine whether intergradation occurs.

Type.— ♀ ; San Bernardino Ranch, Cochise County, Arizona. Elevation 3900 to 3950 feet. September 24, 1922. (Rehn and Hebard). [Hebard Collection, Type no. 1276].

Size large, form very robust, surface comparatively smooth for the genus. Head very large and full, vertex broad and very feebly impressed, frontal costa broad dorsad and expanding between antennae thence narrower and soon disappearing ventrad, lateral foveolae represented by irregularly oval pits (varying in series from shallow to moderately deep). Antennae slender and moderately elongate. Pronotum with principal sulcus alone well indicated, medio-longitudinal carina very fine and obsolete mesocephalad; metazona twice (varying to less than twice) as long as prozona, with caudal angle acute; lateral lobes deep with cephalic and caudal margins vertical; surface of pronotal disk very finely, thickly and evenly beaded and with some larger nodes and short rugae, appearing quite smooth to the naked eye. Tegmina and wings showing definite reduction, extending beyond the apices of the caudal femora distinctly (rarely varying to scarcely) less than the pronotal length. Caudal femora short and very broad with dorsal and ventral flanges prominent, particularly the latter just before it subsides distad.

Allotype.— ♂ ; same data as type. [Hebard Collection].

Size much smaller and form much less robust than female, but more robust than males of the other Arizona forms of the genus. Head proportionately much the same but broad paired impressions of vertex more distinct though very shallow. Antennae proportionately more elongate. Pronotum definitely smoother, due to the subsidence of beading and much weaker nodes and rugae (often appearing smooth to the naked eye). Organs of flight showing weak reduction, surpassing caudal femora by slightly more than pronotal length (in males of the other Arizona forms of the genus usually decidedly more caudate). Caudal femora proportionately similar.

[29] Comparison has been made with one male and three females from San Luis Potosi in the Academy collection.

General coloration depending on immediate environment, brown tinged with tawny or gray brown or sometimes with a decided pinkish tinge. Antennae usually darker. Head with face and occiput sometimes marked with very minute black specks. Pronotum often immaculate, often with large tubercles dark brown or black. Tegmina of the general coloration, crossed by two irregular darker bands beyond the second of which is an extensive darker area separated from it by a large transverse pale buff marking and sometimes invaded beyond by one, very rarely by two, small pale areas; apices transparent, immaculate but tinged with the ground color; humeral vein light buff to near proximal portion. Wings with disk dull opaline green, sometimes pale veronese green (more yellowish), very rarely pale nile blue, always shading to nile blue at base; wing band broad, dark brown, widest across the area of the wing tip and showing only weak external indentation at the juncture of the anterior and posterior fields; wing tip immaculate, very rarely with a suffused brown spot (this indentation is usually more decided and the wing tip usually has one or two suffused brown areas in the other Arizona forms of the genus). Abdomen buffy, extensively tinged with blue dorso-proximad. Caudal femora with a pre-genicular annulus slightly paler than the other portions, preceded by a vague and often incomplete transverse dark band, the dorso-external margin with two darker areas preceding that, which rarely are vaguely continued on the external pagina as a darker suffusion or a group of dots; internal surface blue-black in nearly proximal half and a transverse band of the same beyond, the other portions light buffy with genicular area marked with brown. Caudal tibiae very pale glaucous with proximal third, apex and feet buffy, external surface usually also buffy in females.

In the characters most useful in distinguishing *robustus* the following variation must be considered. Though the males are distinctly more robust and broader than those of *L. cyaneus* Cockerell, this is not always true for females which, in atypical *cyaneus* from some of the localities in southern Arizona where both species occur, are quite as large, the head, however, averaging proportionately not as large, the pronotum not as broad and as a rule rougher. In *robustus* the tegmina and wings are normally shorter and less maculate distad; rare individuals show, however, sufficient variation in these features to prevent correct specific assignment without consideration of the other diagnostic characters. In typical *robustus* the wing disk is light yellowish green and in typical *cyaneus* rich blue, but both species show very wide variation in this feature if material from all portions of their range is considered. Although the pronotal lateral lobes

are never convexly produced ventro-caudad in *robustus,* such production in *cyaneus* and its allies is variable in degree and very rarely obsolete in individuals from large series taken at points coincident in their distribution. Usually *robustus* may be distinguished at a glance from *cyaneus* and its allies by the broad short caudal femora with wide dorsal and ventral flanges, but rare individuals have these limbs no broader than in some of the atypical material of *cyaneus.* In typical *robustus* the caudal tibiae are largely very pale glaucous and in typical *cyaneus* they are largely deep blue, but again this difference does not hold in atypical *cyaneus* where the ranges of the two species coincide.

♂	Length of body	Length of pronotum	Greatest width of pronotal disk	Length of tegmen	Length of caudal femur	Greatest width of caudal femur
Franklin Mountains, Texas.	27.8	9.1	6.4	30.	17.	6.1
Lordsburg, New Mexico	28.8 to 30.	8.2 to 8.7	5.9 to 6.7	27.7 to 30.7	16.3 to 17.4	5.7 to 6.1
San Bernardino Ranch, Arizona. *Paratypes.*	29. to 35.	7.2 to 8.8	5.2 to 6.4	24.7 to 29.6	15.3 to 17.1	5.2 to 6.
Madera Canyon, Santa Rita Mountains, Arizona.	29.8 to 32.8	7.4 to 8.8	5.3 to 6.3	24.6 to 30.6	15. to 18.1	5.7 to 6.2
♀						
Hachita Grande Mountains, New Mexico.	42.2 to 47.8	11.1 to 12.2	8.7 to 8.9	35.6 to 38.7	21.7 to 22.2	7.3 to 7.8
San Bernardino Ranch, Arizona. *Paratypes.*	41.8 to 50.	10.9 to 12.3	8.7 to 9.1	33.8 to 37.	20.7 to 20.9	7. to 7.7
Schaeffer Canyon, Baboquivari Mountains, Arizona.	42.8 to 49.7	10.3 to 12.8	7.8 to 9.4	33.3 to 38.2	19.3 to 23.2	7.3 to 8.1

Specimens Examined: 222; 119 males, 100 females and 3 immature individuals.

TEXAS: Franklin Mountains near El Paso, 4600 feet, IX, 15, 1912, (Rehn and Hebard; on rather bare slopes with much Lecheguilla, few grasses and various desert plants), 1♂.

NEW MEXICO: Lordsburg, 4300 feet, X, 15, 1910, (R. and H.; occasional in scanty yellow grass at foot of hill), 5♂, 2♀. Canyon northwest of Hachita Grande Peak, 5300 to 5800 feet, IX, 27, 1922, (R. and H.; few in scanty grass among thick brush), 6♂, 6♀.

ARIZONA: Rock House Canyon, Dos Cabezos Mountains, 4200 feet, X, 14, 1910, (R. & H.; on bare rocks just below extensive patches of *Dasylirion*), 3♂, 2♀. San Bernardino Ranch, Cochise County, 3900 to 3950 feet, IX, 24, 1922, (R. & H.; on plain covered with rounded chunks of lava with much Creosote Bush, Ocotillo and a mimosa and areas of sparse yellowish grasses), 18♂, 11♀, *type, allotype, paratypes,* 1 large juv. ♂. South end of Perillas Mountains, 4500 feet, IX, 24, 1922, (R. &. H.; gravelly hills with same cover as above), 1♂. Mule Pass in Mule Mountains, 6100 feet, IX, 23, 1922, (M. Hebard; on rocky slope), 1♂. Don Luis, 5100 feet, (M. Hebard; very scarce on gentle slopes with yellow grass and much semi-desert vegetation), 2♂. Benson, 4100 feet, X, 13, 1910, (R. & H.; on mesa in patches of short dry yellow grass), 8♂, 2♀. Oracle, IX, 8, 1932, (E. R. Tinkham), 2♂. Santa Catalina Mountains, 4000 to 5000 feet, IX, 29, 1922, 2♀. Lower Madera Canyon, Santa Rita Mountains, 4600 feet, IX, 26, 1924, (M. Hebard; on hillside among rock fragments and short grass), 3♂. Madera Canyon, Santa Rita Mountains, IX, 10, 1932, (E. R. Tinkham), 1♂. Santa Rita Mountains, VIII, 29 to IX, 24, 1919 to 1924, 1♂, 2♀, [Univ. of Ariz.]. Flux, Alum Canyon, Santa Cruz County, 3900 feet, IX, 25, 1924, (J. A. G. Rehn; at foot of hill on broken rock), 2♂, 3♀. River Camp above Nogales, 3500 feet, IX, 20, 1922, (R. & H.; moderate numbers in short green but dry grass; an unwieldy insect, slow in its movements and easy to collect), 7♀. Six miles northeast of Nogales, 4000 feet, IX, 20, 1922, (R. & H.; moderately common on rolling hilltops), 11♂, 4♀. Nogales, X, 11, 1918, (J. A. Kusche), 1♂. Calabasas Canyon, Santa Cruz County, 3750 feet, IX, 23, 1924, (R. & H.; in area of gramma grass dotted with mesquite), 3♀. Foothills of Pajaritos Mountains, 4400 feet, IX, 21, 1922, (R. & H.; small numbers on summits of rolling hills), 2♂. Austerlitz, Tumacacori Mountains, 4325 feet, IX, 21, 1924, (R. & H.; on oak dotted hills), 2♀. Two miles north of Oro Blanco, foothills of Tumacacori Mountains, 3800 feet, IX, 21, 1924, (R. & H.), 1♀, 1 juv. ♀. Tumamoc Hill, Tucson Mountains, 2400 to 3092 feet, X, 3 and 4, 1910, (R. & H.; usually on exposed areas of rocky soil in dry yellow grass with many desert shrubs present), 4♂, 5♀. Roebles Pass, Tucson Mountains, 3000 feet, X, 11, 1910, (R. & H.), 1♀. Sahuaro plain between Tucson and Coyote Mountains, X, 5, 1910, (R. & H.; in dry yellow grass among composites, much Mesquite, some Creosote Bush), 6♂, 3♀. Palo Alto Rancho, Altar Valley, 3000 feet, X, 6, 1910, (R. & H.; in short yellow grass on gravelly soil among mesquite), 2♂, 1♀. Espinosa Rancho, Altar Valley, 3200 feet, X, 9, 1910, (R. &. H.; in wash with much Mesquite and low yellow grass), 3♀. Four miles north of Buenos Aires Well, Altar Valley, 3850 feet, IX, 20, 1924, (R. & H.), 2♂, 1♀. Santa Margharita Rancho, Altar Valley, 4850 feet, IX, 20, 1924, (R. & H.; on low gravelly ridges with fine green grass and cat-claw), 1♂. Sycamore Canyon, Babo-

quivari Mountains, 3400 to 5800 feet, X, 6 and 9, 1910, (R. & H.; on plain and hillsides up to oaks, most plentiful on bench), 30♂, 34♀. Schaeffer Canyon, Baboquivari Mountains, 4500 to 4600 feet, IX, 18 and 19, 1924, (R. & H.; few on hillsides, one on bare rock, one on gravelly area beside wash), 5♂, 2♀. Mount Mildred, Baboquivari Mountains, 5600 feet, IX, 19, 1924, (M. Hebard; on steep slopes), 1♂, 1 juv. ♀.

Atypical Material

The following sixty-one specimens differ from typical *robustus* in having the average form slightly but definitely less robust, the organs of flight conspicuously more caudate and the wing disk conspicuously bluer, ranging from very pale methyl blue, through lumiere blue (normal) to nile blue.

COLORADO: Cedar Creek, Montrose County, 6900 feet, IX, 1, 1921, (M. Hebard; in grassy area on hillside, only one seen), 1♂.[30]

NEW MEXICO: Farmington, 5300 to 5500 feet, IX, 6 and 7, 1921, (R. & H.; common on boulder-strewn hillsides with quite a little short green grass and low plants), 43♂, 17♀.

Specimens from Grand Junction and Delta, Colorado,[31] are also before us which may represent a northern geographic race of *robustus*, but which may show merely the extremes of variation away from the normal. We feel that more material is needed to determine which is the case. They average even less robust, with tegmina and wings maculate distad (in the four males but not in the two females) and have the wing disk ranging from pale methyl blue to deep nile blue (as deep as is normal in typical *cyaneus*).

CYRTACANTHACRINAE

Perixerus gloriosus new species (Pl. V, figs. 1 to 3.)

This, the fifth species of a genus hitherto known only from Mexico, is again a distinctive insect, widely separated from the others not only by its very unusual coloration but also by structural characters.

[30] Recorded as *Leprus* sp. near *interior* by Hebard in 1929. The specimen from Carbon Junction, Colorado, then so recorded represents *L. cyaneus* Cockerell.

[31] Recorded as *cyaneus* by Gillette in 1904 and as *Leprus* sp. near *interior* by Hebard in 1929.

It is apparently slightly nearer *P. laevis* Rehn than the others, agreeing in the vertex which shows very weak (but stronger) impression only proximad and in being very weakly hirsute.

The caudal margin of the pronotal disk is, unlike in the other species, very faintly obtuse-angulate produced and the tegmina are decidedly more approximate.

Type.— ♂ ; south slopes of Atascosa Peak, Pajaritos Mountains, Arizona. Elevation 5500 to 6200 feet. September 21, 1922. (M. Hebard). [Hebard Collection, Type no. 1272].

Size and form medium for the genus, but moderately slender. Interocular space moderately broad, slightly broader than in *laevis* (from females seen to be broader in the present species than in *P. hirsutus* Hebard but decidedly narrower than in *P. variabilis* Rehn. Fastigium short, blunt, declivent, very feebly impressed proximad. Frontal costa expanding very slightly to between antennae where it is slightly widest, thence narrowing to juncture with fastigium; its surface flat, impressed about and below median ocellus. Carina of face blunt but distinct like lateral carinae of frontal costa, infra-ocular sulcus very decided. Pronotum rather coarsely pitted, rounding into lateral lobes without trace of lateral carinae, transverse sulci decided as in *variabilis,* deeper than in *laevis,* medio-longitudinal carina very weak and present only on metazona, caudal margin of disk distinctive as described above. Tegmina represented by fairly large ovate pads, subattingent (in type, varying in paratypes from briefly separated to overlapping), larger and broader than in *laevis,* venation prominent and regular. Prosternal spine prominent, blunt, elongate conical. Furcula represented by two small equilateral projecting triangles. Supra-anal plate triangularly shield-shaped, broader than long, lateral margins feebly concave in median half; lateral portions rather strongly concave to apex of plate, other portions of surface elevated except for a meso-proximal impression. Cerci simple, styliform, slightly over twice as long as basal width, tapering to the acute apices which are scarcely decurved (moderately decurved in *laevis*). Penis (Pl. V, fig. 2) projecting a much shorter distance than in *laevis.* Subgenital plate with a small but decided apical tubercle. Cephalic and median tibiae thickened but hardly at all bowed. Caudal tibiae with eight spines on each margin. Caudal metatarsus rather short, very slightly shorter than combined length of the two succeeding joints. Arolium large and elongate.

Allotype.— ♀ ; same data as type. [Hebard Collection].

Larger and more robust than male. Interocular space and fastigium broader. Caudal margin of pronotum similarly very faintly obtuse-

angulate produced. Tegmina separated by a moderate interval, (varying to attingent in paratypes). Ovipositor valves short with apices rather strongly curved.

General coloration clear light green (fading in dried specimens to greenish yellow except on tegmina), except as follows. A broad band from apex of vertex to caudal margin of pronotum, cephalic and median femora and tibiae and all of caudal femora except dorsal carina, genicular lobes and ventro-internal carina, very bright jasper red (almost a light scarlet). Antennal joints very extensively suffused with brown. Caudal tibiae glaucous.

This coloration is very distinctive. Nearest approach is shown by *Hesperotettix speciosus* (Scudder) in which the colors are all much less brilliant, the red much less extensive and the caudal tibiae are green.

Immatures differ in having the red less brilliant, the entire dorsum and the external pagina of the caudal femora extensively marked with shining dark brown.

The extremes in the series before us measure as follows: length of body ♂ 16.7 to 18.7, ♀ 20.5 (abdomen retracted) to 26.7 (abdomen moderately extruded); length of pronotum ♂ 4. to 4.7, ♀ 5.2 to 6.3; total caudal width of pronotum ♂ 3.3 to 4., ♀ 4.8 to 5.8; exposed length of tegmen ♂ 3.8 to 4.3, ♀ 4.3 to 5.4; width of tegmen ♂ 2.2 to 2.8; ♀ 3.2 to 4.; length of caudal femur ♂ 10. to 10.5, ♀ 12.3 to 13.3 mm.

All of the adults are considered paratypes. The series was secured at the same locality as was the type by Rehn and Hebard, six males and four females on September 21, 1922; three males, three females, six immature males and seven immature females on September 21 and 22, 1924. One immature female was taken, probably at the same locality, on August 31, 1927, by J. C. Bradley and belongs to Cornell University.

The series was found over an area not more than a mile in diameter on the south slopes of Atascosa Peak from 5500 to 6200 feet, where these slopes pitch steeply down into Bear Valley and toward the nearby Mexican line, in the thick low covering of grass and a variety of plants. In life the coloration was remarkably rich and brilliant. The field notes read "The food plant grows in small scattered and widely separated patches on the steep mountain slopes. I found as many as three immature individuals in one plant, perched up in it just like *Poecilotettix pantherinus* (Walker). Like that species they also quickly abandoned their bush when approached. They leap fairly vigor-

ously for such soft-bodied grasshoppers, but their other movements are not rapid and they seem stupid."

Comparisons have been made with the female types of *laevis* and *variabilis* and males of the former species (males of which alone are known of the formerly described species) in the Academy Collection and female paratypes of *hirsutus* in the author's collection.

TETTIGONIIDAE

PHANEROPTERINAE

Insara tessellata new species (Pl. V, figs. 4 and 5.)

This delicately beautiful katydid is much nearer the recently described *I. juniperi* Hebard from New Mexico [32] than any of the other previously known species. In size and form it is very similar and its general appearance on first glance looks much the same. The coloration and pattern, on further examination, is however seen to be very different; the tegmina with stridulating field of male (anal field of female) purplish brown excepted mesad and sutural margin narrowly to broadly that color, the pale areas toward that margin (usually) as broad as long and as large as the intervening green (or brown in the brown phase) areas and the other portions of the tegmina less evenly colored, appearing more definitely tessellate. The abdomen and caudal femora are also marbled with a paler shade, the former showing everywhere minute microscopic purplish dots and the latter with decided dark flecks along their pale ventro-external margins.

These and the shorter broader dorsal markings of the tegmina compose a strongly spotted and tessellate pattern actually very unlike the more solidly colored *juniperi* in which the tegmina particularly differ in showing a definite herring-bone type of marking.

In addition the present species has the lateral lobes of the pronotum very definitely longer than deep (these proportions equal in *juniperi*) and the limbs are noticeably more elongate and proportionately quite as heavy. The male genitalia are very

[32] Proc. Acad. Nat. Sci. Phila., LXXXVII, p. 70, (1935).

similar, differing only in the convexity of the inner margin of the cerci at the apical tooth being more decided (but this feature is subject to some individual variation as it is slightly more pronounced in the males from Prescott than the others).

Type.— ♂ ; Wheeler Canyon, Hualapai Mountains, Arizona. Elevation 5000 feet. (O. C. Poling). [Hebard Collection, Type no. 1281].

Size medium small for the genus, form rather robust, the abdomen in life being short and extremely inflated. Head as in *juniperi,* slightly broader than in *I. elegans* (Scudder); eye prominent, elongate, nearly oval, almost vertical; vertex similar, declivent, this strongest proximad, its dorsal surface very narrow and sulcate. Pronotum of medium length and definitely longer than in *juniperi,* very weakly (individually varying to weakly) sellate, lateral carinae coarsely and weakly indicated, cephalic margin very weakly concave, caudal margin broadly convex with flattening of the convexity shown on each side (often to a less degree than in *juniperi*); lateral lobes with greatest depth distinctly less than greatest width, the humeral sinus large, deep, concave, its margins perpendicular to each other, below this the ventro-caudal portion is roundly produced caudad, that section occupied by a very large convex callosity which is even broader than in *juniperi.* Tegmina (particularly stridulating field) as in *juniperi;* narrow with apices rounded, marginal field narrowing less rapidly than in *juniperi* but similarly disappearing mesad. Wings extending well beyond tegmina. Dorsal abdominal tergites pinched meso-distad but not produced. Disto-dorsal tergite with a large meso-distal depressed area. Supra-anal plate small, triangular. Cerci tapering, slightly curved but definitely bent inward mesad, just before apical tooth strongly impressed dorsad, the inner margin there strongly convex and rounding into the small acute triangular apical tooth, which is directed dorsad and slightly distad. Subgenital plate with short non-articulate styliform appendages and with distal margin transverse but bluntly produced mesad. Limbs comparatively heavy and moderately elongate for the genus. Cephalic tibiae enlarged proximad with both large tympana apert, narrowing gradually distad of these. Genicular lobes of cephalic and median femora minutely bidentate. Ventral femoral margins unarmed. Very important diagnostic characters are shown by the color pattern.

Allotype.— ♀ ; Boulder Spring, Mojave County, Arizona. July 14, 1920. (O. C. Poling). [Hebard Collection].

Very similar to male in ambisexual features but larger. Sellation of pronotum even weaker. Ovipositor comparatively large, deep, particularly at base where it is strongly bent dorsad, margins beyond converging very

weakly then curving to apex, dorsal margin armed with minute triangular teeth which increase in size distad, ventral margin so armed only distad; lateral surfaces of dorsal valves microscopically acutely tuberculate, of ventral valves showing microscopic vertical ridges dorsad and weaker more irregular ones mesad, these becoming general distad.

General coloration bright cedar green, the face and sides slightly paler green; markings as follows. Eyes wood brown. Antennae light green, distad with irregular annuli, some very short and dark brown, others longer and light brown. Head with all of vertex, vertical facial carinae broadly, upper portion of clypeus, ventro-caudal portions of cheeks and postocular bar buffy, these markings vague or obsolete in all poorly preserved specimens. Pronotum with lateral margins of disk faintly indicated in buffy cephalad, this marking becoming broader and green caudad, caudal margin laterad very narrowly whitish, almost all of metazona preceding this rusty brown; lateral lobes showing a few microscopic olivaceous dots and convex callosity white. Tegminal marking distinctive as described above; microscopic black dots in discoidal and marginal fields very numerous, more numerous than in *juniperi*. Male stridulating field purplish brown except mesad where it becomes green, its caudal portion and the sutural margin rich purplish brown; female anal field and sutural margin similar except that the green in the former is more extensive. Abdomen rich green, everywhere thickly supplied with microscopic purplish dots and marbled with buffy ventro-laterad, proximal tergites with a broad dorso-lateral band of buffy the margins of which are very irregular, the third tergite with that band tinged with purplish in dorsal portion, the fourth there similar and with a very large shining dark brown blotch meso-caudad. Ventral sternites green with a broad shining yellow buff median line and marbling of the same laterad, everywhere thickly supplied with microscopic purplish dots. Ovipositor red brown at apex. Cephalic and median limbs extensively but very vaguely annulate with whitish green, with numerous minutely microscopic dots of olivaceous and with small pale brownish flecks along the ventral margins; caudal femora green, finely marbled with greenish white and pale greenish brown, the pale ventral margins with conspicuous flecks of dark brown; caudal tibiae with a broad inconspicuous annulus of whitish green followed by other even more vaguely paler annuli and sometimes with exceedingly faint traces of brownish suffusions.

A brown phase in which the general coloration is ochraceous tawny becoming buffy citrine on the tegmina, with similar markings to those of the green phase buffy, is represented by a male from Prescott and a female from Sawmill Canyon.

	Length of body	Length of pronotum	Length of tegmen	Projection of wing beyond tegmen	Length of caudal femur	Length of ovipositor
♂						
Prescott, Ariz. *Paratype.*	14.3	3.8	20.2	3.6	17.8	——
Prescott, Ariz. *Paratype.*	17.	3.8	23.	3.1	17.8	——
Wheeler Canyon, Hualapai Mts., Ariz. *Type.*	20. [33]	3.9	24.7	1.7	19.1	——
♀						
Sawmill Canyon, Hualapai Mts., Ariz. *Paratype.*	19.5	4.	26.7	3.7	21.7	6.2
Boulder Springs, Ariz. *Allotype.*	18.3 [34]	4.	25.2	2.8	20.2	5.8
Kingman, Ariz. *Paratype.*	18.1 [34]	4.1	26.	3.3	23.3	5.8

Specimens Examined: 11; 8 males and 3 females.

ARIZONA. Prescott, VII, 29, 1933, (R. H. and J. D. Beamer), 5♂, *paratypes,* [Univ. of Kansas and Hebard Cln.]; VIII, 24, 1917, (J. A. Kusche), 1♂, *paratype.* Yavapai County, VIII, 9, 1927, (R. H. Beamer), 1♂, *paratype.* Sawmill Canyon, Hualapai Mountains, IX, 19, 1919, (O. C. Poling), 1♀, *paratype.* Wheeler Canyon, Hualapai Mountains, 5000 feet, (O. C. Poling; on oak brush), 1♂, *type.* Kingman, IX, 25, 1919, (O. C. Poling), 1♀, *paratype.* Boulder Spring, Mojave County, VIII, 14, 1920, (O. C. Poling), 1♀, *allotype.*

Arethaea coyotero new species (Pl. V, fig. 6; pl. VI, figs. 1 and 2)

1914. *Arethaea brevicauda* Rehn and Hebard (in part not *Dichopetala brevicauda* Scudder, 1900), Trans. Amer. Ent. Soc., XL, p. 172 to 175. [♀; Crestline, Nevada.)

This species is peculiar to southern Nevada and northwestern Arizona, whereas *A. brevicauda* (Scudder) occurs there and also in southern California.

This interesting new species occupies a position between *A. semialata* Rehn and Hebard and *A. gracilipes* (Thomas) but shows nearer relationship to the latter, the specialization of the first abdominal tergite being very similar to that of *gracilipes gracilipes.* The organs of flight are strongly caudate in the males, very greatly reduced in the females. It further differs from *gracilipes* in having the females decidedly more robust than the males, the pronotum with caudal margin of disk broadly convex and the male cerci have the inbent apical portion formed by a rather slender tooth which is no wider proximad than mesad.

[33] Abdomen extruded.

[34] Abdomen retracted.

Females are spearable from the strongly brachypterous females of certain other species of the genus by the much longer ovipositor which curves gradually (and is not bent) dorsad.

TYPE.— ♂ ; Prescott, Arizona. Elevation 5400 feet. August 20, 1917. (O. C. Poling). [Hebard Collection, Type no. 1277].

Size small, form very elongate. Head much as in *gracilipes* [35] but not quite as deep; eye prominent, infra-ocular portion of genae not as deep. Margins of pronotum simple, not at all nodose. Pronotum moderately inflated, sub-bullate across the lateral lobes, sellate; caudal margin of disk broadly convex, showing no angulation; lateral lobes rather shallow, humeral sinus shallow and concave, convex callosity very large and decidedly inflated. Tegmina elongate and narrow, appreciably narrower meso-proximad than meso-distad, not darkened at sutural margins; stridulating field small, scarcely produced at apex of stridulating vein. Wings strongly surpassing tegmina, extending decidedly beyond apices of caudal femora. Abdominal tergites with caudal margins laterad showing very weak crenulation (individually varying to simple [36]). Abdomen with first tergite (following median segment) specialized meso-caudad, this process moderately high, about as high as its basal width, its apex bulbous, its cephalic face thickly hirsute, its caudal face deeply concave; ultimate tergite transverse, surface showing extensive weak concavity meso-distad, distal margin broadly and very weakly convex laterad and broadly and very weakly concave mesad; supra-anal plate below this tergite, vertical, its caudal surface concave, its form rectangulate, distinctly broader than long, with disto-lateral angles rounded. Cercus stout, gradually tapering and faintly incurved to apical portion which is strongly bent inward, chitinous, flattened, slender, as narrow mesad as proximad with apex itself acute. Subgenital plate broad, moderately elongate, the distal margin very deeply concave between the moderately elongate slender styliform processes. Limbs very elongate and very slender. Femora with apices not produced dorsad; genicular lobes of cephalic and median bispinose, of caudal unispinose.

Allotype.— ♀ ; same data as type but taken July 18, 1917. [Hebard Collection].

Decidedly more robust than male with decidedly shorter and slightly heavier limbs. Pronotum very feebly sellate and convex callosity narrower and far less inflated. Tegmina represented by very short convex overlapping pads, their venation distinct, outline rounded in dorsal aspect but

[35] See Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 122, (1914).

[36] Except in the Nevada male, in which these margins are conspicuously crenulate.

apices minutely but sharply angulate produced. Ultimate tergite small, transverse, rectanglar, the semicircular supra-anal plate hinged to it, these plates medio-longitudinally sulcate. Ovipositor only moderately deep, curved gradually and weakly dorsad; sides very finely toothed, this becoming weaker proximad and disappearing at base, dorsal and ventral margins serrato-dentate, this heaviest distad, those of the ventral margin weaker, more spaced and directed proximad. Subgenital plate small, rounded triangular.

♂	Length of body	Length of pronotum	Greatest dorsal width of pronotum	Length of tegmen	Length of wing beyond tegmen	Length of caudal femur	Length of ovipositor
Ash Meadow, Nevada.	11.5 [37]	3.2	2.	18.8	9.4	22.8	——
Prescott, Ariz. *Type.*	14.7	3.2	2.1	21.	11.8	24.8	——
Prescott, Ariz. *Paratype.*	13. [37]	3.3	2.	19.01	10.8	10.8	——
♀							
Crestline, Nevada.	18.	3.9	2.4	3.5	——	22.5	5.2
Beatty, Nevada.	17.3	4.4	2.6	3.2	——	21.	5.3
Prescott, Ariz. *Allotype.*	15.8	4.4	2.7	2.9	——	22.3	5.4
Prescott, Ariz. *Paratype.*	17.2	4.3	2.8	3.7	——	24.8	5.3

General coloration light green (bodies frequently faded to buffy or brownish), femora often suffused with purplish. Markings very delicate. Head with two vertical lines of whitish running down from antennal sockets to border clypeus; dorsal surface of fastigium purplish; a very narrow postocular bar of whitish margined internally with purplish, this continued briefly on pronotum. Caudal margin of pronotum narrowly whitish margined internally with purplish, this marginal marking becoming wider on lateral lobes; pronotal surface usually microscopically dotted with purplish, these dots sometimes very numerous. Abdomen dorsad similarly dotted, a very fine medio-longitudinal whitish line flanked with purplish and on each side a broader band of whitish flanked dorsad with purplish, these lateral bands showing strong convexity ventrad. Tegmina and wings light green, immaculate except that the males have the stridulating field suffused laterad with brown and margined externally with purplish. Apices of male cerci dark brown.

The female from Beatty, Nevada, shows a response to that arid environment in being whitish buff with sides and femora beautifully tinted with very pale green. In this specimen all trace of the purplish margins of the whitish markings is lost while the purplish dots are unusually numerous but minute in the extreme.

[37] Body shrivelled.

Preservation of the color in such fragile insects is extremely difficult.

Specimens Examined: 208; 142 males, 21 females and 45 immature individuals.

NEVADA: Crestline, 600 feet, IX, 4, 1909, (Rehn and Hebard; in bunch of dry yellow grass among junipers where there was hardly any other vegetation), 1 ♀. Ash Meadows, Amargosa Desert, 2300 feet, VIII, 14 to 19, 1921, (Knaus, Nininger and Hoover), 1 ♂. Beatty, 3309 feet, VIII, 12, 1919, (J. A. G. Rehn; beaten from top of a spiny greenish-gray desert bush near dry bed of Amargosa River), 1 ♀.

ARIZONA: Prescott, 5400 feet, VII, 8 to VIII, 24, 1917, (Poling; Kusche), 100 ♂, 19 ♀, *type, allotype, paratypes;* VII, 1 to VIII, 25, 1917, 18 juv. ♂, 24 juv. ♀. Granite Peak, Prescott, VIII, 6 and 17, 1917, (J. A. Kusche), 15 ♂, 1 juv. ♂, 1 juv. ♀. Mount Trydal, Prescott, 7300 feet, VIII, 27 and 28, 1917, (J. A. Kusche), 1 ♂. Senator, VIII, 12, 1917, (J. A. Kusche), 19 ♂, 1 juv. ♂. Kingman, VII, 17 to VIII, 25, 1920, (O. C. Poling), 6 ♂.

Arethaea gracilipes papago new subspecies

(Pl. V, fig. 7; pl. VI, figs. 3 to 6.)

Very large series of the genus now before us show that Rehn and Hebard's concept of *gracilipes gracilipes* (Thomas) in 1914 was incorrect. It is now evident that *constricta* Brunner is a distinct species but that *gracilipes* is divisible into three races, the typical condition occurring in southern Colorado, western Oklahoma, the Pan-Handle of Texas and New Mexico; an undescribed race is present in the Big Bend of the Rio Grande in Texas and the present race to the west of these.

All of the races of *gracilipes* are separated from the two races into which *constricta* divides by not having the pronotum with caudal margin of disk sharply angulate produced at slightly less than a rightangle and never having the sutural margin of the tegmina darkened with the principal veins there paler than the intervening areas. Typical *constricta* is known from Texas, the undescribed race occurring in the central southern portion of the latter State.

The present race is very close to typical *gracilipes* (see plate V, figure 7), separated only by the decidedly weaker development of the specialization of the first abdominal tergite in the male, while none of the many females before us show reduction in the organs of flight (which is often indicated, though individually to a highly variable degree, in *gracilipes gracilipes*).

Type.— ♂ ; Growler Valley, south of Growler Pass, Pima County, Arizona. Elevation 1200 feet. September 19, 1922. (Rehn and Hebard). [Hebard Collection, Type no. 1278].

Pronotum with margins simple; caudal margin of disk bluntly (rarely sharply) obtuse-angulate (individually varying to rectangulate) produced. First abdominal tergite (following median segment) with height of its meso-caudal specialization not as great (individually varying to equal) its basal width, its apex rounded (this process in typical *gracilipes* higher than its basal width with apex bulbous). Abdominal tergites with caudal margins showing laterad very faint but appreciable traces of crenulation. Supra-anal plate simple, not recessed into the preceding tergite, as broad as long, its dorsal surface moderately concave, its margins convex (varying individually from semicircular to having the lateral margins straight proximad, thence broadly rounding). Cerci strongly bent inward distad, the apical portion weakly horizontally flattened, its margins converging to form a moderately stout acute tooth. Organs of flight slender and caudate. Tegmina with stridulating field moderately produced at apex of stridulating vein. Femora not compressed distad nor angulate produced disto-dorsad.

Allotype.— ♀ ; same data as type. [Hebard Collection].

Very similar to male in ambisexual features, the organs of flight fully as caudate (subject to some slight individual variation in both sexes). Form very similar, though the abdomen is considerably larger. Ovipositor deep, curved moderately dorsad, proportionately shorter than in *coyotero* here described.[38]

The coloration is much as here described for *coyotero,* all of the markings often even weaker and the whitish markings when extensive usually less heavily bordered with purplish.

The measurements of twenty individuals were given by Rehn and Hebard in 1914. The type and allotype measure as follows: length of body ♂ 13.7, ♀ 14.2; length of pronotum ♂ 3.7, ♀ 3.8; greatest dorsal width of pronotal disk ♂ 2, ♀ 2; length of tegmen ♂ 21.1, ♀ 22; length of wing beyond tegmen ♂ 7.9, ♀ 8.1; length of caudal femur ♂ 24.4, ♀ 26.6; length of ovipositor 4.8 mm.

This race was recorded as *A. constricta* Brunner in 1907 by Rehn from Tucson and by Snow from there and the Baboquivari Mountains. Twenty-six specimens were later recorded as *A. gracilipes constricta* by Rehn and Hebard from Tucson, Tumamoc Hill, Roeble's Pass, Sahuaro Plain, Snyder's Hill, Roeble's Rancho, Palo Alto Rancho, Espinosa Rancho and Sycamore

[38] A female of this race from Tucson, Arizona, was fully described by Rehn and Hebard, Trans. Amer. Ent. Soc., XL, p. 123, (1914).

Canyon in the Baboquivari Mountains, Arizona.[39]

From material before us the distribution of *gracilipes gracilipes* is found to extend westward as far as Fort Wingate, the White Sands and Bent, New Mexico.

The range of *gracilipes papago* reaches east to Oracle the Santa Rita and the Patagonia Mountains, Arizona and it is known from many localities westward and not far from the Mexican border as far as the Growler Valley, but still further west and north we have it from Blythe, on the Colorado River in California and from Wickenburg and Kingman, Arizona. It is probable that the species will be found extensively distributed in northeastern Arizona and that *gracilipes gracilipes* is the race there represented, but in central eastern Arizona we do not know which race will be found and in extreme southeastern Arizona, though much collecting has been done, it has not been seen, though we have numerous records from there of *A. sellata* Rehn and *A. carita* Scudder.

The following additional specimens have been studied: 66; 36 males, 18 females and 12 immature individuals.

ARIZONA: Oracle, IX, 8, 1931, (E. R. Tinkham), 4♂, 2♀. Santa Catalina Mountains, VIII, 25, 1924, (A. A. Nichol), 1♂, [Univ. of Ariz.]. Lower Madera Canyon, Santa Rita Mountains, 4500 feet, IX, 26, 1924, (J. A. G. Rehn; in bunch of dry grass at foot of hill), 1♀. Madera Canyon, Santa Rita Mountains, IX, 10, 1931, (E. R. Tinkham), 1♂. Sycamore Canyon, Patagonia Mountains, 4300 to 5600 feet, IX, 22, 1922, (R. & H.; occasional in much dry grass on gravelly ridges), 3♂, 6♀. South slopes of Atascosa Peak, Pajaritos Mountains, VIII, 31, 1927, (J. C. Bradley), 1♀, [Cornell Univ.]; 5100 to 5500 feet, IX, 21 and 22, 1924, (R. & H.), 1♂, 1♀. Bear Valley, Pajaritos Mountains, 5300 feet, IX, 21, 1922, (R. & H.), 1♂. Austerlitz, Tumacacori Mountains, 4325 feet, IX, 21, 1924, (R. & H.), 1♀. Tucson, VI, 14 to VIII, 24, 1922 and 1924, (A. A. Nichol; one at light), 3♂, [Univ. of Ariz.]. Tucson Mountains, IX, 4, 1931, (E. R. Tinkham), 1 large juv. ♂. Quinlan Mountains, IX, 3, 1931, (E. R. Tinkham), 2♂, 1 large juv. ♀. Roadside Mine, Coyote Mountains, 2800 feet, IX, 14, 1924, (J. A. G. Rehn; beaten from rabbit-weed), 1 large juv. ♀. Coyote Mountains, 3500 feet, VIII, 4 to 7, 1916, (Rehn and Lutz), 2 very small juv. ♂, [A.M.N.H. and A.N.S.P.]. Near Kit's Peak, Baboquivari Mountains, 3600 feet, VIII, 7 to 9, 1916, (Rehn and Lutz), 1 very small juv. ♂, 1 very small

[39] Trans. Amer. Ent. Soc., XL, p. 124, (1914). The female at that time so recorded from Pine, Arizona, can not at present be determined as to race.

juv. ♀, [A.M.N.H. and A.N.S.P.]. Cobabi Mountains, IX, 2, 1931, (E. R. Tinkham), 1 large juv. ♂. Four miles east of Pozo Blanco, Quijotoa Mountains, 2750 feet, IX, 17, 1924, (R. & H), 1♂. Covered Wells, IX, 2, 1931, (E. R. Tinkham), 1 large juv. ♀. Quijotoa Mountains, IX, 1, 1931, (E. R. Tinkham), 1♂, 2♀. Thirty miles south of Quijotoa, Baboquivari Valley, VIII, 28 and 29, 1927, 4♂, [Cornell Univ.]. Valley of the Ajo six miles north of Ajo, 1600 feet, IX, 18, 1922, (R. & H.), 2♂, 2♀, *paratypes*, 1 large juv. ♂, 1 large juv. ♀. Ajo, in Little Ajo Mountains, VIII, 31, 1931, (E. R. Tinkham), 1♂, 1♀, *paratypes;* 1800 feet, IX, 18, 1922, (M. Hebard; in small low clumps of a gray-green leaved desert brush), 2♂, *paratypes*. Growler Valley south of Growler Pass, 1200 feet, IX, 19, 1922, (R. & H.; occasional in short drying grasses of wash), 5♂, 1♀, *type, allotype, paratypes,* 1 large juv. ♀. Kingman, VIII, 2, 1920, (O. C. Poling), 2♂. Wickenburg, VII, 27, 1933, (R. H. Beamer), 1♂, [Univ. of Kansas].

CALIFORNIA. Blythe, VIII, 20, 1927, (J. C. Bradley), 1♂.

Two males of this race from Nogales, Sonora, Mexico, were recorded as *A. g. gracilipes* by Hebard in 1932.

Arethaea polingi new species (Pl. V, figs. 8 and 9; pl. VI, figs. 8 and 9.)

This interesting species occupies a position between *A. carita* Scudder and *A. brevicauda* (Scudder). The lack of nodes on the margins of the abdominal tergites, even distal curvature of the male cerci and very great reduction of the organs of flight in females show agreement with the latter species, but the stridulating field of the male tegmina is decidedly less produced at the apex of the stridulating vein as in *carita* and the specialization of the first abdominal tergite is less decided but of the same type as in that species.

The ovipositor is even shorter than in *brevicauda* and is definitely bent dorsad.

Type.— ♂ ; Prescott, Arizona. July 5, 1917. (O. C. Poling). [Hebard Collection, Type no. 1279].

Size moderately large, form very elongate. Head and margins of pronotum as here described for *A. coyotero*. Pronotum moderately inflated, sub-bullate across the lateral lobes, strongly sellate; caudal margin of disk roundly angulate produced at slightly less than a rightangle; lateral lobes elongate, longer even than in *A. gracilipes papago* here described, humeral sinus rounded rectangulate emarginate, convex callosity very large and decidedly inflated. Tegmina elongate and narrow, very slightly narrower meso-proximad than meso-distad, not darkened at sutural margins; stridulating field large for the genus, decidedly produced at apex of stridulating vein. Wings strongly surpassing tegmina, extending decidedly beyond

apices of caudal femora. Abdominal tergites with caudal margins neither nodose or crenulate but showing a meso-lateral angulate production. Abdomen with first tergite (succeeding median segment) specialized meso-distad, this process moderately high, apex convex, cephalic surface and adjacent surface of tergite thickly hirsute, margins of tergite laterad of this specialization turned dorsad and convex in outline to its base; ultimate tergite and supra-anal plate as here described for *coyotero*. Cercus stout, gradually tapering and straight to apical portion which curves gently inward, is tapered more strongly in proximal portion and terminates in an acute chitinous apex. Subgenital plate broad, moderately elongate, the distal margin straight, transverse, between the elongate slender styliform processes. Limbs exceedingly elongate and slender. Femora with apices formed and genicular lobes armed as here described for *coyotero*.

Allotype.— ♀ ; same data as type but taken July 11, 1917. [Hebard Collection].

Decidedly more robust than male with decidedly shorter and slightly heavier limbs. Pronotum weakly sellate and convex callosity narrower and very weakly inflated. Tegmina represented by very short convex overlapping pads, their venation distinct, their outline not as rounded in dorsal aspect as in *coyotero*, each tapering to the broader rounded apex. Ultimate tergite and supra-anal plate as here described for this sex of that species. Ovipositor rather deep and very short, bent dorsad though the curvature of the ventral margin is even, armament as in *coyotero*. Subgenital plate much as in that species. Pronotum differing from that of male in being narrower dorso-caudad with latero-caudal shoulders much less distinct and humeral sinus barely indicated by a broad and very shallow concavity of the margin.

♂	Length of body	Length of pronotum	Greatest dorsal width of pronotum	Length of tegmen	Length of wing beyond tegmen	Length of caudal femur	Length of ovipositor
Prescott, Ariz. *Paratype.*	14.3 [40]	4.2	2.7	21.9	13.2	26.	——
Prescott, Ariz. *Type.*	17.	4.2	2.8	24.6	12.1	28.	——
Kingman, Ariz.	15.5	4.1	2.7	20.7	10.8	25.7	——
♀							
Prescott, Ariz. *Paratype.*	13.1 [40]	4.3	2.3	3.	——	23.3	4.3
Prescott, Ariz. *Allotype.*	19.3	4.7	2.3	3.	——	24.	4.4
Prescott, Ariz. *Paratype.*	20.	4.9	2.4	3.7	——	25.2	4.9

[40] Abdomen retracted.

General coloration very light green in male, darker in the female, markings as here described for *coyotero* except as follows. Pronotum lacking microscopic purplish flecks except in intensively colored females. Stridulating area of male tegmina pale brownish buff, this slightly darker proximo-laterad and on stridulating vein.

Specimens Examined: 11; 7 males and 4 females.

ARIZONA: Prescott, VII, 5 to 24, 1917, (O. C. Poling), 3♂, 4♀, *type, allotype, paratypes.* Truxton, VI, 16, 1920, (O. C. Poling), 2♂. Kingman, VI, 20 and VII, 17, 1920, (O. C. Poling), 2♂.

DECTICINAE

Ateloplus coconino new species. (Pl. VII, figs. 1 and 2)

1905. *Ateloplus notatus* Rehn (not of Scudder, 1900), Trans. Kansas Acad. Sci., XIX, p. 227. [♂; Bill Williams Fork, Arizona.]

1907. *Ateloplus notatus* Snow (in part not of Scudder, 1900), Trans. Kansas Acad. Sci., XX, p. 39. (Same specimen as above only.)

1907. *Ateloplus notatus* Caudell (in part not of Scudder, 1900), Proc. U.S. Nat. Mus., XXXII, p. 369, fig. 55. (Same specimen as above only.)

The general appearance of this insect closely resembles that of normal weakly mottled males of *A. schwarzi* Caudell from southern Arizona. The male cerci are, however, very distinct, showing closest agreement with those of the larger, more robust and distinctively marked *A. splendidus* Hebard from southeastern California. The male cerci in these two species are of the more conventional type, not developed in any of the other species of the genus.

Type.—♂; Bill Williams Fork, Arizona. August, 1903. (F. H. Snow). [Hebard Collection, Type no. 1284].

Size large for the genus, form robust. Head much as in *schwarzi,* rather full and rounded but proportionately distinctly narrower than in *splendidus;* fastigium with dorsal surface showing a short strong medio-longitudinal sulcus distad (this in *schwarzi* normally obsolete, rarely very weakly indicated), width of fastigium slightly greater than that of first antennal joint as in that species. Pronotum with disk rounding evenly into the shallow lateral lobes with cephalic and caudal margins truncate, the first transverse sulcus fine but decided, the other sulci distinct only on the lateral lobes, generally of the same type as in *schwarzi* but proportionately more elongate, with caudal portion of ventral margin of lateral lobes straight instead of very shallowly concave and the large adjacent convex callosity larger and distinct. Tegmina with less than half of portion beyond stridulating vein projecting (in *schwarzi* with all or nearly all of the portion beyond the stridulating vein exposed). Prosternum unarmed.

Ultimate tergite with two small sharp triangular projections, each broader than long, on each side of a meso-distal impression; these considerably shorter than in *schwarzi*, much as in *splendidus* but like *schwarzi* with latero-distal margins lacking the deflexed area with margins broadly convex developed in that species. Titillators represented by two divergent slender flattened chitinous fingers which widen very slightly and gradually distad and have their external margin sharply toothed; much as in *splendidus*, in which species, however, the external margin is sometimes slightly convex distad; in *schwarzi* a distal convexity is very pronounced, the external margin toothed there only, but the shaft with numerous teeth on the dorso-external surface of its proximal portion. Cercus moderately large; a straight cylindrical shaft, with apical portion, beyond the rather large slightly recurved disto-internal tooth, bent very weakly outward and tapering to the bluntly rounded apex; of the same general type as in *splendidus* which species, has the cercus, however, proportionately much smaller, the external margin of the shaft showing faint convexity and the apical portion shorter and heavier. Subgenital plate much as in *splendidus;* heavy rounded lateral carinae run to the sockets of the simple cylindrical styles which are over twice as long as broad, each distinctly longer than the width of the intervening margin which is angulate-emarginate at slightly more than a rightangle; in *schwarzi* the cerci are smaller and the intervening area broader and very shallowly concave (or rarely rounded obtuse-angulate emarginate). Cephalic tibiae proportionately more elongate than in *schwarzi*, with dorso-external margin armed with a very minute proximal, a median (on one limb but not on the other) and a distal spine. Femora as in *schwarzi* but not as in *splendidus* with cephalic-internal, median-external and median-internal genicular lobes alone armed with a minute spine. Ventral femoral margins armed with small spines as follows: cephalic-internal 5 and 6, external 0; median-internal 1 and 4, external 5 and 7; caudal-internal 7 and 9, external 7 and 7. Caudal femora very robust.

Allotype.— ♀ ; Kingman, Arizona. August 16, 1920. (O. C. Poling). [Hebard Collection].

Generally similar to male in ambisexual features, smaller.[41] Tegmina represented by small vestigial lateral pads concealed by the pronotum. Pronotum similar to that of male but with caudal margin of disk very shallowly concave and caudal margin of lateral lobes opposite the subobsolete convex callosity[42] shallowly concave, in this feature agreeing

[41] This probably indicates decided size variation in the species, as in series from the same locality females of other species of *Ateloplus* are in most cases larger than the males.

[42] Which however is prominent in the paratypic female from west of Blythe, California.

closely with females of *schwarzi*. Ultimate tergite medio-longitudinally deeply sulcate and with caudal margin not produced (or very briefly triangularly produced in paratype) above each side of the very small rounded triangular supra-anal plate. Ovipositor comparatively short for the genus, decidedly shorter than the robust caudal femur, broadly curved dorsad, base stout, apex very sharply acute, margins unarmed, dorsal and ventral valves each with a medio-longitudinal carina only at apex. Sternite preceding the subgenital plate with a large prominent but bluntly rounded meso-proximal projection (less prominent and even more broadly rounded in paratype), preceding tergite unspecialized. Subgenital plate with lateral margins very broadly convex convergent to the small concave meso-distal emargination which is as deep as broad, along the sides of that emargination and gradually diverging to the base of the plate are two very coarse rounded carinae and there is a finer medio-longitudinal carina decidedly developed only toward the base of the plate (in the paratype the lateral carinae are more divergent and disappear two-thirds the distance to the base of the plate while the medio-longitudinal carina is percurrent and equally decided throughout its length).[43]

In considering the specialization of the sternites in females of *Ateloplus* we find that *A. splendidus* agrees with *coconino* in this feature except that the sternite preceding the subgenital plate shows meso-proximad an even weaker though more extensive projection which could therefore be easily overlooked. In *A. luteus* Caudell and *A. hesperus* Hebard that sternite bears a more prominent projection than in *coconino* while there is also a large rounded projection mesad on the preceding sternite. In females (including the type) of *schwarzi* similar specialization to that of *luteus* is developed, but in some others, which are apparently wholly inseparable and taken with males which are normal for that species, the preceding tergite is unspecialized as in *coconino*. Such difference, which apparently has no geographic significance, we can not explain at the present time.

Male dull clay color inconspicuously marked with darker, this shown particularly on disk of pronotum as a medio-longitudinal and two narrow postocular lines which latter converge caudad and all became practically obsolete at the principal sulcus, to reappear very feebly as a medio-longitudinal and marginal lines on the metazona. Antennae tawny, very thickly, irregularly and vaguely annulate with deep russet. Abdomen with

[43] In spite of the evident considerable individual variation we believe, from our series of females of the other species of *Ateloplus*, that the female subgenital plate shows important diagnostic characters to distinguish most if not all of these.

very minute flecks of dark brown. Caudal femora externally with a narrow medio-longitudinal line of dark brown which disappears before reaching either end of the enlarged portion, apices extensively suffused with blackish brown before which the limb is buffy for an even greater distance.

The female allotype is marked very much like the male. The large immature male is paler, immaculate, clay color. The other female, a paratype, and the large immature female are maculate, grayish with a broad striking percurrent medio-longitudinal dorsal stripe of blackish brown much resembling the vittate color phase frequently developed in *luteus*.[44]

All of these specimens have the caudal femora marked as described for the male type except the very recessively colored immature male in which all trace of such marking is lost.

The measurements of the adults before us are as follows, those of the allotype being given last: length of body ♂ 23., ♀ (abdomen extruded in both) 23. and 22.3; length of pronotum ♂ 6.9, ♀ 6.6 and 6.2; greatest (meso-caudal) width of pronotum ♂ 6.6, ♀ 6. and 5.8; exposed length of tegmen ♂ 1.7; length of cephalic femur ♂ 6.4, ♀ 5.7 and 5.2; length of caudal femur ♂ 17.8, ♀ 16.7 and 16.; greatest width of caudal femur ♂ 4., ♀ 4. and 4.; length of ovipositor 12.7 and 10.1 mm.

In the immature male the cerci have the apical production of the shaft much weaker with tooth consequently more distal, much as in adults of *A. notatus* Scudder. This may be the normal shape of the male cercus in the instar preceding maturity.

Specimens Examined: 5; 1 male, 2 females and 2 immature individuals.

ARIZONA: Ash Fork, VI, 16, 1921, (C. D. Duncan), 1 large juv. ♂. Kingman, VIII, 16, 1920, (O. C. Poling), 1♀, *allotype*. Yucca, Mohave County, VI, 14, 1921, (C. D. Duncan), 1 large juv. ♀. Bill Williams Fork, 1903, (F. H. Snow), 1♂, *type*.

CALIFORNIA: Twenty-five miles west of Blythe, VIII, 18 and 19, 1927, (on Yucca), 1♀, *paratype*.

[44] Caudell described *Ateloplus luteus* from "Mohave, Arizona", the original pair taken by H. F. Wickham. These specimens agree extremely closely with a pair now before us from Mojave, California. We believe Wickham's specimens came also from that locality as most of his work was done in Nevada and California not far east of the mountains and there is no Mohave, Arizona, although there is a Mohave County. In that county we find *coconino*, a species which differs signally from *luteus* in both sexes, but the two are sufficiently closely related to occupy a very similar if not identical niche in their respective faunas and we very much doubt that one will be found to have to any extent coincident distribution with the other.

RHAPHIDOPHORINAE

Pristoceuthophilus arizonae new species. (Pl. VII, figs. 3 to 5.)

This species is particularly distinguished by having the male abdominal tergites smooth, the nearest approach to this condition in the other species of the genus is found in the Mexican *P. rhoadsi* Rehn, known only from an immature male in the Academy Collection, which specimen shows merest traces of tuberculation on the abdominal tergites, this however indicating that such tuberculation is more distinct in adults.

The male cerci are unspecialized as in *rhoadsi, P. pacificus* (Thomas) and *P. marmoratus* (Rehn). The caudal femora are very heavy, particularly in the male which sex shows a very large heavy external and internal tooth on the ventral margins as in *pacificus* (and sometimes in *marmoratus*). The male caudal tibiae are as arcuate as in *pacificus* or *marmoratus,* with ventro-proximal swelling decidedly greater than is ever the case in those species. The tessellation of the body is quite as conspicuous as in *marmoratus.* The labrum is not swollen, this being a conspicuous feature in both sexes of *marmoratus.* The male pseudosternite and penis are distinctive.

Type.— ♂ ; North slopes of Santa Catalina Mountains, south of Oracle, Arizona. Elevation 9300 feet. September 5 to 7, 1931. (E. R. Tinkham). [Hebard Collection, Type no. 1200].

Size small, limbs rather short, caudal femora very robust for the genus. Vertex a blunt deflexed spine, as characteristic of the genus. Antennae comparatively not elongate, not much longer than the body. Clypeus moderately convex, (not greatly swollen as is the case in *marmoratus*). Palpi very elongate, the ultimate joint curved and one and two-fifths times as long as the preceding joint. Apterous. Dorsal surface smooth and shining, without trace of tuberculation. Cerci simple, tapering, segments distinct only distad. Tenth tergite rather strongly concave mesad. Narrow chitinous margin of pseudosternite produced mesad as a narrow lamella with apex formed by two triangular projections. Below this is the large soft penis, thickly covered with very minute spinulae. Subgenital plate convex, rounded angulate emarginate between the short straight socketed styles. Cephalic and median femora with ventro-cephalic margin armed distad with (0 to 2 in series) small spines. Caudal femora short and extremely inflated, dorsal and a latero-distal area thickly armed with very small short teeth, similar teeth thickly scattered along the ventro-external

margin; ventral margins not lamellate, armed distad each with a single very large tooth, the internal of these the largest and not as near the apex of the limb. Caudal tibiae violently curved dorsad in meso-proximal portion, before which the ventro-proximal surface is produced in a large rounded-triangular lamellation; dorsal margins armed with 4 rather short spines between which are (5 to 7) regular minute teeth. Spurs not very elongate, the longest (meso-internal) about two-thirds as long as the metatarsus. Pulvilli occupying all of ventral surfaces of the tarsal joints. Arolium absent.

Allotype.— ♀ ; same data as type. [Hebard Collection].

Slightly smaller than male (as is the average throughout the series). Tenth tergite little impressed. Ovipositor slender, short, weakly recurved, disto-ventral serrations of working valves very shallow and very broad. Subgenital plate very small, rounded triangular. Caudal femora smooth except for a few minute teeth distad on ventro-internal margin. Caudal tibiae straight and unspecialized proximo-ventrad.

Coloration chestnut brown flecked with buffy, this rather generally distributed, but pronotum, mesonotum and metanotum sometimes appearing somewhat banded, due to the greater number and crowding of the darker areas caudad. Limbs buffy, the caudal femora and tibiae mottled with brown, the darkest markings usually along the ventro-median line of the external surface of the caudal femora (not along their ventro-external margins as is the case in *rhoadsi,* where there are very dark and conspicuous markings).

Decided size variation, apparently usual in the species of this genus, is shown by the series of paratypes, the measurements of which are as follows. Length of body ♂ 9.2 to 12.6, ♀ 10. to 12.8; length of pronotum ♂ 2.7 to 2.9, ♀ 2.8 to 3.3; length of cephalic femur ♂ 3.7 to 4.2, ♀ 3.6 to 4.1; length of caudal femur ♂ 7.7. to 10., ♀ 7.7 to 8.5; width of caudal femur ♂ 2.8 to 3.8, ♀ 2.8 to 3.1; length of ovipositor 5.3 to 6. mm. The size of the series before us averages only a little below the maximum given above. It is to be remembered in studying the species of *Pristoceuthophilus* that the armament of body and caudal femora and curvature and specialization of the caudal tibiae in males appears only in the late instars of immaturity and is far more pronounced in the adult normally than in the instar preceding maturity, but that adult males in many, if not all of the species, may occasionally be far less highly specialized along these lines than is normal for their species, and such specimens usually show some or decided depauperation.

Specimens Examined: 39; 14 males, 15 females and 10 immature individuals.

ARIZONA: Chiricahua Mountains, 8900 feet, IX, 12 to 14, 1931, (E. R. Tinkham), 3♂, 3♀, [Hebard Cln.]. Santa Rita Mountains, IX, 5, 1933, (E. D. Ball), 2♂, [Univ. of Arizona and Hebard Cln.]. Madera Canyon, Santa Rita Mountains, 4900 to 5000 feet, IX, 24, 1924, (M. Hebard; one under can among dead oak leaves, one between granite boulders, two on or near dead oak stumps, all in low oak forest of canyon bottom), 1♂, 3♀, IX, 10, 1931, (E. R. Tinkham), 1 very small juv. ♂, [Hebard Cln.]. North slope of Santa Catalina Mountains, south of Oracle, 9300 feet, IX, 6 and 7, 1931, (E. R. Tinkham), 8♂, 8♀, *type, allotype, paratypes,* 5 juv. ♂, 3 juv. ♀, 1 very small juv., [Hebard Cln.].

GRYLLIDAE

GRYLLINAE

In considering a new species from Arizona before us we at once recognized its affinity to *Gryllodes toltecus* Saussure, but realized also the wide difference between these species and the genotype *G. sigillatus* (Walker). Turning to the literature we find that though *sigillatus* has been distributed throughout the tropics of the World (apparently by commerce) and in 1906 was selected by Kirby as genotype of *Gryllodes* Saussure 1874, little or no attention has been paid it by the describers of the very many species which have been referred to this genus. Its synonyms are *Gryllus pustulipes* Walker 1869, *Gryllodes poeyi* Saussure 1874, *Homaloblemmus indicus* Boliver 1900, *Miogryllus transversalis* Scudder 1901 and *Gryllodes subapterus* Chopard 1912.

Though *Gryllodes* long remained the repository for many widely distinct species, Chopard has in recent years vastly improved the situation by proposing *Itaropsis* in 1925, *Eugryllus* in 1927 (thereby removing all of the European and a number of other Old World species) and *Gryllopsis* in 1928.

In our studies of *Miogryllus* Saussure 1877 which were published in 1915 we noted that many of the American species which had been referred to *Gryllodes* were referable to that genus and established a number of synonyms. It is now clear that the new genus *Gryllita,* here proposed, is actually very much nearer *Miogryllus* than *Gryllodes.*

Material of all the genera concerned is before including the genotypic species of all but *Gryllopsis.* These genera may be distinguished as follows:

1. General appearance unlike *Gryllomorpha*. Form compact. Caudal femora proportionately shorter. Caudal tibiae with disto-external spine shorter than the dorso-external spur.....2

General appearance very similar to *Gryllomorpha*. Form less compact, depressed. Caudal femora proportionately longer. Caudal tibiae with disto-external spine longer than the dorso-external spur. (Head not large, obliquely flattened. Pronotum (and mesonotum of female) transversely vittate. Pronotum widening little caudad. Mediastine vein of male tegmina branched distad.)

Gryllodes Saussure

Genotype, *G. sigillatus* (Walker)

2. Male tegmina with two oblique veins. New World genera. (Pronotum widening little caudad. Head quite evenly rounded, normally [45] not large.).....3

Male tegmina with over two oblique veins. Old World genera.....4

3. Coloration quite uniform, without markings, appearance glabrous, occiput never with vertical vittae, lateral lobes of pronotum never bicolored. Appearance definitely Grylloid but, to different degrees in different species, suggesting such Phalangopsine genera as *Gryllosoma* Hebard and *Tairona* Hebard.

Gryllita new genus

Genotype, *G. arizonae* new species

Coloration not uniform, frequently tessellate, appearance not glabrous, occiput (except in decidedly intensively colored individuals) with vertical vittae, lateral lobes of pronotum usually particolored (except in *convolutus*). Appearance definitely Grylloid, the smaller species (of which *convolutus* is the smallest) suggesting the Nemobiine genus *Nemobius* Serville.....*Miogryllus* Saussure [46]

Genotype, *M. convolutus* (Johansson)

4. Coloration paler, with dark markings. Appearance Grylloid. Head full and rounded. Pronotum widening little caudad. Caudal femora short and very robust.....5

Coloration dark, without markings, appearance glabrous. Appearance Eneopteroid. Head comparatively small. Pronotum of male [47] widening strongly caudad. Caudal femora not as robust. (Male tegmina very fully developed, not at all reduced distad).

Itaropsis Chopard

Genotype, *I. parviceps* (Walker)

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[45] Except in rare individuals of *Miogryllus verticalis* (Serville) and *Miogryllus lineatus* (Scudder) in which very strong megacephalism occurs.

[46] This genus was studied by the author in 1915, Jour. New York Ent. Soc., XXIII, pp. 101 to 121.

[47] The female sex, just received through the kindness of L. Chopard, has the pronotum little widened caudad and, as in *Anurogryllus*, the ovipositor is barely visible.

5. Form robust. Head pale with longitudinal darker stripes.
Eugryllus Chopard
Genotype, *E. pipiens* (Dufour)

Form very robust. Head with dark transverse bands.
Gryllopsis Chopard
Genotype, *G. niloticus* (Saussure)

The logical sequence of these and related genera is as follows: *Acheta, Gryllus, Miogryllus, Gryllita, Eugryllus, Gryllopsis, Itaropsis, Anurogryllus.*

The Genus *Gryllita* includes *arizonae* here described, the Mexican *tolteca* (Saussure) and *forcipata* (Saussure). To it may also belong *Gryllodes rufipes* Redtenbacher, described from St. Vincent, a large species in which the female has lobiform tegminal pads. In addition three undescribed Costa Rican species are before us representing this or a very closely allied genus.

On the other hand the unicolored *Miogryllus tucumanensis* Giglio-Tos from South America can apparently not remain in that genus, but its proper generic association can not be determined from the original description.

Gryllita arizonae new species (Pl. VII, figs. 6 to 8.)

Nearest *G. tolteca* (Saussure), this species may be easily separated by its smaller size, paler head and pronotum, male tegmina much less abbreviate and not at all truncate so that only the tip of the subgenital plate is exposed and female apterous with ovipositor proportionately much longer and with differently specialized apex.

In *G. forcipata* (Saussure) the male has even more reduced tegmina than in *tolteca* and in both the titillatores are very differently specialized.

Type.— ♂ ; Hendricks Canyon, Baboquivari Mountains, Arizona. Elevation 3200 feet. September 14, 1924. (M. Hebard). [Hebard Collection, Type no. 1280].

Size rather small for the genus, form moderately robust, limbs short, caudal femora robust though slightly less so than in *tolteca*. Head similar, small, quite evenly rounded, facial projection not decided, eyes rather small. Lateral ocelli large, the median ocellus very small, these forming a triangle the base of which is nearly three times its height. Palpi elongate,

considerably more elongate than in *tolteca*. Pronotum with a very delicate medio-longitudinal sulcus, cephalic margin broadly concave, caudal margin transverse but showing very feeble convexity, lateral lobes deeper cephalad than caudad. Tegmina very ample, the apex of the subgenital plate alone projecting beyond them; dorsal fields flat, broader than body, lateral margins very weakly convex and rounding into the caudal margin which is more strongly convex; two oblique veins present, mirror large and lacking a transverse vein; lateral fields deep, the mediastine vein with a single delicate distal branch, five (and sometimes six) free veins present. Wings absent. Titillatores short, not visible unless dissected out,[48] their sides converging to the truncate apex which is deeply hollowed out and is bordered by very small blunt points which curve slightly inward and thus roughly suggest the empty setting of a ring. Subgenital plate truncate conical, longer than its greatest width. Cephalic tibiae with very large oval auditory foramen on caudal face only. Caudal femora armed dorsad with six external and five (or six) internal spines and three pairs of distal spurs of which the dorso-internal is very long and the medio-internal slightly longer. Caudal metatarsus with dorsal margins each armed with (six to eight) very small teeth.

Allotype.— ♀ ; Schaeffer Canyon, Baboquivari Mountains, Arizona. Elevation 5200 feet. September 18, 1924. (M. Hebard). [Hebard Collection].

Longer and more cylindrical than male. Lateral ocelli not as large. Pronotum no wider caudad than cephalad. Organs of flight absent. Ovipositor straight, comparatively fairly thick, almost as long as the caudal femur, its apex spear-headed but the upper and lower portions deeply divided much as in *toltecus,* but the dorsal portion is slightly deflexed and the lower portion lacks the distinctive quadrate flange meso-proximad on its dorsal margin shown by *toltecus.*[49]

Head, pronotum and ovipositor rich shining chestnut, limbs often very slightly paler, palpi still paler. Abdomen in the male (concealed) shining blackish brown, the mesothorax and metathorax buffy; in the female (exposed) only slightly less glossy blackish brown. Male tegmina transparent strongly suffused with bister but with dorsal portions of lateral fields (and particularly the veins there) dull bay.

The series before us shows the following extremes in measurements, the allotype being the second female: length of body ♂ 12.4 to 13.7, ♀ 12.8 and 13.4; length of pronotum ♂ 2.7 to 3.3, ♀ 3.5 and 3.3; caudal width of pronotum ♂ 3.8 to 4.7, ♀ 3.9 and 4., length of tegmen ♂ 7.1 to 7.7, width of

[48] In *tolteca* the slender apex of the titillatores projects briefly.

[49] See Saussure, Biol. Cent.-Amer. Orth., I, pl. 2, fig. 28.

tegminal dorsal fields ♂ 4.8 to 5.6; length of caudal femur ♂ 8.3 to 9.2, ♀ 9.5 and 9.3; greatest width of caudal femur ♂ 2.8 to 3., ♀ 3.2 and 3.2; length of ovipositor 9. and 9. mm.

Specimens Examined: 6; 4 males and 2 females.

ARIZONA: Schaeffer Canyon, Baboquivari Mountains, 5200 feet, IX, 18, 1924, (M. Hebard), 1♀, *allotype*. Hendricks Canyon, Baboquivari Mountains, 3200 feet, IX, 14, 1924, (M. Hebard), 4♂, *type* and *paratypes*. South slopes of Atascosa Peak, Pajaritos Mountains, 5100 feet, IX, 22, 1924, (J. A. G. Rehn; at light at night), 1♀, *paratype*.

This insect was first heard after dark on September 14, 1924, its song a "tschritt" given at short intervals and only moderately loud but high-pitched, resonant and penetrating. About a dozen were heard, all on the floor of the canyon over a distance of one-half mile. All located were near the summits of granite boulders in depressions or crevices. Individuals remained motionless when approached very closely with the hand but attempts to put a finger suddenly down upon them failed several times as they leap with lightning-like agility. Had they not been so fearless, stridulating until closely approached and remaining motionless almost always until an actual attempt at seizure was made, they would have been almost impossible to capture. Their dark color was in sharp contrast to the light-colored boulders when the light was thrown on them. On September 18 a female was found after dark resting on the face of a granite ledge beside a wash and one male was seen there but none were stridulating.

EXPLANATION OF PLATES

PLATE IV

Fig. 1.—*Blattella vaga* new species. Cephalic view of male head. *Type*. Phoenix, Arizona. (X 10.)

Fig. 2.—*Blattella vaga* new species. Dorsal view of male pronotum. *Type*. Phoenix, Arizona. (X 7.)

Fig. 3.—*Blattella vaga* new species. Dorsal view of male supra-anal plate. *Type*. Phoenix, Arizona. (X 15.)

Fig. 4.—*Blattella vaga* new species. Ventral view of male subgenital plate. *Type*. Phoenix, Arizona. (X 15.)

Fig. 5.—*Pseudovates arizonae* new species. Dorsal view of female head. *Type*. Baboquivari Mountains, Arizona. (X 4½.)

Fig. 6.—*Pseudovates arizonae* new species. Dorsal (or caudal) view of median limb of female. *Type*. Baboquivari Mountains, Arizona. (X 3.)

Fig. 7.—*Pseudovates arizonae* new species. Lateral outline of marginal field of female tegmen. *Type*. Baboquivari Mountains, Arizona. (X 1½.)

Fig. 8.—*Eumorsea balli* new genus and species. Dorsal view of male head and pronotum. *Type*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 9.—*Eumorsea balli* new genus and species. Lateral view of male head and pronotum. *Type*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 10.—*Eumorsea balli* new genus and species. Cephalic view of male head. *Type*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 11.—*Eumorsea balli* new genus and species. Cephalic view of female head. *Allotype*. Ramsey Canyon, Huachuca Mountains, Arizona. (X 7.)

Fig. 12.—*Ageneotettix deorum curtipennis* Bruner. Lateral view of male tegmen. Prescott, Arizona. (X 7.) (To show maximum tegminal development at that locality.)

Fig. 13.—*Ageneotettix deorum curtipennis* Bruner. Lateral view of male tegmen. Prescott, Arizona. (X 7.) (To show normal tegminal development at that locality.)

Fig. 14.—*Ageneotettix deorum curtipennis* Bruner. Lateral view of female. Bill Williams Mountain, Arizona. (X 3.) (To show appearance of individual in which great brachypterism is developed.)

Plate V

Fig. 1.—*Perixerus gloriosus* new species. Lateral outline of male cercus. *Paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (Much enlarged.)

Fig. 2.—*Perixerus gloriosus* new species. Penis of *paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (Greatly enlarged.)

Fig. 3.—*Perixerus gloriosus* new species. Dorsal view of female. *Allotype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (X 3.)

Fig. 4.—*Insara tessellata* new species. Dorsal view of male. *Type*. Wheeler Canyon, Hualapai Mountains, Arizona. (X 2½.)

Fig. 5.—*Insara tessellata* new species. Lateral view of female. *Allotype*. Boulder Spring, Arizona. (X 2½.)

Fig. 6.—*Arethaea coyotero* new species. Dorsal view of male cercus. *Type*. Prescott, Arizona. (X 16.)

Fig. 7.—*Arethaea gracilipes papago* new subspecies. Dorsal view of male cercus. *Type*. Growler Valley, Arizona. (X 16.)

Fig. 8.—*Arethaea polingi* new species. Dorsal view of male cercus. *Type*. Prescott, Arizona. (X 16.)

Fig. 9.—*Arethaea polingi* new species. Lateral view of ovipositor. *Paratype*. Prescott, Arizona. (X 8.)

Plate VI

Fig. 1.—*Arethaea coyotero* new species. Dorsal view of stridulating field of male tegmina. *Type*. Prescott, Arizona. (X 11½.)

Fig. 2.—*Arethaea coyotero* new species. Lateral view of ovipositor. *Allotype*. Prescott, Arizona. (X 8.)

Fig. 3.—*Arethaea gracilipes papago* new subspecies. Dorsal view of stridulating field of male tegmina. *Type*. Growler Valley, Arizona. (X 11½.)

Fig. 4.—*Arethaea gracilipes papago* new subspecies. Caudal view of specialization of first abdominal tergite of male. *Type*. Growler Valley, Arizona. (Greatly enlarged.)

Fig. 5.—*Arethaea gracilipes papago* new subspecies. Lateral view of dorsal portion of first abdominal tergite of male. *Type*. Growler Valley, Arizona. (Greatly enlarged.)

Fig. 6.—*Arethaea gracilipes papago* new subspecies. Lateral view of ovipositor. *Allotype*. Growler Valley, Arizona. (X 8.)

Fig. 7.—*Arethaea gracilipes gracilipes* (Thomas). Caudal view of specialization of first abdominal tergite of male. *Topotype*. Trinidad, Colorado. (Same scale as Fig. 4.)

Fig. 8.—*Arethaea polingi* new species. Dorsal view of stridulating field of male tegmina. *Type*. Prescott, Arizona. (X 11½.)

Fig. 9.—*Arethaea polingi* new species. Lateral view of dorsal portion of first abdominal tergite of male. *Type*. Prescott, Arizona. (Same scale as Fig. 5.)

Fig. 10.—*Microcentrum californicum* Hebard. Dorsal view of male. Lower Madera Canyon, Santa Rita Mountains, Arizona. (Slightly over X 1½.)

Fig. 11.—*Microcentrum californicum* Hebard. Dorsal view of male cercus. Lower Madera Canyon, Santa Rita Mountains, Arizona. (Much enlarged.)

Fig. 12.—*Microcentrum californicum* Hebard. Lateral view of female. Paradise, Arizona. (X 1½.)

Plate VII

Fig. 1.—*Ateloplus coconino* new species. Dorsal view of distal portion of male supra-anal plate and of cerci. *Type*. Bill Williams Fork, Arizona. (X 11½.)

Fig. 2.—*Ateloplus coconino* new species. Ventral view of female subgenital plate. *Allotype*. Kingman, Arizona. (X 11½.)

Fig. 3.—*Pristoceuthophilus arizonae* new species. Dorsal view of male. *Type*. North slopes of Santa Catalina Mountains, near Oracle, Arizona. (X 3.)

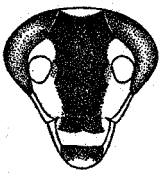
Fig. 4.—*Pristoceuthophilus arizonae* new species. Lateral (external) view of caudal limb of male. *Type*. North slopes of Santa Catalina Mountains, near Oracle, Arizona. (X 3⅗.)

Fig. 5.—*Pristoceuthophilus arizonae* new species. Caudal view of chitinized portion of male pseudosternite. *Paratype*. North slopes of Santa Catalina Mountains, near Oracle, Arizona. (Greatly enlarged.)

Fig. 6.—*Gryllodes arizonae* new species. Dorsal view of male. *Paratype*. Hendricks Canyon, Baboquivari Mountains, Arizona. (X 3).

Fig. 7.—*Gryllodes arizonae* new species. Dorsal view of female. *Paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (X 3.)

Fig. 8.—*Gryllodes arizonae* new species. Lateral view of distal portion of ovipositor. *Paratype*. South slopes of Atascosa Peak, Pajaritos Mountains, Arizona. (X 3.)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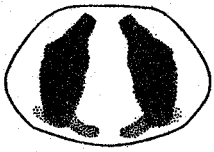
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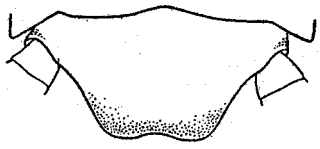
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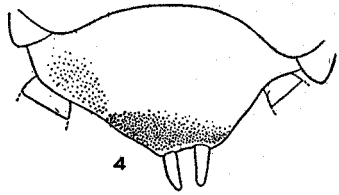
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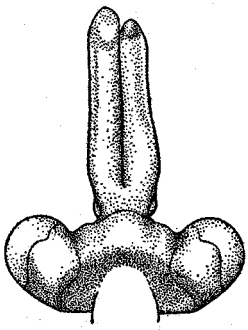
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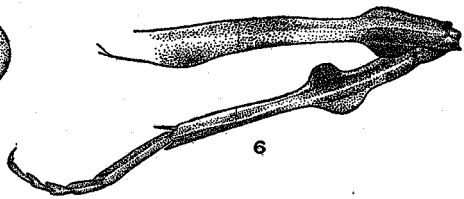
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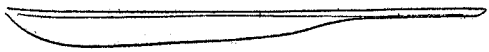
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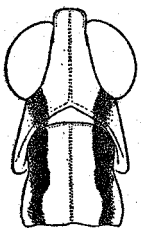
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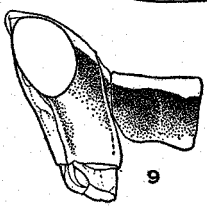
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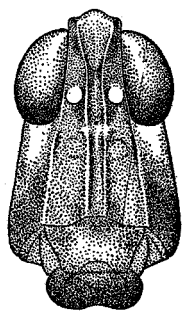
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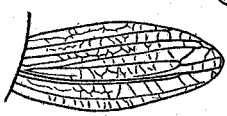
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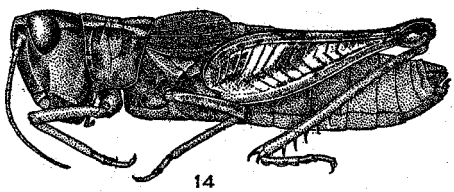
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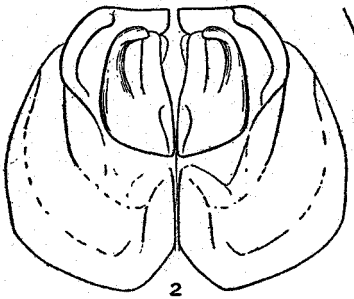
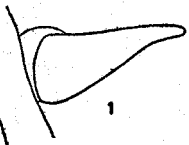
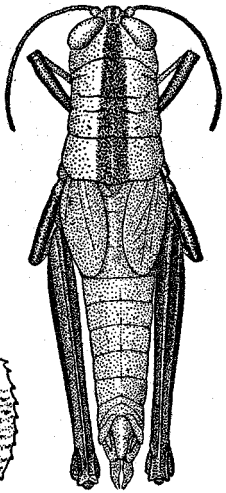
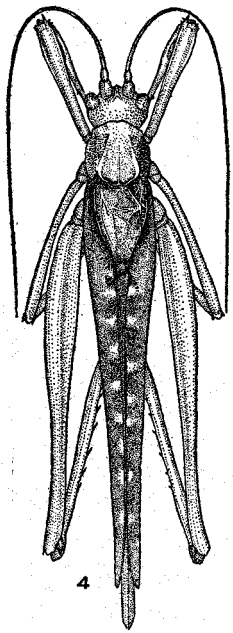
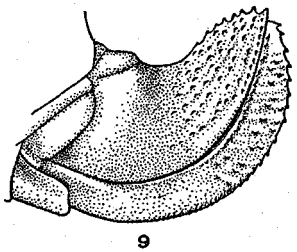
HEBARD—ARIZONA ORTHOPTERA

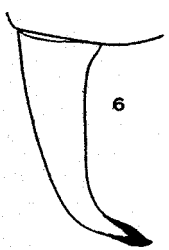


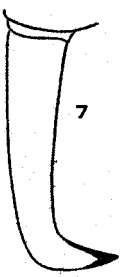


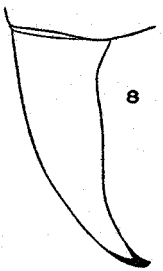


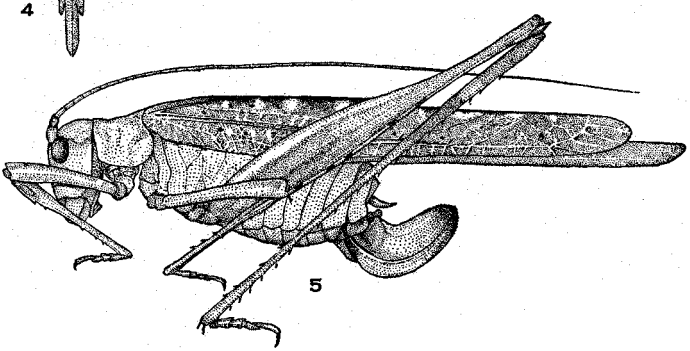


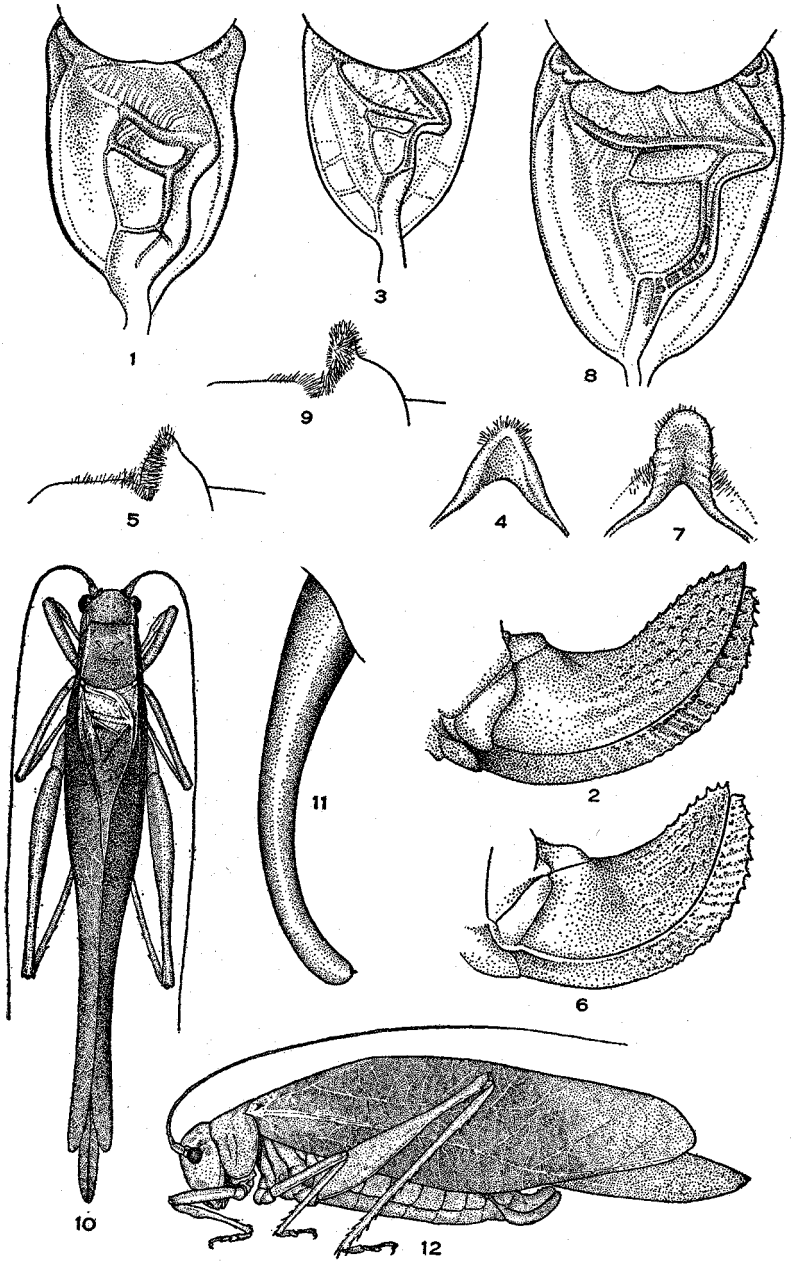




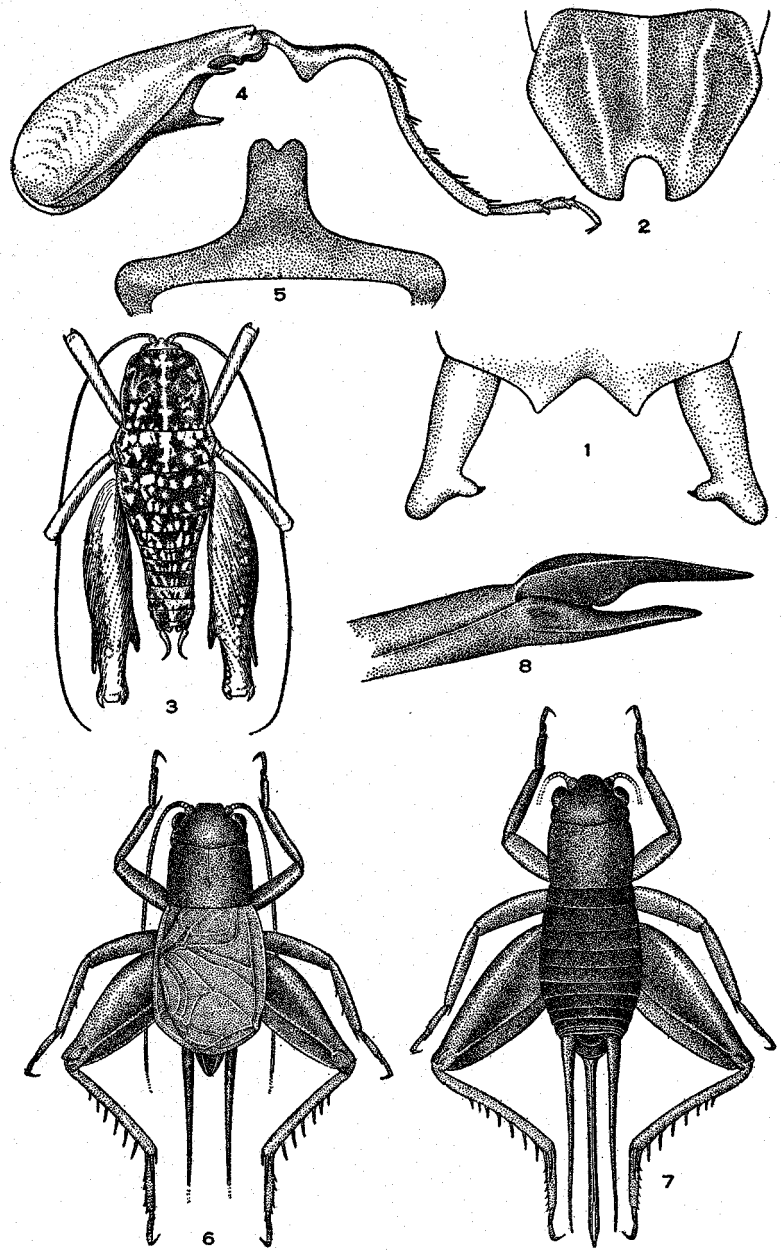








HEBARD—ARIZONA ORTHOPTERA



HEBARD—ARIZONA ORTHOPTERA